CONCEPTUAL SITE MODEL

Titanium Metals Corporation Facility

Henderson, Nevada

Submitted to

Nevada Division of Environmental Protection

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April 25, 2007

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CONCEPTUAL SITE MODEL

Titanium Metals Corporation
Henderson, Nevada

April 25, 2007

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April 25, 2007

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ABBREVIATIONS AND ACRONYMS

µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
ACM	Asbestos-containing material
AOC	Administrative Order of Consent
AST	Aboveground storage tank
ATC/OP	Authority to Construct/Operating Permit
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below ground surface
BHC	Benzene hexachloride
BMI	Black Mountain Industrial Complex
BRC	Basic Remediation Company
CO	Carbon monoxide
COC	Chemical of concern
COPC	Chemical of potential concern
CRC	Colorado River Commission
CSD	Continuous sludge dryer
CSM	Conceptual site model
DAF	Dilution attenuation factor
DAQEM	Department of Air Quality & Environmental Management
DCE	1,1-Dichloroethene
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
DO	Dissolved oxygen
DRI	Desert Research Institute
ECA	Environmental conditions assessment
ECI	Environmental conditions investigation
ECIA	Environmental conditions investigation addendum
EPA	U.S. Environmental Protection Agency
ERM	Environmental Resources Management
ESA	Environmental site assessment
ft/day	Feet per day
ft/ft	Feet per foot
GM	Silty gravels, gravel-sand-silt mixture
GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
gpm	Gallons per minute
GSA	General Services Administration

ABBREVIATIONS AND ACRONYMS (Continued)

HAP	Hazard air pollutants
Kerr-McGee	Kerr-McGee Chemical Corporation
LOU	Letter of understanding
MCL	Maximum contaminant level
mgd	Million gallons per day
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
Montrose	Montrose Chemical Corporation
msl	Mean sea level
MWH	Montgomery Watson Harza
NAC	Nevada Administrative Code
NAPL	Nonaqueous-phase liquid
NCCW	Noncontact cooling water
NDEP	State of Nevada, Division of Environmental Protection
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
NSA	Northern Storage Area
OPW	Other process wastewater
ORP	Oxidation-reduction potential
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
pCi/L	Picocuries per liter
Pepcon	Pacific Engineering and Production Company
Pioneer	Pioneer Chlor Alkali Company, Inc.
PM_{10}	Particulate matter 10 microns and smaller
PQL	Practical quantitation limit
PSA	Potential source area
RWQCB	Regional Water Quality Control Board
SNWA	Southern Nevada Water Authority
SM	Silty sands, sand-silt mixture
SP	Poorly graded sands or gravelly sands, little or no fines
SQL	Sample quantification limit
SRC	Site-related chemical
Stauffer	Stauffer Management Company, Inc.
SVOC	Semivolatile organic compound

ABBREVIATIONS AND ACRONYMS (Continued)

SW	Well-graded sands, gravelly sands, little or no fines
SWPPP	Stormwater Pollution Prevention Plan
TCE	Trichloroethene
Tetra Tech	Tetra Tech EM Inc.
TIMET	Titanium Metals Corporation
TPH	Total petroleum hydrocarbons
USCS	Unified Soil Classification System
USPHS	U.S. Public Health Service
UST	Underground storage tank
VC	Vinyl chloride
VDP	Vacuum Distillation Process
VOC	Volatile organic compound
Wash	Las Vegas Wash
WECCO	Western Electrochemical Company
WRF	Water Reclamation Facility

1.0 INTRODUCTION

Titanium Metals Corporation (TIMET) has prepared this document to address the State of Nevada, Division of Environmental Protection's (NDEP) request for a conceptual site model (CSM) of the TIMET facility in Henderson, Nevada ("the Plant Site"). The purpose of this CSM is to enable stakeholders from all disciplines to communicate effectively with one another, resolve issues concerning the site, and facilitate the decision-making process. This document follows the guidelines set forth in ASTM International's "Standard Guide for Developing Conceptual Site Models for Contaminated Sites" (ASTM International 2003). As such, this document was written to achieve the following objectives: (1) integrate technical information from various sources, (2) identify data needs and serve as a guide for future data collection activities, and (3) evaluate (qualitatively) the risk to human health and the environment posed by a contaminated site. Major components of the CSM are addressed throughout this document in the following manner:

- Evaluation of the limits of the study area or system boundaries are presented in Sections 1.0 and 2.0
- Identification of potential chemicals, as well as characterization of chemical sources, is presented in Section 3.0
- Delineation of potential migration pathways through environmental media is presented in Section 4.0 on an analyte-by-analyte basis and generalized in Section 5.0 by source area
- Establishment of background chemical concentrations for each contaminated medium was addressed in the Basic Remediation Company (BRC)/TIMET Background Report (BRC 2006) and is synopsized in Section 4.2
- Identification and characterization of potential environmental receptors are presented in Section 5.0
- Identification of data needs is presented in Section 6.0

TIMET submitted a preliminary CSM in June 2004 (Tetra Tech EM Inc. [Tetra Tech] 2004d), which was used to guide the collaborative background investigation undertaken by BRC and TIMET and the hydrogeologic characterization undertaken in late 2005 and early 2006 by TIMET. Appendix A summarizes the field activities performed during the hydrogeologic characterization, and Appendix B presents the data validation results of this document.

1.1 SITE LOCATION

The TIMET facility, which is part of the Black Mountain Industrial (BMI) Complex, is located in the City of Henderson in unincorporated Clark County, Nevada, near the southeast margin of Las Vegas Valley. Figure 1-1 shows the location of the TIMET facility. The study area of the CSM is defined by the TIMET property boundaries (Plant Site) and off-site areas based on an analysis of exposure pathways. Figure 1-2 presents the Plant Site and surrounding areas of interest. Groundwater impacted by industrial activities from the BMI Complex discharges at a seep along the Las Vegas Wash (Wash); as a result, the boundary of the CSM is defined by areas located within the southern portion of the Wash watershed between US 93/95 and Lake Mead Drive.

1.2 PRINCIPAL SITE FEATURES

Over the years, the Plant Site was divided into subareas using various classification methods. Site features were identified by their remedial investigation study boundaries, remedial action boundaries, legal property description, or functional purpose.

The TIMET Plant Site comprises 108 acres and includes various operational buildings. A composite list of active and inactive facility features at the Plant Site is provided below and shown on Figure 1-3.

- Management and operations buildings
- Process buildings and units
- Maintenance shops
- Landfills
- Material and equipment storage areas
- Retention/evaporation ponds and tanks
- Interior and perimeter roadways
- Railroad tracks

Features of the TIMET Plant Site are described in detail in the Phase I Environmental Conditions Assessment (ECA) Report (Law Engineering, Inc. 1993) and the Final Phase II Environmental Conditions Investigation (ECI) and Draft ECI Addendum Reports (Tetra Tech 1998, 1999, respectively). The following sections of this document discuss those site features where a potential chemical release may have occurred.

1.3 OPERATIONAL HISTORY

Prior to 1941, the TIMET Plant Site and surrounding area was undeveloped desert. In response to the outbreak of World War II, the United States military established a substantial aircraft-purchasing program. Because magnesium metal was a crucial component in aircraft production, the United States government took action to ensure the supply of magnesium by deeding 5,000 acres in the southeast quadrant of the Las Vegas Valley for the manufacture of magnesium metal.

1.3.1 United States Government

On August 1, 1941, the United States government entered into an agreement with Basic Magnesium, Inc. for the construction of magnesium facilities, which were designated Plancor 201 (BRC 2006). After many complications in engineering and construction management, the plant began operation in August 1942 and went into full production in July 1943. With the war coming to an end and the magnesium supply increasing, the demand for magnesium declined, thus ending the operation of the magnesium plant in November 1944.

The government's agreement with Basic Magnesium, Inc. for the operation of the plant was terminated when J.M. Montgomery & Co., Inc. took over supervision of the facilities in May 1945 (BRC 2006). In 1949, the magnesium plant was transferred to the Colorado River Commission (CRC) by the War Assets Administration; and in 1951, Basic Management, Inc. was formed to administer the property. Over the next several years, portions of the facilities were leased to various private industry companies. This began the gradual conversion of the magnesium plant into a private-sector manufacturing complex, currently referred to as the BMI Complex. An exhaustive recounting of the transactions was developed and reported in Section 2.0 of the BMI Common Areas Closure Plan, dated August 2006 (BRC 2006).

1.3.2 Titanium Metals

In 1950, TIMET was formed by a joint venture agreement between Allegheny Ludlum Steel Corporation and National Lead Company to manufacture titanium metal. TIMET planned to convert portions of the former magnesium plant facilities into what has become one of the world's largest manufacturers of titanium metal.

As part of its payment to the federal government, the CRC reassigned six leases to the General Services Administration (GSA) in January 1953 (BRC 2006). It was from the GSA that National Lead Company purchased the manufacturing facilities and property commonly referred to as the TIMET Plant Site.

Table 1-1 lists and Figure 1-4 depicts the land acquisition and conveyances involving TIMET, Allegheny Ludlum Steel Corporation, and National Lead Company.

TABLE 1-1: LAND ACQUISITIONS[1]

Date	From	To	Area
8/20/1957	BMI	TIMET	Portion of NW ¼ of Section 13 and Roadways around Building T-3.
9/4/1957	A.T. and Mildred Newell	TIMET	Portion of NW ¼ of Section 13.
3/2/1962	GSA	National Lead Company	Refineries J-1 and J-5.
4/28/1967	GSA	National Lead Company	Metals Units 7, 8, 9, and 10; Refinery Buildings J-1, J2, and J-5. Peat Buildings B-5 and S-14. Change House S-1 and the east half of Change House S-7. Cafeteria Building S-11, Canteen S-12, and Loading Platform J-12.
12/29/1967 and 1/20/1972	National Lead Company	TIMET	Fourteen parcels, Refinery Building J2, Canteens S-12 and S-14, Loading Platform J-12, Peat Building B-5, Ingot Refinery J-1, Billet Foundry J-5, and additional land.
4/17/1985 8/13/1980 4/13/1972	BMI	TIMET	Parcel 1 (62.8 acres); Parcel 2 (204.02 acres); Parcel 3 (197.6 acres).

Notes:

1 Source: BRC 2006

1.3.2.1 Lessees and Easements on Plant Site

Over the operational period of TIMET, various buildings and parcels of land were leased to industrial or commercial companies. Other portions of land were also transferred via easement to utility providers. Information on the tenants and easements granted has been compiled from the BMI Common Areas, BRC Closure Plan (BRC 2006), and the previous environmental site assessment (ESA) reports described in Section 1.4.1. Table 1-2 lists the various companies, areas occupied, and their associated operations.

TABLE 1-2: LESSEES ON PLANT SITE

Company	Area	Operations[1]
1400 Corporation	T-52, storage vault, KBMI Radio Tower	Operated a radio station in 1963.
BMI Complex Headquarters	Fire Station Building S-10 and Building T-1	Occupied office space used to perform various complex-wide maintenance activities in July 1961.
Chemtec Corporation	Building K-55	Occupied building from 1975 to 1978. Site operations consisted of a possible pilot plant and small laboratory.
City of Henderson	TIMET ballpark	Operated a municipal baseball park in April 1959.
Coyote Construction (Wirthlin Trenching)	Building S-17 (gatehouse) and 1 acre of land	Occupied the gatehouse for a period of 1 year (1978 to 1979). Site operations were not documented.
Frank Briscoe Company	B-5, including railroad track 5	Operated equipment and rail area for the unloading of filter media materials for 60 to 90 days in 1980.
Magnesite Truck Company	Building T-30	Occupied building from 1951 (possibly) to late 1956 when building was demolished as indicated in aerial photography. Operations were not documented.
Musical Arrangements, Inc.	Building K-3	Operations consisted of making music tapes in April 1972.
National Sound Corporation	Building K-55	In 1972, leased the building for a period of 2 months with no documented site operations.
Per Boy Associates	Southwest quarter of Section 7	Conducted unknown activities in June 1965
Pioche Manganese Company	Refinery Building J2, Metal Unit 10, East one-half of Change House S-17, Canteen S-12, and Loading Platform S-12 (originally leased to Combined Metals Reduction)	From 1951 to 1956, operation of Combined Metals Reduction Company were likely related to the production of ferro-manganese alloys and were similar in nature to Pioche Manganese (Henderson Steering Committee ECA, pg. 14). Pioche Manganese Company used a portion of the leased area for storage of manganese slag storage. Pioche processed ore supplied by Three Kids' Mine. The company operated an arc (carbon electrode) furnace for ore processing to produce manganese and process slag, which were stockpiled in an area north and east of Building J2.
Rosecrest Cabinets	Half of Building K-32	Operated in October 1973 to 1989 likely manufacturing cabinets.
TIMET Employees Federal Credit Union	Building K-32	Leased office space in March 1968.

TABLE 1-2: LESSEES ON PLANT SITE (continued)

Company	Area	Operations[1]
Henderson Telephone Company	Building K-32	Leased facilities until 1954; no manufacturing processes appear to have occurred.
M. Zenoft (lease assigned to Television Company of America)	Portion of Building K-32	Leased facilities for a radio station in September 1953.
Western Area Power Administration	Yard 3 of Basic Substation; utility easement that extended in east to west direction just south of manufacturing unit buildings.	The Bureau of Reclamation operated an electrical substation from 1942 through 1976. Since that time, the Western Area Power Administration operated the facility.
Basic Power	Cable control tunnel (2,900 feet long) which is part of the Basic Substation	Leases the use of the cable control tunnel for electrical transmission lines
Southern Nevada Power Company	Utility easements	From 1950 to current, maintained power and communication easements.

Notes:

1 Operational time frame is approximated from multiple sources and provided as a contextual frame of reference; in some instances, exact time frames could not be ascertained.

1.3.2.2 TIMET Activities

The principal products manufactured by TIMET are titanium ingots, titanium tetrachloride, titanium sponge, and titanium fines. The titanium manufacturing processes, including process flow diagrams and major modifications that have occurred over time, are summarized in Section 3.0. The manufacturing process results in the generation of both solid and liquid waste streams that were managed and disposed of on the Plant Site and off site. Facility waste streams and on-site management practices and facilities are described in Section 3.0.

Historically, TIMET operated the Pabco Road Ponds, which are located on the northeast side of Boulder Highway, approximately 2,000 feet north-northeast of the Plant Site. The Pabco Road Ponds were originally part of the former wastewater effluent ponds and conveyance ditches (Alpha and Beta Ditches) into which various wastewaters from the BMI Complex were discharged from the early 1940s through 1976. From the 1940s to the mid-1970s, the unlined Upper and Lower Ponds were used as evaporation ponds of process effluent from the BMI Complex. TIMET built 31 lined ponds on top of the southwestern portion of the Upper Ponds from 1976 to 1982. The ponds received four waste streams generated as process effluent from the facility. The waste streams included effluent from the continuous sludge dryer (CSD), leach liquor, other process wastes (OPW), and spent caustic. This process effluent was piped to permitted ponds in the Pabco Road Ponds Area for neutralization and evaporative treatment.

As part of the Liability Transfer and Assumption Agreement between TIMET and BRC, BRC is responsible for characterizing and remediating the contents of the active ponds in the Pabco Road Ponds Area and any residual soil contamination and resultant groundwater impacts. In order for BRC to effectively characterize and remediate contaminants in the Pabco Road Ponds Area, TIMET had to eliminate the discharge of their process effluent to the Pabco Road Ponds. As a result, TIMET elected to construct a Wastewater Conservation Facility (WCF) on the Plant Site. The purpose of the WCF was to treat process effluent on site and, in doing so, discontinue the use of the ponds in the Pabco Road Ponds Area. Following construction and start-up of the WCF in 2005, TIMET ceased all use of the Pabco Road Ponds and sold this property to the Landwell Company. BRC, hired by Landwell Company, is responsible for performing any and all necessary investigations concerning the Pabco Road Ponds Area and remediating any pollution conditions at, on, under, or emanating from this property. As such the Pabco Road Ponds Area is not included within the boundaries of this CSM.

1.4 REGULATORY FRAMEWORK

1.4.1 Administrative Order of Consent

In 1991, the NDEP entered into Consent Agreements with six of the companies that had facilities at the BMI Complex in Henderson, Nevada. Present and former owners and operators entering into this agreement included TIMET; Chemstar Corporation; Kerr-McGee Chemical Corporation (Kerr-McGee); Montrose Chemical Corporation of California, Inc. (Montrose); Pioneer Chlor Alkali Company, Inc. (Pioneer); and Stauffer Management Company, Inc. (Stauffer). The following three phases were identified in the Consent Agreement:

- Phase I – Develop Phase I ECA reports for the BMI Common Area, which consists of the Upper and Lower Ponds, conveyance ditches and the Pabco Road Ponds Area, and each individual company site
- Phase II – Perform an ECI to fill data gaps identified in Phase I, if determined necessary by NDEP
- Phase III – Identify and implement appropriate remedial measures to address conditions identified in Phases I and II, if determined necessary by NDEP

TIMET completed a Phase I ECA, and results of the ECA were presented in the “Final Report of Phase I Environmental Conditions Assessment” (Law Engineering, Inc. 1993).

Based on the information in the TIMET Phase I ECA and subsequent discussions with TIMET, NDEP issued a letter of understanding (LOU), dated August 16, 1994, that identified 54 study items where additional information or further investigation were recommended. On June 7, 1996, TIMET submitted complete responses to some of the LOU items, including identifying LOU items requiring additional investigation. In June 1996, NDEP entered into a Consent Agreement with TIMET to perform an ECI, remedial alternative studies, interim remedial measures, and additional work.

The action items identified in the LOU response were addressed in the Phase II ECI in accordance with the June 1996 Consent Agreement. Results of the ECI were reported in the "Final Environmental Conditions Investigation Report" (Tetra Tech 1998) and the "Environmental Conditions Investigation Addendum Draft Report" (Tetra Tech 1999). In December, 2003, TIMET received correspondence from NDEP, which provided their response to the ECI Addendum (ECIA) Report and requested additional work.

In fall 2006, TIMET received the proposed Phase III Administration Order of Consent (AOC) from NDEP for review. Currently, the terms and conditions of the Phase III AOC are under consideration by TIMET management and legal counsel.

1.4.2 TIMET Operating Permits

1.4.2.1 Solid Waste

TIMET owns and operates the J2 Landfill (see Figure 1-3), an industrial solid waste Class III landfill facility that receives wastes that are generated on site during the production of titanium. The landfill received inorganic solid wastes generated during the production of titanium, construction debris, and other inert waste materials. No wastes containing free liquids are accepted. No hazardous wastes may be disposed of within the landfill.

The landfill cells are designed to contain wastes so no exposure to the surrounding environment occurs. The cells are constructed with synthetic liners and leachate collection systems whose materials were selected for their compatibility with the waste types handled by the facility. Table 1-3 lists the solid wastes that have been disposed of in the J2 Landfill.

TABLE 1-3: PERMITTED SOLID WASTE OF THE J2 LANDFILL

Solid Wastes	Major Components
Henderson Technical Library	
Sandblasting dust	Sand
Chlorination	
Chlorinator bed dump material	Unreacted rutile, petroleum coke, zircon, and quartz
Condenser rakeouts	Unreacted rutile, petroleum coke, and metal oxides
Chlorinator brick	Refractory brick made of alumina silicate
Chlorinator cyclone dust	Unreacted rutile ore and coke fines removed during the production of titanium tetrachloride
Condenser/scrubber packing	Inert ceramic or metal rings
Spent packing tower material	Inert ceramic or metal rings
PVS condenser sump rakeout	Titanium dioxide
Crushing	
Magnesium chloride baghouse dust	Magnesium chloride dust
Dust	Iron, scrap metal, titanium, magnesium, and magnesium
Floor sweepings	Inert solids
C-9 dry cyclone dust	Magnesium chloride, magnesium oxide, and titanium
Leaching (former process, included as historical reference)	
Burnt Sponge	Titanium sponge and salt
Magnesium Recovery	
Cell runouts	Magnesium and magnesium chloride
Electrolytic salt waste (cell smut)	Solidified magnesium, magnesium chloride, and brick
Carbon anodes	Carbon and magnesium chloride
Floor sweepings	Dirt and magnesium chloride
Reclaim	
Waste shot	--
Reduction	
Dirt and floor sweeps	Titanium sponge, dirt, and magnesium chloride
Magnesium chloride	Magnesium chloride
Furnace scale	Titanium and magnesium chloride
Rubber hoses, gaskets	--
Pangborn fines	Magnesium chloride
Discarded chips	Titanium and magnesium chloride

1.4.2.2 Air Emissions

The TIMET facility operates under two air permits; the Authority to Construct/Operating Permit (ATC/OP) and Title V Permit. TIMET must maintain compliance with both the ATC/OP and Title V permits.

The ATC/OP is issued by the Clark County Department of Air Quality & Environmental Management (DAQEM). The ATC/OP regulates the five criteria pollutants:

- Particulate Matter 10 microns and smaller (PM_{10});
- Oxides of Nitrogen (NO_X);
- Carbon Monoxide (CO);
- Oxides of Sulfur (SO_X); and
- Volatile Organic Compounds (VOC).

The ATC/OP also regulates hazardous air pollutants (HAP) and toxics.

The ATC/OP allows for construction and operation of any equipment that potentially emits the aforementioned pollutants. The permit is to be obtained prior to the construction of any equipment that emits a criteria pollutant and is then maintained as long as the facility operates the equipment.

The permit is issued with conditions. The conditions generally limit hours of operation, tons of pollutant emitted, and requires record-keeping and performance testing. The ATC/OP is considered in good-standing so long as the conditions of the ATC/OP are satisfied and an annual fee is paid. The permit does not need to be renewed per se, so long as the fees are paid and the conditions are met.

The Title V is issued by DAQEM in conjunction with the U.S. Environmental Protection Agency (EPA). The Title V regulates the same criteria pollutants as mentioned above. However, this program only applies to sources considered to be a Major Source for the pollutants. The following processes are covered by TIMET's Title V permit:

- Raw material storage
- Chlorination
- Purification
- Vacuum distillation process
- Magnesium recovery
- Blending
- Reclaim
- Emergency scrubber for wastewater treatment process

The permit is issued with conditions. The conditions generally limit hours of operation and tons of pollutant emitted and require record-keeping and performance testing. The Title V is considered in good-

standing so long as the conditions are satisfied and an annual fee is paid. The Title V is good for a period of 5 years, after which point it must be renewed. Renewals are required to be submitted 180 days prior to permit expiration.

1.4.2.3 Surface Water Discharge

TIMET's National Pollution Elimination Discharge System (NPDES) Permit No. NV0000060 was issued to TIMET on April 29, 2005 (effective May 2, 2005) (NDEP 2005a). TIMET's NPDES permit allows discharge from the TIMET facility to the Wash via the Pittman Bypass in compliance with the provisions of the Federal Water Pollution Control Act and Chapter 445a of the Nevada Revised Statutes. The permitted discharge travels to the Wash from two separate discharges at the TIMET facility: Outfall 001, which is noncontact cooling water (NCCW) from the plant, and Outfall 002, which is reverse osmosis permeate from the wastewater neutralization plant.

Discharges to evaporation ponds HP-1 and HP-6 are permitted under the Groundwater Permit No. NEV2000510. This permit was issued on April 29, 2005 (effective May 2, 2005) (NDEP 2005b). Conditions of the permit include operational requirements, routine inspection of the integrity of containment structures, and analysis of groundwater quality at wells CLD1-R, CLD3-R, CLD4-R, J2U2, J2D4, and MW-6R.

1.4.3 Areas Not Included in Study Boundaries of Conceptual Site Model

Several areas were excluded from the framework of this CSM. A brief synopsis of each area is provided in the following subsections.

1.4.3.1 Wastewater Conservation Facility

The WCF is located on the TIMET Plant Site as depicted on Figure 1-3. Prior to construction of the WCF, a soil investigation within the footprint of the proposed facility was conducted in August, 2004. TIMET installed three soil borings (JS-01, JS-02, and JS-03) and collected soil samples for analyses. Locations and analytical regime were determined based on the historical waste disposal practices. Five site features in the vicinity of the WCF footprint were identified as having a potential to affect soil within the footprint. These site features were:

- Transformers within the footprint (LOU Item 25)
- A former caustic pond (LOU Item 16)
- CSD stockpile (LOU Item 20)
- J2 Landfill
- J-9 Tailings ponds

Sample results were compared with EPA Region 9 preliminary remediation goals (PRG) (EPA 2004c). Although several results exceeded the PRGs, the exceedances did not indicate the presence of a waste material nor a continuing source to groundwater. Pathway analysis indicated that the concrete foundation for the WCF would effectively eliminate exposure to on-site receptors.

Based upon the results, the NDEP issued a letter of findings stating no further action (NFA) was required within the footprint of the WCF on November 29, 2004 (BAI 2004). Groundwater within this area was excluded from the NFA because of reported effects from other sources in proximity to this site. Results of this investigation were retained and are assessed as part of the soil-to-groundwater migration pathway.

1.4.3.2 TRECO

The TRECO site consists of approximately 73 acres of the southern portion of the TIMET Plant Site as depicted on Figure 1-3. The TRECO site is in the northeast quarter of Section 13, Township 22 South, Range 62 East, and the northwest quarter of Section 18, Township 22 South, Range 63 East, Mount Diablo Base and Meridian. The TRECO site is generally undeveloped, although current uses include a hike and bike trail along the southern property boundary and a baseball field at the southeast corner of the parcel. Former TRECO site uses date back to the 1940s and include vehicle parking, storage and office buildings, a former gasoline station, a fire station, a radio tower, and a communications building (Montgomery Watson Harza [MWH] 2005). The underground storage tanks (UST) from the former gasoline station were removed, and an NFA letter was received from NDEP in 1999.

Because future plans for the TRECO site include developing the parcel for commercial purposes, this area was investigated by BRC in 2005. Twenty-two soil borings were installed, with samples collected at the surface, 5 feet below ground surface (bgs), and 10 feet bgs. Samples were analyzed for inorganic ions, metals, VOCs, radionuclides, semivolatile organic compounds (SVOC), total petroleum hydrocarbons (TPH), dioxins and furans, polychlorinated biphenyls (PCB), and pesticides. Results of the investigation were analyzed and assessed for risk to future commercial occupants in the Basic Environmental Company's Risk Assessment Report, dated October 2005. Based upon the reported findings, the NDEP

granted the request for NFA in a letter to TRECO, dated April 19, 2006. The NFA was granted with conditions; most notably, groundwater beneath the property was excluded from the NFA. Because TIMET retained responsibility for addressing groundwater beneath the site, the data collected during BEC's investigation was included in the CSM analysis.

During this same time period, a separate investigation of the TRECO site was conducted by Ninyo & Moore as part of a prospective buyer's due diligence (Ninyo & Moore 2005). The results from this investigation were evaluated qualitatively by the project team, but data were not included in the CSM analysis because of concerns regarding the methodology used to collect the data and the data quality.

1.4.3.3 Parcel F

Parcel F is a 3.76-acre site, located at the southeastern corner of the intersection of 4th Street and Avenue F, within the BMI complex on Lake Mead Parkway. The Clark County Assessor's description is PT SE 4 SW4 SEC 12 22 62, parcel number 178-12-401-007. Figure 1-2 shows the location of the subject property.

Based upon the documentation provided in an ESA and NFA Request for Parcel F (Tetra Tech 2005b), the NDEP requested additional environmental characterization in the following areas:

- Clarifier Lid Storage Area
- Former Aboveground Storage Tank (AST) Area
- Building B-7 (used to store electrical equipment)
- Former Building B-5 (used to store rutile)

Characterization activities included hand-augering and collecting samples from two soil borings near the Clarifier Lid Storage and Former AST Areas, collecting a wipe sample from the concrete floor of Building B-7, and performing a radiological survey of former Building B-5. Based upon the investigation activities, remediation activities were conducted to remove SVOCs from surface soil in the Clarifier Lid Storage Area and to remove PCBs from the concrete in Building B-7. Details of these activities are reported in the Parcel F Removal Action and Closure Report (TIMET 2006a) and the subsequent addendum (TIMET 2006b).

NDEP granted the request for a finding of NFA in a letter to TIMET dated November 7, 2006. Groundwater under this area was excluded from the NFA because of reported effects from other sources in proximity to this site.

1.4.3.4 Parcel E

This property consists of 6.34 acres within the BMI Complex. This site is bordered by Tronox LLC (formerly Kerr McGee Chemical Corporation) to the north and east, by MCC Development Corporation to the south, and by Pioneer/Montrose operations to the west (see Figure 1-2). Because this site is not continuous with the TIMET Plant Site nor involved the same processes, the environmental concerns are being addressed separately from the Plant Site.

TIMET submitted an ESA and NFA Request for Parcel E on February 16, 2006 (Tetra Tech 2006). The NDEP provided comments and requested further investigation at several locations in a letter dated March 2, 2006. Preliminary site investigation activities are ongoing in preparation of a work plan for field sampling activities planned to occur in mid-2007.

1.4.3.5 Western Area Power Administration Basic Substation

The Basic Substation comprises 48.34 acres of land upslope of the processing facilities of the former magnesium manufacturing facilities (see Figure 1-3). It was constructed as the electrical substation for the original plant and continued operating to support the various manufacturing plants that eventually obtained the site. The Bureau of Reclamation operated the Basic Substation from 1942 until the Western Area Power Administration (WAPA) took over operation in 1976. The substation consisted of three electrical substations (Yards 1, 2, and 3), utility corridors, a rail line, a control building, an underground control cable tunnel, and transformer maintenance facilities. The control building was demolished in 2004 and the three substations aboveground facilities were dismantled in 2005 (Terracon 2007).

In 1989, the U.S. Public Health Service (USPHS) began site investigation activities, which found that dielectric fluid contaminated with PCBs had been released from electrical equipment during the substation operations (USPHS 1993). This report and subsequent investigations documented releases of TPH and PCBs to on-site soils, control cable tunnel sump soils, drain sediments, and concrete foundations (Terracon 2007).

Yard 3 is located immediately upslope of the TIMET manufacturing buildings. As part of the Phase I investigation, the USPHS collected 24 surface soil (0 to 3 inches) samples from the open yard area (9 composite) and around electrical equipment (15 discrete), 1 surface soil sample from the stormwater drain, and 1 surface soil sample at the outlet of the stormwater drain from Yard 3. Additional soil and wipe samples were collected from the transformer trenches and nonporous surfaces that supported the PCB equipment. All samples were screened using a Dexsil analyzer. A subset of samples was submitted

to a fixed laboratory as confirmation samples. Laboratory analyses included PCBs and pesticides. The field screening results for the surface soils around the equipment ranged from 3.4 milligrams per kilogram (mg/kg) to 14 mg/kg. PCB concentrations in the transformer trench samples ranged from 9.2 mg/kg to 55 mg/kg, and the stormwater drain sample at the outfall was 16.3 mg/kg. Stormwater from Yard 3 was routed to drain onto Avenue H and into TIMET's stormwater collection system which then discharged to the Alpha ditch on the TIMET Plant Site. The fixed laboratory results did not appear to correlate with the field screening results; however, they did indicate the detected PCBs were all Aroclor-1260. A total of eleven surface soil samples were analyzed for pesticides. Detected compounds were:

- Beta-benzene hexachloride (-BHC) was detected six times, concentrations ranged from 0.008 microgram per kilogram (µg/kg) to 0.082 µg/kg
- 4,4-Dichlorodiphenyldichloroethane (-DDD) was detected twice, concentrations ranged from 0.042 µg/kg to 0.045 µg/kg
- 4,4-Dichlorodiphenyldichloroethene (-DDE) was detected seven times, concentrations ranged from 0.009 µg/kg to 0.66 µg/kg
- 4,4-Dichlorodiphenyltrichloroethane (DDT) was detected seven times, concentrations ranged from 0.012 µg/kg to 0.34 µg/kg
- Endrin was detected once at 0.006 µg/kg

The underground cable tunnel extending the length of the WAPA site (approximately 3,370 feet) remains in service. This tunnel is large enough for manned entry (8 feet high by 6 feet wide) and contains power transmission lines. Based upon environmental assessment findings, the tunnel was renovated and abated for asbestos-containing material (ACM) in 1996. The air clearance testing results were reported in a letter report by Converse Environmental Consultants dated January 15, 1997. Eight sumps are located within the cable control tunnel that reportedly contain soils impacted by TPH and PCBs. Additional characterization of the cable control tunnel is planned by WAPA in spring 2007 (Terracon 2007).

Results from additional investigation of contaminated media at this site will continue to be assessed and incorporated into the analysis of the TIMET CSM as the data become available.

1.4.3.6 Southern Nevada Power Company Electrical Transformer Area

Located west of the WAPA site, a fenced area housing four inactive electrical transformers began to leak dielectrical fluid in late 2006 (see Figure 1-3). This area was originally believed to be part of the WAPA

site since it was adjacent to the Basic Substation. Based upon property easement research, it appears that this area is located in a utility easement granted to Southern Nevada Power Company by TIMET.

TIMET took action to mitigate the extent of the release and notified the NDEP on February 8, 2007. A site visit was conducted by representatives of the Southern Nevada Power Company the following week. TIMET is waiting for additional action to remove the transformers and investigate contaminated media. Results from additional investigation of contaminated media at this site will continue to be assessed and incorporated into the analysis of the TIMET CSM as the data become available.

1.4.4 Interim Corrective Actions

Over the course of 2005, TIMET conducted several interim removal actions that removed over 18,000 tons of pond solids and waste material from the Plant Site. The excavation areas targeted were the CSD Ponds and Francy's Mountain. These areas are depicted on Figure 1-3 and described below.

- CSD Ponds: From the 1950s to the 1970s, wastes from the chlorination process, scrap reclaim, and the purification process were discharged to the CSD ponds. Beginning in the 1970s, CSD solids slurried with OPW effluent, sponge water, wet scrubber effluent from the leaching process, and makeup water from chlorination process wash towers were neutralized with lime and discharged into the CSD north and south ponds. The ponds were earthen bermed and unlined until 1976.

- Francy's Mountain: Mixed chlorinator dust and CSD solids from the CSD ponds were placed directly over native soil as depicted on Figure 1-5. Landfilling activities ceased in 1967.

Figure 1-5 Former Francy's Mountain

Figure 1-5 Former Francy's Mountain

Waste solids from Francy's Mountain and the ponds were excavated, blended, and transported via railcar to an approved facility for disposal. At the completion of the removal action, a soil boring was installed at the base of the North CSD Pond excavation (TMSB-123) for vertical delineation (see Section 4.0). The ponds were then lined with reinforced polyethylene liners as depicted on Figure 1-6.

Figure 1-6 CSD Pond Removal Action

After removal of Francy's Mountain, the disturbed area was treated with a stabilization compound to prevent migration of surface soils or residual waste material.

Following this introduction, this report is organized into the following six sections:

- Section 2.0, Site Setting
- Section 3.0, Processes, Waste Streams, Source Areas, Site-Related Chemicals, and Principal Chemicals
- Section 4.0, Summary of Current Conditions
- Section 5.0, Conceptual Site Model
- Section 6.0, Data Gaps
- Section 7.0, References

2.0 SITE SETTING

2.1 PHYSIOGRAPHY

2.1.1 Land Use

The TIMET Plant Site is the easternmost facility of an industrial complex known as the BMI Complex (as previously discussed in Section 1.0). As depicted on Figure 1-2, the Tronox facility borders TIMET to the west. To the east and north of the TIMET Plant Site, lies existing or planned residential development. The TRECO property, to the south of the TIMET Plant Site, is in the initial development phases. When constructed, this property will be used for commercial and light industrial purposes. It is anticipated that future use of the TIMET Plant Site will remain heavy industrial as this facility is the only manufacturer of high grade titanium ingot in North America.

2.1.2 Topography

TIMET is in Las Vegas Valley, a broad alluvial valley that occupies a structural basin in the Valley and Range Physiographic Province. The Las Vegas Valley is mostly surrounded by mountains, ranging from 2,000 to 10,000 feet higher than the valley floor. The valley floor ranges in elevation from about 3,000 feet above mean sea level (msl) in the west at the mountain front to 1,500 feet above msl in the east at the Wash (SNWA 1996). The surrounding mountain ranges, as shown on Figure 1-1, are:

- Sheep Range to the north
- Frenchman and Sunrise Mountains to the east
- McCullough and River Ranges to the south
- Spring Mountains and Sierra Nevada Mountains of California to the west

The valley is about 1,550 square miles in size, and the structural and topographical axis is aligned approximately northwest to southeast. The eastern edge of the valley is about 5 miles west of Lake Mead, a major multipurpose reservoir and drinking water source on the Colorado River.

2.1.3 Climatology

To characterize climate at TIMET, local weather observations from the meteorological monitoring station at McCarran Airport were used. McCarran Airport, at an elevation of 2,127 feet above msl, is about

5 miles south of downtown Las Vegas and about 9 miles northwest of and 300 feet higher than TIMET. Data were summarized for a period from 1948 through 1998 (NCDC 2004).

The Las Vegas Valley has an arid southwest climate. In the summer, daytime maximum temperatures commonly exceed 100 ºF. Winters are mild, with daytime temperatures averaging 60 ºF. Snow is rare. The mean annual temperature is 67 ºF, and the mean daily maximum and minimum temperatures are 80 and 54 ºF, respectively.

The mountains to the west of the valley act as barriers to moisture moving east from the Pacific Ocean, contributing to low precipitation and high evaporation rates. The average number of days with rainfall is 50, and the mean annual precipitation is 4.1 inches (NCDC 2004). Most precipitation occurs during the summer months of July and August and during the winter (Wild 1990). The mountains surrounding the basin may receive up to 20 inches of precipitation per year, usually the result of snowfall (Brothers and Katzer 1988). The predominant sky cover is clear. The mean annual relative humidity ranges from 28 to 38 percent, and the average wind speed is 10 knots from the southwest with southeasterly components.

Most winter precipitation is derived from frontal systems moving east from the Pacific Ocean. Rainfall is usually low-intensity and occurs over broad areas. Conversely, nearly all summer precipitation originates from infrequent local thunderstorms that move into Las Vegas Valley from the southwest. The thunderstorms are characterized by short periods of high intensity rainfall and wind speeds that can exceed 50 mph. High rates of runoff can cause local flooding.

Evapotranspiration rates are very high, influenced by high temperatures, high winds, and low humidity. Annual potential evapotranspiration exceeds 86 inches (SNWA 1996). During a 3-year measuring period (1985 to 1988), monthly pan evaporation rates were measured as high as 17 inches per month, and the months with the highest evaporation (May through September) coincide with those months with the highest intensity rainfall (Environmental Resources Management [ERM] 1996).

2.1.4 Surface Drainage

All surface water in Las Vegas Valley is tributary to Lake Mead via the Wash (Brothers and Katzer 1988), the major drainage in the valley. The Wash collects stormwater, shallow groundwater, urban runoff, and treated sewage effluent. It is the receiving water body for all major Las Vegas area discharges. In dry weather, flow in the Wash comprises mainly treated effluent from the Clark County Water Reclamation District (76 million gallons per day [mgd]) and the City of Las Vegas Water Pollution

Control Facility (80 mgd). The City of Henderson contributes a smaller amount (8.4 mgd).[1] TIMET uses the Wash as a receiving stream for permitted, once-through NCCW. Discharge from these sources is sufficient to maintain surface flows in the Wash throughout the year.

The TIMET Plant Site is located about 2.8 miles south of Las Vegas Wash (Figure 2-1) at an elevation that ranges from 1,873 feet above msl at Lake Mead Drive to about 1,750 feet above msl at the northern property boundary. From the Plant Site, the land surface in this area slopes north-northeast toward the Wash at a rate of about 0.020 foot per foot (ft/ft).

At the TIMET Plant Site, the natural topography has been modified to control surface water drainage patterns in accordance with the Stormwater Pollution Prevention Plan (Golder 2002). Off-site stormwater is diverted around the Plant Site in drainage ditches. Prior to construction of the current stormwater system, open ditches crossed the northern portion of the TIMET Plant Site (Figure 2-2). These ditches conveyed both stormwater and wastewater discharges from the BMI Complex to the Upper Ponds. These ditches were replaced by the current system to meet regulatory requirements and to reduce the potential for flooding during storm events.

Two drainage systems are present on site: a stormwater drainage system and an acid drain system. The inlets for the storm drainage are set above grade to prevent flow into the storm drain system during normal operations, and the acid drain system inlets are set at grade. All surface flow and stormwater generated on site is conveyed to the acid drain system. This system discharges to the WCF as OPW. If the storm event is significant enough, then the rising stormwater will reach the stormwater drainage inlets and is combined with the noncontact process water within the storm drain system.

The storm drain system directs stormwater and noncontact process waters to the Stilling Pond via the Alpha Ditch. Once through the pond, the water is discharged to the Pittman Bypass at the north end of the Plant Site. Discharges via the Pittman Bypass are regulated and monitored under TIMET's NPDES permit NV0000060.

Dike crest elevations of the TIMET active ponds in the Pabco Road Ponds Area were constructed above the 100-year floodplain elevation to preclude flooding. Surface runon originating from south of the area is routed around the ponds by a series of earthen, bermed flood-control structures.

[1] Flow values are from 2000 data from the Las Vegas Wash Coordination Committee website (Online address: http://www.lvwash.org/resources/docs/lvwcamp.html).

2.2 GEOLOGY

This section describes the geology of the TIMET Plant Site. Descriptions are based on published literature and site-specific lithologic data from current and previous investigations. Two principal geologic units are formally designated within the CSM boundaries at TIMET: Quaternary Alluvium and Muddy Creek Formation of Tertiary-age.

The Muddy Creek Formation (MCF) can be further divided into local hydro-stratigraphic units to facilitate discussion of site characteristics and hydrogeology by other investigators in the BMI complex. With these informal MCF units added, the sequence (from youngest to oldest) at TIMET includes:

- Quaternary Alluvium
- Transitional (or Reworked) Muddy Creek Formation (MCF)
- Muddy Creek Formation
  - Fine-Grained MCF (yields insignificant water)
  - Coarse-Grained MCF (designated water-bearing zones)

2.2.1 Quaternary Alluvium

The TIMET Plant Site is located near the south margin of Las Vegas Valley on Quaternary-age alluvial fan deposits of the McCullough Range (Figure 2-3). The surface of the Quaternary Alluvium, which is the present-day land surface at most of the BMI Complex and throughout much of the Henderson area, slopes north toward the Wash. Near TIMET, the slope rate is about 2.7 percent. Close to the Wash, the slope rate of the land surface is about 1.5 percent.

The thickness of the Quaternary Alluvium ranges from a feather edge at the mountain front, about 1 mile south of the Plant Site, to about 80 feet near Las Vegas Wash, about 2 miles to the north. In TIMET wells and borings, the average thickness of the Quaternary Alluvium is about 40 to 80 feet. The unit is thickest and (possibly) coarsest-grained where it was deposited in paleochannels eroded into the surface of underlying finer-grained sediments.

The Quaternary Alluvium is predominantly sands and gravels that consist mainly of volcanic detritus (Carlsen, Lunnis, and Prudie 1991). Several hundred borings and monitoring wells have been drilled into the unit at the BMI Complex, and lithologic descriptions show that the unit is typically logged as silty or

sandy gravel, sand, or silty sand (Desert Research Institute [DRI] 2004). Common Unified Soil Classification System (USCS) [2] soil groups are GP, GM, SW, SP, and SM.

Transitional Muddy Creek Formation

Transitional Muddy Creek Formation is encountered at the base of the Quaternary Alluvium at the Plant site in a number of monitor wells. Presently, monitor wells at the Plant Site are water table wells (i.e., screened intervals span the water table), and are therefore screened primarily in the alluvium. However, in a number of well bores, Transitional MCF, and the contact with fine-grained MCF facies (e.g., "in-place" MCF), was encountered.

The Transitional MCF is not readily distinguished from MCF. Sediments are MCF derived and therefore, appear similar to MCF. However, the Transitional MCF at the Plant Site consists of reworked, less consolidated and indurated sediments. Figure 2-4 depicts the cross section of local stratigraphic and topographic relationships where the transitional MCF occurs at the northern Plant Site.

As a result (although not specifically tested), it is suspected to be of sufficient permeability to transmit limited groundwater. Fine-grained MCF, which underlies the Transitional MCF, does not appear to yield appreciable groundwater. A discussion of water bearing versus fine grained MCF zones is provided in the discussion of hydrogeology below.

2.2.2 Muddy Creek Formation

The Quaternary Alluvium is underlain by the Muddy Creek Formation, an older valley-fill unit of Tertiary age (Bell and Smith 1980). During drilling, the contact between the two units is usually easy to recognize based on color, grain size, and drilling characteristics. There are no known surface exposures of the Muddy Creek Formation at the BMI Complex.

According to the Nevada Bureau of Mines and Geology (1977), the Muddy Creek Formation consists of basin fill sediments of lacustrine and subaerial origin (Bingler 1977). These sediments are several million years older than the overlying Quaternary Alluvium, and the contact between the two units is an erosional unconformity. The top of the Muddy Creek Formation slopes toward Las Vegas Wash, approximately parallel to the slope of the land surface.

[2] Unified Soil Classification System of ASTM International.

The source of Muddy Creek sediments has not been completely resolved. Some of the sediments have a local origin, but a portion appears to have been deposited in pre-Grand Canyon time by the proto-Colorado River. The Muddy Creek Formation occurs in more than a dozen closed basins at the eastern edge of the Basin and Range physiographic province in northwestern Arizona, southwestern Utah, and southern Nevada. To the east, closer to a suspected sediment source, the Muddy Creek Formation is mostly sand. In the westernmost basins (which include Las Vegas Valley), silt and clay predominate in thick, tabular beds (Schmidt 2000).

In the vicinity of the Plant Site, the total thickness of the Muddy Creek Formation is unknown. Existing TIMET wells extend no more than 15 feet below the upper contact. Deeper wells were drilled for groundwater investigations at the Former Pepcon Facility, Montrose, Stauffer/Pioneer, and Tronox (formerly Kerr-McGee) (Kleinfelder 1999; SECOR 2002b; Kerr-McGee 1999). More recently, BRC drilled several Muddy Creek wells in the Upper and Lower Ponds area east of Pabco Road (BRC 2004b). However, the Muddy Creek Formation also extends below the deepest of these wells. According to ERM (2003), 2,158 feet of Muddy Creek sediments were drilled at a salt exploration well about 2 miles north of the former Stauffer Plant Site.

Lithologic logs of most monitoring wells and borings that were drilled into the Muddy Creek Formation at the BMI Complex indicate that the upper portion of the unit is typically sandy silt and clayey silt. However, sand layers are not uncommon. At Montrose and Tronox, the upper portion of the Muddy Creek Formation is predominantly fine-grained; however, interbedded sand layers with thicknesses of 1 to 13 feet are present in the fine-grained strata (SECOR 2002b; Kerr-McGee 1999). At the TIMET facility, where only the upper 5 to 10 feet of the unit was drilled at most wells,[3] the Muddy Creek Formation usually was logged as a silty clay or clayey silt (Tetra Tech 1998, 1999).

Where deeper wells were drilled, most of the sand lenses in the upper portion of the Muddy Creek Formation appeared to be laterally discontinuous. However, some coarse-grained layers in the upper portion of the Muddy Creek Formation at Pepcon might be correlative over distances of several hundred feet (Kleinfelder 1999).

The proportion of coarse-grained sediments in the upper portion of the Muddy Creek Formation appears to decrease to the east and north. At most wells and borings recently drilled by BRC in the Upper and Lower Ponds area (BRC 2004b), sand lenses are rare in the upper portion of the Muddy Creek Formation.

[3] About 20 feet of Muddy Creek sediments were drilled at BRW-R1.

For example, at BRC-SB-1, which was continuously cored,[4] only one 4-inch-thick sand lens was reported in the Muddy Creek Formation between 50 and 309 feet. The rest of the interval was logged as silt, clayey silt, and sandy silt. At BRC-SB-9, close to BRC-SB-1 and in the Pabco Road Ponds, conditions are similar.[5]

Fine-grained sediments are also predominant in the upper portion of the Muddy Creek Formation at wells and borings that were drilled at Montrose, Tronox, the Upper and Lower Ponds, and the TIMET facility. However, a coarse-grained facies of the Muddy Creek Formation occurs closer to the mountain front. In monitoring wells MW-A and MW-AL at the former Pepcon plant, about 2 miles west of the TIMET facility and about 1 mile from the McCullough Range, sediments interpreted as the upper part of the Muddy Creek Formation were mainly sand and gravel. As stated in a recent hydrogeologic investigation report (Kleinfelder 1999), the former Pepcon plant is in or near the transition zone between the coarse-grained and fine-grained facies of the Muddy Creek Formation.

In some wells that were drilled at the BMI Complex, the deeper portion of the Muddy Creek Formation contains thicker layers of coarse-grained sand and gravel (coarse-grained facies) than the upper portion. At Tronox, the top of an approximately 50-to-70-foot-thick coarse-grained unit consisting of sand, gravelly sand, and gravel was encountered in all of the "TR" wells between depths of about 160 and 220 feet (Kerr-McGee 1999).

Like the sand layers at the shallower depths, the proportion of coarse-grained sediments in the deeper portion of the Muddy Creek Formation (referred to as the Upper Muddy Creek aquifer by BRC) also appear to decrease to the east and north, away from the mountain front. In the Upper Ponds, at BRC-SB-1 and BRC-SB-3, interbedded sequences of silty sand, clayey sand, and silt about 40 to 60 feet thick were encountered between depths of about 300 and 400 feet (BRC 2004a).[6] At other BRC wells, sand was reported as a minor component in samples of drill cuttings between depths of about 300 and 400 feet. These beds may correlate with the coarse-grained unit at Tronox. However, preliminary lithologic and geophysical data indicate that the strata are considerably more fine-grained than the coarse-grained unit at Tronox (BRC 2004b).

[4]BRC-SB-1 is the closest of the deep BRC wells to the TIMET Plant Site and is arguably the most representative of conditions at the Plant Site. Core recovery was poor in the Quaternary Alluvium but appears to have been nearly 100 percent in the Muddy Creek Formation.

[5] All of the logs for the new BRC wells and borings are not yet available for review.

[6] From 309 to 356 feet at BRC-1 and between about 360 and 420 feet at BRC-3, based on lithologic and geophysical logs (BRC 2004b)

2.3 HYDROGEOLOGY

Groundwater occurs beneath the Plant Site in the Quaternary Alluvium (alluvial aquifer), the Transitional MCF, and in course grained facies in the MCF. Groundwater in the alluvial aquifer and Transitional MCF constitutes the water table aquifer. Deeper water bearing zones in coarse grained MCF facies are confined by fine-grained MCF facies.

The water table occurs in the Quaternary Alluvium, Transitional MCF, and perhaps paleosol on the erosional MCF surface. The contacts and relationships between the MCF and overlying Transitional MCF and Quaternary Alluvium, which strongly influence the nature of the alluvial (water table) aquifer, are discussed below.

- The undulating erosional surface on the MCF creates several relationships between Quaternary Alluvium, Transitional MCF, and MCF that have a bearing on contaminant transport and warrant discussion. These include: places where the MCF erosional surface was topographically high, Quaternary Alluvium below the water table may be thin, or not present at all.

- In these places, water table wells are screened in MCF, or perhaps Transitional MCF. Well logs from earlier investigations neither note nor differentiate between MCF and Transitional MCF, so in these areas, the water table may occur in Transitional MCF or perhaps a paleosol formed on the MCF.

- In places where the MCF was topographically low (i.e., paleo-channels), the thickness of Quaternary Alluvium below the water table has been observed to be thick, and in cases, coarse and permeable.

- Borelogs from along the north Plant Site presented in this report show an alternate relationship can exist between paleochannels and overlying sediments (see Figure 2-4). It had previously been thought that paleochannels contained thickened sections of permeable Quaternary Alluvium. However, the borelogs from along the northern Plant Site indicate that Transitional MCF fills what appears to be a paleochannel exiting the Plant Site to the north. In places where this occurs, the paleochannel sediments are lower in permeability than the overlying Quaternary Alluvium.

- Finally, in areas where sufficient Quaternary Alluvium exists to complete water table monitor wells, the wells are screened in Quaternary Alluvium only. Saturated Transitional MCF may exist in these locations, and may provide the ability to evaluate vertical concentration gradients for TIMET solute plumes via nested wells screened specifically in this interval.

Alluvial aquifer sediments are typically permeable – on the order of 30 to 40 feet per day bulk hydraulic conductivity. The Transitional MCF, although more permeable than fine grained MCF facies, is much lower – perhaps 1 foot per day or less. Since the alluvial (water table) aquifer is encountered in both

these units – Quaternary Alluvium and Transitional MCF – this creates a situation where wells are screened across vastly differently permeability; therefore, aquifer test results represent an average of the two units.

The degree of saturation of fine grained facies within the MCF is a topic of current investigation. Within the context of this CSM, the fine grained MCF facies, coarse grained MCF facies, and overlying Transitional MCF are all considered saturated based on the following observations:

- Coarse grained facies within the MCF are known to be saturated, and wells completed in these zones have confined heads that rise to near the water table heads.
- Fine-grained MCF facies provide aquicludes between the coarse-grained facies. The fine-grained facies are considered saturated; however, the fine grained facies are considered low in permeability, low in specific yield, and have very low potential to yield and transmit groundwater. Nonetheless, the conceptual model that considers fine-grained MCF facies saturated allows discussion of vertical head gradients since the heads are considered continuous.
- Because the saturation is considered continuous, contaminant transport by advection and dispersion, and calculations using these concepts are valid.
- Transitional MCF is saturated everywhere on the Plant Site it has been encountered. Paleosols on the MCF surface are saturated.
- The flux of groundwater through the alluvial aquifer appears to be far more than can be sustained by natural recharge, and is thought to be related to upslope irrigation infiltration.
- The natural water table was therefore likely located in Transitional MCF and MCF paleosols. The flux of groundwater through these sediments at prevailing hydraulic gradients (one to three feet per hundred) is thought to be more in alignment with natural recharge.

In summary, TIMET considers the entire vertical domain of this CSM to be saturated starting at the water table and continuing to the bottom boundary. The validity of this needs to be tested, and constitutes a site characterization data gap that will be addressed along with vertical solute plume delineation. Nonetheless, TIMET will attempt to answer these questions assuming saturated flow (i.e., seepage), and not unsaturated flow.

2.3.1 Groundwater Gradient

Groundwater measurements are routinely taken during quarterly monitoring events at the Site as provided in Table 2-1. These measurements indicate that groundwater occurs at an approximate depth of 25 to

50 feet. The depth to groundwater is greatest in the southernmost wells, which are farthest upgradient and farthest upslope (TMMW-101 through TMMW-104).

The directions of the horizontal component of the shallow groundwater gradient and the shallow groundwater flow are approximately parallel to the slope of the land surface. Shallow groundwater at the TIMET facility flows generally north, toward the Wash. Figure 2-5 shows that groundwater from the Plant Site discharges into the Wash.

The average regional slope of the water table is about 0.02 to 0.04 ft/ft, and measurements at the Plant Site are in this range.

Vertical groundwater gradients are also present. In the multiple-completion wells DX and AGX at Pepcon, vertical gradients of more than 0.5 ft/ft were measured in the Muddy Creek Formation (Kleinfelder 1999). In upslope (and upgradient) wells the vertical gradient is downward, and at downgradient wells the vertical gradient is upward. The downgradient well at Pepcon, AGX flowed at the surface from the 230-foot completion zone[7] and had a shut-in pressure of 10 pounds per square inch (Kleinfelder 1999). No vertical gradients have been measured in monitoring wells at the TIMET facility. In addition, no nested, clustered, or multiport wells are present for such measurements. At the TIMET Plant Site, all wells drilled to date were completed at about the same depth in the Quaternary Alluvium or in the shallowest part of the Muddy Creek Formation.

2.3.2 Hydraulic Conductivity and Rate of Groundwater Flow

Long term pumping data from Tronox provide perhaps the best data to evaluate average hydraulic conductivity and rate of groundwater flow. The data used to estimate these properties are provided in the report titled "Semi-Annual Performance Chromium Mitigation Program, Henderson, Nevada Facility" prepared by Kerr-McGee Shared Services Company LLC in January—June 2005 (Kerr-McGee 2005). In particular, the June well discharge data were used. In June 2005, the cumulative interceptor well discharge was 64.7 gallons per minute along approximately 1,600 linear feet of interceptor trench. With this information, and the May 2005 potentiometric surface map at Tronox (Plate 1, Kerr-McGee 2005), we can calculate hydraulic conductivity, Darcy velocity and estimate seepage velocity.

- Q = discharge = 64.7 gpm = 8.65 ft^3/min
- $\Delta H/\Delta L$ = I = hydraulic gradient along flow direction = 0.02 ft/ft

[7] The top of the completion zone was 230 feet deep. The completion interval extended from 230 to 250 feet bgs.

- L = interceptor trench width = 1,600 feet
- b = aquifer thickness = 10 feet (estimated average for Alluvial Aquifer)
- Discharge Cross-Sectional Area Into Interceptor Trench = A = L $\times$ b = 16,000 ft^2
- Q = KIA (Darcy's Law) such that K = Q/(IA) = 8.65 ft^3/min/(0.02*16,000 ft^2) = 0.27 ft/min = 39 feet per day (ft/day)

Seepage velocity can now be estimated with an assumed effective porosity (φ_e) of 0.30. V =KI/φ_e = (39 ft/day $\times$ 0.02 ft/ft)/0.3 = 2.6 ft/day = 950 feet per year. As regards typical groundwater seepage velocities, this is on the high side.

A number of aquifer tests have been recently conducted (Appendix C) to measure hydraulic conductivity at the Plant Site and immediately downgradient. For tests recently conducted on the Plant Site, results range from a low of about 0.07 to a high of 125 ft/day. This variability is not inconsistent with the alluvial aquifer. For example, sustained pumping rates in the interceptor trench (June 2005) at Tronox varied from 0.3 to 8.8 gpm. The value of 0.07 ft/day was from a slug test performed in TMMW-102, located on the south Plant Site boundary along Lake Mead Boulevard. This well is thought to be screened across both Qal and Transitional MCF, and the hydraulic conductivity obtained is likely representative of upper, reworked MCF sediments.

The geometric mean of all hydraulic conductivity values obtained in 2006 is 7.8 ft/day. If the data from TMMW-101 through TMMW-104 (located on the south property boundary), are separated from the northern Plant Site and downgradient data, the northern Plant Site geometric mean is 35 ft/day, which is in excellent agreement with the bulk conductivity calculated from interceptor trench yield. The geometric mean of the 4 results on the south plant boundary (TMMW-101 through TMMW-104) is 0.7 ft/day, which is substantially lower than the northern Plant Site value. However, two wells (TMMW-102 and TMMW-104) are screened in Qal and MCF, and yield mixed hydraulic conductivities. The geometric mean of hydraulic conductivity for TMMW-101 and TMMW-103, which would represent Qal only on the south plant boundary, is 1.7 ft/day.

Aquifer tests previously conducted in Plant Site monitoring wells to measure the hydraulic conductivity of the Quaternary Alluvium have been reported (Tetra Tech 1999). Results ranged from about 0.075 to 33 ft/day at the Plant Site. The highest values were measured at J2D2-R2.

No conductivity tests were conducted in the Muddy Creek Formation at TIMET facility; however, Montrose tested one well, CP-1, that was screened across two Muddy Creek sand lenses with a combined thickness of 1.5 feet. The measured hydraulic conductivity was 12.5 ft/day (SECOR 2002b). In a Muddy Creek well at Stauffer/Pioneer, the hydraulic conductivity of the Muddy Creek Formation was 0.00014 square feet per second[8], which is equivalent to about 12 ft/day. These results are probably not representative of the finer-grained sediments of the Muddy Creek Formation, which typically have not been screened for monitoring wells. Based on laboratory tests, the vertical hydraulic conductivity of finer-grained clayey sediments that were cored at Montrose varied from 0.000000058 to 0.000002 centimeters per second (SECOR 2002a; Kleinfelder 1983).[9]

The estimated rate of groundwater flow at the TIMET facility was previously calculated using measured values of hydraulic conductivity in the Quaternary Alluvium (Tetra Tech 1999). Values ranged as high as 2.9 ft/day at the Plant Site.[10] The upper bound previously reported is in the range calculated above from long term Tronox pumping.

[8] This test result was originally reported in a 1986 (or 1987) report by L.E. Hall and was cited by SECOR (2002b).

[9] This is equivalent to about 0.0002 to 0.006 ft/day. Laboratory tests usually measure vertical conductivity, and the horizontal conductivity may be 10 to 100 times higher. There is a discrepancy between the values reported by the two cited sources, and the original 1980 report by Geraghty & Miller for Stauffer Chemical Company has not been reviewed.

[10] The values reported for the Plant Site in the ECI Addendum have been corrected for some math errors. The results reported herein are subject to further review and correction.

TABLES

Table 2-1
Plant Site Groundwater Levels

Monitor Well	UTM Y Zone North-South Coordinates in Meters[1]	UTM Y Zone East-West Coordinates in Meters[1]	Casing Elevation[2]	Date Measured	Depth to Water[3]	Groundwater Elevation[2]
BRW-R1	3990127.844	681159.2243	1,843.88	3/21/00	47.13	1,796.75
				6/20/00	47.57	1,796.31
				9/19/00	47.75	1,796.13
				12/13/00	47.51	1,796.37
				3/13/01	47.16	1,796.72
				6/12/01	47.05	1,796.83
				9/25/01	47.50	1,796.38
				12/11/01	47.20	1,796.68
				3/12/02	47.04	1,796.84
				6/11/02	47.70	1,796.18
				9/25/02	48.00	1,795.88
				12/17/02	47.55	1,796.33
				3/25/03	47.50	1,796.38
				6/25/03	48.09	1,795.79
				9/24/03	49.08	1,794.80
				12/22/03	47.77	1,796.11
				2/10/04	47.87	1,796.01
				4/28/04	48.17	1,795.71
				7/21/04	48.42	1,795.46
				10/25/04	48.45	1,795.43
				2/11/05	47.85	1,796.03
				4/26/05	46.8	1,797.08
				7/28/05	47.2	1,796.68
				10/27/05	45.75	1,798.13
				1/24/06	46.48	1,797.40
				4/21/06	47.38	1,796.50
J2U1	3990594.606	680831.59	1,801.09	3/22/00	47.53	1,753.56
				6/20/00	48.20	1,752.89
				9/20/00	48.80	1,752.29
				12/13/00	48.90	1,752.19
				3/14/01	51.90	1,749.19
				6/12/01	51.85	1,749.24
				9/1/01	51.87	1,749.22
				12/12/01	51.88	1,749.21
				3/12/02	51.88	1,749.21
				6/11/02	50.86	1,750.23
				9/1/02	52.30	1,748.79
				12/18/02	52.30	1,748.79
				3/26/03	52.30	1,748.79
				6/25/03	52.30	1,748.79
				9/25/03	52.30	1,748.79
				12/22/03	Dry	--
				2/11/04	Dry	--
				4/29/04	Dry	--
				7/22/04	Dry	--
				4/25/05	Dry	--
				7/27/05	48.72	1,752.37
				10/28/05	48.04	1,753.05
				1/19/06	48.42	1,752.67
				4/21/06	48.93	1,752.16
J2U2	3990584.726	680701.5619	1,798.54	3/22/00	44.04	1,754.50
				6/20/00	44.46	1,754.08
				9/20/00	44.58	1,753.96
				12/13/00	44.82	1,753.72
				3/14/01	45.21	1,753.33
				6/12/01	45.38	1,753.16
				9/1/01	45.46	1,753.08
				12/12/01	45.68	1,752.86
				3/12/02	45.70	1,752.84
				6/11/02	43.86	1,754.68

Table 2-1 (continued)
Plant Site Groundwater Levels

Monitor Well	UTM Y Zone North-South Coordinates in Meters[1]	UTM Y Zone East-West Coordinates in Meters[1]	Casing Elevation[2]	Date Measured	Depth to Water[3]	Groundwater Elevation[2]
J2U2	3990584.726	680701.5619	1,798.54	9/1/02	43.58	1,754.96
				12/18/02	43.60	1,754.94
				3/26/03	43.87	1,754.67
				6/25/03	44.20	1,754.34
				9/25/03	44.55	1,753.99
				12/22/03	45.64	1,752.90
				2/11/04	45.76	1,752.78
				4/29/04	45.55	1,752.99
				7/22/04	45.30	1,753.24
				10/26/04	44.52	1,754.02
				2/10/05	44.72	1,753.82
				4/27/05	44.28	1,754.26
				7/25/05	43.63	1,754.91
				10/26/05	42.43	1,756.11
				1/17/06	43.92	1,754.62
				4/26/06	44.75	1,753.79
J2D1-R2	3990852.3	680597.2182	1,770.68	3/22/00	37.04	1,733.64
				6/20/00	37.63	1,733.05
				9/21/00	38.30	1,732.38
				12/14/00	38.59	1,732.09
				3/15/01	38.78	1,731.90
				6/13/01	39.14	1,731.54
				9/1/01	39.81	1,730.87
				12/12/01	39.97	1,730.71
				3/12/02	39.96	1,730.72
				6/11/02	40.00	1,730.68
				9/1/02	40.20	1,730.48
				12/18/02	40.10	1,730.58
				3/26/03	40.00	1,730.68
				6/26/03	40.41	1,730.27
				9/25/03	41.70	1,728.98
				12/22/03	39.91	1,730.77
				2/11/04	41.00	1,729.68
				4/29/04	41.10	1,729.58
				7/22/04	41.27	1,729.41
				10/26/04	41.33	1,729.35
				2/14/05	39.96	1,730.72
				4/26/05	39.46	1,731.22
				7/26/05	39.71	1,730.97
				10/26/05	39.32	1,731.36
				1/17/06	39.19	1,731.49
				4/20/06	39.49	1,731.19
J2D2-R2	3990870.147	680646.2836	1,769.55	3/22/00	38.26	1,731.29
				6/21/00	38.83	1,730.72
				9/20/00	39.53	1,730.02
				12/14/00	39.82	1,729.73
				3/15/01	40.50	1,729.05
				6/13/01	40.50	1,729.05
				9/26/01	41.27	1,728.28
				12/12/01	41.40	1,728.15
				3/13/02	41.40	1,728.15
				6/12/02	41.68	1,727.87
				9/27/02	42.05	1,727.50
				12/18/02	41.80	1,727.75
				3/26/03	41.65	1,727.90
				6/26/03	42.26	1,727.29
				9/25/03	42.72	1,726.83
				12/22/03	42.86	1,726.69
				2/11/04	39.91	1,729.64
				4/29/04	43.05	1,726.50

Table 2-1 (continued)
Plant Site Groundwater Levels

Monitor Well	UTM Y Zone North-South Coordinates in Meters[1]	UTM Y Zone East-West Coordinates in Meters[1]	Casing Elevation[2]	Date Measured	Depth to Water[3]	Groundwater Elevation[2]
J2D2-R2	3990870.147	680646.2836	1,769.55	7/22/04	43.40	1,726.15
				10/26/2004	43.6	1,725.95
				2/9/2005	42.07	1,727.48
				4/28/2005	41.4	1,728.15
				7/26/2005	41.77	1,727.78
				10/26/2005	41.39	1,728.16
				1/17/2006	41.01	1,728.54
				4/20/2006	41.21	1,728.34
J2D3-R	3990858.049	680671.7014	1,772.95	3/22/00	36.06	1,736.89
				6/20/00	36.39	1,736.56
				9/20/00	37.34	1,735.61
				12/13/00	37.42	1,735.53
				3/14/01	37.72	1,735.23
				6/12/01	38.17	1,734.78
				9/1/01	39.10	1,733.85
				12/12/01	39.12	1,733.83
				3/12/02	39.93	1,733.02
				6/11/02	39.37	1,733.58
				9/1/02	Not measured	
				12/18/02	Not measured	
				3/26/03	40.19	1,732.76
				6/25/03	40.05	1,732.90
				9/25/03	40.56	1,732.39
				12/22/03	40.37	1,732.58
				2/11/04	40.40	1,732.55
				4/29/04	40.62	1,732.33
				7/22/04	41.10	1,731.85
				10/26/04	41.2	1,731.75
				2/10/05	39.21	1,733.74
				4/25/05	38.76	1,734.19
				8/1/05	39.54	1,733.41
				10/28/05	Not measured	
				1/19/06	38.34	1,734.61
				4/20/06	38.72	1,734.23
J2D4	3990789.191	680534.0569	1,774.66	3/23/00	36.38	1,738.28
				6/20/00	36.83	1,737.83
				9/21/00	37.16	1,737.50
				12/14/00	37.27	1,737.39
				3/15/01	37.31	1,737.35
				6/13/01	37.47	1,737.19
				9/1/01	37.88	1,736.78
				12/13/01	37.91	1,736.75
				3/12/02	37.50	1,737.16
				6/11/02	37.60	1,737.06
				9/1/02	37.90	1,736.76
				12/18/02	38.00	1,736.66
				3/27/03	38.11	1,736.55
				6/26/03	38.17	1,736.49
				9/25/03	38.29	1,736.37
				12/22/03	33.38	1,741.28
				2/11/04	38.47	1,736.19
				4/29/04	38.42	1,736.24
				7/22/04	38.51	1,736.15
				10/26/04	38.47	1,736.19
				2/11/05	37.3	1,737.36
				4/26/05	37.09	1,737.57
				7/26/05	37.35	1,737.31
				10/27/05	37.15	1,737.51
				1/18/06	37.15	1,737.51
				4/21/06	Not measured	

Table 2-1 (continued)
Plant Site Groundwater Levels

Monitor Well	UTM Y Zone North-South Coordinates in Meters[1]	UTM Y Zone East-West Coordinates in Meters[1]	Casing Elevation[2]	Date Measured	Depth to Water[3]	Groundwater Elevation[2]
CLD1-R	3991104.029	680353.0255	1,745.42	3/23/00	25.20	1,720.22
				6/22/00	25.98	1,719.44
				9/21/00	26.40	1,719.02
				12/14/00	26.82	1,718.60
				3/15/01	26.37	1,719.05
				6/14/01	27.29	1,718.13
				9/27/01	27.74	1,717.68
				12/13/01	27.85	1,717.57
				3/12/02	27.90	1,717.52
				6/11/02	27.30	1,718.12
				9/1/02	28.15	1,717.27
				12/19/02	28.20	1,717.22
				3/27/03	28.16	1,717.26
				6/26/03	28.60	1,716.82
				9/25/03	28.88	1,716.54
				12/23/03	29.15	1,716.27
				2/11/04	29.31	1,716.11
				4/29/04	29.08	1,716.34
				7/22/04	29.65	1,715.77
				10/26/2004	29.79	1,715.63
				2/11/2005	26.85	1,718.57
				4/28/2005	27.26	1,718.16
				7/27/2005	27.29	1,718.13
				10/27/2005	25.57	1,719.85
				1/19/2006	26.85	1,718.57
				4/18/2006	24.99	1,720.43
CLD2-R	3991049.912	680331.7115	1,753.79	3/23/00	30.14	1,723.65
				6/22/00	30.87	1,722.92
				9/21/00	31.28	1,722.51
				12/14/00	31.65	1,722.14
				3/15/01	31.01	1,722.78
				6/14/01	31.94	1,721.85
				9/27/01	32.29	1,721.50
				12/13/01	32.17	1,721.62
				3/12/02	31.95	1,721.84
				6/11/02	31.05	1,722.74
				9/1/02	31.95	1,721.84
				12/19/02	32.00	1,721.79
				3/27/03	31.94	1,721.85
				6/26/03	32.38	1,721.41
				9/25/03	32.42	1,721.37
				12/23/03	35.20	1,718.59
				2/11/04	35.23	1,718.56
				4/29/04	32.40	1,721.39
				2/11/2005	30.12	1,723.67
				4/26/2005	30.74	1,723.05
				7/27/2005	30.4	1,723.39
				10/28/2005	28.59	1,725.20
				1/19/2006	30.48	1,723.31
				4/18/2006	28.45	1,725.34
CLD3-R	3991089.646	680487.4613	1,752.57	3/23/00	28.89	1,723.68
				6/20/00	29.48	1,723.09
				9/21/00	29.87	1,722.70
				12/14/00	32.20	1,720.37
				3/15/01	30.51	1,722.06
				6/14/01	30.81	1,721.76
				9/1/01	31.14	1,721.43
				12/13/01	31.47	1,721.10
				3/12/02	31.90	1,720.67
				6/11/02	32.25	1,720.32

Table 2-1 (continued)
Plant Site Groundwater Levels

Monitor Well	UTM Y Zone North-South Coordinates in Meters[1]	UTM Y Zone East-West Coordinates in Meters[1]	Casing Elevation[2]	Date Measured	Depth to Water[3]	Groundwater Elevation[2]
CLD3-R	3991089.646	680487.4613	1,752.57	9/25/02	32.80	1,719.77
				12/19/02	33.10	1,719.47
				3/27/03	33.17	1,719.40
				6/26/03	33.51	1,719.06
				9/25/03	34.03	1,718.54
				12/23/03	34.43	1,718.14
				2/22/04	34.57	1,718.00
				4/29/04	34.59	1,717.98
				7/22/04	34.97	1,717.60
				10/26/04	35.38	1,717.19
				2/8/05	33.61	1,718.96
				4/28/05	33.02	1,719.55
				7/26/05	33.08	1,719.49
				10/27/05	32.88	1,719.69
				1/18/06	32.46	1,720.11
				4/19/06	32.34	1,720.23
CLD4-R	3990712.673	680370.6724	1,782.07	3/23/00	36.96	1,745.11
				6/22/00	37.73	1,744.34
				9/21/00	37.91	1,744.16
				12/14/00	37.60	1,744.47
				3/15/01	37.30	1,744.77
				6/14/01	37.96	1,744.11
				9/1/01	38.23	1,743.84
				12/13/01	37.62	1,744.45
				3/12/02	36.60	1,745.47
				6/13/02	36.60	1,745.47
				9/27/02	37.70	1,744.37
				12/19/02	38.10	1,743.97
				3/27/03	38.00	1,744.07
				6/26/03	38.05	1,744.02
				9/25/03	38.21	1,743.86
				12/23/03	38.35	1,743.72
				2/11/04	38.37	1,743.70
				4/29/04	37.94	1,744.13
				7/22/04	38.18	1,743.89
				10/26/2004	38.03	1,744.04
				2/11/2005	36.24	1,745.83
				4/26/2005	36.18	1,745.89
				7/27/2005	36.68	1,745.39
				10/28/2005	36.61	1,745.46
				1/17/2006	36.87	1,745.20
				4/25/2006	37.2	1,744.87
MW-3	3990019.748	680714.6132	1,843.63	3/22/00	55.95	1,787.68
				6/20/00	56.27	1,787.36
				9/20/00	56.44	1,787.19
				12/12/00	56.31	1,787.32
				3/14/01	56.19	1,787.44
				6/13/01	56.25	1,787.38
				9/26/01	57.48	1,786.15
				12/12/01	56.28	1,787.35
				3/12/02	56.15	1,787.48
				6/12/02	56.50	1,787.13
				9/26/02	56.70	1,786.93
				12/17/02	56.60	1,787.03
				3/26/03	56.72	1,786.91
				6/25/03	56.88	1,786.75
				9/24/03	56.73	1,786.90
				12/18/03	56.54	1,787.09
				2/10/04	56.25	1,787.38
				4/28/04	56.25	1,787.38

Table 2-1 (continued)
Plant Site Groundwater Levels

Monitor Well	UTM Y Zone North-South Coordinates in Meters[1]	UTM Y Zone East-West Coordinates in Meters[1]	Casing Elevation[2]	Date Measured	Depth to Water[3]	Groundwater Elevation[2]
MW-3	3990019.748	680714.6132	1,843.63	7/21/04	56.72	1,786.91
				10/25/04	56.82	1,786.81
				2/10/05	56.23	1,787.40
				4/29/05	55.94	1,787.69
				7/27/05	56	1,787.63
				10/28/05	55.63	1,788.00
				1/23/06	55.6	1,788.03
				4/25/06	55.88	1,787.75
MW-4	3990620.623	680969.126	1,800.61	3/22/00	49.61	1,751.00
				6/20/00	50.35	1,750.26
				9/20/00	50.90	1,749.71
				12/12/00	51.18	1,749.43
				3/14/01	51.18	1,749.43
				6/13/01	51.55	1,749.06
				9/26/01	51.95	1,748.66
				12/12/01	51.77	1,748.84
				3/12/02	51.48	1,749.13
				6/12/02	52.00	1,748.61
				9/26/02	52.00	1,748.61
				12/17/02	51.00	1,749.61
				3/26/03	51.36	1,749.25
				6/25/03	52.05	1,748.56
				9/24/03	52.11	1,748.50
				12/18/03	51.42	1,749.19
				2/10/04	52.00	1,748.61
				4/28/04	52.03	1,748.58
				7/21/04	52.38	1,748.23
				10/25/04	52.35	1,748.26
				2/10/05	50.31	1,750.30
				4/26/05	49.72	1,750.89
				7/25/05	50.58	1,750.03
				10/25/05	50.69	1,749.92
				1/16/06	50.56	1,750.05
				4/21/06	50.63	1,749.98
MW-5	3990421.981	680767.1211	1,812.48	3/22/00	49.10	1,763.38
				6/20/00	49.83	1,762.65
				9/20/00	50.02	1,762.46
				12/12/00	50.43	1,762.05
				3/14/01	50.75	1,761.73
				6/13/01	50.66	1,761.82
				9/26/01	50.68	1,761.80
				12/12/01	50.80	1,761.68
				3/12/02	50.81	1,761.67
				6/12/02	50.45	1,762.03
				9/26/02	50.10	1,762.38
				12/17/02	50.30	1,762.18
				3/26/03	50.63	1,761.85
				6/25/03	50.22	1,762.26
				9/24/03	50.32	1,762.16
				12/18/03	50.80	1,761.68
				2/10/04	50.82	1,761.66
				4/28/04	50.62	1,761.86
				7/21/04	50.28	1,762.20
				10/25/04	49.38	1,763.10
				2/14/05	49.88	1,762.60
				4/27/2005	48.95	1,763.53
				7/25/2005	49.09	1763.39
				10/26/2005	48.71	1763.77
				1/16/2006	49.32	1763.16
				4/21/2006	49.82	1762.66

Table 2-1 (continued)
Plant Site Groundwater Levels

Monitor Well	UTM Y Zone North-South Coordinates in Meters[1]	UTM Y Zone East-West Coordinates in Meters[1]	Casing Elevation[2]	Date Measured	Depth to Water[3]	Groundwater Elevation[2]
MW-6R	3990389.069	680432.3516	1812.36	3/22/2000	43.26	1769.1
				6/21/2000	43.57	1768.79
				9/20/2000	41.57	1770.79
				12/13/2006	42.75	1769.61
				3/14/2006	43.23	1769.13
				6/13/2006	43.51	1768.85
				9/26/2001	43.81	1768.55
				12/12/2001	43.78	1768.58
				3/14/2002	43.31	1769.05
				6/13/2002	43.25	1769.11
				9/30/2002	43.4	1768.96
				12/18/2002	43.8	1768.56
				3/26/2003	43.67	1768.69
				6/25/2003	43.71	1768.65
				9/24/2003	43.89	1768.47
				12/18/2003	43.98	1768.38
				2/10/2004	43.83	1768.53
				4/28/2004	43.52	1768.84
				7/21/2004	43.49	1768.87
				10/25/2004	43.36	1769.00
				2/14/2005	42.5	1769.86
				4/27/2005	42.55	1769.81
				7/25/2005	42.86	1769.5
				10/26/2005	42.51	1769.85
				1/18/2006	43.18	1769.18
				4/25/2006	43.92	1768.44

Notes:

[1]	UTM Zones in meters relative to NAVD 27
[2]	Elevations surveyed to NAVD 1988 reported in feet above mean sea level; surveyed by licensed surveyor.
[3]	Reported depths in feet below top of casing
DRI	Desert Research Institute
NA	Not applicable
NAVD	North American Vertical Datum
UTM	Universal Transverse Mercator

3.0 PROCESSES, WASTE STREAMS, SOURCE AREAS, SITE-RELATED CHEMICALS, AND PRINCIPAL CHEMICALS

Facility processes, waste streams, and waste stream disposition have been evaluated to identify site-related chemicals (SRC), potential contaminants, and potential source areas (PSA). The purpose of this section is to provide an overview of the waste stream sources from facility processes and operations; identify the SRCs associated with each waste stream based on process knowledge and waste analyses; identify PSAs based on waste stream disposition and the associated SRCs; and identify sampling locations and analytical data available for each PSA. This information has been compiled to determine analytical and sampling location data gaps, evaluate the nature and extent of contamination, and prepare the CSM.

The process and waste stream information summarized in this section originated in facility process information, former site investigations, assessments including waste analyses, the Phase I ECA (Law Engineering, Inc. 1993), the ECI and ECIA (Tetra Tech 1998, 1999), and the hydrogeologic characterization (Appendix A). Identification of SRCs is documented in the "Site-Related Chemicals Technical Memorandum," dated October 13, 2004 (Tetra Tech 2004c). Identification of PSAs is documented in the "Potential Source Areas Technical Memorandum," dated July 5, 2005 (Tetra Tech 2005b).

3.1 PROCESSES

Processes conducted on what is now the TIMET Plant Site have included production of magnesium ingot, as well as titanium tetrachloride, titanium sponge, and titanium ingot. Magnesium production was conducted by Basic Magnesium, Inc. for the U.S. Government during the years 1942 through 1944. Titanium production operations have been conducted on the site from 1951 until present. Tenants with process operations on the TIMET Plant Site have included Pioche Manganese and Chemtec (Law Engineering, Inc. 1993). Pioche Manganese was a tenant on the TIMET property from 1951 through 1956. Chemtec Corporation was a tenant for an undetermined period of time from 1972 until 1978.

3.1.1 Magnesium Production

Magnesium production operations included a chlorine/caustic plant, which was located on properties to the west of what is now the TIMET Plant Site, and the magnesium production facilities. The following subsections provide a brief overview of the processes used to produce magnesium (BRC 2006).

3.1.1.1 Chlorine/Caustic Plant

Sodium chloride (salt) was processed (dissolved) in the chlorine/caustic plant to form saturated brine. The saturated brine was then purified by settling out the mud and solid material, and then treated with sodium carbonate. After the sodium carbonate reacted with the calcium and magnesium, those materials were then settled from the brine. The brine was cleaned up and put into a chlorine electrolytic cell where a direct electric current passed through the cell and formed chlorine gas, sodium hydroxide (caustic soda) and byproduct hydrogen.

3.1.1.2 Magnesium Plant

The magnesium plant consisted of 10 large buildings, Units 1 through 10. Units 7, 8, 9, and 10 are located on the TIMET Plant Site. Units 7, 8, 9, and 10 are still in use for the production of titanium. Each of the magnesium plant buildings were divided into two rooms: a chlorinator room and an electrolytic cell room.

The chlorinators produced the feed for the electrolytic cells by converting magnesium into magnesium chloride. In this process, magnesium oxide was mixed with coke, recycled magnesium chloride, and peat moss to form a pellet. The pellets were dried and fed to the chlorinator. The material was heated to the appropriate temperature, the reaction occurred, and then the molten magnesium chloride was drawn off and transported to the electrolytic cells.

Electrolytic cells contained a molten salt bath consisting of the chloride salts of sodium, potassium, calcium, and magnesium. The cells consisted of steel cathodes and graphite anodes contained in a refractory-lined steel box. When a direct current passed through the cell, chlorine gas was drawn to the positively charged anode, and magnesium was drawn to the negatively charged cathode of the cell. The magnesium eventually broke off of the cathode and floated to the top of the cell. Periodically, the magnesium was removed from the cell and then cast into ingots or mixed with other metals to make magnesium alloys.

Waste streams from the magnesium plant operations likely included solid and liquid wastes similar to the wastes generated by TIMET. Waste streams from the magnesium operations were discharged to the on-site J-9 Tailings Ponds, the S-18/J2 Landfill, and off site to the BMI Tailings Ponds.

3.1.2 Titanium Production

Titanium production has occurred in Units 7 through 12 on the Plant Site (Figure 1-3). The major titanium production processes include:

- Chlorination
- Purification
- Reduction
- Magnesium recovery
- Leaching
- Crushing
- Blending/melting
- Scrap reclaim
- Laboratory testing

Process flow diagrams for operations from the 1950s through 1993 (Figure 3-1), 1993 through 2005 (Figure 3-2), and 2005 through present (Figure 3-3) show the titanium production processes and identify building locations, raw materials, intermediates, waste streams, and waste stream disposition and relative volumes. The volumes shown on the process flow diagrams are not exact quantities and have varied over time because of production rates and process changes. The volumes are presented to provide an indicator of the volume of wastes coming from each production unit. Air emissions from the facility have been controlled and are permitted by the Clark County Health Department. As such, no PSAs have been identified as a result of air emissions and this CSM does not address emissions to the air.

3.1.2.1 Chlorination

Rutile ore is primarily (>95%) titanium dioxide (TiO_2). In chlorination, the TiO_2 in the rutile is reacted with chlorine to produce titanium tetrachloride ($TiCl_4$).

The chlorination unit includes chlorinators, condensers, caustic tanks, caustic towers, wash towers, and venturi scrubbers. In the chlorinators, chlorine gas is passed through a mixture of rutile ore and coke at 1,000 °C to produce crude $TiCl_4$. The crude $TiCl_4$ is collected in the off-gas from the chlorinator along with other chloride gases and is liquefied by passing the gas through a series of condensers. Residual $TiCl_4$ is removed from the off-gas from the final condenser in a wash tower. Residual acids and chlorine

are scrubbed from the off-gas in a caustic tower. Particulates are removed with venturi scrubbers prior to venting.

Acid wastes and caustic wastes from the wash towers are discharged to the OPW and caustic wastewater systems. The primary solid wastes, chlorinator dust and chlorinator bed dump, are nonhazardous and have been disposed in the J2 Landfill. Chlorinator dust is currently transported off site for disposal.

There have been no major changes to chlorination raw materials or processes from the 1950s to the present.

3.1.2.2 Purification

In purification, the crude $TiCl_4$ is mixed with a nonhazardous proprietary chemical to complex and remove trace metal impurities. Purification includes fractionation columns, condensers, storage and vaporization tanks, and a vent condenser and scrubber system. The treated $TiCl_4$ is vaporized in a vaporizer tank and then distilled to remove low- and high-boiling chloride impurities. A recycle stream of liquid $TiCl_4$ containing about 25 percent solids is diverted from the vaporizer tank to the CSD. In the CSD, the $TiCl_4$ is vaporized, condensed, and recycled to the crude feed tanks. The CSD solids are sluiced with OPW liquids for on-site management. Scrubber wastewater is discharged to the OPW system.

There have been no major changes to purification raw materials or processes from the 1950s to the present.

3.1.2.3 Reduction

1951-1993 (Old Process)

The old reduction process involved the reduction of $TiCl_4$ with magnesium metal to produce titanium and magnesium chloride in the J-1 and J-5 buildings. The reduction reactors were loaded with magnesium and heated to 850 °C to melt the magnesium. $TiCl_4$ was then injected into the reactor where it reacted with the molten magnesium to form molten magnesium chloride salt and titanium. The molten magnesium chloride was tapped off the base of the reactor and sent to the magnesium recovery unit. The reactor was cooled with NCCW and the titanium was removed.

Venture scrubber water and NCCW used on the reactors and a vacuum pump were discharged to the Alpha Ditch. Solid wastes generated during the process (titanium, magnesium, and magnesium chloride dust) were disposed of in the J2 and BMI Landfills.

1994-Present (Vacuum Distillation Process)

In the new and current reduction process, which occurs in Unit 10, the chemistry is the same as the old process. Magnesium is reacted with $TiCl_4$ to form molten magnesium chloride salt and titanium. After the reaction, the magnesium and magnesium chloride salts are distilled from the titanium mass in the Vacuum Distillation Process (VDP). The VDP vessel is then cooled and the titanium is removed. The magnesium chloride is recycled to magnesium recovery for reuse.

Solid wastes include titanium, magnesium, and magnesium chloride dusts. These wastes are disposed of in the J2 Landfill.

Liquid wastes include cooling tower blowdown, VDP scrubber water, the sand filter backwash, the VDP reverse osmosis unit cleaning water, the spray return tank discharge, and various floor drains. All of these liquid wastes were routed to the OPW system until 2005. Beginning in 2005, the OPW wastes were routed to the WCF.

3.1.2.4 Magnesium Recovery

Prior to 1983, magnesium recovery was conducted in Units 7 and 10. In 1983, new, more efficient magnesium recovery cells were installed in Unit 9 to replace the older cells in Unit 10. During magnesium recovery, the molten magnesium chloride from reduction is electrolytically converted to magnesium metal and chlorine gas. The magnesium metal is recycled to reduction and the chlorine gas is recycled to chlorination.

Solid wastes include electrolytic salts, smut, refractory brick, and carbon anodes that are disposed of in the J2 Landfill or sold for recycling. Liquid wastes include spent caustic, cooling tower blowdown water, anode cooling water system reject water, chlorine compressor area washdown water, and baghouse salt solutions. The liquid wastes were discharged to the spent caustic or OPW systems until 2005. After 2005, the liquid wastes were discharged to the WCF.

3.1.2.5 Leaching

The leaching process, conducted in large heated tanks, removed residual magnesium and magnesium chloride salts from crushed titanium chips using a mixture of hydrochloric, nitric, and citric acids and urea (leach liquor). After leaching, the titanium chips were water rinsed and then dried. The leaching process was discontinued in 1993 and replaced with the VDP. The leach liquor was neutralized with lime and

discharged to on-site and off-site ponds. Water from the washer unit was discharged to the OPW system. NCCW and chip transfer water was discharged to the Alpha Ditch. Titanium fines generated from this process were sold.

3.1.2.6 Crushing

Titanium chips are processed through a multistory crusher, which reduces the size of the chip and separates it into individual size categories. Crushing is conducted in Unit 8 and Buildings J-3 and C-9. Prior to 1993, crushing was conducted before the leaching process. Since the startup of the VDP, crushing has been conducted after the distillation step.

Solid wastes from crushing have included iron, scrap metal, titanium dust, magnesium dust, and magnesium chloride dust. All solid wastes are disposed of in the J2 Landfill or sold. Liquid wastes from the crushing process include the crusher scrubber unit water from Building J-3, the C-9 wet scrubber effluent, and washdown water. All of these liquid wastes are discharged to the OPW system.

3.1.2.7 Blending/Melting

The melting and blending processes are conducted in Units 11, 12, and 13. Blending operations combine titanium sponge into larger blends in blenders and splitters. No water or liquid is used in the blending operation. The blended titanium sponge is combined with other metal alloys, pressed into blocks using a hydraulic press, welded, and melted in consumable electrode vacuum arc furnaces.

Liquid wastes discharged to the OPW system include Unit 12 washwater and pickling wastes (until the early 1980s when the pickling process was replaced with a hydroblast unit). Pickling (hydrochloric, nitric, and hydrofluoric acids) and hydroblasting were used to remove residual metal salts from titanium ingots prior to melting and blending. Solids from hydroblasting are settled out in a lugger box prior to discharge of the wastewater. Other liquid wastes that are or were discharged to the Blast Ditch, then to the Back Ditch, and then to the Alpha Ditch are hydroblast water, once-through NCCW, washdown water from the melt areas, water from ingot cutting, crucible cleaning water, furnace washout water, and steam ejector water discharge.

Solid wastes include titanium fines from the cyclone dust collectors that are drummed and sold. Before the 1980s, titanium fines were disposed of in the J2 and BMI Landfills. Scrap metal and sponge are recycled or sold. Solid wastes from the hydroblast unit are primarily salts that are removed from the sheath that surrounds the ingots. These salts are disposed of in the J2 Landfill. Crucible cleaning solids

are disposed of in the J2 Landfill. Since 1991, spent oil absorbents have been disposed of off site. Prior to 1991, the spent absorbents were disposed of in the J2 Landfill. Since 1981, used oil has been collected and recycled off site. Prior to 1981, used oil was used as a dust suppressant on plant roadways.

3.1.2.8 Scrap Reclaim

Scrap reclaim is located in Unit 8. Scrap titanium delivered from various facilities is processed through a shot blast unit for cleaning and either welded into electrodes for melting or collected in reactor vessels for processing in hydrogenation furnaces. Scrap reclaim is either reused on site or sold off site.

Liquid wastes include washwater that is discharged to the spent caustic system, ingot cutting cooling water that is discharged to the OPW system, and wet cyclone water that is discharged to the Alpha Ditch. Solid wastes include spent shot from the shot blast unit that is disposed of in the J2 Landfill and particulates from the cyclone scrubber that are collected and sold for reuse.

3.1.3 Former Tenant Processes

3.1.3.1 Pioche Manganese

Pioche Manganese operated out of Building J2 and owned Unit 10. Pioche Manganese processed ore from the nearby Three Kids Mine using an arc (carbon electrode) furnace for approximately 4 years (1954 through 1958). The ore melting operations in Building J2 produced manganese and process slag (the major waste stream), which was stockpiled east and north of Building J2. Pioche Manganese wastes were placed in the S-18/J2 Landfill and the manganese slag was stockpiled in the area referred to as the S-20 Landfill. The J2 Landfill was purchased by TIMET in 1979 from Pioche Manganese (Law Engineering, Inc. 1993, Section 3.1.2).

3.1.3.2 Chemtec

Chemtec leased Building K-55 for use as a laboratory from TIMET from about 1975 until March 1978. The facility may have included a small pilot plant. Laboratory wastes discharged to the OPW waste system included about 2 gallons per week of acids (hydrochloric, nitric and sulfuric), sodium salts, and small quantities of reagents. Tailings were stored outside of Building K-55, but are no longer stored there.

The disposition of facility waste streams from the site processes have been identified and waste characterization has been conducted to assist with identifying SRCs and PSAs.

3.2 WASTE STREAMS

The waste streams from magnesium, titanium, and other (tenant-conducted) production processes as identified in process flow diagrams and the process descriptions are listed in Table 3-1. A description of each waste stream, including major waste components and known SRCs associated with each PSA, is provided. The disposition of each waste stream to on-site and off-site waste management facilities, including dates (where available) of operations, is also provided.

Characterization and identification of components of the waste streams have been made through process knowledge and waste analyses. Waste stream analytical data are provided in Appendix D. The analytical data are representative of the waste streams sampled. The principal chemicals present and residual chemicals identified in the analytical data are generally representative of the waste stream composition. Concentrations of the waste stream constituents in the analytical reports may vary based on process operation schedules, production volumes, and types of wastes discharges at any given time.

3.3 SITE-RELATED CHEMICALS

The list of SRCs was developed through evaluation of site processes, raw material analyses, waste stream analyses, and other sources. The SRCs are those chemicals that are raw materials, intermediates, products, byproducts, waste components, and otherwise-used chemicals that were stored, used, produced, handled, disposed of, or otherwise used at the TIMET Plant Site. SRCs may also include certain chemicals that have been detected in site media (soil, sediment, or groundwater) during previous investigations, but have an unidentified or unknown source. The list of SRCs for the TIMET facility is included in the "Technical Memorandum – Site Related Chemicals – Revision 3" included in Appendix E. This memorandum details the methodology and rationale used in developing the list of SRCs.

The inclusion of chromium on the SRC list requires further discussion since there are two potential valence states: trivalent chromium and hexavalent chromium. Chromium is present in trace quantities in the rutile ore as trivalent chromium only (Silver State Laboratory Report, 12/11/2003 located in Appendix D). The titanium manufacturing process concentrates trace metal quantities in process waste streams as the titanium is purified. The primary waste stream where trace metals are concentrated is the CSD solids. The chromium in the CSD solids is also trivalent chromium (Silver State Laboratory Report, 12/18/2003 located in Appendix D).

3.4 POTENTIAL SOURCE AREAS

PSAs were identified on the TIMET Plant Site based on process information, waste stream management and disposition, and former site assessments and investigations. PSAs were identified in the "Potential Source Areas, Technical Memorandum," dated July 5, 2005. The TIMET property and associated PSAs were divided into Parcels A, B, C, D, E, and F based on location, ownership, current and past use, and potential future use in this memorandum. Only those PSAs in Parcels A, B, C, and D which are located on the plant site are adjacent to the plant site are included in this CSM. PSAs associated with Parcels E and F will be addressed in separate documents. The PSAs are shown on Figure 3-4 through 3-7 and detailed in Table 3-2.

Table 3-2 groups the PSAs into five source areas based on location, waste streams, and potential contaminants:

- Surface Ditches and Northern Storage Area
- Near-Surface Soil Source Areas
- Pond Areas
- J2 Landfill Area
- Current and Historical Operational Areas

Subsurface piping on the site is included in the five source areas listed above based on location.

Each PSA is numbered, and associated with the original LOU identification number. Dates of operation, significant modifications, corrective actions, and information on closure or inactivity are provided. A discussion of PSA operations, including their use and waste streams managed in the PSA, is provided. Soil samples collected in the PSAs are listed, and the analytical requirements for the PSA are identified based on the waste streams managed in the PSA. The analytical methods conducted for soil samples collected previously will be compared to the analytical methods based on waste streams managed to assist in determining analytical data gaps for the PSA.

3.5 PRINCIPAL CHEMICALS

The principal categories of chemicals potentially present in PSAs on the site include:

- Metals
- Anions

- Radionuclides
- VOCs
- Water Quality Indicators
- Polycyclic Aromatic Hydrocarbons (PAH)
- PCBs
- Dioxins

The principal chemicals associated with each PSA were identified based on waste streams managed in the area, waste stream components, and a review of existing soil data. The principal chemicals are listed in Table 3-2 and are a subset of the SRCs associated with the PSA. The list of principal chemicals is not intended to eliminate any SRC from further evaluation, but will be used to focus and prioritize future site actions with the goal of determining chemicals of concern (COPC) for each PSA.

TABLES

Table 3-1
Waste Stream Characterization

Waste Stream Number	Waste Stream Name	Description	Disposition	Known Site-Related Chemical
1	CSD Solids	CSD solids consist primarily of coke and unreacted rutile ore, with chlorides and trace amounts of metal oxides from the purification process continuous sludge dryer. The primary metals present include iron, niobium zirconium, vandadium, aluminum, and titanium. Other residual metals present in the rutile, such as chromium, manganese, uranium, and thorium, are concentrated in the CSD from the purification process. The CSD solids are slurried with OPW effluent.	1950s to 1970s - BMI Landfill and J-2 Landfill 1970s to 2005 - Sluiced with OPW effluent in OPW drain lines to CSD North and South Ponds. Liquids from the CSD ponds were routed to the former Pabco Road Ponds. 2005 to Present - Sluiced with OPW effluent in OPW drain lines to the WCF. Other locations - old caustic pond, Francy's Mountain, NSA.	Carbon; metals (excluding antimony, barium, beryllium, cadmium, cobalt, copper, lithium, mercury, molybdenum, nickel, palladium, phosphorus, selenium, silver, thallium tungsten) chloride; radionuclides (Th-232, U-238, U-235 decay chains); and water quality indicators
2	OPW Wastewater	OPW wastewater is generated from all operational areas of the plant, including chlorination (cooling water, scrubber water with titanium dioxide and hydrochloric acid); purification (PVS scrubber water containing titanium dioxide, silicon dioxide, and tin oxides); magnesium recovery (cooling water, spent sulfuric acid, chlorine baghouse slurry (chloride salts in water); scrubber water, including hydrchloric acid; crushing (water and titanium solids); leaching (washer unit wastewater containing acids, magnesium, and magnesium chloride); melt shop (wash water); scrap reclaim (cooling water, HCl pickling acid, detergent wash water); laboratory acids and pickling solutions (lithium chloride); and small quantities of other laboratory wastes (hydraulic fluids, photochemical process liquids, reagents). The OPW wastewater is acidic in nature and contains trace amounts of solids in water.	1950s-2005 - OPW wastewater was collected in subsurface piping, neutralized with slaked lime or soda ash, and routed to on-site CSD, HP-1, HP-6, and SW-1 ponds. Solids were settled out in on-site ponds. 1951 to 1977 - Liquids were discharged to the Beta Ditch System and then to the BMI Upper Ponds. 1977 to 2005 - :iquids were pumped through subsurface piping to the former Pabco Road Ponds off site. CSD solids are sluiced with OPW at the sludge dryer in purification. Present - OPW with CSD solids is pumped through piping for treatment at the WCF.	Metals; anions; radionuclides (Th-232, U-238, U-235 decay chains); and water quality indicators
3	Spent Caustic	Caustic wastewater includes spent caustic scrubber water used to remove chlorine gas from the chlorination process and the magnesium recovery process. The caustic liquids also include washwater from Unit 12 and reclaim washer unit water. The primary components of this waste stream include water and sodium chloride. Other waste constituents include calcium, magnesium, potassium, sodium hypochlorite, sodium bicarbonate, sodium carbonate, and silicon dioxide.	1950s to 2005 - Caustic wastewater was collected in subsurface piping and routed to an on-site caustic pond and HP-6. 1952 to 1965 - Liquids were discharged to the Beta Ditch System and then to the BMI Upper Ponds. 1965 to 2003 - Caustic wastewater was also pumped to the former Pabco Road Ponds off site. Present - Caustic wastewater is routed to the WCF for treatement.	Metals (chromium, titanium, magnesium, sodium); anions (chloride, sulfate, fluoride); and water quality indicators
4	Leach Liquor	Leach liquor wastewater was generated from leaching of magnesium and magnesium chloride from crushed titanium chips using a mixture of hydrochloric, nitric and citric acids, and urea during the leaching process. Leach liquor was a solution of water and magnesium chloride with residual acidity. Other waste constituents include calcium, titanium, nitrates, and sulfates. Leach liquor is no longer generated by site processes.	1950s to 1993 - Leach liquor wastewater was collected in a common collector in the basement of Building 8, and discharged to the leach liquor piping. The leach liquor piping is dedicated pipe within the OPW line. 1951 to 1977 - Liquids were discharged to the Beta Ditch System and then to the BMI Upper Ponds. 1977 until 1993 - Leach liquor was neutralized with lime and routed to on-site ponds, including SW-1 (formerly LL-1/North), HP-1 (formerly LL-2/South), and HP-6. The liquids were pumped to the former Pabco Road Ponds off site. The magnesium chloride solution was used on facility roadways for dust control.	Metals (excluding antimony, barium, beryllium, cadmium, cobalt, copper, lithium, mercury, molybdenum, nickel, palladium, phosphorus, selenium, silver, thallium, tungsten); anions; and water quality indicators

Table 3-1 (Continued)
Waste Stream Characterization

Waste Stream Number	Waste Stream Name	Description	Disposition	Known Site-Related Chemical
5	Chlorinator Dust	Chlorinator dust consists of rutile and coke particles from cyclones used to scrub gas from the top of the chlorinator.	Prior to 1983 - BMI landfill. 1983 to 2006 - J-2 Landfill. 2006 to Present - Off-site disposal in permitted landfill. Other on-site locations Francy's Mountain.	Carbon; metals (excluding antimony, barium, beryllium, cadmium, cobalt, copper, lithium, mercury, molybdenum, nickel, palladium, phosphorus, selenium, silver, thallium, tungsten); chloride; radionuclides (Th-232, U-238, U-235 decay chains); and water quality indicators
6	ACM	Asbestos was present as insulation material on certain plant piping and tanks.	Formerly, building demolition waste containing asbestos was placed in the J-2 Landfill. Other areas - NSA.	Asbestos
7	Rutile Residues	A minor amount of unprocessed rutile ore is lost in and around the rail siding to the south of the J-2 warehouse. Rutile ore is delivered to chutes and silos located east of J-2 by underground conveyor belts. Ore is transferred in metal hoppers and transported to the chlorination plant.	1970s to Present - Residues on rail siding.	Metals (excluding antimony, barium, beryllium, cadmium, cobalt, copper, lithium, mercury, molybdenum, nickel, palladium, phosphorus, selenium, silver, thallium, tungsten); and radionuclides (Th-232, U-238, U-235 decay chains)
8	Coke Residues	A minor amount of unprocessed coke is lost in and around the rail siding. Coke is stored in silos northwest of Building J-5. Coke is delivered by metal hoppers to the chlorination facility.	Residues on rail siding.	Carbon
9	Pioche Manganese Slag	Slag was generated from a ferromanganese process conducted by Pioche Manganese from 1954 through 1958.	1954 to 1958 - J-2 Landfill and Landfill S-20.	Metals, anions, and water quality indicators
10	WCF Brine (Reject Water)	Brine is generated from the WCF constructed in 2005 to treat facility OPW and CSD wastewaters.	2005 to Present - On-site Ponds HP-1 and HP-6. These ponds were relined prior to receiving WCF brine.	Carbon, metals, anions, radionuclides (Th-232, U-238, U-235 decay chains), and water quality indicators
11	NCCW	NCCW sources include reduction vessel cooling water, Melt Unit 11 cooling water from welding operations, and cooling water jacket leakage.	1950s to Present - Discharge to the Blast Ditch, to the Back Ditch, to the oil skimmer, and then to the Alpha Ditch. Discharge is included in facility NPDES permit.	Metals (chromium, copper, magnesium, titanium); phosphorus; anions (chloride); oil and grease; and water quality indicators
12	Unit 11 Discharges	These wastewaters included washdown water from melt areas (no longer generated), spent hydroblast liquids, water from ingot cutting, crucible cleaning water, furnace washout water, steam ejector vacuum water discharge (no longer generated), and cooling water from slotter machine (no longer generated).	1950s to Present - Discharge to the Blast Ditch, to the Back Ditch, to the oil skimmer, and then to the Alpha Ditch. Discharge is included in facility NPDES permit.	Oil; metals (chromium, copper, iron, lead, mercury, selenium, silver, sodium, titanium); anions (chloride); and water quality indicators
13	Paint Shop Solvents (VOC)	Paint shop wastes include solvents, used paint cans, and brushes and other painting equipment	Prior to 1991 - J-2 Landfill. Solvents were blended with oil and used as a dust suppressant on plant roadways, or broadcast near Unit 7. 1991 to Present - all paint wastes are disposed off site.	Metals (barium, chromium, iron, lead, titanium, zinc) and VOCs
14	Wooden Pallets	Wooden pallets were stored and possibly burned at the site.	Landfill S-17	PAHs and dioxins/furans
15	PCBs	PCB transformers were historically in use on the site and the WAPA facility. PCBs wastes result from leaking PCB electrical equipment in use and storage .	Maintenance Yard north of Building J-2, transformer storage area (vicinity of former J-9 tailings ponds), and the WAPA facility located along the southeast site border have had PCB contaminated oil leaks that have impacted facility soils and stormwater. Stormwater from the WAPA site discharges to TIMET's stormwater collection system at the southeast end of Avenue H and then to the Alpha Ditch.	PCBs

Table 3-1 (Continued)
Waste Stream Characterization

Waste Stream Number	Waste Stream Name	Description	Disposition	Known Site-Related Chemical
16	Petroleum Hydrocarbons	Petroleum hydrocarbon sources included USTs for gasoline, diesel or fuel oil; hydraulic fluids; melt shop hydraulic oil; equipment oil and greases.	Waste oil drain (2-inch pipe north end of gear/equipment room in Building J-5) Prior to 1981 - Spent oil was used as a dust suppressant on plant roadways (estimated 5,000 gallons total). 1981 to present - All used oil is shipped off site for recycling. All USTs have been removed or closed in-place. UST closures have been obtained from Clark County or NDEP, or are in process.	TPH, metals (chromium, cadmium, lead), and VOCs (BTEX)
17	Magnesium Wastes	Wastewater and solid wastes were generated from magnesium production processes.	1941-1944 - Magnesium production wastes were routed to the J-9 Tailings ponds . Solid wastes were place into the S-18/J-2 Landfill and other wastewaters were discharged off site to the BMI tailings ponds.	Metals (aluminum, antimony, beryllium, cadmium, cobalt, magnesium, nickel, thallium, zinc); anions; radionuclides (Th-232, U-238, U-235 decay chains); and water quality indicators
18	Nonhazardous Plant Solid Wastes	Nonhazardous plant solid wastes include sandblasting dust, chlorinator bed dump, condenser rake outs, chlorinator brick, scrubber packing, floor sweepings, baghouse and cyclone dusts, burnt sponge, carbon anodes, electrolytic salt waste, cell runouts, anodes, magnesium recovery bricks, magnesium chloride, furnace scale, rubber hoses and gaskets, titanium dusts, magnesium and magnesium chloride chips and dusts, scrap metals, construction demolition wastes including asbestos, and oily solid wastes from past spill cleanups.	Prior to 1979 - BMI Landfill. 1979 to present - J-2 Landfill.	Metals, anions, radionuclides (Th-232, U-238, U-235 decay chains), water quality indicators, and asbestos
19	Magnesium Oxide/Silica Sand/Sandblasting Media	Magnesium oxide is removed from vessels by sandblasting with silica sand (formerly), and currently with sandblasting material (Black Beauty). The area used to conduct this facility operation is adjacent to the south side of Avenue G and west of the property line.	Current operating area adjacent to the south side of Avenue G and west of the property line contains blasting materials and residues of magnesium oxide sandblasted from kettles. Possible residues from kettle cleaning by sandblasting using silica sand historically, and black beauty. Residues from kettle cleaning are removed along with sandblast material to the J-2 Landfill	Metals (magnesium, silicon)
20	Scrap Metal, Recyclable Metals, Alloys, Waste Roofing Tar	Material storage, rubble and debris area, and drum storage areas (LOU items 54c and 54f-54n) are present at the site. LOU 54c is a "Rubble and Debris" area that was reported in the ECA on Plate 1 and is believed to be scrap that has been relocated (IIS). LOU items 54f-54n are the drum storage areas referenced in the ECA. The drums were inventoried and found to contain solids, including scrap metal, recyclable metals, alloys, and solidified roofing tar.	Scrap metals are recycled off site, other alloys are used in the process. Solidified roofing tar is disposed of off site.	Metals (excluding antimony, barium, beryllium, cadmium, cobalt, copper, lithium, mercury, molybdenum, nickel, palladium, phosphorus, selenium, silver, thallium, tungsten); and PAHs
21	Nitric Acid and Hydrochloric Acid	The former rail acid delivery and acid tank farm areas (LOU items 8 and 9) were used for receiving and storing nitric and hydrochloric acids. The acid tank farm base materials were removed and disposed of off site, the tank farm was lined, and tank farm berms were increased in height in 1992. The tank farm ceased operations in 1993.	1950s to 1993 - The former acid tank farm and acid rail car unloading areas drained to the OPW collection system.	Nitric acid and hydrochloric acid
22	Titanium Tetrachloride Liquid Residues	Titanium tetrachloride is loaded into railcars as part of current operations.	Current operating area for loading.	Titanium tetrachloride

Table 3-1 (Continued)
Waste Stream Characterization

Waste Stream Number	Waste Stream Name	Description	Disposition	Known Site-Related Chemical
23	BMI Waste Streams	Wastewater from other BMI facilities located to the west discharged to drainage ditches that intersected the NSA of the TIMET Plant Site. These wastewaters flowed into the former BMI Pond in the NSA and were then discharged off site. Historically the off-site ditches that discharged to this area included the Trade Effluent Ditch, caustic from Outfall (R-4), the Alpha Ditch, the Beta Ditch, and the Northwest Ditch. Wastewaters included process effluents, NCCW, and stormwater from BMI companies located to the west.	1940s to Present - NSA.	Metals, anions, organochlorine pesticides, PAHs, petroleum hydrocarbons, PCBs, VOCs, radionuclides, and water quality indicators
24	Sodium Hydroxide/Potassium Hydroxide	Residual NaK (about 8 ounces) was removed from crucible cleaning jackets with steam. The NaK reacts with steam to form sodium hydroxide and potassium hydroxide.	Until Mid-1980s - Cleaning of the residual NaK with steam occurred outside and just south of Building K-53 on an infrequent basis when there was a crucible jacket failure. This practice has been discontinued.	Sodium hydroxide and potassium hydroxide

Notes:

ACM	Asbestos-containing material	NSA	Northern Storage Area
BMI	Basic Management, Inc	OPW	Other processed waste
BTEX	Benzene, toluene, ethyl benzene, xylenes	PAH	Polycyclic aromatic hydrocarbon
CSD	Continuous sludge dryer	PCB	Polychlorinated biphenyl
ECA	Environmental conditions assessment	PVS	Purification vent scrubber
IIS	Initial Information submittal	Th	Thorium
LL	Leach Liquor	TIMET	Titanium Metals Corporation
LOU	Letter of understanding	U	Uranium
NAK	Sodium-potassium	UST	Underground Storage Tank
NCCW	Noncontact Cooling Water	VOC	Volatile Organic Compound
NDEP	Nevada Division of Environmental Protections	WAPA	Western Area Power Administration
NPDES	National Pollution Discharge Elimination System	WCF	Water Conservation Facility

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Table 3-2
Source Areas

PSA No.	Location	LOU No.	Description	Dates of Contruction, Modification, Operation	Discussion	PSA Dimensions	Waste Streams	Sample ID Nos.	Analytical Methods Required to Characterize	Principal Chemicals
Source Area: Surface Ditches and Northern Storage Area										
1	Parcel D	2	Northern Storage Area	NA	Storage of solids from CSD ponds and caustic pond, refractory brick, construction equipment, concrete, magnesium chloride ingots, reactor lids, asbestos, and coke. The storage area is unlined and is traversed by inactive drainage segments of the previous liquid waste distribution facilities. The former BMI pond and siphon that are BMI Common Area issues are also located in this area.	13 Acres	CSD solids, OPW, spent caustic chlorinator dust scrap metal, recyclable metals, alloys, waste roofing tar	RP-2-0/0, TMSB-105, TMSB-125, TMSB-106, TMSB-107, TMSB-108, IDN10-02, IDN16-01	Metals Anions Radionuclides WQ Indicators Asbestos	Ti, Zr, Cr, Nb, V, Mg, Si, Na, Th-232, U-238 and U-338 Decay Chains, Chloride, Sulfate, Nitrate, Asbestos
11	Parcels C and D and west of Parcels C and D	43, 53	Former Drainage Ditches	Construction: Before 1943 Modification: Dates unknown Operation: From at least 1943 to late 1970s	Beta Ditch, inactive site ditches, Northwestern Ditch, Mystery Ditch, and former BMI pond. The Beta Ditch is an abandoned unlined ditch located along the northern boundary of the TIMET facility and the southern boundary of the Pabco Ponds Area. The Beta Ditch was active from at least 1943 until 1976 and was used to transport process water along with liquid effluent wastes from the BMI Complex facilities to an unlined tailings ponds area. The Mystery Ditch is an approximate 100-foot , open unlined stormwater drainage ditch that flows from the property, west to the north. TIMET records suggest that the Mystery Ditch may have contained evaporative cooler water or floor washings from a maintenance shop in Unit 7 that repaired metal tote containers. The BMI pond was a small unlined impoundment.	Not Applicable	OPW, spent caustic, leach liquor, NCCW, Unit 11 discharges, BMI wastewater	TMSB-106,107,108,109,110, 124, RP-3-0/0, IDN10-01, IDN12-01, IDN10-02, IDN16-01, MD-01, SF-01	Metals Anions Radionuclides VOCs PAHs Organochlorine Pesticides PCBs Petroleum Hydrocarbons WQ Indicators	All site-related chemicals except asbestos
Source Area: Near-Surface Soil Source Area										
3	Parcel C	21	Francy's Mountain	Construction: 1950 Modifications: NA Operation: 1950 to 1967	In this area, mixed chlorinator dust and CSD solids from the CSD ponds were place directly over native soil. Landfilling activities ceased in 1967. The contents of Francy's Mountain were removed and disposed of off site.	Volume: 8,600 cubic yards	CSD solids, OPW, chlorinator dust	None	Metals Anions Radionuclides WQ Indicators	Ti, Zr, Cr, Nb, V, Mg, Si, Na, Th-232, U-238 and U-338 Decay Chains, Chloride, Sulfate, Nitrate
9	Natural Stormwater Drainage Detention Area	NA	Low-lying area adjacent to the east side of site Pond HP-6.	NA	This low-lying area collects stormwater runoff from north and west of the on-site landfill. The area north and west of the on-site landfill is used for temporary storage of chlorinator dust and anodes.	0.67 Acres	Chlorinator dust	TMSB-126	Metals Anions Radionuclides WQ Indicators	Ti, Zr, Cr, Nb, V, Mg, Si, Na, Rad, Chloride, Sulfate, Nitrate
12	Parcel C	44	Alpha Ditch	Construction: Before 1943 Modification: Dates unknown Operation: Before 1943 until present	The Alpha Ditch is an active unlined conveyance ditch that traverses the eastern portion of the TIMET Plant Site and discharges northeast to the Pabco Ponds Area. Until the Pittman Bypass pipeline was constructed in 1985, the Alpha Ditch discharged stormwater and noncontact process water from various industries in the BMI Complex. Stormwater from the WAPA facility located along the southeastern border of the site is discharged to the TIMET stormwater collection system. Only surface water runoff or wastewater exceeding the bypass pipeline capacity are currently discharged through the Alpha Ditch per NPDES permit requirements. Discharged wastewaters include or have included venturi scrubber water, NCCW, liquid discharges from Unit 11, dewatering box water, swamp cooler water, and hydroblast descaling water. Discharges have occurred coincident with system failures such as pipe breakage and valve failures. Approximately 6.4 mgd are discharged to the current Alpha Ditch, which is approximatley 260 feet long.	Length: 260 feet Width: 6-10 feet Depth: 3-5 feet	NCCW, Unit 11 discharges, TPH, PCBs	AD-01, AD-02	Metals Anions PCBs Petroleum Hydrocarbons WQ Indicators	Ti, Cr, Cu, Mg, Chloride

Table 3-2 (continued)
Source Areas

PSA No.	Location	LOU No.	Description	Dates of Contruction, Modification, Operation	Discussion	PSA Dimensions	Waste Streams	Sample ID Nos.	Analytical Methods Required to Characterize	Principal Chemicals
17	Parcel C	22	S-17 Landfill	NA	This is an area identified as a landfill, based on a review of aerial photographs by an EPA contrator, and indicated to contain mounded dirt and a bermed area. The area was observed in a 1960 aerial photograph, but was no longer visible in a 1969 aerial photograph. The area was estimated to be 1.2 acres in size. No facility records indicated the presence of a landfill in this area. Based on aerial photographs from 1963, 1969, and undated photographs and knowledge of historical site operations, TIMET believes that the area was not a landfill. There is no evidence of landfilling activites in the photographs reviewed. TIMET believes this is an area where wooden pallets were stacked and possibly burned.	1.2 Acres	Wooden pallets	S-17-1, S-17-2, S-17-3	PAHs Dioxins/Furans	PAHs, Dioxins/furans
18	Parcel B	24	Area of Stained Soil Between Units 8 and 9	NA	This is an area on the 13th Street roadway just north of Units 8 and 9 that appears with a darkened pattern in an aerial photograph dated June 1963. The Phase I ECA identified the darkened area as potential staining from possible spills from the purification process. Aerial photographs from May 1961 and November 1963 also show a darkened pattern that corresponds with a high traffic area on the 13 Street roadway. TIMET believes that the darkened areas on the 13th Street roadway are from rubber tire marks because the darkened area does not extend from the roadway to the purification process area and no darkened or stained areas were observed in the aerial photographs in the purification process area.	0.2 Acres	None	None	None	None
19	Parcel B	29	Vicinity of Northwest Corner of Unit 7	NA	This is an area where solvents from the paint shop may have been disposed. The area was assessed in the roadway sampling.	0.25 Acres	Paint Shop Solvents	RI-12-0/0	Metals VOCs	TCE PCE
20	Parcel B	31	Unit 10 Demolition Soil Stockpile	NA	During the demolition of Unit 10, about 70 tons of hyrocarbon-contaminated soils was destroyed by Las Vegas Paving. Documentation of the destruction and the Clark County Health District closure letter indicating no futher remediation is required was submitted to NDEP in the IIS. NDEP has requested justification for no further action.	0.23 Acres	TPH	None	Petroleum Hydrocarbons	TPH
21	Parcels B and C	32	Back Ditch	Construction: 1976 Modifications: 1988, Use of unlined portion of Back Ditch ceased, pipe installed to transport effluents previously dishcarged to the unlined portion Operation: 1976 - Present	This ditch contained discharges from the hydroblast descaling water channel/Unit 11 Discharge Channel (see PSAs 28 and 29). The Back Ditch originally consisted of an appoximately 650-foot-long, 18-inch reinforced concrete pipe conduit that discharged into an aproximately 960-foot unlined bermed channel (Phase I, 5-6). The unlined portion of the Back Ditch is no longer in use. TIMET excavated contaminated soils in the ditch in 1999. Documentation of the excavation was submitted to NDEP in the ECIA.	Reinforced Concrete Pipe Length: 650 feet Diameter: 1.5 feet Unlined Bermed Channel Length: 960 feet	NCCW, TPH	BD-01, 02, 03, 04, 05, 06, 07, 08	Metals Anions Petroleum Hydrocarbons WQ Indicators	Ti, Cu, Fluoride, TPH
22	Parcel C	33	Boneyard	NA	This is a large area north of the J-2 Landfill and south of the Boulder Highway. The area is used for storage of intermediate process materials, titanium fines, titanium scrap storage, equipment storage, other metals storage, and MgCl2 storage. Materials are stored in bulk, on pallets, and in drums on bare soil (Phase I, 4-36). NDEP stated that no further characterization is required except for one large transformer observed in the area on June 3, 1993. TIMET moved the non-PCB transformer to the transformer storage area (LOU 25).	4.7 Acres	PCBs	None	PCBs	PCB

Table 3-2 (continued)
Source Areas

PSA No.	Location	LOU No.	Description	Dates of Contruction, Modification, Operation	Discussion	PSA Dimensions	Waste Streams	Sample ID Nos.	Analytical Methods Required to Characterize	Principal Chemicals
23	Parcel B	34, 30	Soils in Area South of Building K-53 Bay Doors	Construction: NA Modification: NA Operation: Unknown to mid-1980s	Building K-53 is a miniature melt shop, a machine shop, and a mechanical testing labaratory. When there was a crucible jacket failure, residual NaK (a heat transfer fluid) was historically cleaned outside Building K-53. This occurred approximately twice a year. Prior to cleaning outside, the NaK was drained from the crucible jacket into an indoor reservoir. The crucible jacket was then purged with dry steam outside the building to remove any residual liquid (approximately 8 fluid ounces). The NaK from the jacket reacts with the cleaning water to form sodium and potassium hydroxides, which were allowed to infiltrate into the soil. Crucible jacket cleaning operations have not been conducted in this area since the mid-1980s.	0.2 Acres	Sodium and potassium hydroxide	None	Metals WQ Indicators	Na, K
25	Parcel B	41	Chemtec Corporation Site	Construction: NA Modification: NA Operation: 1975-1978	Chemtec leased Building K-55 for a period of about 3 years. Operations are believed to be a laboratory and possibly a pilot plant. Industrial wastewater containing acids was discharged to the OPW system. Components of the wastewater included approximately 2 gallons per week of acids (hydrochloric acid, nitric acid, and sulfuric acid), sodium salts, and small quantities of standard laboratory reagents. Tailings were stored outside the building. No evidence of Chemtec operations remain at Building K-55.	0.2 Acres	OPW	None	Metals Anions WQ Indicators	Sulfate, Nitrate
28, 29	Parcel B	51, 52	Hydroblast Descaling Water Channel, Unit 11 Liquid Discharge Channel	Construction:1957 Modification: NA Operation: 1957 - present	Liquid wastes from the melt shop include hydroblast descaling water, NCCW, washdown water, crucible cleaning water, furnace washout water, and steam ejector water are discharged to the concrete-lined Blast Ditch. Prior to discharge to the Blast Ditch, hydroblast descaling water is directed through a sedimentation chamber to separate solids. A report detailing sampling and analysis in this channel was submitted with the IIS.	Length: 700 feet Width: 75 feet Depth: 20 feet	NCCW, Unit 11 discharges, TPH	None	1,2,9,10 Metals Anions Petroleum Hydrocarbons WQ Indicators	Ti, Cr, Cu, Chloride
31	Parcels B, C, and D	27,28	Perimeter and Interior Roadways	Construction: 1940s Modification: NA Operation: 1940s - 1981	Solvents blended with waste oil were disposed of on the roadways for dust control. The ECA reports that prior to 1981 waste oil was used as a dust suppressant on roadways. Sampling and analysis was conducted and reported during the ECI.	Length: 28,800 feet	Leach liquor, TPH	RP-1, 2, 3, 4, 5, 6, 7, 8, RP-6A, RP-6B, RP-6C, RI-9-0/0, RI-10, 11, 12-0/0	Metals Anions VOCs Petroleum Hydrocarbons	Pb, Cd, Mg, TPH, Chloride, Sulfate, Nitrate
32	Parcel B	54b	White Material Deposits	NA	This operating area is an abrasive blast area where various equipment parts are cleaned. The IIS reports that the white material deposits are believed to be magnesium oxide cleaned from equipment or silica sand used for abrasive blast. The area is paved with asphalt, and the white material deposits are routinely removed and disposed of in the J-2 Landfill.	0.2 Acres	Magnesium, oxide/sandblasting media	None	Metals	Mg, Si
34	Parcel B	54d	Spill Stain on Avenue F	NA	The spill stain referenced in the ECA is believed to be in areas where magnesium chloride solution was sprayed for dust control in the past. This area was addressed as part of the roadways investigation.	0.5 Acres	Leach Liquor	None	Metals Anions WQ Indicators	Mg, Chloride
35	Parcels B and C	54f-54n	Drum Storage Areas	NA	The drums in the drum storage areas were inventoried during the ECI and found to contain scrap metals, rubber hoses, in-process materials, alloys for use in the melt shop, recycleable metals, and some roofing tar material (that were disposed of off site). There were no apparent leaks in any of the drums.	NA	Scrap metal, recyclable metals, alloys, waste roofing tar	None	Metals PAHs	Ti, PAHs

Table 3-2 (continued)
Source Areas

PSA No.	Location	LOU No.	Description	Dates of Contruction, Modification, Operation	Discussion	PSA Dimensions	Waste Streams	Sample ID Nos.	Analytical Methods Required to Characterize	Principal Chemicals
36	Parcel B	8,9	Rail Delivery Areas and Acid Tank Farm and Ancillary Piping	Construction: 1950s Modification: NA Operation: 1950s - 1993	Unlined rail delivery areas historically recieved acidic solution products for leaching. Four ASTs containing hydrochloric acid and three ASTs containing nitric acid were located within the acid tank farm. Each tank had a capacity of approximately 25,000 gallons. The tanks were located on neutralizing limestone rock over soil. The acid tank farm was bermed and any runoff from the acid tank farm was directed to the OPW drain system. In November 1985, an ancillary piping failure occurred in the main HCl feed line outside of Unit 8. The volume of HCl released is unknown. In December 1988, a second ancillary piping failure occured and approximatley 1,500 to 2,000 gallons of nitric acid leaked from the main supply line from the acid tank farm. As a result of the failure, the HCl supply line also failed and approximatley 400 to 500 gallons of HCl was released to subsurface soils. Leaching acids are no longer used at the TIMET facility. The tanks have been filled with water and remain in place. TIMET proposed to assess any leaks from the tank farm in the groundwater investigation.	0.4 Acres	Nitric acid, hydrochloric acid	None	Anions WQ Indicators	Chloride, Nitrate, Mg, Ti
37	Coke Unloading	NA	Coke Storage Silo	NA	Fine-grained coke is unloaded from railcars into a silo located in a three-sided building. Coke is loaded into lugger boxes for transport by forklift to chlorination (Unit 8).	0.2 Acres	Coke residues	None	None	None
38	Titanium Tetrachloride Loading	NA	Titanium Tetrachloride Railcar Loading	NA	Liquid titanium tetrachloride is loaded from five storage areas into railcars for shipment. Drip pans along the railroad are used to capture drips or spills.	0.18 Acres	Titanium tetrachloride, liquid residues	None	Metals Anions Radionuclides	Ti, Chloride, Rad
Source Area: Pond Areas										
2	Parcel C	19	CSD North and South Ponds	Construction: 1950s Modifications: 1976, Expanded and single-lined with Gilsabine asphalt liners Operation: 1950s to 2005	From the 1950s to the 1970s, wastes from the chlorination process, scrap reclaim, and the purification process were discharged to the CSD ponds. Beginning in the 1970s, CSD solids slurried with OPW effluent, sponge water, and wet scrubber effluent from the leaching process, and makeup water from chlorination process wash towers were neutralized with lime and discharged into the CSD North and South Ponds. The ponds were earthen bermed and unlined until 1976. The dimensions of the orginal ponds were 150 feet by 50 feet, with an unknown depth. The ponds are no longer in use. The contents of the CSD North and South Ponds were removed and disposed of off site. The ponds were excavated to a depth of 10 feet.	North CSD Pond Length: 164 feet Width: 66 feet Depth: 5.8 feet Area: 0.5 Acres South CSD Pond Length: 161 feet Width: 61 feet Depth: 6.5 feet Area: 0.5 Acres (Phase I, Table 5-1)	CSD solids, OPW	TMSB-123	Metals Anions Radionuclides WQ Indicators	Ti, Zr, Cr, Nb, V, Mg, Si, Na, Rad, Chloride, Sulfate, Nitrate
5	Parcel C	46	Site Pond SW-1	Construction: 1976 Modifications: none reported Operation:1976-1990	The SW-1 pond is an inactive PVC double-lined pond constructed in 1976 over the old unlined North Nitrate Pond. The SW-1 pond received leach liquor from 1976 until 1984. From 1984 until 1990, the pond was used as a settling/overflow pond for the OPW liquid wastes. Primary and secondary liner failure is documented. SW-1 is currently filled with CSD solids.	Length: 384 feet Width: 240 feet Depth: 17 feet	CSD solids, OPW, leach liquor	None	Metals Anions Radionuclides WQ Indicators	Ti, Zr, Cr, Nb, V, Mg, Si, Na, Rad, Chloride, Sulfate, Nitrate
6	Parcel C	47	Site Pond HP-1	Construction: 1979 Modifications: new HDPE liners with leak detection installed in 1993 and 2005 Operation:1979 to present	The HP-1 pond is an active PVC double-lined settling and overflow pond constructed over the old unlined South Nitrate Pond. The HP-1 pond was used to receive cooling tower blowdown and non-contact cooling water since 1976 and leach liquor from 1976 to 1990. Primary liner failure was noted in 1989. HP-1 pond is used to collect and evaporate the WCF brine.	Length: 396 feet Width: 312 feet Depth: 14 feet	Leach liquor, WCF brine, NCCW	None	Metals Anions WQ Indicators	Ti, Zr, Cr, Nb, V, Mg, Si, Na, Chloride, Sulfate, Nitrate
7	Parcel C	48	HP-6 Pond	Construction: 1991 Modifications: new double liner installed in 2006 Operation:1991 to present	The HP-6 Pond is an active double-lined evaporation pond for leach liquor and spent caustic wastewater constructed in 1991. HP-6 was emptied and a new double liner was installed. The HP-6 pond is used for recycling spend caustic wastewater.	2.7 Acres	Spent caustic, leach liquor, WCF brine	None	Metals Anions WQ Indicators	Ti, Zr, Cr, Nb, V, Mg, Si, Na, Chloride, Sulfate, Nitrate

Table 3-2 (continued)
Source Areas

PSA No.	Location	LOU No.	Description	Dates of Contruction, Modification, Operation	Discussion	PSA Dimensions	Waste Streams	Sample ID Nos.	Analytical Methods Required to Characterize	Principal Chemicals
8	Parcel C	16, 20	Old Caustic Pond/CSD Stockpile	Old Caustic Pond Construction: 1966 Modification: NA Operation: 1966-1976 CSD Stockpile Construction: late 1970s Modification: NA Operation: late 1970s to early 1991	This area contains an abandoned, unlined caustic wastewater disposal and evaporation pond. Caustic liquids discharged to the caustic pond include spent caustic scrubber water used to remove chlorine gas from the chlorination process and the magnesium recovery process. From the late 1970s until early 1991, dredged CSD solids from the CSD north and south ponds were stockpiled in this area and allowed to dry through evaporation and gravity drainage of liquids. Dried CSD solids were removed from the old caustic pond and disposed of elsewhere. This area is inactive.	Old Caustic Pond Length: 260 feet Width: 180 feet Depth: 2 feet	CSD, spent caustic	C-1, C-2, C-3, TMSB-121	Metals Anions Radionuclides WQ Indicators	Ti, Zr, Cr, Nb, V, Mg, Si, Na, Rad, Chloride, Sulfate, Nitrate
27	Parcel C	50	BMI J-9 Tailings Ponds	Construction:1942 Modification: none Operation: 1942-1944	This area consists of two small tailings ponds (approximately 0.23 acres each) used by BMI from 1942 to 1944 for discharge of magnesium-manufacturing wastes. The tailings ponds were constructed of concrete and wood reservoirs and were open to the surface (Phase I, 5-42). A portion of the J-9 tailings ponds were capped during the current construction of the WCF.	Approximately 0.23 acres each	Magnesium wastes	JS-01	Metals Anions Radionuclides WQ Indicators	Mg
Source Area: J-2 Landfill Area										
16	Parcel C	12	Used Paints and Solvent Area	NA	This is an area on the J-2 Landfill cap that was used to store used paint and solvent from the paint shop. The paint and solvent are stored in drums on pallets. There are no records or evidence of spills or disposal of paint/solvent mixtures in this area.	0.27 Acres	Paint shop solvents	TMSB-120	Metals VOCs	TCE PCE
30	Parcel C	1, 38	J-2/S-18 Landfill	Construction: 1954 Modification: 1990s, landfill expansion with new lined cell Operation: 1954-present	The S-18 Landfill was operated by Pioche Manganese from 1954 to 1958. There is no record of the material placed into the landfill. The S-18 Landfill is contiguous to the south side of the current J-2 Landfill and is essentially contained within the J-2 Landfill. The J-2 Landfill was purchased by TIMET in 1979 from Pioche Manganese. Manganese slag was a major waste produced by Pioche Manganese. The J-2 Landfill is currently in operation and recieves nonhazardous solid plant wastes, including inert metals and salts, construction debris, and packing materials. The original unlined landfill operated as a cut-and-fill landfill constructed with a low earth barrier upgradient of the landfill to divert surface runoff around the lanfill. The landfill was measured as approximately 7.2 acres in size during an EPA aerial reconnaissance. The J-2 Landfill cell at the north end of the landfill is lined.	11.2 Acres	CSD solids, ACM, chlorinator dust, Pioche manganese slag, nonhazardous plant solid waste, magnesium oxide/sandblasting media	TMSB-117, 118, 119, 120	Metals Anions Radionuclides VOCs Petroleum Hydrocarbons WQ Indicators Asbestos	Ti, Zr, Cr, Nb, V, Mg, Si, Na, Rad, Chloride, Sulfate, Nitrate
33	Parcel B	54c	Rubble and Debris	NA	The source of the rubble and debris reported in the ECA is unknown but is believed to be scrap material that was relocated.	0.2 Acres	Scrap metal, recyclable metals, alloys, waste roofing tar	None	Metals PAHs	None
Source Area: Current and Historical Operational Areas										
4	Parcel B	39	Pioche Manganese Landfill S-20	Construction:1954 Modifications: Graded in late 1960s to early 1970s Operation:1954 - 1958	Site of former manganese slag stockpile from Pioche Manganese. The site was graded sometime in the late 1960s to early 1970s. The graded area is used for equipment storage.	Approximately 5 acres	Pioche manganese slag	PM1, PM2, PM-1/B-1/, PM-K/l-6/, PM-J/K-8/, TMSB-116, TMSB-115	Metals Anions WQ Indicators	Mn
13	Parcel B	NA	Rutile off loading area	Construction: NA Modification: NA Operation: 1950s to present	Area where Rutile ore is off-loaded from rail cars and transferred to storage area. Best management practices are addressed in the stormwater pollution prevention plan. A minor amount of unprocessed rutile ore is lost in the vicinity of the rail siding due to spillage and wind transport.	Area: 2.1 acres	Rutile residues	None	Metals Radionuclides	Ti, Zr, Cr, Nb, V, Mg, Si, Na, Rad

Table 3-2 (continued)
Source Areas

PSA No.	Location	LOU No.	Description	Dates of Contruction, Modification, Operation	Discussion	PSA Dimensions	Waste Streams	Sample ID Nos.	Analytical Methods Required to Characterize	Principal Chemicals
15	Parcel B	10	Materials and Equipment Storage Area Located East of Building J-2	Construction:1967 Modifications: Early 1990s - UST and contaminated soils removed, soil venting system installed to remediate remaining contamination Operation: 1967 - 1991	This is an area used for storage of incoming new and replacement equipment, bulk (drummed) materials, and other items used at the TIMET facility. The storage area is partially asphalted. Several 55-gallon unopened drums of TCE solvents located on wooden pallets over soil were observed in this area during the Phase I site reconnaissance. A 2,000-gallon, single-walled steel UST containing leaded gasoline was installed in 1967 and removed in 1991. Pressure testing conducted prior to tank removal indicated that the tank was leaking leaded gasoline at a rate of appoximatley 0.15 gallons per hour. The UST and contaminated soils were removed. A soil venting system was installed in the excavated area to remediate remaining contamination. Further investigation was conducted in June 1997 as part of the ECI. Approval of final closure was requested in February 1998.	0.2 Acres	TPH	UST-06	Metals VOCs Petroleum Hydrocarbons	None
Subsurface Piping[1]										
10	Parcels B, C, and D; the piping in this source area is addressed in the above five source areas based on location.	43	Conveyances-Subsurface Piping	Various	Current and historic piping locations for stormwater, OPW, CSD, caustic, and leach liquor. The current zero discharge liquid effluent delivery piping system consists of a variety of buried and surface pipelines, including a 6-inch Drisco pipe for Alpha system discharge water diversion, a 6-inch Drisco pipe for the CSD solid wastes, a 6-inch Drisco pipe for leach liquor conveyance, an 8-inch PVC pipe for SC delivery and an 8-inch pipe for OPW wastes. The pipelines are single-walled. Historic piping and conveyance systems included BMI's cooling water underground pipeline system.	Various	CSD solids, OPW, leach liquor, spent caustic, WCF brine, NCCW, nitric acid/ hydrochloric acid		Metals Anions Radionuclides WQ Indicators	Ti, Zr, Cr, Nb, V, Mg, Si, Na, Rad, Chloride, Sulfate, Nitrate

Notes:

1 Subsurface Piping is described separately from each source are in order to avoid duplication of text. Subsurface piping will be managed for the purpose of this CSM and future actions based on the location in the five identified source areas listed in this table.

ACM	Asbestos-containing material	mgd	million per gallon	PVS	Purification vent scrubber
AST	Aboveground storage tank	NA	Not applicable	Rad	Radionuclides
BMI	Basic Management, Inc	NAK	Sodium-potassium	SC	Spent Caustic
CSD	Continuous sludge dryer	NCCW	Noncontact Cooling Water	SW	Southwest
ECA	Environmental conditions assessment	NDEP	Nevada Division of Environmental Protections	TCE	Trichloroethylene
ECI	Environmental conditions investigation	NPDES	National Pollution Discharge Elimination System	TIMET	Titanium Metals Corporation
ECIA	Environmental conditions investigation addendum	OPW	Other processed waste	TPH	Total petroleum
EPA	U.S. Environmental Protection Agency	PAH	Polycyclic aromatic hydrocarbon	UST	Underground storage tank
HCl	Hydrochloric Acid	PCB	Polychlorinated biphenyl	VOC	Volatile organic compound
HDPE	High-Density Polyethylene	PCE	Tetrachlorethene	WAPA	Western Area Power Administration
IIS	Initial information submittal	PSA	Potential source area	WCF	Water Conservation Facility
LOU	Letter of understanding	PVC	Polyvinyl chloride	WQ	Water quality
MgCl2	Magnesium Chloride				

Elements:

Cd	Cadmium	Mg	Magnesium	Si	Silicon	U	Uranium
Cr	Chromium	Na	Sodium	Th	Thorium	V	Vanadium
Cu	Copper	Nb	Niobium	Ti	Titanium	Zn	Zinc
K	Potassium	Pb	Lead				

Sources:

Hydro-Search, Inc. 1996. "Initial Information Submission Pursuant to Letter of Understanding dated August 16, 1994 between Nevada Division of Environmental Protection and Titanium Metals Corporation." June 7.

Law Engineering, Inc. 1993. "Final Report of Phase I Environmental Conditions Assessment." Prepared for TIMET under Project No. 92136.504. April 15.

Tetra Tech EM Inc. (Tetra Tech). 1998. "Final Environmental Conditions Investigation Report." Prepared for TIMET. October 15.

Tetra Tech. 1999. "Environmental Conditions Investigation Addendum Draft Report, Titanium Metals Corporation Facility, Environmental Conditions Investigation, Henderson, Nevada." Prepared for TIMET. September 24.

4.0 SUMMARY OF CURRENT CONDITIONS

4.1 PREVIOUS INVESTIGATIONS

Previous investigations at the TIMET facility have focused on characterization of groundwater and soil. Data from these investigations have been used in the development of this CSM, where applicable. Table 4-1 summarizes the data validation reports for the respective data sets.

TABLE 4-1: CROSS REFERENCE TO DATA VALIDATION SUMMARY REPORTS

Data Set	Source	Reference
Groundwater 2000 to 2005	TIMET	"Data Validation Summary Report for Historical Groundwater Data – 1st Quarter 2000 through 1st Quarter 2005." Tetra Tech EM Inc. July 18, 2005.
Groundwater 2005	TIMET	"2005 Annual Data Validation Summary Report for Groundwater Monitoring Data – 2nd Quarter 2005 through 4th Quarter 2005." TIMET. February 15, 2006.
Groundwater 2006	TIMET	"2006 Annual Data Validation Summary Report for Groundwater Monitoring Data – 1st Quarter 2006 through 4th Quarter 2006." TIMET. January 31, 2007.
ECI/ECIA soil data	TIMET	"Data Validation Summary Report for ECI and ECIA Data – TIMET." Tetra Tech EM Inc. January 24, 2005.
Soil and Groundwater from Hydrogeologic Characterization	TIMET	Data Validation Summary Report, Appendix B
Downgradient Groundwater Data (primarily in Common Areas)	BRC	"Groundwater Monitoring Results, BMI Common Areas (Eastside), First Quarterly Event 2006, April – June 2006." October 2006.
Chromium Data at Tronox and Areas Downgradient	Tronox	"Semi-Annual Chromium Mitigation Report – January - June 2006." Tronox LLC. July 25, 2006.

The frequency of detections in soil for each analytical group is summarized in Table 4-2 (shallow) and Table 4-3 (subsurface), with the detailed analytical results provided in Appendix F (Tables F-1 through F-9). Similarly, the groundwater data are summarized in Tables 4-4 through 4-7, with the detailed analytical results provided in Appendix F (Tables F-10 through F-14). Appendix F also includes the data filtering rules applied in the queries to generate the output tables.

A brief synopsis of the activities associated with each investigation is provided below.

4.1.1 Environmental Conditions Investigation

In 1993, a Phase I ECA was conducted at the TIMET facility (Law Engineering, Inc. 1993). Based on the findings of the Phase I ECA and subsequent discussions with TIMET, the NDEP issued a LOU dated August 16, 1994, that identified 54 study items on the TIMET facility where additional information or

further investigation were recommended. TIMET submitted a response to the LOU dated June 7, 1996, that provided complete responses to most items and identified some items that required additional investigation. Items that required additional investigation were addressed in the ECI Workplan (Tetra Tech 1997). The primary objectives of the ECI were to (1) satisfy the requirements of the LOU, dated August 16, 1994, which included characterization of potentially affected media at or near sites identified as requiring additional investigation in the response to the LOU; and (2) collect data of adequate technical quality to support development and evaluation of potential remedial alternatives at the TIMET facility. In total, 120 soil, 10 groundwater, 4 sediment, 3 surface water, and 4 waste samples were collected during the ECI.

4.1.2 Environmental Conditions Investigation Addendum

The ECIA was prepared in response to comments on the Draft ECI Report. The ECIA focused on areas of the site requiring further action (Tetra Tech 1999). The primary objectives of the ECIA were to (1) address, in combination with the Final ECI Report, the issues raised in the NDEP comment letter, dated June 10, 1998, and the supplemental review letter, dated July 9, 1998; (2) collect data of adequate technical quality to fill data gaps to help develop and evaluate potential remedial alternatives at the TIMET facility; and (3) provide remedial action plans for areas where the extent of contamination is defined and limited. In total, 102 samples (17 soil [roadway] and sediment and 85 groundwater) were collected during the ECIA. To address NDEP comments (NDEP 2003), a revised ECIA report was issued on January 24, 2005 (Tetra Tech 2005a).

4.1.3 Groundwater Monitoring Program

The groundwater monitoring program was conducted as part of the requirements for data collection presented in the ECI Workplan (Tetra Tech 1997) and further developed in the ECIA (Tetra Tech 1999). The purpose of the groundwater investigation is to (1) characterize the distribution of inorganic, organic, and radionuclide analytes in groundwater; (2) characterize the hydraulic characteristics of the aquifer; and (3) evaluate relationships between groundwater chemistry, hydrogeology, and potential sources. The following activities are conducted as part of the groundwater monitoring program:

- Measure groundwater levels in wells
- Collect groundwater samples for field and chemical analysis

- Evaluate groundwater hydraulic and water quality data
- Analyze groundwater data for trends and by comparison with drinking water maximum contaminant levels (MCL)

The groundwater data set has been grouped into four categories based upon the following criteria.

- Plant Site groundwater monitoring data from March 2000 to September 2001 represent data collected by purging three well volumes and analyzed by Severn Trent Laboratories
- Plant Site groundwater monitoring data from October 2001 to December 2004 represent data collected by purging three well volumes, analyzed by Severn Trent Laboratories, and collected after installation of Tronox's slurry wall (adjacent property)
- Plant Site groundwater monitoring data from January 2005 to May 2006 represent data collected by micropurge sampling technique and analyzed by Paragon Analytics
- Downgradient groundwater monitoring data from April 2006 to May 2006 represent data collected by TIMET as part of the hydrogeologic characterization

The groundwater monitoring wells were generally analyzed for total metals, VOCs, alkalinity, anions (chloride, nitrate, and sulfate), pH, radionuclides, and total dissolved solids. Additional analytical methods (such as perchlorate and pesticides) were added to a specific sampling event. Details about the overall groundwater monitoring program and a data summary from the first quarter of 2000 through the fourth quarter of 2003 are presented in the 2004 quarterly groundwater monitoring report (Tetra Tech 2004a). Groundwater data for subsequent sampling events are documented in the quarterly groundwater monitoring reports for January 2005 through December 2006.

In order to assess areas downgradient of the Plant Site, additional data were used from groundwater monitoring programs conducted by BRC and Tronox. Data from these programs have been included on relevant groundwater plume figures in the spring 2006 which was generally within the same time period (April – May 2006). Details on these data can be found in their respective reports, as noted in Table 4-1.

4.1.4 Hydrogeological Characterization

A field sampling effort was undertaken in spring 2006 to address specific data needs identified in the preliminary CSM (Tetra Tech 2004d). The following field activities were conducted as part of the hydrogeologic characterization:

- Installed eight soil borings and groundwater piezometers at the Plant Site boundary to obtain lithologic data as part of a paleochannel assessment
- Installed four groundwater monitoring wells on the Plant Site in the alluvial aquifer and the Intermediate Tertiary-Age MCF aquifer to assess upgradient conditions
- Advanced 13 soil borings in PSAs at the Plant Site for vertical delineation of potential effects from source areas
- Measured water levels in the alluvial aquifer at existing and new wells at the Plant Site and selected off-site existing wells to generate a regional potentiometric surface map
- Collected groundwater samples from monitoring wells installed at the Plant Site and selected existing off-site wells to assess groundwater effects downgradient from the Plant Site
- Conducted hydraulic tests at a select list of Plant Site and off-site wells to assess hydraulic conditions of the alluvial aquifer

The findings from this investigation have been integrated into development of this CSM as presented herein. Details regarding the field activities are documented in Appendix A. The data has been validated and summarized in the in Appendix B, and the aquifer test results are provided in Appendix C.

4.2 BACKGROUND SOIL CONCENTRATIONS AND TIMET SCREENING LEVELS

Background soil concentrations and soil and groundwater screening levels have been developed and are used in this CSM to focus on chemicals and areas presenting a potential risk to human health and the environment. Because some (particularly inorganic) analytes are found naturally (and/or anthropogenically) and thus ubiquitously in the environment, a joint background soil study was conducted by BRC and TIMET to collect and evaluate analytical data that are representative of background conditions at the BMI Complex and Common Areas. The main objective of the study was the development of a representative background soil data set that can be used to evaluate whether concentrations of SRCs detected in site soil samples statistically exceed concentrations of these chemicals in background soil. The results of the background soil study are documented in the Background Soil Summary Report, BMI Complex and Common Areas submitted to the NDEP on March 16, 2007 (TIMET 2007). Background samples were collected from soils up to a depth of 10 feet bgs, and were analyzed for metals, anions, and radionuclides. No background soil data have been collected at soil depths greater than 10 feet bgs or in the Muddy Creek soils. The background soil study is a working document that provides a validated background data set with extensive statistical summaries of the data.

Descriptive summary statistics and a variety of statistical plots are included in the Background Soil Summary Report to facilitate evaluations of site data and site-to-background data comparisons.

TIMET identified conservative screening levels that are protective of potential receptors and pathways presented in this evolving site-specific CSM. The "Technical Memorandum for Establishing a Screening Process for Soil and Groundwater Data from On-Site and Off-Site Areas," dated December 13, 2004 was used to select screening levels (Tetra Tech 2004e). Soil screening levels were based on EPA Region 9 PRGs (EPA 2004c) and the Risk Assessment Information System (RAIS) PRG for radionuclides (EPA 2004d). EPA Safe Drinking Water Levels (EPA 2004a), Region 9 tap water PRGs (EPA 2004c), Nevada Administrative Code (NAC) – Standards for Toxic Materials Applicable to Designated Waters (NAC 2001), and the RAIS PRG for radionuclides (EPA 2004b) were used for groundwater screening levels.

The site-specific soil and groundwater screening levels that are used in this CSM are summarized in Tables 4-8 and 4-9, respectively. Comparison of existing site data against these screening levels in this CSM will enable TIMET to focus resources on areas, contaminants, and conditions that require further action to be protective of human health and the environment. The screening levels are not action levels or cleanup standards and do not trigger the need for a response action.

The TIMET soil screening levels shown in Table 4-8 include maximum detected background values from BRC and TIMET, the EPA Region 9 industrial or outdoor worker PRGs, and a dilution attenuation factor (DAF) equal to 20 (DAF20). The maximum detected background value was selected to compare to site data as a "frame of reference" to qualitatively evaluate existing site data in this CSM. Since the future use of the site will be industrial, the EPA Region 9 industrial or outdoor worker PRG was selected as the risk-based screening level for soil exposure. The threat to groundwater from chemicals in soil was assessed by comparing the soil result with the DAF20 value. It should be noted that application of DAF20 values are not considered as conservative as screening levels as a DAF equal to 1 (DAF1). DAF1 values assume no attenuation of a contaminant (that is, the concentration in the monitoring well is equal to the soil leachate concentration). For purposes of the CSM, application of DAF20 values enabled the assessment to focus on the areas with higher concentrations (those with the greatest threat to groundwater) of chemicals within the source areas.

In the context of this CSM, the BRC/TIMET maximum detected background value is used as the TIMET soil screening level unless the following is true:

- The EPA Region 9 industrial or outdoor worker PRG is greater than the maximum detected background value
- The DAF20 is greater than the maximum detected background value
- If both the EPA Region 9 PRG and the DAF20 are greater than the maximum detected background value, then the lowest value of the PRG and DAF20 is used as the soil screening level
- If there are no background data, the lowest value of the PRG and the DAF20 is used as the soil screening level

TIMET groundwater screening levels shown in Table 4-9 include primary drinking water standard MCLs, secondary drinking water standards, NAC standards, and tap water PRGs. The lowest value of all screening levels is used as the groundwater screening level for this CSM. Future groundwater screening levels for TIMET may consider upgradient and Muddy Creek groundwater conditions.

4.3 DISTRIBUTION OF SITE-RELATED CHEMICAL EFFECTS

The distribution of SRCs, based on existing data, was evaluated to establish the current understanding of nature and extent of SRCs in shallow and subsurface soils at the Plant Site and in the alluvial aquifer both on and downgradient of the Plant Site. This discussion forms the basis for identifying data gaps to be filled to support further site assessment, interim remedial actions, and risk assessment. Data collected during previous investigations were used in this assessment. Figure 4-1 depicts the sampling locations and associated source areas. This section is organized in the framework of the CSM (by pathway); accordingly, the occurrence of SRCs is discussed in terms of their distribution by:

- Identified waste streams and source areas;
- Shallow soil (0 to 1 foot bgs) for the purpose of evaluating shallow soil pathways and exposure routes;
- Subsurface soil (greater than 1 foot bgs) for the purpose of evaluating construction worker pathways and (for all soil depths) soil leaching to groundwater pathway; and
- Groundwater for the purpose of evaluating groundwater pathways and exposure routes, as well as groundwater discharge to surface water and resultant ecological exposure to sediment and surface water.

The subsections below are arranged by analyte group, then by individual analyte. A brief reference to waste stream and source area is provided (Table 3-2), followed by a discussion of results for (1) shallow soil, (2) subsurface soil, and (3) solute plume. Supporting figures are arranged similarly, with the figure

sequence by analyte in (1) surface soil, (2) subsurface soil, and (3) groundwater (spring 2006), which includes site data and off-site data to the north obtained from BRC and, for select analytes, Tronox.

By arranging the discussion in this manner, it allows the reader to follow an analyte along pathways without cumbersome cross referencing of other sections of the report. This arrangement will assist in identifying data gaps for principal SRCs and provide clarity for scoping additional assessment work to fill the data gaps.

4.3.1 General Inorganic Ions

General inorganic ions that exceed applicable TIMET screening levels include nitrate, chloride, sulfate, and total dissolved solids. A discussion of the nature and occurrence of these anions is provided below.

4.3.1.1 Nitrate

Nitrate was present in a number of waste streams, including (1) OPW, (2) leach liquor, (3) spent caustic, (4) chlorinator dust, (5) Pioche Manganese slag, and (5) nitric acid (Table 3-1). These include both solid and liquid wastes; therefore, nitrate was likely disposed of in the Ponds Area, Pioche Manganese landfill, Surface Ditches and NSA, and subsurface piping that conveyed these waste streams.

The soil screening level that soil concentrations are screened against is 102 mg/kg (the background value) (Section 4.2). The distribution of nitrate (based on available data) in shallow soil is shown on Figure 4-2, in subsurface soil as Figure 4-3, and in groundwater (solute plume) as Figure 4-4. The groundwater screening level is 10 milligrams per liter (mg/L) based on the MCL.

Shallow Soil

Nitrate in shallow soil (Figure 4-2) exceeds the soil screening level (background value) in IDN10-02 along a remnant of the Beta Ditch, TMSB-125 in the Northern Storage Area (NSA) (just north of former Nitrate Ponds), IDN12-01 (Near-Surface Soil Source Areas), and PM3 (200J mg/kg) in the Pioche Manganese Landfill S-20 (PSA 4 – Current and Historic Operational Areas).

Subsurface Soil

Nitrate in subsurface soil (Figure 4-3) exceeds the soil screening level in only one boring: TMSB-125 at 4 to 5 feet bgs (270 mg/kg). This boring is located just north of the former Nitrate Ponds; however, below a depth of 4 to 5 feet bgs, concentrations fall to 100, 27, and 18 mg/kg, respectively, indicating a

sharp decline in the vertical concentration profile. Elsewhere in subsurface soil, there is virtually no indication of elevated nitrate in soil at depth, except for TMSB-109 located along the Beta Ditch. No nitrate concentrations exceeded the soil screening level in samples from TMSB-109; however, concentrations in the boring increased from 14 mg/kg at 4 to 5 feet bgs to 96 mg/kg at 14 to 15 feet bgs. Below this maximum, concentrations fall to 87, 49, and 2.2U mg/kg at 19 to 20, 24 to 25, and 29 to 30 feet bgs, respectively.

This reversal in vertical concentration profile is not indicative of a significant source of nitrate in this area. Moreover, when one views this nitrate profile in conjunction with the chloride distribution (Section 4.3.1.2) in TMSB-109, the chloride also increases with depth to 19 to 20 feet bgs (1,000 mg/kg) then drops to 630 and 210 mg/kg at 24 to 25 and 29 to 30 feet bgs, respectively. This further supports that significant leaching of wastewaters did not occur in this location.

In the Ponds Area and J2 Landfill Area, vertical chloride profiles (Section 4.3.1.2) suggest infiltration from formerly unlined ponds has reached the water table. However, in borings TMSB-117, TMSB-123, and TMSB-125 where this was observed, significantly elevated nitrate is not observed at depth. Based on these specific observations, as well as the general lack of nitrate in subsurface soil, it does not appear that significant sources of nitrate exist at the Plant Site.

Groundwater

The distribution of nitrate in groundwater is shown on Figure 4-4. Nitrate in groundwater exceeds the MCL of 10 mg/L in most monitoring wells. Even nitrate concentrations in TMMW-103 (on Lake Mead Boulevard) and BRW-R1 (upgradient of suspected nitrate source areas) slightly exceed (12 and 11 mg/L, respectively) the MCL. Most concentrations off site to the north are less than 5 times the MCL; however, at PC-064, PC-067, BEC-09, and AA-19, nitrate concentrations were 74, 59, 64.8, and 165 mg/L, respectively. Based on the distribution of nitrate in groundwater, it appears that nitrate is elevated under the Ponds Area and J2 Landfill; however, soil data do not support this observation. Moreover, groundwater concentrations downgradient of the Plant Site exceed those on the Plant Site.

4.3.1.2 Chloride

Chloride is perhaps the most widespread indicator of historic releases at the Plant Site. Chloride was present in a number of waste streams, including (1) CSD solids, (2) OPW, (3) spent caustic, (4) leach liquor, and (5) chlorinator dust (Table 3-2). These include both solid and liquid wastes; therefore, chloride was likely disposed of in the Ponds Area, J2 Landfill, Surface Ditches and NSA, and subsurface

piping that conveyed these waste streams. Of these PSAs, the Ponds Area, when unlined, created the most straightforward mechanism for release to subsurface soil and groundwater. The J2 Landfill is also a PSA, with chloride-bearing wastes potentially in contact with leachate generated, which would in turn release to subsurface soil beneath the unlined landfill.

Chloride is characteristic of the waste streams listed above, is neither retarded nor degraded, and is soluble, such that it serves as a "direct observation" indicator of the depth to which wastewaters, leachates, and precipitation infiltration have migrated on the site. As an indicator, chloride is used elsewhere in this section to discuss the nature and degree of migration of select metals.

The soil screening level that soil concentrations are screened against is 1,110 mg/kg (the background value) (Section 4.2). The distribution of chloride (based on available data) in shallow soil is shown on Figure 4-5, in subsurface soil as Figure 4-6, and in groundwater (solute plume) as Figure 4-7. The groundwater screening level is 250 mg/L based on the Secondary Drinking Water Standard.

Shallow Soil

The occurrence of chloride above the screening level in shallow soil is limited to the Pioche Manganese Landfill (Current and Historical Operational Areas) at TMSB-120 and PM-3, the J2 Landfill at TMSB-120 (may be a waste sample), and in the Surface Ditches and NSA at borings IDN-12-01 and TMSB-109 (along remnants of the former Alpha and Beta Ditches) and TMSB-125, which is located in the NSA just north of the Ponds Area.

Subsurface Soil

In the J2 Landfill, subsurface soil sample results indicate that chloride-bearing pore water has migrated to the water table at TMSB-117. At TMSB-118, chloride leached to about 20 feet bgs and in TMSB-120 to about 4 to 5 feet bgs. Samples TMSB-118 and TMSB-120 are probably in landfill waste.

In the Ponds Area, the depth of chloride leaching (defined as chloride above the soil screening level) in TMSB-123, TMSB-121, and TMSB-125 (in immediate proximity to Ponds Area) has not been defined since no samples were collected below depths of 20 feet bgs. In the Surface Ditches and NSA, at TMSB-106, likely along remnants of the Northwestern Ditch, chloride impacts appear to have reached groundwater. Chloride concentrations in subsurface soil to the south, in the Treco Property, are all low and suggest no anthropogenic effects.

Groundwater

Chloride is widespread in groundwater downgradient from the BMI Complex. Only chloride concentrations in MW-4, TMMW-101, TMMW-102, and TMMW-104 are below the groundwater screening level of 250 mg/L (Figure 4-7). Figure 4-7 shows the 1,000 mg/L isoconcentration, which cuts through the northern Plant Site. Overlay of the 1,000 mg/L isoconcentration on the Ponds Area, J2 Landfill, and Surface Ditches and NSA indicate that these source areas may have contributed to chloride effects in groundwater. CLD-3R contained 7,000 mg/L, the highest chloride concentration shown on Figure 4-7.

South of the Ponds Area and the J2 Landfill, chloride concentrations in groundwater, in conjunction with subsurface soil chloride profiles, indicate little migration to depth of chloride-bearing waste streams. This lack of migration may indicate that disposal of chloride-bearing waste streams was limited to the Source Areas on the site listed in Table 3-2. Information on potential chloride source areas from the BMI Complex facilities located to the west is a data gap.

4.3.1.3 Sulfate

Sulfate is present in CSD, leach liquor, spent caustic, and OPW wastewater, and as such, was primarily disposed of on site in liquid waste streams. As a result, the Ponds Area is a likely PSA for discharge of sulfate to shallow and subsurface soil. The Surface Ditches and NSA also may have received sulfate-bearing wastewaters via conveyance to the Pabco Road Ponds Area and surface water sheet flow into low-lying areas in the NSA. Additionally, subsurface piping that conveyed OPW is suspected to a lesser degree. The soil screening level for sulfate is 4,130 mg/kg (background value) (Section 4.2). Figures 4-8 and 4-9 show the distribution of sulfate concentrations in shallow soil and subsurface soil, respectively.

Shallow Soil

In shallow soil, sulfate concentrations are below the screening level at all sample locations. In the Ponds Area, sulfate concentrations ranged from 65.3J mg/kg at location C-1 to 3,150 mg/kg at location C-2. In the Surface Ditches and NSA, concentrations ranged from 15 mg/kg in TMSB-107, located in the vicinity of the former Northwestern Ditch, to 2,800 mg/kg in TMSB-105, located at the very northwest corner of the NSA.

Subsurface Soil

Sulfate exceeded the screening level in two subsurface soil samples. Both samples were from depth (34 to 35 feet bgs and 39 to 40 feet bgs) at boring TMSB-104. Sampling results for this boring indicate no impacts to soil shallower than these depths in this boring. It is possible that soil at these depths may be naturally high in gypsum, which is known to occur in local sediments. Elsewhere, subsurface soil sulfate concentrations are below the soil screening level. In the Ponds Area, where migration to depth might be expected, vertical sulfate concentration profiles indicate a general decline with depth. Vertical concentration profiles in the Surface Ditches and NSA also indicate no significant increase in concentrations with depth. A vertical profile from the Pioche Manganese Landfill (Current and Historical Operational Source Area) obtained from boring TMSB-115 indicates an increase in sulfate concentrations at about 9 to 15 feet bgs, which decreases by an order of magnitude in samples below this depth. Boring TMSB-120, located in the J2 Landfill, shows a similar profile to TMSB-115, except for a detection of sulfate at 2,200 mg/kg at 46 to 47 feet bgs.

Groundwater

Sulfate impacts to groundwater are widespread downgradient from the BMI Complex. As shown on Figure 4-10, sulfate concentrations in all groundwater samples collected exceeded the groundwater screening level of 250 mg/L, which is based on the Secondary Drinking Water Standard. TMMW-101 through TMMW-104 are located along Treco's southern property boundary and are not believed to have been impacted by waste streams containing sulfate from Plant Site operations. Sulfate concentrations in these wells ranged from 620 to 1,200 mg/L. The highest sulfate concentration on the TIMET facility was 3,200 mg/L at CLD-3R. The highest sulfate concentration shown on Figure 4-10 is 9,670 mg/L, which was detected in a sample from AA-19 located in the BMI Upper Ponds area. Differentiation of discrete groundwater plumes with sulfate concentrations exceeding the screening level of 250 mg/L is virtually impossible because of the widespread impacts and likelihood of commingled impacts. Information on potential sulfate source areas from the BMI Complex located to the west is a data gap.

4.3.1.4 Perchlorate

Perchlorate is not associated with TIMET processes or waste streams. Documented releases of ammonium perchlorate are reported from the facility west and adjacent to the TIMET Plant Site (ENSR 2005). Perchlorate has been added to the investigations at the Plant Site and areas downgradient

(when not available from other sources) to gain a broader understanding of nature and extent of media impacted by this release.

Shallow Soil

Although not associated with a potential release from TIMET processes, soil borings (TMSB- series) from the hydrogeologic characterization were analyzed for perchlorate. Spatially, sampling locations are representative of the entire Plant Site (Figure 4-1). Results are detailed in Appendix F, Table F-1. Of the 23 shallow soils samples analyzed for perchlorate, 17 samples exhibited detectable concentrations ranging from 0.063 to 70 mg/kg (Table 4-2). None of these samples exceeded the screening level of 100 mg/kg based upon the EPA Region 9 Industrial PRG.

Subsurface Soil

The TMSB-series of soil borings was profiled vertically for perchlorate. Of the 171 samples analyzed for perchlorate, 114 samples exhibited detectable concentrations ranging from 0.051 to 18 mg/kg (Table 4-3). As detailed in Table F-1, detections were very low, with no exceedance of the screening level of 100 mg/kg. Detections of perchlorate at the southern line of borings (TMSB-101 through TMSB-104) were generally lower than the borings located at the northern boundary of the Plant Site.

Groundwater

Groundwater monitoring wells CLD2-R and CLD4-R were analyzed for perchlorate in June 2000. Perchlorate concentrations in samples from both wells exceeded the screening level of 0.018 mg/L (NDEP standard). As part of the hydrogeological characterization in spring 2006, samples from well CLD4-R and seven other Plant Site wells were analyzed for perchlorate (see Appendix F, Table F-10). Concentrations at CLD4-R only decreased slightly from 4.1 mg/L to 3.6 mg/L over the 6-year time period. Perchlorate concentrations exceeded the groundwater screening level in all eight wells, with the higher concentrations observed in the northern portion of the Plant Site (in line with the documented solute plume). The sample from well TMMW-102 exhibited a perchlorate concentration of 0.069 mg/L; this well is upgradient of the perchlorate solute plume emanating from Tronox. It should also be noted that unvalidated groundwater results from the TRECO due diligence investigation (Ninyo & Moore 2005) reported perchlorate concentrations of 0.098 mg/L in well BRW-R1 (also upgradient of the perchlorate solute plume).

4.3.1.5 Total Dissolved Solids

Total dissolved solids is a metric in water (not soil) and thus are discussed in terms of groundwater only. The groundwater screening level for TDS is 1,900 mg/L based on the NAC standards. At the Plant Site, TDS consists predominately of the following anions and cations:

- Anions – Bicarbonate, Chloride, and Sulfate
- Cations – Calcium, Magnesium, and Sodium

Groundwater

The distribution of TDS in groundwater is shown on Figure 4-11. TDS concentrations in groundwater to the south of the Plant Site are below or slightly above the screening level. TDS concentrations increase from south to north across the Plant Site. Elevated TDS concentrations are observed in the northern portion of the Plant Site, in and downgradient of the Ponds Area and J2 Landfill. In order to qualitatively evaluate TDS, it is helpful to discuss the TDS concentrations in terms of upgradient contributions from the major ions, as compared with the range of major ions observed in areas that are affected. Quantitative evaluation can be performed by computing charge balance (or imbalance as may be the case) for the purpose of separating impacted waters from natural waters. A regimen for analysis of charge balance and preparation of Stiff and Piper diagrams to aide in this purpose is being currently being developed. A qualitative discussion of major ions comprising TDS at the Plant Site is presented below.

In general, groundwater at the Plant Site is characterized by moderate sulfate concentrations (2,000 to 3,000 mg/L); sulfate concentrations in TMMW-101 through TMMW-104 (at the south property boundary) ranged from 600 to 1,200 mg/L. Bicarbonate alkalinity does not vary substantially across the Plant Site and occurs in the range of 100 to 400 mg/L. Chloride varies substantially, ranging from 100 to 600 mg/L in upgradient wells to several thousand in impacted wells. Chloride is the best discriminator for establishing impacted areas of groundwater via anions, and areas with high TDS concentrations are also areas of substantially elevated chloride relative to sulfate and bicarbonate.

Cation concentrations follow a similar pattern: calcium varies from between just under 100 to just under 300 mg/L in TMMW-101 through TMMW-104, and 500 to 1,100 mg/L in impacted areas downgradient of the Ponds Area and J2 Landfill. Magnesium varies from 41 to 130 mg/L (nonimpacted areas) to 200 to 500 mg/L (impacted areas) at wells TMMW-101 through TMMW-104. Sodium, however, ranges from 100 to 400 mg/L in nonimpacted areas and is as high as 1,700 and 3,600 mg/L in wells CLD4-R and

CLD3-R, respectively. Therefore, it (at least generally) appears that impacted groundwater has a sodium-chloride signature. However, some wells that appear impacted (such as J2D2-R2 with 2,300 mg/L chloride and 550 mg/L of sodium and J2D1-R2 with 2,300 mg/L of chloride and 570 mg/L of sodium) have what also appears to be a significant sodium-chloride charge imbalance. The regimen of charge balancing and preparation of Stiff and Piper diagrams will hopefully clarify these inconsistencies.

As shown on Figure 4-11, an area of elevated TDS concentrations appears in and downgradient of the Ponds Area and J2 Landfill, and extends downgradient a distance toward PC-67. However, the elevated TDS concentrations in CLD4-R suggest off-site impacts from the west may be migrating under the northern Plant Site. Stiff and Piper diagrams are expected to shed light on the nature of these impacted waters from BMI facilities located to the west of the Plant Site.

4.3.2 Principal Metals

As they occur naturally in both soil and groundwater, inorganic metals are widely detected at TIMET. Some waste streams, processes, and PSAs contain metals that may impact human health or the environment. A discussion of the detected metals at TIMET is presented below.

4.3.2.1 Arsenic

Arsenic has been neither suspected nor detected in historic or current waste streams. However, if arsenic were present in minor quantities in historically processed ore, likely disposal areas may have been the Ponds Area (J-9 Tailings Ponds), J2 Landfill, or perhaps the old Pioche Manganese Landfill (PSA 4 – Current and Historic Operational Areas). As discussed below, Plant Site data do not identify a source of arsenic in soil; however, they suggest arsenic is present in groundwater (solute plume) as a result of both on- and off-site sources. Resolving this inconsistency forms the basis for data gaps relating to establishing the nature and extent of arsenic.

The soil screening level for arsenic is 7.2 mg/kg (background value). Figures 4-12 and 4-13 show the distribution of arsenic concentrations in shallow soil and subsurface soil, respectively. The groundwater screening level is 10 micrograms per liter (µg/L) based on the MCL for drinking water. The distribution of arsenic in groundwater (solute plume) is shown on Figure 4-14.

Shallow Soil

Shallow soil data were less than the screening level of 7.2 mg/kg, except in four samples (Figure 4-12): (1) one sample from boring TMSB-124, located just west of the Ponds Area, and (2) one sample from boring PM-2 and one sample from boring PM-1, both borings located in the Pioche Manganese Landfill. The arsenic concentration in the sample from TMSB-124 slightly exceeded (7.5 mg/kg) the screening level (7.2 mg/kg). Arsenic concentrations in the samples from PM-1 and PM-2 were clearly elevated; however, the shallow samples from the Pioche Manganese Landfill may have contained waste with the soil. Data from shallow soil samples collected in the southern portion of the Plant Site (Treco Property) indicate no arsenic concentrations exceeded the screening level.

Subsurface Soil

Subsurface soil samples were screened against the screening level of 7.2 mg/kg and the DAF20 value (soil leaching to groundwater) (Figure 4-13). Several samples had arsenic concentrations above these levels, including TMSB-120 in the J2 Landfill; PM1 in the Pioche Manganese Landfill; TMSB-105, TMSB-107, and TMSB-125 in the Surface Ditches and NSA; and along the southern boundary of the Plant Site at TMMW-101 through TMMW-104. At TMSB-124, arsenic concentrations exceeded the screening level in shallow soil, but were less than the screening level in subsurface soils.

Boring TMSB-120, in the J2 Landfill, had arsenic at 13 and 15 mg/kg at 4 to 5 and 9 to 10 feet bgs, respectively. These samples may have been collected in landfill waste. Deeper in this boring, arsenic concentrations drop well below the screening level. At 19 to 20, 29 to 30, and 39 to 40 feet bgs, the concentration gradient reverses, indicating that arsenic did not significantly migrate out of waste to a substantial depth.

The Pioche Manganese Landfill samples are similar in nature to the J2 Landfill sample in that arsenic concentrations are elevated in shallow soil, in what may be waste samples. However, in borings PM-1 and PM-2, the arsenic concentrations drop to well below the screening level by 5 feet bgs, indicating little or no migration of arsenic out of the waste zone.

The elevated arsenic concentrations observed in borings in the Surface Ditches and NSA, and along the southern boundary of the Plant Site, along Lake Mead Boulevard, have similar vertical profiles. At the Surface Ditches and NSA, arsenic is observed at concentrations slightly exceeding the screening level at 24 to 25 feet bgs in TMSB-105 and TMSB-107. Along the southern boundary of the Plant Site, elevated

arsenic concentrations are observed in TMSB-101, TMSB-102, TMSB-103, and TMSB-104 at 39 to 40 and 64 to 65 feet bgs. These sample results are not attributable to vertical leaching at these locations; rather, they are thought to be attributed to elevated arsenic concentrations in the strata 10 to 20 feet or so above the top of the Muddy Creek Formation. Soils at these depths were not evaluated in the Background Study, and the TIMET screening level may not be representative of background levels at these depths.

Boring TMSB-125, located in the Surface Ditches and NSA, is located just north of the Ponds Area. The elevated arsenic concentrations observed at 14 to 15 and 19 to 20 feet bgs could be attributed to infiltration of arsenic-bearing wastewater during times of unlined pond operation. However, the results are only slightly elevated (neither greater than two times the screening level). Nonetheless, the chloride profile in this boring (Figure 4-6), suggests wastewaters have historically discharged to depth at this location.

Groundwater

Spring 2006 sampling results indicated arsenic concentrations exceed the MCL in all monitoring wells at the Plant Site (Figure 4-14). The highest arsenic concentrations were observed in monitoring wells CLD1-R, CLD2-R, and CLD3-R. These wells are located in an area where arsenic concentrations could be a result of releases from the Ponds Area or off-site sources to the west. However, elevated arsenic concentrations at MW-4 (110 µg/L), MW-5 (150 µg/L), J2D1-R2 (140 µg/L), J2U1 (120 µg/L), J2U2 (110 µg/L), and J2D2-R2 (96 µg/L) indicate the source of arsenic concentrations in groundwater may be from the Pioche Manganese Landfill and J2 Landfill. However, based on existing data, there is no indication that arsenic has migrated to depth through the soil profile in either the Pioche Manganese Landfill or J2 Landfill. This inconsistency forms the basis for establishing a data gap for arsenic in subsurface soil and groundwater at the Plant Site.

The arsenic concentrations along the southern boundary of the Plant Site at TMMW-101 through TMMW-104 ranged from 16 to 34 µg/L. If these results represent background conditions, then the impacts in the northern portion of the Plant Site are roughly an order of magnitude elevated.

4.3.2.2 Chromium

Chromium is present in the waste streams, CSD solids, OPW, spent caustic, leach liquor, and chlorinator dust. Disposal areas include (1) Ponds Area, (2) J2 Landfill, (3) Surface Ditches and NSA, and (4) Near-Surface Soil Source Areas (in particular Francy's Mountain [PSA 3]). Based on process knowledge (Section 3.3), the chromium in waste streams generated at the Plant Site is trivalent chromium (chromium

III). Chromium speciation conducted on soil samples shows that the total chromium results are also predominantly trivalent (Table 4-10).

The distribution of chromium in shallow soils is shown on Figure 4-15, in subsurface soils on Figure 4-16, and in groundwater on Figure 4-17. The fate and transport of chromium in the environment is strongly a function of the oxidation state. Chromium VI (hexavalent chromium) is considered mobile, whereas trivalent chromium (chromium III) is virtually immobile. The distribution coefficient between the two varies by orders of magnitude. Because of this behavior, the migration of chromium at the Plant Site is suspected to be limited.

The screening level for soils are 450 mg/kg (EPA Region 9 Industrial PRGs) for total chromium (equivalent to 1 part hexavalent chromium to 6 parts trivalent chromium in soil, which is abundantly conservative given Table 4-10 shows less than a 1:6 ratio at TIMET), and the DAF20 value of 38 mg/kg to evaluate soil leaching to groundwater. The groundwater screening level is 100 µ/L based on the MCL for drinking water.

Shallow Soil

Chromium concentrations exceeded the screening level in numerous shallow soil samples collected in the northern portion of the Plant Site (Figure 4-15). In the southern portion of the Plant Site (Treco Property), no chromium concentrations exceeded the screening level in shallow soil. Chromium concentrations also exceeded the DAF 20 value in the northern portion of the Plant Site. However, this screening level is based on leaching hexavalent chromium not trivalent chromium, and thus would only be of concern for those handful of locations listed in Table 4-10 that contained hexavalent chromium: no samples exceeded the DAF20 in those locations. Although not calculated for this CSM, the DAF20 value for trivalent chromium would likely be an order of magnitude (or more) higher.

Subsurface Soil

In subsurface soil, the same issue exists regarding the DAF20 value. Additionally, chromium concentrations in two samples (IDN-16-02 at 4 to 5 feet bgs and TMSB-123 at 4 to 5 feet bgs) exceeded the EPA Region 9 industrial PRG. However, as evidenced by borings with sufficient vertical chromium profiles (such as TMSB-107, TMSB-109, TMSB-117, TMSB-118, TMSB-119, TMSB-123, and TMSB-126), it appears that chromium does not migrate to depth; rather, concentrations drop below the TIMET screening levels. In particular, at borings TMSB-117 (J2 Landfill Area) and TMSB-123 (North

CSD Pond), where chloride profiles indicate anthropogenic impacts from near-surface to the water table, the chromium is observed to migrate to 10 feet bgs in TMSB-117 (J2 Landfill) and to 5 feet below the base of the excavated North CSD Pond (PSA 2). These vertical profiles further support the concept that chromium contamination related to Plant Site operations is trivalent rather than hexavalent and is generally immobile.

Groundwater

Chromium concentrations exceeding the groundwater screening level are limited to wells in the northwest corner of the Plant Site. These data are shown along with chromium results from Tronox, located to the immediate west of the Plant Site. These data strongly suggest that the source of chromium at the Plant Site is related to the chromium plume at Tronox, which has been in active remediation for some time. The west-to-east concentration gradient further suggests that the Plant Site contamination is on the east flank of the Tronox plume. For example, the west-to-east line of wells at CLD2-R, CLD1-R, and CLD3-R have respective chromium concentrations of 1,700, 870, and 320 µg/L.

TIMET has begun to conduct speciation of chromium in groundwater in Plant Site samples. More data are required; however, based on the analyses conducted so far (Table 4-11), it appears that chromium in groundwater under the Plant Site is virtually all hexavalent chromium, and not trivalent chromium, trivalent chromium being the oxidation state of chromium in Plant Site waste streams.

TABLE 4-11: CHROMIUM SPECIATION IN PLANT SITE GROUNDWATER

		Total Chromium (mg/L)				Hexavalent Chromium (mg/L)			
		EPA Method 6010B				EPA Method 7196			
Sample ID	Matrix	SQL	PQL	Result	Qualifier	SQL	PQL	Result	Qualifier
J2U2	Groundwater	0.00042	0.01	0.056	--	0.0019	0.01	0.054	J
CLD4-R	Groundwater	0.00042	0.01	0.49	--	0.019	0.1	0.64	J
MW-6R	Groundwater	0.00042	0.01	0.069	--	0.0019	0.01	0.072	J

4.3.2.3 Magnesium

Magnesium ore processing was the original activity at the Plant Site. Magnesium chloride has been and continues to be used and recycled in the processing of titanium ore (Figures 3-1, 3-2, and 3-3). As a result, the potential for magnesium in waste exists.

The soil screening level that soil concentrations are screened against is 17,500 mg/kg (the background value) (Section 4.2). The distribution of magnesium (based on available data) in shallow soil is shown on Figure 4-18, in subsurface soil as Figure 4-19, and in groundwater as Figure 4-20. Soil leaching to groundwater PRGs and groundwater MCLs for magnesium do not exist.

Shallow Soil

In shallow soil, only boring TMSB-121 (sample from 0 to 1 feet bgs) located in the Ponds Area contained magnesium above background (Figure 4-18).

Subsurface Soil

In subsurface soil, several samples from borings in the J2 Landfill exceeded the screening level (Figure 4-19). These samples were from borings TMSB-117 (4 to 5 feet bgs), TMSB-118 (9 to 10 feet bgs), TMSB-119 (4 to 5 feet bgs) and TMSB-120 (4 to 5 and 9 to 10 feet bgs). These samples are thought to be in waste or immediately below waste in the J2 Landfill. All concentrations below these sample depths are below background.

Groundwater

Figure 4-20 shows the distribution of magnesium in groundwater. No screening level has been established for magnesium in groundwater; however, for illustrative purposes, arbitrary contours of 200 and 400 mg/L are depicted. Magnesium concentrations along Lake Mead Boulevard (TMMW-101 through 104) are 65, 75, 130 and 41 mg/L respectively. Therefore, the 200 and 400 mg/L contours are thought to represent areas of anthropogenic impact.

The magnesium impacts in groundwater (Figure 4-20) depict a similar pattern as shown by TDS in groundwater, particularly along the center of mass of the impacts (e.g., the 400 mg/L contour for magnesium and 15,000 mg/L contour for TDS). Magnesium impacts appear to emanate from the J2 Landfill; however, vertical profiles in J2 Landfill borings do not suggest significant leaching of magnesium.

4.3.2.4 Manganese

Manganese has only been identified in the Pioche manganese slag waste stream, which was stored and ultimately graded in-place in the Pioche Manganese Landfill S-20 (PSA 4, Current and Historic Operational Areas). Additionally, Pioche manganese slag may have been disposed of in the J2 Landfill.

Nonetheless, no other waste streams and storage or disposal areas were identified for manganese-containing wastes, which spatially limit potential release mechanisms for manganese at the Plant Site.

The soil screening level for manganese is 19,000 mg/kg based on the EPA Region 9 industrial PRG. The groundwater screening level for manganese is 50 µg/L based on the MCL for drinking water. The distribution of manganese (based on available data) in shallow soil is shown on Figure 4-21, in subsurface soil as Figure 4-22, and in groundwater as Figure 4-23.

Shallow Soil

Manganese was not detected in any soil samples at a concentration exceeding the screening level of 19,000 mg/kg based on EPA Region 9 industrial PRG (Figure 4-21).

Subsurface Soil

In subsurface soil, manganese concentrations did not exceed the screening level except in samples from one boring (TMSB-120 at 4 to 5 and 9 to 10 feet bgs) in the J2 Landfill (Figure 4-22). However, the depths of these samples place them in waste within the landfill. Below these depths, at 19 to 20, 29 to 30, and 39 to 40 feet bgs, manganese concentrations drop by over two orders of magnitude, are below the screening level, and indicate no migration to depth of manganese.

Groundwater

The distribution of manganese in groundwater is shown on Figure 4-23. Manganese concentrations in groundwater exceeded the screening level in sample from CLD2-R. Manganese is below the screening level in samples from all other monitoring wells at the Plant Site. Figure 4-23 shows the distribution of dissolved manganese in monitoring wells to the north and west, which show that the source of manganese in CLD2-R is from an off-site manganese plume.

4.3.2.5 Titanium

Titanium is the principal metal in ore being processed at Plant Site. As such, it is suspected to occur in ore and liquid (spent caustic, other process wastes, and leach liquor) and solid (continuous sludge dryer solids, chlorinator dust) waste streams. Likely disposal areas include Ponds Area, J2 Landfill, Francy's Mountain, and Current Operational Areas.

The soil screening level that soil concentrations are screened against is 1,010 mg/kg (the background value) (Section 4.2). The distribution of titanium (based on available data) in shallow soil is shown on Figure 4-24, in subsurface soil as Figure 4-25, and in groundwater as Figure 4-26.

Shallow Soil

Titanium in shallow soil is shown on Figure 4-24 as compared to the screening level which is the background concentration established. Titanium is above screening level in two samples from the Ponds Area (TMSB-123 and TMSB-124), J2 Landfill (TMSB-118 and TMSB-119), Near-Surface Soil Source Areas (TMSB-113 and TMSB-126), and Surface Ditches and NSA (TMSB-109). Titanium concentrations range from 1,200 to 3200 mg/kg in these samples, as compared to the screening level of 1,010 mg/kg based on background (Section 4.2).

Subsurface Soil

In subsurface soil, elevated titanium is observed at 4-5 ft bgs along the Beta Ditch in TMSB-107 and TMSB-109. In the J2 Landfill, elevated titanium is seen at TMSB-117 (4 to 5 and 9 to 10 feet bgs), TMSB-118 (4 to 5 and 19 to 20 feet bgs) and TMSB-119 (4 to 5 feet bgs). Finally, in the Ponds Area, sample TMSB-123 from 4 to 5 feet bgs exceeds screening level. The distribution of all subsurface soil data for titanium is shown on Figure 4-25. In all of these borings, concentrations decrease significantly with depth, and do not indicate appreciable leaching to depth.

Groundwater

Figure 4-26 shows the distribution of titanium in groundwater. For the most part, titanium concentrations are less than 20 µg/L in Plant Site and downgradient monitor wells. However, elevated titanium is observed at TMMW-101 along Lake Mead Boulevard, and PC28, PC-50, PC-64, PC-67, and PC-108 to the north of the Plant Site. Groundwater titanium concentrations in the northern Plant Site range from 0.77J µg/L in CLD4-R to 10J µg/L in J2U1. These data suggest no sourcing of titanium from the Plant Site presently exists.

4.3.2.6 Uranium

Uranium, along with thorium, are two radiological metals that are present in minor quantities in titanium ore. Uranium concentrations, in mass per mass (such as mg/kg), are discussed in this section. Isotopes of

uranium and thorium, as well as daughter decay products, in terms of activity concentrations are discussed in Section 4.3.4.

Since uranium is present in ore, it is suspected in ore processing waste streams, including (1) CSD solids, (2) OPW, (3) rutile residues, and (4) chlorinator dust. Disposal areas include (1) Ponds Area, (2) J2 Landfill, (3) Surface Ditches and NSA, and (4) Near-Surface Soil Source Areas (in particular Francy's Mountain, PSA 3).

The soil screening level that soil concentrations are screened against is 200 mg/kg based on the EPA Region 9 Industrial PRG. The distribution of uranium (based on available data) in shallow soil is shown on Figure 4-27, in subsurface soil as Figure 4-28, and in groundwater (solute plume) as Figure 4-29. The groundwater screening level is 30 µg/L based on the MCL for drinking water.

Shallow Soil

Uranium concentrations in shallow soil are all well below the screening level (Figure 4-27) of 200 mg/kg based on the EPA Region 9 industrial PRG. Detectable concentrations of uranium in shallow soil range from 0.6 mg/kg to 4.2 mg/kg (Table 4-2).

Subsurface Soil

Subsurface concentrations of uranium at the Plant Site are all below the screening level (Figure 4-28). However, uranium concentrations in subsurface soil were higher in samples from TMSB-117 and TMSB-120, located in the J2 Landfill, and TMSB-123, located in the Ponds Area (former North CSD Pond).

In TMSB-117, the uranium concentrations are 50 and 6 mg/kg at 4 to 5 and 9 to 10 feet bgs, respectively. These samples are likely in landfill waste. Samples below this depth exhibited concentrations of 1.6, 1.4, and 2.1 mg/kg at 19 to 20, 29 to 30, and 39 to 40 feet bgs, respectively. Likewise, in TMSB-120, uranium concentrations are 19 and 21 mg/kg at 4 to 5 and 9 to 10 feet bgs, respectively, which are also suspected to be in waste. At 19 to 20, 29 to 30, and 39 to 40 feet bgs, concentrations dropped to 1.2, 1.6, and 2.3 mg/kg, respectively. These vertical concentration profiles do not suggest that uranium has leached to significant depths below the J2 Landfill.

In the Ponds Area, a similar vertical profile is observed in TMSB-123. In TMSB-123, the peak concentration is 31 mg/kg at about 15 feet bgs (near the base of former North CSD Pond excavation),

then drops to 3.4 mg/kg at about 20 feet bgs and 1.9 mg/kg at about 30 feet bgs. This profile also does not suggest significant vertical leaching of uranium.

Although shallow and subsurface soil data suggest higher uranium concentrations, albeit well below the screening level, in the J2 Landfill and Ponds Area, they do not suggest (1) leaching of uranium to substantial depth below waste levels and (2) a source to groundwater contamination.

Groundwater

Groundwater concentrations of uranium in Plant Site and off-site wells are shown on Figure 4-29. As shown on Figure 4-29, uranium concentrations exceeding the MCL of 30 µg/L are present in the northern portion of the Plant Site, monitoring wells MW-3 and MW-6R, south of Operational Areas, and most wells north of the Plant Site. The plume centerline passes through J2U2, CLD3-R, and PC-067. The groundwater data suggest a source area in the J2 Landfill; however, the soil data do not. This discrepancy forms the basis for a data gap for the nature and occurrence of uranium in soil versus distribution of uranium in groundwater.

4.3.2.7 Vanadium

Vanadium, like trivalent chromium, is present in titanium ore, so it is expected to be present in the waste streams (CSD solids, OPW, and chlorinator dust). Disposal areas for these waste streams include (1) Ponds Area, (2) J2 Landfill, (3) Surface Ditches and NSA, and (4) Near-Surface Soil Source Areas (in particular Francy's Mountain –PSA 3).

The soil screening level that soil concentrations are screened against is 1,000 mg/kg based on the EPA Region 9 industrial PRG. The distribution of vanadium (based on available data) in shallow soil is shown on Figure 4-30, in subsurface soil as Figure 4-31, and in groundwater as Figure 4-32.

Vanadium is relatively immobile in soil and groundwater; however, the mobility of vanadium is dependant on its oxidation state. Regardless, as evidenced by the DAF 20 value of 6,000 mg/kg for soil leaching to groundwater, the leachability of vanadium is, for the most part, generally low.

Shallow Soil

No vanadium concentrations exceeded the screening level in shallow soil samples (Figure 4-30). However, results for several soil borings in shallow soils (TMSB 109, near the former Alpha/Beta Ditches, and TMSB-124, near the TRONOX east property boundary) suggest vanadium concentrations

were elevated when compared to the background level. Vanadium concentrations in these borings decline in subsurface soils consistent with the low leachability of vanadium.

Subsurface Soil

Vanadium concentrations in all subsurface soil samples do not exceed the EPA Region 9 industrial PRG and DAF20 value. Results for several borings in suspected source areas suggest elevated concentrations of vanadium (Figure 4-31), such as TMSB-107 in the vicinity of the former Northwestern Ditch, TMSB-117 and TMSB-118 in the J2 Landfill, and TMSB-123 (Ponds Area). In these borings, vanadium appears slightly elevated in the upper vadose zone and then concentrations drop significantly, demonstrating a favorable decreasing vertical profile. This behavior indicates vanadium has not leached through the soil column to groundwater at the Plant Site, even in areas where chloride profiles suggest anthropogenic impacts through the entire vadose zone.

Groundwater

Vanadium concentrations in Plant Site groundwater are generally well below 100 µg/L (Figure 4-32). The exception is in the northwest corner, where the concentrations at CLD4-R, CLD1-R, and CLD2-R are 9,900, 300, and 160 µg/L, respectively. The concentration of 9,900 µg/L is more than two orders of magnitude higher than most concentrations detected in Plant Site monitoring wells, and is clearly anomalous.

The wells in the northwest corner of the Plant Site follow the same plume pattern as manganese and chromium, both of which are attributable to off-site impacts. Since CLD4-R is located along the western boundary of the Plant Site and contains by far the highest concentration of vanadium, it suggests a source of vanadium elsewhere in the BMI Complex.

4.3.2.8 Antimony

Antimony is a silvery white metal of medium hardness with little abundance in the earth's crust (Agency for Toxic Substances and Disease Registry [ATSDR] 1992). Antimony is usually mixed with other metals (such as lead and zinc) to form alloys. Alloys are typically used in lead storage batteries, solder, sheet and pipe metal, bearings, castings, ammunition and pewter (ATSDR 1992).

Waste streams at the Plant Site that either contain or potentially contain antimony include OPW, Pioche Manganese slag, magnesium wastes, nonhazardous plant solid wastes (J2 Landfill), and BMI waste

streams (Table 3-1). Based upon waste stream analysis, antimony is not a constituent in CSD solids, leach liquor, spent caustic, chlorinator dust, or rutile residuals.

The soil screening level that soil concentrations are screened against is 410 mg/kg based on the EPA Region 9 industrial PRG. The distribution of antimony (based on available data) in shallow soil is shown on Figure 4-33 and in subsurface soil as Figure 4-34.

Shallow Soil

Concentrations of antimony in 21 shallow soil samples ranged from 0.31 to 1.6 mg/kg (Table 4-2). Of the total 41 samples analyzed, none of the concentrations exceeded the soil screening level of 410 mg/kg (EPA Region 9 industrial PRG) or the DAF20 value of 5 mg/kg, as shown on Figure 4-33.

Subsurface Soil

Concentrations of antimony in 56 subsurface soil samples ranged from 0.24 to 3.6 mg/kg (Table 4-3). Of the total 132 samples analyzed, none of the concentrations exceeded the soil screening level and only two exceeded the DAF20 screening value, as shown on Figure 4-34. Concentrations detected above the DAF20 value were reported as nondetect with elevated detection limits. As noted previously, these samples were collected within the waste zone of the J2 Landfill.

Groundwater

None of the 86 groundwater samples exhibited detected concentrations of antimony in Plant Site and downgradient wells (Tables 4-6 and 4-7). In 12 instances, elevated detection limits (0.1 mg/kg maximum), which were likely a result of matrix interference (high solids), exceeded the groundwater screening level of 0.006 mg/kg based upon the MCL.

4.3.2.9 Barium

Barium is a silvery-white metal that takes on a silver-yellow color when exposed to air (ATSDR 2005). Two forms of barium (barium sulfate and barium carbonate) are often found in ore deposits. Uses of barium are common and diverse. Barium sulfate is used in drill mud as a lubricant. Barium sulfate is also used to make paints, bricks, tiles, glass, and in other applications such as medical tests (ATSDR 2005).

Waste streams at the Plant Site that either contain or potentially contain barium include OPW, Pioche Manganese slag, paint shop solvents, nonhazardous plant solid wastes (J2 Landfill), and BMI waste

streams (Table 3-1). Based upon waste stream analysis, barium is not a constituent in CSD solids, leach liquor, spent caustic, chlorinator dust, or rutile residuals.

The soil screening level that soil concentrations are screened against is 67,000 mg/kg based on the EPA Region 9 industrial PRG. The distribution of barium (based on available data) in shallow soil is shown on Figure 4-35, in subsurface soil as Figure 4-36, and in groundwater as Figure 4-37.

Shallow Soil

Concentrations of barium in 60 shallow soil samples ranged from 95.8 to 3130 mg/kg (Table 4-2). Of the total 60 samples analyzed, none exhibited concentrations exceeding the soil screening level of 67,000 mg/kg (EPA Region 9 industrial PRG). Barium concentrations in one sample from boring location PM1 exceeded the DAF20 value of 1,600 mg/kg, as shown on Figure 4-35.

Subsurface Soil

Concentrations of barium in 161 subsurface soil samples ranged from 47 to 30,000 mg/kg (Table 4-3). Of the total 161 samples analyzed, none exhibited barium concentrations exceeding the soil screening level and four exhibited concentrations exceeding the DAF20 value, as shown on Figure 4-36. Barium concentrations in sample intervals at boring location PM1 exceeded the DAF20 value until 4.5 feet bgs, where concentrations decreased by an order of magnitude. Similar results were reported at boring location TMSB-120, where elevated barium concentrations in the 4-to-5- and 9-to-10-foot sample intervals dropped from a high of 30,000 mg/kg to 190 mg/kg in the 19-to-20-foot sample interval. As noted previously, both of these sample locations and intervals are believed to be representative of waste zone samples.

Groundwater

Of the 344 groundwater samples analyzed for barium, none exhibited concentrations exceeding the groundwater screening level of 2,000 µg/L (MCL) (Figure 4-37). Only two wells on the Plant Site were reported detectable concentrations of barium, MW-01 (23.7 µg/L) and CLD3-R (23J µg/L).

4.3.3 Volatile Organic Compounds

The occurrence of VOCs is spatially limited at the Plant Site. The known source areas receiving VOC wastes are the J2 Landfill, in particular the Used Paint and Solvent Area (PSA 16) located within the J2 Landfill, and the Surface Ditches and NSA due to BMI Complex wastes that passed through the area in

the former Alpha Ditch, Beta Ditch, and Northwest Ditch on route to off-site disposal areas. The wastewater streams passing through the Surface Ditches and NSA carried a number of organic compounds, including VOCs, pesticides, and potentially other SVOCs. VOC impacts that may be related to this conveyance practice are discussed below.

4.3.3.1 Chloroform

Chloroform is not identified (by process knowledge) in historic or present-day Plant Site processes or waste streams. Since chloroform is not suspected, based on process knowledge, of having been stored on site as either process feed-stock or waste solvent, there is no potential release from tanks or drums as nonaqueous-phase liquid (NAPL) or from site ponds or ditches as dilute aqueous contamination.

The screening levels for soil are 470 µg/kg based on the EPA Region 9 industrial PRG and 600 µg/kg based on the DAF20 value for evaluation of soil leaching to groundwater. The groundwater screening level is 100 µg/L for total trihalomethanes based on the MCL for drinking water. The distribution of chloroform (based on available data) in shallow soil is shown on Figure 4-38, in subsurface soil as Figure 4-39, and in groundwater as Figure 4-40. Chloroform is the primary trihalomethane found in groundwater beneath the Plant Site (Figure 4-41).

Shallow Soil

Chloroform concentrations detected in shallow soil samples were all well below the soil screening level (Figure 4-38). Most chloroform results were not detected, and all detected results were very near the detection limit. Although data for shallow soil is sparse in the northern portion of the Plant Site (such as in the Ponds Area, J2 Landfill Area, and Surface Ditches and NSA), subsurface soil data indicate that no significant releases of chloroform have occurred.

Subsurface Soil

Chloroform concentrations detected in subsurface soil samples were all well below the soil screening level (Figure 4-39), indicating chloroform was not released in significant amounts at the Plant Site. Most results were not detected, and the detected results are very near the detection limit. The vertical profiles in the Pond Area (JS-1, JS-2, JS-3 and TMSB-123), in the J2 Landfill (TMSB-117 and TMSB-118), and the Surface Ditches and NSA (TMSB-105 through TMSB-1110) indicate no migration to depth of chloroform at these source areas.

Groundwater

Chloroform was routinely detected in monitoring well samples at the Plant Site (Figure 4-40). The chloroform plume cuts across the northern portion of the Plant Site, and the solute concentrations in Plant Site monitoring wells do not indicate the occurrence of chloroform as dense NAPL. Data collected to date suggest the chloroform detected in on-site monitoring wells is from off-site sources within the BMI Complex, where releases of chloroform are suspected (by process knowledge). Accordingly, chloroform concentrations observed in samples from the Plant Site monitoring wells represent a transgressing plume emanating from the southwest. Information on potential chloroform source areas from the BMI Complex is a data gap.

4.3.3.2 Tetrachloroethene

In the J2 Landfill (PSA 16), tetrachloroethene (PCE) concentrations exceeded the groundwater screening level. PCE was likely present in paint shop solvents. Management areas included PSA 16, Used Paint and Solvent Area, which is located in the southwest portion of the J2 Landfill, and PSA 19 and 31 along facility roadways where used oil containing solvents was used as dust suppressant.

The PCE screening levels for soils are 1,300 µg/kg (based on the EPA Region 9 industrial PRG) and 60 µg/kg (DAF20 value for soil leaching to groundwater). The groundwater screening level is 5 µg/L based on the MCL for drinking water. The distribution of tetrachloroethene (based on available data) in shallow soil is shown on Figure 4-42, in subsurface soil as Figure 4-43, and in groundwater as Figure 4-44.

Shallow Soil

The distribution of PCE in shallow soil is shown on Figure 4-42. Based on these data, no PCE concentrations exceeded the screening levels in shallow soil. Sample results for shallow soil are not available for the Used Paint and Solvent Area within the J2 Landfill; however, this area is industrial landfill, and “shallow soil” is represented by landfill cover or other anthropogenic fill materials. No PCE waste was detected in samples collected in the vicinity of PSA19, along the roadway near the northwest corner of Unit 7, or in samples collected from PSA 31, the facility roadways. The lack of PCE elsewhere in shallow soil supports the limited (spatially) sourcing of PCE at the Plant Site to the J2 Landfill area.

Subsurface Soil

All of the quantifiable occurrences of PCE in subsurface soil are located in and around the J2 Landfill, Ponds Area, and adjacent Near-Surface Soil Areas (Figure 4-43). The detected PCE results slightly exceeded the detection limit, ranging from 5 to 6.5 µg/kg at eight locations. Based on the low frequency of detections, the source of PCE in subsurface soil could not be identified. Given the relatively low concentrations of the solute plume (discussed below), it is possible that PCE is migrating to groundwater by vapor transport, at which points it partitions into the aqueous phase. This mode of solvent transport, often facilitated by methane migration, is typical with landfills in alluvial fan environments with intermediate to deep vadose zones.

Groundwater

The distribution of PCE in groundwater is shown on Figure 4-44. The distribution of PCE in groundwater at the Plant Site represents a rather unique occurrence – it forms a narrow (relative to most BMI Complex groundwater impacts) groundwater plume that is quite definable. Because the Used Paint and Solvent Area is contained within the landfill boundaries, it is possible that PCE undergoes reductive dechlorination under anaerobic conditions to some degree, the byproduct of which is trichloroethene (TCE); and if the process continues, dichloroethene (DCE), then vinyl chloride (VC). There is no evidence of DCE or VC at the Plant Site, so reductive dechlorination, if occurring, appears limited.

Because groundwater at the site is considered aerobic, with positive oxidation-reduction potentials (ORP) and measurable dissolved oxygen (DO) throughout, the reductive dechlorination process, if ongoing, is suspected of being limited to the landfill waste and immediately below. Once chlorinated ethenes enter the groundwater, they will tend toward recalcitrance in aerobic solute plume conditions. Perhaps this is why DCE is not observed in distal plume positions in off-site areas.

Given the relatively low concentrations of the solute plume, it is possible that PCE is migrating to groundwater by vapor transport, at which points it partitions into the aqueous phase. This mode of solvent transport, often facilitated by methane migration, is typical with landfills in alluvial fan environments with intermediate to deep vadose zones.

The PCE solute plume is well defined and bounded by monitoring wells J2U2 and MW-4 on the south (of the Plant Site); AA-27, DM-1, POD2-R and AA-19 on the east; AA-20 (just above the MCL), AA-22, and PC-4 to north; and CLD1-R and PC-050 to the west. To the west, samples from wells PC-028 and

PC-064 exhibited nondetect concentrations of PCE, but with detection limits exceeding the MCL, and a PCE concentration (12J µg/L) in a sample from PC-067 was just over twice the MCL; however, this concentration was not quantified. Regardless of the results for the PC-series wells, PCE in groundwater is considered well defined.

Because PCE is not a wide-spread SRC within the BMI Complex, the PCE solute plume depicted on Figure 4-44 provides an exceptional glimpse of the mean direction of groundwater flow from the northern Plant Site. This is useful in that various hypotheses have been suggested regarding the influence of "paleochannels" on the Muddy Creek Formation surface play on solute plume transport. The PCE plume at the Plant Site suggests that groundwater flows in a direction that is (1) 5 to 10 degrees east of due north, (2) in general agreement with the topography, and (3) in general agreement with mean groundwater flow directions observed at other BMI Complex facilities to the west. Based on these observations, it does not appear that paleochannels play a significant, if any, role in advection of solute plumes from the Plant Site.

4.3.3.3 Trichloroethene

The TCE groundwater plume mimics the PCE plume, but is not as large. The potential sources of TCE at the Plant Site are the same as for PCE. The TCE plume may be related to (1) primary disposal of TCE in the Used Paint and Solvent Area – J2 Landfill, or (2) a degradation product of PCE in the J2 Landfill undergoing reductive dechlorination. Because it occurs with PCE (to a lesser extent), it is plausible that this second release mechanism is the source of TCE in groundwater.

The screening levels for TCE in soils are 110 µg/kg (EPA Region 9 industrial PRG) and 60 µg/kg (DAF20 value for soil leaching to groundwater). The groundwater screening level is 5 µg/L based on the MCL for drinking water. The distribution of trichloroethene (based on available data) in shallow soil is shown on Figure 4-45, in subsurface soil as Figure 4-46, and in groundwater as Figure 4-47.

Shallow Soil

TCE concentrations in shallow soil samples were all well below the screening level of 110 µg/kg (Figure 4-45).

Subsurface Soil

In subsurface soil, TCE results (Figure 4-46) are similar to the PCE results observed – several detections were just above the detection level in the J2 Landfill and Ponds Area, with no clearly defined source areas or vertical profiles suggesting leaching to groundwater. It is possible that vadose zone transport of TCE, similar to PCE, may be via vapor transport without a specific TCE source area.

Groundwater

The TCE plume on the Plant Site (Figure 4-47) is defined by well J2U2 (12 µg/L) and well J2D2-R2 (11 µg/L). The concentrations detected at these two wells were just over twice the MCL, and are not suggestive of a significant source of TCE. The TCE plume is contained within the boundaries of the PCE plume; therefore, it is likely sourced in the same location as the PCE. This occurrence, as well as the low concentrations of TCE detected, indicates the reductive dechlorination hypothesis is viable.

4.3.4 Radionuclides

Radionuclides are naturally occurring in site soils and the rutile ore material used to manufacture titanium. Naturally occurring radionuclides present in the rutile ore include primarily Uranium (^{238}U and ^{235}U decay chains), thorium (^{232}Th decay chain), and ^{40}K. Processing of rutile ore to produce and purify titanium results in removal and concentration of other components of rutile ore such as metals and radionuclides in process waste streams. Radionuclides are present at the Plant Site in CSD solids, OPW, chlorinator dust, rutile ore residues, and possibly in Pioche Manganese slag. These solid and liquid wastes were disposed of in the Ponds Area, the J2 Landfill, Surface Ditches and NSA, Near-Surface Soil Areas (particularly PSA 3, Francy's Mountain), and subsurface piping that conveyed these waste streams.

Radionuclides present at the Plant include isotopes of (1) uranium (U), (2) protactinium (Pa), (3) thorium (Th), (4) actinium (Ac), (5) radium (Ra), (6) radon (Rn), (7) polonium (Po), (8) bismuth (Bi), (9) lead (Pb), and (10) thallium (Tl). In order to understand the fate of these radionuclides, the decay chains must be understood. The various isotopes of these elements can all be derived, via decay, from ^{238}U, ^{232}Th, and ^{235}U. The decay chain elements are followed by whether the subsequent decay is alpha (α) or beta (β), followed by the half life in years (y), days (d), minutes (m), or seconds (s). Half-lives are provided to assist in understanding nondetects, which may result from very short half-lives, thereby making detection problematic. Many of the isotopes in these decay chains have half-lives of seconds and minutes – others millions of years. This, in turn, affects the ability to detect these isotopes.

4.3.4.1 Uranium-238 Decay Series

Uranium-238 constitutes 99.3 percent of natural crustal uranium; therefore, it is considered in this CSM to constitute the isotope present (in minor quantity) in the titanium ore. The soil screening levels for Uranium-238 are based on the EPA Region 9 industrial PRG and the DAF20 value for soil leaching to groundwater. The groundwater screening levels are based on tap water PRGs, and the combined ^{226}Ra/^{228}Ra activity of 5 picoCuries per liter (pCi/L) based on the MCL for drinking water. The distribution of uranium-238 (based on available data) in shallow soil is shown on Figure 4-48, in subsurface soil as Figure 4-49, and in groundwater as combined ^{226}Ra/^{228}Ra on Figure 4-50.

Shallow Soil

The distribution of uranium-238 and selected decay chain daughter products (^{230}Th, ^{226}Ra, ^{210}Pb) in shallow soil are shown on Figure 4-48. The detections in the uranium-238 decay chain in shallow soil are summarized in Table 4-2, and occurrences are highlighted (large bold font) in the decay chain below. Radionuclides in italics were not analyzed.

^{238}**U** (α)[4.5E9 y] → ^{234}**Th** (β)[24 d] → *^{234}Pa (α)[1.2 m]* → ^{234}**U** (α)[2.5E5 y] → ^{230}**Th** (α)[8E4 y] → ^{226}**Ra** (α)[1,600 y] → *^{222}Rn (α)[3.8 d]* → *^{218}Po (α)[3.05 m]* → ^{214}**Pb** (β)[26.8 m] → ^{214}**Bi** (β)[19.7 m] → ^{214}**Po** (α)[0.0002 s] → ^{210}**Pb** (β)[21 y] → ^{210}Bi (β)[5 d] → ^{210}Po (α)[138 d] → *^{206}Pb (stable)*

Of the radionuclide occurrences in shallow soil in the uranium-238 decay chain highlighted above, not all exceed the screening level for soil (Region 9 Outdoor Worker PRG) and soil leaching to groundwater (DAF20 value). However, it should be remembered that most of these elements (particularly including radon) are present throughout the U.S., and their detection does not mean a TIMET-generated release has been detected. Those radionuclides exceeding the screening levels, followed by number of detections exceeding each screening level (PRG, DAF20 value), include: ^{238}U (0, 3), ^{226}Ra (5, 14), and ^{210}Pb (1, 3). Only a small percentage of all detections exceeded the respective screening levels. In most cases, the activities detected for radionuclides only slightly exceeded the screening level for soil.

Subsurface Soil

The distribution of uranium-238 and selected decay chain daughter products (^{230}Th, ^{226}Ra, ^{210}Pb) in subsurface soil are shown on Figure 4-49. The detections in the uranium-238 decay chain in subsurface

soil are summarized in Table 4-3, and occurrences are highlighted (large bold font) in the decay chain below. Radionuclides in italics were not analyzed.

^{238}**U** (α)[4.5E9 y] → ^{234}**Th** (β)[24 d] → *^{234}Pa (α)[1.2 m]* → ^{234}**U** (α)[2.5E5 y] → ^{230}**Th** (α)[8E4 y] → ^{226}**Ra** (α)[1,600 y] → *^{222}Rn (α)[3.8 d]* → *^{218}Po (α)[3.05 m]* → ^{214}**Pb** (β)[26.8 m] → ^{214}**Bi** (β)[19.7 m] → ^{214}**Po** (α)[0.0002 s] → ^{210}**Pb** (β)[21 y] → ^{210}Bi (β)[5 d] → ^{210}Po (α)[138 d] → *^{206}Pb (stable)*

Of the uranium-238 decay isotope occurrences in subsurface soil (highlighted above), the detections exceeding screening level are similar to those for shallow soil. These radionuclides followed by the number of occurrences above each screening level (PRG, DAF20 value), include: ^{238}U (0, 8), ^{230}Th (1, 2), ^{226}Ra (5, 16), and ^{210}Pb (3, 7). Only a small percentage of all detections exceeded both screening levels.

Plant Site Groundwater

The detections in the uranium-238 decay chain in Plant Site groundwater are summarized in Tables 4-4 through 4-7, and occurrences are highlighted (large bold font) in the decay chain below. Radionuclides in italics were not analyzed.

^{238}**U** (α)[4.5E9 y] → ^{234}**Th** (β)[24 d] → *^{234}Pa (α)[1.2 m]* → ^{234}**U** (α)[2.5E5 y] → ^{230}**Th** (α) [8E4 y] → ^{226}**Ra** (α)[1,600 y] → ^{222}**Rn** (α)[3.8 d] → *^{218}Po (α)[3.05 m]* → ^{214}**Pb** (β)[26.8 m] → ^{214}**Bi** (β)[19.7 m] → *^{214}Po (α)[0.0002 s]* → ^{210}**Pb** (β)[21 y] → *^{210}Bi (β)[5 d]* → *^{210}Po (α)[138 d]* → *^{206}Pb (stable)*

The uranium-238 decay isotopes detections highlighted above all exceed screening level for Plant Site groundwater (EPA Region 9 Outdoor Worker PRG), which are considered conservative. The number of concentrations exceeding screening level by isotope is: ^{238}U (47), ^{234}Th (4), ^{234}U (4), ^{222}Rn (48), ^{214}Pb (2), ^{214}Bi (1) and ^{210}Pb (14). From these data, it can be seen that the predominant occurrences in Plant Site groundwater related to uranium-238 decay chain are ^{238}U, ^{222}Rn, and ^{210}Pb. The combined ^{226}Ra/^{228}RA results at all groundwater sampling locations do not exceed the groundwater screening level based on the MCL for drinking water (Figure 4-50).

Downgradient Groundwater

The detections in the uranium-238 decay chain in downgradient groundwater are summarized in Table 4-7, and occurrences are highlighted (large bold font) in the decay chain below. Radionuclides in italics were not analyzed.

^{238}**U** (α)[4.5E9 y] → ^{234}**Th** (β)[24 d] → *^{234}Pa (α)[1.2 m]* → ^{234}**U** (α)[2.5E5 y] → ^{230}**Th** (α)[8E4 y] → ^{226}**Ra** (α)[1,600 y] → ^{222}**Rn** (α)[3.8 d] → *^{218}Po (α)[3.05 m]* → ^{214}**Pb** (β)[26.8 m] → ^{214}Bi (β)[19.7 m] → *^{214}Po (α)[0.0002 s]* → ^{210}**Pb** (β)[21 y] → *^{210}Bi (β)[5 d]* → *^{210}Po (α)[138 d]* → *^{206}Pb (stable)*

The uranium-238 decay isotopes exceeding the screening level in downgradient groundwater (Table 4-7) include: ^{238}U (9), ^{234}Th (1), ^{234}U (9), ^{230}Th (1), ^{222}Rn (9), and ^{210}Pb (5). In downgradient wells samples, the predominant uranium-238 decay-related isotopes are ^{238}U, ^{234}U, ^{222}Rn, and ^{210}Pb. The combined ^{226}Ra/^{228}RA results at all groundwater sampling locations do not exceed the groundwater screening level based on the MCL for drinking water (Figure 4-50).

4.3.4.2 Thorium-232 Decay Series

Thorium-232 constitutes 99.99 percent of natural crustal thorium; therefore, it is considered in this CSM to constitute the primary thorium isotope present (in minor quantity) in the titanium ore. The soil screening levels for Thorium-232 are based on the EPA Region 9 Outdoor Worker PRG and the DAF20 value for soil leaching to groundwater. The groundwater screening levels are based on tap water PRG and the combined ^{226}Ra/^{228}Ra activity of 5 pCi/L based on the MCL for drinking water. The distribution of thorium-232 (based on available data) in shallow soil is shown on Figure 4-51 and in subsurface soil as Figure 4-52.

Shallow Soil

The distribution of ^{232}Th and ^{228}Ra in shallow soil are shown on Figure 4-51. The detections in the ^{232}Th decay in shallow soil are summarized in Table 4-2, and occurrences are highlighted (large bold font) in the decay chain below. Radionuclides in italics were not analyzed.

^{232}**Th** (α)[1.4E10 y] → ^{228}**Ra** (β)[5.8 y] → ^{228}**Ac** (β)[6.13 h] → ^{228}**Th** (α)[1.91 y] → ^{224}**Ra** (α)[3.6 d] → *^{220}Rn (α)[55 s]* → ^{216}**Po** (α)[0.15 s] → ^{212}**Pb** (β)[10.6 h] → ^{212}**Bi** (β)[60.6 m] → ^{212}**Po** (α)[3E-7 s]→ *^{208}Pb (stable)* *or* ^{212}**Bi** (α)[60.6 m] → ^{208}**Tl** (β)[4.79 m]→ *^{208}Pb (stable)*

Of the radionuclide occurrences in shallow soil in the ^{232}Th-chain highlighted above, only two exceeded screening levels (PRG, DAF20 value), including ^{228}Ra (0, 1) and ^{212}Po (1, 0). Only a small percentage of all detections exceeded the respective screening levels.

Subsurface Soil

The distribution of ^{232}Th and ^{228}Ra in subsurface soil are shown on Figure 4-52. The detections in the ^{232}Th decay in subsurface soil are summarized in Table 4-3, and occurrences are highlighted (large bold font) in the decay chain below. Radionuclides in italics were not analyzed.

^{232}Th (α)[1.4E10 y] → **^{228}Ra** (β)[5.8 y] → **^{228}Ac** (β)[6.13 h] → **^{228}Th** (α)[1.91 y] → **^{224}Ra** (α)[3.6 d] → *^{220}Rn (α)[55 s]* → **^{216}Po** (α)[0.15 s] → **^{212}Pb** (β)[10.6 h] → **^{212}Bi** (β)[60.6 m] → **^{212}Po** (α)[3E-7 s]→ *^{208}Pb (stable) or* **^{212}Bi** (α)[60.6 m] → **^{208}Tl** (β)[4.79 m]→ *^{208}Pb (stable)*

Of the radionuclide occurrences in subsurface soil in the ^{232}Th-chain highlighted above, the same isotope as in shallow soil exceeded screening levels (PRG, DAF20): ^{228}Ra (0, 5).

Plant Site Groundwater

The detections in the ^{232}Th decay in Plant Site groundwater are summarized in Tables 4-4, 4-5, and 4-6 and occurrences are highlighted (large bold font) in the decay chain below. The radionuclides in italics were not analyzed.

^{232}Th (α)[1.4E10 y] → **^{228}Ra** (β)[5.8 y] → **^{228}Ac** (β)[6.13 h] → ^{228}Th (α)[1.91 y] → **^{224}Ra** (α)[3.6 d] → *^{220}Rn (α)[55 s]* → *^{216}Po (α)[0.15 s]* → **^{212}Pb** (β)[10.6 h] → **^{212}Bi** (β)[60.6 m] → *^{212}Po (α)[3E-7 s]*→ *^{208}Pb (stable) or* **^{212}Bi** (α)[60.6 m] → **^{208}Tl** (β)[4.79 m]→ *^{208}Pb (stable)*

Of the ^{232}Th-decay isotopes detections highlighted above, three exceeded groundwater screening levels (EPA Region 9 tap water PRGs), including ^{228}Ac (2), ^{224}Ra (3) and ^{212}Bi (1). The combined ^{226}Ra/^{228}RA results at all groundwater sampling locations do not exceed the groundwater screening level based on the MCL for drinking water (Figure 4-50).

Downgradient Groundwater

The detections in the ^{232}Th decay in downgradient groundwater are summarized in Table 4-7, and occurrences are highlighted (large bold font) in the decay chain below. Radionuclides in italics were not analyzed.

^{232}**Th** (α)[1.4E10 y] → ^{228}**Ra** (β)[5.8 y] → ^{228}**Ac** (β)[6.13 h] → ^{228}**Th** (α)[1.91 y] → ^{224}**Ra** (α)[3.6 d] → ^{220}*Rn (α)[55 s]* → ^{216}*Po (α)[0.15 s]* → ^{212}**Pb** (β)[10.6 h] → ^{212}Bi (β)[60.6 m] → ^{212}Po (α)[3E-7 s]→ ^{208}Pb (stable) *or* ^{212}Bi (α)[60.6 m] → ^{208}Tl (β)[4.79 m]→ ^{208}*Pb (stable)*

Of the ^{232}Th-decay isotopes detections in downgradient groundwater, two exceeded the screening level (EPA Region 9 tap water PRGs): ^{224}Ra (1), and ^{212}Pb (1). The combined ^{226}Ra/^{228}RA results at all groundwater sampling locations do not exceed the groundwater screening level based on the MCL for drinking water (Figure 4-50).

4.3.4.3 Uranium-235 Decay Series

Uranium-235 constitutes only 0.72 percent (by weight) of natural crustal uranium; however, by activity it is roughly equal to ^{238}U. Therefore, although ^{235}U is suspected to constitute a minor trace occurrence in Plant Site wastes, its contribution to activity measured in samples might be substantial. However, as shown below, the occurrences of ^{235}U-decay-series isotopes in soil are relatively limited, while ^{235}U in groundwater is widespread in Plant Site and downgradient groundwater.

The soil screening levels for ^{235}U are based on EPA Region 9 outdoor worker PRG and the DAF20 value for evaluating soil leaching to groundwater. The groundwater screening level is based on the EPA Region 9 tap water PRG. The distribution of uranium-235 (based on available data) in shallow soil is shown on Figure 4-53 and in subsurface soil as Figure 4-54.

Shallow Soil

The detections in the ^{235}U decay chain in shallow soil are shown on Figure 4-53, and occurrences are highlighted (large bold font) in the decay chain below. Radionuclides not analyzed are in italics.

^{235}**U** (α)[7.1E8 y] → ^{231}**Th** (β)[25.5 h] → ^{231}*Pa (α)[3.2E4 y]* → ^{227}Ac (β)[21.6 y] → ^{227}Th (α)[18.2 d] → ^{223}Ra (α)[11.4 d] → ^{218}*Rn (α)[4 s]* → ^{215}Po (α)[0.002 s] → ^{211}Pb (β)[36.1 m] → ^{211}Bi (α)[2.15 m] → ^{207}*Tl (β)[4.79 m]*→ ^{207}*Pb (stable)*

Of the radionuclide occurrences in shallow soil in the ^{235}U-chain highlighted above, none exceeded the screening levels for soil.

Subsurface Soil

The detections in the ^{235}U decay chain in subsurface soil are shown on Figure 4-54, and occurrences are highlighted (large bold font) in the decay chain below. Radionuclides not analyzed are in italics.

$$^{235}\mathbf{U}\ (\alpha)[7.1E8\ y] \rightarrow {}^{231}\mathbf{Th}\ (\beta)[25.5\ h] \rightarrow {}^{231}\mathit{Pa}\ (\alpha)[3.2E4\ y] \rightarrow {}^{227}\mathbf{Ac}\ (\beta)[21.6\ y] \rightarrow {}^{227}\mathbf{Th}\ (\alpha)[18.2\ d] \rightarrow {}^{223}\mathrm{Ra}\ (\alpha)[11.4\ d] \rightarrow {}^{218}\mathit{Rn}\ (\alpha)[4\ s] \rightarrow {}^{215}\mathrm{Po}\ (\alpha)[0.002\ s] \rightarrow {}^{211}\mathrm{Pb}\ (\beta)[36.1\ m] \rightarrow {}^{211}\mathrm{Bi}\ (\alpha)[2.15\ m] \rightarrow {}^{207}\mathit{Tl}\ (\beta)[4.79\ m] \rightarrow {}^{207}\mathit{Pb}\ (stable)$$

In subsurface soil, only ^{235}U exceeded the screening levels, with two detections exceeding the PRG and two detections exceeding the DAF20 value (out of 159 samples collected and analyzed to date).

Plant Site Groundwater

Plant Site groundwater samples were analyzed for ^{235}U, and the results are summarized in Tables 4-4, 4-5, and 4-6. ^{235}U was detected in about 75 percent of the Plant Site groundwater samples, and exceeded the screening level (EPA Region 9 tap water PRG) in roughly two-thirds of all detections. A groundwater figure for ^{235}U has not been generated, although the distribution of uranium as a metal is depicted on Figure 4-29.

Downgradient Groundwater

Downgradient groundwater samples were analyzed for ^{235}U, and the results are summarized in Table 4-7. ^{235}U was detected in all nine downgradient groundwater samples, and exceeded the screening level in about 90 percent of all detections.

4.3.5 Semivolatile Organic Compounds

PAHs are a group of chemicals that are formed during the incomplete burning of coal, oil, gas, wood, garbage, or other organic substances. PAHs are a subset of the SVOCs class of chemicals. Although there are over 100 different PAHs, environmental assessments focus upon a smaller set of 17 compounds due in part to their toxicity and likelihood of exposure (ATSDR 1995). The list of PAHs can be found in the SRC list (Appendix E). PAHs were identified as SRCs in several waste streams at the Plant Site. The wooden pallets at Landfill S-17 (LOU 22) and the waste roofing tar located in the drum storage areas (LOU 54) were identified in the ECA. Facilities located west of the Plant Site have reported waste streams containing PAH compounds. Historically, these waste streams were discharged to conveyance

ditches (Beta Ditch in particular) that crossed the Northern Storage Area in route to the Pabco Road Ponds Area (LOU 43 and 53).

Shallow and Subsurface Soil

No assessment of PAHs has been completed at the Plant Site. Recent assessment of soils in the TRECO area reported only minor occurrence of SVOCs. PAHs were also assessed at lower detection limits than SVOCs in these same soils with similar results.

Groundwater

No assessment of PAHs in groundwater has been completed at the Plant Site. However, PAHs as a class are hydrophobic and poorly soluble, and based upon their physical properties, would not be expected in groundwater at the TIMET Plant Site.

4.3.6 Polychlorinated Biphenyls

PCBs are a group of synthetic organic chemicals manufactured as mixtures containing a variety of individual chlorinated biphenyl components (congeners). Commercial production of PCBs stopped in 1977 due to heightened concern over their harmful effects. Until 1977, PCBs were used primarily as coolants and lubricants in transformers, capacitors, and other electrical equipment. Areas where PCBs are suspected coincide with areas where electrical equipment has been stored, as noted during the ECA. The Boneyard (LOU 33) is an area north of the J2 Landfill where a large non-PCB transformer was temporarily stored. As noted in Section 1.4.3, the Basic Substation and adjacent transformers (So. Nevada) are reported PCB-impacted sites. As such, assessment of migration pathways will continue to be developed as site characterization progresses. In addition, facilities located west of the Plant Site have reported media impacted by PCBs. Surface soils or sediment from these areas could have discharged to conveyance ditches (Beta Ditch in particular), which crossed the Northern Storage Area en route to the Pabco Road Ponds Area (LOU 43 and 53).

Shallow Soil

Investigation of PCBs in surface soils (Figure 4-55) has been conducted in the transformer storage area, ditches, and at TRECO to a limited extent. PCB concentrations (maximum concentration reported at 2 mg/kg) exceeded the soil screening level in samples from the transformer storage area and Alpha Ditch. The transformer storage area is capped with the foundation for the WCF, and the Alpha Ditch was

excavated when the ditch was converted into a piped conveyance. The only remaining potentially complete release pathway for both of these locations is for contaminants to move from (residual) soil to groundwater. One sample (RP-2-0/0.5CompA), which was also nondetect for PCBs, was collected near ditches in the Northern Storage Area. Only one of the samples collected in the TRECO area was detected but did not exceed the screening level of 0.74 mg/kg.

Subsurface Soil

Subsurface soil in the vicinity of the transformer storage was investigated as part of the WCF soils investigation. Specifically, JS-02 was reported as nondetect for PCBs in the 4-to-5-foot-bgs sample interval (Figure 4-56). Confirmation samples were not collected at the base of the excavation in the Alpha Ditch, although the 4-to-5-foot sample interval in sample OWS-01 along the banks of the Alpha Ditch were also nondetect for PCBs. Five sample locations were assessed as part of the TRECO investigation. All samples from the 5- and 10-foot intervals were reported as nondetect for PCBs.

Groundwater

There is no screening level (DAF) to assess the soil to groundwater migration pathway. PCBs are not likely to migrate to groundwater because of their strong binding to soil. With maximum reported concentrations of 2 mg/kg, site data do not suggest PCB releases would have impacted groundwater. As such, no Plant Site groundwater data have been collected to date.

4.3.7 Pesticides

Pesticides are not related to any Plant Site waste stream or application. They are included within this CSM because of organochlorine pesticides were known to be manufactured at facilities west of TIMET within the BMI Complex (such as lindane at Montrose). Wastewater discharges from these facilities traversed the Northern Storage Area via the Beta Ditch en route to the Pabco Road Ponds Area for evaporative treatment. As such, the investigation and or occurrence of pesticides are limited to the Northern Storage Area of the Plant Site. The TRECO investigation also collected pesticide data in surface and subsurface soils.

Shallow Soil

Soil borings TMSB-107 and TMSB-108 were sampled for pesticides because of their location within the Northern Storage Area. Detectable quantities (although below screening levels) were reported for 4,4'-

DDE, 4,4'-DDT, and beta-BHC in both borings (Appendix F). The TRECO investigation reported similar detections of the same compounds, with the addition of gamma-BHC (lindane), alpha-BHC, and methoxychlor. No exceedances of the soil screening levels were reported.

Subsurface Soil

Subsurface soil samples were collected from locations TMSB-107 and TMSB-108 to depths of 25 and 10 feet bgs, respectively. Vertical profiling of compounds detected in surface soil in the TBSB-107 boring indicates that the pesticide impacts did not migrate into the subsurface. Concentrations of pesticides in soil boring TMSB-108 were not detected to 10 feet bgs. Vertical profiling of the detections in surface soil at the TRECO sampling locations was limited to 10 feet bgs. Although there were detectable quantities of pesticides, none of the detections exceeded soil screening levels.

Groundwater

Groundwater monitoring wells CLD1-R, CLD3-R, J2D1-R2, and J2D3-R were sampled for pesticides during the hydrogeological characterization. CLD1-R and CLD3-R reported detectable concentrations of alpha-BHC, beta-BHC, delta-BHC, and gamma-BHC (Lindane) as noted in Table F-14 of Appendix F.

4.3.8 Total Petroleum Hydrocarbons

Sources of petroleum hydrocarbons at the Plant Site included USTs for gasoline, diesel, or fuel oil; hydraulic fluids; melt shop hydraulic oil; and equipment oil and greases. Prior to 1981, an estimated 5,000 gallons (total) spent oil was used as a dust suppressant on plant roadways. Since 1981, all used oil is shipped off site for recycling. All USTs have been removed or closed in-place. UST closures have been obtained from Clark County or NDEP, or are in process.

Shallow Soil

Of the four samples collected in the ditches, one sample (IDN10-01) was detected for motor oil-range organics at 89 mg/kg but below the screening level of 100 mg/kg. The interior and perimeter roadways had several detections (see Table F-6, Appendix F) of motor oil-range organics, with two samples exceeding the screening level. The maximum concentration occurred in composite sample RI-10-0/0.5CompA at 400 mg/kg.

Subsurface Soil

Since no significant release of TPH has been reported at the Plant Site, subsurface impacts are not expected. Vertical profiling to depth (about 5 feet bgs) indicates TPH impacts are limited to surface soils. Only one detection of the motor oil-range organics was reported (in subsurface soil sample IDN10-01), at a concentration of 54 mg/kg (below the comparable screening level of 100 mg/kg).

4.3.9 Asbestos

ACM was present as insulation material on certain plant piping and tanks. Formerly, building demolition waste containing asbestos was placed in the J2 Landfill. The Northern Storage Area was identified in previous investigations as containing a waste pile with potential ACM. Visual inspection of the Northern Storage Area has not located the referenced ACM. There is no exposure potential to ACM within the J2 Landfill since the waste is covered with several feet of soil. As noted in Section 1.3.4.5, an asbestos abatement was conducted in the cable tunnel.

4.3.10 Polychlorinated Dibenzodioxins and Dibenzofurans

The S-17 Landfill (LOU 22) is believed to be an area where wooden pallets were stacked and possibly burned (Table 3-2). Because polychlorinated dibenzodioxins and dibenzofurans are naturally produced from the incomplete combustion of organic material, they have been listed a SRC for the S-17 Landfill. Investigation of this class of chemicals has not been conducted at the S-17 Landfill. It should be noted that while the TRECO investigation reported detectable concentrations they were below risk levels (MWH 2005).

Source Area

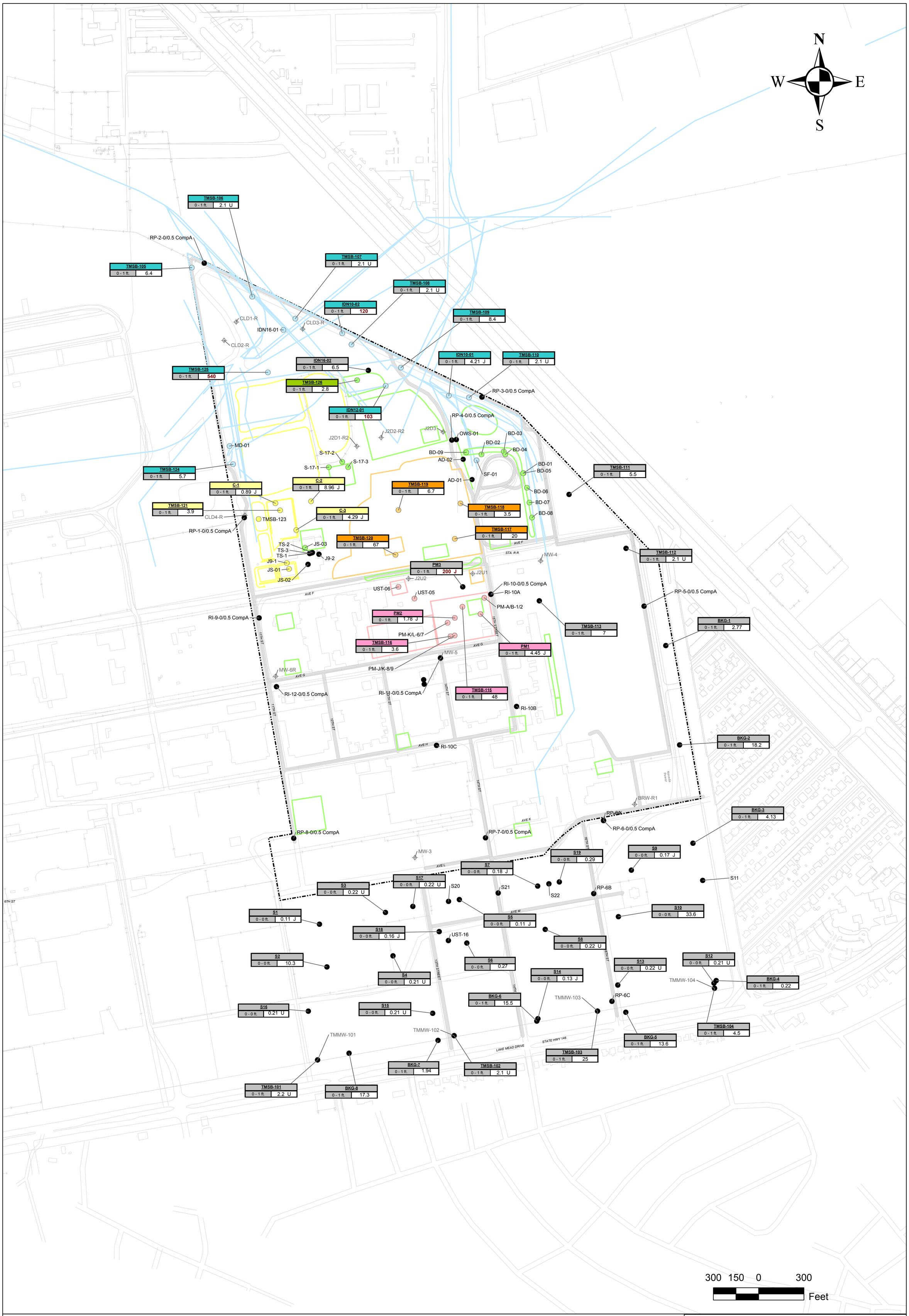
- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-1
SAMPLE LOCATIONS

TIMET

C:\TIMET\CSM-RI\mxd\sample_locations.mxd 04/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR NITRATE IS 102 MG/KG

NOTE: Source for TIMET SSL is BRC/TIMET background data.

TMSB-125	
0 - 1 ft.	540

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
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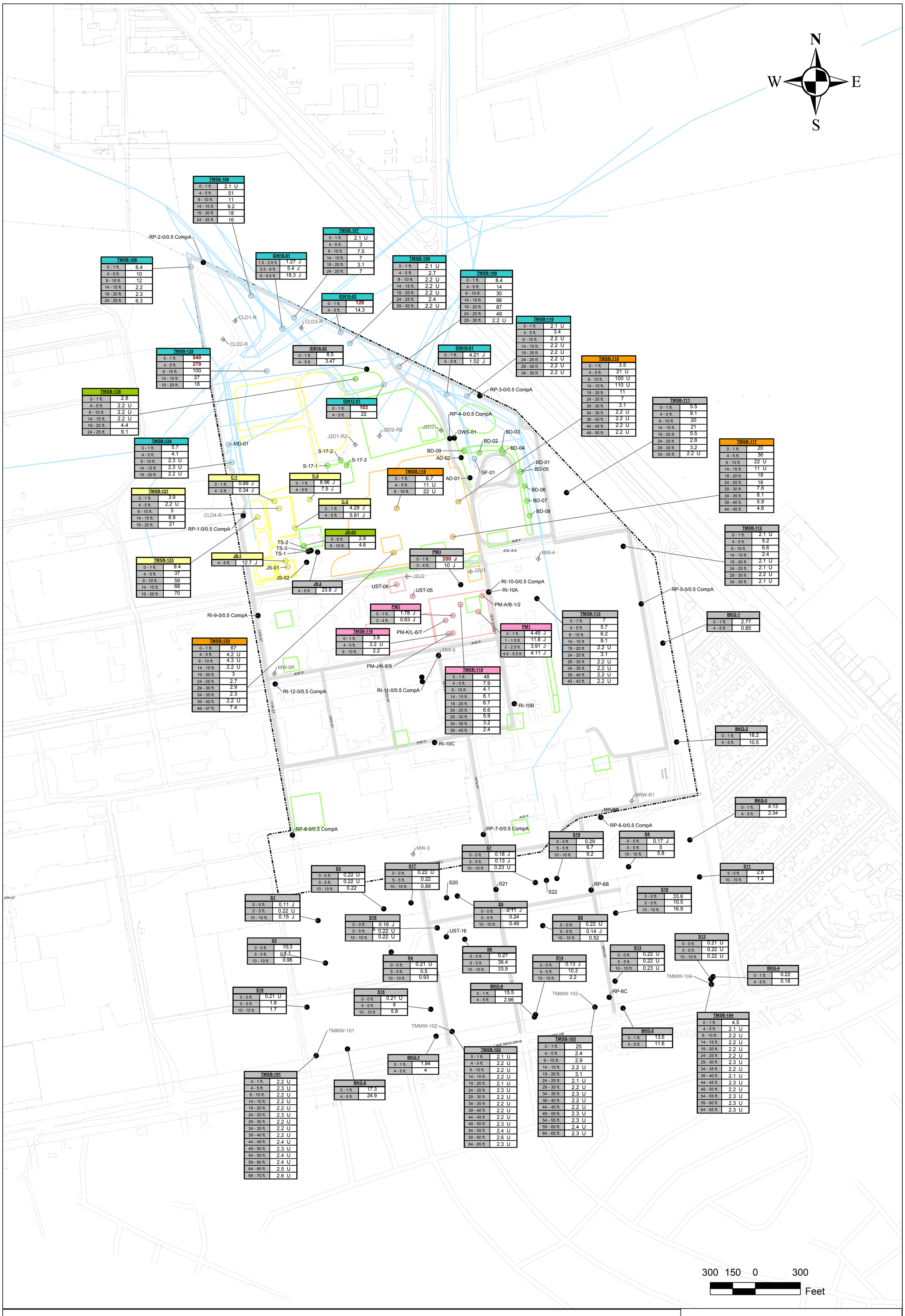
Henderson, Nevada

FIGURE 4-2
DISTRIBUTION OF NITRATE IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_NITRATE_shallow.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR NITRATE IS 102 MG/KG

NOTE: Source for TIMET SSL is BRC/TIMET background data.

IDN12-01	
0 - 1 ft.	103
4 - 5 ft.	22

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
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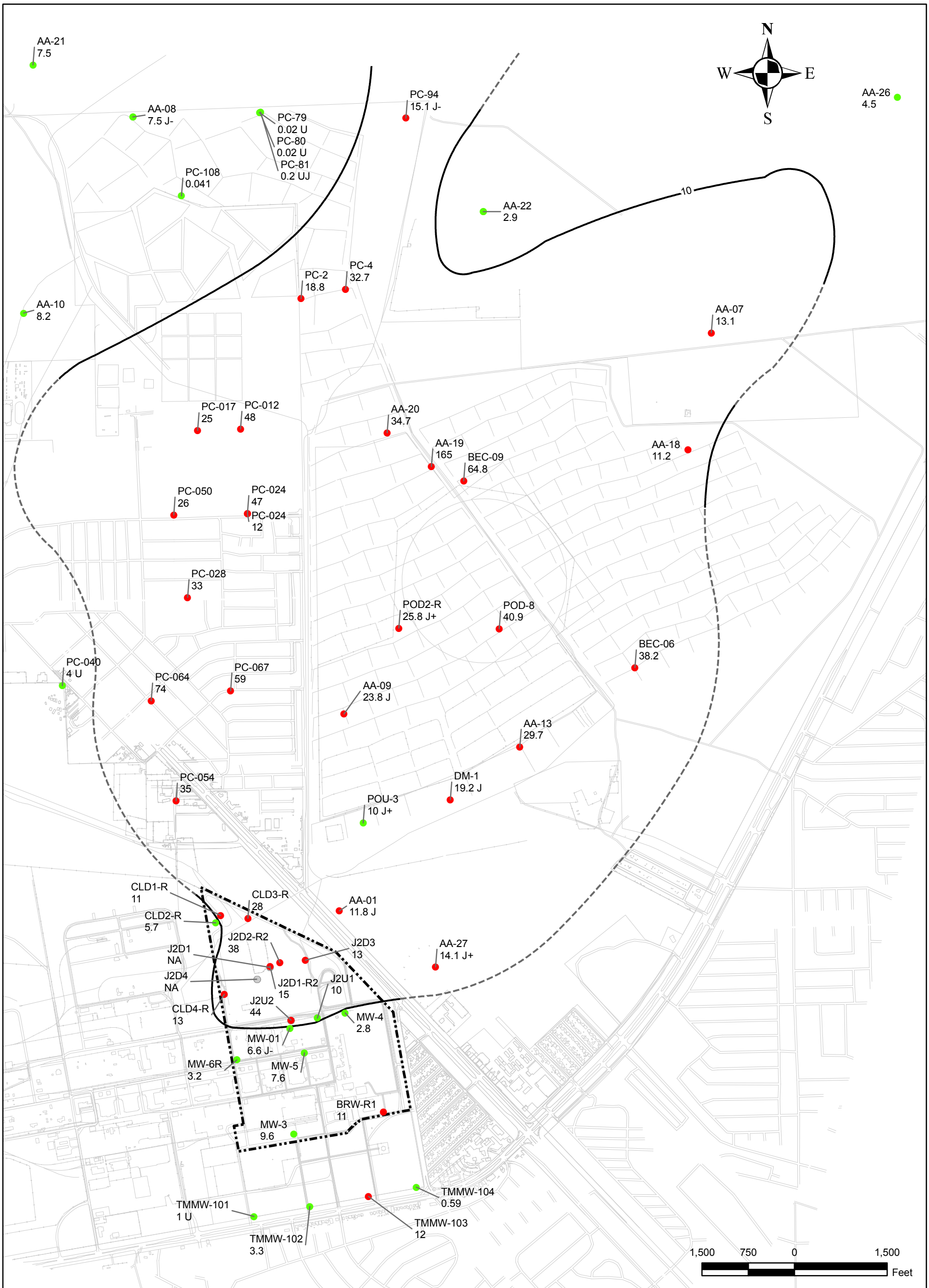
Henderson, Nevada

FIGURE 4-3
DISTRIBUTION OF NITRATE IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_NITRATE_subsurface.mxd 02/05/07 michelle.handley MO



MW-4 2.8 — MONITORING WELL WITH NITRATE AS NITROGEN CONCENTRATION (mg/L)

BRW-R1 11 — MONITORING WELL WITH NITRATE AS NITROGEN CONCENTRATION EXCEEDING SCREENING LEVEL

J2D1 NA — WELL NOT ANALYZED

mg/L — MILLIGRAM PER LITER

10 — NITRATE AS NITROGEN CONTOUR (mg/L)

APPROXIMATE CONTOUR LOCATION

NOTES:
1. The screening level used for nitrate is the EPA National Drinking Water Standard Maximum Contaminant Level (MCL). The MCL for nitrate is 10 mg/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
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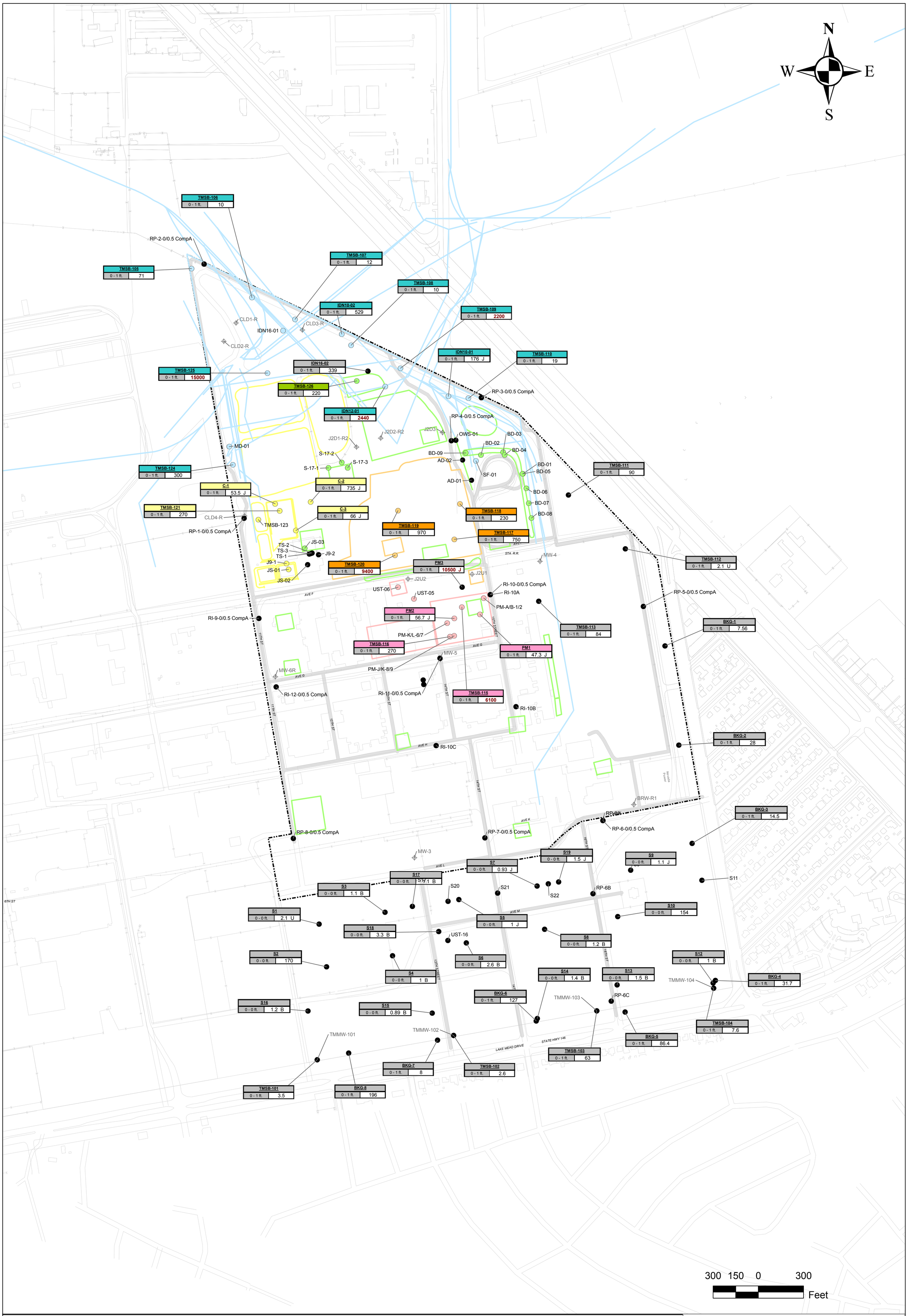
Henderson, Nevada

FIGURE 4-4
NITRATE AS NITROGEN IN GROUNDWATER SPRING 2006

TIMET

2007-01-05 :\TIMET\CSM-R\MXD\TIMET_siteN.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR CHLORIDE IS 1110 MG/KG

NOTE: Source for TIMET SSL is BRC/TIMET background data.

IDN12-01	
0 - 1 ft.	2440

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

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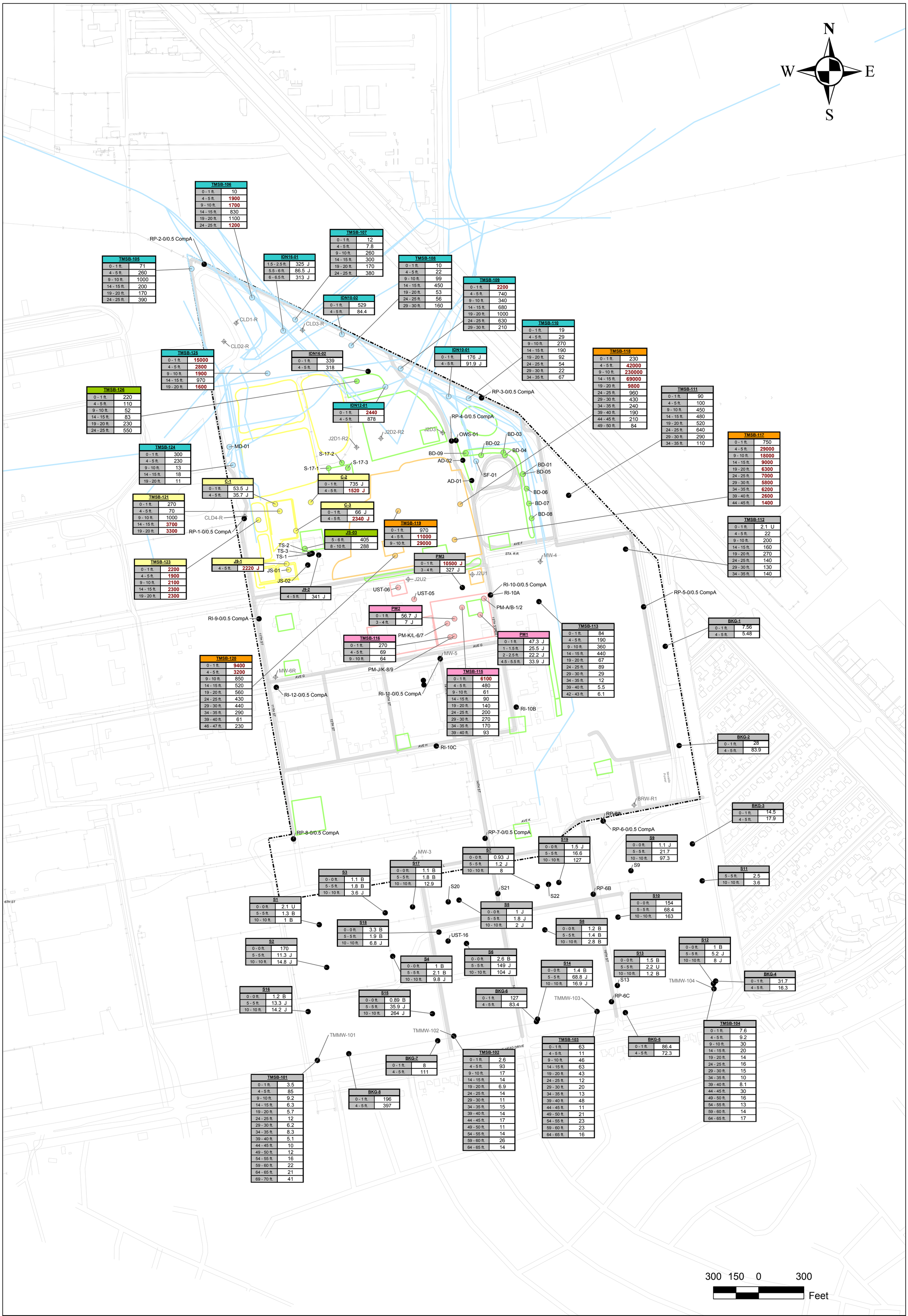
Henderson, Nevada

FIGURE 4-5
DISTRIBUTION OF CHLORIDE IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_CHLORIDE_shallow.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR CHLORIDE IS 1110 MG/KG

NOTE: Source for TIMET SSL is BRC/TIMET background data.

IDN12-01	
0 - 1 ft.	**2440**
4 - 5 ft.	878

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
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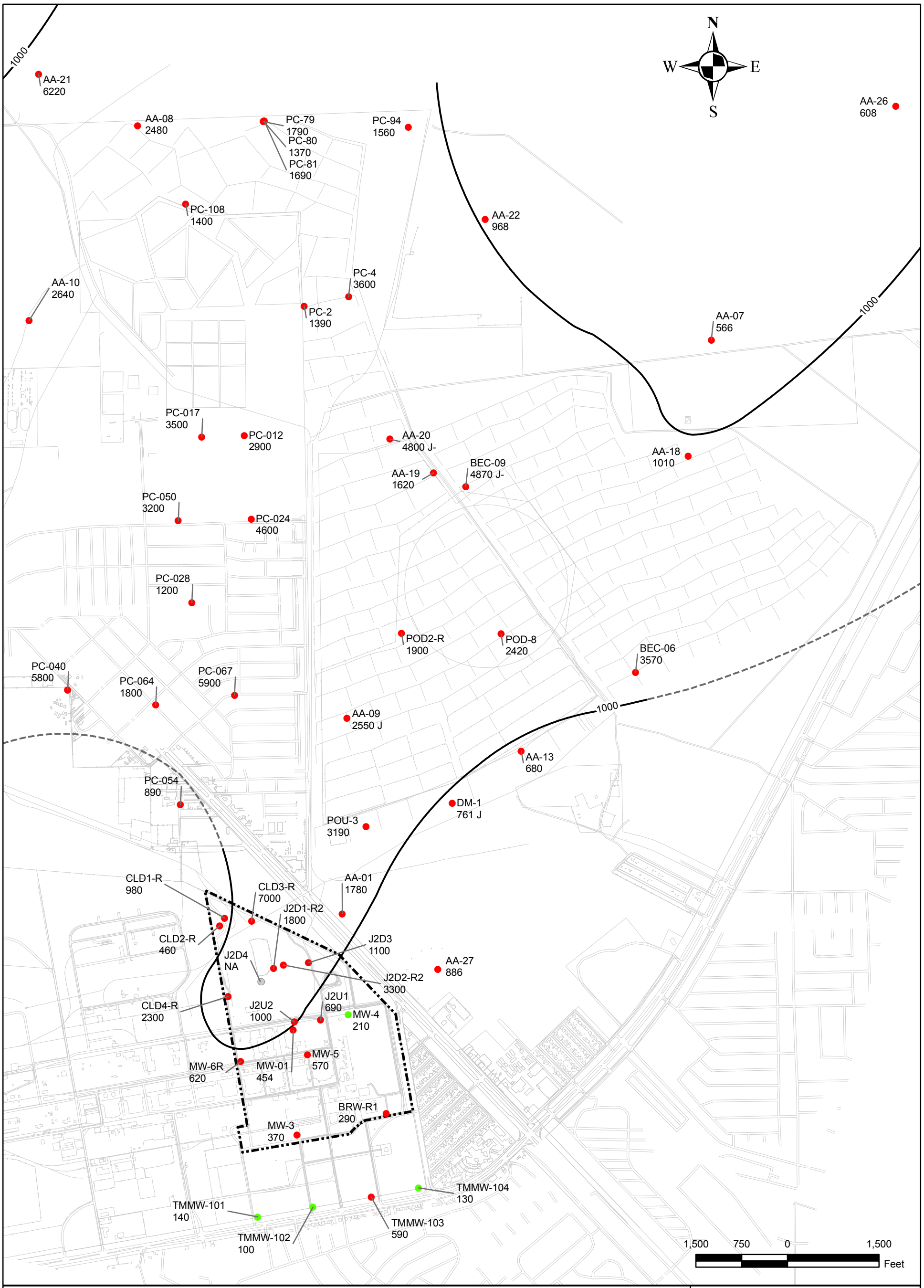
Henderson, Nevada

FIGURE 4-6
DISTRIBUTION OF CHLORIDE IN SUBSURFACE SOIL

TIMET

C:\TIMET\GSM-RI\mxd\SOIL_CHLORIDE_subsurface.mxd 02/05/07 michelle.handley MO



MW-4 210	MONITORING WELL WITH CHLORIDE CONCENTRATION (mg/L)
MW-3 370	MONITORING WELL WITH CHLORIDE CONCENTRATION EXCEEDING SCREENING LEVEL
J2D1 NA	WELL NOT ANALYZED
mg/L	MILLIGRAM PER LITER

1000 CHLORIDE CONTOUR (mg/L)

APPROXIMATE CONTOUR LOCATION

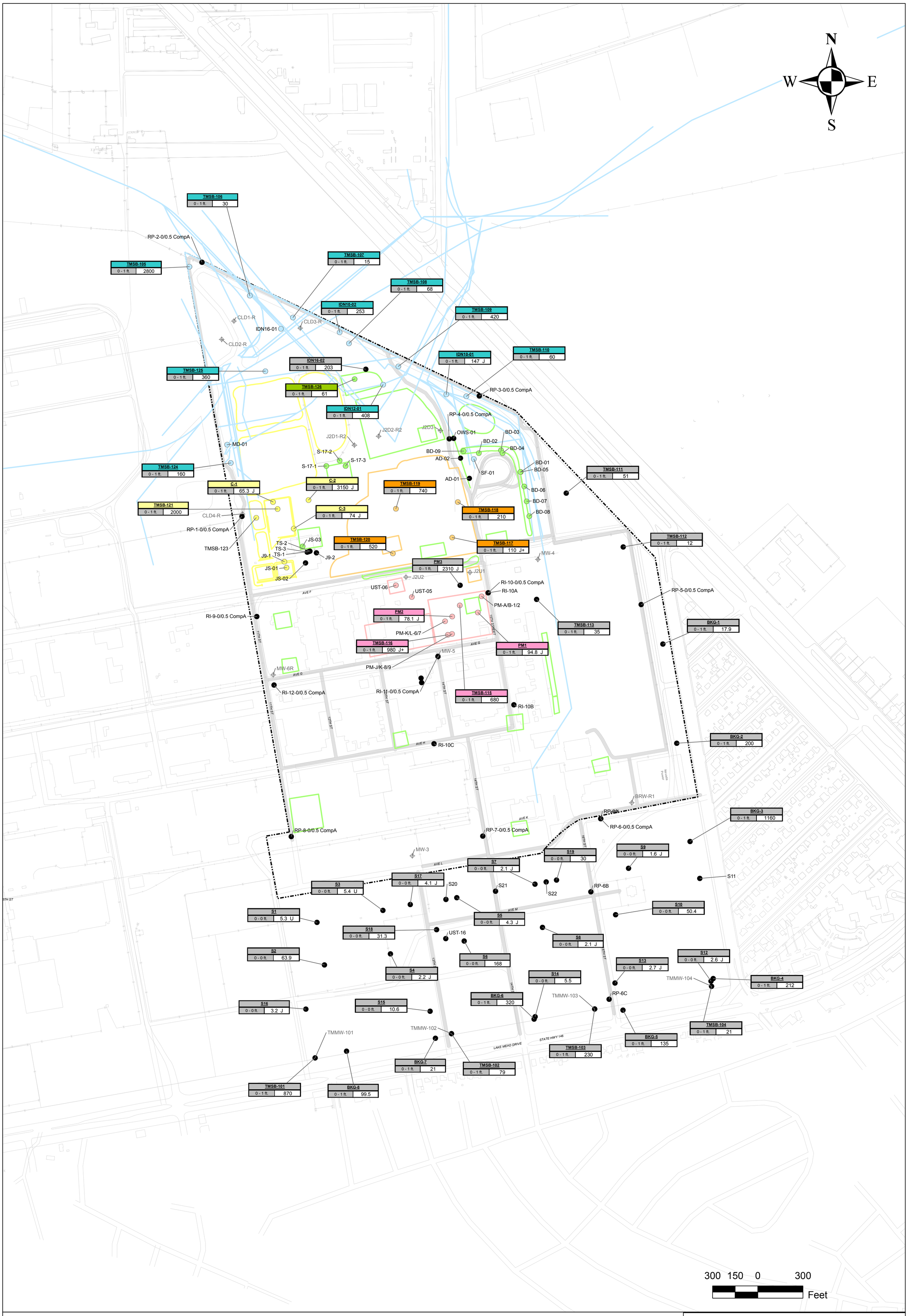
NOTES:
1. The screening level used for chloride is the EPA National Secondary Drinking Water Standard. The standard for chloride is 250 mg/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-7
CHLORIDE IN GROUNDWATER
SPRING 2006

TIMET

2007-02-12 :\TIMET\CSM-R1\MXD\TIMET_siteCHLORIDE.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR SULFATE IS 4130 MG/KG

NOTE: Source for TIMET SSL is BRC/TIMET background data.

TMSB-125
0 - 1 ft. 360

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

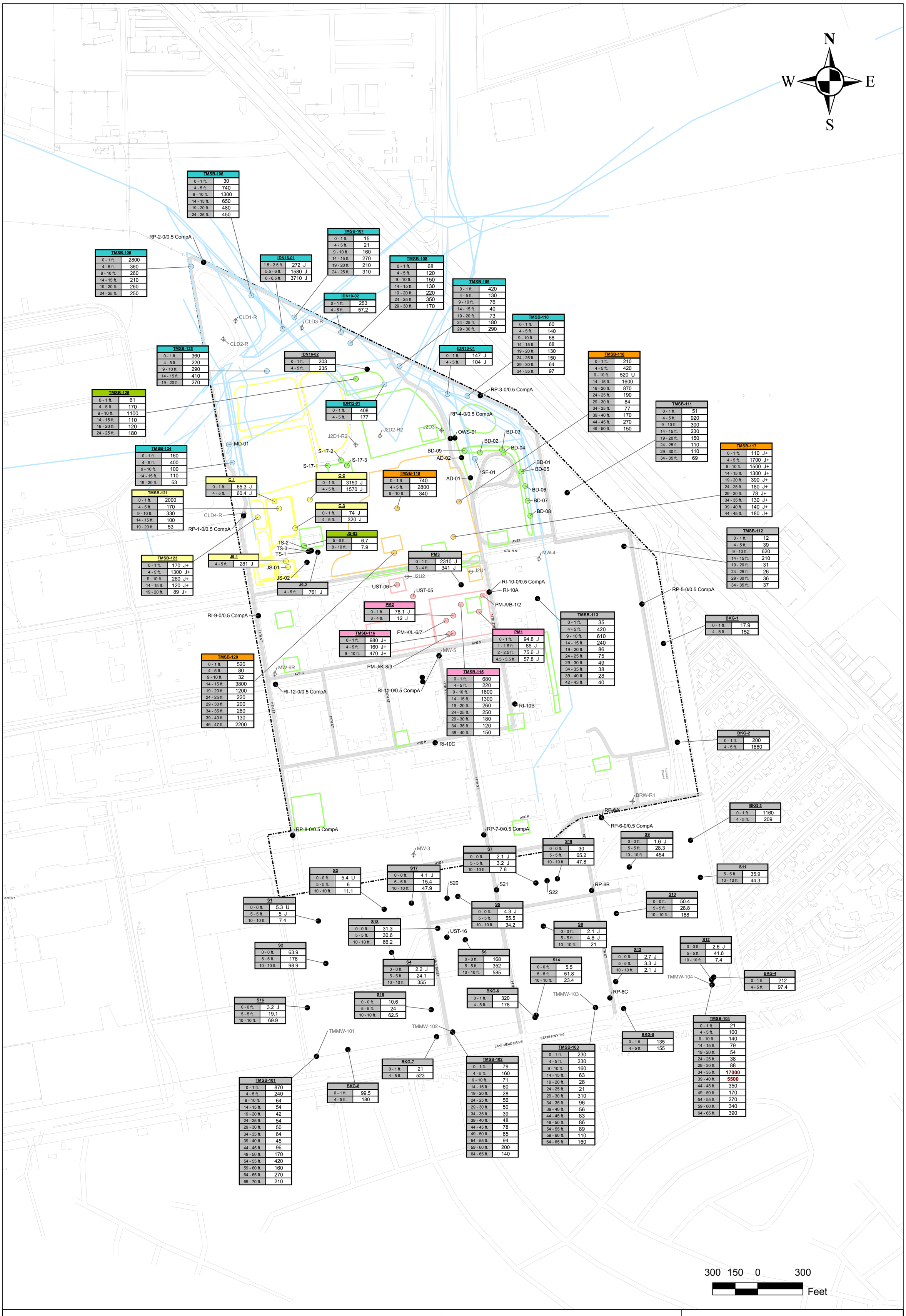
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-8
DISTRIBUTION OF SULFATE IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_SULFATEbig.mxd 02/05/07 michelle.handley MO



TMSB-106	
0 - 1 ft.	30
4 - 5 ft.	740
9 - 10 ft.	1300
14 - 15 ft.	650
19 - 20 ft.	480
24 - 25 ft.	450

TMSB-105	
0 - 1 ft.	2800
4 - 5 ft.	360
9 - 10 ft.	260
14 - 15 ft.	210
19 - 20 ft.	260
24 - 25 ft.	250

IDN16-01	
1.5 - 2.5 ft.	272 J
5.5 - 6 ft.	1580 J
6 - 6.5 ft.	3710 J

TMSB-107	
0 - 1 ft.	15
4 - 5 ft.	21
9 - 10 ft.	160
14 - 15 ft.	270
19 - 20 ft.	210
24 - 25 ft.	310

TMSB-108	
0 - 1 ft.	68
4 - 5 ft.	120
9 - 10 ft.	150
14 - 15 ft.	130
19 - 20 ft.	220
24 - 25 ft.	350
29 - 30 ft.	170

IDN10-02	
0 - 1 ft.	253
4 - 5 ft.	57.2

TMSB-109	
0 - 1 ft.	420
4 - 5 ft.	130
9 - 10 ft.	76
14 - 15 ft.	40
19 - 20 ft.	73
24 - 25 ft.	180
29 - 30 ft.	290

TMSB-110	
0 - 1 ft.	60
4 - 5 ft.	140
9 - 10 ft.	68
14 - 15 ft.	68
19 - 20 ft.	130
24 - 25 ft.	150
29 - 30 ft.	64
34 - 35 ft.	97

TMSB-125	
0 - 1 ft.	360
4 - 5 ft.	220
9 - 10 ft.	290
14 - 15 ft.	410
19 - 20 ft.	270

IDN16-02	
0 - 1 ft.	203
4 - 5 ft.	235

IDN10-01	
0 - 1 ft.	147 J
4 - 5 ft.	104 J

TMSB-118	
0 - 1 ft.	210
4 - 5 ft.	420
9 - 10 ft.	520 U
14 - 15 ft.	1600
19 - 20 ft.	870
24 - 25 ft.	190
29 - 30 ft.	84
34 - 35 ft.	77
39 - 40 ft.	170
44 - 45 ft.	270
49 - 50 ft.	150

TMSB-126	
0 - 1 ft.	61
4 - 5 ft.	170
9 - 10 ft.	1100
14 - 15 ft.	110
19 - 20 ft.	120
24 - 25 ft.	180

IDN12-01	
0 - 1 ft.	408
4 - 5 ft.	177

TMSB-111	
0 - 1 ft.	51
4 - 5 ft.	920
9 - 10 ft.	300
14 - 15 ft.	230
19 - 20 ft.	150
24 - 25 ft.	110
29 - 30 ft.	110
34 - 35 ft.	69

TMSB-124	
0 - 1 ft.	160
4 - 5 ft.	400
9 - 10 ft.	100
14 - 15 ft.	110
19 - 20 ft.	53

TMSB-117	
0 - 1 ft.	110 J+
4 - 5 ft.	1700 J+
9 - 10 ft.	1500 J+
14 - 15 ft.	1300 J+
19 - 20 ft.	390 J+
24 - 25 ft.	180 J+
29 - 30 ft.	78 J+
34 - 35 ft.	130 J+
39 - 40 ft.	140 J+
44 - 45 ft.	180 J+

C-1	
0 - 1 ft.	65.3 J
4 - 5 ft.	60.4 J

C-2	
0 - 1 ft.	3150 J
4 - 5 ft.	1570 J

TMSB-119	
0 - 1 ft.	740
4 - 5 ft.	2800
9 - 10 ft.	340

TMSB-121	
0 - 1 ft.	2000
4 - 5 ft.	170
9 - 10 ft.	330
14 - 15 ft.	100
19 - 20 ft.	53

C-3	
0 - 1 ft.	74 J
4 - 5 ft.	320 J

JS-03	
5 - 6 ft.	6.7
8 - 10 ft.	7.9

TMSB-112	
0 - 1 ft.	12
4 - 5 ft.	39
9 - 10 ft.	620
14 - 15 ft.	210
19 - 20 ft.	31
24 - 25 ft.	26
29 - 30 ft.	36
34 - 35 ft.	37

TMSB-123	
0 - 1 ft.	170 J+
4 - 5 ft.	1300 J+
9 - 10 ft.	260 J+
14 - 15 ft.	120 J+
19 - 20 ft.	89 J+

J9-1	
4 - 5 ft.	281 J

PM3	
0 - 1 ft.	2310 J
3 - 4 ft.	341 J

J9-2	
4 - 5 ft.	761 J

PM2	
0 - 1 ft.	78.1 J
3 - 4 ft.	12 J

TMSB-113	
0 - 1 ft.	35
4 - 5 ft.	420
9 - 10 ft.	610
14 - 15 ft.	240
19 - 20 ft.	86
24 - 25 ft.	75
29 - 30 ft.	49
34 - 35 ft.	38
39 - 40 ft.	28
42 - 43 ft.	40

BKG-1	
0 - 1 ft.	17.9
4 - 5 ft.	152

TMSB-116	
0 - 1 ft.	980 J+
4 - 5 ft.	160 J+
9 - 10 ft.	470 J+

PM1	
0 - 1 ft.	94.8 J
1 - 1.5 ft.	86 J
2 - 2.5 ft.	75.6 J
4.5 - 5.5 ft.	57.8 J

TMSB-120	
0 - 1 ft.	520
4 - 5 ft.	80
9 - 10 ft.	32
14 - 15 ft.	3800
19 - 20 ft.	1200
24 - 25 ft.	220
29 - 30 ft.	200
34 - 35 ft.	280
39 - 40 ft.	130
46 - 47 ft.	2200

TMSB-115	
0 - 1 ft.	680
4 - 5 ft.	220
9 - 10 ft.	1600
14 - 15 ft.	1300
19 - 20 ft.	260
24 - 25 ft.	250
29 - 30 ft.	180
34 - 35 ft.	120
39 - 40 ft.	150

BKG-2	
0 - 1 ft.	200
4 - 5 ft.	1880

BKG-3	
0 - 1 ft.	1160
4 - 5 ft.	209

S9	
0 - 0 ft.	1.6 J
5 - 5 ft.	28.3
10 - 10 ft.	454

S19	
0 - 0 ft.	30
5 - 5 ft.	65.2
10 - 10 ft.	47.8

S7	
0 - 0 ft.	2.1 J
5 - 5 ft.	3.2 J
10 - 10 ft.	7.6

S17	
0 - 0 ft.	4.1 J
5 - 5 ft.	15.4
10 - 10 ft.	47.9

S3	
0 - 0 ft.	5.4 U
5 - 5 ft.	6
10 - 10 ft.	11.1

S11	
5 - 5 ft.	35.9
10 - 10 ft.	44.3

S1	
0 - 0 ft.	5.3 U
5 - 5 ft.	5 J
10 - 10 ft.	7.4

S5	
0 - 0 ft.	4.3 J
5 - 5 ft.	55.5
10 - 10 ft.	34.2

S10	
0 - 0 ft.	50.4
5 - 5 ft.	28.8
10 - 10 ft.	188

S18	
0 - 0 ft.	31.3
5 - 5 ft.	30.6
10 - 10 ft.	66.2

S8	
0 - 0 ft.	2.1 J
5 - 5 ft.	4.8 J
10 - 10 ft.	21

S2	
0 - 0 ft.	63.9
5 - 5 ft.	176
10 - 10 ft.	98.9

S6	
0 - 0 ft.	168
5 - 5 ft.	352
10 - 10 ft.	585

S13	
0 - 0 ft.	2.7 J
5 - 5 ft.	3.3 J
10 - 10 ft.	2.1 J

S12	
0 - 0 ft.	2.6 J
5 - 5 ft.	41.6
10 - 10 ft.	7.4

S4	
0 - 0 ft.	2.2 J
5 - 5 ft.	24.1
10 - 10 ft.	355

S14	
0 - 0 ft.	5.5
5 - 5 ft.	51.8
10 - 10 ft.	23.4

BKG-4	
0 - 1 ft.	212
4 - 5 ft.	97.4

BKG-6	
0 - 1 ft.	320
4 - 5 ft.	178

S15	
0 - 0 ft.	10.6
5 - 5 ft.	24
10 - 10 ft.	62.5

S16	
0 - 0 ft.	3.2 J
5 - 5 ft.	19.1
10 - 10 ft.	69.9

BKG-5	
0 - 1 ft.	135
4 - 5 ft.	155

TMSB-104	
0 - 1 ft.	21
4 - 5 ft.	100
9 - 10 ft.	140
14 - 15 ft.	79
19 - 20 ft.	54
24 - 25 ft.	38
29 - 30 ft.	88
34 - 35 ft.	**17000**
39 - 40 ft.	**5500**
44 - 45 ft.	350
49 - 50 ft.	170
54 - 55 ft.	270
59 - 60 ft.	340
64 - 65 ft.	390

BKG-7	
0 - 1 ft.	21
4 - 5 ft.	523

TMSB-102	
0 - 1 ft.	79
4 - 5 ft.	160
9 - 10 ft.	71
14 - 15 ft.	60
19 - 20 ft.	28
24 - 25 ft.	56
29 - 30 ft.	50
34 - 35 ft.	39
39 - 40 ft.	48
44 - 45 ft.	78
49 - 50 ft.	85
54 - 55 ft.	94
59 - 60 ft.	200
64 - 65 ft.	140

TMSB-103	
0 - 1 ft.	230
4 - 5 ft.	230
9 - 10 ft.	160
14 - 15 ft.	63
19 - 20 ft.	28
24 - 25 ft.	21
29 - 30 ft.	310
34 - 35 ft.	96
39 - 40 ft.	56
44 - 45 ft.	83
49 - 50 ft.	86
54 - 55 ft.	89
59 - 60 ft.	110
64 - 65 ft.	160

BKG-8	
0 - 1 ft.	99.5
4 - 5 ft.	180

TMSB-101	
0 - 1 ft.	870
4 - 5 ft.	240
9 - 10 ft.	64
14 - 15 ft.	54
19 - 20 ft.	42
24 - 25 ft.	54
29 - 30 ft.	50
34 - 35 ft.	64
39 - 40 ft.	45
44 - 45 ft.	96
49 - 50 ft.	170
54 - 55 ft.	420
59 - 60 ft.	160
64 - 65 ft.	270
69 - 70 ft.	210

BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR SULFATE IS 4130 MG/KG

NOTE: Source for TIMET SSL is BRC/TIMET background data.

TMSB-104	
0 - 1 ft.	21
4 - 5 ft.	100
9 - 10 ft.	140
14 - 15 ft.	79
19 - 20 ft.	54
24 - 25 ft.	38
29 - 30 ft.	88
34 - 35 ft.	**17000**
39 - 40 ft.	**5500**
44 - 45 ft.	350
49 - 50 ft.	170
54 - 55 ft.	270
59 - 60 ft.	340
64 - 65 ft.	390

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

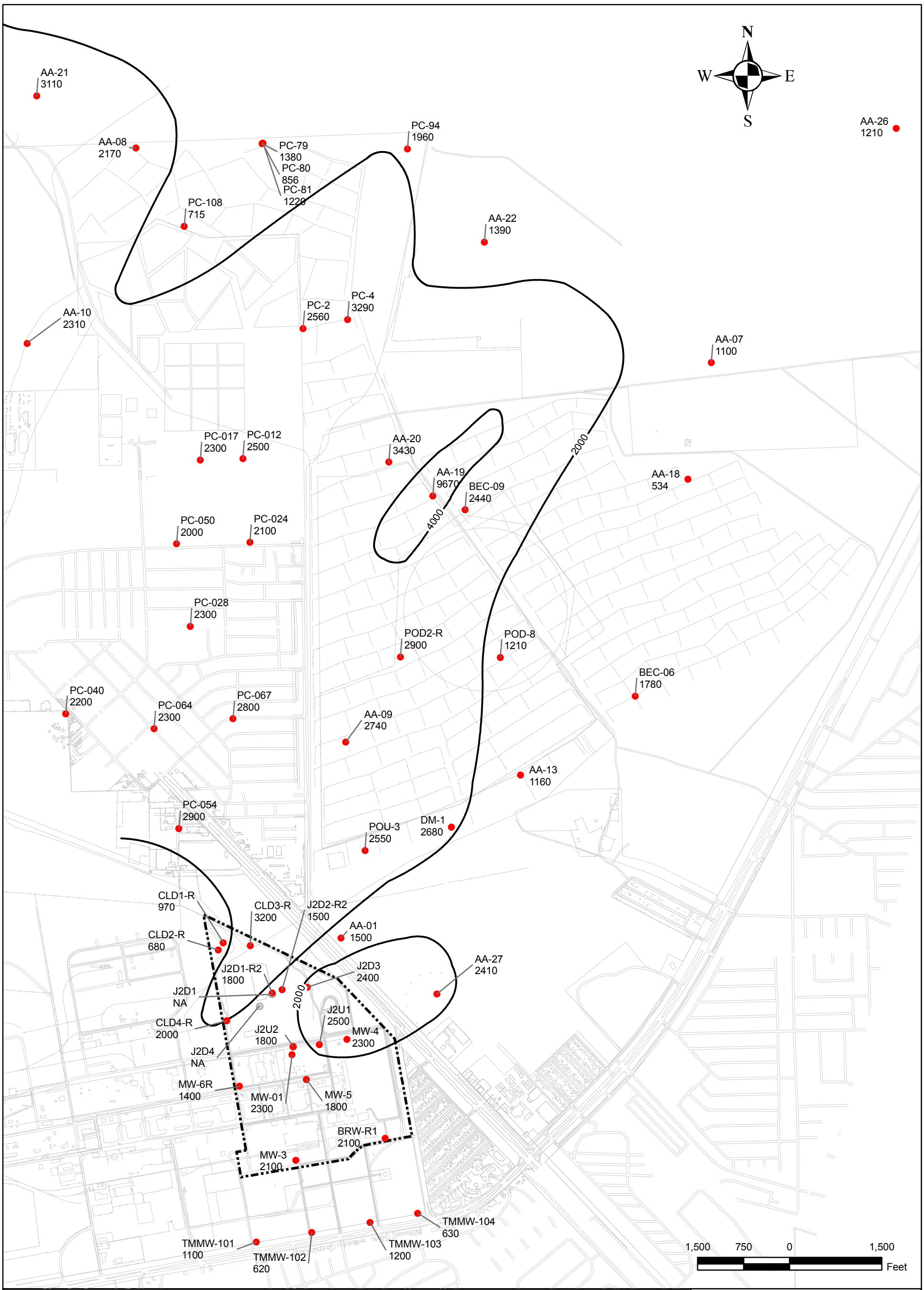
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-9
DISTRIBUTION OF SULFATE IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_SULFATEbig.mxd 02/05/07 michelle.handley MO



CLD2-R 680 — MONITORING WELL WITH SULFATE CONCENTRATION (mg/L) EXCEEDING SCREENING LEVEL

J2D1 NA — WELL NOT ANALYZED

mg/L — MILLIGRAM PER LITER

1000 — SULFATE CONTOUR (mg/L)

APPROXIMATE CONTOUR LOCATION

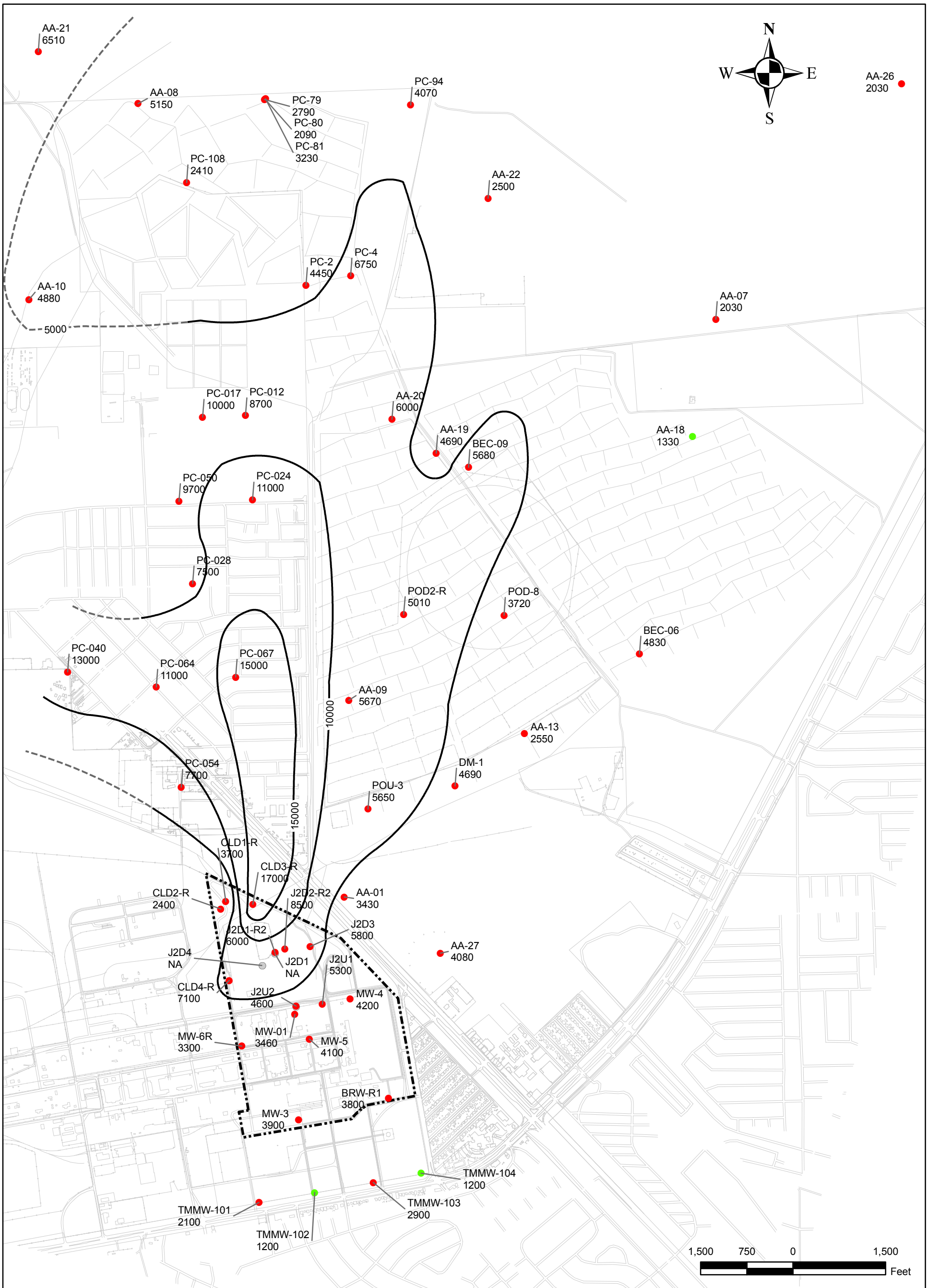
NOTES:
1. The screening level used for sulfate is the EPA National Secondary Drinking Water Standard. The standard for sulfate is 250 mg/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-10
SULFATE IN GROUNDWATER
SPRING 2006

TIMET

2007-02-12 :\TIMET\CSM-RI\MXD\TIMET_sites.mxd TTEMI-MO michelle.handley



TMMW-104 1200	MONITORING WELL WITH TOTAL DISSOLVED SOLIDS CONCENTRATION (mg/L)	10000	TOTAL DISSOLVED SOLIDS CONTOUR (mg/L)
BRW-R1 3800	MONITORING WELL WITH TOTAL DISSOLVED SOLIDS CONCENTRATION (mg/L) EXCEEDING SCREENING LEVEL		APPROXIMATE CONTOUR LOCATION
J2D1 NA	WELL NOT ANALYZED		
mg/L	MILLIGRAM PER LITER		

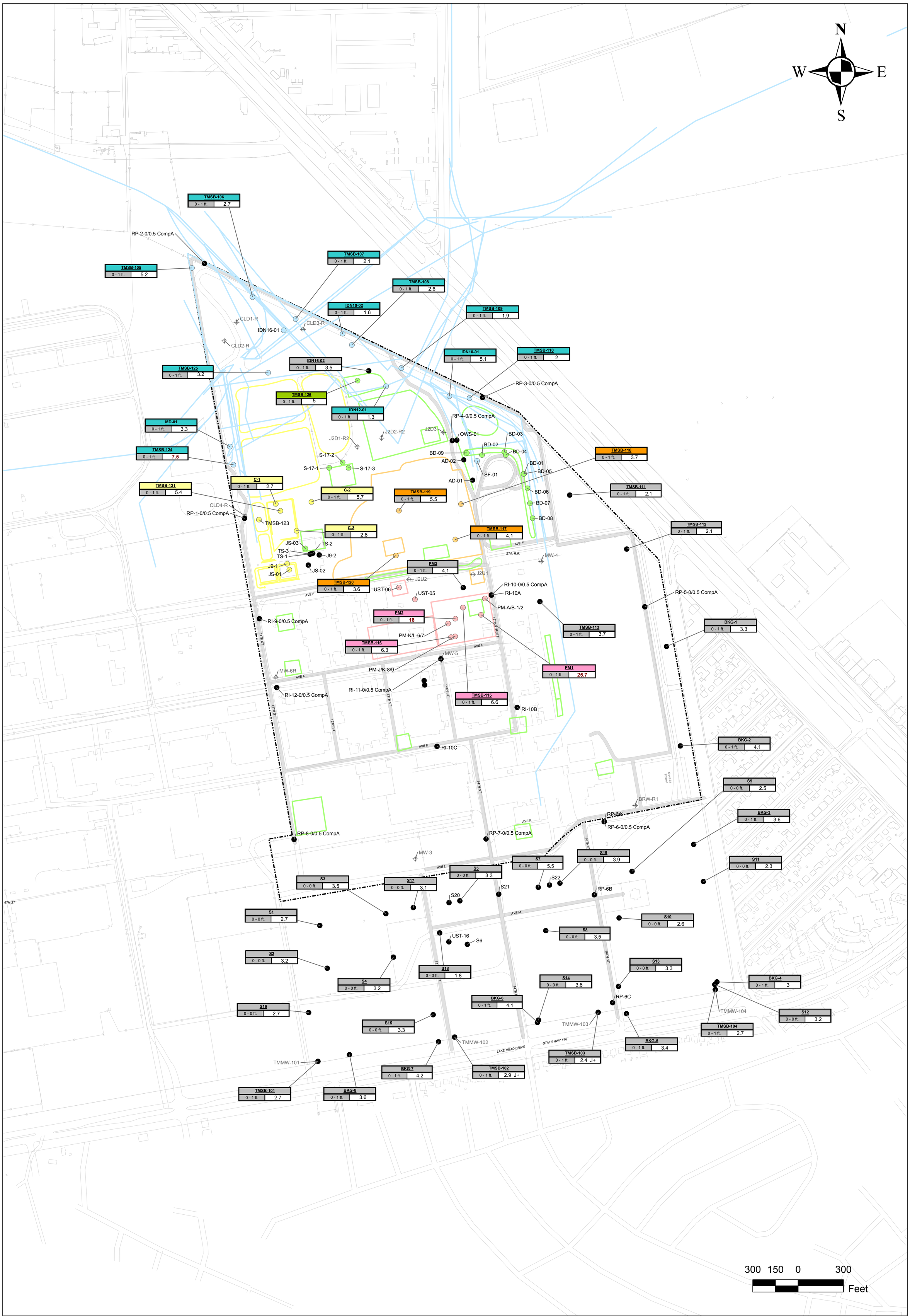
NOTES:
1. The screening level used for total dissolved solids is the State of Nevada Administration Code, Toxic Standards Applicable to Designated Waters. The standard for total dissolved solids is 1,900 mg/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-11
TOTAL DISSOLVED SOLIDS IN GROUNDWATER
SPRING 2006

TIMET

2007-01-05 :\TIMET\CSM-RI\MXD\TIMET_siteTDS.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR ARSENIC IS 7.2 MG/KG

NOTE: Source for TIMET SSL is BRC/TIMET background data.

PM1	
0 - 1 ft.	25.7

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 FOR ARSENIC IS 29 MG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

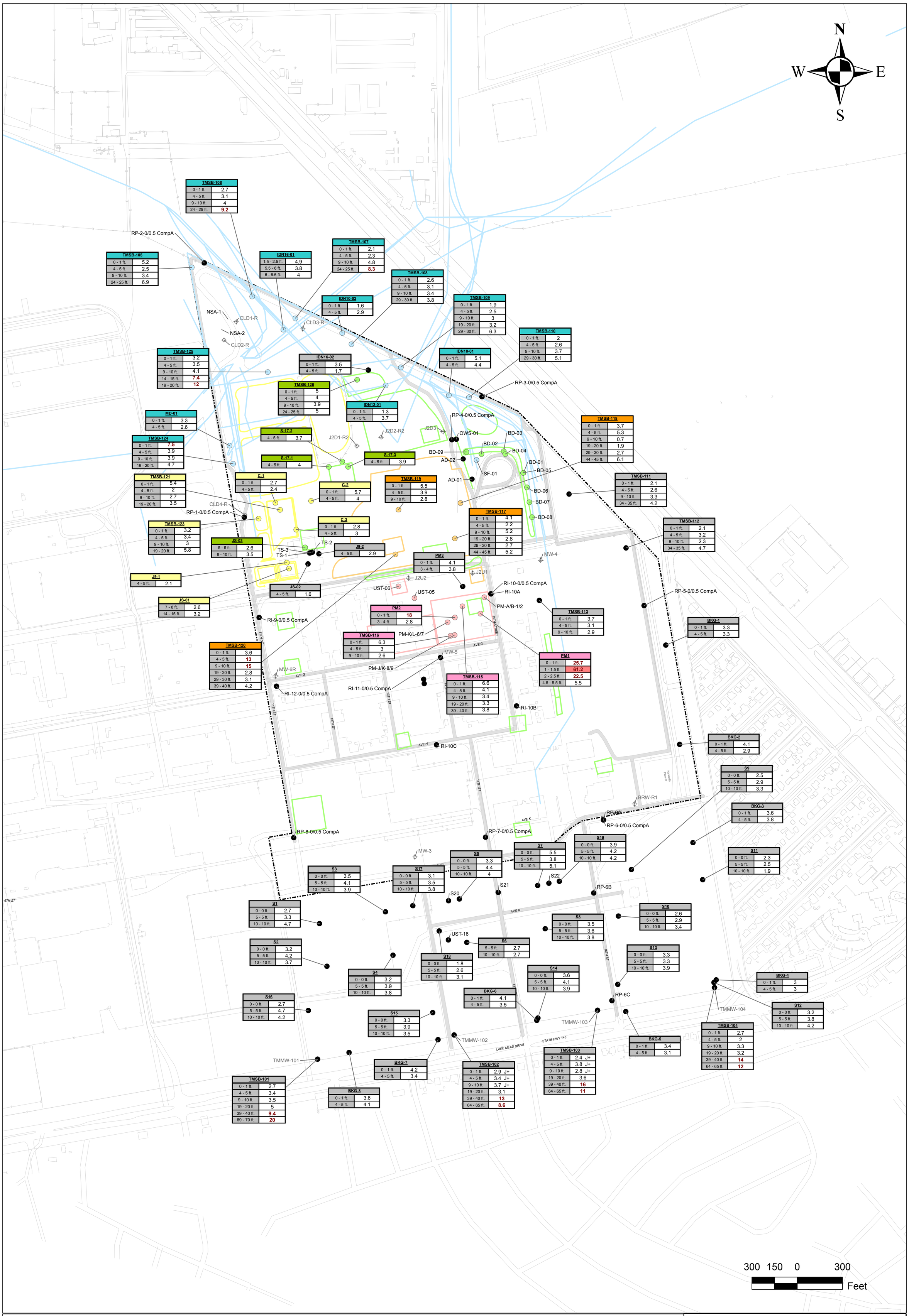
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-12
DISTRIBUTION OF ARSENIC IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_ARSENICbig.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR ARSENIC IS 7.2 MG/KG

NOTE: Source for TIMET SSL is BRC/TIMET background data.

PM1	
0 - 1 ft.	25.7
1 - 1.5 ft.	61.2
2 - 2.5 ft.	22.5
4.5 - 5.5 ft.	5.5

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 FOR ARSENIC IS 29 MG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

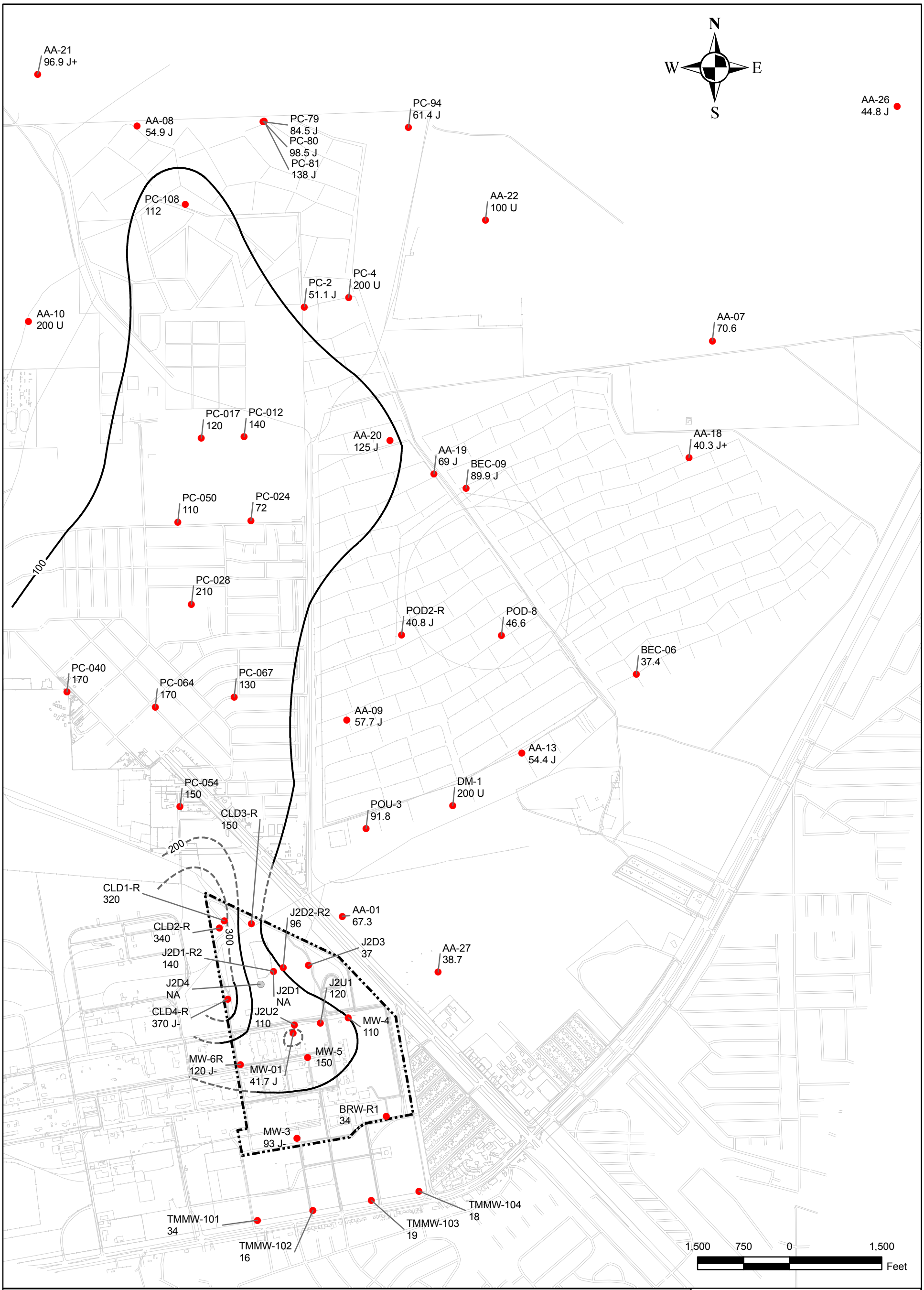
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-13
DISTRIBUTION OF ARSENIC
IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_ARSENIC\big.mxd 02/05/07 michelle.handley MO



MW-3 93 J- ● MONITORING WELL WITH ARSENIC CONCENTRATION EXCEEDING SCREENING LEVEL

J2D1 NA ● WELL NOT ANALYZED

µg/L MICROGRAM PER LITER

100 ARSENIC CONTOUR (µg/L)

APPROXIMATE CONTOUR LOCATION

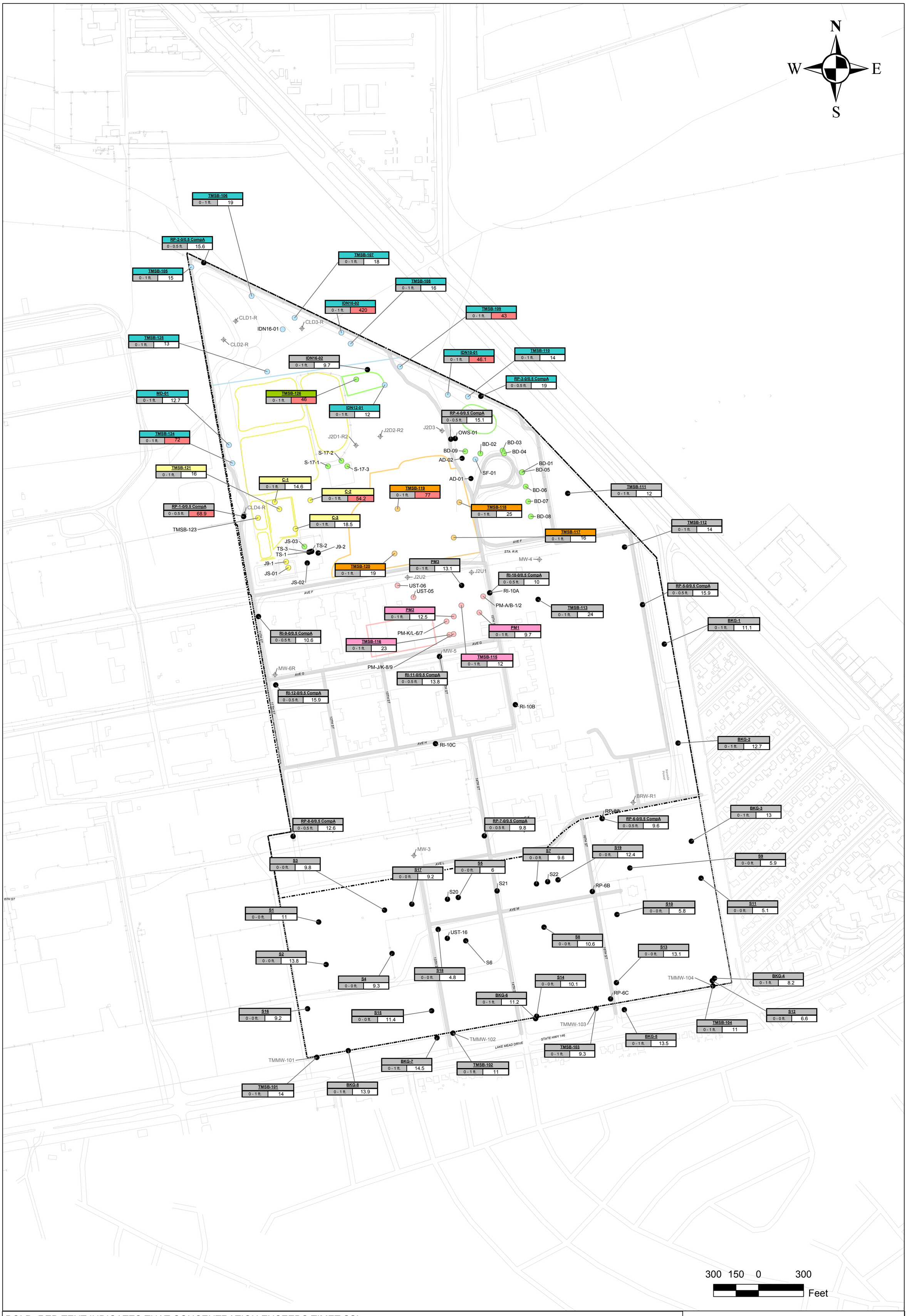
NOTES:
1. The screening level used for arsenic is the EPA National Drinking Water Standard Maximum Contaminant Level (MCL). The MCL for arsenic is 10 µg/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-14
ARSENIC IN GROUNDWATER
SPRING 2006

TIMET

2007-2-12 :\TIMET\CSM-RI\MXD\TIMET_siteAS.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR CHROMIUM IS 450 MG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

IDN10-01	
0 - 1 ft.	46.1

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 FOR CHROMIUM IS 38 MG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

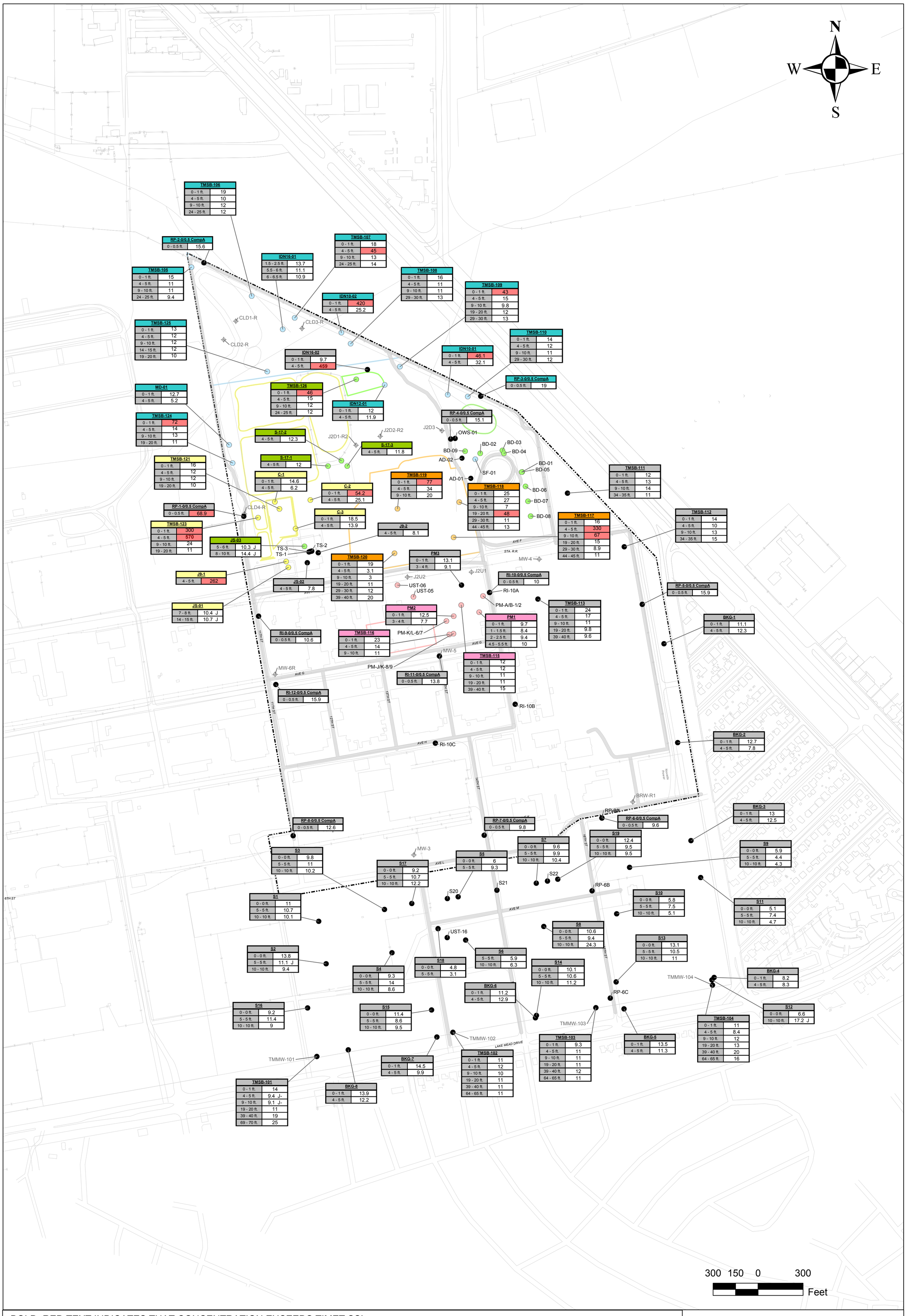
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-15
DISTRIBUTION OF CHROMIUM IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_CHROMIUMbig.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR CHROMIUM IS 450 MG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

IDN16-02	
0 - 1 ft.	9.7
4 - 5 ft.	▲ 459

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 FOR CHROMIUM IS 38 MG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

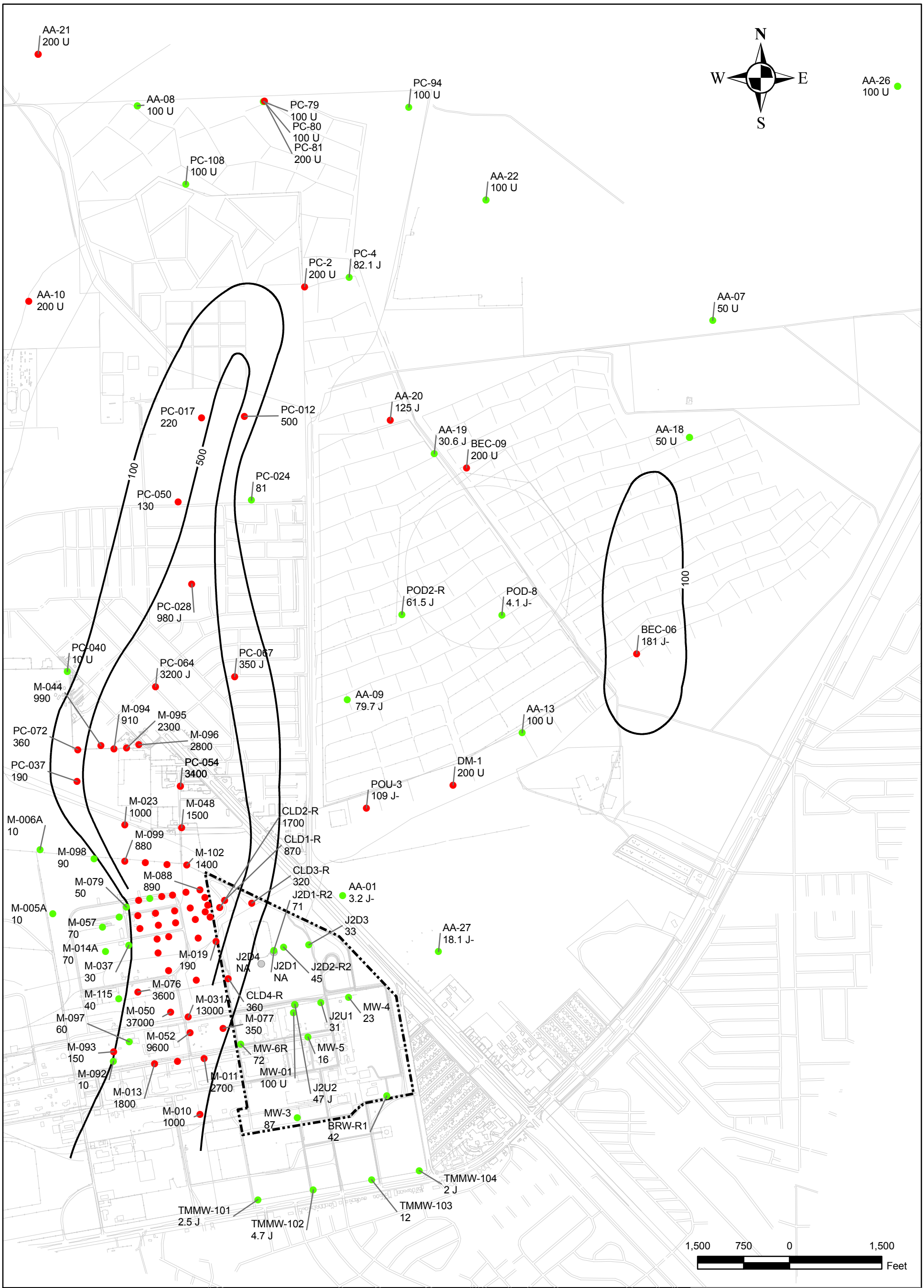
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-16
DISTRIBUTION OF CHROMIUM IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_CHROMIUMbig.mxd 02/05/07 michelle.handley MO



BRW-R1 42 — MONITORING WELL WITH CHROMIUM CONCENTRATION (µg/L)

M-010 1000 — MONITORING WELL WITH CHROMIUM CONCENTRATION EXCEEDING SCREENING LEVEL

J2D1 NA — WELL NOT ANALYZED

µg/L — MICROGRAM PER LITER

100 — CHROMIUM CONTOUR (µg/L)

APPROXIMATE CONTOUR LOCATION

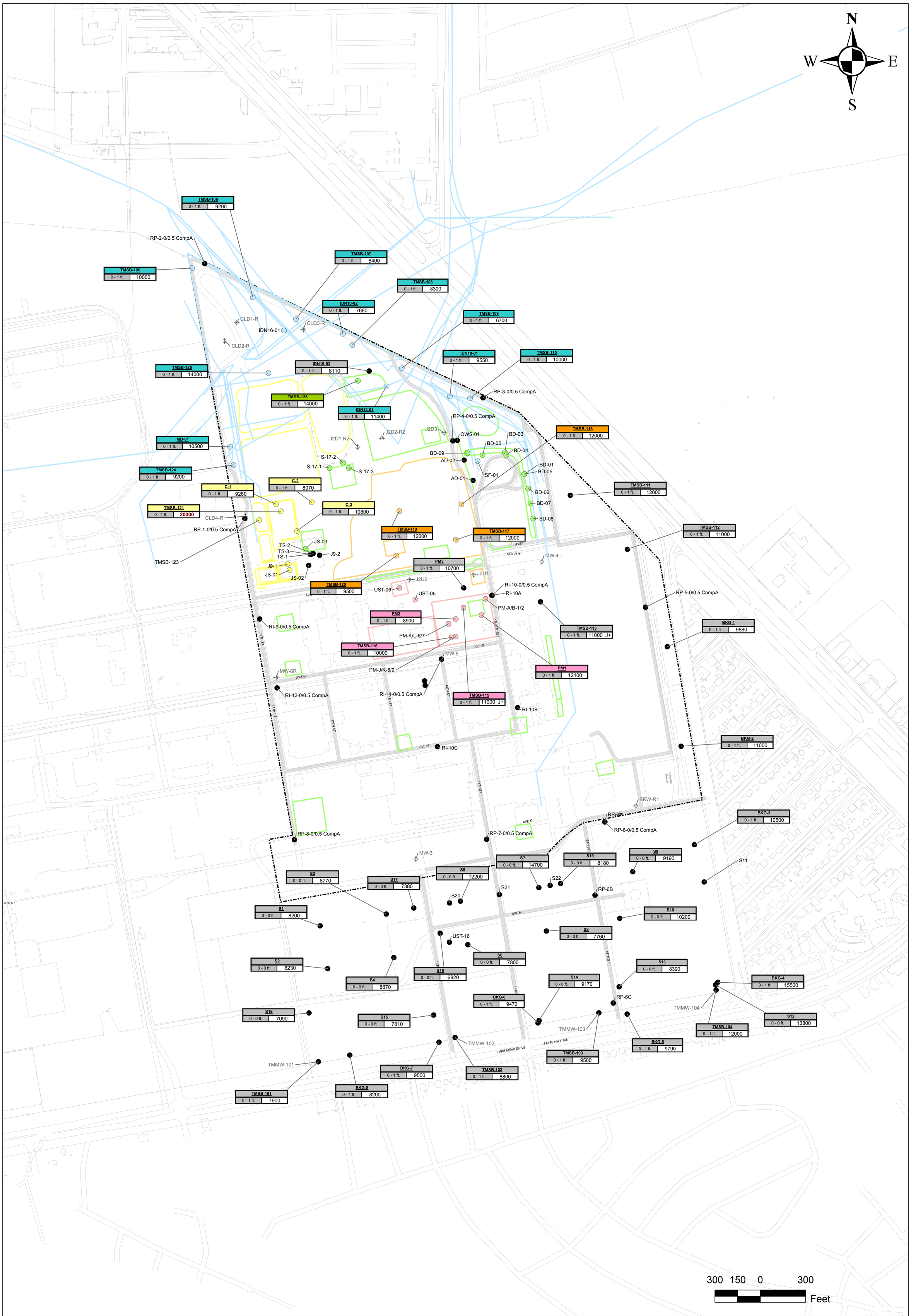
NOTES:
1. The screening level used for chromium is the EPA National Drinking Water Standard Maximum Contaminant Level (MCL). The MCL for chromium is 100 µg/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-17
CHROMIUM IN GROUNDWATER
SPRING 2006

TIMET

2007-02-12 .\TIMET\CSM-R1\MXD\TIMET_siteCHROMIUM.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR MAGNESIUM IS 17500 MG/KG

NOTE: Source for TIMET SSL is BRC/TIMET background data.

TMSB-121	
0 - 1 ft.	20000

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

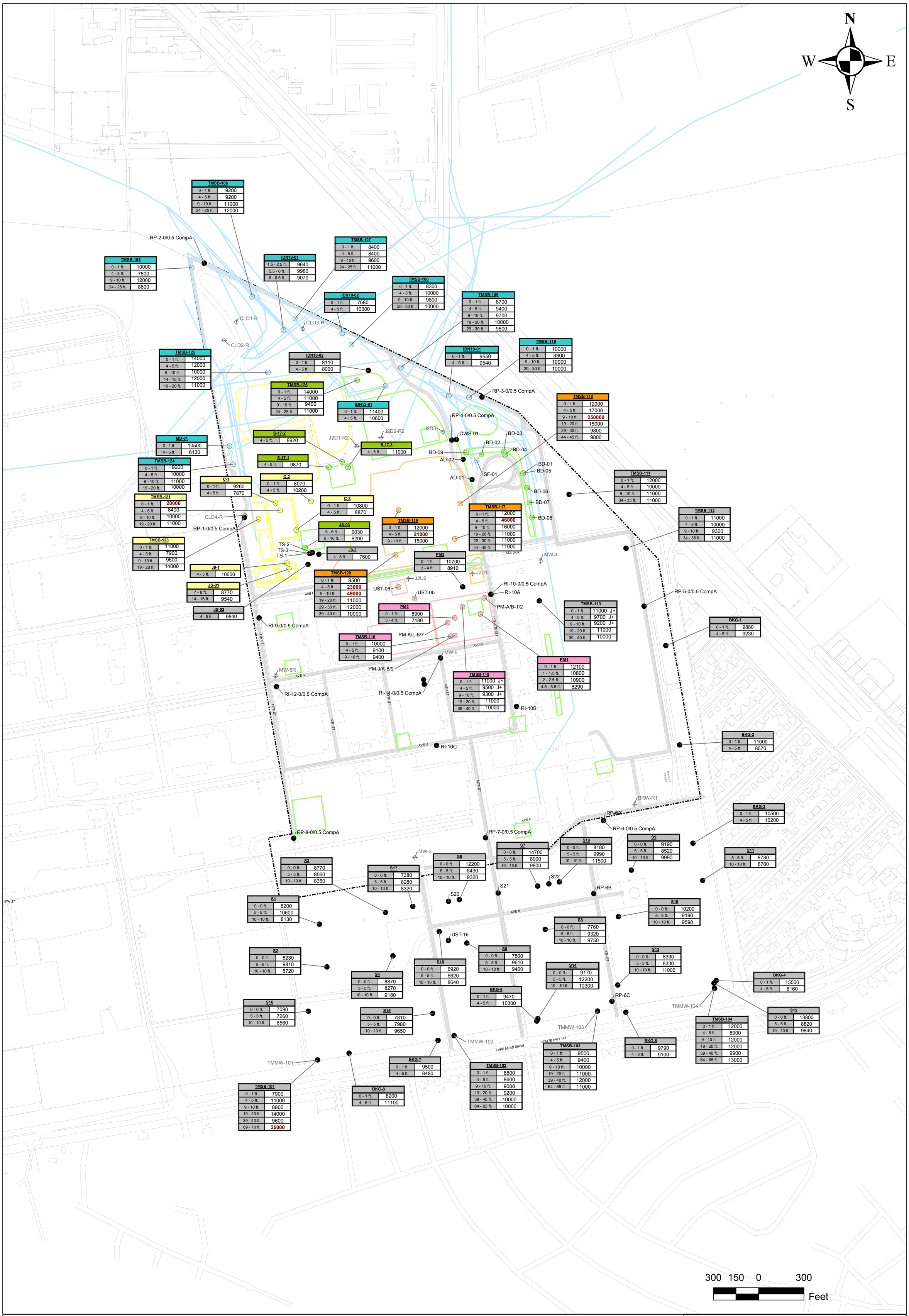
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-18
DISTRIBUTION OF MAGNESIUM IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_MAGNESIUMbig.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR MAGNESIUM IS 17500 MG/KG

NOTE: Source for TIMET SSL is BRC/TIMET background data.

TMSB-119	
0 - 1 ft.	12000
4 - 5 ft.	21000
9 - 10 ft.	15000

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

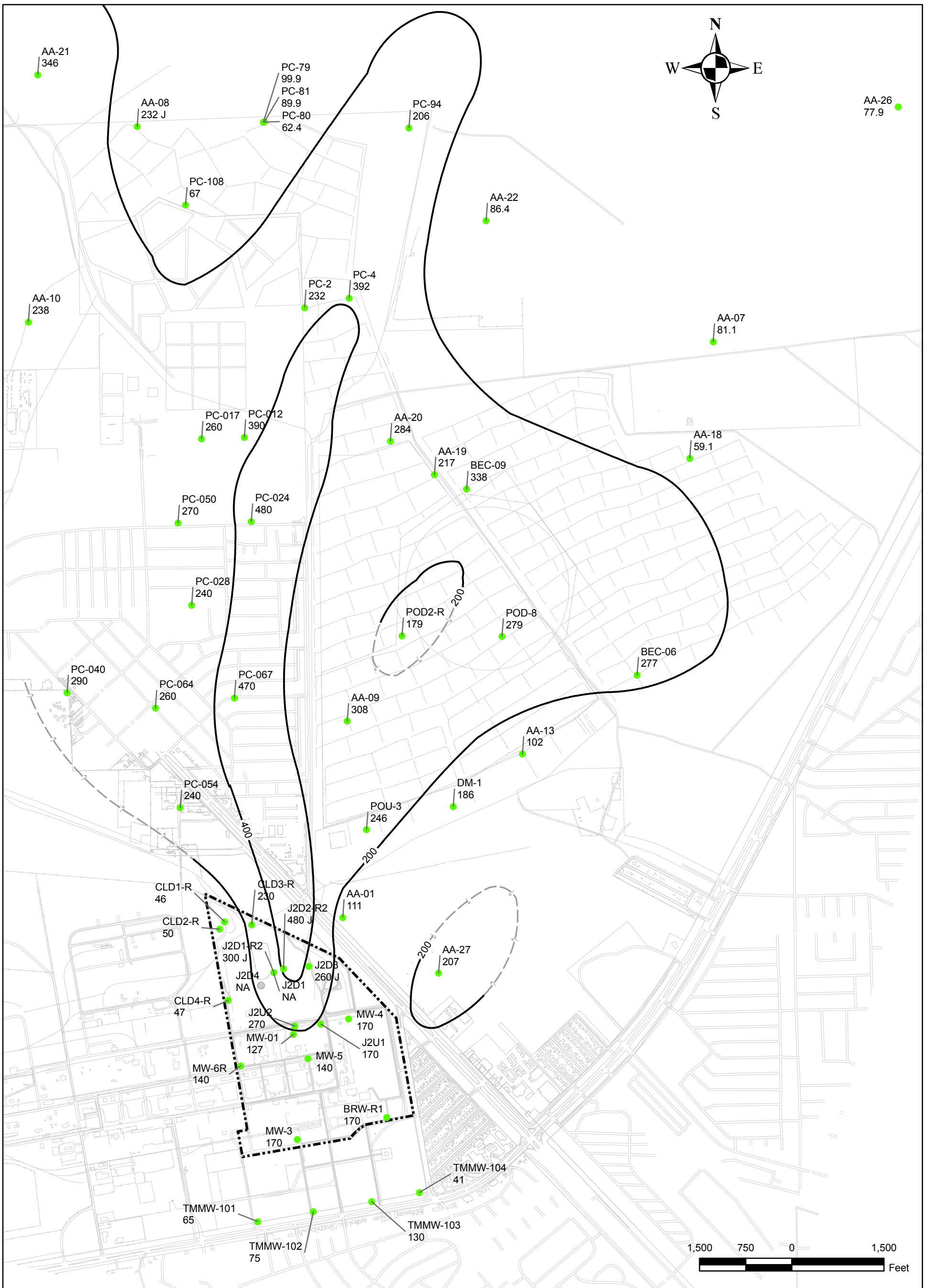
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-19
DISTRIBUTION OF MAGNESIUM IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_MAGNESIUMbig.mxd 02/05/07 michelle.handley MO



BRW-R1 170 — MONITORING WELL WITH MAGNESIUM CONCENTRATION (mg/L)

J2D1 NA — WELL NOT ANALYZED

mg/L — MILLIGRAM PER LITER

100 — MAGNESIUM CONTOUR (mg/L)

APPROXIMATE CONTOUR LOCATION

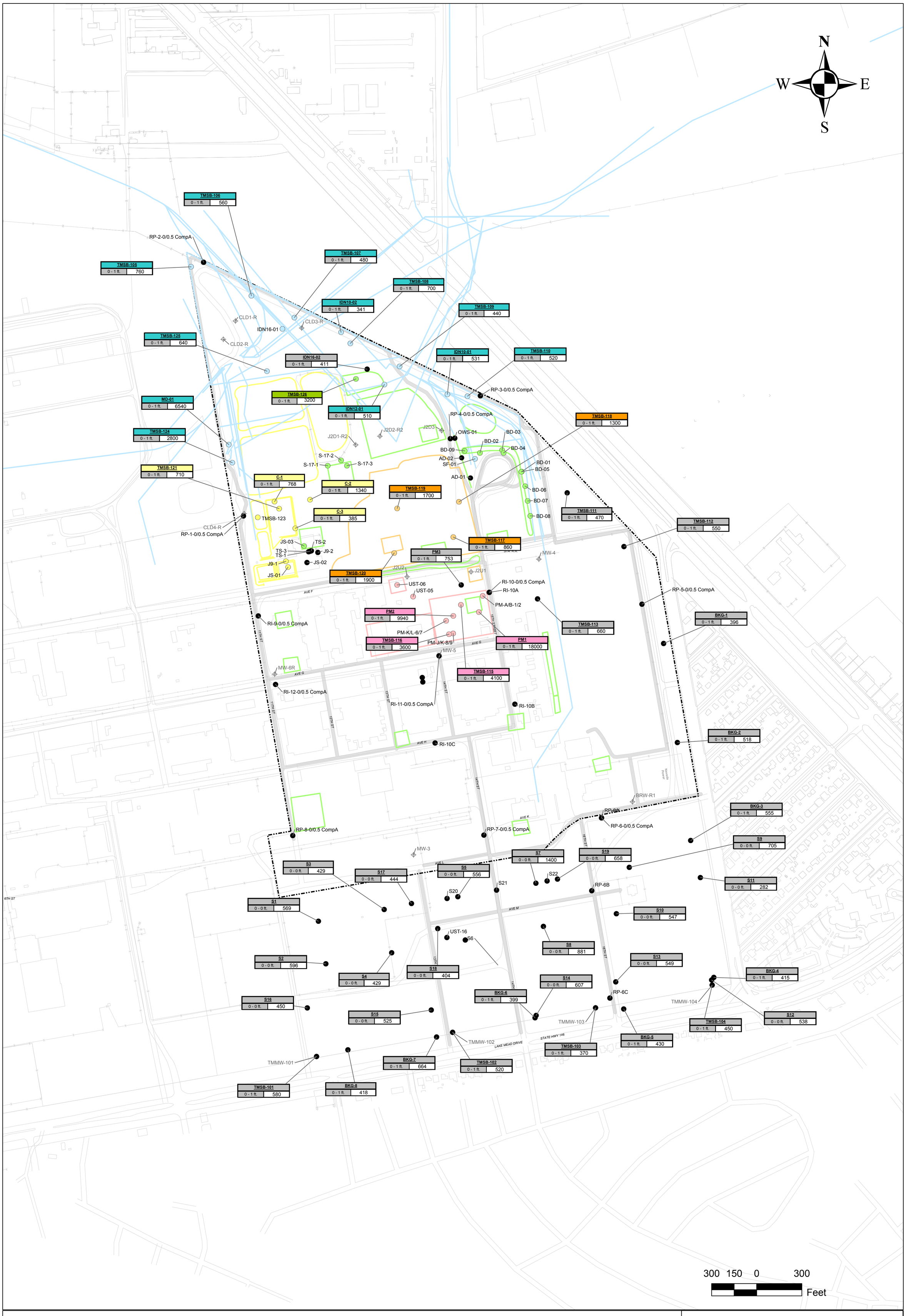
NOTES:
1. There are no EPA National Primary or Secondary Drinking Water Standards for magnesium.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-20
MAGNESIUM IN GROUNDWATER
SPRING 2006

TIMET

2007-3-30 :\TIMET\CSM-R\MXD\TIMET_siteMAGNESIUM.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR MANGANESE IS 19000 MG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

TMSB-116	
0 - 1 ft.	3600

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

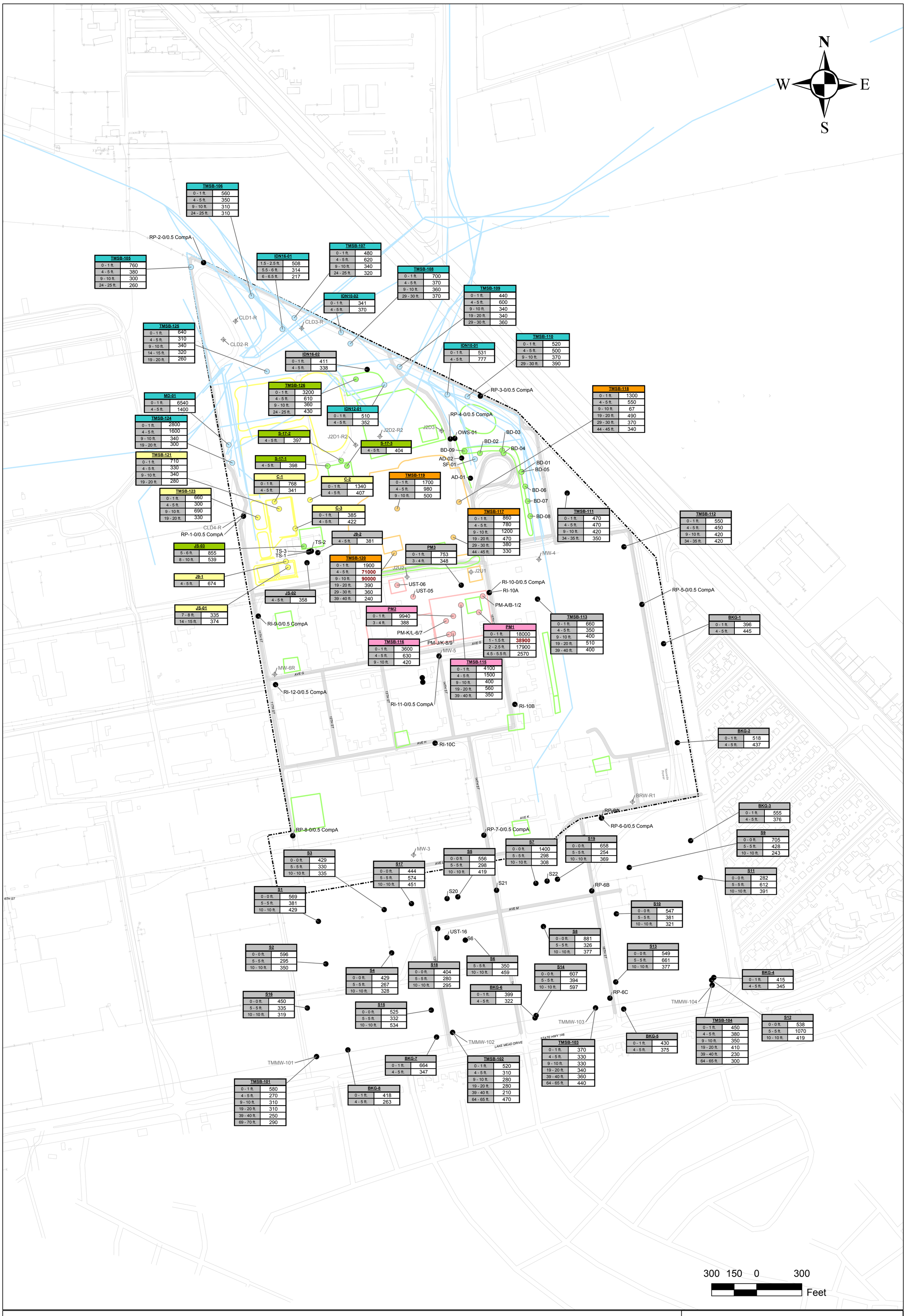
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-21
DISTRIBUTION OF MANGANESE IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_MANGANESEbig.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR MANGANESE IS 19000 MG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

PM1	
0 - 1 ft.	18000
1 - 1.5 ft.	**38900**
2 - 2.5 ft.	17900
4.5 - 5.5 ft.	2570

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

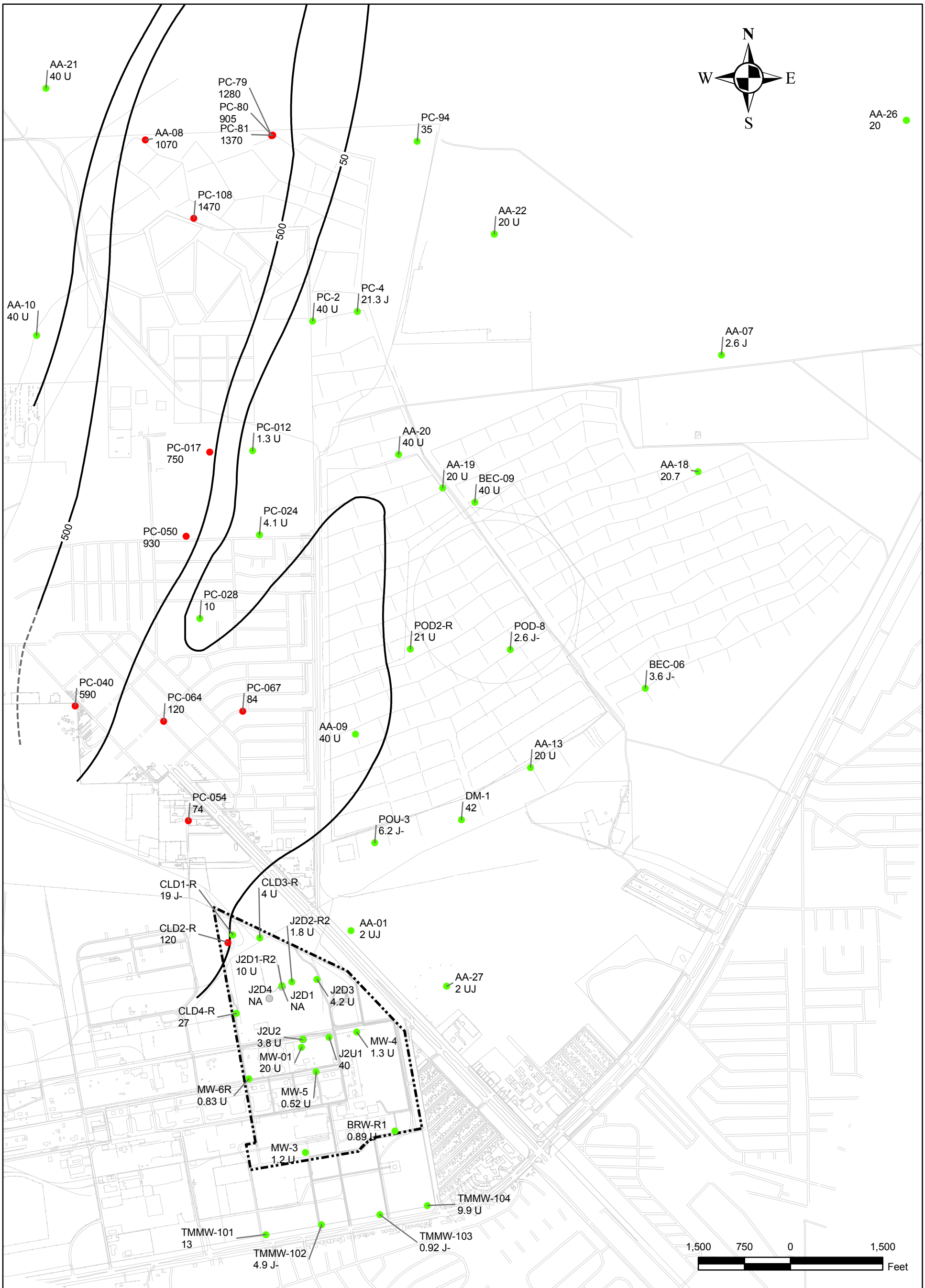
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-22
DISTRIBUTION OF MANGANESE IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_MANGANESEbig.mxd 02/05/07 michelle.handley MO



MW-5 0.52 U — MONITORING WELL WITH MANGANESE CONCENTRATION (µg/L)

CLD2-R 120 — MONITORING WELL WITH MANGANESE CONCENTRATION EXCEEDING SCREENING LEVEL

J2D1 NA — WELL NOT ANALYZED

µg/L — MICROGRAM PER LITER

500 — MANGANESE CONTOUR (µg/L)

APPROXIMATE CONTOUR LOCATION

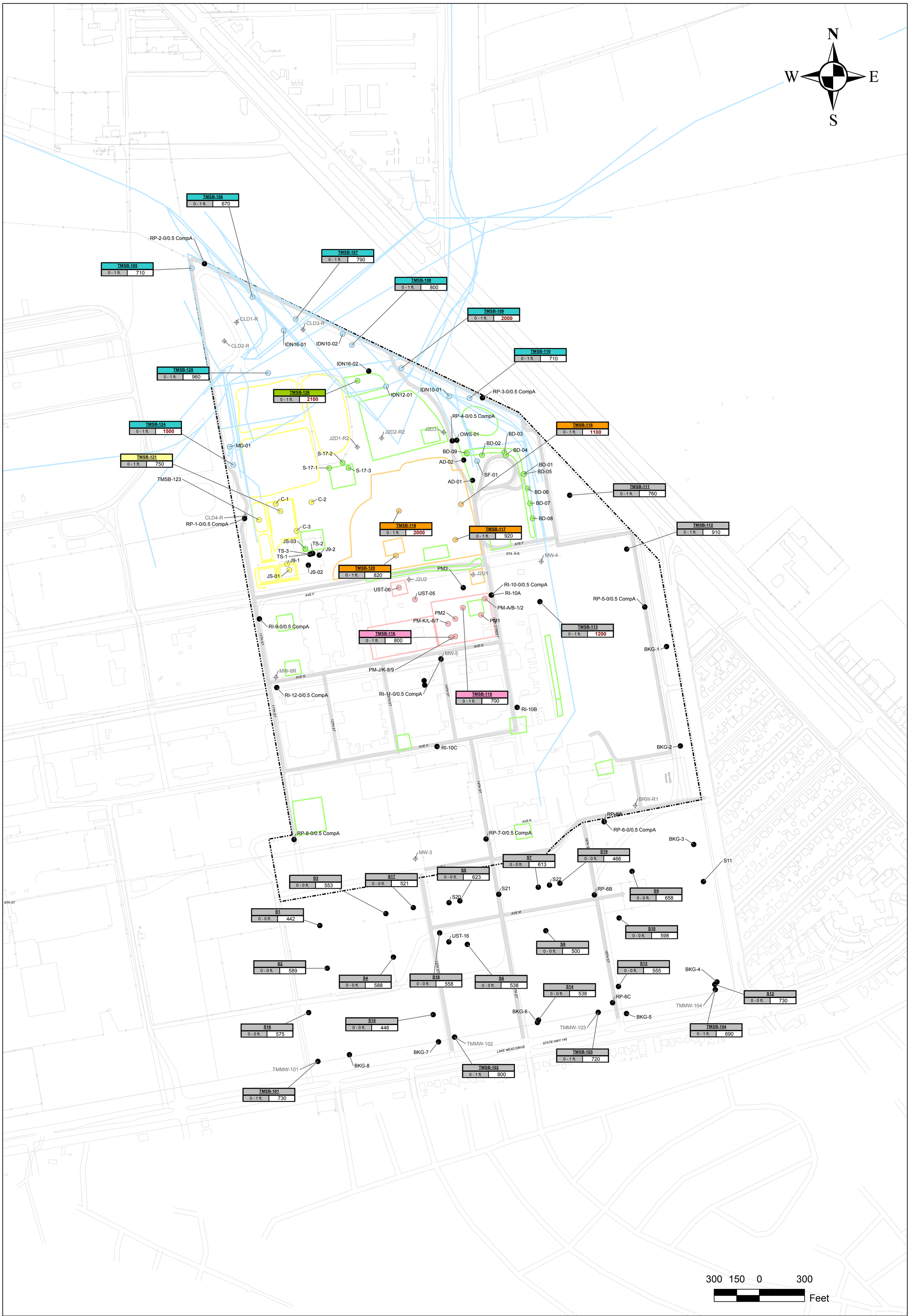
NOTES:
1. The screening level used for manganese is the EPA National Secondary Drinking Water Standard. The standard for manganese is 50 µg/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-23
MANGANESE IN GROUNDWATER
SPRING 2006

TIMET

2007-02-12 :\TIMET\CSM-R\MXD\TIMET_siteMN.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR TITANIUM IS 1010 MG/KG

NOTE: Source for TIMET SSL is BRC/TIMET background data.

TMSB-119	
0 - 1 ft.	2000

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

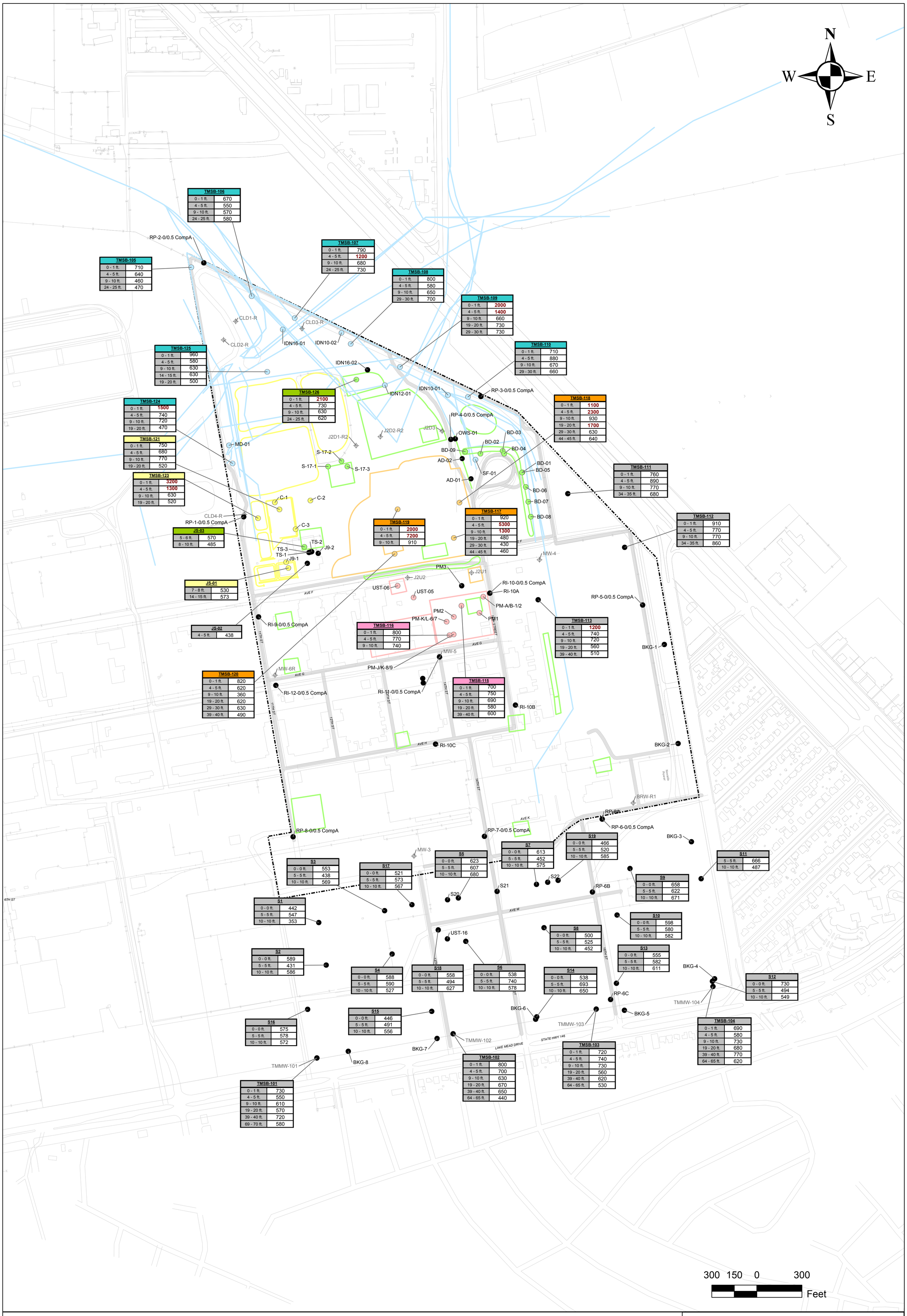
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-24
DISTRIBUTION OF TITANIUM IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_TITANIUMbig.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR TITANIUM IS 1010 MG/KG

NOTE: Source for TIMET SSL is BRC/TIMET background data.

TMSB-119	
0 - 1 ft.	2000
4 - 5 ft.	7200
9 - 10 ft.	910

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

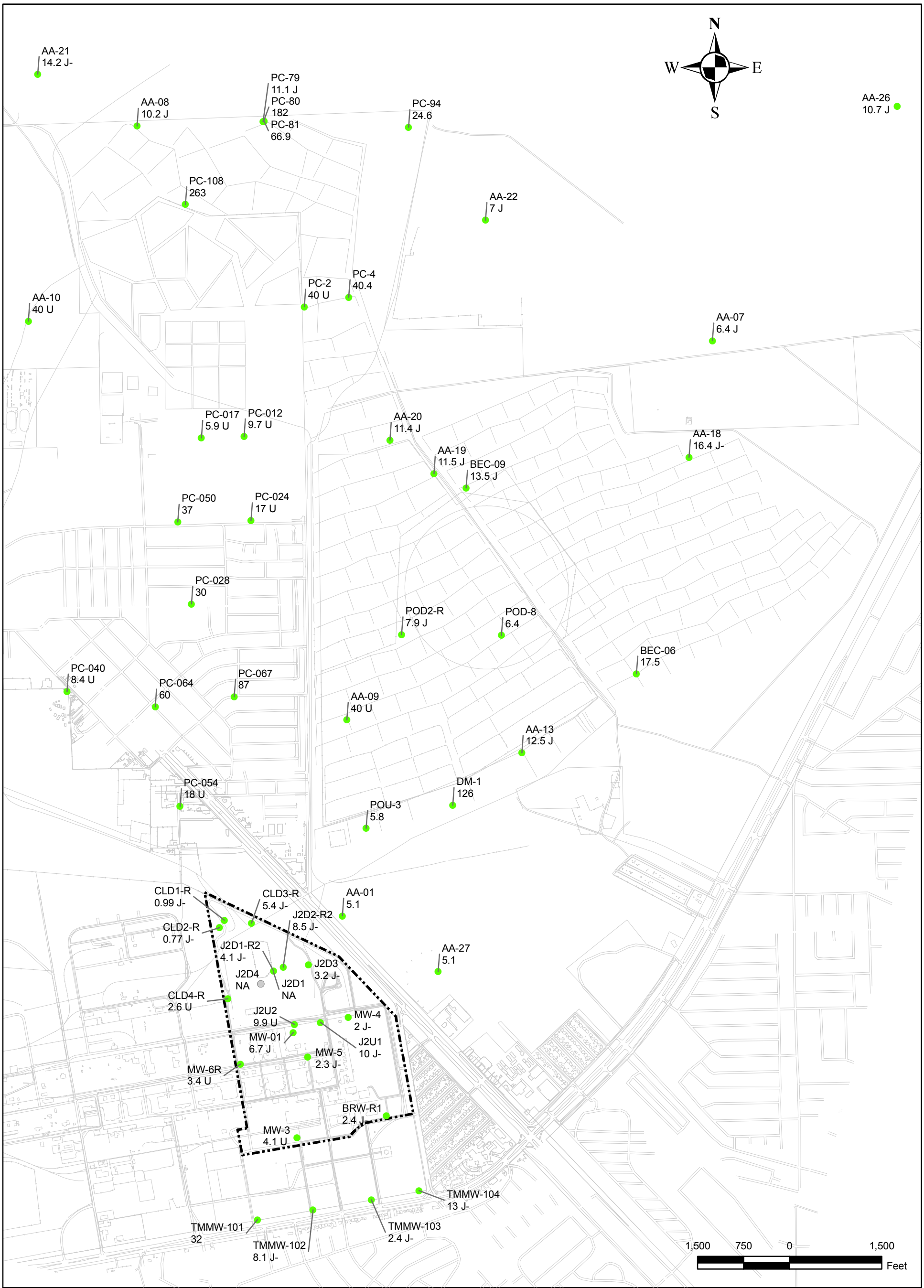
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-25
DISTRIBUTION OF TITANIUM IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_TITANIUMbig.mxd 02/05/07 michelle.handley MO



BRW-R1 2.4 J- ● MONITORING WELL WITH TITANIUM CONCENTRATION (µg/L)

J2D1 NA ● WELL NOT ANALYZED

µg/L MICROGRAM PER LITER

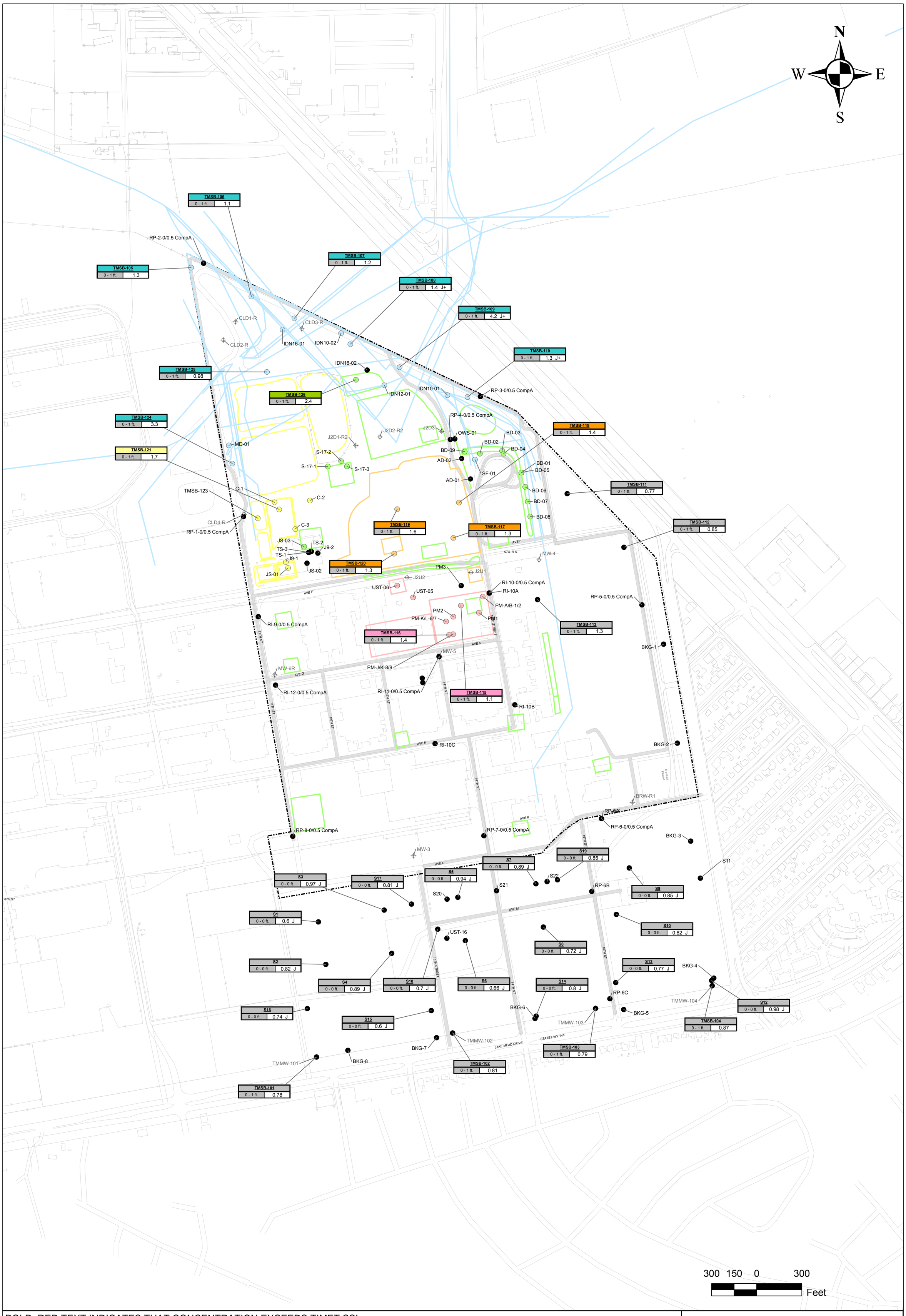
NOTES:
1. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-26
TITANIUM IN GROUNDWATER
SPRING 2006

TIMET

2007-3-30 :\TIMET\CSM-R\MXD\TIMET_siteTITANIUM.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR URANIUM IS 200 MG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

TMSB-121	
0 - 1 ft.	1.7

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

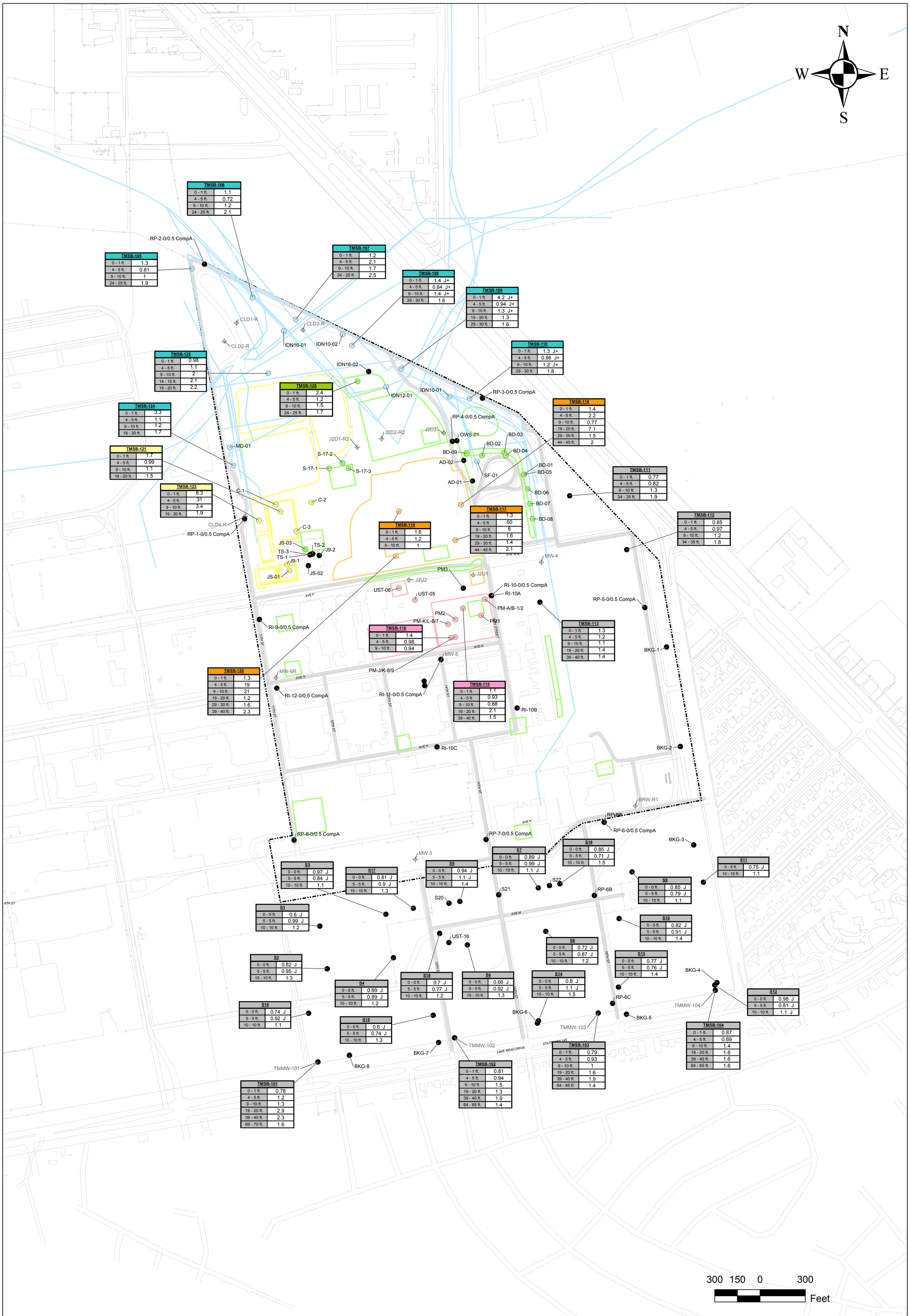
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-27
DISTRIBUTION OF URANIUM IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_URANIUM\big.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR URANIUM IS 200 MG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

TMSB-121	
0 - 1 ft.	1.7
4 - 5 ft.	0.99
9 - 10 ft.	1.1
19 - 20 ft.	1.5

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

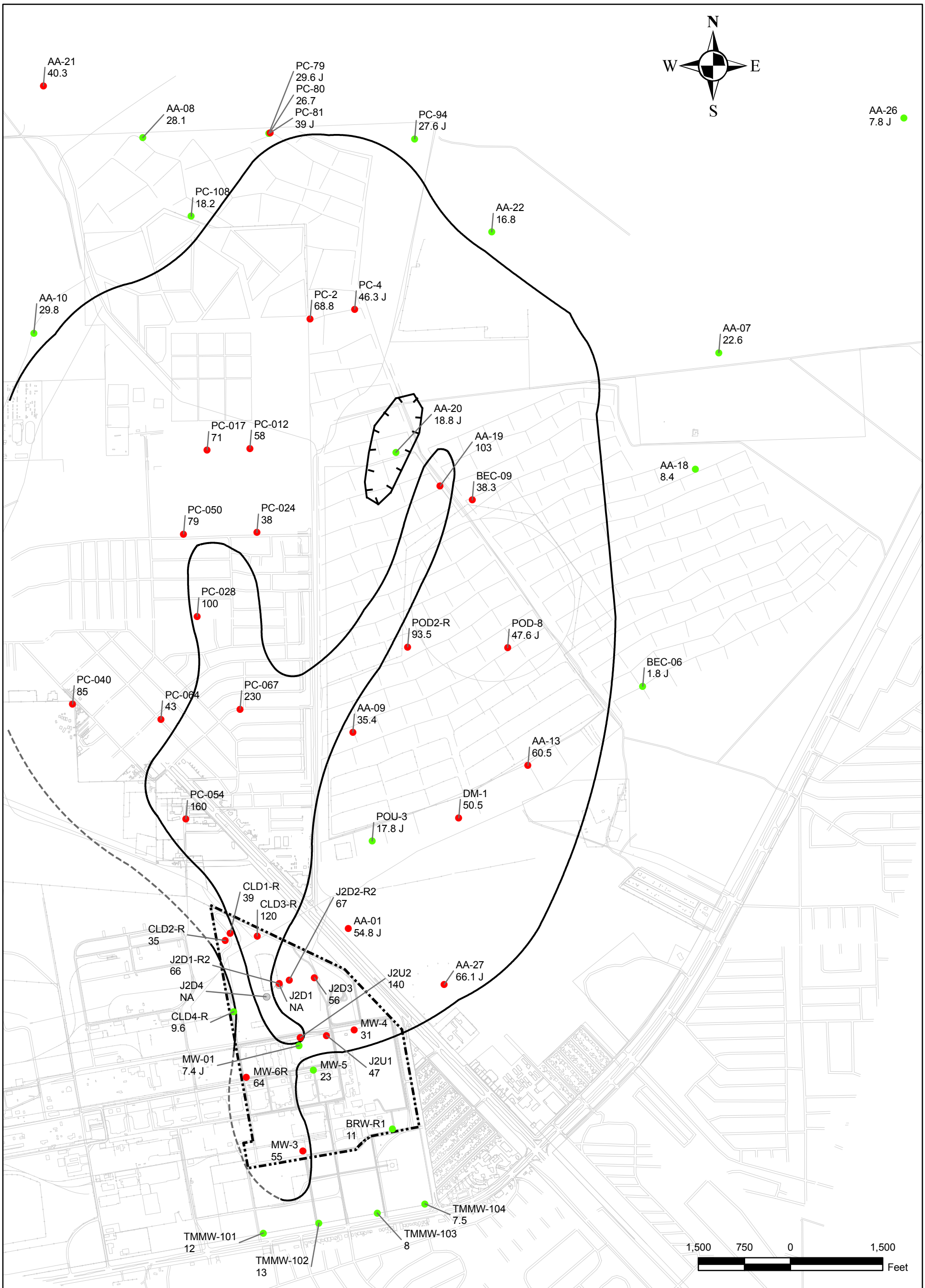
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-28
DISTRIBUTION OF URANIUM IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_URANIUMbig.mxd 02/05/07 michelle.handley MO



MW-5 23 — MONITORING WELL WITH TOTAL URANIUM CONCENTRATION (µg/L)

MW-3 55 — MONITORING WELL WITH TOTAL URANIUM CONCENTRATION EXCEEDING SCREENING LEVEL

J2D1 NA — WELL NOT ANALYZED

µg/L — MICROGRAM PER LITER

100 — TOTAL URANIUM CONTOUR (µg/L)

APPROXIMATE CONTOUR LOCATION

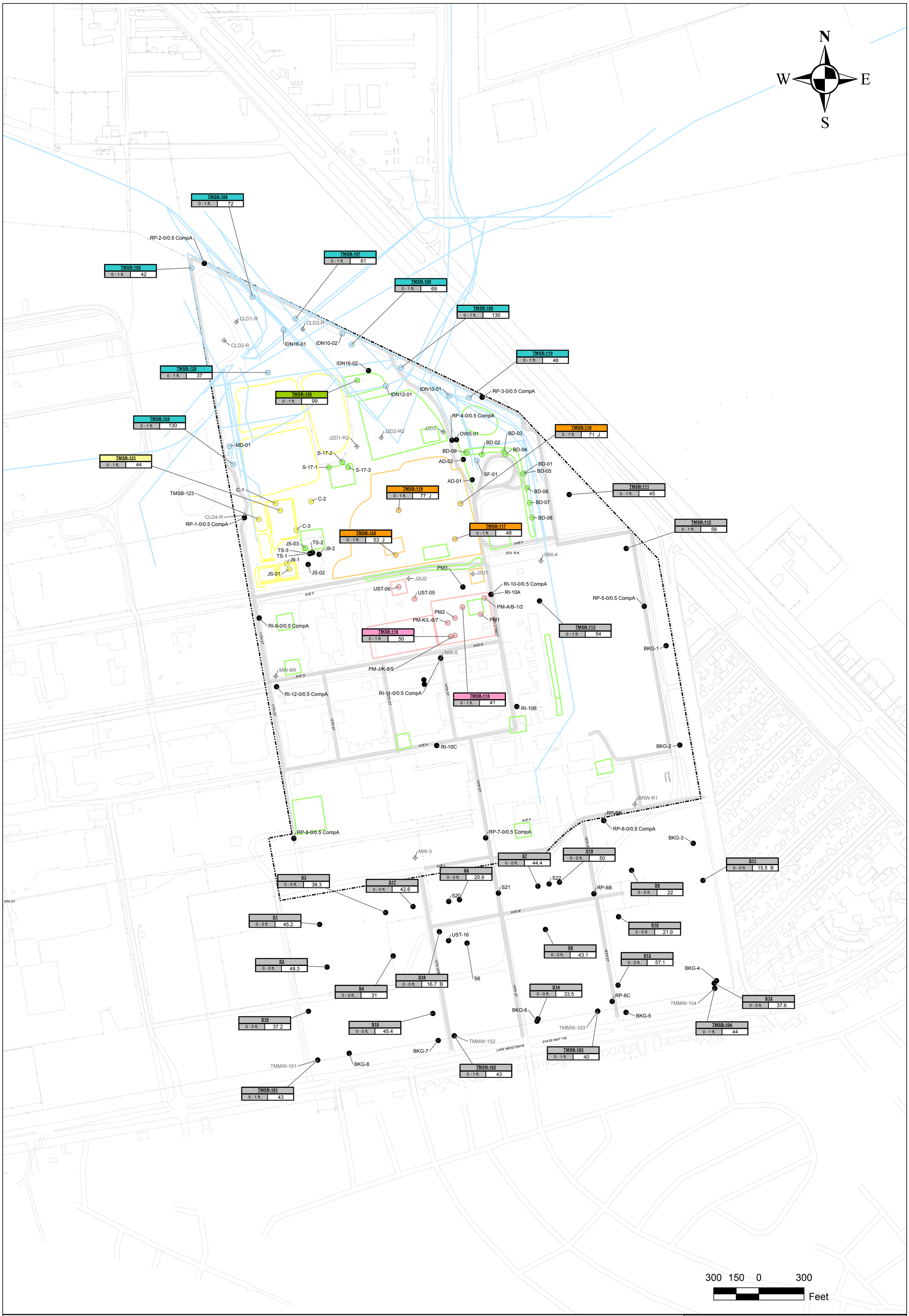
NOTES:
1. The screening level used for uranium is the EPA National Drinking Water Standard Maximum Contaminant Level (MCL). The MCL for uranium is 30 µg/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-29
TOTAL URANIUM IN GROUNDWATER
SPRING 2006

TIMET

2007-02-12 :\TIMET\CSM-R\MXD\TIMET_siteU.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR VANADIUM IS 1000 MG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

TMSB-126	
0 - 1 ft.	99

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 FOR VANADIUM IS 6000 MG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

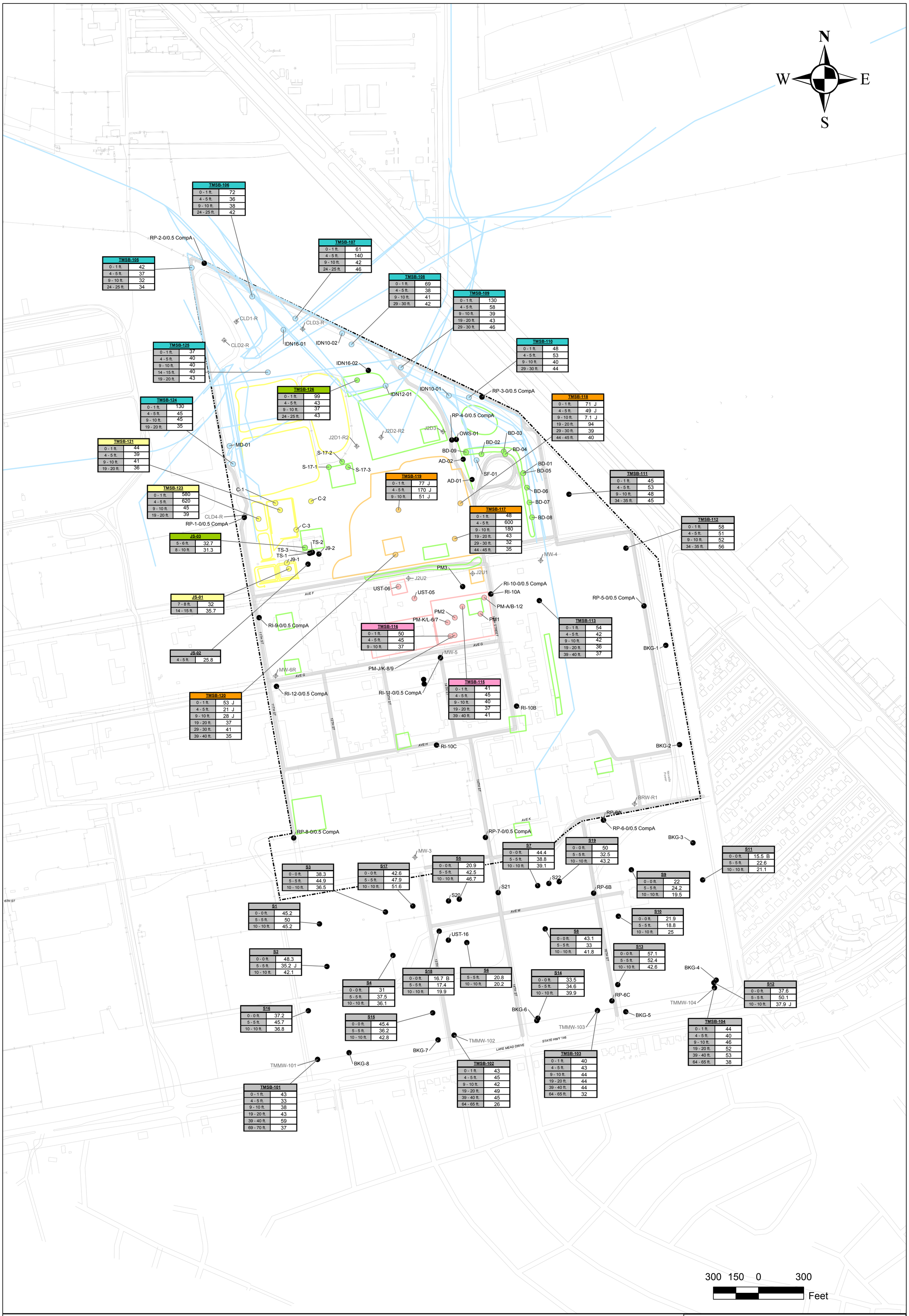
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-30
DISTRIBUTION OF VANADIUM IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_VANADIUMbig.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR VANADIUM IS 1000 MG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

TMSB-126	
0 - 1 ft.	99
4 - 5 ft.	43
9 - 10 ft.	37
24 - 25 ft.	43

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 FOR VANADIUM IS 6000 MG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

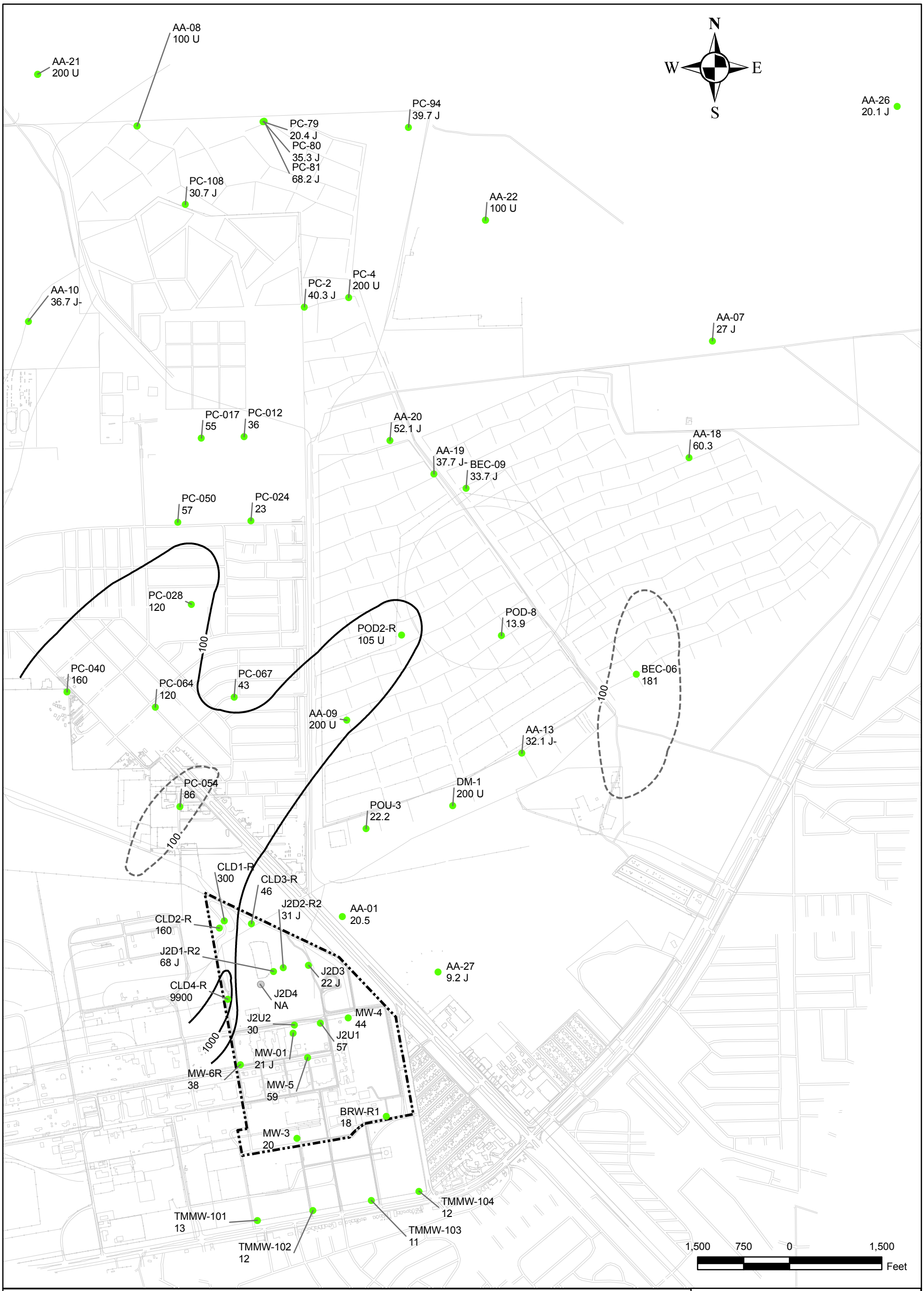
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-31
DISTRIBUTION OF VANADIUM
IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_VANADIUMbig.mxd 02/05/07 michelle.handley MO



BRW-R1 18 — MONITORING WELL WITH VANADIUM CONCENTRATION (µg/L)

J2D1 NA — WELL NOT ANALYZED

µg/L — MICROGRAM PER LITER

100 — VANADIUM CONTOUR (µg/L)

APPROXIMATE CONTOUR LOCATION

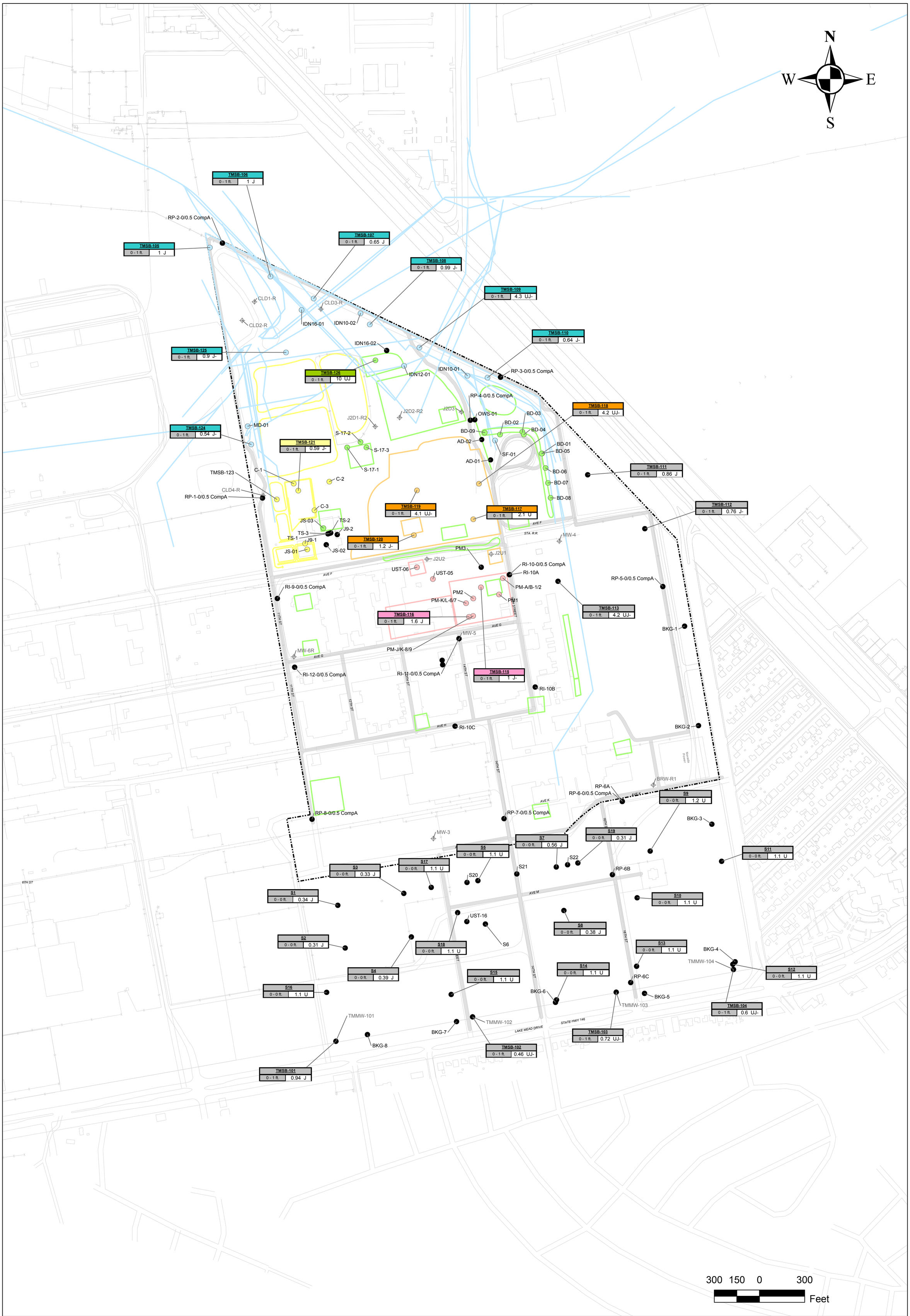
NOTES:
1. There are no EPA National Primary or Secondary Drinking Water Standards for vanadium.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-32
VANADIUM IN GROUNDWATER
SPRING 2006

TIMET

2007-02-12 .\TIMET\CSM-RI\MXD\TIMET_siteVANADIUM.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR ANTIMONY IS 410 MG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

TMSB-115
0 - 1 ft. 1 J-

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF 20 VALUE FOR ANTIMONY IS 5 MG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

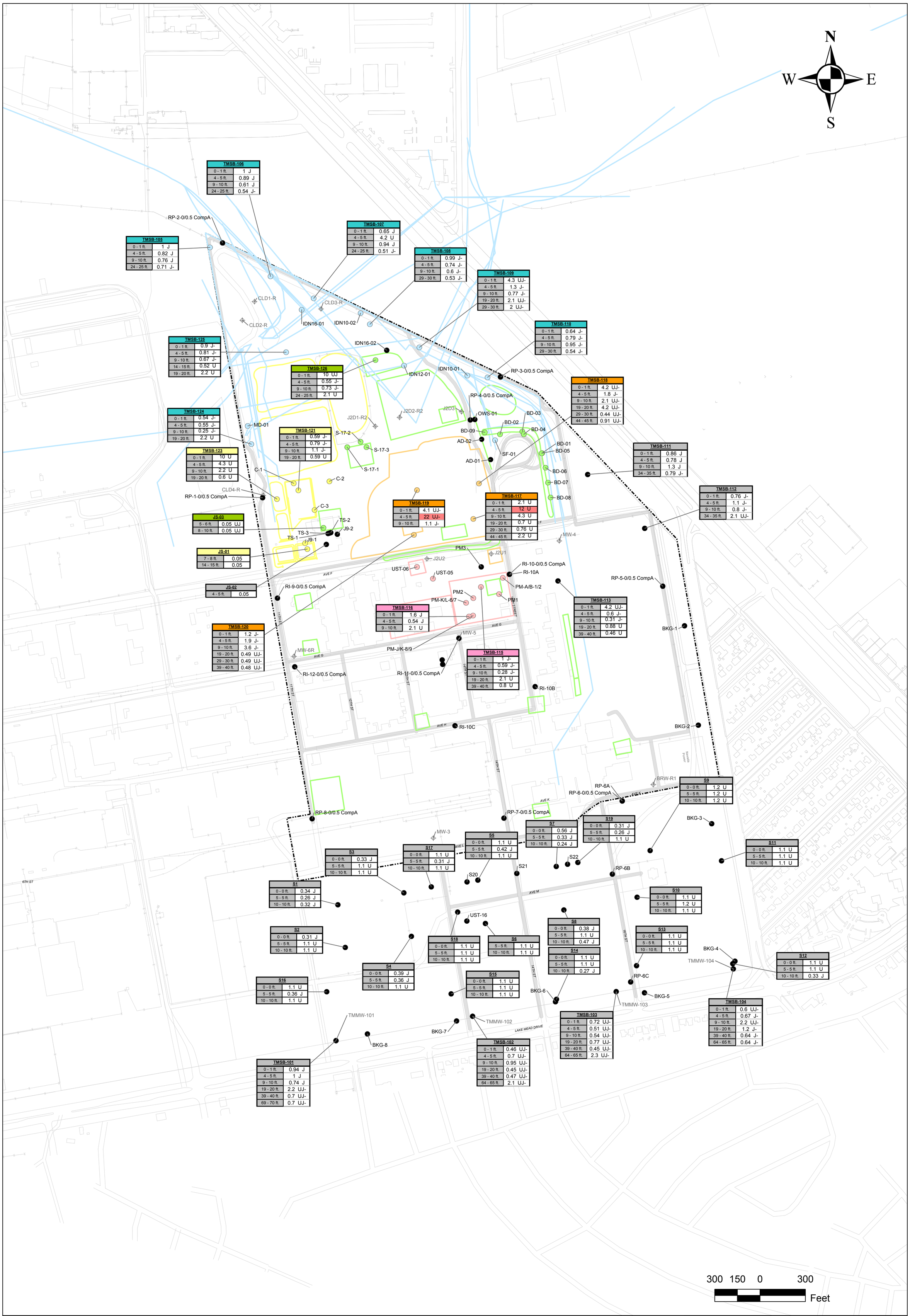
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-33
DISTRIBUTION OF ANTIMONY IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-R\mxd\SOIL_ANTIMONY\big.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR ANTIMONY IS 410 MG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

TMSB-119	
0 - 1 ft.	4.1 UJ-
4 - 5 ft.	22 UJ-
9 - 10 ft.	1.1 J-

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF 20 VALUE FOR ANTIMONY IS 5 MG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

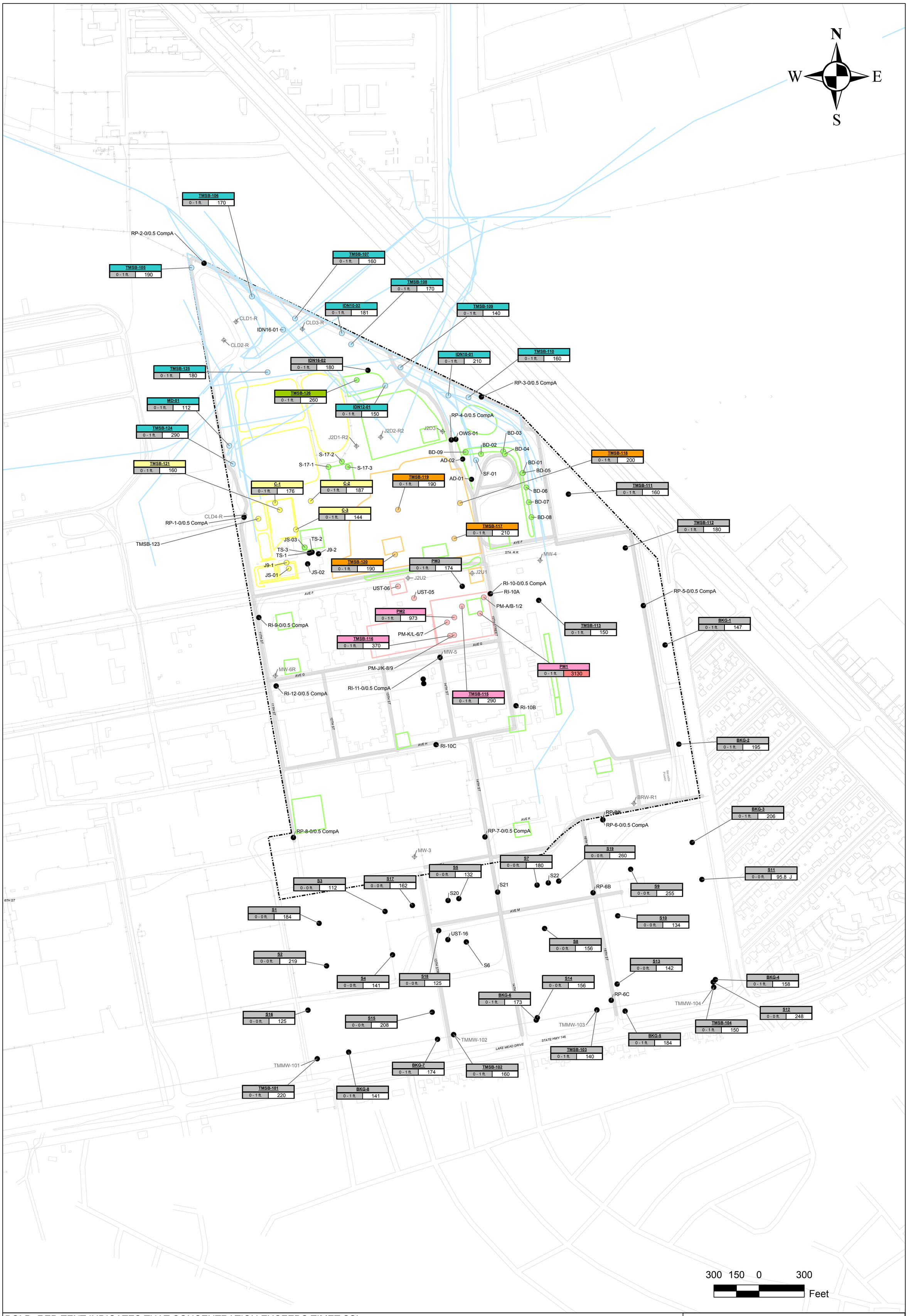
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-34
DISTRIBUTION OF ANTIMONY
IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-R\mxd\SOIL_ANTIMONYbig.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR BARIUM IS 67000 MG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

PM1
0 - 1 ft. 3130

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 FOR BARIUM IS 1600 MG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

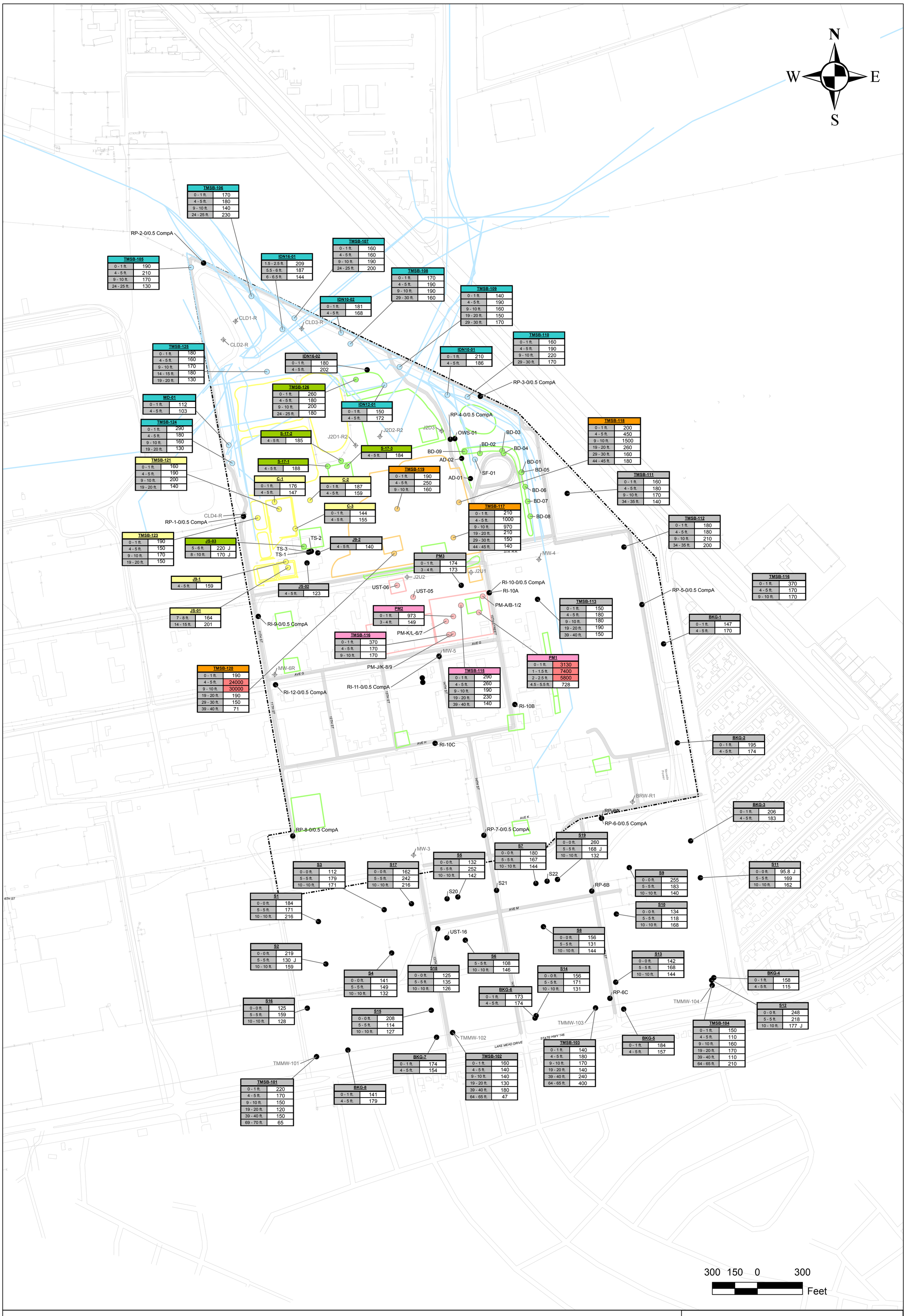
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-35
DISTRIBUTION OF BARIUM
IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_BARIUMbig.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR BARIUM IS 67000 MG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

PM1	
0 - 1 ft.	3130
1 - 1.5 ft.	7400
2 - 2.5 ft.	▲ 5800
4.5 - 5.5 ft.	728

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 FOR BARIUM IS 1600 MG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

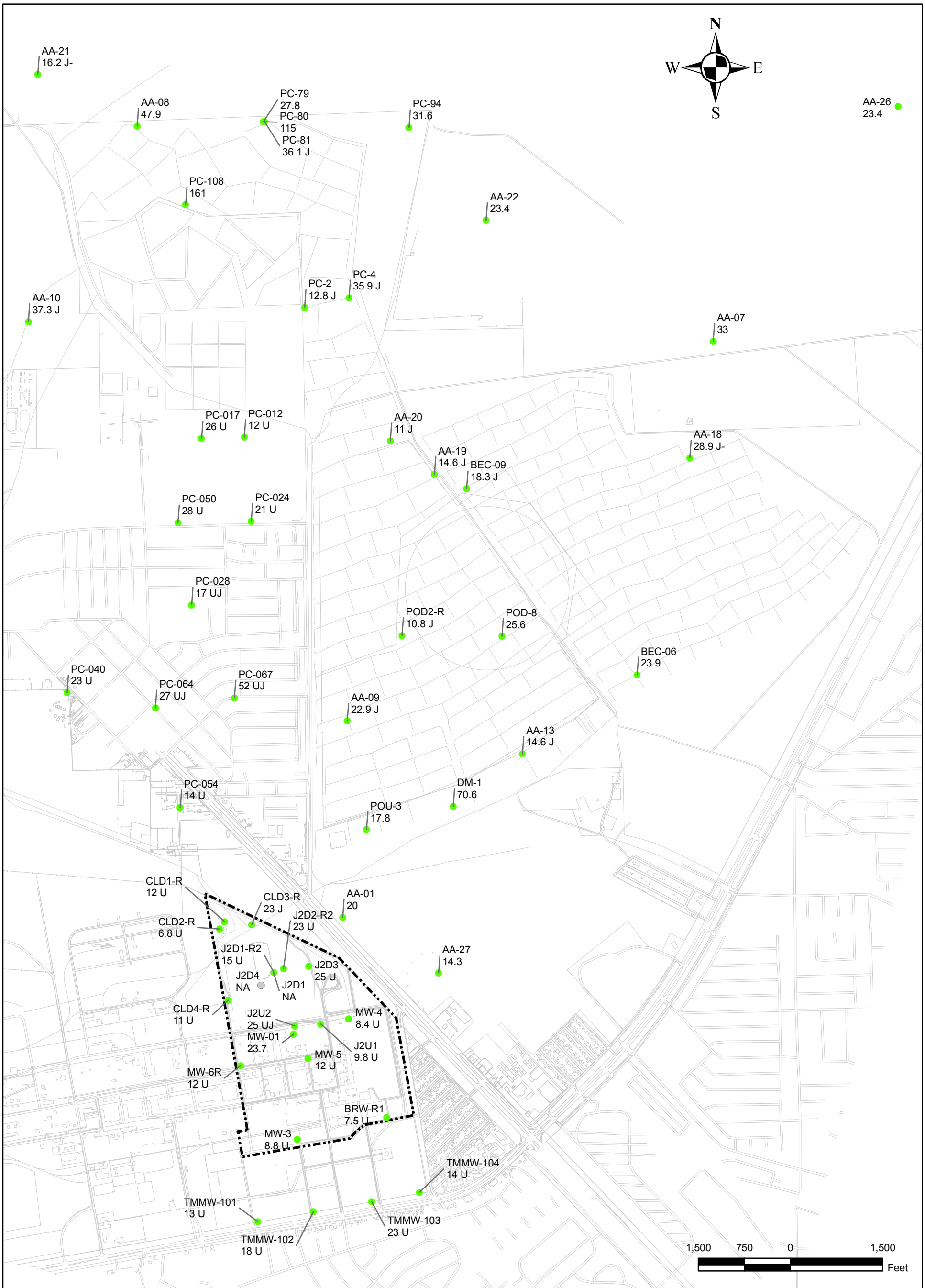
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-36
DISTRIBUTION OF BARIUM
IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_BARIUMbig.mxd 02/05/07 michelle.handley MO



BRW-R1 7.5 U — MONITORING WELL WITH BARIUM CONCENTRATION (µg/L)

J2D1 NA — WELL NOT ANALYZED

µg/L — MICROGRAM PER LITER

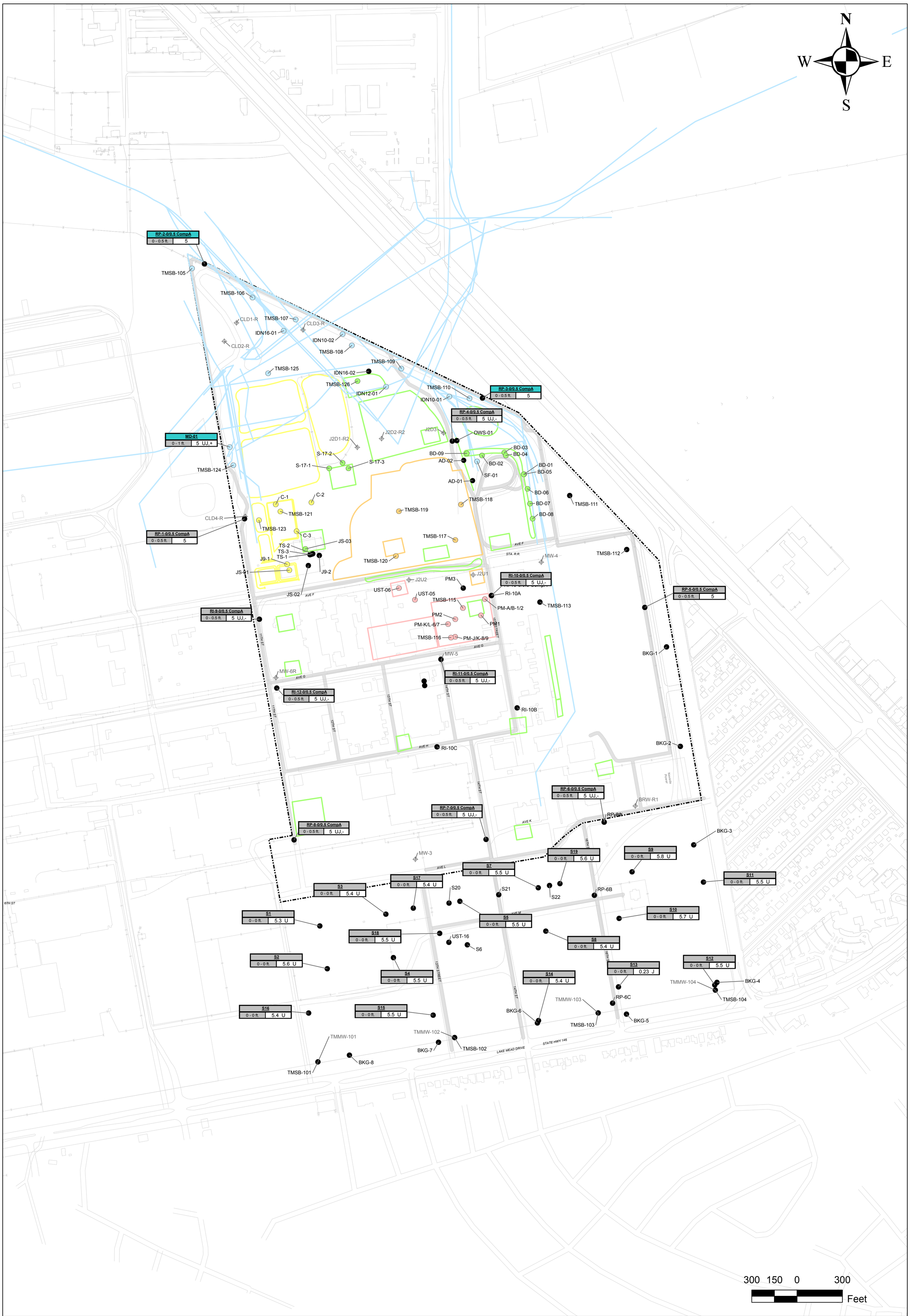
NOTES:
1. The screening level used for arsenic is the EPA National Drinking Water Standard Maximum Contaminant Level (MCL). The MCL for barium is 2,000 µg/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-37
BARIUM IN GROUNDWATER
SPRING 2006

TIMET

2007-3-30 :\TIMET\CSM-R\MXD\TIMET_siteBARIUM.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR CHLOROFORM IS 470 UG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

MD-01
0 - 1 ft. 5 UJ,+

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 VALUE FOR CHLOROFORM IS 600 UG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

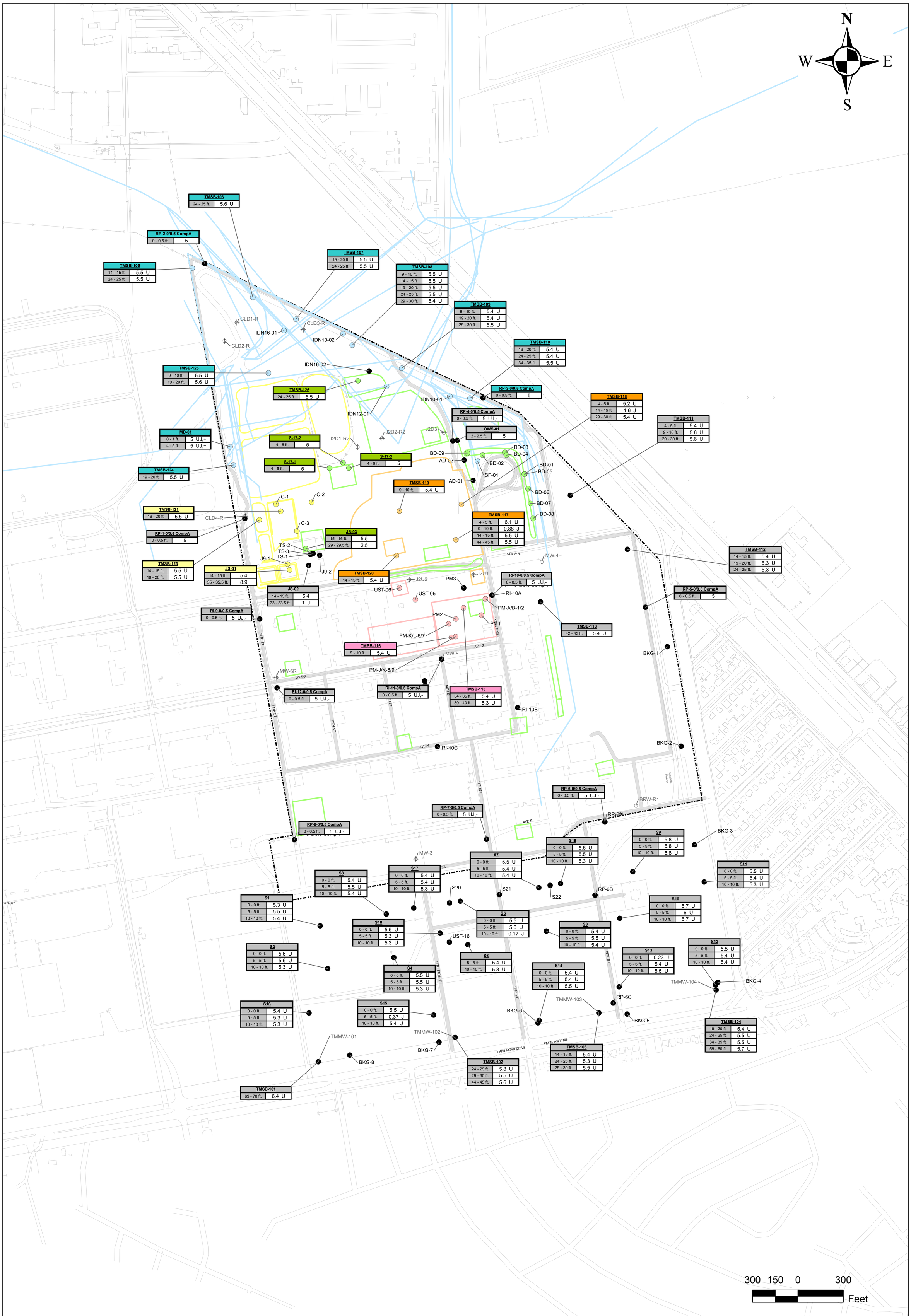
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-38
DISTRIBUTION OF CHLOROFORM IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_CHLOROFORMbig.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR CHLOROFORM IS 470 UG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

TMSB-115	
34 - 35 ft.	5.4 U
39 - 40 ft.	5.3 U

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 VALUE FOR CHLOROFORM IS 600 UG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

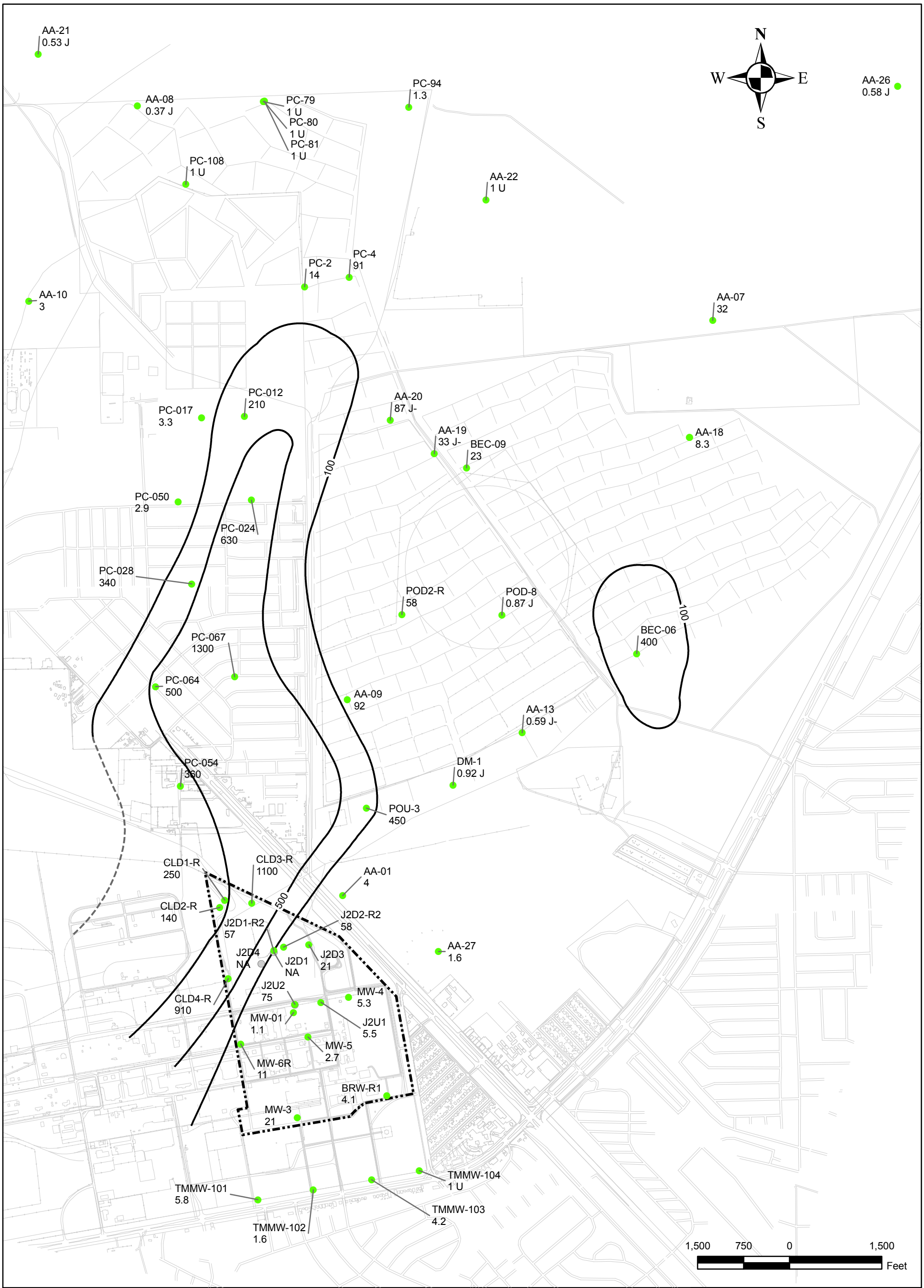
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-39
DISTRIBUTION OF CHLOROFORM IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_CHLOROFORMbig.mxd 02/05/07 michelle.handley MO



BRW-R1 4.1 — MONITORING WELL WITH CHLOROFORM CONCENTRATION (µg/L)

J2D1 NA — WELL NOT ANALYZED

µg/L — MICROGRAM PER LITER

100 — ARSENIC CONTOUR (µg/L)

APPROXIMATE CONTOUR LOCATION

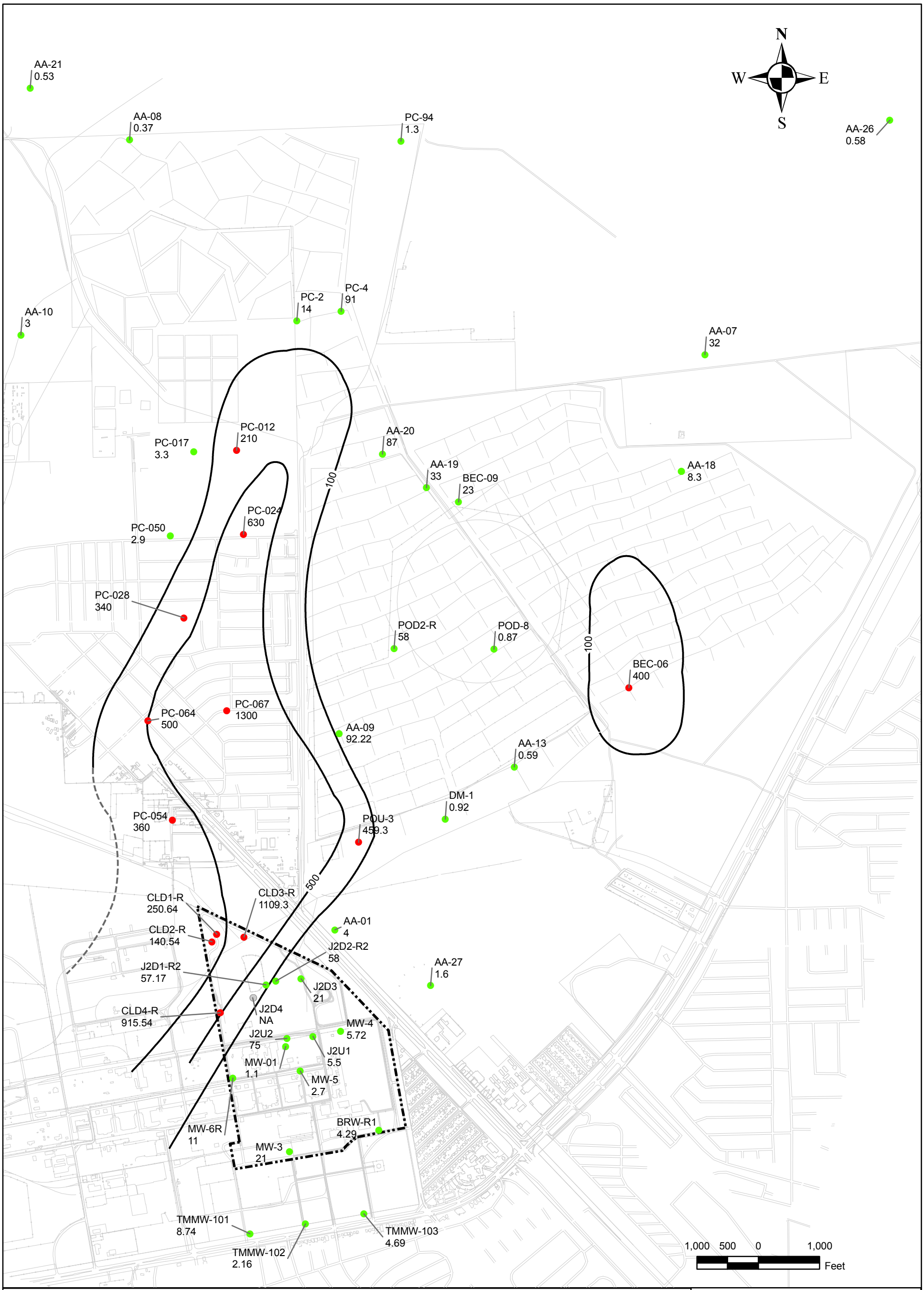
NOTES:
1. There are no EPA National Primary or Secondary Drinking Water Standards for chloroform.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-40
CHLOROFORM IN GROUNDWATER
SPRING 2006

TIMET

2007-02-12 :\TIMET\CSM-RI\MXD\TIMET_siteChloroform.mxd TTEMI-MO michelle.handley



MW-5 2.7 — MONITORING WELL WITH TOTAL TRIHALOMETHANES CONCENTRATION (µg/L)

J2D1-R2 57.17 — MONITORING WELL WITH TOTAL TRIHALOMETHANES CONCENTRATION EXCEEDING SCREENING LEVEL

J2D1 NA — WELL NOT ANALYZED

µg/L — MICROGRAM PER LITER

1000 — TOTAL TRIHALOMETHANES CONTOUR (µg/L)

APPROXIMATE CONTOUR LOCATION

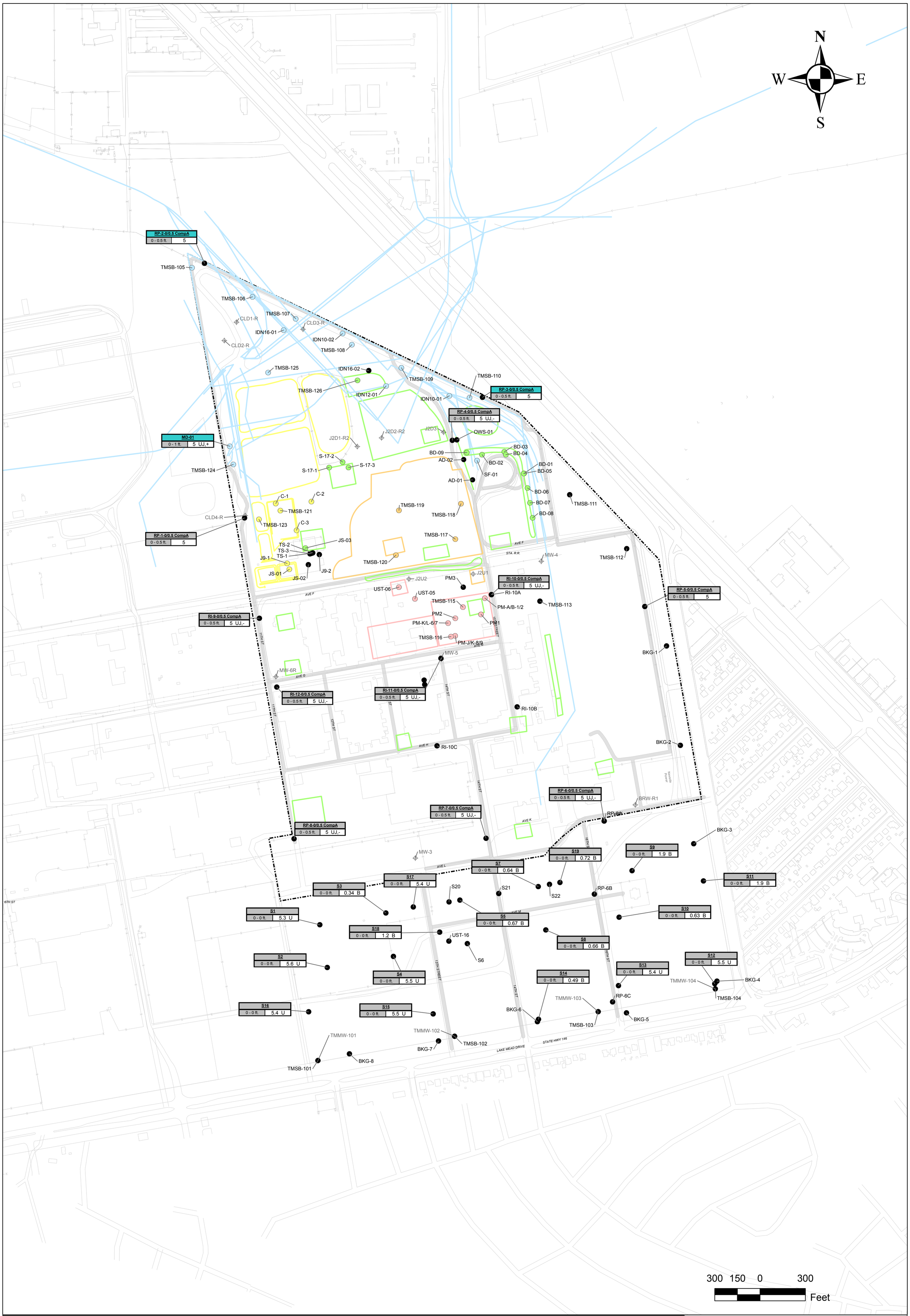
NOTES:
1. The screening level used for total trihalomethanes is the EPA National Drinking Water Standard Maximum Contaminant Level (MCL). The MCL for total trihalomethanes is 100 µg/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-41
TOTAL TRIHALOMETHANES IN GROUNDWATER
SPRING 2006

TIMET

2007-02-12 :\TIMET\CSM-R\MXD\TIMET_siteToTALTRIHALOMETHANES.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR TETRACHLOROETHENE IS 1300 UG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

MD-01	
0 - 1 ft.	5 UJ,+

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 VALUE FOR TETRACHLOROETHENE IS 60 UG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

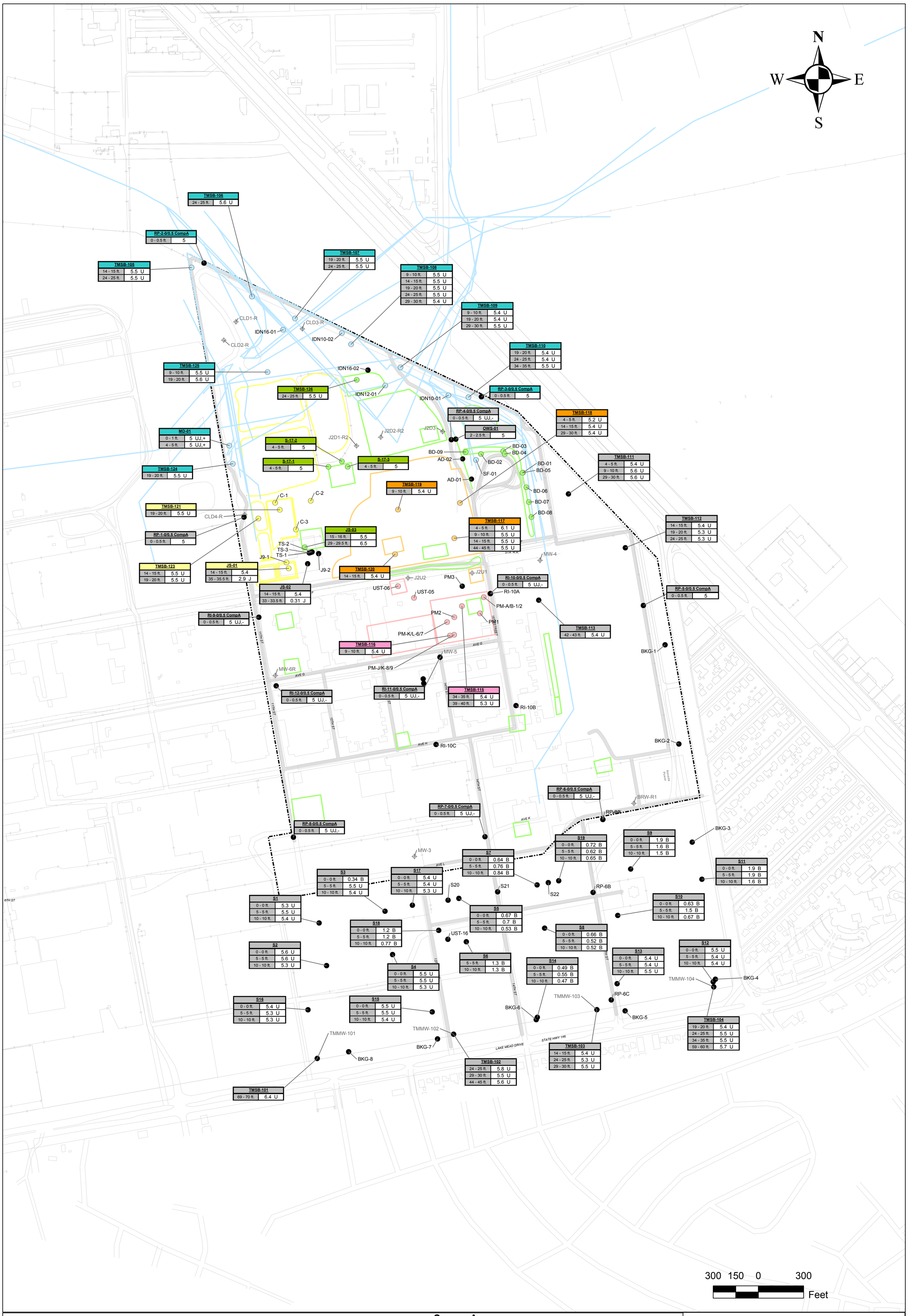
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-42
DISTRIBUTION OF TETRACHLOROETHENE IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-R\lmxd\SOIL_TETRACHLOROETHENEbig.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR TETRACHLOROETHENE IS 1300 UG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

MD-01	
0 - 1 ft.	5 UJ,+
4 - 5 ft.	5 UJ,+

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 VALUE FOR TETRACHLOROETHENE IS 60 UG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

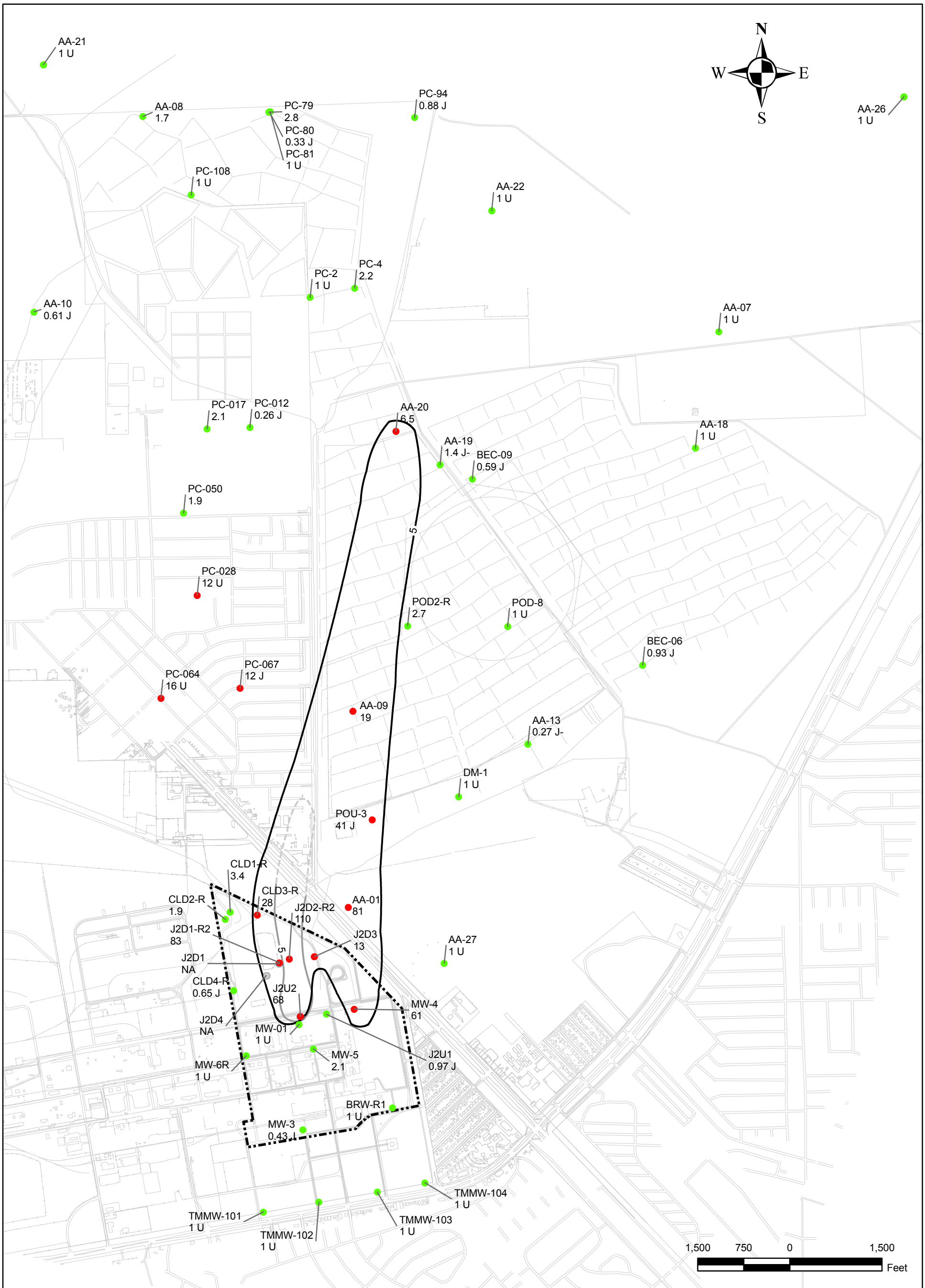
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-43
DISTRIBUTION OF TETRACHLOROETHENE IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-R\lmxd\SOIL_TETRACHLOROETHENEbig.mxd 02/05/07 michelle.handley MO



MW-3 0.43 J	●	MONITORING WELL WITH TETRACHLOROETHENE CONCENTRATION (µg/L)
J2U2 68	●	MONITORING WELL WITH TETRACHLOROETHENE CONCENTRATION EXCEEDING SCREENING LEVEL
J2D1 NA	●	WELL NOT ANALYZED
µg/L		MICROGRAM PER LITER

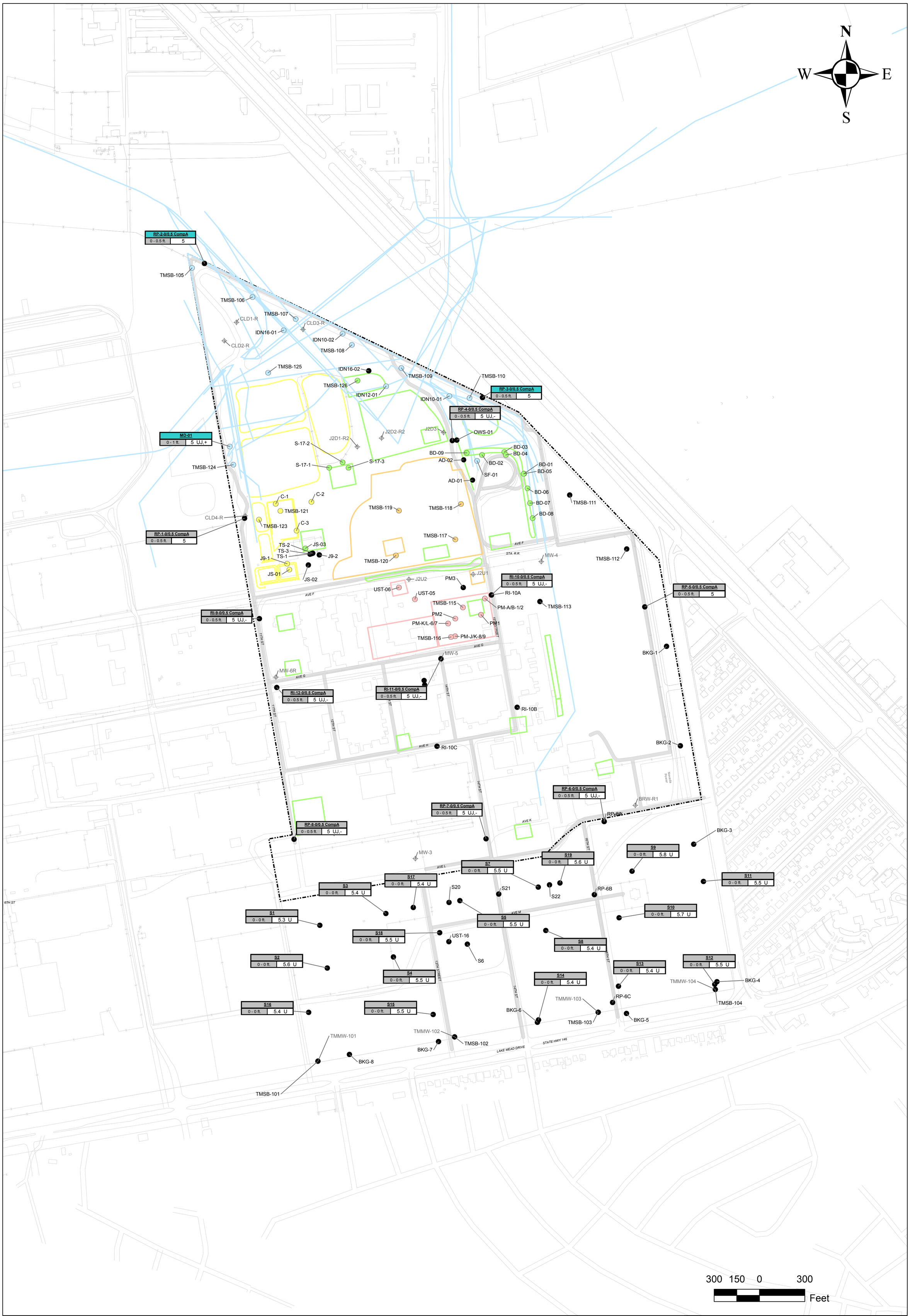
NOTES:
1. The screening level used for tetrachloroethene is the EPA National Drinking Water Standard Maximum Contaminant Level (MCL). The MCL for tetrachloroethene is 5 µg/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-44
TETRACHLOROETHENE IN GROUNDWATER SPRING 2006

TIMET

2007-02-12 :\TIMET\CSM-RI\MXD\TIMET_sitePCE.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR TRICHLOROETHENE IS 110 UG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

MD-01	
0 - 1 ft.	5 UJ,+

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 VALUE FOR TRICHLOROETHENE IS 60 UG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

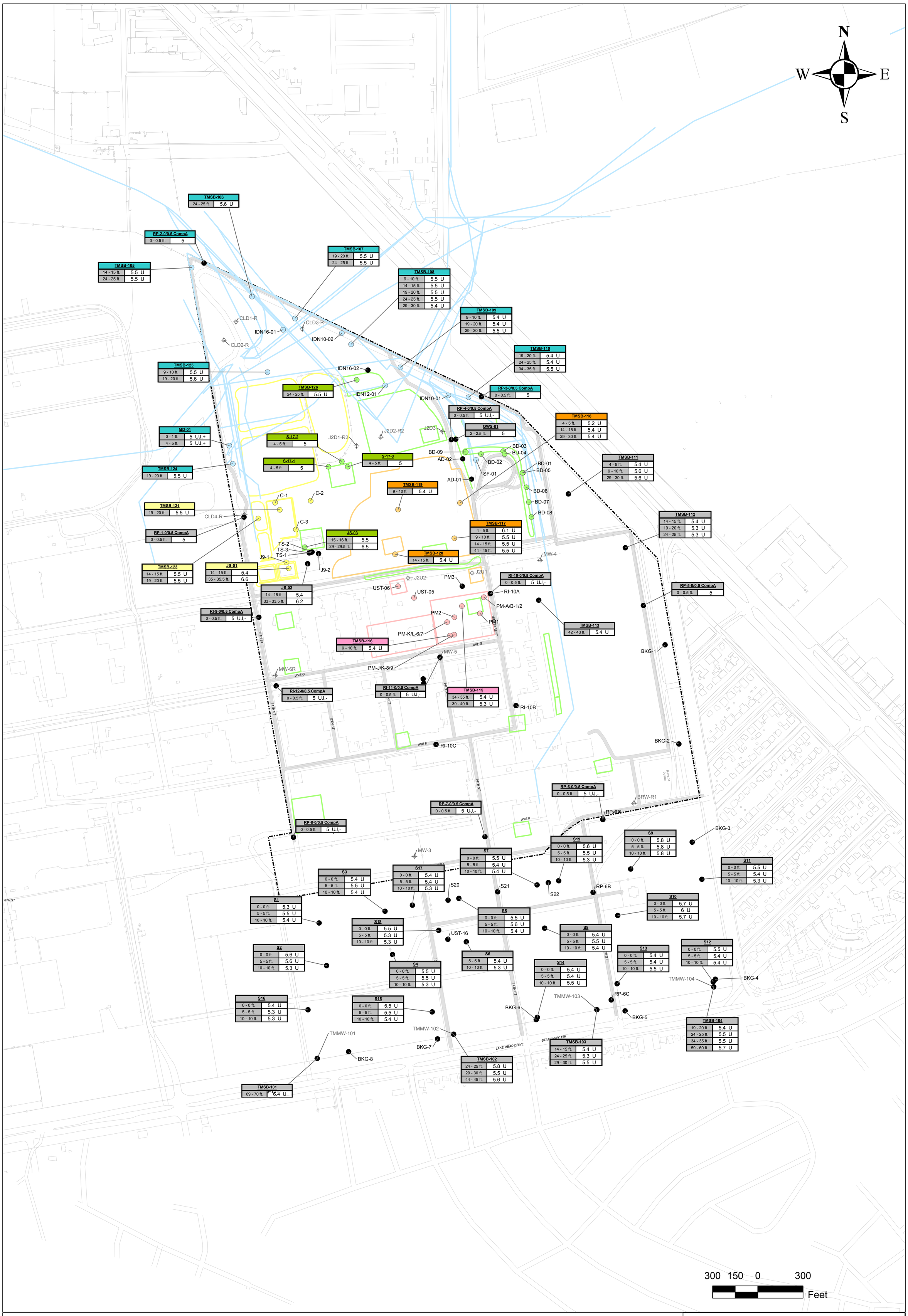
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-45
DISTRIBUTION OF TRICHLOROETHENE IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_TRICHLOROETHENEbig.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR TRICHLOROETHENE IS 110 UG/KG

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

MD-01	
0 - 1 ft.	5 UJ,+
4 - 5 ft.	5 UJ,+

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 VALUE FOR TRICHLOROETHENE IS 60 UG/KG

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

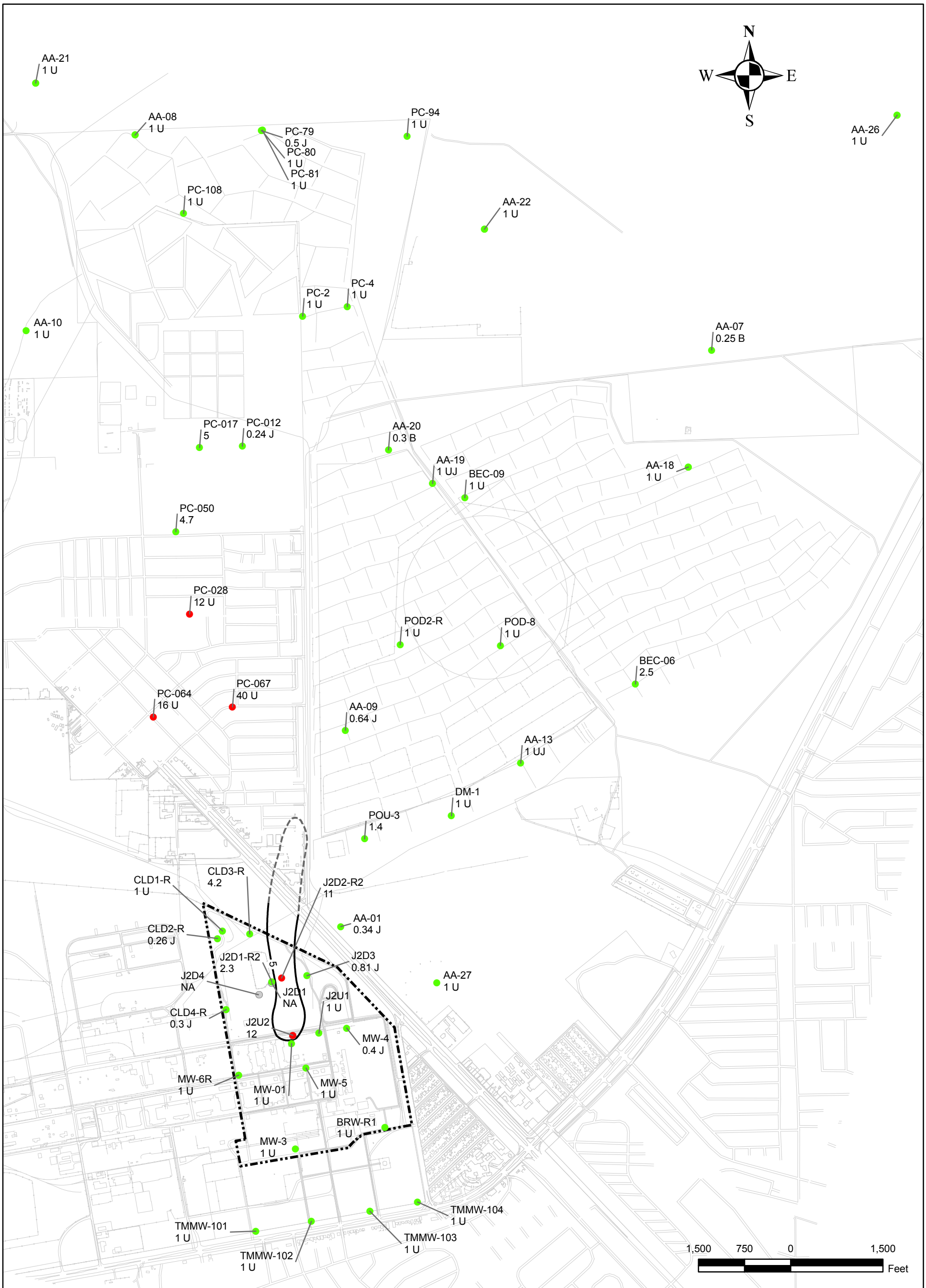
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-46
DISTRIBUTION OF TRICHLOROETHENE IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_TRICHLOROETHENEbig.mxd 02/05/07 michelle.handley MO



BRW-R1 1 U — MONITORING WELL WITH TRICHLOROETHENE CONCENTRATION (µg/L)

J2U2 12 — MONITORING WELL WITH TRICHLOROETHENE CONCENTRATION EXCEEDING SCREENING LEVEL

J2D1 NA — WELL NOT ANALYZED

µg/L — MICROGRAM PER LITER

5 — TRICHLOROETHENE CONTOUR (µg/L)

APPROXIMATE CONTOUR LOCATION

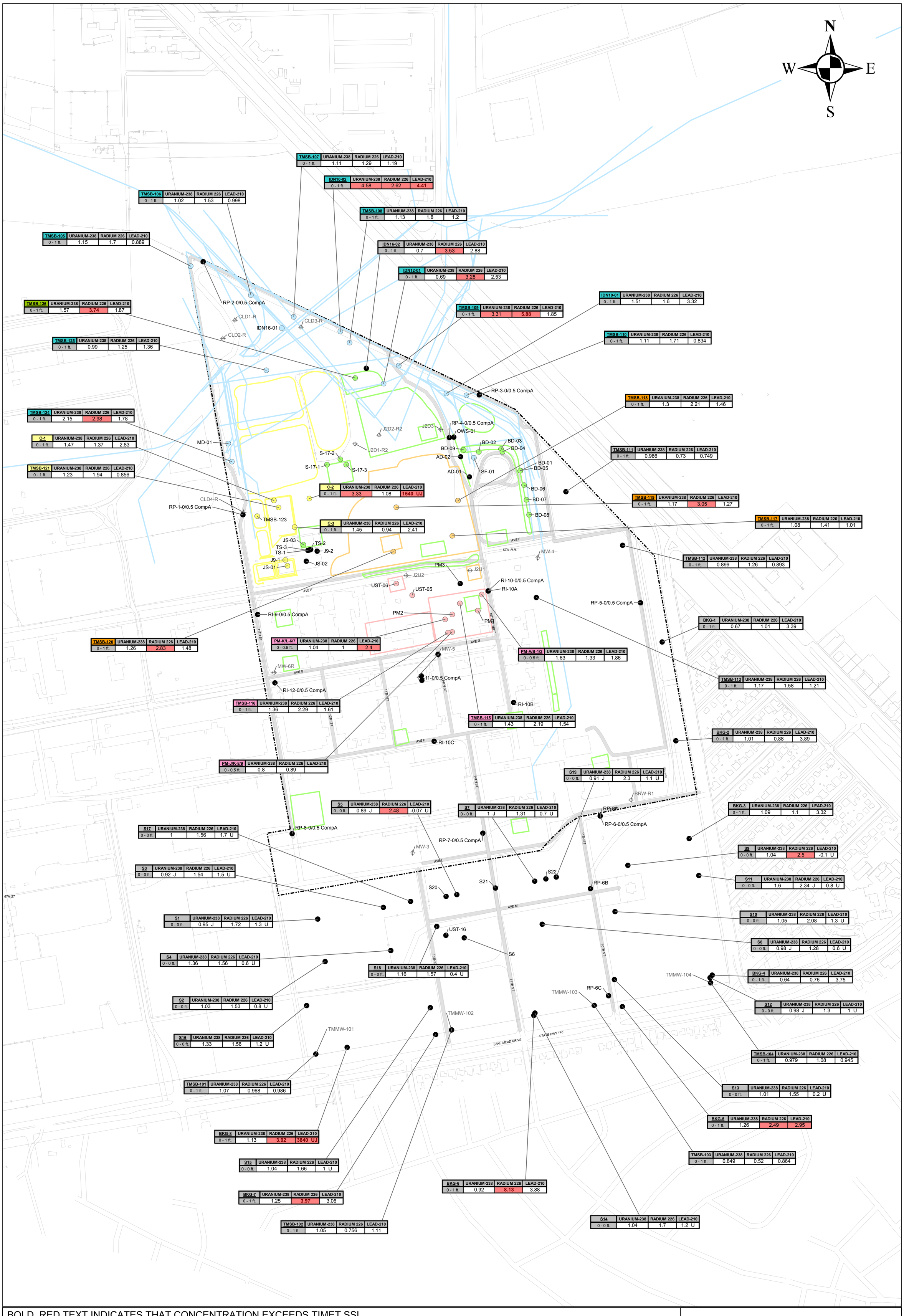
NOTES:
1. The screening level used for trichloroethene is the EPA National Drinking Water Standard Maximum Contaminant Level (MCL). The MCL for trichloroethene is 5 µg/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-47
TRICHLOROETHENE IN GROUNDWATER SPRING 2006

TIMET

2007-01-05 :\TIMETCSM-R1\MXD\TIMET_siteTCE.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR URANIUM-238 IS 36.8 PCI/G; RADIUM-226 IS 3.7 PCI/G;
LEAD-210 IS 4.19 PCI/G

TMSB-109	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	3.31	5.88	1.85

NOTE: Source for TIMET SSL is EPA Region 9 Outdoor Worker PRG.

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 FOR URANIUM-238 IS 2.37 PCI/G (BACKGROUND SUBSTITUTED), RADIUM-226 IS 2.36 PCI/G (BACKGROUND SUBSTITUTED), AND LEAD-210 IS 2.2 PCI/G (BACKGROUND SUBSTITUTED).

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

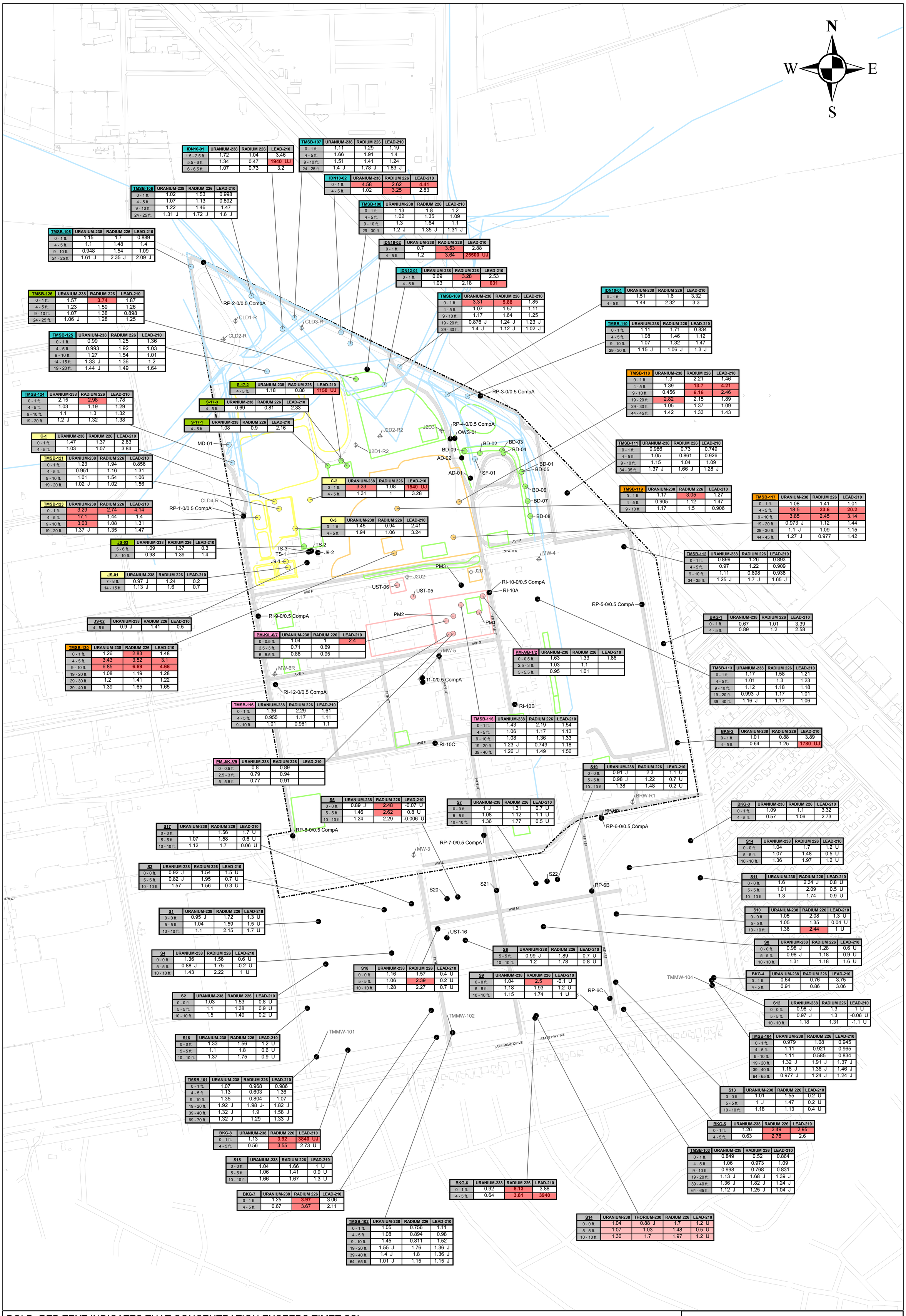
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-48
DISTRIBUTION OF URANIUM-238 DECAY SERIES IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_U-238DECAYbig.mxd 02/05/07 michelle.handley MO



IDN16-01	URANIUM-238	RADIUM 226	LEAD-210
1.5 - 2.5 ft.	1.72	1.04	3.46
5.5 - 6 ft.	1.34	0.47	1940 UJ
6 - 6.5 ft.	1.07	0.73	3.2

TMSB-107	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.11	1.29	1.19
4 - 5 ft.	1.66	1.91	1.4
9 - 10 ft.	1.51	1.41	1.24
24 - 25 ft.	1.4 J	1.78 J	1.83 J

IDN10-02	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	4.58	2.62	4.41
4 - 5 ft.	1.02	3.25	2.83

TMSB-106	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.02	1.53	0.998
4 - 5 ft.	1.07	1.13	0.892
9 - 10 ft.	1.22	1.46	1.47
24 - 25 ft.	1.31 J	1.72 J	1.6 J

TMSB-108	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.13	1.8	1.2
4 - 5 ft.	1.02	1.35	1.09
9 - 10 ft.	1.3	1.64	1.1
29 - 30 ft.	1.2 J	1.35 J	1.31 J

TMSB-105	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.15	1.7	0.889
4 - 5 ft.	1.1	1.48	1.4
9 - 10 ft.	0.948	1.54	1.09
24 - 25 ft.	1.61 J	2.35 J	2.09 J

IDN16-02	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	0.7	3.53	2.88
4 - 5 ft.	1.2	3.64	25500 UJ

IDN12-01	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	0.69	3.28	2.53
4 - 5 ft.	1.03	2.18	631

TMSB-126	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.57	3.74	1.87
4 - 5 ft.	1.23	1.59	1.26
9 - 10 ft.	1.07	1.38	0.898
24 - 25 ft.	1.06 J	1.28	1.25

TMSB-109	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	3.31	5.88	1.85
4 - 5 ft.	1.07	1.57	1.11
9 - 10 ft.	1.17	1.64	1.25
19 - 20 ft.	0.876 J	1.24 J	1.23 J
29 - 30 ft.	1.4 J	1.12 J	1.02 J

IDN10-01	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.51	1.6	3.32
4 - 5 ft.	1.44	2.32	3.3

TMSB-125	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	0.99	1.25	1.36
4 - 5 ft.	0.993	1.92	1.03
9 - 10 ft.	1.27	1.54	1.01
14 - 15 ft.	1.33 J	1.36	1.2
19 - 20 ft.	1.44 J	1.49	1.64

TMSB-110	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.11	1.71	0.834
4 - 5 ft.	1.08	1.46	1.12
9 - 10 ft.	1.07	1.32	1.47
29 - 30 ft.	1.15 J	1.06 J	1.3 J

TMSB-118	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.3	2.21	1.46
4 - 5 ft.	1.39	13.7	4.21
9 - 10 ft.	0.456	6.16	2.46
19 - 20 ft.	2.82	2.15	1.89
29 - 30 ft.	1.05	1.37	1.09
44 - 45 ft.	1.42	1.33	1.43

S-17-2	URANIUM-238	RADIUM 226	LEAD-210
4 - 5 ft.	1.18	0.86	1150 UJ

S-17-3	URANIUM-238	RADIUM 226	LEAD-210
4 - 5 ft.	0.69	0.81	2.33

S-17-1	URANIUM-238	RADIUM 226	LEAD-210
4 - 5 ft.	1.08	0.9	2.16

TMSB-124	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	2.15	2.98	1.78
4 - 5 ft.	1.03	1.19	1.29
9 - 10 ft.	1.1	1.3	1.32
19 - 20 ft.	1.2 J	1.32	1.38

C-1	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.47	1.37	2.83
4 - 5 ft.	1.03	1.07	3.84

TMSB-111	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	0.986	0.73	0.749
4 - 5 ft.	1.05	0.861	0.926
9 - 10 ft.	1.15	1.04	1.09
34 - 35 ft.	1.37 J	1.66 J	1.28 J

TMSB-121	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.23	1.94	0.856
4 - 5 ft.	0.951	1.16	1.31
9 - 10 ft.	1.01	1.54	1.06
19 - 20 ft.	1.02 J	1.02	1.56

C-2	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	3.33	1.08	1540 UJ
4 - 5 ft.	1.31	1	3.28

TMSB-119	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.17	3.05	1.27
4 - 5 ft.	0.905	1.12	1.47
9 - 10 ft.	1.17	1.5	0.906

TMSB-117	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.08	1.41	1.01
4 - 5 ft.	18.5	23.6	20.2
9 - 10 ft.	3.85	2.45	3.14
19 - 20 ft.	0.973 J	1.12	1.44
29 - 30 ft.	1.1 J	1.09	1.15
44 - 45 ft.	1.27 J	0.977	1.42

TMSB-123	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	3.29	2.74	4.14
4 - 5 ft.	17.1	1.44	1.4
9 - 10 ft.	3.03	1.08	1.31
19 - 20 ft.	1.37 J	1.35	1.47

C-3	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.45	0.94	2.41
4 - 5 ft.	1.94	1.06	3.24

JS-03	URANIUM-238	RADIUM 226	LEAD-210
5 - 6 ft.	1.09	1.37	0.3
8 - 10 ft.	0.98	1.39	1.4

TMSB-112	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	0.899	1.26	0.893
4 - 5 ft.	0.97	1.22	0.909
9 - 10 ft.	1.11	0.898	0.938
34 - 35 ft.	1.25 J	1.7 J	1.65 J

JS-01	URANIUM-238	RADIUM 226	LEAD-210
7 - 8 ft.	0.97 J	1.24	0.2
14 - 15 ft.	1.13 J	1.6	0.7

JS-02	URANIUM-238	RADIUM 226	LEAD-210
4 - 5 ft.	0.9 J	1.41	0.5

BKG-1	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	0.67	1.01	3.39
4 - 5 ft.	0.89	1.2	2.58

PM-K/L-6/7	URANIUM-238	RADIUM 226	LEAD-210
0 - 0.5 ft.	1.04	1	2.4
2.5 - 3 ft.	0.71	0.69	
5 - 5.5 ft.	0.88	0.95	

TMSB-120	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.26	2.83	1.48
4 - 5 ft.	3.43	3.52	3.1
9 - 10 ft.	6.85	6.69	4.66
19 - 20 ft.	1.08	1.19	1.28
29 - 30 ft.	1.2	1.41	1.22
39 - 40 ft.	1.39	1.65	1.65

PM-A/B-1/2	URANIUM-238	RADIUM 226	LEAD-210
0 - 0.5 ft.	1.63	1.33	1.86
2.5 - 3 ft.	1.03	1.1	
5 - 5.5 ft.	0.95	1.01	

TMSB-113	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.17	1.58	1.21
4 - 5 ft.	1.01	1.3	1.23
9 - 10 ft.	1.12	1.18	1.18
19 - 20 ft.	0.993 J	1.17	1.01
39 - 40 ft.	1.16 J	1.17	1.06

TMSB-116	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.36	2.29	1.61
4 - 5 ft.	0.955	1.17	1.11
9 - 10 ft.	1.01	0.961	1.1

TMSB-115	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.43	2.19	1.54
4 - 5 ft.	1.06	1.17	1.13
9 - 10 ft.	1.08	1.36	1.33
19 - 20 ft.	1.23 J	0.749	1.18
39 - 40 ft.	1.26 J	1.49	1.56

BKG-2	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.01	0.88	3.89
4 - 5 ft.	0.64	1.25	1780 UJ

PM-J/K-8/9	URANIUM-238	RADIUM 226	LEAD-210
0 - 0.5 ft.	0.8	0.89	
2.5 - 3 ft.	0.79	0.94	
5 - 5.5 ft.	0.77	0.91	

S19	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	0.91 J	2.3	1.1 U
5 - 5 ft.	0.98 J	1.22	0.7 U
10 - 10 ft.	1.38	1.48	0.2 U

S5	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	0.89 J	2.48	-0.07 U
5 - 5 ft.	1.46	2.62	0.8 U
10 - 10 ft.	1.24	2.29	-0.006 U

S7	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	1 J	1.31	0.7 U
5 - 5 ft.	1.08	1.12	1.1 U
10 - 10 ft.	1.36	1.77	0.5 U

BKG-3	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.09	1.1	3.32
4 - 5 ft.	0.57	1.06	2.73

S17	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	1	1.56	1.7 U
5 - 5 ft.	1.07	1.58	0.6 U
10 - 10 ft.	1.12	1.7	0.06 U

S14	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	1.04	1.7	1.2 U
5 - 5 ft.	1.07	1.48	0.5 U
10 - 10 ft.	1.36	1.97	1.2 U

S3	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	0.92 J	1.54	1.5 U
5 - 5 ft.	0.82 J	1.95	0.7 U
10 - 10 ft.	1.57	1.56	0.3 U

S11	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	1.6	2.34 J	0.8 U
5 - 5 ft.	1.01	2.09	0.5 U
10 - 10 ft.	1.3	1.74	0.9 U

S1	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	0.95 J	1.72	1.3 U
5 - 5 ft.	1.04	1.59	1.5 U
10 - 10 ft.	1.1	2.15	1.7 U

S10	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	1.05	2.08	1.3 U
5 - 5 ft.	1.05	1.35	0.04 U
10 - 10 ft.	1.36	2.44	1 U

S8	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	0.98 J	1.28	0.6 U
5 - 5 ft.	0.98 J	1.18	0.9 U
10 - 10 ft.	1.31	1.18	1.6 U

S4	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	1.36	1.56	0.6 U
5 - 5 ft.	0.88 J	1.75	-0.2 U
10 - 10 ft.	1.43	2.22	1 U

S6	URANIUM-238	RADIUM 226	LEAD-210
5 - 5 ft.	0.99 J	1.89	0.7 U
10 - 10 ft.	1.2	1.78	0.8 U

S18	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	1.16	1.57	0.4 U
5 - 5 ft.	1.06	2.39	0.2 U
10 - 10 ft.	1.28	2.27	0.7 U

S9	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	1.04	2.5	-0.1 U
5 - 5 ft.	1.18	1.93	1.2 U
10 - 10 ft.	1.15	1.74	1 U

BKG-4	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	0.64	0.76	3.75
4 - 5 ft.	0.91	0.86	3.06

S2	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	1.03	1.53	0.8 U
5 - 5 ft.	1.1	1.38	0.9 U
10 - 10 ft.	1.5	1.49	0.2 U

S12	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	0.98 J	1.3	1 U
5 - 5 ft.	0.97 J	1.3	-0.06 U
10 - 10 ft.	1.18	1.31	-1.1 U

S16	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	1.33	1.56	1.2 U
5 - 5 ft.	1.1	1.8	0.6 U
10 - 10 ft.	1.37	1.75	0.9 U

TMSB-104	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	0.979	1.08	0.945
4 - 5 ft.	1.11	0.921	0.965
9 - 10 ft.	1.11	0.585	0.834
19 - 20 ft.	1.32 J	1.91 J	1.37 J
39 - 40 ft.	1.18 J	1.36 J	1.46 J
64 - 65 ft.	0.977 J	1.24 J	1.24 J

TMSB-101	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.07	0.968	0.986
4 - 5 ft.	1.13	0.603	1.36
9 - 10 ft.	1.35	0.804	1.07
19 - 20 ft.	1.92 J	1.98 J-	1.82 J
39 - 40 ft.	1.32 J	1.9	1.58 J
69 - 70 ft.	1.32 J	1.29	1.33 J

S13	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	1.01	1.55	0.2 U
5 - 5 ft.	1 J	1.47	0.2 U
10 - 10 ft.	1.18	1.13	0.4 U

BKG-8	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.13	3.92	3840 UJ
4 - 5 ft.	0.56	3.55	2.73 U

BKG-5	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.26	2.49	2.95
4 - 5 ft.	0.63	2.78	2.6

TMSB-103	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	0.849	0.52	0.864
4 - 5 ft.	1.06	0.973	1.09
9 - 10 ft.	0.998	0.768	0.831
19 - 20 ft.	1.13 J	1.68 J	1.39 J
39 - 40 ft.	1.36 J	1.82 J	1.24 J
64 - 65 ft.	1.12 J	1.25 J	1.04 J

S15	URANIUM-238	RADIUM 226	LEAD-210
0 - 0 ft.	1.04	1.66	1 U
5 - 5 ft.	1.06	1.41	0.9 U
10 - 10 ft.	1.66	1.67	1.3 U

BKG-7	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.25	3.97	3.06
4 - 5 ft.	0.67	3.67	2.11

BKG-6	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	0.92	8.13	3.88
4 - 5 ft.	0.64	3.81	3940

TMSB-102	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	1.05	0.756	1.11
4 - 5 ft.	1.08	0.894	0.98
9 - 10 ft.	1.45	0.811	1.52
19 - 20 ft.	1.55 J	1.76	1.36 J
39 - 40 ft.	1.4 J	1.8	1.36 J
64 - 65 ft.	1.01 J	1.15	1.15 J

S14	URANIUM-238	THORIUM-230	RADIUM 226	LEAD-210
0 - 0 ft.	1.04	0.88 J	1.7	1.2 U
5 - 5 ft.	1.07	1.03	1.48	0.5 U
10 - 10 ft.	1.36	1.7	1.97	1.2 U

BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR URANIUM-238 IS 36.8 PCI/G; RADIUM-226 IS 3.7 PCI/G;
LEAD-210 IS 4.19 PCI/G

IDN12-01	URANIUM-238	RADIUM 226	LEAD-210
0 - 1 ft.	0.69	3.28	2.53
4 - 5 ft.	1.03	2.18	631

NOTE: Source for TIMET SSL is EPA Region 9 Outdoor Worker PRG.

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF20 FOR URANIUM-238 IS 2.37 PCI/G (BACKGROUND SUBSTITUTED), RADIUM-226 IS 2.36 PCI/G (BACKGROUND SUBSTITUTED), AND LEAD-210 IS 2.2 PCI/G (BACKGROUND SUBSTITUTED).

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

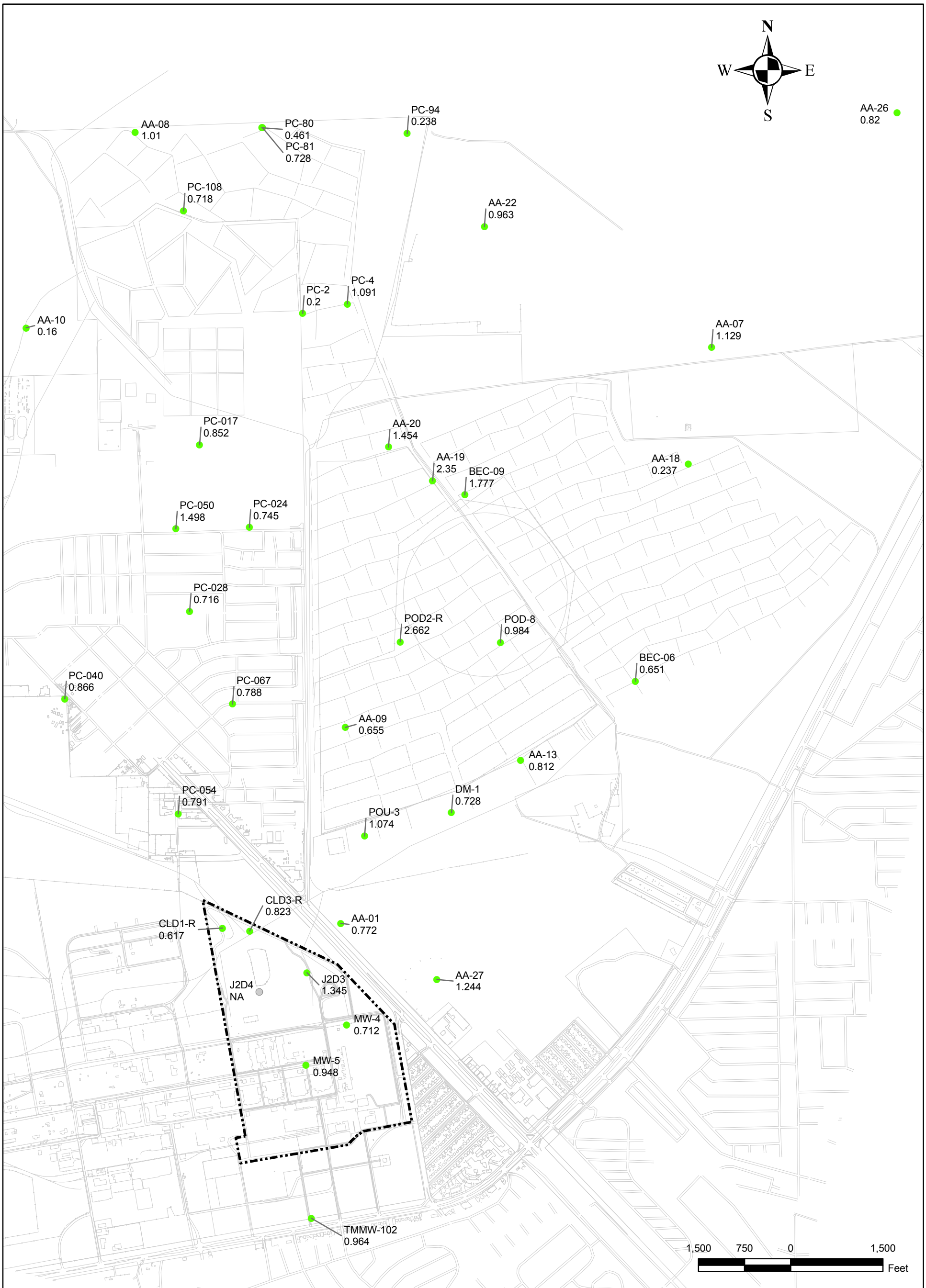
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-49
DISTRIBUTION OF URANIUM-238 DECAY SERIES IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_U-238DECAY\big.mxd 02/05/07 michelle.handley MO



MW-5 0.948 — MONITORING WELL WITH COMBINED RADIUM-226 AND RADIUM-228 CONCENTRATION (pCi/L)

J2D4 NA — WELL NOT ANALYZED

pCi/L — PICOCURIE PER LITER

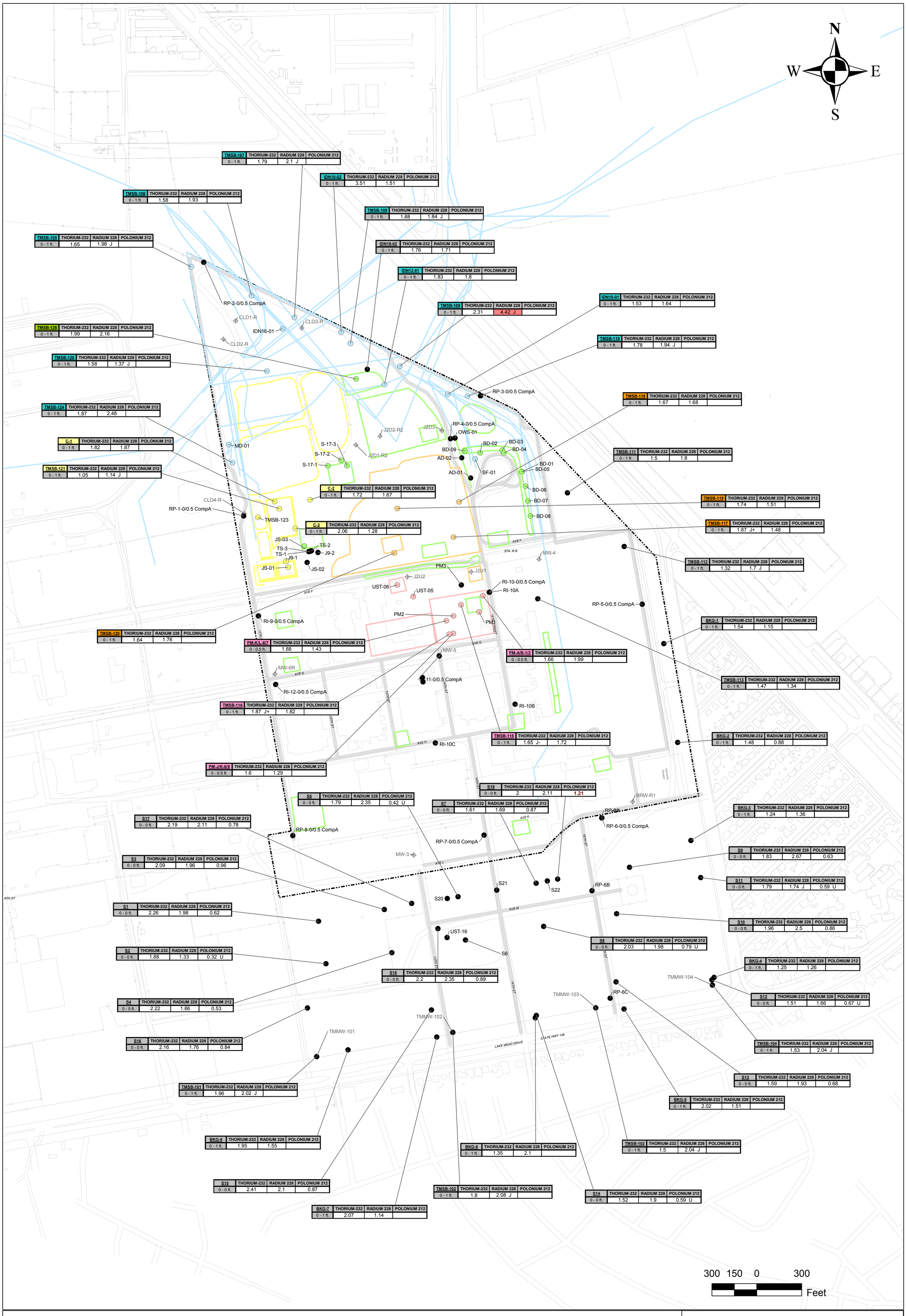
NOTES:
1. The screening level used for combined radium is the EPA National Drinking Water Standard Maximum Contaminant Level (MCL). The MCL for combined radium is 5 pCi/L.
2. Qualifiers are defined in Table 3 of Data Validation Summary Report.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-50
COMBINED RADIUM-226 AND RADIUM-228 IN GROUNDWATER
SPRING 2006

TIMET

2007-01-05 :\TIMET\CSM-R\MXD\TIMET_siteRAD.mxd TTEMI-MO michelle.handley



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR THORIUM-232 IS 19 PCI/G; RADIUM-228 IS 8.4 PCI/G; POLONIUM-212 IS 1.17 PCI/G (BACKGROUND SUBSTITUTED).

S19	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	2	2.11	**1.21**

NOTE: Source for TIMET SSL is EPA Region 9 Outdoor Worker PRG.

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20. DAF20 FOR THORIUM-232 IS 6.06 PCI/G; RADIUM-228 IS 2.94 PCI/G (BACKGROUND SUBSTITUTED); THERE IS NO DAF20 VALUE FOR POLONIUM-212.

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

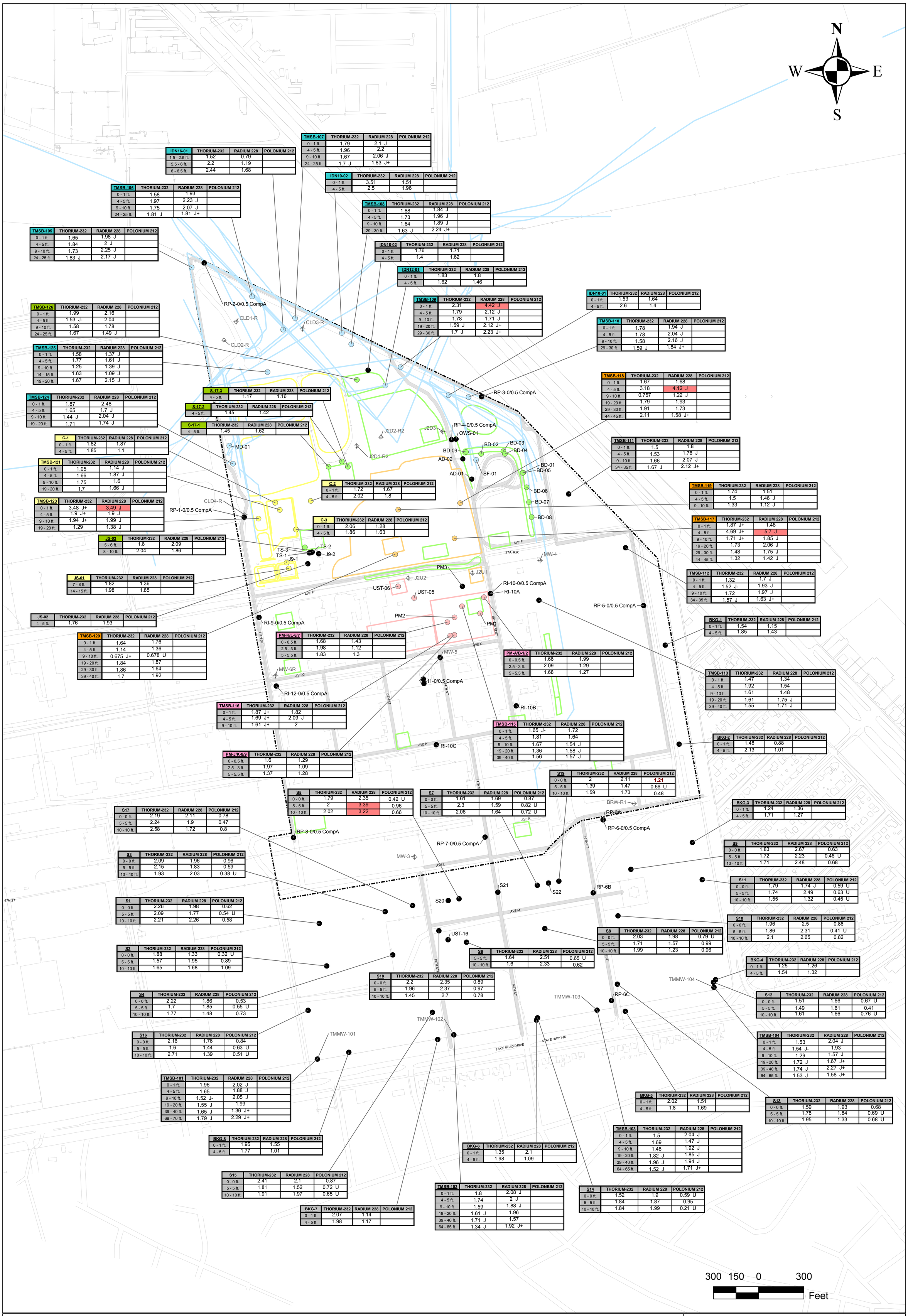
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-51
DISTRIBUTION OF THORIUM-232 DECAY SERIES IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_TH-232DECAYbig.mxd 02/05/07 michelle.handley MO



TMSB-126	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.99	2.16	
4 - 5 ft.	1.53 J-	2.04	
9 - 10 ft.	1.58	1.78	
24 - 25 ft.	1.67	1.49 J	

TMSB-125	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.58	1.37 J	
4 - 5 ft.	1.77	1.61 J	
9 - 10 ft.	1.25	1.39 J	
14 - 15 ft.	1.63	1.09 J	
19 - 20 ft.	1.67	2.15 J	

TMSB-124	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.87	2.48	
4 - 5 ft.	1.65	1.7 J	
9 - 10 ft.	1.44 J	2.04 J	
19 - 20 ft.	1.71	1.74 J	

C-1	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.82	1.87	
4 - 5 ft.	1.85	1.1	

TMSB-121	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.05	1.14 J	
4 - 5 ft.	1.66	1.87 J	
9 - 10 ft.	1.75	1.6	
19 - 20 ft.	1.7	1.66 J	

TMSB-123	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	3.48 J+	3.49 J	
4 - 5 ft.	1.9 J+	1.9 J	
9 - 10 ft.	1.94 J+	1.99 J	
19 - 20 ft.	1.29	1.38 J	

JS-03	THORIUM-232	RADIUM 228	POLONIUM 212
5 - 6 ft.	1.8	2.09	
8 - 10 ft.	2.04	1.86	

JS-01	THORIUM-232	RADIUM 228	POLONIUM 212
7 - 8 ft.	1.82	1.36	
14 - 15 ft.	1.98	1.85	

JS-02	THORIUM-232	RADIUM 228	POLONIUM 212
4 - 5 ft.	1.76	1.93	

TMSB-120	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.64	1.76	
4 - 5 ft.	1.14	1.36	
9 - 10 ft.	0.675 J+	0.678 U	
19 - 20 ft.	1.84	1.87	
29 - 30 ft.	1.86	1.64	
39 - 40 ft.	1.7	1.92	

TMSB-116	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.87 J+	1.82	
4 - 5 ft.	1.69 J+	2.09 J	
9 - 10 ft.	1.61 J+	2	

PM-J/K-8/9	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0.5 ft.	1.6	1.29	
2.5 - 3 ft.	1.97	1.09	
5 - 5.5 ft.	1.37	1.28	

S17-3	THORIUM-232	RADIUM 228	POLONIUM 212
4 - 5 ft.	1.17	1.16	

S17-2	THORIUM-232	RADIUM 228	POLONIUM 212
4 - 5 ft.	1.45	1.42	

S17-1	THORIUM-232	RADIUM 228	POLONIUM 212
4 - 5 ft.	1.45	1.62	

C-2	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.72	1.67	
4 - 5 ft.	2.02	1.8	

C-3	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	2.06	1.28	
4 - 5 ft.	1.86	1.63	

PM-K/L-6/7	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0.5 ft.	1.68	1.43	
2.5 - 3 ft.	1.98	1.12	
5 - 5.5 ft.	1.83	1.3	

PM-A/B-1/2	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0.5 ft.	1.66	1.99	
2.5 - 3 ft.	2.09	1.29	
5 - 5.5 ft.	1.68	1.27	

TMSB-115	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.65 J-	1.72	
4 - 5 ft.	1.81	1.64	
9 - 10 ft.	1.67	1.54 J	
19 - 20 ft.	1.36	1.58 J	
39 - 40 ft.	1.56	1.57 J	

S19	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	2	2.11	1.21
5 - 5 ft.	1.39	1.47	0.66 U
10 - 10 ft.	1.59	1.73	0.48

S5	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	1.79	2.35	0.42 U
5 - 5 ft.	2	3.39	0.96
10 - 10 ft.	2.02	3.22	0.66

S7	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	1.61	1.69	0.87
5 - 5 ft.	2.3	1.59	0.82 U
10 - 10 ft.	2.06	1.64	0.72 U

S17	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	2.19	2.11	0.78
5 - 5 ft.	2.24	1.9	0.47
10 - 10 ft.	2.58	1.72	0.8

S3	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	2.09	1.96	0.96
5 - 5 ft.	2.15	1.83	0.59
10 - 10 ft.	1.93	2.03	0.38 U

S1	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	2.26	1.98	0.62
5 - 5 ft.	2.09	1.77	0.54 U
10 - 10 ft.	2.21	2.26	0.58

S2	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	1.88	1.33	0.32 U
5 - 5 ft.	1.57	1.95	0.89
10 - 10 ft.	1.65	1.68	1.09

S4	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	2.22	1.86	0.53
5 - 5 ft.	1.7	1.85	0.55 U
10 - 10 ft.	1.77	1.48	0.73

S16	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	2.16	1.76	0.84
5 - 5 ft.	1.6	1.44	0.63 U
10 - 10 ft.	2.71	1.39	0.51 U

TMSB-101	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.96	2.02 J	
4 - 5 ft.	1.65	1.88 J	
9 - 10 ft.	1.52 J-	2.05 J	
19 - 20 ft.	1.55 J	1.99	
39 - 40 ft.	1.65 J	1.36 J+	
69 - 70 ft.	1.79 J	2.29 J+	

BKG-8	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.95	1.55	
4 - 5 ft.	1.77	1.01	

S15	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	2.41	2.1	0.87
5 - 5 ft.	1.81	1.52	0.72 U
10 - 10 ft.	1.91	1.97	0.65 U

BKG-7	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	2.07	1.14	
4 - 5 ft.	1.98	1.17	

S6	THORIUM-232	RADIUM 228	POLONIUM 212
5 - 5 ft.	1.64	2.51	0.65 U
10 - 10 ft.	1.6	2.33	0.62

S18	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	2.2	2.35	0.89
5 - 5 ft.	1.96	2.37	0.97
10 - 10 ft.	1.45	2.7	0.78

TMSB-102	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.8	2.08 J	
4 - 5 ft.	1.74	2 J	
9 - 10 ft.	1.59	1.88 J	
19 - 20 ft.	1.61 J	1.96	
39 - 40 ft.	1.71 J	1.57	
64 - 65 ft.	1.34 J	1.92 J+	

BKG-6	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.35	2.1	
4 - 5 ft.	1.98	1.09	

S8	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	2.03	1.98	0.79 U
5 - 5 ft.	1.71	1.57	0.99
10 - 10 ft.	1.99	1.23	0.96

S14	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	1.52	1.9	0.59 U
5 - 5 ft.	1.84	1.87	0.95
10 - 10 ft.	1.84	1.99	0.21 U

TMSB-103	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.5	2.04 J	
4 - 5 ft.	1.69	1.47 J	
9 - 10 ft.	1.48	1.92 J	
19 - 20 ft.	1.82 J	1.85 J	
39 - 40 ft.	1.96 J	1.94 J	
64 - 65 ft.	1.52 J	1.71 J+	

BKG-5	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	2.02	1.51	
4 - 5 ft.	1.8	1.69	

TMSB-104	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.53	2.04 J	
4 - 5 ft.	1.54 J-	1.93	
9 - 10 ft.	1.29	1.57 J	
19 - 20 ft.	1.72 J	1.67 J+	
39 - 40 ft.	1.74 J	2.27 J+	
64 - 65 ft.	1.53 J	1.58 J+	

S13	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	1.59	1.93	0.68
5 - 5 ft.	1.78	1.84	0.69 U
10 - 10 ft.	1.95	1.33	0.68 U

S12	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	1.51	1.66	0.67 U
5 - 5 ft.	1.49	1.61	0.41
10 - 10 ft.	1.61	1.66	0.76 U

BKG-4	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.25	1.26	
4 - 5 ft.	1.54	1.32	

S10	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	1.96	2.5	0.86
5 - 5 ft.	1.86	2.31	0.41 U
10 - 10 ft.	2.1	2.65	0.82

S11	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	1.79	1.74 J	0.59 U
5 - 5 ft.	1.74	2.49	0.63 U
10 - 10 ft.	1.55	1.32	0.45 U

S9	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	1.83	2.67	0.63
5 - 5 ft.	1.72	2.23	0.46 U
10 - 10 ft.	1.71	2.48	0.68

BKG-3	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.24	1.36	
4 - 5 ft.	1.71	1.27	

BKG-2	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.48	0.88	
4 - 5 ft.	2.13	1.01	

BKG-1	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.54	1.15	
4 - 5 ft.	1.85	1.43	

TMSB-113	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.47	1.34	
4 - 5 ft.	1.92	1.54	
9 - 10 ft.	1.61	1.48	
19 - 20 ft.	1.61	1.75 J	
39 - 40 ft.	1.55	1.71 J	

TMSB-112	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.32	1.7 J	
4 - 5 ft.	1.52 J-	1.93 J	
9 - 10 ft.	1.72	1.97 J	
34 - 35 ft.	1.57 J	1.63 J+	

TMSB-117	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.87 J+	1.48	
4 - 5 ft.	4.69 J+	5.7 J	
9 - 10 ft.	1.71 J+	1.85 J	
19 - 20 ft.	1.73	2.06 J	
29 - 30 ft.	1.48	1.75 J	
44 - 45 ft.	1.32	1.42 J	

TMSB-119	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.74	1.51	
4 - 5 ft.	1.5	1.46 J	
9 - 10 ft.	1.33	1.12 J	

TMSB-111	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.5	1.8	
4 - 5 ft.	1.53	1.76 J	
9 - 10 ft.	1.66	2.07 J	
34 - 35 ft.	1.67 J	2.12 J+	

TMSB-118	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.67	1.68	
4 - 5 ft.	3.18	4.12 J	
9 - 10 ft.	0.757	1.22 J	
19 - 20 ft.	1.79	1.93	
29 - 30 ft.	1.91	1.73	
44 - 45 ft.	2.11	1.58 J+	

TMSB-110	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.78	1.94 J	
4 - 5 ft.	1.78	2.04 J	
9 - 10 ft.	1.58	2.16 J	
29 - 30 ft.	1.59 J	1.84 J+	

IDN10-01	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.53	1.64	
4 - 5 ft.	2.6	1.4	

TMSB-109	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	2.31	4.42 J	
4 - 5 ft.	1.79	2.12 J	
9 - 10 ft.	1.78	1.71 J	
19 - 20 ft.	1.59 J	2.12 J+	
29 - 30 ft.	1.7 J	2.23 J+	

IDN12-01	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.83	1.8	
4 - 5 ft.	1.62	1.46	

IDN16-02	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.76	1.71	
4 - 5 ft.	1.4	1.62	

TMSB-108	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.88	1.84 J	
4 - 5 ft.	1.73	1.96 J	
9 - 10 ft.	1.64	1.89 J	
29 - 30 ft.	1.63 J	2.24 J+	

IDN10-02	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	3.51	1.51	
4 - 5 ft.	2.5	1.96	

TMSB-107	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.79	2.1 J	
4 - 5 ft.	1.96	2.2	
9 - 10 ft.	1.67	2.06 J	
24 - 25 ft.	1.7 J	1.83 J+	

IDN16-01	THORIUM-232	RADIUM 228	POLONIUM 212
1.5 - 2.5 ft.	1.52	0.79	
5.5 - 6 ft.	2.2	1.19	
6 - 6.5 ft.	2.44	1.68	

TMSB-106	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.58	1.93	
4 - 5 ft.	1.97	2.23 J	
9 - 10 ft.	1.75	2.07 J	
24 - 25 ft.	1.81 J	1.81 J+	

TMSB-105	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 1 ft.	1.65	1.98 J	
4 - 5 ft.	1.84	2 J	
9 - 10 ft.	1.73	2.25 J	
24 - 25 ft.	1.83 J	2.17 J	

BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR THORIUM-232 IS 19 PCI/G; RADIUM-228 IS 8.4 PCI/G; POLONIUM-212 IS 1.17 PCI/G (BACKGROUND SUBSTITUTED).

S19	THORIUM-232	RADIUM 228	POLONIUM 212
0 - 0 ft.	2	2.11	1.21
5 - 5 ft.	1.39	1.47	0.66 U
10 - 10 ft.	1.59	1.73	0.48

NOTE: Source for TIMET SSL is EPA Region 9 Outdoor Worker PRG.

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20. DAF20 FOR THORIUM-232 IS 6.06 PCI/G; RADIUM-228 IS 2.94 PCI/G (BACKGROUND SUBSTITUTED); THERE IS NO DAF20 VALUE FOR POLONIUM-212.

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-52
DISTRIBUTION OF THORIUM-232 DECAY SERIES IN SUBSURFACE SOIL

TIMET

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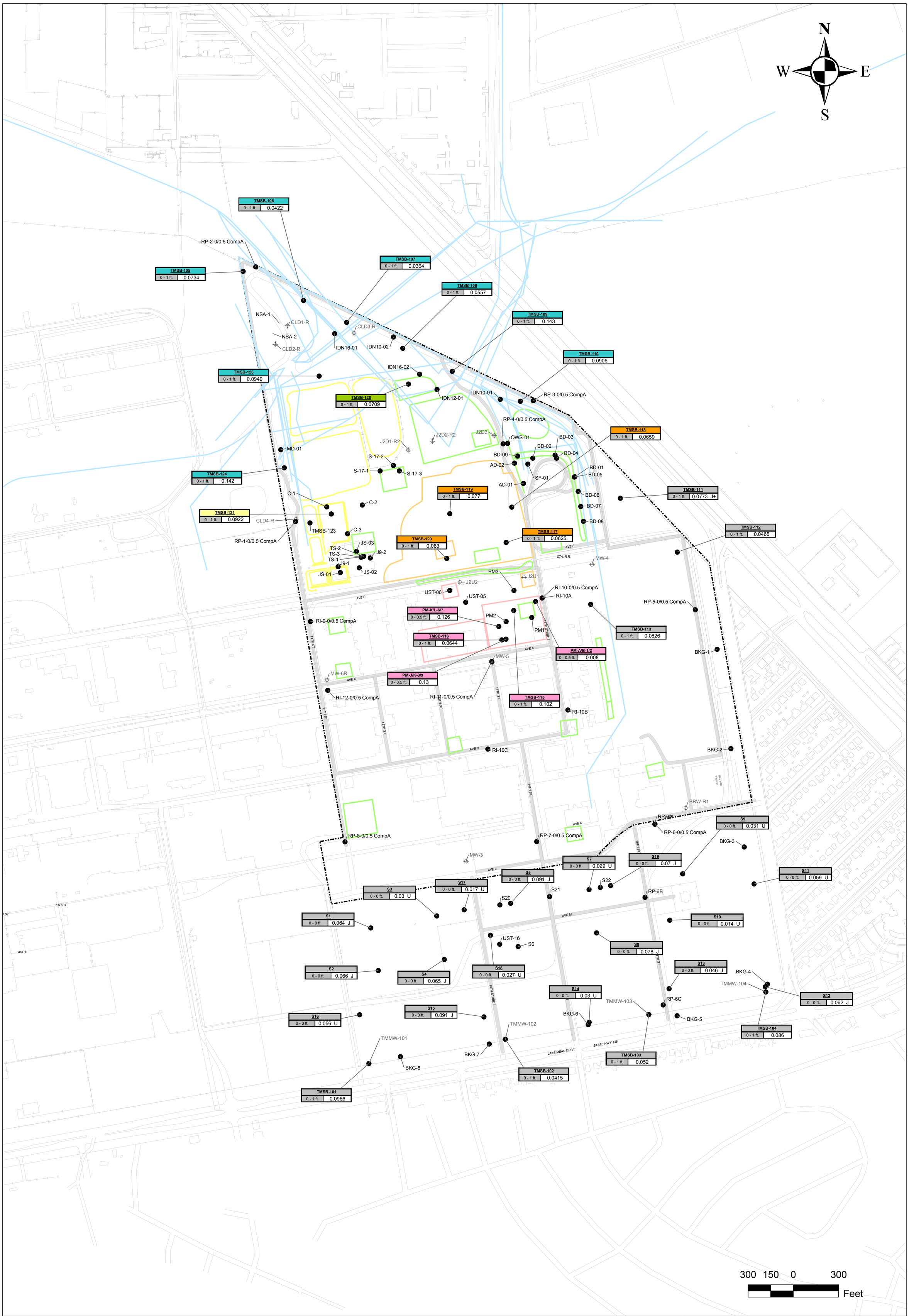

BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR URANIUM 235 IS 0.417 PCI/G

NOTE: Source for TIMET SSL is EPA Region 9 Outdoor Worker PRG.

TMSB-115	
0 - 1 ft.	0.102

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF 20 VALUE FOR URANIUM 235 IS 0.777 PCI/G

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-53
DISTRIBUTION OF URANIUM 235
IN SHALLOW SOIL

TIMET

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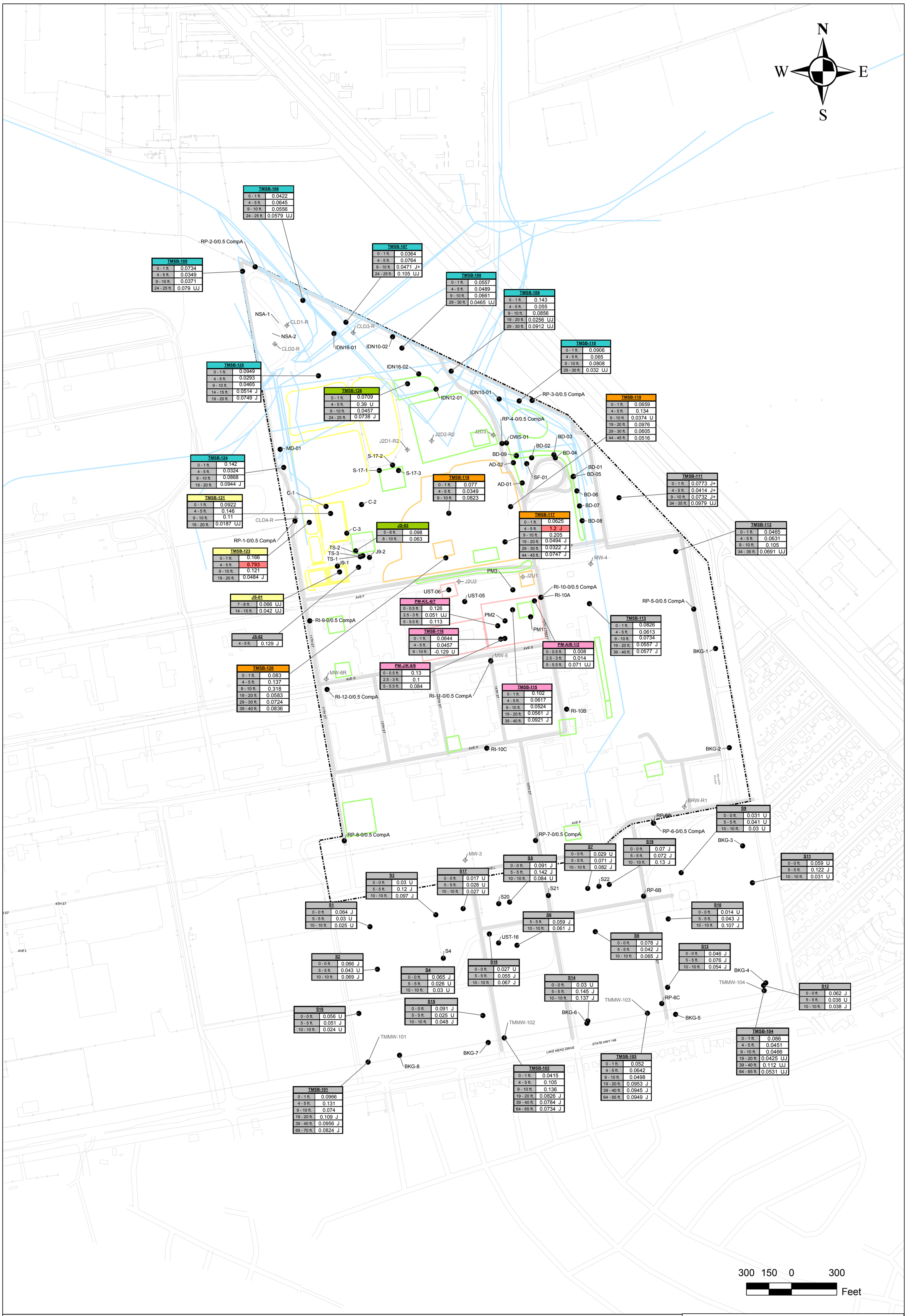


BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR URANIUM 235 IS 0.417 PCI/G

NOTE: Source for TIMET SSL is EPA Region 9 Outdoor Worker PRG.

TMSB-123	
0 - 1 ft.	0.166
4 - 5 ft.	**0.793**
9 - 10 ft.	0.121
19 - 20 ft.	0.0484 J

RED CELL HIGHLIGHTING INDICATES THAT CONCENTRATION EXCEEDS DAF20
DAF 20 VALUE FOR URANIUM 235 IS 0.777 PCI/G

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

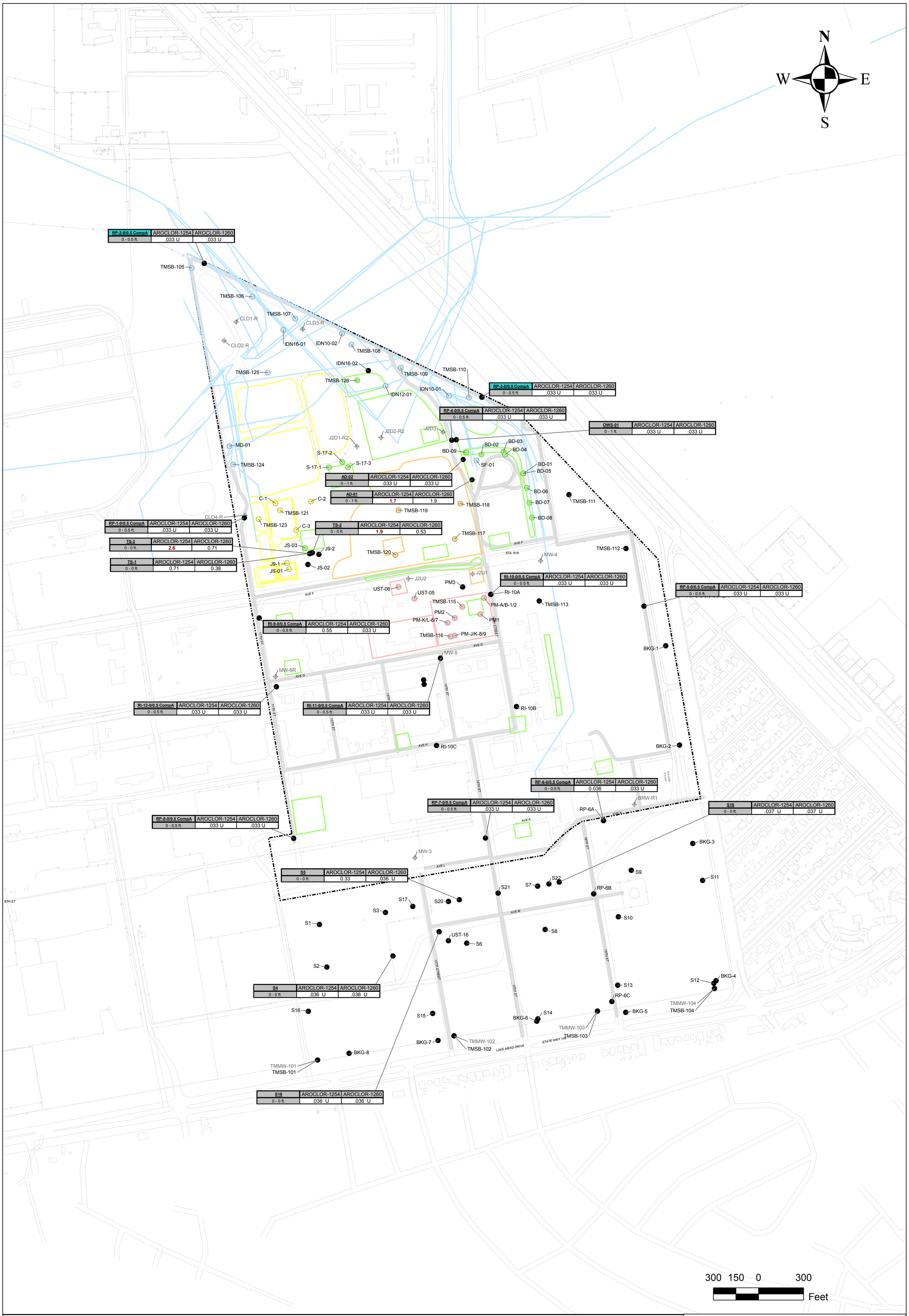
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-54
DISTRIBUTION OF URANIUM 235
IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_URANIUM235big.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR AROCLOR-1254 IS 0.74 MG/KG AND AROCLOR-1260 IS 1 MG/KG.

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

TS-3	AROCLOR-1254	AROCLOR-1260
0 - 0 ft.	2.6	0.71

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

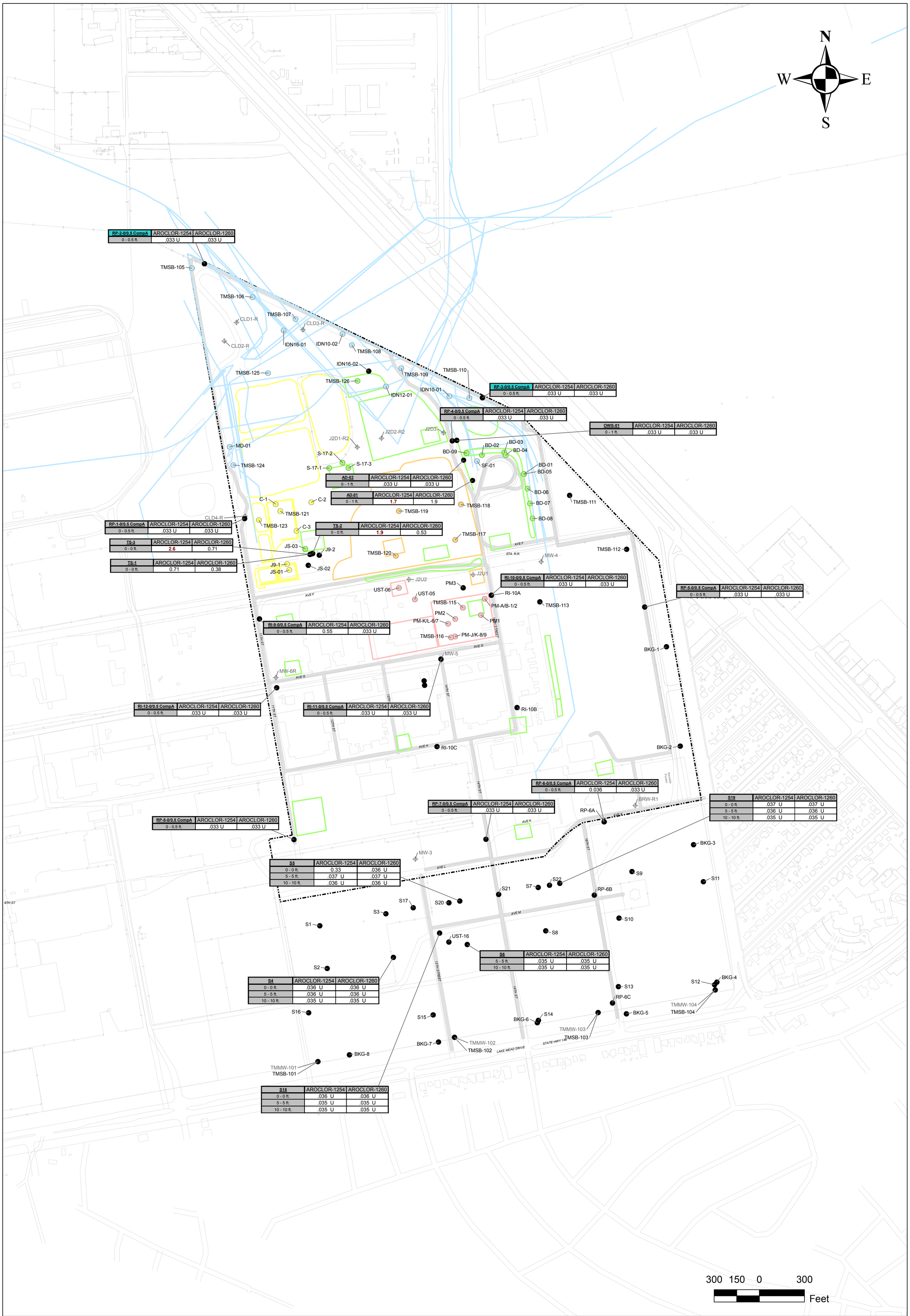
NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-55
DISTRIBUTION OF POLYCHLORINATED BIPHENYLS IN SHALLOW SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_VANADIUMbig.mxd 02/05/07 michelle.handley MO



BOLD, RED TEXT INDICATES THAT CONCENTRATION EXCEEDS TIMET SSL
TIMET SSL FOR AROCLOR-1254 IS 0.74 MG/KG AND AROCLOR-1260 IS 1 MG/KG.

NOTE: Source for TIMET SSL is EPA Region 9 Industrial PRG.

TS-3	AROCLOR-1254	AROCLOR-1260
0 - 0 ft.	2.6	0.71

Source Area

- 1 - Surface Ditches and Northern Storage Area
- 2 - Near-Surface-Soil Source Areas
- 3 - Pond Areas
- 4 - J2 Landfill Area
- 5 - Current and Historic Operational Areas

NOTE: TMSB-123 was installed at the base of the excavation approximately 10 feet below ground surface.

Conceptual Site Model
Titanium Metals Corporation
Henderson, Nevada

FIGURE 4-56
DISTRIBUTION OF POLYCHLORINATED BIPHENYLS IN SUBSURFACE SOIL

TIMET

C:\TIMET\CSM-RI\mxd\SOIL_VANADIUMbig.mxd 02/05/07 michelle.handley MO

TABLES

Table 4-2
Detection Frequency of Chemicals in Shallow Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
GENERAL ANALYSES														
BICARBONATE ALKALINITY	--	--	--	18	18	110	377	--	--	--	--	--	--	--
CHLORIDE	1.11E+03	A	--	59	57	0.89	15,000	6	--	2	0.43	0.73	--	--
FLUORIDE	3.7E+04	B	--	18	3	0.16	0.93	--	--	15	0.1	0.1	--	--
NITRATE	1.02E+02	A	--	59	44	0.11	540	4	--	15	0.04	0.1	--	--
NITRITE	2.10E-01	A	--	18	--	--	--	--	--	18	0.04	0.04	--	--
PERCHLORATE	1.0E+02	D	--	23	17	0.1	70	--	--	6	0.024	0.025	--	--
SULFATE	4.13E+03	A	--	59	57	1.6	3,150	--	--	2	1.2	1.2	--	--
METALS														
ALUMINUM	1.0E+05	B	--	41	41	6,100	11,600	--	--	--	--	--	--	--
ANTIMONY	4.1E+02	B	5.0E+00	41	21	0.31	1.6	--	--	20	0.2	0.9		--
ARSENIC	7.20E+00	A	2.9E+01	60	60	1.3	25.7	3	--	--	--	--	--	--
BARIUM	6.7E+04	B	1.6E+03	60	60	95.8	3,130	--	1	--	--	--	--	--
BERYLLIUM	1.9E+03	B	6.3E+01	41	40	0.35	0.81	--	--	1	0.0021	0.0021	--	--
CADMIUM	4.5E+02	B	8.0E+00	72	24	0.087	1.7	--	--	48	0.02	0.34	--	--
CALCIUM	8.28E+04	A	--	60	60	6,170	121,000	2	--	--	--	--	--	--
CHROMIUM	4.5E+02	B	3.8E+01	72	72	4.8	420	--	8	--	--	--	--	--
CHROMIUM HEXAVALENT	6.4E+01	B	3.8E+01	43	1	2.1	2.1	--	--	42	0.3	2.1	--	--
COBALT	1.9E+03	B	--	41	41	5.7	25	--	--	--	--	--	--	--
COLUMBIUM	--	--	--	18	6	1.4	1.8	--	--	12	0.224	0.224	--	--
COPPER	4.1E+04	B	--	41	41	12.4	170	--	--	--	--	--	--	--
DELTA-BORON 11	--	--	--	18	14	3.2	4.8	--	--	4	0.52	0.52	--	--
IRON	1.0E+05	B	--	61	61	6,370	25,000	--	--	--	--	--	--	--
LEAD	8.0E+02	B	--	72	72	4.8	161	--	--	--	--	--	--	--
LITHIUM	2.0E+04	B	--	18	18	8.5	15.7	--	--	--	--	--	--	--
MAGNESIUM	1.75E+04	A	--	60	60	6,700	20,000	1	--	--	--	--	--	--
MANGANESE	1.90E+04	B	--	60	60	282	18,000	--	--	--	--	--	--	--
MERCURY	3.1E+02	B	--	60	35	0	0.93	--	--	25	0.001	0.05	--	--
MOLYBDENUM	5.1E+03	B	--	41	32	0.16	28	--	--	9	0.13	0.13	--	--
NICKEL	2.0E+04	B	1.3E+02	41	41	11.9	84	--	--	--	--	--	--	--
PALLADIUM	1.50E+00	A	--	18	18	0.25	0.66	--	--	--	--	--	--	--
PHOSPHORUS	2.01E+03	A	--	18	18	1,330	2,150	1	--	--	--	--	--	--
POTASSIUM	3.89E+03	A	--	41	41	1,200	3,000	--	--	--	--	--	--	--
SELENIUM	5.1E+03	B	5.0E+00	60	4	0.37	2.6	--	--	56	0.3	1.5	--	--
SILVER	5.1E+03	B	3.4E+01	60	9	0.098	4.5	--	--	51	0.07	0.67	--	--
SODIUM	1.32E+03	A	--	60	60	174	2,430	2	--	--	--	--	--	--
THALLIUM	6.7E+01	B	--	41	18	0.47	1.9	--	--	23	0.3	1.5	--	--
TIN	1.0E+05	B	--	18	14	0.16	1.1	--	--	4	0.022	0.022	--	--
TITANIUM	1.01E+03	A	--	41	41	442	2,100	6	--	--	--	--	--	--
TUNGSTEN	--	--	--	18	18	0.67	2.9	--	--	--	--	--	--	--

Table 4-2 (continued)
Detection Frequency of Chemicals in Shallow Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
URANIUM	2.0E+02	B	--	41	41	0.6	4.2	--	--	--	--	--	--	--
VANADIUM	1.0E+03	B	6.0E+03	41	41	15.5	130	--	--	--	--	--	--	--
ZINC	1.0E+05	B	1.2E+04	41	41	28	250	--	--	--	--	--	--	--
ZIRCONIUM	1.79E+02	A	--	18	18	152	213	9	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS														
1,1,1,2-TETRACHLOROETHANE	--	--	--	18	--	--	--	--	--	18	7.0E-05	7.0E-05	--	--
1,1,1-TRICHLOROETHANE	1.2E+03	B	2.0E+00	31	--	--	--	--	--	31	1.1E-04	5.0E-03	--	--
1,1,2,2-TETRACHLOROETHANE	--	--	--	31	--	--	--	--	--	31	8.0E-05	5.0E-03	--	--
1,1,2-TRICHLOROETHANE	1.6E+00	B	2.0E-02	31	--	--	--	--	--	31	1.9E-04	5.0E-03	--	--
1,1-DICHLOROETHANE	1.7E+03	B	2.3E+01	31	--	--	--	--	--	31	1.2E-04	5.0E-03	--	--
1,1-DICHLOROETHENE	4.1E+02	B	6.0E-02	31	--	--	--	--	--	31	2.8E-04	5.0E-03	--	--
1,1-DICHLOROPROPENE	--	--	--	18	--	--	--	--	--	18	1.1E-04	1.1E-04	--	--
1,2,3-TRICHLOROBENZENE	--	--	--	18	--	--	--	--	--	18	3.6E-04	3.6E-04	--	--
1,2,3-TRICHLOROPROPANE	--	--	--	18	--	--	--	--	--	18	2.7E-04	2.7E-04	--	--
1,2,4-TRICHLOROBENZENE	--	--	--	18	--	--	--	--	--	18	2.4E-04	2.4E-04	--	--
1,2,4-TRIMETHYLBENZENE	--	--	--	18	1	2.2E-04	2.2E-04	--	--	17	1.1E-04	1.1E-04	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	18	--	--	--	--	--	18	2.4E-04	2.4E-04	--	--
1,2-DICHLOROBENZENE	--	--	--	18	--	--	--	--	--	18	9.0E-05	9.0E-05	--	--
1,2-DICHLOROETHANE	6.0E-01	B	2.0E-02	31	--	--	--	--	--	31	1.2E-04	5.0E-03	--	--
1,2-DICHLOROETHENE (TOTAL)	--	--	--	13	--	--	--	--	--	13	5.0E-03	5.0E-03	--	--
1,2-DICHLOROPROPANE	7.4E-01	B	3.0E-02	31	--	--	--	--	--	31	9.0E-05	5.0E-03	--	--
1,3,5-TRIMETHYLBENZENE	--	--	--	18	--	--	--	--	--	18	1.2E-04	1.2E-04	--	--
1,3-DICHLOROBENZENE	6.0E+02	B	--	31	--	--	--	--	--	31	1.3E-04	5.0E-03	--	--
1,3-DICHLOROPROPANE	--	--	--	18	--	--	--	--	--	18	1.6E-04	1.6E-04	--	--
1,4-DICHLOROBENZENE	--	--	--	18	--	--	--	--	--	18	1.3E-04	1.3E-04	--	--
2,2-DICHLOROPROPANE	--	--	--	18	--	--	--	--	--	18	1.7E-04	1.7E-04	--	--
2-BUTANONE	1.1E+05	B	--	31	3	4.0E-03	7.5E-03	--	--	28	1.6E-03	2.0E-02	--	--
2-CHLOROTOLUENE	--	--	--	18	--	--	--	--	--	18	1.3E-04	1.3E-04	--	--
2-HEXANONE	--	--	--	13	--	--	--	--	--	13	2.0E-02	2.0E-02	--	--
4-CHLOROTOLUENE	--	--	--	18	--	--	--	--	--	18	1.5E-04	1.5E-04	--	--
4-METHYL-2-PENTANONE	4.7E+04	B	--	31	--	--	--	--	--	31	7.0E-04	2.0E-02	--	--
ACETONE	5.4E+04	B	1.6E+01	31	9	1.5E-03	3.3E-02	--	--	22	1.4E-03	2.0E-02	--	--
BENZENE	1.4E+00	B	3.0E-02	31	3	2.5E-04	7.4E-04	--	--	28	9.0E-05	5.0E-03	--	--
BROMOBENZENE	--	--	--	18	--	--	--	--	--	18	1.4E-04	1.4E-04	--	--
BROMODICHLOROMETHANE	1.8E+00	B	6.0E-01	31	--	--	--	--	--	31	9.0E-05	5.0E-03	--	--
BROMOFORM	2.2E+02	B	8.0E-01	13	--	--	--	--	--	13	5.0E-03	5.0E-03	--	--
BROMOMETHANE	1.3E+01	B	2.0E-01	31	--	--	--	--	--	31	4.7E-04	1.0E-02	--	--
CARBON DISULFIDE	7.2E+02	B	3.2E+01	31	2	5.8E-04	2.3E-03	--	--	29	1.3E-04	5.0E-03	--	--
CARBON TETRACHLORIDE	5.5E-01	B	7.0E-02	31	--	--	--	--	--	31	1.6E-04	5.0E-03	--	--
CHLOROBENZENE	5.3E+02	B	1.0E+00	31	--	--	--	--	--	31	7.0E-05	5.0E-03	--	--

Table 4-2 (continued)
Detection Frequency of Chemicals in Shallow Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
CHLOROETHANE	--	--	--	31	--	--	--	--	--	31	5.5E-04	1.0E-02	--	--
CHLOROFORM	4.7E-01	B	6.0E-01	31	1	2.3E-04	2.3E-04	--	--	30	8.0E-05	5.0E-03	--	--
CHLOROMETHANE	1.6E+02	B	--	31	--	--	--	--	--	31	3.1E-04	1.0E-02	--	--
CIS-1,2-DICHLOROETHENE	1.5E+02	B	4.0E-01	18	--	--	--	--	--	18	2.7E-04	2.7E-04	--	--
CIS-1,3-DICHLOROPROPENE	--	--	--	13	--	--	--	--	--	13	5.0E-03	5.0E-03	--	--
DIBROMOCHLOROMETHANE	2.6E+00	B	4.0E-01	31	--	--	--	--	--	31	5.0E-05	5.0E-03	--	--
ETHYLBENZENE	4.0E+02	B	1.3E+01	31	6	1.1E-04	1.7E-04	--	--	25	9.0E-05	5.0E-03	--	--
ISOPROPYLBENZENE	--	--	--	18	--	--	--	--	--	18	1.0E-04	1.0E-04	--	--
M,P-XYLENEPo	--	--	--	18	7	2.9E-04	8.0E-04	--	--	11	2.5E-04	2.5E-04	--	--
METHYL IODIDE	--	--	--	18	--	--	--	--	--	18	1.3E-04	1.3E-04	--	--
METHYLENE BROMIDE	--	--	--	18	--	--	--	--	--	18	1.0E-04	1.0E-04	--	--
METHYLENE CHLORIDE	2.1E+01	B	2.0E-02	31	7	5.1E-04	1.4E-03	--	--	24	3.1E-04	5.0E-03	--	--
N-BUTYLBENZENE	--	--	--	18	--	--	--	--	--	18	1.5E-04	1.5E-04	--	--
N-PROPYLBENZENE	--	--	--	18	--	--	--	--	--	18	2.2E-04	2.2E-04	--	--
O-XYLENE	--	--	--	18	5	8.9E-05	1.3E-04	--	--	13	8.0E-05	8.0E-05	--	--
STYRENE	1.7E+03	B	4.0E+00	31	--	--	--	--	--	31	7.0E-05	5.0E-03	--	--
TERT-BUTYLBENZENE	--	--	--	18	--	--	--	--	--	18	1.9E-04	1.9E-04	--	--
TETRACHLOROETHENE	1.3E+00	B	6.0E-02	31	10	3.4E-04	1.9E-03	--	--	21	1.7E-04	5.0E-03	--	--
TOLUENE	5.2E+02	B	1.2E+01	31	10	1.1E-04	5.5E-04	--	--	21	8.0E-05	5.0E-03	--	--
TRANS-1,2-DICHLOROETHENE	2.4E+02	B	7.0E-01	18	--	--	--	--	--	18	1.5E-04	1.5E-04	--	--
TRANS-1,3-DICHLOROPROPENE	--	--	--	13	--	--	--	--	--	13	5.0E-03	5.0E-03	--	--
TRICHLOROETHENE	1.1E-01	B	6.0E-02	31	--	--	--	--	--	31	1.3E-04	5.0E-03	--	--
VINYL ACETATE	--	--	--	18	--	--	--	--	--	18	4.7E-04	4.7E-04	--	--
VINYL CHLORIDE	7.5E-01	B	1.0E-02	31	--	--	--	--	--	31	2.2E-04	1.0E-02	--	--
XYLENE (TOTAL)	4.2E+02	B	2.1E+02	31	11	1.4E-04	9.3E-04	--	--	20	3.0E-05	5.0E-03	--	--
RADIONUCLIDES														
ACTINIUM-227	1.14E+01	B	--	18	--	--	--	--	--	18	-0.4 +/- 0.52	0.32 +/- 0.51	--	--
ACTINIUM-228	1.19E+03	B	--	58	54	1.14 +/- 0.425	4.42 +/- 0.746	--	--	4	1.7	2.11	--	--
BISMUTH 212	3.70E+04	B	--	56	26	0.82 +/- 0.85	4.68 +/- 2.11	--	--	30	0.49 +/- 0.62	6.88	--	--
BISMUTH-210	8.55E+04	B	--	18	--	--	--	--	--	18	-0.1 +/- 1.2	1.7 +/- 1.3	--	--
BISMUTH-211	4.95E+06	B	--	18	--	--	--	--	--	18	-0.4 +/- 0.52	-0.4 +/- 0.52	--	--
BISMUTH-214	1.34E+04	B	--	56	53	0.74 +/- 0.24	8.44 +/- 1.66	--	--	3	0.78	1.08	--	--
CESIUM-134	--	--	--	38	--	--	--	--	--	38	-0.339 +/- 1.14	0.3	--	--
CESIUM-137	--	--	--	41	2	0.24 +/- 0.13	0.25 +/- 0.18	--	--	39	-0.0258 +/- 0.0795	0.44	--	--
COBALT-57	--	--	--	56	--	--	--	--	--	56	-0.0546 +/- 0.0716	0.24	--	--
COBALT-60	--	--	--	56	--	--	--	--	--	56	-0.0965 +/- 0.0865	0.48	--	--
LEAD-210	4.19E+00	B	2.2E+00	58	27	0.749 +/- 0.37	4.41 +/- 2.54	1	3	31	-0.1 +/- 1.2	3840 +/- 8750	2	13
LEAD-211	2.41E+05	B	1.3E+12	18	--	--	--	--	--	18	-0.4 +/- 0.52	0.32 +/- 0.51	--	--

Table 4-2 (continued)
Detection Frequency of Chemicals in Shallow Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
LEAD-212	6.13E+03	B	7.0E+07	59	59	0.92 +/- 0.31	4.15 +/- 0.6	--	--	--	--	--	--	--
LEAD-214	7.56E+04	B	2.9E+12	59	59	0.73 +/- 0.19	10.2 +/- 1.29	--	--	--	--	--	--	--
POLONIUM-210	2.73E+02	B	--	18	--	--	--	--	--	18	-0.1 +/- 1.2	1.7 +/- 1.3	--	--
POLONIUM-212	1.17E+00	A	--	18	12	0.53 +/- 0.54	1.21 +/- 0.47	1	--	6	0.32 +/- 0.4	0.79 +/- 0.41	--	--
POLONIUM-214	1.89E+15	B	--	18	18	0.74 +/- 0.24	1.17 +/- 0.27	--	--	--	--	--	--	--
POLONIUM-215	8.97E+13	B	--	18	--	--	--	--	--	18	-0.4 +/- 0.52	0.32 +/- 0.51	--	--
POLONIUM-216	1.01E+13	B	--	36	36	0	8.3 +/- 1.7	--	--	--	--	--	--	--
POTASSIUM-40	3.50E+01	A	--	59	59	16.8 +/- 3.58	29.1 +/- 7.1	--	--	--	--	--	--	--
PROTACTINIUM-234	5.68E+02	B	--	41	--	--	--	--	--	41	-5.28 +/- 13.9	20.4 +/- 19.6	--	--
RADIUM 226	3.70E+00	B	2.4E+00	59	59	0.52 +/- 0.238	8.13 +/- 0.82	5	14	--	--	--	--	--
RADIUM 228	8.40E+00	B	2.9E+00	76	76	0.88 +/- 0.4	4.42 +/- 0.746	--	1	--	--	--	--	--
RADIUM-223	2.70E+02	B	5.7E+03	18	--	--	--	--	--	18	-0.4 +/- 0.52	0.32 +/- 0.51	--	--
RADIUM-224	7.91E+03	B	7.8E+04	41	41	1.17 +/- 0.282	8.3 +/- 4.8	--	--	--	--	--	--	--
THALLIUM-208	3.68E+04	B	--	57	56	0.413 +/- 0.163	1.34 +/- 0.25	--	--	1	0.59	0.59	--	--
THORIUM-227	1.94E+02	B	6.7E+04	41	--	--	--	--	--	41	-3.1 +/- 12.7	2.24 +/- 11.8	--	--
THORIUM-228	1.25E+02	B	6.6E+01	59	59	1.15 +/- 0.33	3.17 +/- 0.55	--	--	--	--	--	--	--
THORIUM-230	2.02E+01	B	6.1E+00	59	54	0.88 +/- 0.2	5.55 +/- 0.86	--	--	5	0.81 +/- 0.28	0.92 +/- 0.24	--	--
THORIUM-231	5.28E+04	B	4.4E+08	18	13	0	0.091 +/- 0.08	--	--	5	0.014 +/- 0.04	0.059 +/- 0.064	--	--
THORIUM-232	1.90E+01	B	--	77	77	1.05 +/- 0.237	3.51 +/- 0.59	--	--	--	--	--	--	--
THORIUM-234	3.28E+03	B	8.3E+04	43	21	1.17 +/- 0.48	11.3 +/- 2.8	--	--	22	-1.07 +/- 1.64	2.49 +/- 2.26	--	--
URANIUM 234	3.24E+01	B	2.2E+03	59	59	0.48 +/- 0.26	3.79 +/- 0.81	--	--	--	--	--	--	--
URANIUM 235	4.17E-01	B	7.8E-01	44	34	0.0364 +/- 0.0303	0.143 +/- 0.0657	--	--	10	0.008 +/- 0.044	0.059 +/- 0.064	--	--
URANIUM 235/236	--	--	--	15	4	0.059 +/- 0.054	0.12 +/- 0.09	--	--	11	-0.012 +/- 0.063	0.17 +/- 0.34	--	--
URANIUM-238	3.68E+01	B	2.4E+00	60	60	0.64 +/- 0.25	4.58 +/- 1.46	--	3	--	--	--	--	--
SEMI-VOLATILE ORGANIC COMPOUNDS														
2,2'-OXYBIS(1-CHLOROPROPANE)	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
2,4,5-TRICHLOROPHENOL	--	--	--	18	--	--	--	--	--	18	0.03	0.03	--	--
2,4,6-TRICHLOROPHENOL	--	--	--	18	--	--	--	--	--	18	0.03	0.03	--	--
2,4-DICHLOROPHENOL	--	--	--	18	--	--	--	--	--	18	0.03	0.03	--	--
2,4-DIMETHYLPHENOL	--	--	--	18	--	--	--	--	--	18	0.03	0.03	--	--
2,4-DINITROPHENOL	--	--	--	18	--	--	--	--	--	18	0.06	0.06	--	--
2,4-DINITROTOLUENE	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
2,6-DINITROTOLUENE	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
2-CHLORONAPHTHALENE	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
2-CHLOROPHENOL	--	--	--	18	--	--	--	--	--	18	0.01	0.01	--	--
2-METHYLNAPHTHALENE	--	--	--	18	--	--	--	--	--	18	0.01	0.01	--	--
2-NITROANILINE	--	--	--	18	--	--	--	--	--	18	0.04	0.04	--	--
2-NITROPHENOL	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
3,3'-DICHLOROBENZIDINE	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
3,4-METHYLPHENOL	--	--	--	18	--	--	--	--	--	18	0.04	0.04	--	--

Table 4-2 (continued)
Detection Frequency of Chemicals in Shallow Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
3-NITROANILINE	--	--	--	18	--	--	--	--	--	18	0.03	0.03	--	--
4-BROMOPHENYL-PHENYLETHER	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
4-CHLORO-3-METHYLPHENOL	--	--	--	18	--	--	--	--	--	18	0.03	0.03	--	--
4-CHLOROPHENYL-PHENYLETHER	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
4-NITROPHENOL	--	--	--	18	--	--	--	--	--	18	0.04	0.04	--	--
ACENAPHTHENE	2.9E+04	B	5.7E+02	41	1	0.11	0.11	--	--	40	0.02	0.02	--	--
ACENAPHTHYLENE	--	--	--	41	--	--	--	--	--	41	0.02	0.03	--	--
ACETOPHENONE	--	--	--	18	--	--	--	--	--	18	0.05	0.05	--	--
ANILINE	--	--	--	18	--	--	--	--	--	18	0.04	0.04	--	--
ANTHRACENE	1.0E+05	B	1.2E+04	41	--	--	--	--	--	41	0.00	0.02	--	--
AZOBENZENE	--	--	--	18	--	--	--	--	--	18	0.10	0.10	--	--
BENZO(A)ANTHRACENE	2.1E+00	B	2.0E+00	41	1	0.024	0.024	--	--	40	0.002	0.02	--	--
BENZO(A)PYRENE	2.1E-01	B	8.0E+00	41	1	0.028	0.028	--	--	40	0.002	0.02	--	--
BENZO(B)FLUORANTHENE	2.1E+00	B	5.0E+00	41	2	0.025	0.036	--	--	39	0.003	0.04	--	--
BENZO(G,H,I)PERYLENE	--	--	--	41	--	--	--	--	--	41	0.003	0.10	--	--
BENZO(K)FLUORANTHENE	2.1E+01	B	4.9E+01	41	--	--	--	--	--	41	0.001	0.02	--	--
BENZOIC ACID	--	--	--	18	--	--	--	--	--	18	0.12	0.12	--	--
BENZYL ALCOHOL	--	--	--	18	--	--	--	--	--	18	0.03	0.03	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	18	--	--	--	--	--	18	0.01	0.01	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	18	1	0.21	0.21	--	--	17	0.03	0.03	--	--
CARBAZOLE	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
CHRYSENE	2.1E+02	B	1.6E+02	41	3	0.016	0.034	--	--	38	0.00	0.01	--	--
DIBENZO(A,H)ANTHRACENE	2.1E-01	B	2.0E+00	41	--	--	--	--	--	41	0.01	0.08	--	--
DIBENZOFURAN	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
DIETHYL PHTHALATE	--	--	--	18	--	--	--	--	--	18	0.04	0.04	--	--
DIMETHYLPHTHALATE	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
DI-N-BUTYL PHTHALATE	--	--	--	18	--	--	--	--	--	18	0.03	0.03	--	--
DI-N-OCTYLPHTHALATE	--	--	--	18	--	--	--	--	--	18	0.14	0.14	--	--
FLUORANTHENE	2.2E+04	B	4.3E+03	18	--	--	--	--	--	18	0.02	0.02	--	--
FLUORENE	2.6E+04	B	5.6E+02	18	--	--	--	--	--	18	0.02	0.02	--	--
HEXACHLOROBENZENE	1.1E+00	B	2.0E+00	18	--	--	--	--	--	18	0.02	0.02	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	18	--	--	--	--	--	18	0.07	0.07	--	--
HEXACHLOROETHANE	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
INDENO(1,2,3-CD)PYRENE	2.1E+00	B	1.4E+01	41	1	0.021	0.021			40	0.004	0.02	--	--
ISOPHORONE	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
NAPHTHALENE	1.9E+02	B	8.4E+01	18	--	--	--	--	--	18	0.01	0.01	--	--
NITROBENZENE	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--
N-NITROSODIPHENYLAMINE	--	--	--	18	--	--	--	--	--	18	0.02	0.02	--	--

Table 4-2 (continued)
Detection Frequency of Chemicals in Shallow Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
OCTACHLOROSTYRENE	--	--	--	18	--	--	--	--	--	18	0.3	0.4	--	--
PENTACHLOROPHENOL	--	--	--	18	--	--	--	--	--	18	0.12	0.12	--	--
PHENANTHRENE	--	--	--	41	1	0.035	0.035			40	0.01	0.02	--	--
PHENOL	--	--	--	18	--	--	--	--	--	18	0.09	0.09	--	--
PYRENE	2.9E+04	B	4.2E+03	41	1	0.09	0.09			40	0.01	0.02	--	--
PYRIDINE	--	--	--	18	--	--	--	--	--	18	0.07	0.07	--	--
TOTAL PETROLEUM HYDROCARBONS (TPH)														
DIESEL RANGE ORGANICS	1.0E+02	C	--	32	--	--	--	--	--	32	0.94	30	--	--
GASOLINE RANGE ORGANICS	1.0E+02	C	--	14	--	--	--	--	--	14	0.5	0.5	--	--
MOTOR OIL RANGE ORGANICS	1.0E+02	C	--	16	6	33	400	2	--	10	30	30	--	--
DIOXANS AND FURANS														
1234678-HEPTACHLORINATED DIBENZOFURAN	--	--	--	23	14	3.60E-06	6.00E-04	--	--	9	4.9E-08	9.1E-07	--	--
1234678-HEPTACHLORINATED DIBENZO-P-DIOXI	--	--	--	23	11	3.30E-06	1.50E-04	--	--	12	7.1E-08	1.2E-06	--	--
1234789-HEPTACHLORINATED DIBENZOFURAN	--	--	--	23	11	3.00E-06	1.60E-04	--	--	12	3.8E-08	2.0E-06	--	--
123478-HEXACHLORINATED DIBENZOFURAN	--	--	--	23	12	4.70E-06	3.80E-04	--	--	11	8.2E-08	2.5E-06	--	--
123478-HEXACHLORINATED DIBENZO-P-DIOXIN	--	--	--	22	1	5.80E-06	5.80E-06	--	--	21	5.9E-08	2.2E-06	--	--
123678-HEXACHLORINATED DIBENZOFURAN	--	--	--	23	12	3.30E-06	2.70E-04	--	--	11	4.8E-08	1.9E-06	--	--
123678-HEXACHLORINATED DIBENZO-P-DIOXIN	--	--	--	23	5	3.10E-06	1.40E-05	--	--	18	5.9E-08	2.1E-06	--	--
123789-HEXACHLORINATED DIBENZOFURAN	--	--	--	23	5	4.60E-06	1.30E-05	--	--	18	3.8E-08	2.3E-06	--	--
123789-HEXACHLORINATED DIBENZO-P-DIOXIN	--	--	--	23	5	2.70E-06	1.10E-05	--	--	18	5.9E-08	2.0E-06	--	--
12378-PENTACHLORINATED DIBENZOFURAN	--	--	--	23	11	2.80E-06	1.30E-04	--	--	12	8.1E-08	2.5E-06	--	--
12378-PENTACHLORINATED DIBENZO-P-DIOXIN	--	--	--	23	2	3.50E-06	6.30E-06	--	--	21	1.5E-07	1.9E-06	--	--
234678-HEXACHLORINATED DIBENZOFURAN	--	--	--	23	8	4.50E-06	7.90E-05	--	--	15	2.7E-08	2.4E-06	--	--
23478-PENTACHLORINATED DIBENZOFURAN	--	--	--	23	10	3.40E-06	1.60E-04	--	--	13	8.1E-08	1.7E-06	--	--
2378-TETRACHLORINATED DIBENZOFURAN	--	--	--	23	13	8.90E-07	2.40E-04	--	--	10	1.1E-07	5.7E-07	--	--
2378-TETRACHLORINATED DIBENZO-P-DIOXIN	1.6E-05	B	--	23	5	6.40E-07	1.30E-06	--	--	18	9.3E-08	5.8E-07	--	--

Table 4-2 (continued)
Detection Frequency of Chemicals in Shallow Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
OCTACHLORINATED DIBENZOFURAN	--	--	--	23	14	7.10E-06	1.30E-03	--	--	9	2.0E-07	2.4E-06	--	--
OCTACHLORINATED DIBENZO-P-DIOXIN	--	--	--	23	11	1.60E-05	2.80E-03	--	--	12	2.9E-07	3.6E-06	--	--
POLYCHLORINATED BIPHENYLS (PCBs)														
AROCLOR-1016	2.1E+01	B	--	20	--	--	--	--	--	20	0.005	0.033	--	--
AROCLOR-1221	1.0E+00	C	--	20	--	--	--	--	--	20	0.005	0.033	--	--
AROCLOR-1232	1.0E+00	C	--	20	--	--	--	--	--	20	0.005	0.033	--	--
AROCLOR-1242	1.0E+00	C	--	20	--	--	--	--	--	20	0.005	0.033	--	--
AROCLOR-1248	1.0E+00	C	--	20	--	--	--	--	--	20	0.005	0.033	--	--
AROCLOR-1254	7.4E-01	B	--	20	6	0.036	2.6	2	--	14	0.005	0.033	--	--
AROCLOR-1260	1.0E+00	C	--	20	3	0.38	0.71	--	--	17	0.005	0.033	--	--
PESTICIDES														
2,4'-DDE	--	--	--	18	--	--	--	--	--	18	2.0E-02	2.0E-02	--	--
4,4'-DDD	1.0E+01	B	1.6E+01	20	--	--	--	--	--	20	1.9E-04	4.6E-04	--	--
4,4'-DDE	7.0E+00	B	5.4E+01	20	6	1.7E-03	8.8E-03	--	--	14	2.7E-04	2.7E-04	--	--
4,4'-DDT	7.0E+00	B	3.2E+01	20	8	2.2E-03	8.3E-03	--	--	12	3.3E-04	4.3E-04	--	--
ALDRIN	--	--	--	20	--	--	--	--	--	20	1.2E-04	5.2E-04	--	--
ALPHA-BHC	--	--	--	20	4	2.2E-03	7.1E-03	--	--	16	1.1E-04	1.3E-04	--	--
ALPHA-CHLORDANE	--	--	--	20	--	--	--	--	--	20	1.8E-04	3.3E-04	--	--
BETA-BHC	--	--	--	20	4	1.0E-03	6.1E-03	--	--	16	1.4E-04	1.4E-04	--	--
CHLORDANE	--	--	--	18	--	--	--	--	--	18	1.7E-03	1.7E-03	--	--
DELTA-BHC	--	--	--	20	--	--	--	--	--	20	1.1E-04	1.4E-04	--	--
DIELDRIN	--	--	--	20	--	--	--	--	--	20	1.5E-04	1.8E-04	--	--
ENDOSULFAN I	--	--	--	20	--	--	--	--	--	20	1.2E-04	1.3E-04	--	--
ENDOSULFAN II	--	--	--	20	--	--	--	--	--	20	1.6E-04	2.7E-04	--	--
ENDOSULFAN SULFATE	--	--	--	20	--	--	--	--	--	20	1.3E-04	3.2E-04	--	--
ENDRIN	--	--	--	20	--	--	--	--	--	20	1.8E-04	1.9E-04	--	--
ENDRIN ALDEHYDE	--	--	--	20	--	--	--	--	--	20	1.9E-04	5.8E-04	--	--
ENDRIN KETONE	--	--	--	20	--	--	--	--	--	20	3.1E-04	4.2E-04	--	--
GAMMA-BHC (LINDANE)	--	--	--	20	3	2.3E-03	3.2E-03	--	--	17	1.1E-04	1.5E-04	--	--
GAMMA-CHLORDANE	--	--	--	20	--	--	--	--	--	20	1.2E-04	1.8E-04	--	--
HEPTACHLOR	--	--	--	20	--	--	--	--	--	20	2.1E-04	2.1E-04	--	--
HEPTACHLOR EPOXIDE	--	--	--	20	--	--	--	--	--	20	1.9E-04	2.3E-04	--	--
METHOXYCHLOR	--	--	--	20	4	8.9E-03	5.2E-02	--	--	16	3.3E-04	1.5E-03	--	--
TOXAPHENE	--	--	--	20	--	--	--	--	--	20	1.5E-02	1.8E-02	--	--

Table 4-2 (continued)
Detection Frequency of Chemicals in Shallow Soil

Notes:

A	BRC/TIMET Maxiumum Background
B	EPA Region 9 Preliminary Remediation Goal
C	Toxic Substances Control Act
D	State of Nevada
BHC	Benzenehexachloride
BRC	Basic Remediation Company
Conc	Concentration
DAF20	Diluation Attenuation Factor Equal to 20
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
mg/kg	Milligram per kilogram
pCi/g	Picocuries per liter
Qual	Qualifier
SSL	Soil Screening Level
TIMET	Titanium Metals Corporation

Table 4-3

Detection Frequency of Chemicals in Subsurface Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
GENERAL ANALYSES														
BICARBONATE ALKALINITY	--	--	--	25	24	105	408	--	--	1	109	109	--	--
CHLORIDE	1.11E+03	A	--	237	235	1	230,000	32	--	1	0.43	0.43	--	--
FLUORIDE	3.7E+04	B	--	38	25	0.17	4.4	--	--	13	0.1	0.1	--	--
NITRATE	1.02E+02	A	--	237	133	0.13	270	1	--	104	0.04	7.4	--	--
NITRITE	2.10E-01	A	--	38	1	0.87	0.87	1	--	37	0.04	0.04	--	--
PERCHLORATE	1.0E+02	D	--	171	114	0.051	18	--	--	57	0.024	0.48	--	--
SULFATE	4.13E+03	A	--	237	236	2.1	17,000	2	--	1	42	42	--	--
METALS														
ALUMINUM	1.0E+05	B	--	132	132	1,100	20,000	--	--	--	--	--	--	--
ANTIMONY	4.1E+02	B	5.00E+00	132	56	0.24	3.6	--	--	76	0.05	1.7	--	--
ARSENIC	7.20E+00	A	2.90E+01	161	161	0.7	61.2	16	1	--	--	--	--	--
BARIUM	6.7E+04	B	1.60E+03	161	161	47	30,000	--	4	--	--	--	--	--
BERYLLIUM	1.9E+03	B	6.30E+01	132	129	0.38	30	--	--	3	0.0021	0.0021	--	--
CADMIUM	4.5E+02	B	8.00E+00	161	27	0.054	1.6	--	--	133	0.02	0.34	--	--
CALCIUM	8.28E+04	A	--	164	164	5,500	180,000	2	--	--	--	--	--	--
CHROMIUM	4.5E+02	B	3.80E+01	158	158	3	570	2	8	--	--	--	--	--
CHROMIUM HEXAVALENT	6.4E+01	B	3.80E+01	99	2	9.3	10	--	--	97	0.25	43	--	1
COBALT	1.9E+03	B	--	132	128	5.5	22	--	--	4	0.1	2.5	--	--
COLUMBIUM	--	--	--	38	--	--	--	--	--	38	0.22	0.22	--	--
COPPER	4.1E+04	B	--	132	132	10.3	160	--	--	--	--	--	--	--
DELTA-BORON 11	--	--	--	38	33	2.9	7	--	--	5	0.52	0.52	--	--
IRON	1.0E+05	B	--	161	161	1,600	36,000	--	--	--	--	--	--	--
LEAD	8.0E+02	B	--	161	161	1.4	367	--	--	--	--	--	--	--
LITHIUM	2.0E+04	B	--	38	38	9.4	20.3	--	--	--	--	--	--	--
MAGNESIUM	1.75E+04	A	--	161	161	6,130	250,000	6	--	--	--	--	--	--
MANGANESE	1.9E+04	B	--	161	161	67	90,000	3	--	--	--	--	--	--
MERCURY	3.1E+02	B	--	121	55	0.0015	0.36	--	--	66	0.00062	0.05	--	--
MOLYBDENUM	5.1E+03	B	--	132	53	0.1	43.5	--	--	79	0.09	0.17	--	--
NICKEL	2.0E+04	B	1.30E+02	132	131	0.18	180	--	1	1	0.07	0.07	--	--
PALLADIUM	1.50E+00	A	--	38	38	0.32	1.5	--	--	--	--	--	--	--
PHOSPHORUS	2.01E+03	A	--	38	38	992	1,880	--	--	--	--	--	--	--
POTASSIUM	3.89E+03	A	--	132	132	868	32,000	4	--	--	--	--	--	--
SELENIUM	5.1E+03	B	5.00E+00	161	7	0.43	7.6	--	1	154	0.04	31	--	2
SILVER	5.1E+03	B	3.40E+01	161	16	0.081	9.8	--	--	145	0.07	0.67	--	--
SODIUM	1.32E+03	A	--	161	161	296	59,000	25	--	--	--	--	--	--

Table 4-3 (continued)

Detection Frequency of Chemicals in Subsurface Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
THALLIUM	6.7E+01	B	--	132	42	0.099	2.7	--	--	90	0.013	30	--	--
TIN	1.0E+05	B	--	38	29	0.19	0.69	--	--	9	0.022	0.022	--	--
TITANIUM	1.01E+03	A	--	132	132	353	7,200	9	--	--	--	--	--	--
TUNGSTEN	--	--	--	43	43	0.67	49.6	--	--	--	--	--	--	--
URANIUM	2.0E+02	B	--	127	127	0.69	50	--	--	--	--	--	--	--
VANADIUM	1.0E+03	B	6.00E+03	132	132	7.1	620	--	--	--	--	--	--	--
ZINC	1.0E+05	B	1.20E+04	132	132	3.8	71	--	--	--	--	--	--	--
ZIRCONIUM	1.79E+02	A	--	38	38	139	201	11	--	--	--	--	--	--
VOLATILE ORGANIC COMPOUNDS														
1,1,1,2-TETRACHLOROETHANE	--	--	--	38	--	--	--	--	--	38	7.0E-05	7.0E-05	--	--
1,1,1-TRICHLOROETHANE	1.2E+03	B	2.00E+00	102	--	--	--	--	--	102	1.1E-04	6.6E-03	--	--
1,1,2,2-TETRACHLOROETHANE	--	--	--	102	--	--	--	--	--	102	8.0E-05	6.6E-03	--	--
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	--	--	--	53	--	--	--	--	--	53	1.0E-03	1.2E-03	--	--
1,1,2-TRICHLOROETHANE	1.6E+00	B	2.00E-02	102	--	--	--	--	--	102	1.9E-04	6.6E-03	--	--
1,1-DICHLOROETHANE	1.7E+03	B	2.30E+01	102	--	--	--	--	--	102	1.2E-04	6.6E-03	--	--
1,1-DICHLOROETHENE	4.1E+02	B	6.00E-02	102	--	--	--	--	--	102	2.8E-04	6.6E-03	--	--
1,1-DICHLOROPROPENE	--	--	--	38	--	--	--	--	--	38	1.1E-04	1.1E-04	--	--
1,2,3-TRICHLOROBENZENE	--	--	--	91	--	--	--	--	--	91	3.6E-04	1.9E-03	--	--
1,2,3-TRICHLOROPROPANE	--	--	--	38	--	--	--	--	--	38	2.7E-04	2.7E-04	--	--
1,2,4-TRICHLOROBENZENE	--	--	--	91	--	--	--	--	--	91	2.4E-04	1.6E-03	--	--
1,2,4-TRIMETHYLBENZENE	--	--	--	38	--	--	--	--	--	38	1.1E-04	1.1E-04	--	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	91	--	--	--	--	--	91	2.4E-04	3.6E-03	--	--
1,2-DICHLOROBENZENE	--	--	--	97	--	--	--	--	--	97	9.0E-05	6.6E-03	--	--
1,2-DICHLOROETHANE	6.0E-01	B	2.00E-02	102	--	--	--	--	--	102	1.2E-04	6.6E-03	--	--
1,2-DICHLOROETHENE (TOTAL)	--	--	--	5	--	--	--	--	--	5	5.0E-03	5.0E-03	--	--
1,2-DICHLOROPROPANE	7.4E-01	B	3.00E-02	102	--	--	--	--	--	102	9.0E-05	6.6E-03	--	--
1,3,5-TRIMETHYLBENZENE	--	--	--	38	--	--	--	--	--	38	1.2E-04	1.2E-04	--	--
1,3-DICHLOROBENZENE	6.0E+02	B	--	102	--	--	--	--	--	102	1.3E-04	6.6E-03	--	--
1,3-DICHLOROPROPANE	--	--	--	38	--	--	--	--	--	38	1.6E-04	1.6E-04	--	--
1,4-DICHLOROBENZENE	--	--	--	97	1	1.5E-03	1.5E-03	--	--	96	1.3E-04	6.6E-03	--	--
2,2-DICHLOROPROPANE	--	--	--	38	--	--	--	--	--	38	1.7E-04	1.7E-04	--	--
2-BUTANONE	1.1E+05	B	--	102	2	2.5E-03	2.8E-03	--	--	100	1.6E-03	2.7E-02	--	--
2-CHLOROTOLUENE	--	--	--	38	--	--	--	--	--	38	1.3E-04	1.3E-04	--	--
2-HEXANONE	--	--	--	64	--	--	--	--	--	64	7.4E-03	2.7E-02	--	--
4-CHLOROTOLUENE	--	--	--	38	--	--	--	--	--	38	1.5E-04	1.5E-04	--	--

Table 4-3 (continued)

Detection Frequency of Chemicals in Subsurface Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
4-METHYL-2-PENTANONE	4.7E+04	B	--	102	--	--	--	--	--	102	7.0E-04	2.7E-02	--	--
ACETONE	5.4E+04	B	1.60E+01	102	24	1.5E-03	9.1E-02	--	--	78	1.4E-03	2.7E-02	--	--
BENZENE	1.4E+00	B	3.00E-02	106	1	7.9E-04	7.9E-04	--	--	105	9.0E-05	6.6E-03	--	--
BROMOBENZENE	--	--	--	38	--	--	--	--	--	38	1.4E-04	1.4E-04	--	--
BROMOCHLOROMETHANE	--	--	--	53	--	--	--	--	--	53	1.2E-03	1.4E-03	--	--
BROMODICHLOROMETHANE	1.8E+00	B	6.00E-01	102	--	--	--	--	--	102	9.0E-05	6.6E-03	--	--
BROMOFORM	2.2E+02	B	8.00E-01	64	--	--	--	--	--	64	1.2E-03	6.6E-03	--	--
BROMOMETHANE	1.3E+01	--	--	102	--	--	--	--	--	102	4.7E-04	1.3E-02	--	--
CARBON DISULFIDE	7.2E+02	B	3.20E+01	102	4	1.8E-04	9.7E-04	--	--	98	1.3E-04	6.6E-03	--	--
CARBON TETRACHLORIDE	5.5E-01	B	7.00E-02	102	--	--	--	--	--	102	1.6E-04	6.6E-03	--	--
CHLOROBENZENE	5.3E+02	B	1.00E+00	102	--	--	--	--	--	102	7.0E-05	6.6E-03	--	--
CHLOROETHANE	--	--	--	102	--	--	--	--	--	102	5.5E-04	1.3E-02	--	--
CHLOROFORM	4.7E-01	B	6.00E-01	102	7	1.7E-04	8.9E-03	--	--	95	8.0E-05	5.5E-03	--	--
CHLOROMETHANE	1.6E+02	B	--	102	--	--	--	--	--	102	3.1E-04	1.3E-02	--	--
CIS-1,2-DICHLOROETHENE	1.5E+02	B	4.00E-01	97	--	--	--	--	--	97	2.7E-04	6.6E-03	--	--
CIS-1,3-DICHLOROPROPENE	--	--	--	64	--	--	--	--	--	64	7.2E-04	6.6E-03	--	--
DIBROMOCHLOROMETHANE	2.6E+00	B	4.00E-01	102	--	--	--	--	--	102	5.0E-05	6.6E-03	--	--
DIBROMOETHANE	--	--	--	53	--	--	--	--	--	53	9.8E-04	1.2E-03	--	--
DICHLORODIFLUOROMETHANE	--	--	--	53	--	--	--	--	--	53	8.7E-04	1.1E-03	--	--
ETHYLBENZENE	4.0E+02	B	1.30E+01	106	9	1.0E-04	1.3E-03	--	--	97	9.0E-05	6.6E-03	--	--
ISOPROPYLBENZENE	--	--	--	91	--	--	--	--	--	91	1.0E-04	1.1E-03	--	--
M,P-XYLENEPo	--	--	--	48	15	2.9E-04	8.2E-04	--	--	33	2.5E-04	6.6E-03	--	--
METHYL IODIDE	--	--	--	38	1	1.7E-04	1.7E-04	--	--	37	1.3E-04	1.3E-04	--	--
METHYLENE BROMIDE	--	--	--	38	--	--	--	--	--	38	1.0E-04	1.0E-04	--	--
METHYLENE CHLORIDE	2.1E+01	B	2.00E-02	102	20	3.7E-04	4.9E-03	--	--	82	3.1E-04	6.5E-03	--	--
METHYL-T-BUTYL ETHER	--	--	--	53	--	--	--	--	--	53	8.0E-04	9.8E-04	--	--
N-BUTYLBENZENE	--	--	--	38	--	--	--	--	--	38	1.5E-04	1.5E-04	--	--
N-PROPYLBENZENE	--	--	--	38	--	--	--	--	--	38	2.2E-04	2.2E-04	--	--
O-XYLENE	--	--	--	48	6	9.3E-05	1.5E-04	--	--	42	8.0E-05	6.6E-03	--	--
STYRENE	1.7E+03	B	4.00E+00	102	--	--	--	--	--	102	7.0E-05	6.6E-03	--	--
TERT-BUTYLBENZENE	--	--	--	38	--	--	--	--	--	38	1.9E-04	1.9E-04	--	--
TETRACHLOROETHENE	1.3E+00	B	6.00E-02	102	22	3.1E-04	2.9E-03	--	--	80	1.7E-04	6.5E-03	--	--
TOLUENE	5.2E+02	B	1.20E+01	106	25	9.2E-05	3.0E-03	--	--	81	8.0E-05	6.6E-03	--	--
TRANS-1,2-DICHLOROETHENE	2.4E+02	B	7.00E-01	97	--	--	--	--	--	97	1.5E-04	6.6E-03	--	--
TRANS-1,3-DICHLOROPROPENE	--	--	--	64	--	--	--	--	--	64	8.1E-04	6.6E-03	--	--
TRICHLOROETHENE	1.1E-01	B	6.00E-02	102	--	--	--	--	--	102	1.3E-04	6.6E-03	--	--

Table 4-3 (continued)

Detection Frequency of Chemicals in Subsurface Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
TRICHLOROFLUOROMETHANE	2.0E+03	B	--	53	--	--	--	--	--	53	7.0E-04	8.5E-04	--	--
VINYL ACETATE	--	--	--	38	--	--	--	--	--	38	4.7E-04	4.7E-04	--	--
VINYL CHLORIDE	7.5E-01	B	1.00E-02	102	--	--	--	--	--	102	2.2E-04	1.0E-02	--	--
XYLENE (TOTAL)	4.2E+02	B	2.10E+02	102	20	1.9E-04	9.6E-04	--	--	82	3.0E-05	1.3E-02	--	--
RADIONUCLIDES														
ACTINIUM-227	1.14E+01	B	--	43	1	0.61 +/- 0.32	0.61 +/- 0.32	--	--	42	-0.61 +/- 0.47	0.53 +/- 0.47	--	--
ACTINIUM-228	1.19E+03	B	--	154	142	1.09 +/- 0.301	5.7 +/- 0.823	--	--	12	0.678 +/- 0.399	2.17	--	--
BISMUTH 212	3.70E+04	B	--	153	61	0.64 +/- 0.63	5.04 +/- 1.76	--	--	92	0.32 +/- 0.53	5.62	--	--
BISMUTH-210	8.55E+04	B	--	38	--	--	--	--	--	38	-1.1 +/- 1.2	1.7 +/- 1.3	--	--
BISMUTH-211	4.95E+06	B	--	38	--	--	--	--	--	38	-0.61 +/- 0.47	0.53 +/- 0.47	--	--
BISMUTH-214	1.34E+04	B	--	153	143	0.602 +/- 0.262	20.8 +/- 2.51	--	--	10	0.86	1.1	--	--
CESIUM-134	--	--	--	115	1	0.131 +/- 0.0748	0.131 +/-	--	--	114	-0.0997 +/- 0.0734	0.32	--	--
CESIUM-137	--	--	--	121	--	--	--	--	--	121	-0.133 +/- 0.0917	0.35	--	--
COBALT-57	--	--	--	153	1	0.164 +/- 0.0958	0.164 +/-	--	--	152	-0.0856 +/- 0.0557	0.24	--	--
COBALT-60	--	--	--	153	--	--	--	--	--	153	-0.108 +/- 0.115	0.49	--	--
GROSS ALPHA	--	--	--	5	5	24.2 +/- 8.4	32.4 +/- 9	--	--	--	--	--	--	--
GROSS BETA	--	--	--	5	5	35.1 +/- 6	45.2 +/- 9	--	--	--	--	--	--	--
LEAD-210	4.19E+00	B	2.20E+00	153	89	0.831 +/- 0.373	20.2 +/- 5.01	3	7	64	-1.1 +/- 1.2	25500 +/- 57700	6	19
LEAD-211	2.41E+05	B	1.32E+12	38	--	--	--	--	--	38	-0.61 +/- 0.47	0.53 +/- 0.47	--	--
LEAD-212	6.13E+03	B	6.97E+07	159	159	0.671 +/- 0.21	5.87 +/- 0.752	--	--	--	--	--	--	--
LEAD-214	7.56E+04	B	2.85E+12	159	159	0.64 +/- 0.24	22.8 +/- 2.71	--	--	--	--	--	--	--
POLONIUM-210	2.73E+02	B	--	38	--	--	--	--	--	38	-1.1 +/- 1.2	1.7 +/- 1.3	--	--
POLONIUM-212	1.17E+00	A	--	38	19	0.41 +/- 0.41	1.09 +/- 0.42	--	--	19	0.21 +/- 0.34	0.82 +/- 0.42	--	--
POLONIUM-214	1.89E+15	B	--	38	38	0.61 +/- 0.2	1.4 +/- 0.3	--	--	--	--	--	--	--
POLONIUM-215	8.97E+13	B	--	38	--	--	--	--	--	38	-0.61 +/- 0.47	0.53 +/- 0.47	--	--
POLONIUM-216	1.01E+13	B	--	76	76	0	8.7 +/- 1.7	--	--	--	--	--	--	--
POTASSIUM-40	3.50E+01	A	--	159	159	6.24 +/- 2.22	30.8 +/- 6.6	--	--	--	--	--	--	--
PROTACTINIUM-234	5.68E+02	B	--	127	1	21 +/- 12.9	21 +/- 12.9	--	--	126	-18.6 +/- 15.7	22.6 +/- 17.4	--	--
RADIUM 226	3.70E+00	B	2.36E+00	159	159	0.47 +/- 0.2	23.6 +/- 6.08	5	16	--	--	--	--	--
RADIUM 228	8.40E+00	B	2.94E+00	196	194	0.79 +/- 0.45	5.7+/-0.823	--	5	2	0.17 +/- 0.35	0.678 +/- 0.399	--	--
RADIUM-223	2.70E+02	B	5.67E+03	38	--	--	--	--	--	38	-0.61 +/- 0.47	0.53 +/- 0.47	--	--
RADIUM-224	7.91E+03	B	7.84E+04	127	127	0.671 +/- 0.21	8.7 +/- 4.9	--	--	--	--	--	--	--
THALLIUM-208	3.68E+04	B	--	157	156	0.351 +/- 0.147	1.83 +/- 0.283	--	--	1	0.122 +/- 0.104	0.122 +/- 0.104	--	--
THORIUM-227	1.94E+02	B	6.68E+04	127	1	1.46 +/- 0.607	1.46 +/- 0.607	--	--	126	-4.8 +/- 14.1	4.72 +/- 10.1	--	--
THORIUM-228	1.25E+02	B	6.60E+01	159	159	0.706 +/- 0.177	5.08 +/- 0.983	--	--	--	--	--	--	--
THORIUM-230	2.02E+01	B	6.06E+00	159	154	0.869 +/- 0.2	25.7 +/- 4.36	1	2	5	0.99 +/- 0.21	1.75 +/- 0.33	--	--

Table 4-3 (continued)

Detection Frequency of Chemicals in Subsurface Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
THORIUM-231	5.28E+04	B	4.44E+08	38	34	0	0.142 +/-	--	--	4	0.03 +/- 0.052	0.084 +/- 0.082	--	--
THORIUM-232	1.90E+01	B	--	199	199	0.675 +/- 0.171	4.69 +/- 0.904	--	--	--	--	--	--	--
THORIUM-234	3.28E+03	B	8.26E+04	128	49	1.32 +/- 0.88	21.2 +/- 3.6	--	--	79	-1.4 +/- 1.69	2.86 +/- 2.6	--	--
URANIUM 234	3.24E+01	B	2.24E+03	159	159	0.43 +/- 0.118	19.4 +/- 3.38	--	--	--	--	--	--	--
URANIUM 235	4.17E-01	B	7.77E-01	138	100	0.0293 +/- 0.0277	1.2 +/- 0.577	2	2	38	-0.129 +/- 0.464	0.39 +/- 0.408	--	--
URANIUM 235/236	--	--	--	21	8	0.057 +/- 0.053	0.17 +/- 0.09	--	--	13	-0.13 +/- 0.34	0.35 +/- 0.46	--	--
URANIUM-238	3.68E+01	B	2.37E+00	159	158	0.456 +/- 0.123	18.5 +/- 3.23	--	8	1	0.56 +/- 0.63	0.56 +/- 0.63	--	--
SEMI-VOLATILE ORGANIC COMPOUNDS														
2,2'-OXYBIS(1-CHLOROPROPANE)	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
2,4,5-TRICHLOROPHENOL	--	--	--	38	--	--	--	--	--	38	0.03	0.03	--	--
2,4,6-TRICHLOROPHENOL	--	--	--	38	--	--	--	--	--	38	0.03	0.03	--	--
2,4-DICHLOROPHENOL	--	--	--	38	--	--	--	--	--	38	0.03	0.03	--	--
2,4-DIMETHYLPHENOL	--	--	--	38	--	--	--	--	--	38	0.03	0.03	--	--
2,4-DINITROPHENOL	--	--	--	38	--	--	--	--	--	38	0.06	0.06	--	--
2,4-DINITROTOLUENE	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
2,6-DINITROTOLUENE	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
2-CHLORONAPHTHALENE	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
2-CHLOROPHENOL	--	--	--	38	--	--	--	--	--	38	0.01	0.01	--	--
2-METHYLNAPHTHALENE	--	--	--	38	--	--	--	--	--	38	0.01	0.01	--	--
2-NITROANILINE	--	--	--	38	--	--	--	--	--	38	0.04	0.04	--	--
2-NITROPHENOL	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
3,3'-DICHLOROBENZIDINE	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
3,4-METHYLPHENOL	--	--	--	38	--	--	--	--	--	38	0.04	0.04	--	--
3-NITROANILINE	--	--	--	38	--	--	--	--	--	38	0.03	0.03	--	--
4-BROMOPHENYL-PHENYLETHER	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
4-CHLORO-3-METHYLPHENOL	--	--	--	38	--	--	--	--	--	38	0.03	0.03	--	--
4-CHLOROPHENYL-PHENYLETHER	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
4-NITROPHENOL	--	--	--	38	--	--	--	--	--	38	0.04	0.04	--	--
ACENAPHTHENE	2.90E+04	B	5.70E+02	76	--	--	--	--	--	76	0.02	0.02	--	--
ACENAPHTHYLENE	--	--	--	76	--	--	--	--	--	76	0.02	0.03	--	--
ACETOPHENONE	--	--	--	38	--	--	--	--	--	38	0.05	0.05	--	--
ANILINE	--	--	--	38	--	--	--	--	--	38	0.04	0.04	--	--
ANTHRACENE	1.00E+05	B	1.20E+04	76	--	--	--	--	--	76	0.00	0.02	--	--
AZOBENZENE	--	--	--	38	--	--	--	--	--	38	0.10	0.10	--	--
BENZO(A)ANTHRACENE	2.10E+00	B	2.00E+00	76	--	--	--	--	--	76	0.00	0.02	--	--
BENZO(A)PYRENE	2.10E-01	B	8.00E+00	76	--	--	--	--	--	76	0.00	0.02	--	--

Table 4-3 (continued)

Detection Frequency of Chemicals in Subsurface Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
BENZO(B)FLUORANTHENE	2.10E+00	B	5.00E+00	76	--	--	--	--	--	76	0.00	0.04	--	--
BENZO(G,H,I)PERYLENE	--	--	--	76	--	--	--	--	--	76	0.00	0.10	--	--
BENZO(K)FLUORANTHENE	2.10E+01	B	4.90E+01	76	--	--	--	--	--	76	0.00	0.02	--	--
BENZOIC ACID	--	--	--	38	--	--	--	--	--	38	0.12	0.12	--	--
BENZYL ALCOHOL	--	--	--	38	--	--	--	--	--	38	0.03	0.03	--	--
BIS(2-CHLOROETHOXY)METHANE	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
BIS(2-CHLOROETHYL)ETHER	--	--	--	38	--	--	--	--	--	38	0.01	0.01	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	38	5	0.073	0.25	--	--	33	0.03	0.03	--	--
CARBAZOLE	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
CHRYSENE	2.10E+02	B	1.60E+02	76	--	--	--	--	--	76	0.00	0.01	--	--
DIBENZO(A,H)ANTHRACENE	2.10E-01	B	2.00E+00	76	--	--	--	--	--	76	0.01	0.08	--	--
DIBENZOFURAN	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
DIETHYL PHTHALATE	--	--	--	38	--	--	--	--	--	38	0.04	0.04	--	--
DIMETHYLPHTHALATE	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
DI-N-BUTYL PHTHALATE	--	--	--	38	--	--	--	--	--	38	0.03	0.03	--	--
DI-N-OCTYLPHTHALATE	--	--	--	38	--	--	--	--	--	38	0.14	0.14	--	--
FLUORANTHENE	2.20E+04	B	4.30E+03	38	--	--	--	--	--	38	0.02	0.02	--	--
FLUORENE	2.60E+04	B	5.60E+02	38	--	--	--	--	--	38	0.02	0.02	--	--
HEXACHLOROBENZENE	1.10E+00	B	2.00E+00	38	--	--	--	--	--	38	0.02	0.02	--	--
HEXACHLOROCYCLOPENTADIENE	--	--	--	38	--	--	--	--	--	38	0.07	0.07	--	--
HEXACHLOROETHANE	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
INDENO(1,2,3-CD)PYRENE	2.10E+00	B	1.40E+01	76	--	--	--	--	--	76	0.00	0.02	--	--
ISOPHORONE	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
NAPHTHALENE	1.90E+02	B	8.40E+01	38	--	--	--	--	--	38	0.01	0.01	--	--
NITROBENZENE	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
N-NITROSO-DI-N-PROPYLAMINE	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
N-NITROSODIPHENYLAMINE	--	--	--	38	--	--	--	--	--	38	0.02	0.02	--	--
OCTACHLOROSTYRENE	--	--	--	38	--	--	--	--	--	38	0.35	0.41	--	--
PENTACHLOROPHENOL	--	--	--	38	--	--	--	--	--	38	0.12	0.12	--	--
PHENANTHRENE	--	--	--	76	--	--	--	--	--	76	0.01	0.02	--	--
PHENOL	--	--	--	38	--	--	--	--	--	38	0.09	0.09	--	--
PYRENE	2.90E+04	B	4.20E+03	76	--	--	--	--	--	76	0.01	0.02	--	--
PYRIDINE	--	--	--	38	--	--	--	--	--	38	0.07	0.07	--	--

Table 4-3 (continued)

Detection Frequency of Chemicals in Subsurface Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
TOTAL PETROLEUM HYDROCARBONS (TPH)														
DIESEL RANGE ORGANICS	1.00E+02	D	--	51	--	--	--	--	--	51	0.94	200	3	--
GASOLINE RANGE ORGANICS	1.00E+02	D	--	23	--	--	--	--	--	23	0.5	0.5	--	--
MOTOR OIL RANGE ORGANICS	1.00E+02	D	--	13	1	54	54	--	--	12	29	30	--	--
WASTE OIL	1.00E+02	D	--	6	--	--	--	--	--	6	25	25	--	--
DIOXANS AND FURANS														
1234678-HEPTACHLORINATED DIBENZOFURAN	--	--	--	19	1	1.6E-05	1.6E-05	--	--	18	4.8E-08	2.1E-06	--	--
1234678-HEPTACHLORINATED DIBENZO-P-DIOXI	--	--	--	19	1	6.8E-06	6.8E-06	--	--	18	8.1E-08	5.9E-07	--	--
1234789-HEPTACHLORINATED DIBENZOFURAN	--	--	--	19	1	7.2E-06	7.2E-06	--	--	18	3.7E-08	7.5E-07	--	--
123478-HEXACHLORINATED DIBENZOFURAN	--	--	--	19	2	3.4E-06	8.9E-06	--	--	17	7.0E-08	1.2E-06	--	--
123478-HEXACHLORINATED DIBENZO-P-DIOXIN	--	--	--	19	--	--	--	--	--	19	7.0E-08	8.4E-07	--	--
123678-HEXACHLORINATED DIBENZOFURAN	--	--	--	19	1	6.9E-06	6.9E-06	--	--	18	3.8E-08	1.9E-06	--	--
123678-HEXACHLORINATED DIBENZO-P-DIOXIN	--	--	--	19	--	--	--	--	--	19	7.0E-08	7.6E-07	--	--
123789-HEXACHLORINATED DIBENZOFURAN	--	--	--	19	--	--	--	--	--	19	5.4E-08	1.1E-06	--	--
123789-HEXACHLORINATED DIBENZO-P-DIOXIN	--	--	--	19	--	--	--	--	--	19	5.9E-08	7.8E-07	--	--
12378-PENTACHLORINATED DIBENZOFURAN	--	--	--	19	1	5.2E-06	5.2E-06	--	--	18	8.1E-08	1.3E-06	--	--
12378-PENTACHLORINATED DIBENZO-P-DIOXIN	--	--	--	19	--	--	--	--	--	19	1.1E-07	4.8E-07	--	--
234678-HEXACHLORINATED DIBENZOFURAN	--	--	--	19	--	--	--	--	--	19	3.8E-08	2.3E-06	--	--
23478-PENTACHLORINATED DIBENZOFURAN	--	--	--	19	1	2.8E-06	2.8E-06	--	--	18	8.1E-08	1.7E-06	--	--
2378-TETRACHLORINATED DIBENZOFURAN	--	--	--	19	2	1.7E-06	3.4E-06	--	--	17	8.2E-08	5.2E-07	--	--
2378-TETRACHLORINATED DIBENZO-P-DIOXIN	1.60E-05	B	--	19	--	--	--	--	--	19	4.9E-08	2.0E-07	--	--

Table 4-3 (continued)

Detection Frequency of Chemicals in Subsurface Soil

Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
					No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
OCTACHLORINATED DIBENZOFURAN	--	--	--	19	1	3.6E-05	3.6E-05	--	--	18	1.4E-07	4.0E-06	--	--
OCTACHLORINATED DIBENZO-P-DIOXIN	--	--	--	19	1	7.8E-05	7.8E-05	--	--	18	2.4E-07	2.1E-06	--	--
POLYCHLORINATED BIPHENYLS (PCBs)														
AROCLOR-1016	2.10E+01	B	--	12	--	--	--	--	--	12	0.005	0.035	--	--
AROCLOR-1221	1.0E+00	C	--	12	--	--	--	--	--	12	0.005	0.035	--	--
AROCLOR-1232	1.0E+00	C	--	12	--	--	--	--	--	12	0.005	0.035	--	--
AROCLOR-1242	1.0E+00	C	--	12	--	--	--	--	--	12	0.005	0.035	--	--
AROCLOR-1248	1.0E+00	C	--	12	--	--	--	--	--	12	0.005	0.035	--	--
AROCLOR-1254	7.40E-01	B	--	12	--	--	--	--	--	12	0.005	0.035	--	--
AROCLOR-1260	1.0E+00	C	--	12	--	--	--	--	--	12	0.005	0.035	--	--
AROCLOR-1262	1.0E+00	C	--	1	--	--	--	--	--	1	0.035	0.035	--	--
AROCLOR-1268	1.0E+00	C	--	1	--	--	--	--	--	1	0.035	0.035	--	--
PESTICIDES														
2,4'-DDE	--	--	--	38	--	--	--	--	--	38	2.0E-02	2.0E-02	--	--
4,4'-DDD	1.00E+01	B	1.60E+01	45	--	--	--	--	--	45	1.9E-04	4.9E-04	--	--
4,4'-DDE	7.00E+00	B	5.40E+01	45	7	1.8E-03	4.9E-02	--	--	38	2.0E-04	2.7E-04	--	--
4,4'-DDT	7.00E+00	B	3.20E+01	45	10	2.4E-03	1.6E-02	--	--	35	3.3E-04	4.3E-04	--	--
ALDRIN	--	--	--	45	--	--	--	--	--	45	1.2E-04	5.5E-04	--	--
ALPHA-BHC	--	--	--	45	3	4.4E-03	6.8E-03	--	--	42	1.1E-04	1.4E-04	--	--
ALPHA-CHLORDANE	--	--	--	45	--	--	--	--	--	45	1.8E-04	3.3E-04	--	--
BETA-BHC	--	--	--	45	2	2.5E-03	9.5E-03	--	--	43	1.4E-04	3.9E-04	--	--
CHLORDANE	--	--	--	38	--	--	--	--	--	38	1.7E-03	1.7E-03	--	--
DELTA-BHC	--	--	--	45	--	--	--	--	--	45	1.1E-04	1.5E-04	--	--
DIELDRIN	--	--	--	45	--	--	--	--	--	45	1.5E-04	1.9E-04	--	--
ENDOSULFAN I	--	--	--	45	--	--	--	--	--	45	1.2E-04	1.4E-04	--	--
ENDOSULFAN II	--	--	--	45	--	--	--	--	--	45	1.6E-04	2.9E-04	--	--
ENDOSULFAN SULFATE	--	--	--	45	--	--	--	--	--	45	1.3E-04	3.4E-04	--	--
ENDRIN	--	--	--	45	--	--	--	--	--	45	1.8E-04	2.1E-04	--	--
ENDRIN ALDEHYDE	--	--	--	45	--	--	--	--	--	45	1.9E-04	6.2E-04	--	--
ENDRIN KETONE	--	--	--	45	--	--	--	--	--	45	3.1E-04	4.5E-04	--	--
GAMMA-BHC (LINDANE)	--	--	--	45	3	1.9E-03	3.2E-03	--	--	42	1.1E-04	1.6E-04	--	--
GAMMA-CHLORDANE	--	--	--	45	--	--	--	--	--	45	1.2E-04	1.9E-04	--	--
HEPTACHLOR	--	--	--	45	--	--	--	--	--	45	2.1E-04	2.3E-04	--	--
HEPTACHLOR EPOXIDE	--	--	--	45	--	--	--	--	--	45	1.8E-04	2.3E-04	--	--

Table 4-3 (continued)

Detection Frequency of Chemicals in Subsurface Soil

					Detections (mg/kg or pCi/g)					Nondetections (mg/kg or pCi/g)				
Analyte	TIMET SSL (mg/kg or pCi/g)	TIMET SSL Source	DAF20 (mg/kg or pCi/g)	Total Count	No. of Detects	Minimum	Maximum	No. > SSL	No. > DAF20	No. of Nondetects	Minimum	Maximum	No. > SSL	No. > DAF20
METHOXYCHLOR	--	--	--	45	8	4.3E-03	4.8E-02	--	--	37	3.3E-04	1.6E-03	--	--
TOXAPHENE	--	--	--	45	--	--	--	--	--	45	1.5E-02	1.9E-02	--	--

Notes:

A	BRC/TIMET Maxiumum Background
B	EPA Region 9 Preliminary Remediation Goal
C	Toxic Substances Control Act
D	State of Nevada
BHC	Benzenehexachloride
BRC	Basic Remediation Company
Conc	Concentration
DAF20	Diluation Attenuation Factor Equal to 20
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
mg/kg	Milligram per kilogram
pCi/g	Picocuries per liter
Qual	Qualifier
SSL	Soil Screening Level
TIMET	Titanium Metals Corporation

Table 4-4
Detection Frequency of Chemicals in the Plant Site Groundwater Monitorings Wells, March 2000 to September 2001

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
INORGANIC IONS											
BICARBONATE ALKALINITY	--	--	88	87	12	480	--	1	5	5	--
CHLORIDE	250	B	88	88	184	5,990	83	--	--	--	--
NITRATE	10	A	88	87	0.32	128	66	1	2	2	--
PERCHLORATE	0.018	D	2	2	4.1	5.2	2	--	--	--	--
SULFATE	250	B	88	88	13.4	21,000	86	--	--	--	--
TOTAL DISSOLVED SOLIDS	1900	D	88	88	396	15,600	87	--	--	--	--
METALS											
ARSENIC	0.01	A	95	95	0.0276	0.493	95	--	--	--	--
BARIUM	2	A	95	95	0.008	0.39	--	--	--	--	--
CADMIUM	0.005	A	95	3	0.002	0.0045	--	92	0.005	0.05	10
CALCIUM	--	--	93	93	295	1850	--	--	--	--	--
CHROMIUM	0.1	A	95	95	0.017	0.591	36	--	--	--	--
IRON	0.3	B	93	79	0.0328	26.5	43	14	0.1	0.5	2
LEAD	0.015	A	95	38	0.00096	0.024	4	57	0.003	0.003	--
MAGNESIUM	--	--	93	93	77.4	929	--	--	--	--	--
MANGANESE	0.05	B	93	74	0.002	2.29	37	19	0.015	0.015	--
MERCURY	0.002	A	95	29	0.000037	0.00031	--	66	0.0	0.0002	--
SELENIUM	0.05	A	95	92	0.0031	0.0165	--	3	0.005	0.005	--
SILVER	0.1	B	95	3	0.0081	0.01	--	92	0.01	0.05	--
SODIUM	--	--	93	86	270	3720	--	7	5	5	--
URANIUM	0.03	A	84	84	0.0073	0.18	60	--	--	--	--
VANADIUM	0.036	C	39	39	0.009	8.94	27	--	--	--	--
VOLATILE ORGANIC COMPOUNDS											
1,1,1-TRICHLOROETHANE	0.2	A	85	--	--	--	--	85	0.005	0.025	--
1,1,2,2-TETRACHLOROETHANE	--	--	85	--	--	--	--	85	0.005	0.025	--
1,1,2-TRICHLOROETHANE	0.005	A	85	--	--	--	--	85	0.005	0.025	1
1,1-DICHLOROETHANE	0.81	C	85	18	0.00041	0.0031	--	67	0.005	0.025	--
1,1-DICHLOROETHENE	0.007	A	85	39	0.001	0.011	11	46	0.005	0.025	1
1,2-DICHLOROETHANE	0.005	A	85	2	0.00055	0.00057	--	83	0.005	0.025	1
1,2-DICHLOROETHENE (TOTAL)	--	--	85	4	0.00094	0.0018	--	81	0.005	0.025	--
1,2-DICHLOROPROPANE	0.005	A	85	--	--	--	--	85	0.005	0.025	1
1,3-DICHLOROBENZENE	0.18	C	85	--	--	--	--	85	0.005	0.025	--
1,4-DICHLOROBENZENE	--	--	2	--	--	--	--	2	0.005	0.005	--
2-BUTANONE	7	C	85	--	--	--	--	85	0.02	0.1	--
2-HEXANONE	--	--	85	--	--	--	--	85	0.02	0.1	--
4-METHYL-2-PENTANONE	2	C	85	--	--	--	--	85	0.02	0.1	--
ACETONE	5.5	C	85	7	0.002	0.096	--	78	0.02	0.1	--
BENZENE	0.005	A	85	--	--	--	--	85	0.005	0.025	1
BROMODICHLOROMETHANE	0.00018	C	85	25	0.00061	0.0052	25	60	0.005	0.025	60

Table 4-4 (continued)
Detection Frequency of Chemicals in the Plant Site Groundwater Monitorings Wells, March 2000 to September 2001

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
BROMOFORM	0.0085	C	85	4	0.00092	0.003	--	81	0.005	0.025	1
BROMOMETHANE	0.0087	C	85	--	--	--	--	85	0.01	0.05	85
CARBON DISULFIDE	1	C	85	3	0.00061	0.018	--	82	0.005	0.025	--
CARBON TETRACHLORIDE	0.005	A	85	51	0.001	0.013	9	34	0.005	0.025	1
CHLOROBENZENE	0.1	A	85	--	--	--	--	85	0.005	0.025	--
CHLOROETHANE	--	--	85	--	--	--	--	85	0.01	0.05	--
CHLOROFORM	0.00017	C	85	84	0.003	1.1	84	1	0.005	0.005	1
CHLOROMETHANE	0.16	C	85	--	--	--	--	85	0.01	0.05	--
CIS-1,3-DICHLOROPROPENE	--	--	85	--	--	--	--	85	0.005	0.025	--
DIBROMOCHLOROMETHANE	0.00013	C	85	4	0.00086	0.001	4	81	0.005	0.025	81
ETHYLBENZENE	0.7	A	85	--	--	--	--	85	0.005	0.025	--
METHYLENE CHLORIDE	0.005	A	85	4	0.005	0.0087	3	81	0.005	0.025	1
STYRENE	0.1	A	85	--	--	--	--	85	0.005	0.025	--
TETRACHLOROETHENE	0.005	A	85	54	0.00059	0.25	41	31	0.005	0.025	1
TOLUENE	1	A	85	2	0.00055	0.001	--	83	0.005	0.025	--
TRANS-1,3-DICHLOROPROPENE	--	--	85	--	--	--	--	85	0.005	0.025	--
TRICHLOROETHENE	0.005	A	85	33	0.00038	0.021	28	52	0.005	0.025	1
VINYL CHLORIDE	0.002	A	85	--	--	--	--	85	0.01	0.05	85
XYLENE (TOTAL)	10	A	85	--	--	--	--	85	0.005	0.025	--
RADIONUCLIDES											
ACTINIUM-228	24	C	9	--	--	--	--	9	-65 +/- 44	45 +/- 36	1
BISMUTH 212	67	C	9	--	--	--	--	9	-60 +/- 120	110 +/- 150	1
BISMUTH-214	250	C	9	--	--	--	--	9	-24 +/- 15	2 +/- 20	--
CESIUM-134	--	--	9	--	--	--	--	9	-9.2 +/- 7.8	5.6 +/- 9.6	--
CESIUM-137	--	--	22	--	--	--	--	22	-13 +/- 7.1	6.7 +/- 8.8	--
COBALT-57	--	--	9	--	--	--	--	9	-7.8 +/- 5.1	3.2 +/- 7.3	--
COBALT-60	--	--	9	--	--	--	--	9	-11 +/- 13	10 +/- 11	--
GROSS ALPHA	--	A	57	34	16 +/- 9.8	164 +/- 53	--	23	-34 +/- 47	45	--
GROSS BETA	--	A	58	24	24 +/- 13	94 +/- 29	--	34	-14 +/- 43	46 +/- 39	--
LEAD-210	0.0541	C	9	--	--	--	--	9	60 +/- 270	670 +/- 870	9
LEAD-212	1.9	C	9	--	--	--	--	9	-34 +/- 15	-7 +/- 12	--
LEAD-214	140	C	9	--	--	--	--	9	-40 +/- 16	-0.6 +/- 13	--
POTASSIUM-40	1.9	C	9	--	--	--	--	9	-140 +/- 150	110 +/- 150	3
RADIUM 226	--	A	58	45	0.188 +/- 0.035	5.06 +/- 0.56	--	13	-0.89 +/- 0.32	0.2 +/- 0.14	--
RADIUM 228	--	A	58	14	0.68 +/- 0.41	1.21 +/- 0.45	--	44	-1 +/- 0.86	1 +/- 1.1	--
RADON 222	1.3	C	50	50	294 +/- 41.1	1664 +/- 65.9	50	--	--	--	--
THALLIUM-208	--	--	9	--	--	--	--	9	-19 +/- 10	1.9 +/- 9.1	--
THORIUM-228	0.445	C	18	7	0.24 +/- 0.22	0.75 +/- 0.4	3	11	-0.000006 +/- 0.12	0.23 +/- 0.31	--
THORIUM-230	0.523	C	18	11	0.15 +/- 0.13	2 +/- 0.87	5	7	0.062 +/- 0.085	0.94 +/- 0.45	2
THORIUM-232	0.471	C	18	5	0.25 +/- 0.18	0.76 +/- 0.36	1	13	-0.02 +/- 0.041	0.2 +/- 0.19	--

Table 4-4 (continued)
Detection Frequency of Chemicals in the Plant Site Groundwater Monitorings Wells, March 2000 to September 2001

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
URANIUM 234	0.674	C	59	59	3 +/- 0.9	84	59	--	--	--	--
URANIUM 235	0.663	C	59	52	0.12 +/- 0.12	5.5	42	7	0 +/- 0	0.28 +/- 0.32	--
URANIUM-238	0.744	C	59	59	2 +/- 0.63	59	59	--	--	--	--

Notes:

A	BRC/TIMET Maxiumum Background
B	EPA Region 9 Preliminary Remediation Goal
C	Toxic Substances Control Act
D	State of Nevada
BHC	Benzenehexachloride
BRC	Basic Remediation Company
Conc	Concentration
DAF20	Diluation Attenuation Factor Equal to 20
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
mg/kg	Milligram per kilogram
pCi/g	Picocuries per liter
Qual	Qualifier
SSL	Soil Screening Level
TIMET	Titanium Metals Corporation

Table 4-5

Detection Frequency of Chemicals in the Plant Site Groundwater Monitorings Wells, October 2001 to December 2004

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
INORGANIC IONS											
BICARBONATE ALKALINITY	--	--	151	151	58	266	--	--	--	--	--
CHLORIDE	250	B	151	151	204	26,300	145	--	--	--	--
NITRATE	10	A	151	151	2	95.4	108	--	--	--	--
SULFATE	250	B	151	151	851	5,850	151	--	--	--	--
TOTAL DISSOLVED SOLIDS	1900	D	151	151	253	40,400	150	--	--	--	--
METALS											
ARSENIC	0.01	A	167	167	0.0178	0.592	167	--	--	--	--
BARIUM	2	A	167	158	0.0016	1.53	--	9	1	5	2
CADMIUM	0.005	A	167	5	0.002	0.025	2	162	0.002	0.125	36
CALCIUM	--	--	166	166	38.5	3,370	--	--	--	--	--
CHROMIUM	0.1	A	167	166	0.0026	1.23	66	1	0.04	0.04	--
IRON	0.3	B	166	85	0.0158	91.4	33	81	0.01	2.5	16
LEAD	0.015	A	167	75	0.001	0.0735	15	92	0.002	0.075	8
MAGNESIUM	--	--	166	166	17.3	2,000	--	--	--	--	--
MANGANESE	0.05	B	166	87	0.001	2.08	41	79	0.0003	0.375	1
MERCURY	0.002	A	167	23	0.000017	0.0002	--	144	4.6E-05	0.0002	--
SELENIUM	0.05	A	167	136	0.0013	0.0387	--	31	0.005	0.125	4
SILVER	0.1	B	167	10	0.0022	0.05	--	157	0.0018	0.25	2
SODIUM	--	--	166	166	58.8	10,800	--	--	--	--	--
URANIUM	0.03	A	159	159	0.005	1.33	110	--	--	--	--
VANADIUM	0.036	C	165	157	0.0084	12.2	111	8	0.038	1.25	8
VOLATILE ORGANIC COMPOUNDS											
1,1,1-TRICHLOROETHANE	0.2	A	151	--	--	--	--	151	0.005	0.05	--
1,1,2,2-TETRACHLOROETHANE	--	--	151	--	--	--	--	151	0.005	0.05	--
1,1,2-TRICHLOROETHANE	0.005	A	151	--	--	--	--	151	0.005	0.05	20
1,1-DICHLOROETHANE	0.81	C	151	34	0.00037	0.0014	--	117	0.005	0.05	--
1,1-DICHLOROETHENE	0.007	A	151	64	0.0005	0.012	7	87	0.005	0.05	17
1,2-DICHLOROBENZENE	--	--	9	--	--	--	--	9	0.005	0.005	--
1,2-DICHLOROETHANE	0.005	A	151	--	--	--	--	151	0.005	0.05	20
1,2-DICHLOROETHENE (TOTAL)	--	--	151	2	0.00086	0.001	--	149	0.005	0.1	--
1,2-DICHLOROPROPANE	0.005	A	151	--	--	--	--	151	0.005	0.05	20
1,3-DICHLOROBENZENE	0.18	C	151	--	--	--	--	151	0.005	0.05	--
1,4-DICHLOROBENZENE	--	--	11	--	--	--	--	11	0.005	0.005	--
2-BUTANONE	7	C	151	--	--	--	--	151	0.02	0.2	--
2-HEXANONE	--	--	151	--	--	--	--	151	0.02	0.2	--
4-METHYL-2-PENTANONE	2	C	151	--	--	--	--	151	0.02	0.2	--
ACETONE	5.5	C	151	15	0.0033	0.03	--	136	0.02	0.2	--
BENZENE	0.005	A	151	--	--	--	--	151	0.005	0.05	20
BROMODICHLOROMETHANE	0.00018	C	151	48	0.00027	0.037	48	103	0.005	0.05	103

Table 4-5 (continued)

Detection Frequency of Chemicals in the Plant Site Groundwater Monitorings Wells, October 2001 to December 2004

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
BROMOFORM	0.0085	C	151	15	0.0007	0.068	11	136	0.005	0.05	15
BROMOMETHANE	0.0087	C	151	--	--	--	--	151	0.01	0.1	151
CARBON DISULFIDE	1	C	151	--	--	--	--	151	0.005	0.05	--
CARBON TETRACHLORIDE	0.005	A	151	102	0.00032	0.0084	17	49	0.005	0.05	3
CHLOROBENZENE	0.1	A	151	1	0.00083	0.00083	--	150	0.005	0.05	--
CHLOROETHANE	--	--	151	--	--	--	--	151	0.01	0.1	--
CHLOROFORM	0.00017	C	150	146	0.0021	1.6	146	4	0.005	0.005	4
CHLOROMETHANE	0.16	C	152	7	0.00032	0.0026	--	145	0.01	0.1	--
CIS-1,3-DICHLOROPROPENE	--	--	151	--	--	--	--	151	0.005	0.05	--
DIBROMOCHLOROMETHANE	0.00013	C	151	17	0.00061	0.027	17	134	0.005	0.05	134
ETHYLBENZENE	0.7	A	151	--	--	--	--	151	0.005	0.05	--
M,P-XYLENEPo	--	--	9	--	--	--	--	9	0.005	0.005	--
METHYLENE CHLORIDE	0.005	A	151	15	0.0022	0.035	6	136	0.005	0.05	15
O-XYLENE	--	--	9	--	--	--	--	9	0.005	0.005	--
STYRENE	0.1	A	151	--	--	--	--	151	0.005	0.05	--
TETRACHLOROETHENE	0.005	A	151	108	0.00051	0.12	76	43	0.005	0.05	9
TOLUENE	1	A	151	1	0.00047	0.00047	--	150	0.005	0.05	--
TRANS-1,3-DICHLOROPROPENE	--	--	151	--	--	--	--	151	0.005	0.05	--
TRICHLOROETHENE	0.005	A	151	56	0.0005	0.02	31	95	0.005	0.05	13
VINYL CHLORIDE	0.002	A	150	--	--	--	--	150	0.005	0.05	150
XYLENE (TOTAL)	10	A	150	--	--	--	--	150	0.005	0.1	--
RADIONUCLIDES											
ACTINIUM-227	0.237	C	23	--	--	--	--	23	-81 +/- 36	25 +/- 33	1
ACTINIUM-228	24	C	23	--	--	--	--	23	-28 +/- 24	36 +/- 29	1
BISMUTH 212	67	C	23	--	--	--	--	23	-27 +/- 47	48 +/- 59	--
BISMUTH-214	250	C	23	1	41 +/- 21	41 +/- 21	--	22	-21 +/- 12	42	--
CESIUM-134	--	--	23	--	--	--	--	23	-12.5 +/- 6.6	3.3 +/- 5.8	--
CESIUM-137	--	--	23	--	--	--	--	23	-13.8 +/- 7	10.3 +/- 9.5	--
COBALT-57	--	--	23	--	--	--	--	23	-9.8 +/- 4.3	3.1 +/- 3.6	--
COBALT-60	--	--	23	--	--	--	--	23	-10 +/- 11	9.7 +/- 8.2	--
GROSS ALPHA	--	A	100	64	30 +/- 19	980 +/- 260	--	36	0 +/- 0.16	230 +/- 270	--
GROSS BETA	--	A	100	44	18 +/- 11	500 +/- 140	--	56	-13 +/- 25	210 +/- 150	--
LEAD-210	0.0541	C	23	2	205 +/- 99.8	240 +/- 100	2	21	-110 +/- 200	400 +/- 390	15
LEAD-212	1.9	C	23	--	--	--	--	23	-19 +/- 11	10	8
LEAD-214	140	C	23	1	40	40	--	22	-24 +/- 12	26 +/- 17	--
POTASSIUM-40	1.9	C	23	--	--	--	--	23	-68 +/- 75	180 +/- 100	14
RADIUM 226	--	A	101	89	0.23 +/- 0.16	9.6 +/- 1.7	--	12	-0.94 +/- 0.82	0.23 +/- 0.16	--
RADIUM 228	--	A	101	37	0.67 +/- 0.39	6.5 +/- 2.4	--	64	-0.22 +/- 0.66	1.6 +/- 1.2	--
RADON 222	1.3	C	86	86	305 +/- 34.1	2390 +/- 170	86	--	--	--	--
THALLIUM-208	--	--	23	--	--	--	--	23	-21 +/- 19	7.4 +/- 6.8	--

Table 4-5 (continued)

Detection Frequency of Chemicals in the Plant Site Groundwater Monitorings Wells, October 2001 to December 2004

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
THORIUM-228	0.445	C	23	6	0.2 +/- 0.16	1.24 +/- 0.44	1	17	-0.018	0.34 +/- 0.41	--
THORIUM-230	0.523	C	23	16	0.16	4.46 +/- 0.84	12	7	0.13 +/- 0.19	0.63 +/- 0.29	1
THORIUM-232	0.471	C	23	5	0.2	0.85 +/- 0.32	1	18	-0.036 +/- 0.03	0.19 +/- 0.21	--
THORIUM-234	2.1	C	2	2	161 +/- 82	230	2	--	--	--	--
URANIUM 234	0.674	C	107	107	3 +/- 0.92	565 +/- 70	107	--	--	--	--
URANIUM 235	0.663	C	106	99	0.12 +/- 0.12	24.8 +/- 4.1	69	7	0.053 +/- 0.095	0.16 +/- 0.17	--
URANIUM-238	0.744	C	106	106	2 +/- 0.72	437 +/- 54	106	--	--	--	--

Notes:

A	BRC/TIMET Maxiumum Background
B	EPA Region 9 Preliminary Remediation Goal
C	Toxic Substances Control Act
D	State of Nevada
BHC	Benzenehexachloride
BRC	Basic Remediation Company
Conc	Concentration
DAF20	Diluation Attenuation Factor Equal to 20
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
mg/kg	Milligram per kilogram
pCi/g	Picocuries per liter
Qual	Qualifier
SSL	Soil Screening Level
TIMET	Titanium Metals Corporation

Table 4-6

Detection Frequency of Chemicals in the Plant Site Groundwater Monitorings Wells, January 2005 to May 2006

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
INORGANIC IONS											
BICARBONATE ALKALINITY	--	--	71	71	72	430	--	--	--	--	--
CHLORIDE	250	B	68	68	100	10,000	61	--	--	--	--
NITRATE	10	A	68	67	0.59	50	41	1	0.33	0.33	--
PERCHLORATE	0.018	D	9	9	0.069	4.3	9	--	--	--	--
SULFATE	250	B	68	68	620	4,200	68	--	--	--	--
TOTAL DISSOLVED SOLIDS	1900	D	71	71	1,200	23,000	69	--	--	--	--
METALS											
ALUMINUM	36	C	73	8	0.13	0.7	--	65	4.1E-06	0.5	--
ANTIMONY	0.006	A	73	--	--	--	--	73	1.5E-06	0.1	12
ARSENIC	0.01	A	73	73	0.016	0.52	73	--	--	--	--
BARIUM	2	A	73	1	0.023	0.023	--	72	7.4E-08	0.5	--
BERYLLIUM	0.004	A	73	--	--	--	--	73	2E-08	0.01	2
CADMIUM	0.005	A	73	--	--	--	--	73	1.8E-07	0.025	12
CALCIUM	--	--	73	73	66	1,100	--	--	--	--	--
CHROMIUM	0.1	A	73	72	0.002	2.6	22	1	3.8E-07	3.8E-07	--
COBALT	0.73	C	73	13	0.002	0.016	--	60	4.8E-07	0.05	--
COPPER	1.3	A	73	3	0.0026	0.0048	--	70	2.7E-07	0.05	--
IRON	0.3	B	73	13	0.11	0.53	3	60	6.8E-06	0.5	1
LEAD	0.015	A	73	--	--	--	--	73	1.1E-06	0.015	--
LITHIUM	0.73	C	18	18	0.072	0.65	--	--	--	--	--
MAGNESIUM	--	--	73	73	18	480	--	--	--	--	--
MANGANESE	0.05	B	73	32	0.00025	0.32	5	41	9.5E-08	0.05	--
MERCURY	0.002	A	73	3	0.0000048	0.0000084	--	70	3.6E-09	0.0002	--
MOLYBDENUM	0.18	C	18	18	0.017	0.3	2	--	--	--	--
NICKEL	0.013	C	73	24	0.00072	0.0086	--	49	6.3E-07	0.1	12
POTASSIUM	--	--	73	73	7.6	78	--	--	--	--	--
SELENIUM	0.05	A	73	58	0.0043	0.026	--	15	2.9E-06	0.015	--
SILVER	0.1	B	73	3	0.002	0.003	--	70	5.1E-07	0.05	--
SODIUM	--	--	73	73	100	5,300	--	--	--	--	--
THALLIUM	0.002	A	73	5	0.00004	0.000094	--	68	1.6E-08	0.0002	--
TITANIUM	150	C	18	14	0.00077	0.032	--	4	5.4E-07	0.001	--
URANIUM	0.03	A	73	73	0.0071	0.19	49	--	--	--	--
VANADIUM	0.036	C	73	70	0.011	11	46	3	0.02	0.05	1
ZINC	5	B	73	12	0.0013	0.076	--	61	3.4E-07	0.1	--
VOLATILE ORGANIC COMPOUNDS											
1,1,1-TRICHLOROETHANE	0.2	A	70	--	--	--	--	70	0.0002	0.004	--
1,1,2,2-TETRACHLOROETHANE	--	--	58	--	--	--	--	58	0.0001	0.003	--
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	--	--	58	--	--	--	--	58	0.0002	0.004	--
1,1,2-TRICHLOROETHANE	0.005	A	70	--	--	--	--	70	0.0001	0.002	--
1,1-DICHLOROETHANE	0.81	C	70	35	0.00014	0.0014	--	35	0.0001	0.002	--
1,1-DICHLOROETHENE	0.007	A	70	39	0.00025	0.012	8	31	0.0002	0.004	--
1,2,3-TRICHLOROBENZENE	--	--	58	5	0.0004	0.0019	--	53	0.0001	0.002	--

Table 4-6 (continued)

Detection Frequency of Chemicals in the Plant Site Groundwater Monitorings Wells, January 2005 to May 2006

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
1,2,4-TRICHLOROBENZENE	--	--	58	5	0.00038	0.0015	--	53	0.0001	0.002	--
1,2-DIBROMO-3-CHLOROPROPANE	--	--	58	--	--	--	--	58	0.0005	0.011	--
1,2-DICHLOROBENZENE	--	--	58	5	0.00017	0.00027	--	53	0.0001	0.002	--
1,2-DICHLOROETHANE	0.005	A	70	2	0.00018	0.00036	--	68	0.0001	0.002	--
1,2-DICHLOROPROPANE	0.005	A	70	5	0.00014	0.00026	--	65	0.0001	0.003	--
1,3-DICHLOROBENZENE	0.18	C	70	--	--	--	--	70	0.0001	0.002	--
1,4-DICHLOROBENZENE	--	--	58	6	0.000099	0.00036	--	52	0.0001	0.00	--
2-BUTANONE	7	C	58	--	--	--	--	58	0.001	0.02	--
2-HEXANONE	--	--	58	--	--	--	--	58	0.0005	0.01	--
4-METHYL-2-PENTANONE	2	C	58	--	--	--	--	58	0.0007	0.014	--
ACETONE	5.5	C	58	--	--	--	--	58	0.0014	0.029	--
BENZENE	0.005	A	70	7	0.00014	0.00027	--	63	0.0001	0.003	--
BROMOCHLOROMETHANE	--	--	58	--	--	--	--	58	0.0002	0.003	--
BROMODICHLOROMETHANE	0.00018	C	70	36	0.00013	0.024	32	34	0.0001	0.002	9
BROMOFORM	0.0085	C	69	8	0.00078	0.04	1	61	0.0002	0.003	--
BROMOMETHANE	0.0087	C	70	--	--	--	--	70	0.0001	0.002	--
CARBON DISULFIDE	1	C	70	1	0.00043	0.00043		69	0.0001	0.002	--
CARBON TETRACHLORIDE	0.005	A	70	52	0.00021	0.014	7	18	0.0001	0.001	--
CHLOROBENZENE	0.1	A	70	--	--	--	--	70	0.0001	0.002	--
CHLOROETHANE	--	--	58	--	--	--	--	58	0.0002	0.0035	--
CHLOROFORM	0.00017	C	70	69	0.0015	1.8	69	1	0.0001	0.0001	--
CHLOROMETHANE	0.16	C	70	--	--	--	--	70	0.0002	0.003	--
CIS-1,2-DICHLOROETHENE	0.07	A	70	11	0.00019	0.00055	--	59	0.0002	0.004	--
CIS-1,3-DICHLOROPROPENE	--	--	58	--	--	--	--	58	0.0001	0.002	--
DIBROMOCHLOROMETHANE	0.00013	C	70	15	0.00036	0.018	15	55	0.0001	0.003	23
DIBROMOETHANE	--	--	58	--	--	--	--	58	0.0001	0.003	--
DICHLORODIFLUOROMETHANE	--	--	58	--	--	--	--	58	0.0001	0.002	--
ETHYLBENZENE	0.7	A	70	--	--	--	--	70	0.0001	0.0035	--
ISOPROPYLBENZENE	--	--	58	--	--	--	--	58	0.0001	0.002	--
METHYLENE CHLORIDE	0.005	A	70	2	0.00069	0.0012	--	68	0.0002	0.011	1
METHYL-T-BUTYL ETHER	--	--	58	--	--	--	--	58	0.0001	0.0025	--
STYRENE	0.1	A	70	--	--	--	--	70	0.0001	0.002	--
TETRACHLOROETHENE	0.005	A	70	56	0.00043	0.17	32	14	0.0001	0.003	--
TOLUENE	1	A	70	6	0.00011	0.00071		64	0.0001	0.0025	--
TRANS-1,2-DICHLOROETHENE	0.1	A	70	--	--	--	--	70	0.0001	0.0025	--
TRANS-1,3-DICHLOROPROPENE	--	--	58	--	--	--	--	58	0.0001	0.003	--
TRICHLOROETHENE	0.005	A	70	37	0.00025	0.019	13	33	0.0002	0.004	--
TRICHLOROFLUOROMETHANE	1.3	A	70	--	--	--	--	70	0.0001	0.002	--
VINYL CHLORIDE	0.002	A	70	--	--	--	--	70	0.0001	0.003	1
XYLENE (TOTAL)	10	A	70	--	--	--	--	70	0.0001	0.002	--

Table 4-6 (continued)

Detection Frequency of Chemicals in the Plant Site Groundwater Monitorings Wells, January 2005 to May 2006

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
RADIONUCLIDES											
ACTINIUM-228	24	C	47	7	15.5 +/- 9.1	27.2 +/- 10.8	2	40	-7.31 +/- 16.9	21 +/- 13.3	--
AMERICIUM-241	--	--	1	1	6.98 +/- 3.78	6.98 +/- 3.78	--		--	--	--
BISMUTH 212	67	C	47	2	57.2 +/- 31.5	78.2 +/- 36.6	1	45	-26 +/- 44.9	69.8 +/- 61.8	1
BISMUTH-214	250	C	47	11	10.8 +/- 5.17	256 +/- 38.4	1	36	-30.4 +/- 10.3	14.7 +/- 11.1	--
CESIUM-134	--	--	40	--	--	--	--	40	-6.44 +/- 3.74	13.5 +/- 24.9	--
CESIUM-137	--	--	40	--	--	--	--	40	-5.52 +/- 3.09	1.72 +/- 2.63	--
COBALT-57	--	--	40	--	--	--	--	40	-1.58 +/- 2.38	2.78 +/- 2.81	--
COBALT-60	--	--	40	--	--	--	--	40	-2.57 +/- 2.47	2.44 +/- 3.47	--
GROSS ALPHA	--	A	30	27	6.37 +/- 3.11	97.1 +/- 17.2	--	3	3.73 +/- 3.26	8.05 +/- 5.52	--
GROSS BETA	--	A	30	21	11.7 +/- 6.29	79.6 +/- 33.8	--	9	6.88 +/- 5.85	42.4 +/- 32.7	--
LEAD-210	0.0541	C	47	14	0.447 +/- 0.243	2.34 +/- 0.75	14	33	-0.387 +/- 0.582	0.977 +/- 0.667	32
LEAD-212	1.9	C	47	4	6.41 +/- 3.97	15.4 +/- 4.6	4	43	-4.1 +/- 7.57	6.89 +/- 7.37	11
LEAD-214	140	C	47	9	11.7 +/- 7.26	267 +/- 32.7	2	38	-5.81 +/- 8.7	8.71 +/- 9.18	--
POTASSIUM-40	1.9	C	47	5	77.3 +/- 48.3	289 +/- 53.7	5	42	-41.9 +/- 102	83.9 +/- 105	36
PROTACTINIUM-234	18.6	C	47		--	--	--	47	-239 +/- 450	734 +/- 506	36
RADIUM 226	--	A	47	24	0.339 +/- 0.229	2.21 +/- 0.69	--	23	-0.19 +/- 0.332	0.729 +/- 0.578	--
RADIUM 228	--	A	55	17	0.617 +/- 0.359	1.42 +/- 0.573	--	38	-4.35 +/- 13.5	1.94 +/- 2.05	--
RADIUM-224	0.00095	C	25	3	6.41 +/- 3.97	9.39 +/- 4.91	3	22	-2.81 +/- 5.29	5.06 +/- 8.61	18
RADON 222	1.3	C	48	48	43.4 +/- 18.6	3590 +/- 413	48		--	--	--
THALLIUM-208	--	--	47	5	4.61 +/- 2.58	6.94 +/- 2.92	--	42	-1.76 +/- 3.26	4.2 +/- 2.89	--
THORIUM-227	1	C	47		--	--	--	47	-27.6 +/- 24.9	20.6 +/- 21.2	20
THORIUM-228	0.445	C	47		--	--	--	47	-0.0358 +/- 0.0599	0.189 +/- 0.155	--
THORIUM-230	0.523	C	47	2	0.128 +/- 0.0823	0.15 +/- 0.0847	--	45	-0.0709 +/- 0.0473	0.126 +/- 0.0813	--
THORIUM-232	0.471	C	47	4	0.017 +/- 0.0142	0.0459 +/-	--	43	-0.013 +/- 0.0195	0.0399 +/- 0.0373	--
THORIUM-234	2.1	C	47	4	55.8 +/- 35	248 +/- 51.8	4	43	-50.8 +/- 68.8	42.2 +/- 82	23
URANIUM 234	0.674	C	47	47	3.88 +/- 0.784	73.3 +/- 12	47		--	--	--
URANIUM 235	0.663	C	64	48	0.125 +/- 0.0738	30.9 +/- 16.8	33	16	-11 +/- 21.1	28.2 +/- 21.8	13
URANIUM-238	0.744	C	47	47	2.29 +/- 0.398	57.2 +/- 9.36	47		--	--	--
PESTICIDES											
4,4'-DDD	--	--	4	--	--	--	--	4	9.1E-06	9.3E-06	--
4,4'-DDE	--	--	4	--	--	--	--	4	8.6E-06	8.7E-06	--
4,4'-DDT	--	--	4	--	--	--	--	4	9.8E-06	1.0E-05	--
ALDRIN	--	--	4	--	--	--	--	4	1.2E-05	1.2E-05	--
ALPHA-BHC	--	--	4	2	2.4E-05	7.9E-05	--	2	5.9E-06	5.9E-06	--
ALPHA-CHLORDANE	--	--	4	--	--	--	--	4	4.8E-06	4.9E-06	--
BETA-BHC	--	--	4	1	4.0E-04	4.0E-04	--	3	8.2E-06	8.3E-06	--
DELTA-BHC	--	--	4	1	8.0E-06	8.0E-06	--	3	4.0E-06	4.0E-06	--
DIELDRIN	--	--	4	--	--	--	--	4	4.2E-06	4.3E-06	--
ENDOSULFAN I	--	--	4	--	--	--	--	4	6.8E-06	6.9E-06	--
ENDOSULFAN II	--	--	4	--	--	--	--	4	1.2E-05	1.2E-05	--
ENDOSULFAN SULFATE	--	--	4	--	--	--	--	4	9.1E-06	9.2E-06	--
ENDRIN	--	--	4	--	--	--	--	4	8.7E-06	8.8E-06	--

Table 4-6 (continued)

Detection Frequency of Chemicals in the Plant Site Groundwater Monitorings Wells, January 2005 to May 2006

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
ENDRIN ALDEHYDE	--	--	4	--	--	--	--	4	7.9E-06	8.1E-06	--
ENDRIN KETONE	--	--	4	--	--	--	--	4	8.8E-06	9.0E-06	--
GAMMA-BHC (LINDANE)	--	--	4	2	1.5E-05	1.6E-05	--	2	4.1E-06	4.1E-06	--
GAMMA-CHLORDANE	--	--	4	--	--	--	--	4	4.6E-06	4.6E-06	--
HEPTACHLOR	--	--	4	--	--	--	--	4	4.5E-06	4.6E-06	--
HEPTACHLOR EPOXIDE	--	--	4	--	--	--	--	4	4.5E-06	4.6E-06	--
METHOXYCHLOR	--	--	4	--	--	--	--	4	4.0E-05	4.0E-05	--
TOXAPHENE	--	--	4	--	--	--	--	4	6.3E-04	6.5E-04	--

Notes:

A	BRC/TIMET Maxiumum Background
B	EPA Region 9 Preliminary Remediation Goal
C	Toxic Substances Control Act
D	State of Nevada
BHC	Benzenehexachloride
BRC	Basic Remediation Company
Conc	Concentration
DAF20	Diluation Attenuation Factor Equal to 20
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
mg/kg	Milligram per kilogram
pCi/g	Picocuries per liter
Qual	Qualifier
SSL	Soil Screening Level
TIMET	Titanium Metals Corporation

Table 4-7

Detection Frequency of Chemicals in the Downgradient Groundwater Monitorings Wells, Second Quarter 2006

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
INORGANIC IONS											
BICARBONATE ALKALINITY	--	--	9	9	70	220	--	--	--	--	--
CHLORIDE	250	B	9	9	890	5,900	9	--	--	--	--
NITRATE	10	A	10	9	12	74	9	1	1.30	1.30	--
SULFATE	250	B	9	9	2,000	2,900	9	--	--	--	--
TOTAL DISSOLVED SOLIDS	1900	D	9	9	7,500	15,000	9	--	--	--	--
METALS											
ALUMINUM	36	C	9	6	0.19	2.1	--	3	6.8E-06	6.8E-06	--
ANTIMONY	0.006	A	9	--	--	--	--	9	4.1E-06	4.1E-06	--
ARSENIC	0.01	A	9	9	0.072	0.21	9	--	--	--	--
BARIUM	2	A	9	--	--	--	--	9	1.7E-07	1.7E-07	--
BERYLLIUM	0.004	A	9	--	--	--	--	9	2.8E-08	2.8E-08	--
CADMIUM	0.005	A	9	--	--	--	--	9	3E-07	3E-07	--
CALCIUM	--	--	9	9	550	1,100	--	--	--	--	--
CHROMIUM	0.1	A	9	8	0.081	3.2	7	1	1.8E-06	1.8E-06	--
COBALT	0.73	C	9	4	0.00076	0.0038	--	5	7.5E-07	7.5E-07	--
COPPER	1.3	A	9	1	0.013	0.013	--	8	6.7E-07	6.7E-07	--
IRON	0.3	B	9	7	0.1	1.7	4	2	1.4E-05	1.4E-05	--
LEAD	0.015	A	9	--	--	--	--	9	2.7E-06	4.1E-06	--
LITHIUM	0.73	C	9	9	0.28	0.52	--	--	--	--	--
MAGNESIUM	--	--	9	9	240	480	--	--	--	--	--
MANGANESE	0.05	B	9	7	0.01	0.93	6	2	2.3E-07	2.3E-07	--
MERCURY	0.002	A	9	5	0.0000072	0.000022	--	4	4.7E-09	4.7E-09	--
MOLYBDENUM	0.18	C	9	9	0.041	--	2	--	--	--	--
NICKEL	0.013	C	9	--	--		--	9	9.9E-07	9.9E-07	--
POTASSIUM	--	--	9	9	16	55	--	--	--	--	--
SELENIUM	0.05	A	9	8	0.0051	0.075	1	1	3.1E-06	3.1E-06	--
SILVER	0.1	B	9	--	--	--	--	9	1E-06	1E-06	--
SODIUM	--	--	9	9	850	2,800	--	--	--	--	--
THALLIUM	0.002	A	9	2	0.00023	0.00053	--	7	1.6E-08	1.6E-08	--
TITANIUM	150	C	9	4	0.03	0.087	--	5	5.4E-07	5.4E-07	--
URANIUM	0.03	A	9	9	0.038	0.23	9	--	--	--	--
VANADIUM	0.036	C	9	9	0.023	0.16	7	--	--	--	--
ZINC	5	B	9	2	0.03	0.047	--	7	5.5E-07	5.5E-07	--
VOLATILE ORGANIC COMPOUNDS											
1,1,1-TRICHLOROETHANE	0.2	A	8	--	--	--	--	8	0.0002	0.0085	--
1,1,2,2-TETRACHLOROETHANE	--	--	8	--	--	--	--	8	0.0001	0.0055	--
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	--	--	8	--	--	--	--	8	0.0002	0.007	--
1,1,2-TRICHLOROETHANE	0.005	A	8	--	--	--	--	8	0.0001	0.005	--
1,1-DICHLOROETHANE	0.81	C	8	3	0.017	0.03	--	5	0.0001	0.004	--
1,1-DICHLOROETHENE	0.007	A	8	3	0.00028	0.00036	--	5	0.0002	0.0075	1
1,2,3-TRICHLOROBENZENE	--	--	8	3	0.00015	0.00082	--	5	0.0001	0.004	--
1,2,4-TRICHLOROBENZENE	--	--	8	3	0.0015	0.004	--	5	0.0001	0.004	--

Table 4-7 (continued)

Detection Frequency of Chemicals in the Downgradient Groundwater Monitorings Wells, Second Quarter 2006

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
1,2-DIBROMO-3-CHLOROPROPANE	--	--	8	--	--	--	--	8	0.0005	0.021	--
1,2-DICHLOROBENZENE	--	--	8	4	0.0012	0.004	--	4	0.0001	0.005	--
1,2-DICHLOROETHANE	0.005	A	8	3	0.00065	0.0023	--	5	0.0001	0.005	--
1,2-DICHLOROPROPANE	0.005	A	8	--	--	--	--	8	0.0002	0.007	1
1,3-DICHLOROBENZENE	0.18	C	8	4	0.00073	0.0027	--	4	0.0001	0.004	--
1,4-DICHLOROBENZENE	--	--	8	4	0.00088	0.0021	--	4	0.0001	0.004	--
2-BUTANONE	7	C	8	--	--	--	--	8	0.0010	0.04	--
2-HEXANONE	--	--	8	--	--	--	--	8	0.0005	0.019	--
4-METHYL-2-PENTANONE	2	C	8	--	--	--	--	8	0.0007	0.027	--
ACETONE	5.5	C	8	--	--	--	--	8	0.0014	0.057	--
BENZENE	0.005	A	8	--	--	--	--	8	0.0001	0.005	1
BROMOCHLOROMETHANE	--	--	8	--	--	--	--	8	0.0002	0.006	--
BROMODICHLOROMETHANE	0.00018	C	8	1	0.00072	0.00072	1	7	0.0001	0.005	3
BROMOFORM	0.0085	C	8	--	--	--	--	8	0.0002	0.006	--
BROMOMETHANE	0.0087	C	8	--	--	--	--	8	0.0001	0.004	--
CARBON DISULFIDE	1	C	8	--	--	--	--	8	0.0001	0.004	--
CARBON TETRACHLORIDE	0.005	A	8	7	0.00012	0.011	3	1	0.0001	0.000	--
CHLOROBENZENE	0.1	A	8	--	--	--	--	8	0.0001	0.004	--
CHLOROETHANE	--	--	8	--	--	--	--	8	0.0002	0.007	--
CHLOROFORM	0.00017	C	9	9	0.0029	1.3	9	--	--	--	--
CHLOROMETHANE	0.16	C	8	--	--	--	--	8	0.0002	0.006	--
CIS-1,2-DICHLOROETHENE	0.07	A	8	--	--	--	--	8	0.0002	0.0075	--
CIS-1,3-DICHLOROPROPENE	--	--	8	--	--	--	--	8	0.0001	0.004	--
DIBROMOCHLOROMETHANE	0.00013	C	8	--	--	--	--	8	0.0001	0.005	3
DIBROMOETHANE	--	--	8	--	--	--	--	8	0.0001	0.005	--
DICHLORODIFLUOROMETHANE	--	--	8	--	--	--	--	8	0.0001	0.005	--
ETHYLBENZENE	0.7	A	8	--	--	--	--	8	0.0002	0.007	--
ISOPROPYLBENZENE	--	--	8	--	--	--	--	8	0.0001	0.004	--
METHYLENE CHLORIDE	0.005	A	8	--	--	--	--	8	0.0006	0.023	3
METHYL-T-BUTYL ETHER	--	--	8	4	0.00022	0.0091	--	4	0.0001	0.005	--
STYRENE	0.1	A	8	--	--	--	--	8	0.0001	0.005	--
TETRACHLOROETHENE	0.005	A	8	6	0.00026	0.012	2	2	0.0017	0.002	--
TOLUENE	1	A	8	--	--	--	--	8	0.0001	0.005	--
TRANS-1,2-DICHLOROETHENE	0.1	A	8	--	--	--	--	8	0.0001	0.005	--
TRANS-1,3-DICHLOROPROPENE	--	--	8	--	--	--	--	8	0.0002	0.006	--
TRICHLOROETHENE	0.005	A	8	5	0.00021	0.006	1	3	0.0025	0.008	1
TRICHLOROFLUOROMETHANE	1.3	A	8	--	--	--	--	8	0.0001	0.0045	--
VINYL CHLORIDE	0.002	A	8	--	--	--	--	8	0.0001	0.005	2
XYLENE (TOTAL)	10	A	8	--	--	--	--	8	0.0001	0.004	--

Table 4-7 (continued)

Detection Frequency of Chemicals in the Downgradient Groundwater Monitorings Wells, Second Quarter 2006

Analyte	Screening Level (mg/L or pCi/L)	Source of Screening Level	Total Count	Detections (mg/L or pCi/L)				Nondetections (mg/L or pCi/L)			
				No. of Detections	Minimum	Maximum	No. of Detections Exceeding	No. of Nondetects	Minimum	Maximum	No. of Nondetects Exceeding
RADIONUCLIDES											
ACTINIUM-228	24	C	9	2	17.3 +/- 9.54	18.6 +/- 11.3	--	7	6.49 +/- 15.3	18.9 +/- 10.8	--
BISMUTH 212	67	C	9	--	--	--	--	9	-2.08 +/- 32.6	58.8 +/- 40.5	--
BISMUTH-214	250	C	9	--	--	--	--	9	-2.4 +/- 10.5	14.4 +/- 10.5	--
CESIUM-134	--	--	9	--	--	--	--	9	-3.47 +/- 2.71	0.675 +/- 3.98	--
CESIUM-137	--	--	9	--	--	--	--	9	-2.64 +/- 3.01	1.81 +/- 2.68	--
COBALT-57	--	--	9	--	--	--	--	9	-0.851 +/- 1.13	1.1 +/- 1.65	--
COBALT-60	--	--	9	--	--	--	--	9	-2.69 +/- 3.15	1.6 +/- 3.5	--
LEAD-210	0.0541	C	9	5	0.704 +/- 0.452	1.28 +/- 0.777	5	4	0.423 +/- 0.472	0.828 +/- 0.697	4
LEAD-212	1.9	C	9	1	8.59 +/- 4.11	8.59 +/- 4.11	1	8	-3.92 +/- 7.78	2.08 +/- 6.23	2
LEAD-214	140	C	9	2	7.27 +/- 4.46	9.67 +/- 5.6	--	7	-3.35 +/- 9.12	10.9 +/- 11.2	--
POTASSIUM-40	1.9	C	9	--	--	--	--	9	-16.6 +/- 65.7	109 +/- 72.6	7
PROTACTINIUM-234	18.6	C	9	--	--	--	--	9	-91.4 +/- 390	298 +/- 476	6
RADIUM 226	--	A	9	3	0.53 +/- 0.344	1.5 +/- 0.533	--	6	-0.125 +/- 0.19	0.337 +/- 0.306	--
RADIUM 228	--	A	9	8	0.716 +/- 0.417	1.06 +/- 0.49	--	1	0.481 +/- 0.385	0.481 +/- 0.385	--
RADIUM-224	0.00095	C	9	1	8.59 +/- 4.11	8.59 +/- 4.11	1	8	-3.92 +/- 7.78	2.08 +/- 6.23	4
RADON 222	1.3	C	9	9	497 +/- 61.4	3210 +/- 367	9	--	--	--	--
THALLIUM-208	--	--	9	--	--	--	--	9	0.13 +/- 5.54	4.14 +/- 7.27	--
THORIUM-227	1	C	9	--	--	--	--	9	-9.31 +/- 18.3	17.7 +/- 13.3	2
THORIUM-228	0.445	C	9	2	0.126 +/- 0.0768	0.181 +/- 0.0762	--	7	-0.0145 +/-	0.0776 +/- 0.073	--
THORIUM-230	0.523	C	9	1	0.255 +/- 0.0805	0.255 +/- 0.0805	--	8	-0.0686 +/-	0.0273 +/-	--
THORIUM-232	0.471	C	9	3	0.0273 +/- 0.0248	0.0603 +/-	--	6	-0.00829 +/-	0.0355 +/-	--
THORIUM-234	2.1	C	9	1	77.3 +/- 39.8	77.3 +/- 39.8	1	8	-25.2 +/- 44.6	30.1 +/- 121	6
URANIUM 234	0.674	C	9	9	16.9 +/- 3.2	82.8 +/- 12.8	9	--	--	--	--
URANIUM 235	0.663	C	9	9	0.61 +/- 0.327	4.4 +/- 0.801	8	--	--	--	--
URANIUM-238	0.744	C	9	9	11.3 +/- 2.25	60.4 +/- 9.34	9	--	--	--	--

Notes:

A	BRC/TIMET Maxiumum Background
B	EPA Region 9 Preliminary Remediation Goal
C	Toxic Substances Control Act
D	State of Nevada
BHC	Benzenehexachloride
BRC	Basic Remediation Company
Conc	Concentration
DAF20	Diluation Attenuation Factor Equal to 20
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
mg/kg	Milligram per kilogram
pCi/g	Picocuries per liter
Qual	Qualifier
SSL	Soil Screening Level
TIMET	Titanium Metals Corporation

TABLE 4-8
TIMET SOIL SCREENING LEVELS

Analytical Group	Chemical	CAS No.	Analytical Method	Shallow Soil Background BRC/TIMET/Environ [a] Maximum Detected (mg/kg) or (pCi/g)	Industrial or Outdoor Worker PRG [b] (mg/kg) or (pCi/g)	TIMET SSL [c] (mg/kg) or (pCi/g)	TIMET SSL Source	Migration to Groundwater DAF 20 [d] (mg/kg) or (pCi/g)	Migration to Groundwater DAF 1 [d] (mg/kg) or (pCi/g)
Anions	Chloride	16887-00-6	300.1 [e]	1.11E+03	--	1.11E+03	BKG	--	--
	Fluoride	16984-48-8	300.1 [e]	2.50E+00	3.7E+04	3.7E+04	PRG	--	--
	Nitrate (as nitrogen)	14797-55-8	300.1 [e]	1.02E+02	--	1.02E+02	BKG	--	--
	Nitrite (as nitrogen)	14797-65-0	300.1 [e]	2.10E-01	--	2.10E-01	BKG	--	--
	Perchlorate	14797-73-0	314.0 [e]	--	1.0E+02	1.0E+02	IPRG	--	--
	Sulfate	14808-79-8	300.1 [e]	4.13E+03	--	4.13E+03	BKG	--	--
Dioxins/ Furans	2,3,7,8-TCDD	1746-01-6	8290A [f]	--	1.6E-05	1.6E-05	IPRG	--	--
	1,2,3,7,8-PeCDD	40321-76-4	8290A [f]	--	--	--	--	--	--
	1,2,3,6,7,8-HxCDD	57653-85-7	8290A [f]	--	--	--	--	--	--
	1,2,3,4,7,8-HxCDD	39227-28-6	8290A [f]	--	--	--	--	--	--
	1,2,3,7,8,9-HxCDD	19408-74-3	8290A [f]	--	--	--	--	--	--
	1,2,3,4,6,7,8-HpCDD	35822-46-9	8290A [f]	--	--	--	--	--	--
	OCDD	3268-87-9	8290A [f]	--	--	--	--	--	--
	2,3,7,8-TCDF	51207-31-9	8290A [f]	--	--	--	--	--	--
	1,2,3,7,8-PeCDF	57117-41-6	8290A [f]	--	--	--	--	--	--
	2,3,4,7,8-PeCDF	57117-31-4	8290A [f]	--	--	--	--	--	--
	1,2,3,6,7,8-HxCDF	57117-44-9	8290A [f]	--	--	--	--	--	--
	1,2,3,7,8,9-HxCDF	72918-21-9	8290A [f]	--	--	--	--	--	--
	1,2,3,4,7,8-HxCDF	70648-26-9	8290A [f]	--	--	--	--	--	--
	2,3,4,6,7,8-HxCDF	60851-34-5	8290A [f]	--	--	--	--	--	--
	1,2,3,4,6,7,8-HpCDF	67562-39-4	8290A [f]	--	--	--	--	--	--
	1,2,3,4,7,8,9-HpCDF	55673-89-7	8290A [f]	--	--	--	--	--	--
	OCDF	39001-02-0	8290A [f]	--	--	--	--	--	--
Metals	Aluminum	7429-90-5	6010B [f]	1.53E+04	1.0E+05	1.0E+05	IPRG	--	--
	Antimony	7440-36-0	6010B [f]	5.00E-01	4.1E+02	4.1E+02	IPRG	5.0E+00	3.0E-01
	Arsenic (cancer endpoint)	7440-38-2	6020 [f]	7.20E+00	1.6E+00	7.20E+00	BKG	2.9E+01	1.0E+00
	Barium	7440-39-3	6010B [f]	8.36E+02	6.7E+04	6.7E+04	IPRG	1.6E+03	8.2E+01
	Beryllium	7440-41-7	6010B [f]	8.90E-01	1.9E+03	1.9E+03	IPRG	6.3E+01	3.0E+00
	Cadmium	7440-43-9	6010B [f]	1.60E-01	4.5E+02	4.5E+02	IPRG	8.0E+00	4.0E-01
	Calcium	7440-70-2	6010B [f]	8.28E+04	--	8.28E+04	BKG	--	--
	Total chromium	7440-47-3	6010B [f]	1.67E+01	4.5E+02	4.5E+02	IPRG	3.8E+01	2.0E+00
	Chromium VI	18540-29-9	Calculated	NC	6.4E+01	6.4E+01	IPRG	3.8E+01	2.0E+00
	Chromium III	16065-83-1	7196 [f]	--	1.0E+05	1.0E+05	IPRG	--	--
	Cobalt	7440-48-4	6010B [f]	1.63E+01	1.9E+03	1.9E+03	IPRG	--	--
	Copper	7440-50-8	6010B [f]	3.05E+01	4.1E+04	4.1E+04	IPRG	--	--
	Iron	7439-89-6	6010B [f]	1.97E+04	1.0E+05	1.0E+05	IPRG	--	--
	Lead	7439-92-1	6010B [f]	3.51E+01	8.0E+02	8.0E+02	IPRG	--	--
	Lithium	7439-93-2	6010B [f]	2.65E+01	2.0E+04	2.0E+04	IPRG	--	--
	Magnesium	7439-95-4	6010B [f]	1.75E+04	--	1.75E+04	BKG	--	--
	Manganese	7439-96-5	6010B [f]	1.09E+03	1.9E+04	1.9E+04	IPRG	--	--
	Mercury	7487-94-7	7470/7471 [f]	1.10E-01	3.1E+02	3.1E+02	IPRG	--	--

TABLE 4-8 (continued)
TIMET SOIL SCREENING LEVELS

Analytical Group	Chemical	CAS No.	Analytical Method	Shallow Soil Background BRC/TIMET/Environ [a] Maximum Detected (mg/kg) or (pCi/g)	Industrial or Outdoor Worker PRG [b] (mg/kg) or (pCi/g)	TIMET SSL [c] (mg/kg) or (pCi/g)	TIMET SSL Source	Migration to Groundwater DAF 20 [d] (mg/kg) or (pCi/g)	Migration to Groundwater DAF 1 [d] (mg/kg) or (pCi/g)
Metals (continued)	Molybdenum	7439-98-7	6010B [f]	2.00E+00	5.1E+03	5.1E+03	IPRG	--	--
	Nickel (soluble salts)	7440-02-0	6010B [f]	3.00E+01	2.0E+04	2.0E+04	IPRG	1.3E+02	7.0E+00
	Niobium	7440-03-1	6010B/6020 [f]	NC	--	--	--	--	--
	Palladium	7440-05-3	6010B/6020 [f]	1.50E+00	--	1.50E+00	BKG	--	--
	Phosphorus (white)	7723-14-0	6010B/6020 [f]	2.01E+03	2.0E+01	2.01E+03	BKG	--	--
	Potassium	7440-09-7	6010B [f]	3.89E+03	--	3.89E+03	BKG	--	--
	Selenium	7782-49-2	6010B [f]	6.00E-01	5.1E+03	5.1E+03	IPRG	5.0E+00	3.0E-01
	Silicon	7440-21-3	6010B [f]	4.15E+03	--	4.15E+03	BKG	--	--
	Silver	7440-22-4	6010B [f]	8.30E-02	5.1E+03	5.1E+03	IPRG	3.4E+01	2.0E+00
	Sodium	7440-23-5	6010B [f]	1.32E+03	--	1.32E+03	BKG	--	--
	Strontium	7440-24-6	6010B/6020 [f]	8.08E+02	--	8.08E+02	BKG		
	Thallium	7446-18-6	6010B [f]	1.80E+00	6.7E+01	6.7E+01	IPRG	--	--
	Thorium	7440-29-1	6010B/6020 [f]	7.70E+00	--	7.7E+00	BKG		
	Tin (inorganic)	7440-31-5	6010B [f]	8.00E-01	1.0E+05	1.0E+05	IPRG	--	--
	Titanium	7440-32-6	6010B [f]	1.01E+03	--	1.01E+03	BKG	--	--
	Tungsten	7440-33-7	6010B [f]	NC	--	--	--	--	--
	Uranium (chemical toxicity)	7440-61-0	6020 [f]	2.70E+00	2.0E+02	2.0E+02	IPRG	--	--
	Vanadium	7440-62-2	6010B [f]	5.91E+01	1.0E+03	1.0E+03	IPRG	6.0E+03	3.0E+02
	Zinc	7440-66-6	6010B [f]	1.21E+02	1.0E+05	1.0E+05	IPRG	1.2E+04	6.2E+02
	Zirconium	7440-67-7	6020 [f]	1.79E+02	--	1.79E+02	BKG	--	--
PAHs	Acenaphthene	83-32-9	8270C SIM [f]	--	2.9E+04	2.9E+04	IPRG	5.7E+02	2.9E+01
	Acenaphthylene	208-96-8	8270C SIM [f]	--	--	--	--	--	--
	Anthracene	120-12-7	8270C SIM [f]	--	1.0E+05	1.0E+05	IPRG	1.2E+04	5.9E+02
	Benzo(a)anthracene	56-55-3	8270C SIM [f]	--	2.1E+00	2.1E+00	IPRG	2.0E+00	8.0E-02
	Benzo(a)pyrene	50-32-8	8270C SIM [f]	--	2.1E-01	2.1E-01	IPRG	8.0E+00	4.0E-01
	Benzo(b)fluoranthene	205-99-2	8270C SIM [f]	--	2.1E+00	2.1E+00	IPRG	5.0E+00	2.0E-01
	Benzo(g,h,i)perylene	191-24-2	8270C SIM [f]	--	--	--	--	--	--
	Benzo(k)fluoranthene	207-08-9	8270C SIM [f]	--	2.1E+01	2.1E+01	IPRG	4.9E+01	2.0E+00
	Chrysene	218-01-9	8270C SIM [f]	--	2.1E+02	2.1E+02	IPRG	1.6E+02	8.0E+00
	Dibenzo(a,h)anthracene	53-70-3	8270C SIM [f]	--	2.1E-01	2.1E-01	IPRG	2.0E+00	8.0E-02
	Fluoranthene	206-44-0	8270C SIM [f]	--	2.2E+04	2.2E+04	IPRG	4.3E+03	2.1E+02
	Fluorene	86-73-7	8270C SIM [f]	--	2.6E+04	2.6E+04	IPRG	5.6E+02	2.8E+01
	Hexachlorobenzene	118-74-1	8270C SIM [f]	--	1.1E+00	1.1E+00	IPRG	2.0E+00	1.0E-01
	Indeno(1,2,3-cd)pyrene	193-39-5	8270C SIM [f]	--	2.1E+00	2.1E+00	IPRG	1.4E+01	7.0E-01
	Naphthalene	91-20-3	8270C SIM [f]	--	1.9E+02	1.9E+02	IPRG	8.4E+01	4.0E+00
	Octachlorostyrene	29082-74-4	8270C SIM [f]	--	--	--	--	--	--
	Phenanthrene	85-01-8	8270C SIM [f]	--	--	--	--	--	--
	Pyrene	129-00-0	8270C SIM [f]	--	2.9E+04	2.9E+04	IPRG	4.2E+03	2.1E+02

TABLE 4-8 (continued)
TIMET SOIL SCREENING LEVELS

Analytical Group	Chemical	CAS No.	Analytical Method	Shallow Soil Background BRC/TIMET/Environ [a] Maximum Detected (mg/kg) or (pCi/g)	Industrial or Outdoor Worker PRG [b] (mg/kg) or (pCi/g)	TIMET SSL [c] (mg/kg) or (pCi/g)	TIMET SSL Source	Migration to Groundwater DAF 20 [d] (mg/kg) or (pCi/g)	Migration to Groundwater DAF 1 [d] (mg/kg) or (pCi/g)
Petroleum Hydrocarbons	Gasoline	8006-61-9	8015 Mod [f]	--	--	1.0E+02	NAC [k]	--	--
	Grease	--	8015 Mod [f]	--	--	1.0E+02	NAC [k]	--	--
	Diesel fuel	--	8015 Mod [f]	--	--	1.0E+02	NAC [k]	--	--
	Waste oil	--	8015 Mod [f]	--	--	1.0E+02	NAC [k]	--	--
PCBs	Aroclor-1016	12674-11-2	8082 [f]	--	2.1E+01	2.1E+01	IPRG	--	--
	Aroclor-1221	11104-28-2	8082 [f]	--	1.0E+00	1.0E+00	TSCA	--	--
	Aroclor-1232	11141-16-5	8082 [f]	--	1.0E+00	1.0E+00	TSCA	--	--
	Aroclor-1242	53469-21-9	8082 [f]	--	1.0E+00	1.0E+00	TSCA	--	--
	Aroclor-1248	12672-29-6	8082 [f]	--	1.0E+00	1.0E+00	TSCA	--	--
	Aroclor-1254	11097-69-1	8082 [f]	--	7.4E-01	7.4E-01	IPRG	--	--
	Aroclor-1260	11096-82-5	8082 [f]	--	--	--	--	--	--
Organochlorine Pesticides	4,4'-DDD	72-54-8	8081 [f]	--	1.0E+01	1.0E+01	IPRG	1.6E+01	8.0E-01
	4,4'-DDE	72-55-9	8081 [f]	--	7.0E+00	7.0E+00	IPRG	5.4E+01	3.0E+00
	4,4'-DDT	50-29-3	8081 [f]	--	7.0E+00	7.0E+00	IPRG	3.2E+01	2.0E+00
Radionuclides	Gross alpha	--	--	--	--	--	--	--	--
	Gross beta	--	--	--	--	--	--	--	--
	Potassium-40 (K-40)	013966-00-2	Gamma/ 901.1 [g]	3.50E+01	2.73E-01	3.50E+01	BKG	--	--
	Uranium-238 Decay Series								
	Uranium-238 (U-238)	007440-61-1	ASTM D3972-90M [h]	2.37E+00	3.68E+01	3.68E+01	IPRG	1.21E-01	6.04E-03
	Thorium-234 (Th-234)	015065-10-8	Gamma/ 901.1 [g]	2.50E+00	3.28E+03	3.28E+03	IPRG	8.26E+04	4.13E+03
	Protactinium-234 (Pa-234)	015100-28-4	Gamma/ 901.1 [g]	NC	5.68E+02	5.68E+02	IPRG	--	--
	Uranium-234 (U-234)	013966-29-5	ASTM D3972-90M [h]	2.84E+00	3.24E+01	3.24E+01	IPRG	2.24E+03	1.12E+02
	Thorium-230 (Th-230)	014269-63-7	ASTM D3972-90M [h]	3.01E+00	2.02E+01	2.02E+01	IPRG	6.06E+00	3.03E-01
	Radium-226 (Ra-226)	013982-68-3	Gamma/ 903.1 [g]	2.36E+00	3.70E+00	3.70E+00	IPRG	3.22E-01	1.61E-02
	Radon-222 (Rn-222)	014859-67-7	--	NC	2.08E+05	2.08E+05	IPRG	2.38E+03	1.19E+02
	Polonium-218 (Po-218)	015422-24-9	Calculated [i]	2.36E+00	1.53E+10	1.53E+10	IPRG	--	--
	Lead-214 (Pb-214)	015067-28-4	Gamma/ 901.1 [g]	1.72E+00	7.56E+04	7.56E+04	IPRG	2.85E+12	1.43E+11
	Bismuth-214 (Bi-214)	014733-03-0	Gamma/ 901.1 [g]	1.62E+00	1.34E+04	1.34E+04	IPRG	--	--
	Polonium-214 (Po-214)	015735-67-8	Calculated [i]	1.62E+00	1.89E+15	1.89E+15	IPRG	--	--
	Lead-210 (Pb-210)	014255-04-0	LSC/SOP726 [j]	2.20E+00	4.19E+00	4.19E+00	IPRG	1.58E-02	7.92E-04
	Bismuth-210 (Bi-210)	014331-79-4	Calculated [i]	2.20E+00	8.55E+04	8.55E+04	IPRG	--	--
	Polonium-210 (Po-210)	013981-52-7	ASTM D3972-90M [h]	2.20E+00	2.73E+02	2.73E+02	IPRG	--	--
	Lead-206 (Pb-206)	7439-92-1	--	NC	--	--	--	--	--
	Thorium-232 Decay Series								
	Thorium-232 (Th-232)	007440-29-1	ASTM D3972-90M [h]	2.23E+00	1.90E+01	1.90E+01	IPRG	6.06E+00	3.03E-01
	Radium-228 (Ra-228)	015262-20-1	Gamma/904.0 [g]	2.94E+00	8.40E+00	8.40E+00	IPRG	1.19E+00	5.95E-02
	Actinium-228 (Ac-228)	014381-83-0	Gamma/ 901.1 [g]	3.40E+00	1.19E+03	1.19E+03	IPRG	--	--
	Thorium-228 (Th-228)	014274-82-9	ASTM D3972-90M [h]	2.28E+00	1.25E+02	1.25E+02	IPRG	6.60E+01	3.30E+00
	Radium-224 (Ra-224)	013233-32-4	Calculated [i]	2.11E+00	7.91E+03	7.91E+03	IPRG	7.84E+04	3.92E+03
	Radon-220 (Rn-220)	022481-48-7	Calculated [i]	NC	1.26E+09	1.26E+09	IPRG	--	--

TABLE 4-8 (continued)
TIMET SOIL SCREENING LEVELS

Analytical Group	Chemical	CAS No.	Analytical Method	Shallow Soil Background BRC/TIMET/Environ [a] Maximum Detected (mg/kg) or (pCi/g)	Industrial or Outdoor Worker PRG [b] (mg/kg) or (pCi/g)	TIMET SSL [c] (mg/kg) or (pCi/g)	TIMET SSL Source	Migration to Groundwater DAF 20 [d] (mg/kg) or (pCi/g)	Migration to Groundwater DAF 1 [d] (mg/kg) or (pCi/g)
Radionuclides (continued)	Polonium-216 (Po-216)	015756-58-8	Calculated [i]	2.11E+00	1.01E+13	1.01E+13	IPRG	--	--
	Lead-212 (Pb-212)	015092-94-1	Gamma/ 901.1 [g]	2.11E+00	6.13E+03	6.13E+03	IPRG	6.97E+07	3.49E+06
	Bismuth-212 (Bi-212)	014913-49-6	Gamma/ 901.1 [g]	1.82E+00	3.70E+04	3.70E+04	IPRG	--	--
	Thallium-208 (Tl-208)	014913-50-9	Gamma/ 901.1 [g]	7.20E-01	3.68E+04	3.68E+04	IPRG	--	--
	Polonium-212 (Po-212)	015389-34-1	Calculated [i]	1.17E+00	--	1.17E+00	BKG	--	--
	Lead-208 (Pb-208)	7439-92-1	--	NC	--	--	--	--	--
	Uranium-235 Decay Series								
	Uranium-235 (U-235)	015117-96-1	ASTM D3972-90M [h]	2.10E-01	4.17E-01	4.17E-01	IPRG	7.77E-01	3.89E-02
	Thorium-231 (Th-231)	--	--	2.10E-01	5.28E+04	5.28E+04	IPRG	4.44E+08	2.22E+07
	Protactinium-231 (Pa-231)	--	--	NC	1.38E+00	1.38E+00	IPRG	--	--
	Actinium-227 (Ac-227)	--	--	NC	1.14E+01	1.14E+01	IPRG	--	--
	Thorium-227 (Th-227)	--	--	NC	1.94E+02	1.94E+02	IPRG	6.68E+04	3.34E+03
	Radium-223 (Ra-223)	--	--	NC	2.70E+02	2.70E+02	IPRG	5.67E+03	2.84E+02
	Radon-219 (Rn-219)	--	--	NC	1.34E+08	1.34E+08	IPRG	--	--
	Polonium-215 (Po-215)	--	--	NC	8.97E+13	8.97E+13	IPRG	--	--
	Lead-211 (Pb-211)	--	--	NC	2.41E+05	2.41E+05	IPRG	1.32E+12	6.60E+10
	Bismuth-211 (Bi-211)	--	--	NC	4.95E+06	4.95E+06	IPRG	--	--
	Thallium-207 (Tl-207)	--	--	NC	2.74E+07	2.74E+07	IPRG	--	--
	Total Uranium	7440-61-0	6020 [f]	2.70E+00	2.0E+02	2.04E+02	IPRG	--	--
VOCs	1,1,1-Trichloroethane	71-55-6	8260B [f]	--	1.2E+03	1.2E+03	IPRG	2.0E+00	1.0E-01
	1,1,2-Trichloroethane	79-00-5	8260B [f]	--	1.6E+00	1.6E+00	IPRG	2.0E-02	9.0E-04
	1,1-Dichloroethane (DCA)	75-34-3	8260B [f]	--	1.7E+03	1.7E+03	IPRG	2.3E+01	1.0E+00
	1,1-Dichloroethene	75-35-4	8260B [f]	--	4.1E+02	4.1E+02	IPRG	6.0E-02	3.0E-03
	1,2-Dichloroethane (DCA)	107-06-2	8260B [f]	--	6.0E-01	6.0E-01	IPRG	2.0E-02	1.0E-03
	1,2-Dichloropropane	78-87-5	8260B [f]	--	7.4E-01	7.4E-01	IPRG	3.0E-02	1.0E-03
	1,3-Dichlorobenzene	541-73-1	8260B [f]	--	6.0E+02	6.0E+02	IPRG	--	--
	2-Butanone (MEK)	78-93-3	8260B [f]	--	1.1E+05	1.1E+05	IPRG	--	--
	4-Methyl-2-pentanone	108-10-1	8260B [f]	--	4.7E+04	4.7E+04	IPRG	--	--
	Acetone	67-64-1	8260B [f]	--	5.4E+04	5.4E+04	IPRG	1.6E+01	8.0E-01
	Benzene	71-43-2	8260B [f]	--	1.4E+00	1.4E+00	IPRG	3.0E-02	2.0E-03
	Bromodichloromethane	75-27-4	8260B [f]	--	1.8E+00	1.8E+00	IPRG	6.0E-01	3.0E-02
	Bromoform	75-25-2	8260B [f]	--	2.2E+02	2.2E+02	IPRG	8.0E-01	4.0E-02
	Bromomethane	74-87-3	8260B [f]	--	1.3E+01	1.3E+01	IPRG	2.0E-01	1.0E-02
	Carbon Disulfide	75-15-0	8260B [f]	--	7.2E+02	7.2E+02	IPRG	3.2E+01	2.0E+00
	Carbon Tetrachloride	56-23-5	8260B [f]	--	5.5E-01	5.5E-01	IPRG	7.0E-02	3.0E-03
	Chlorobenzene	108-90-7	8260B [f]	--	5.3E+02	5.3E+02	IPRG	1.0E+00	7.0E-02
	Chloroform	67-66-3	8260B [f]	--	4.7E-01	4.7E-01	IPRG	6.0E-01	3.0E-02
	Chloromethane	74-87-3	8260B [f]	--	1.6E+02	1.6E+02	IPRG	--	--
	cis-1,2-Dichloroethene	156-59-2	8260B [f]	--	1.5E+02	1.5E+02	IPRG	4.0E-01	2.0E-02
	Dibromochloromethane	124-48-1	8260B [f]	--	2.6E+00	2.6E+00	IPRG	4.0E-01	2.0E-02

TABLE 4-8 (continued)

TIMET SOIL SCREENING LEVELS

Analytical Group	Chemical	CAS No.	Analytical Method	Shallow Soil Background BRC/TIMET/Environ [a] Maximum Detected (mg/kg) or (pCi/g)	Industrial or Outdoor Worker PRG [b] (mg/kg) or (pCi/g)	TIMET SSL [c] (mg/kg) or (pCi/g)	TIMET SSL Source	Migration to Groundwater DAF 20 [d] (mg/kg) or (pCi/g)	Migration to Groundwater DAF 1 [d] (mg/kg) or (pCi/g)
VOCs (continued)	Ethylbenzene	100-41-4	8260B [f]	--	4.0E+02	4.0E+02	IPRG	1.3E+01	7.0E-01
	Methylene chloride	75-09-2	8260B [f]	--	2.1E+01	2.1E+01	IPRG	2.0E-02	1.0E-03
	Styrene	100-42-5	8260B [f]	--	1.7E+03	1.7E+03	IPRG	4.0E+00	2.0E-01
	Tetrachloroethylene (PCE)	127-18-4	8260B [f]	--	1.3E+00	1.3E+00	IPRG	6.0E-02	3.0E-03
	Toluene	108-88-3	8260B [f]	--	5.2E+02	5.2E+02	IPRG	1.2E+01	6.0E-01
	trans-1,2-Dichloroethene	156-60-5	8260B [f]	--	2.4E+02	2.4E+02	IPRG	7.0E-01	3.0E-02
	Trichloroethylene (TCE)	79-01-6	8260B [f]	--	1.1E-01	1.1E-01	IPRG	6.0E-02	3.0E-03
	Trichlorofluoromethane	75-69-4	8260B [f]	--	2.0E+03	2.0E+03	IPRG	--	--
	Vinyl chloride (adult)	75-01-4	8260B [f]	--	7.5E-01	7.5E-01	IPRG	--	--
	Vinyl chloride (child/adult)	75-01-4	8260B [f]	--	--	--	IPRG	1.0E-02	7.0E-04
	Xylenes (total)	1330-20-7	8260B [f]	--	4.2E+02	4.2E+02	IPRG	2.1E+02	1.0E+01
Water Quality Indicators	Bicarbonate alkalinity	--	310.1 [e]	--	--	--	--	--	--
	Total dissolved solids	--	160.1 [e]	--	--	--	--	--	--
Miscellaneous	Asbestos	1332-21-4	CARB 435 [k]	--	--	--	--	--	--

Notes:

a Maximum detected values from BRC/TIMET Shallow Soil Background Study, March 16, 2007.
b PRG values are from the EPA's "Region 9 PRGs 2004 Table" at http://www.epa.gov/region09/waste/sfund/prg/index.htm, and the "Preliminary Remediation Goals for Radionuclides" table at http://epa_prgs.ornl.gov/cgi-bin/epa-prgs/rad_search. -
c TIMET SSL is the maximum value of BRC/TIMET maximum detected shallow soil background value and EPA Region 9 Industrial PRG.
d DAF20 values are from the "Preliminary Remediation Goals for Radionuclides" table at http://epa_prgs.ornl.gov/cgi-bin/epa-prgs/rad_search.
The DAF1 values are calculated from the DAF20 values (DAF 20/20).
e EPA. 1983. "Methods for Chemical Analysis of Water and Wastes."
f EPA. 1998. "Test Method for Evaluting Solid Waste, Chemical/Physical Methods, SW-846."
g EPA. 1980. "Prescribed Procedures for Measurement of Radioactivity in Drinking Water." August. EPA/600/4-80-032.
h ASTM International Method D3972-90 "Standard Test Method for Isotopic Uranium in Water by Radiochemistry" (modified for isotopic thorium)
i Radioisotope calculated from nearest long-lived parent or daughter.
j Paragon Analytics, Inc. "Standard Operating Procedure for the Determination of Lead-210 in Soil, Sediments, and Waters."
k Nevada Administrative Code 445A.2272

--	Information not available	NC	Not calculated (The analyte was not detected)
BKG	Background	PAH	Polycyclic aromatic hydrocarbon
BRC	Basic Remediation Company	PCB	Polychlorinated biphenyl
CARB	California Air Resources Board	pCi/g	PicoCurie per gram
CAS	Chemical Abstracts Service	PRG	Preliminary remediaton goal
DAF	Dilution attenuation factor	SIM	Selective ion monitoring
EPA	U.S. Environmental Protection Agency	SOP	Standard operating procedure
IPRG	Industrial PRG	SSL	Soil screening level
LSC	Liquid scintillation counting	TIMET	Titanium Metals Corporation
mg/kg	Milligrams per kilogram	TSCA	Toxic Substances Control Act
Mod	Modified	VOC	Volatile organic compound

TABLE 4-9

TIMET GROUNDWATER SCREENING LEVELS

Analytical Group	Chemical	CAS No.	Analytical Method	Screening Levels: MCL [a] (mg/L) or (pCi/L)	Secondary Standard [b] (mg/L) or (pCi/L)	NAC Toxic Stds [c] (mg/L) or (pCi/L)	Tap Water PRGs [d] (mg/L)	
Anions	Chloride	16887-00-6	300.1 [e]	--	2.5E+02	--	--	--
	Fluoride	16984-48-8	300.1 [e]	4.0E+00	2.0E+00	1.0E+00	2.2E+00	nc
	Nitrate (as nitrogen)	14797-55-8	300.1 [e]	1.0E+01	--	--	1.0E+01	nc
	Nitrite (as nitrogen)	14797-65-0	300.1 [e]	1.0E+00	--	--	1.0E+00	nc
	Perchlorate	14797-73-0	314.0 [e]	--	--	1.8E-01 [x]	--	--
	Sulfate	14808-79-8	300.1 [e]	HEA[k]	2.5E+02	--	--	--
Dioxins/ Furans	2,3,7,8-TCDD	1746-01-6	8290A [f]	3E-08	--	--	4.5E-10	ca
	1,2,3,7,8-PeCDD	40321-76-4	8290A [f]	--	--	--	--	--
	1,2,3,6,7,8-HxCDD	57653-85-7	8290A [f]	--	--	--	--	--
	1,2,3,4,7,8-HxCDD	39227-28-6	8290A [f]	--	--	--	--	--
	1,2,3,7,8,9-HxCDD	19408-74-3	8290A [f]	--	--	--	--	--
	1,2,3,4,6,7,8-HpCDD	35822-46-9	8290A [f]	--	--	--	--	--
	OCDD	3268-87-9	8290A [f]	--	--	--	--	--
	2,3,7,8-TCDF	51207-31-9	8290A [f]	--	--	--	--	--
	1,2,3,7,8-PeCDF	57117-41-6	8290A [f]	--	--	--	--	--
	2,3,4,7,8-PeCDF	57117-31-4	8290A [f]	--	--	--	--	--
	1,2,3,6,7,8-HxCDF	57117-44-9	8290A [f]	--	--	--	--	--
	1,2,3,7,8,9-HxCDF	72918-21-9	8290A [f]	--	--	--	--	--
	1,2,3,4,7,8-HxCDF	70648-26-9	8290A [f]	--	--	--	--	--
	2,3,4,6,7,8-HxCDF	60851-34-5	8290A [f]	--	--	--	--	--
	1,2,3,4,6,7,8-HpCDF	67562-39-4	8290A [f]	--	--	--	--	--
	1,2,3,4,7,8,9-HpCDF	55673-89-7	8290A [f]	--	--	--	--	--
	OCDF	39001-02-0	8290A [f]	--	--	--	--	--
Metals	Aluminum	7429-90-5	6010B [f]	--	2.0E-01	--	3.6E+01	nc
	Antimony	7440-36-0	6010B [f]	6.0E-03	--	1.5E-01	1.5E-02	nc
	Arsenic (cancer endpoint)	7440-38-2	6020 [f]	1.0E-02	--	--	4.5E-05	ca
	Barium	7440-39-3	6010B [f]	2.0E+00	--	2.0E+00	2.6E+00	nc
	Beryllium	7440-41-7	6010B [f]	4.0E-03	--	0.0E+00	7.3E-02	nc
	Cadmium	7440-43-9	6010B [f]	5.0E-03	--	0.005 [g]	1.8E-02	nc
	Calcium	7440-70-2	6010B [f]	--	--	--	--	--
	Total chromium	7440-47-3	6010B [f]	1.0E-01	--	1.0E-01	--	--
	Chromium VI	18540-29-9	Calculated	--	--	1.1E-01	1.1E-01	nc
	Chromium III	16065-83-1	7196 [f]	--	--	h	5.5E+01	nc
	Cobalt	7440-48-4	6010B [f]	--	--	--	7.3E-01	nc
	Copper	7440-50-8	6010B [f]	1.3E+00	1.0E+00	2.0E-01 [i]	1.5E+00	nc
	Iron	7439-89-6	6010B [f]	--	3.0E-01	1.0E+00	1.1E+01	nc
	Lead	7439-92-1	6010B [f]	1.5E-02	--	5.0E-02 [j]	--	--
	Lithium	7439-93-2	6010B [f]	--	--	--	7.3E-01	nc
	Magnesium	7439-95-4	6010B [f]	--	--	--	--	--
	Manganese	7439-96-5	6010B [f]	HEA[k]	5.0E-02	2.0E-01	8.8E-01	nc
	Mercury	7487-94-7	7470/7471 [f]	2.0E-03	5.0E-02	2.0E-03	1.1E-02	nc
	Molybdenum	7439-98-7	6010B [f]	--	--	1.9E-02	1.8E-01	nc

TABLE 4-9 (continued)

TIMET GROUNDWATER SCREENING LEVELS

Analytical Group	Chemical	CAS No.	Analytical Method	Screening Levels				
				MCL [a] (mg/L) or (pCi/L)	Secondary Standard [b] (mg/L) or (pCi/L)	NAC Toxic Stds [c] (mg/L) or (pCi/L)	Tap Water PRGs [d] (mg/L)	
Metals (continued)	Nickel (soluble salts)	7440-02-0	6010B [f]	--	--	1.3E-02 [l]	7.3E-01	nc
	Niobium	7440-03-1	6010B/6020 [f]	--	--	--	--	--
	Palladium	7440-05-3	6010B/6020 [f]	--	--	--	--	--
	Phosphorus (white)	7723-14-0	6010B/6020 [f]	--	--	--	7.3E-04	nc
	Potassium	7440-09-7	6010B [f]	--	--	--	--	--
	Selenium	7782-49-2	6010B [f]	5.0E-02	--	5.0E-02	1.8E-01	nc
	Silicon	7440-21-3	6010B [f]	--	--	--	--	--
	Silver	7440-22-4	6010B [f]	--	1.0E-01	m	1.8E-01	nc
	Sodium	7440-23-5	6010B [f]	HEA[k]	--	--	--	--
	Thallium	7446-18-6	6010B [f]	2.0E-03	--	1.3E-02	2.4E-03	nc
	Tin (inorganic)	7440-31-5	6010B [f]	--	--	--	2.2E+01	nc
	Titanium	7440-32-6	6010B [f]	--	--	--	1.5E+02	nc
	Tungsten	7440-33-7	6010B [f]	--	--	--	--	--
	Uranium (chemical toxicity)	7440-61-0	6020 [f]	3.0E-02	--	--	7.3E-03	nc
	Vanadium	7440-62-2	6010B [f]	--	--	--	3.6E-02	nc
	Zinc	7440-66-6	6010B [f]	--	5.0E+00	2.0E+00 [n]	1.1E+01	nc
	Zirconium	7440-67-7	6020 [f]	--	--	--	--	--
PAHs	Acenaphthene	83-32-9	8270C SIM [f]	--	--	--	3.7E-01	nc
	Acenaphthylene	208-96-8	8270C SIM [f]	--	--	--	--	--
	Anthracene	120-12-7	8270C SIM [f]	--	--	--	1.8E+00	nc
	Benzo(a)anthracene	56-55-3	8270C SIM [f]	--	--	--	9.2E-05	ca
	Benzo(a)pyrene	50-32-8	8270C SIM [f]	2.0E-04	--	--	9.2E-06	ca
	Benzo(b)fluoranthene	205-99-2	8270C SIM [f]	--	--	--	9.2E-05	ca
	Benzo(g,h,i)perylene	191-24-2	8270C SIM [f]	--	--	--	--	--
	Benzo(k)fluoranthene	207-08-9	8270C SIM [f]	--	--	--	9.2E-04	ca
	Chrysene	218-01-9	8270C SIM [f]	--	--	--	9.2E-03	ca
	Dibenzo(a,h)anthracene	53-70-3	8270C SIM [f]	--		--	9.2E-06	ca
	Fluoranthene	206-44-0	8270C SIM [f]	--	--	4.2E-02	1.5E+00	nc
	Fluorene	86-73-7	8270C SIM [f]	--	--	--	2.4E-01	nc
	Hexachlorobenzene	118-74-1	8270C SIM [f]	--	--	--	4.2E-05	ca
	Indeno(1,2,3-cd)pyrene	193-39-5	8270C SIM [f]	--	--	--	9.2E-05	ca
	Naphthalene	91-20-3	8270C SIM [f]	HEA[k]	--	--	6.2E-03	ca
	Octachlorostyrene	29082-74-4	8270C SIM [f]	--	--	--	--	--
	Phenanthrene	85-01-8	8270C SIM [f]	--	--	--	--	--
	Pyrene	129-00-0	8270C SIM [f]	--	--	--	1.8E-01	nc
PCBs	Aroclor-1016	12674-11-2	8082 [f]	5.0E-04	--	--	9.6E-04	ca
	Aroclor-1221	11104-28-2	8082 [f]	5.0E-04	--	--	--	--
	Aroclor-1232	11141-16-5	8082 [f]	5.0E-04	--	--	--	--
	Aroclor-1242	53469-21-9	8082 [f]	5.0E-04	--	--	--	--
	Aroclor-1248	12672-29-6	8082 [f]	5.0E-04	--	--	--	--
	Aroclor-1254	11097-69-1	8082 [f]	5.0E-04	--	--	3.4E-05	ca*
	Aroclor-1260	11096-82-5	8082 [f]	5.0E-04	--	--	--	--

TABLE 4-9 (continued)

TIMET GROUNDWATER SCREENING LEVELS

Analytical Group	Chemical	CAS No.	Analytical Method	Screening Levels: MCL [a] (mg/L) or (pCi/L)	Secondary Standard [b] (mg/L) or (pCi/L)	NAC Toxic Stds [c] (mg/L) or (pCi/L)	Tap Water PRGs [d] (mg/L)	
Organochlorine Pesticides	4,4'-DDD	72-54-8	8081 [f]	--	--	--	2.8E-04	ca
	4,4'-DDE	72-55-9	8081 [f]	--	--	--	2.0E-04	ca
	4,4'-DDT	50-29-3	8081 [f]	--	--	0.0E+00	2.0E-04	ca*
Petroleum Hydrocarbons	Gasoline	8006-61-9	8015 Mod [f]	--	--	--	--	--
	Grease	--	8015 Mod [f]	--	--	--	--	--
	Diesel fuel	--	8015 Mod [f]	--	--	--	--	--
	Waste oil	--	8015 Mod [f]	--	--	--	--	--
Radionuclides	Gross alpha	--	9310 [f]	1.5E+01 [u]	--	--	--	ca
	Gross beta	--	9310 [f]	4.0E+00 [v]	--	--	--	ca
	Potassium-40 (K-40)	013966-00-2	Gamma/ 901.1 [o]	--	--	--	1.9E+00	--
	Uranium-238 Decay Series						(pCi/L)	
	Uranium-238 (U-238)	007440-61-1	ASTM D3972-90M [p]	--	--	--	7.4E-01	--
	Thorium-234 (Th-234)	015065-10-8	Gamma/ 901.1 [o]	--	--	--	2.1E+00	--
	Protactinium-234 (Pa-234)	015100-28-4	Gamma/ 901.1 [o]	--	--	--	1.9E+01	--
	Uranium-234 (U-234)	013966-29-5	ASTM D3972-90M [p]	--	--	--	6.7E-01	--
	Thorium-230 (Th-230)	014269-63-7	ASTM D3972-90M [p]	--	--	--	5.2E-01	--
	Radium-226 (Ra-226)	013982-68-3	Gamma/903.1 [o]	5.0E+00 [w]	--	--	8.2E-04	--
	Radon-222 (Rn-222)	014859-67-7	LSC/SOP799 [r]	--	--	--	1.3E+00	--
	Polonium-218 (Po-218)	015422-24-9	Calculated [q]	--	--	--	--	--
	Lead-214 (Pb-214)	015067-28-4	Gamma/ 901.1 [o]	--	--	--	1.4E+02	--
	Bismuth-214 (Bi-214)	014733-03-0	Gamma/ 901.1 [o]	--	--	--	2.5E+02	--
	Polonium-214 (Po-214)	015735-67-8	Calculated [q]	--	--	--	--	--
	Lead-210 (Pb-210)	014255-04-0	LSC/SOP726 [s]	--	--	--	5.4E-02	--
	Bismuth-210 (Bi-210)	014331-79-4	Calculated [q]	--	--	--	5.3E+00	--
	Polonium-210 (Po-210)	013981-52-7	ASTM D3972-90M [p]	--	--	--	1.3E-01	--
	Lead-206 (Pb-206)	7439-92-1	--	--	--	--	--	--
	Thorium-232 Decay Series							
	Thorium-232 (Th-232)	007440-29-1	ASTM D3972-90M [p]	--	--	--	4.7E-01	--
	Radium-228 (Ra-228)	015262-20-1	Gamma/904.0 [o]	5.0E+00 [w]	--	--	4.6E-02	--
	Actinium-228 (Ac-228)	014381-83-0	Gamma/ 901.1 [o]	--	--	--	2.4E+01	--
	Thorium-228 (Th-228)	014274-82-9	ASTM D3972-90M [p]	--	--	--	4.5E-01	--
	Radium-224 (Ra-224)	013233-32-4	Calculated [q]	--	--	--	9.5E-04	--
	Radon-220 (Rn-220)	022481-48-7	Calculated [q]	--	--	--	--	--
	Polonium-216 (Po-216)	015756-58-8	Calculated [q]	--	--	--	--	--
	Lead-212 (Pb-212)	015092-94-1	Gamma/ 901.1 [o]	--	--	--	1.9E+00	--
	Bismuth-212 (Bi-212)	014913-49-6	Gamma/ 901.1 [o]	--	--	--	6.7E+01	--
	Thallium-208 (Tl-208)	014913-50-9	Gamma/ 901.1 [o]	--	--	--	--	--
	Polonium-212 (Po-212)	015389-34-1	Calculated [q]	--	--	--	--	--
	Lead-208 (Pb-208)	7439-92-1	--	--	--	--	--	--
	Uranium-235 Decay Series							
	Uranium-235 (U-235)	015117-96-1	ASTM D3972-90M [p]	--	--	--	6.6E-01	--
	Thorium-231 (Th-231)	--	--	--	--	--	2.2E+01	--

TABLE 4-9 (continued)

TIMET GROUNDWATER SCREENING LEVELS

Analytical Group	Chemical	CAS No.	Analytical Method	Screening Levels				
				MCL [a] (mg/L) or (pCi/L)	Secondary Standard [b] (mg/L) or (pCi/L)	NAC Toxic Stds [c] (mg/L) or (pCi/L)	Tap Water PRGs [d] (mg/L)	
Radionuclides (continued)	Protactinium-231 (Pa-231)	--	--	--	--	--	2.8E-01	--
	Actinium-227 (Ac-227)	--	--	--	--	--	2.4E-01	--
	Thorium-227 (Th-227)	--	--	--	--	--	1.0E+00	--
	Radium-223 (Ra-223)	--	--	--	--	--	2.0E-01	--
	Radon-219 (Rn-219)	--	--	--	--	--	--	--
	Polonium-215 (Po-215)	--	--	--	--	--	--	--
	Lead-211 (Pb-211)	--	--	--	--	--	1.2E+02	--
	Bismuth-211 (Bi-211)	--	--	--	--	--	--	--
	Thallium-207 (Tl-207)	--	--	--	--	--	--	--
	Total Uranium	7440-61-1	6020 f	3.0E-02	--	--	--	--
VOCs	1,1,1-Trichloroethane	71-55-6	8260B [f]	2.0E-01	--	2.0E-01	3.2E+00	nc
	1,1,2-Trichloroethane	79-00-5	8260B [f]	5.0E-03	--	--	2.0E-04	ca
	1,1-Dichloroethane (DCA)	75-34-3	8260B [f]	--	--	--	8.1E-01	nc
	1,1-Dichloroethene	75-35-4	8260B [f]	7.0E-03	--	7.0E-03	3.4E-01	nc
	1,2-Dichloroethane (DCA)	107-06-2	8260B [f]	5.0E-03	--	5.0E-03	1.2E-04	ca*
	1,2-Dichloropropane	78-87-5	8260B [f]	5.0E-03	--	--	1.6E-04	ca*
	1,3-Dichlorobenzene	541-73-1	8260B [f]	--	--	4.0E-01	1.8E-01	nc
	2-Butanone (MEK)	78-93-3	8260B [f]	--	--	--	7.0E+00	nc
	4-Methyl-2-pentanone (MIBK)	108-10-1	8260B [f]	--	--	--	2.0E+00	nc
	Acetone	67-64-1	8260B [f]	--	--	--	5.5E+00	nc
	Benzene	71-43-2	8260B [f]	5.0E-03	--	5.0E-03	3.5E-04	ca*
	Bromodichloromethane	75-27-4	8260B [f]	--	--	--	1.8E-04	ca
	Bromoform (tribromomethane)	75-25-2	8260B [f]	--	--	--	8.5E-03	ca*
	Bromomethane (Methyl bromide)	74-87-3	8260B [f]	--	--	--	8.7E-03	nc
	Carbon Disulfide	75-15-0	8260B [f]	--	--	--	1.0E+00	nc
	Carbon Tetrachloride	56-23-5	8260B [f]	5.0E-03	--	5.0E-03	1.7E-04	ca*
	Chlorobenzene	108-90-7	8260B [f]	1.0E-01	--	4.9E-01	1.1E-01	nc
	Chloroform	67-66-3	8260B [f]	--	--	--	1.7E-04	ca
	Chloromethane (Methyl chloride)	74-87-3	8260B [f]	--	--	--	1.6E-01	nc
	cis-1,2-Dichloroethene	156-59-2	8260B [f]	7.0E-02	--	--	6.1E-02	nc
	Dibromochloromethane	124-48-1	8260B [f]	--	--	--	1.3E-04	ca
	Ethylbenzene	100-41-4	8260B [f]	7.0E-01	--	1.4E+00	1.3E+00	nc
	Methylene chloride	75-09-2	8260B [f]	5.0E-03	--	--	4.3E-03	ca
	Styrene	100-42-5	8260B [f]	1.0E-01	--	--	1.6E+00	nc
	Tetrachloroethylene (PCE)	127-18-4	8260B [f]	5.0E-03	--	--	1.0E-04	ca
	Toluene	108-88-3	8260B [f]	1.0E+00	--	1.4E+01	7.2E-01	nc
	trans-1,2-Dichloroethene	156-60-5	8260B [f]	1.0E-01	--	--	1.2E-01	nc
	Trichloroethylene (TCE)	79-01-6	8260B [f]	5.0E-03	--	5.0E-03	2.8E-05	ca
	Trichlorofluoromethane	75-69-4	8260B [f]	--	--	--	1.3E+00	nc
	Vinyl chloride (adult)	75-01-4	8260B [f]	--	--	--	--	--
	Vinyl chloride (child/adult)	75-01-4	8260B [f]	2.0E-03	--	2.0E-03	2.0E-05	ca
	Xylenes (total)	1330-20-7	8260B [f]	1.0E+01	--	--	2.1E-01	nc

TABLE 4-9 (continued)

TIMET GROUNDWATER SCREENING LEVELS

Analytical Group	Chemical	CAS No.	Analytical Method	Screening Levels				
				MCL [a] (mg/L) or (pCi/L)	Secondary Standard [b] (mg/L) or (pCi/L)	NAC Toxic Stds [c] (mg/L) or (pCi/L)	Tap Water PRGs [d] (mg/L)	
Water Quality Indicators	Bicarbonate alkalinity	--	310.1 [e]	--	--	--	--	--
	Total dissolved solids	--	160.1 [e]	--	5E+02	1.9E+03 [y]	--	--
Miscellaneous	Asbestos [t]	1332-21-4	100.2 [e]	7.0E+00	--	--	--	--

Notes:

a EPA. 2004. "Drinking Water MCLs." May (http://www.epa.gov/safewater/mcl.html)
b EPA. 2004. "Drinking Water MCLs." May (http://www.epa.gov/safewater/mcl.html); secondard standards
c The lower of the domestic, aquatic, irrigation, or livestock benefical use toxicity standards; NAC. Chapter 445A Water Controls Section 144 "Standards for Toxic Materials Applicable to Designated Waters" (http://www.leg.state.nv.us/NAC/NAC-445A.html#NAC445ASec144)
d PRG values are from EPA's "Region 9 PRGs 2004 Table" at http://www.epa.gov/region09/waste/sfund/prg/index.htm, and the "Preliminary Remediation Goals for Radionuclides" table at http://epa_prgs.ornl.gov/cgi-bin/epa-prgs/rad_search.
e EPA. 1983. "Methods for Chemical Analysis o EPA 1983. "Methods for Chemi EPA 1983. "Methods for Chemical Analysis of Water and Wastes"
f EPA. 1998. "Test Method for Evaluting Solid Waste, Chemical/Physical Methods, SW-846."
g Equation for chronic exposure cadmium aquatic toxicity is 0.85 exp(0.7852 ln(H) - 3.490)
h Equation for chronic exposure chromium III aquatic toxicity is 0.85 exp(0.8190 ln(H) + 1.561)
i Equation for chronic exposure copper aquatic toxicity is 0.85 exp(0.8545 ln(H) - 1.465)
j Equation for chronic exposure lead aquatic toxicity is 0.25 exp(1.273 ln(H) - 4.705)
k HEA taken from http://www.epa.gov/safewater/dw_unregcontaminants.html.
l Equation for chronic exposure nickel aquatic toxicity is 0.85 exp(0.8460 ln(H) + 1.1645)
m Equation for chronic exposure silver aquatic toxicity is 0.85 exp(1.72 ln(H) - 6.52)
n Equation for chronic exposure zinc aquatic toxicity is 0.85 exp(0.8473 ln(H) + 0.7614)
o EPA. 1980. "Prescribed Procedures for Measurement of Radioactivity in Drinking Water." August. EPA/600/4-80-032.
p ASTM International Method D3972-90 "Standard Test Method for Isotopic Uranium in Water by Radiochemistry" (modified for isotopic thorium)
q Radioisotope calculated from nearest long-lived parent or daughter.
r Paragon Analytics, Inc. "Standard Operating Procedure for the Determination of Lead-210 in Soil, Sediments, and Waters."
s Paragon Analytics, Inc. "Standard Operating Procedure for the Determination of Radon-222 in Waters."
t Asbestos is measured in million fibers per liter (MFL).
u MCL measured in pCi/L.
v MCL measured in milliRem per year (mR/yr).
w MCL takes into account Radium-226 and Radium-228 combined.
x Perchlorate value is a provisional action level, as identified by the Nevada Division of Environmental Protection, Corrective Action Bureau website: http://ndep.nv.gov/bca/perchlorate02_05.htm
y Nevada Administrative Code - Toxic Standard for Beneficial Use of Las Vegas Wash

--	Information not available	max	Ceiling limit
ca	Cancer PRG	MCL	Maximum concentration level
ca*	Where nc< 100x ca	mg/L	Milligrams per liter
ca**	Where nc< 10x ca	nc	Noncancer PRG
CAS	Chemical Abstracts Service	NAC	Nevada Administrative Code
EPA	U.S. Environmental Protection Agency	pCi/L	Picocurie per liter
exp	Exponential	PRG	Preliminary remediaton goal
H	Hardness	Sat	Soil saturation
HEA	Health Effects Assessment	SIM	Selective ion monitoring
ln(H)	Natural log of hardness	SOP	Standard operating procedure
LSC	Liquid scintillation counting		

Table 4-10
Chromium Speciation in Soil

Sample ID	Event	Depth at Top of Sample Interval	Depth at Bottom of Sample Interval	Chemical	Sample Date	Lab	Conc (mg/kg)	Qual	Detect	Method
JS-01	WWNP	7	8	CHROMIUM	11-Aug-04	STL	10.4		Yes	EPA INORGANICS SOW
JS-01	WWNP	7	8	HEX CHROMIUM	11-Aug-04	STL	0.42	U	No	EPA 7196A,SW-846
JS-02	WWNP	4	5	CHROMIUM	11-Aug-04	STL	7.8		Yes	EPA INORGANICS SOW
JS-02	WWNP	4	5	HEX CHROMIUM	11-Aug-04	STL	0.43	U	No	EPA 7196A,SW-846
JS-03	WWNP	5	6	CHROMIUM	12-Aug-04	STL	10.3		Yes	EPA INORGANICS SOW
JS-03	WWNP	5	6	HEX CHROMIUM	12-Aug-04	STL	0.44	U	No	EPA 7196A,SW-846
TMSB-104	HG	0	1	CHROMIUM	10-Dec-05	PARAG	11		Yes	SW6010
TMSB-104	HG	0	1	HEX CHROMIUM	10-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-104	HG	4	5	CHROMIUM	10-Dec-05	PARAG	8.4		Yes	SW6010
TMSB-104	HG	4	5	HEX CHROMIUM	10-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-104	HG	9	10	CHROMIUM	10-Dec-05	PARAG	12		Yes	SW6010
TMSB-104	HG	9	10	HEX CHROMIUM	10-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-105	HG	0	1	CHROMIUM	06-Dec-05	PARAG	15		Yes	SW6010
TMSB-105	HG	0	1	HEX CHROMIUM	06-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-105	HG	4	5	CHROMIUM	06-Dec-05	PARAG	11		Yes	SW6010
TMSB-105	HG	4	5	HEX CHROMIUM	06-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-105	HG	9	10	CHROMIUM	06-Dec-05	PARAG	11		Yes	SW6010
TMSB-105	HG	9	10	HEX CHROMIUM	06-Dec-05	PARAG	2.3	U	No	SW7196
TMSB-106	HG	0	1	CHROMIUM	07-Dec-05	PARAG	19		Yes	SW6010
TMSB-106	HG	0	1	HEX CHROMIUM	07-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-106	HG	4	5	CHROMIUM	07-Dec-05	PARAG	10		Yes	SW6010
TMSB-106	HG	4	5	HEX CHROMIUM	07-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-106	HG	9	10	CHROMIUM	07-Dec-05	PARAG	12		Yes	SW6010
TMSB-106	HG	9	10	HEX CHROMIUM	07-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-107	HG	0	1	CHROMIUM	07-Dec-05	PARAG	18		Yes	SW6010
TMSB-107	HG	0	1	HEX CHROMIUM	07-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-107	HG	4	5	CHROMIUM	07-Dec-05	PARAG	45		Yes	SW6010
TMSB-107	HG	4	5	HEX CHROMIUM	07-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-107	HG	9	10	CHROMIUM	07-Dec-05	PARAG	13		Yes	SW6010
TMSB-107	HG	9	10	HEX CHROMIUM	07-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-108	HG	0	1	CHROMIUM	08-Dec-05	PARAG	16		Yes	SW6010
TMSB-108	HG	0	1	HEX CHROMIUM	08-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-108	HG	4	5	CHROMIUM	08-Dec-05	PARAG	11		Yes	SW6010
TMSB-108	HG	4	5	HEX CHROMIUM	08-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-108	HG	9	10	CHROMIUM	08-Dec-05	PARAG	11		Yes	SW6010
TMSB-108	HG	9	10	HEX CHROMIUM	08-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-109	HG	0	1	CHROMIUM	08-Dec-05	PARAG	43		Yes	SW6010
TMSB-109	HG	0	1	HEX CHROMIUM	08-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-109	HG	4	5	CHROMIUM	08-Dec-05	PARAG	15		Yes	SW6010
TMSB-109	HG	4	5	HEX CHROMIUM	08-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-109	HG	9	10	CHROMIUM	08-Dec-05	PARAG	9.8		Yes	SW6010
TMSB-109	HG	9	10	HEX CHROMIUM	08-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-110	HG	0	1	CHROMIUM	08-Dec-05	PARAG	14		Yes	SW6010
TMSB-110	HG	0	1	HEX CHROMIUM	08-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-110	HG	4	5	CHROMIUM	08-Dec-05	PARAG	12		Yes	SW6010
TMSB-110	HG	4	5	HEX CHROMIUM	08-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-110	HG	9	10	CHROMIUM	08-Dec-05	PARAG	11		Yes	SW6010
TMSB-110	HG	9	10	HEX CHROMIUM	08-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-111	HG	0	1	CHROMIUM	09-Dec-05	PARAG	12		Yes	SW6010
TMSB-111	HG	0	1	HEX CHROMIUM	09-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-111	HG	4	5	CHROMIUM	09-Dec-05	PARAG	13		Yes	SW6010
TMSB-111	HG	4	5	HEX CHROMIUM	09-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-111	HG	9	10	CHROMIUM	09-Dec-05	PARAG	14		Yes	SW6010
TMSB-111	HG	9	10	HEX CHROMIUM	09-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-111	HG	9	10	HEX CHROMIUM	09-Dec-05	PARAG	45	U	No	SW7196
TMSB-112	HG	0	1	CHROMIUM	10-Dec-05	PARAG	14		Yes	SW6010
TMSB-112	HG	0	1	HEX CHROMIUM	10-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-112	HG	4	5	CHROMIUM	10-Dec-05	PARAG	10		Yes	SW6010
TMSB-112	HG	4	5	HEX CHROMIUM	10-Dec-05	PARAG	2.1	U	No	SW7196
TMSB-112	HG	9	10	CHROMIUM	10-Dec-05	PARAG	13		Yes	SW6010
TMSB-112	HG	9	10	HEX CHROMIUM	10-Dec-05	PARAG	2.2	U	No	SW7196
TMSB-113	HG	0	1	CHROMIUM	12-Jan-06	PARAG	24		Yes	SW6010
TMSB-113	HG	0	1	HEX CHROMIUM	12-Jan-06	PARAG	2.1	U	No	SW7196

Table 4-10 (continued)
Chromium Speciation in Soil

Sample ID	Event	Depth at Top of Sample Interval	Depth at Bottom of Sample Interval	Chemical	Sample Date	Lab	Conc (mg/kg)	Qual	Detect	Method
TMSB-113	HG	4	5	CHROMIUM	12-Jan-06	PARAG	17		Yes	SW6010
TMSB-113	HG	4	5	HEX CHROMIUM	12-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-113	HG	9	10	CHROMIUM	12-Jan-06	PARAG	11		Yes	SW6010
TMSB-113	HG	9	10	HEX CHROMIUM	12-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-113	HG	19	20	CHROMIUM	12-Jan-06	PARAG	9.8		Yes	SW6010
TMSB-115	HG	0	1	CHROMIUM	12-Jan-06	PARAG	12		Yes	SW6010
TMSB-115	HG	0	1	HEX CHROMIUM	12-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-115	HG	4	5	CHROMIUM	12-Jan-06	PARAG	12		Yes	SW6010
TMSB-115	HG	4	5	HEX CHROMIUM	12-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-115	HG	9	10	CHROMIUM	12-Jan-06	PARAG	11		Yes	SW6010
TMSB-115	HG	9	10	HEX CHROMIUM	12-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-116	HG	0	1	CHROMIUM	13-Jan-06	PARAG	23		Yes	SW6010
TMSB-116	HG	0	1	HEX CHROMIUM	13-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-116	HG	4	5	CHROMIUM	13-Jan-06	PARAG	14		Yes	SW6010
TMSB-116	HG	4	5	HEX CHROMIUM	13-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-116	HG	9	10	CHROMIUM	13-Jan-06	PARAG	11		Yes	SW6010
TMSB-116	HG	9	10	HEX CHROMIUM	13-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-117	HG	0	1	CHROMIUM	13-Jan-06	PARAG	16		Yes	SW6010
TMSB-117	HG	0	1	HEX CHROMIUM	13-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-117	HG	4	5	CHROMIUM	13-Jan-06	PARAG	330		Yes	SW6010
TMSB-117	HG	4	5	HEX CHROMIUM	13-Jan-06	PARAG	2.4	U	No	SW7196
TMSB-117	HG	9	10	CHROMIUM	13-Jan-06	PARAG	67		Yes	SW6010
TMSB-117	HG	9	10	HEX CHROMIUM	13-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-118	HG	0	1	CHROMIUM	10-Jan-06	PARAG	25		Yes	SW6010
TMSB-118	HG	0	1	HEX CHROMIUM	10-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-118	HG	4	5	CHROMIUM	10-Jan-06	PARAG	27		Yes	SW6010
TMSB-118	HG	4	5	HEX CHROMIUM	10-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-118	HG	9	10	CHROMIUM	10-Jan-06	PARAG	7		Yes	SW6010
TMSB-118	HG	9	10	HEX CHROMIUM	10-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-119	HG	0	1	CHROMIUM	10-Jan-06	PARAG	77		Yes	SW6010
TMSB-119	HG	0	1	HEX CHROMIUM	10-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-119	HG	4	5	CHROMIUM	10-Jan-06	PARAG	34		Yes	SW6010
TMSB-119	HG	4	5	HEX CHROMIUM	10-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-119	HG	9	10	CHROMIUM	10-Jan-06	PARAG	20		Yes	SW6010
TMSB-119	HG	9	10	HEX CHROMIUM	10-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-120	HG	0	1	CHROMIUM	10-Jan-06	PARAG	19		Yes	SW6010
TMSB-120	HG	0	1	HEX CHROMIUM	10-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-120	HG	4	5	CHROMIUM	10-Jan-06	PARAG	3.1		Yes	SW6010
TMSB-120	HG	4	5	HEX CHROMIUM	10-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-120	HG	9	10	CHROMIUM	10-Jan-06	PARAG	3		Yes	SW6010
TMSB-120	HG	9	10	HEX CHROMIUM	10-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-121	HG	0	1	CHROMIUM	11-Jan-06	PARAG	16		Yes	SW6010
TMSB-121	HG	0	1	HEX CHROMIUM	11-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-121	HG	4	5	CHROMIUM	11-Jan-06	PARAG	12		Yes	SW6010
TMSB-121	HG	4	5	HEX CHROMIUM	11-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-121	HG	9	10	CHROMIUM	11-Jan-06	PARAG	12		Yes	SW6010
TMSB-121	HG	9	10	HEX CHROMIUM	11-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-123	HG	0	1	CHROMIUM	13-Jan-06	PARAG	300		Yes	SW6010
TMSB-123	HG	0	1	HEX CHROMIUM	13-Jan-06	PARAG	9.3		Yes	SW7196
TMSB-123	HG	4	5	CHROMIUM	13-Jan-06	PARAG	570		Yes	SW6010
TMSB-123	HG	4	5	HEX CHROMIUM	13-Jan-06	PARAG	10		Yes	SW7196
TMSB-123	HG	9	10	CHROMIUM	13-Jan-06	PARAG	24		Yes	SW6010
TMSB-123	HG	9	10	HEX CHROMIUM	13-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-124	HG	0	1	CHROMIUM	11-Jan-06	PARAG	72		Yes	SW6010
TMSB-124	HG	0	1	HEX CHROMIUM	11-Jan-06	PARAG	2.1		Yes	SW7196
TMSB-124	HG	4	5	CHROMIUM	11-Jan-06	PARAG	14		Yes	SW6010
TMSB-124	HG	4	5	HEX CHROMIUM	11-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-124	HG	9	10	CHROMIUM	11-Jan-06	PARAG	13		Yes	SW6010
TMSB-124	HG	9	10	HEX CHROMIUM	11-Jan-06	PARAG	2.3	U	No	SW7196
TMSB-125	HG	0	1	CHROMIUM	11-Jan-06	PARAG	13		Yes	SW6010
TMSB-125	HG	0	1	HEX CHROMIUM	11-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-125	HG	4	5	CHROMIUM	11-Jan-06	PARAG	12		Yes	SW6010
TMSB-125	HG	4	5	HEX CHROMIUM	11-Jan-06	PARAG	2.2	U	No	SW7196

Table 4-10 (continued)
Chromium Speciation in Soil

Sample ID	Event	Depth at Top of Sample Interval	Depth at Bottom of Sample Interval	Chemical	Sample Date	Lab	Conc (mg/kg)	Qual	Detect	Method
TMSB-125	HG	9	10	CHROMIUM	11-Jan-06	PARAG	12		Yes	SW6010
TMSB-125	HG	9	10	HEX CHROMIUM	11-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-125	HG	9	10	HEX CHROMIUM	11-Jan-06	PARAG	44	U	No	SW7196
TMSB-126	HG	0	1	CHROMIUM	11-Jan-06	PARAG	46		Yes	SW6010
TMSB-126	HG	0	1	HEX CHROMIUM	11-Jan-06	PARAG	2.1	U	No	SW7196
TMSB-126	HG	4	5	CHROMIUM	11-Jan-06	PARAG	15		Yes	SW6010
TMSB-126	HG	4	5	HEX CHROMIUM	11-Jan-06	PARAG	2.2	U	No	SW7196
TMSB-126	HG	9	10	CHROMIUM	11-Jan-06	PARAG	12		Yes	SW6010
TMSB-126	HG	9	10	HEX CHROMIUM	11-Jan-06	PARAG	2.2	U	No	SW7196

Notes:

HG	Hydrogeologic characterization event
mg/kg	Milligram per kilogram
PARAG	Paragon Analytics, Inc.
Qual	Qualifier
STL	Severn Trent Laboratories, Inc.
U	Undetected

5.0 CONCEPTUAL SITE MODEL

As described in EPA guidance (EPA 1988), the purpose of the CSM is to describe what is known about chemical sources, migration pathways, exposure routes, and receptors. The CSM depicts the exposure pathways, which are the mechanisms by which a receptor may come into contact with chemicals of potential concern (COPC) in the environment. For purposes of the CSM relating to human health risk assessment, the chemicals at TIMET are considered of potential concern until they are assessed in comparison with health-protective media concentrations.

An exposure pathway is considered "complete" if the following four elements (EPA 1989) are present:

- A source and mechanism of COPC release to the environment;
- An environmental receiving or transport medium (such as air or soil) for the released COPC;
- A point of potential contact with the medium of concern; and
- An exposure route (such as ingestion) at the contact point.

Only complete exposure pathways need be evaluated. This section presents a preliminary CSM for each source area on the TIMET site based on information obtained through site investigations, records review, site reconnaissance, and interviews (summarized in Sections 3.0 and 4.0). The preliminary CSMs for each source area are graphically illustrated on Figures 5-1 through 5-5.

Previous investigations have indicated that chemicals are present in soil (at both the surface and subsurface, as well as residual industrial waste) and groundwater as a result of current and historic plant operations and waste stream discharges. The chemicals detected in soil and groundwater at the TIMET site include VOCs (such as PCE and TCE), SVOCs (including PAHs), PCBs, and nonvolatile substances (such as metals, anions, and most radionuclides), as described in Section 4.3. Also of note is radon-222, a volatile radionuclide (decay product of ^{238}U) that has been detected in groundwater at the site.

To assess exposure of humans, industrial waste such as that in the waste ponds is considered an equivalent source medium to soil. Data for the site indicate that some COPCs detected in groundwater samples at the TIMET site are not associated with current or previous TIMET operations and are likely associated with off-site sources or have an unknown origin (such as chloroform).

The anticipated use of the TIMET site is expected to remain commercial/industrial because it is the only titanium-processing plant in North America and provides economic benefits for its owners, shareholders,

and local economy. Therefore, most humans exposed to COPCs on the property are expected to be commercial/industrial workers. Residential land use, which is the most restrictive option for protection of human health, is not currently under consideration for the property. However, residential developments exist within approximately 500 feet north of the TIMET property and are proposed for closer undeveloped properties north of the Boulder Highway from the TIMET site (Figure 1-2). These residential and currently undeveloped properties north of the TIMET site are also downgradient from groundwater and surface water flow (i.e., stormwater runoff). Residences adjacent to the east side of the facility within 500 feet of TIMET operations are not downgradient, but near the site. Therefore, exposures to COPCs associated with the TIMET site may be possible for off-site residents to the north (by nature of their downgradient position) and also to the east.

Construction work could occur on the TIMET property in the future, so a construction worker also is included as a potential receptor and is intended to address potential exposure by future short-term maintenance work. The relationship between construction worker and short-term maintenance worker exposure is discussed in the development of the California Regional Water Quality Control Board's (RWQCB) document on the development of environmental screening levels (RWQCB 2005). The TIMET facility is fenced, and no areas suitable for recreational use are present or are likely to be present in the future. However, during site investigations it was noted that trespassers enter the property illegally at times (possibly to steal materials from the site). Therefore, a trespasser scenario is applicable.

5.1 CONCEPTUAL SITE MODELS FOR EACH SOURCE AREA

Preliminary CSMs have been developed for five separate source areas identified at the TIMET site. In this general overview, the PSA group of subsurface piping across the TIMET site is conservatively assumed to be present in all of the remaining five source areas, as many processes were or are connected across the site.

The following sections describe the CSM developed for each source area, including a discussion of the principal waste streams and disposal methods potentially affecting environmental conditions in the area, release mechanisms by which chemicals present in environmental media in the source area may be transported or migrate, environmental media potentially affected by chemicals associated with the source area, relevant exposure routes by which persons might come into contact with chemicals associated with the source area, and the various human receptor categories potentially affected by the chemicals present in the media.

5.1.1 Surface Ditches and Northern Storage Area

This source area includes three PSAs and their associated waste streams, including:

- PSA 1 – the NSA
- PSA 10 – Subsurface Piping (assumed present across much of the TIMET site)
- PSA 11 – Former Drainage Ditches on Active BMI Complex

Though not necessarily released from these PSAs, portions of the TCE and PCE plumes are present in groundwater passing beneath these PSAs (see Figures 4-47 and 4-44); groundwater is as shallow as 25 feet bgs in parts of the NSA, as detailed in Section 2.3, thus the presence of the subsurface plumes passing beneath the area is also of note. Radon-222 has also been detected in groundwater from wells installed in this area of the site. As with VOCs, radon does not necessarily originate in this Source Area because it is a ubiquitous natural decay product present across most soils in the U.S.; however, it is noteworthy because the leading edges of the plumes may pass through and/or leave the TIMET property from this area. Groundwater is sufficiently shallow and radon is sufficiently volatile and able to migrate upward, thus vapor intrusion is a potential concern. The graphical depiction of Source Area 1 is presented on Figure 5-1.

5.1.1.1 Principal Waste Streams

The principal waste streams associated with the former drainage ditches include CSD solids, spent caustic, leach liquor, NCCW, and BMI waste streams. Waste streams associated with the NSA include CSD solids, OPW, spent caustic, and chlorinator dust. Waste streams associated with subsurface piping are limited to an older OPW line that runs across the NSA. Of these principal waste streams, only the BMI waste streams (surface drainage ditches) are associated with VOCs. Additional information on the waste streams is discussed in Section 3.2.

5.1.1.2 Nature of Disposal

Impacts to surface and subsurface soil (including waste solids) and groundwater in Source Area 1 are associated with waste streams and historic disposal methods. The NSA was used for storage of solids from CSD ponds and the caustic ponds, refractory brick, construction equipment, concrete, magnesium chloride ingots, reactor lids, asbestos, and coke. The area contains inactive drainage segments and the former BMI pond. The former drainage ditches on the active BMI Complex include the Alpha Ditch,

Beta Ditch, Western Ditch, Northwestern Ditch, Mystery Ditch, former BMI pond, and various inactive site ditches. Some of these features are seen on Figure 2-2.

Environmental issues associated with the waste streams are typically associated with inorganic dissolved contaminants such as anions, and solids, including metals, radionuclides, coke, and intermediate process wastes that were discharged via subsurface or surface piping or disposed of directly into site features as part of fluid or slurry processes. Still other solids were landfilled or stockpiled in the surface or subsurface areas of the PSAs. These processes resulted in direct contact with surface and subsurface soil and/or waste solids. When these materials come into contact with water or other fluids, they are able to leach to subsurface soil and eventually to groundwater.

Stormwater generated on Source Area 1 is not capable of leaving the site to the north via surface ditches because berms were constructed to keep stormwater on the TIMET site. However, some portion of stormwater generated on Source Area 1 is expected to pool in on-site surface features, including ditches, and either evaporate or percolate into the subsurface.

Information collected during site investigations, interviews, and so forth, indicates that commercial/industrial workers conduct activities infrequently, if at all, in this area of the TIMET property, and that durations of visits to this area are short when they occur. A possible exception are environmental contractors that enter the area periodically to collect groundwater samples from existing wells in the area or to conduct other environmental investigations. However, these contractors are protected with appropriate personal protective equipment and special training appropriate for the waste streams they encounter.

5.1.2 Near-Surface Soil Source Area

This source area includes 13 PSAs and their associated waste streams, including:

- PSA 3 – Francy's Mountain
- PSA 9 – Low-Lying Area Adjacent to East Side of Site Pond HP-6
- PSA 10 – Subsurface Piping (included in Source Areas 1-4)
- PSA 12 – Alpha Ditch
- PSA 17 – S-17 Landfill
- PSA 21 – Back Ditch
- PSA 22 – Boneyard

- PSA 23 – Soils in Area South of Building K-53 Bay Doors
- PSA 25 – Chemtec Corporation Site
- PSA 28/29 – Hydroblast Descaling Water Channel/Unit 11 Liquid Discharge Channel
- PSA 32 – White Material Deposits
- PSA 34 – Spill Stain on Avenue F
- PSA 35 – Drum Storage Areas

In addition to the above-listed PSAs, other miscellaneous PSAs are grouped as part of the near-surface source areas as more minor (localized) historic releases to surface soil. The miscellaneous (minor, localized) PSAs are not necessarily a result of specific historic operations and include the following:

- PSA 18 – Area of Stained Soil Between Units 8 and 9
- PSA 19 – Vicinity of Northwest Corner of Unit 7
- PSA 20 – Unit 10 Demolition Soil Stockpile
- PSA 31 – Perimeter and Interior Roadways
- PSA 36 – Rail Delivery Areas and Acid Tank Farm and Ancillary Piping
- PSA 37 – Coke Storage Silo
- PSA 38 – Titanium Tetrachloride Railcar Loading

Portions of the TCE and PCE plumes are present in groundwater beneath this source area (Figures 4-47 and 4-44), which is as shallow as 36 to 41 feet bgs in the northern portion of the TIMET site near J2D3-R (see Table 2-1), but may vary because this source area includes miscellaneous PSAs.

5.1.2.1 Principal Waste Streams

The following principal waste streams are associated with the various PSAs that comprise the Near-Surface Soil Source Area:

- Francy's Mountain – CSD solids and chlorinator dust (solid waste associated with Francy's Mountain has been removed)
- Low-lying area adjacent to the east side of Pond HP-6 – chlorinator dust
- Alpha Ditch – NCCW and Unit 11 discharges (NPDES-permitted); Alpha Ditch receives discharges from Blast Ditch and Back Ditch (after processing through oil skimmer)
- S-17 Landfill – Wooden pallets (wooden pallet storage and burning)

- Back Ditch – NCCW and TPH (derived from hydraulic oils, which do not contain VOCs)
- Boneyard – PCBs (wastes resulting from storage of transformers and other PCB-containing equipment)
- Chemtec Corporation Site – Acid wastewater from laboratory operations and possibly tailings
- Hydroblast Descaling Water Channel/ Unit 11 Liquid Discharge Channel – Unit 11 discharges (NPDES-permitted) and NCCW
- White Material Deposits – Magnesium oxide and silica sand (residues of blasting media from kettle cleaning)
- Spill Stain on Avenue F – Leach liquor and magnesium chloride solution
- Drum Storage Areas – Scrap metal, recyclable metals, alloys, and waste roofing tar

Waste streams associated with subsurface piping include CSD solids, OPW, spent caustic, leach liquor, and NCCW. Also of note is the S-17 Landfill, which may be impacted with chlorinated hydrocarbons such as furans and dioxins, as well as PAHs. The Boneyard is historically associated with PCB releases to the surface from discarded transformers or other electrical equipment. Waste streams for the miscellaneous (minor, localized) PSAs are listed in Table 3-2.

The PCE and TCE plumes associated with the TIMET site are present in groundwater beneath this portion of the TIMET site. Groundwater in this area is more than 20 feet bgs.

5.1.2.2 Nature of Disposal

Many of the PSAs associated with the Near-Surface Soil Source Area are areas where solid waste and process wastewaters are currently and/or were historically stored or discharged. As such, impacts to environmental media in this source area originate from primary contact with surface soil or settlement and sedimentation from wastewater discharge.

PSAs where solid wastes or materials are or were disposed of, spilled, or stored include Francy's Mountain, S-17 Landfill, Boneyard, Building K-53, Chemtec Corporation Site, and Drum Storage Areas. Solid waste associated with Francy's Mountain has been removed; most remaining impacts would be from inorganic materials leaching from the surface or migrating in stormwater runoff to other areas of this source area.

PSAs in this source area that receive and/or transport process wastewater include Alpha Ditch, Back Ditch, Hydroblast Descaling Water Channel, and Unit 11 Liquid Discharge Channel. As noted in the previous section, most of the environmental concerns associated with these surface discharges are associated with metals, process elements such as chlorinator dusts and magnesium, and other inorganic materials. Subsurface piping present in this source area transported process liquids and/or slurries between locations on the TIMET site. The Back Ditch has previously been backfilled, so any remaining impacts associated with this PSA are now present in the near-surface (rather than surface) soils.

The Low-Lying Area Adjacent to the east side of Pond HP-6 (PSA 9) is a natural depression associated with Pond HP-6 that collects stormwater runoff from areas to the north, as well as the adjacent landfill where chlorinator dusts and anodes are temporarily stored.

Two PSAs (32 and 34) in this source area are operating areas where process materials (sandblasting materials and roadway dust suppressant) were purposely or inadvertently released to the surface and residual impacts may remain.

Stormwater generated on this source area generally is not capable of leaving the site. However, some portion of stormwater generated on this source area is expected to pool in on-site surface features, including ditches, and either evaporate or percolate into the subsurface.

For the miscellaneous PSAs (which are more localized, minor PSAs), releases are to the near-surface soils. Once the features (such as the railcars, siding, and silo) are removed, then the potential for a source of a release is also removed. Figure 5-2 shows these PSAs discharging primarily to the surface with the potential (albeit minor) for further transport.

Information collected during site investigations and interviews indicates that PSAs located in operating areas of the plant, including roadways, sandblasting areas, and areas near existing buildings, are used as needed by site personnel, while other areas in this source area are not entered at all. A possible exception is environmental contractors that enter the area periodically to collect groundwater samples from existing wells in the area or to conduct other environmental investigations. However, these contractors are protected with appropriate personal protective equipment and special training appropriate for the waste streams they encounter.

5.1.3 Ponds Area

This source area includes seven PSAs and their associated waste streams, including:

- PSA 2 – CSD North and South Ponds
- PSA 5 – Site Pond SW-1
- PSA 6 – Site Pond HP-1
- PSA 7 – HP-6 Pond
- PSA 8 – Old Caustic Pond/CSD Stockpile
- PSA 10 – Subsurface Piping (included in most Source Areas)
- PSA 27 – BMI J-9 Tailings Ponds

The TCE plume does not appear to underlie these PSAs of the Ponds Area; however, portions of the PCE plumes are present in groundwater beneath the PSAs grouped within this source area (see Figure 4-47), which is as shallow as 37 to 40 feet bgs in the northern portion of the TIMET site (based on measurements in J2D1-R2 in Table 2-1). Therefore, passive migration of PCE vapors upward from underlying groundwater is also of note in this area.

5.1.3.1 Principal Waste Streams

The principal waste streams associated with the Pond Areas include inorganic process materials and wastes, including CSD solids (PSA 2, 5, 8, and 10), OPW (PSA 2, 5, and 10), leach liquor (PSA 5, 6, 7, and 10), spent caustic (PSA 7, 8, and 10), WCF brine (PSA 6 and 7), NCCW (PSA 10), and magnesium wastes (PSA 27). None of these principal waste streams are associated with VOCs or other organic compounds, although the PCE plume extends beneath the PSAs that comprise this source area of the TIMET site.

5.1.3.2 Nature of Disposal

Impacts to surface and subsurface soil (including waste solids) and groundwater in this source area are associated with waste streams and disposal methods employed historically. The ponds that comprise this PSA are or were used for storage, settling, or disposal of liquids, solids (including slurries), and other process intermediates and wastes from site operations. These processes resulted in direct contact with

surface and subsurface soil and/or sludge. When these materials come into contact with water or other fluids, they are able to leach to subsurface soil and eventually to groundwater.

The CSD North and South ponds received CSD solids slurried with OPW effluent and were unlined until 1976; in subsequent years, the solids were removed from these ponds and disposed of off site. The old caustic pond/CSD stockpile was used for storage of CSD solids dredged from the CSD North and South Ponds, as well as for the storage and evaporation of caustic wastewater. The CSD Ponds were lined in 1976. The old caustic pond was unlined.

Site Pond SW-1 historically received leach liquor and OPW liquid wastes, but is now filled with CSD solids. Site Ponds HP-1 and HP-6 historically received leach liquor, and in the case of Pond HP-6, spent caustic. Ponds SW-1 and HP-1 were constructed over former unlined ponds in the late 1970s. Pond HP-6 was constructed with a double liner. Both Ponds HP-1 and HP-6 were emptied and relined with double-liners. However, impacts to the subsurface from historic practices are possible.

The BMI J-9 Tailings Ponds received magnesium-manufacturing wastes. Part of the J-9 Tailings Pond was removed to make room for the WCF.

Stormwater generated on this source area is not capable of leaving the site. However, some portion of stormwater generated on this source area is expected to pool in on-site surface features, including ditches, and either evaporate or percolate into the subsurface.

Information collected during site investigations, interviews, and so forth, indicates that commercial/ industrial workers conduct activities infrequently in this area of the TIMET property, and that durations of visits to this area are short when they occur. Two exceptions include commercial/industrial workers that conduct routine maintenance activities in the pond area and environmental contractors that enter the area periodically to collect groundwater samples from existing wells in the area or to conduct other environmental investigations. However, these commercial/industrial workers and contractors are protected with appropriate personal protective equipment and special training appropriate for the waste streams they encounter.

5.1.4 J2 Landfill Area

This source area includes the following four PSAs and their associated waste streams:

- PSA 10 – Subsurface Piping (included in most source areas)
- PSA 16 – Used Paints and Solvent Area
- PSA 30 – J2/S-18 Landfill
- PSA 33 – Rubble and Debris

The TCE and PCE groundwater plumes are suspected to originate from, and pass beneath, the PSAs that comprise this source area (see Figures 4-47 and 4-44). In addition, radon-222 has been detected in underlying groundwater, which is as shallow as 48 to 50 feet bgs in the north-central portion of the TIMET site near MW-5 (see Table 2-1). Therefore, upward migration of VOCs and radon vapors is of note for exposure in this area.

5.1.4.1 Principal Waste Streams

The principal waste streams associated with the various PSAs that comprise the J2 Landfill Source Area are modeled on Figure 5-4 and may be summarized as follows:

- Subsurface Piping – CSD solids, OPW, spent caustic, leach liquor, and NCCW
- Used Paints and Solvent Area – Paint shop solvents (VOCs)
- J2/S-18 Landfill – Chlorinator dust, Pioche manganese slag, nonhazardous plant solid wastes
- Rubble and Debris – Scrap metal, recyclable metals, alloys, and waste roofing tar

Of these principal waste streams, only the Used Paints and Solvent Area is known to be associated with VOCs. Given the historic nature of operations and potential releases, however, VOCs are not suspected to persist in significant amounts.

5.1.4.2 Nature of Disposal

Two of the four PSAs associated with the J2 Landfill are areas where solid wastes are currently and/or were historically stored or discharged. As such, impacts to environmental media in this source area originate from primary contact with surface soil. PSAs where solid wastes or materials are or were disposed of, spilled, or stored include J2/S-18 Landfill and Rubble and Debris. Solid wastes associated with these two areas were considered nonhazardous. The J2/S-18 Landfill previously operated as a “cut and fill” landfill. A new cell in the J2 Landfill on the northern end of the PSA is lined.

The Used Paint and Solvent PSA is an area that was used to store used paint and solvent from the plant's paint shop. The used paints and solvents were stored in drums on pallets. Subsurface piping that transported process liquids and/or slurries between locations on the TIMET site is present in this source area. Stormwater generated on this source area does not generally leave the site. However, some portion of stormwater generated on this source area is expected to pool in on-site surface features, including ditches, and either evaporate or percolate into the subsurface.

It has been noted during site investigations, interviews, and so forth, that commercial/industrial workers conduct activities infrequently, if at all, in this area of the TIMET property, and that durations of visits to this area are short when they occur, such as during routine maintenance and landfilling activities. As with the previous Source Area discussions, commercial/industrial workers and environmental contractors that conduct activities in this area are trained and protected for contact with potential hazards.

5.1.5 Current and Historical Operational Areas

Current and Historical Operational Areas are conceptually modeled on Figure 5-5. This source area includes the following three PSAs and their associated waste streams:

- PSA 4 – Pioche Manganese Landfill S-20
- PSA 13 – Rutile Off-Loading Area
- PSA 15 – Material and Equipment Storage Area East of Building J2

This source area is generally upgradient to the likely source of the TCE and PCE plumes (J2 Landfill Area) relative to groundwater flow. However, TCE and PCE have been detected in an upgradient well (well J2U2) located near (approximately crossgradient to) PSA 15 (Material and Equipment Storage Area East of Building J2; see Figures 4-47 and 4-44). Therefore, subsurface vapor migration is of potential note in this source area because of the distance from buildings on PSA 15 to the edge of the plume.

5.1.5.1 Principal Waste Streams

The following principal waste streams are associated with the various PSAs that comprise the Current and Historic Operational Areas:

- Pioche Manganese Landfill S-20 – Pioche manganese slag
- Rutile Off-Loading Area – Rutile

None of these principal waste streams is known to be associated with VOCs or other organic chemicals. For this reason (as illustrated on Figure 5-5), volatile inhalation pathways for all receptors are incomplete.

5.1.5.2 Nature of Disposal

Two of the three PSAs associated with the Current and Historical Operational Areas are historic or current solid wastes storage or discharge areas. As such, impacts to environmental media in this source area originate from primary contact with surface soil. PSAs where solid wastes or materials are or were disposed of, spilled, or stored include Pioche Manganese Landfill S-20 and the Rutile Off-Loading Area. Solid wastes associated with these two areas were considered nonhazardous, although the properties of the Pioche manganese slag are unknown. The Pioche Manganese Landfill S-20 is an area where manganese slag is stockpiled. The Rutile Off-Loading Area is an area where rutile ore is off-loaded from rail cars and transferred to a storage area. A Stormwater Pollution Prevention Plan (SWPPP) is in place to ensure that best management practices are employed (Golder 2002).

Stormwater generated on this source area is not believed to be capable of leaving the site. However, some portion of stormwater generated on this source area is expected to pool in on-site surface features, including ditches, and either evaporate or percolate into the subsurface.

Unlike the other source areas, commercial/industrial workers do conduct activities frequently in this area of the TIMET property. Because of security measures and worker activity, trespassers are unlikely to access active operational areas.

5.2 RELEASE MECHANISMS

Release mechanisms affect the availability of COPCs in the environment for exposure by human and/or ecological receptors. Release mechanisms are functions of source, and represent transportation, migration, or transformation fates of COPCs following their initial entry into the environment; for example, a primary source could be surface soil or sludge in direct contact with a primary waste stream, with a primary release mechanism being infiltration and percolation of these COPCs to the subsurface. Release mechanisms and downstream sources relevant to the TIMET site are described in the following sections.

5.2.1 Primary Release Mechanisms

For the TIMET site, the primary release mechanisms are generally directly associated with solid waste disposal, wastewater discharge streams, and disposal methods described in Section 5.1. For areas subject to direct disposal of solid waste and liquid or slurry, the residual soil, solid waste, or sludge directly in contact with the waste stream would represent a primary release mechanism because human receptors could come into contact with COPCs present in this material. The infiltration and percolation of COPCs present in a waste stream from the surface to the subsurface represents another primary release mechanism. In addition, COPCs present in groundwater migrating from an upstream source area to a downstream location or source area represents a primary release mechanism for the receiving area.

5.2.2 Secondary Source Materials

The preliminary CSMs for the five source areas at the TIMET site all include secondary source materials resulting from primary release mechanisms described in Section 5.2.1. These secondary source materials are discussed herein relative to their primary sources and/or release mechanism from a primary source.

COPCs present in surface soil, residual sludge, and solid waste can enter surface water during and following storm events as stormwater runoff. This stormwater can either migrate to another source area or pool in surface or drainage features such as ponds, ditches, or depressions. Stormwater generated on the Surface Drainage Ditches and Northern Storage Area Source Area can migrate off site. In addition, COPCs present in solid waste and/or sludge can become a secondary source when they come into contact with surface soil.

COPCs that percolate and/or infiltrate to the subsurface from residual solid waste or sludge can impact subsurface soil. COPCs that migrate to a source area from an upstream source can impact the saturated zone beneath the receiving source area.

5.2.3 Secondary Release Mechanisms

COPCs present in secondary source materials can be released to still other environmental media or source materials through numerous processes. COPCs that are present in stormwater runoff or surface water can deposit on the surface and impact pond or ditch sediment in some cases. Volatile chemicals can migrate from soil and groundwater to soil gas, from which they can enter indoor or ambient air. Volatile chemicals can also volatilize into indoor or ambient air during domestic use of groundwater (such as bathing). Semivolatile and nonvolatile compounds can be resuspended with soil particulates by wind and

be present in ambient air. In addition, chemicals in soil can leach from soil and migrate to groundwater. Chemicals in surface soil can migrate to surface water dissolved in or adhered to particulates in runoff from the site.

5.3 RELEVANT EXPOSURE PATHWAYS

Complete exposure pathways potentially exist for four primary human receptor groups for the TIMET site (current and future commercial/industrial workers, trespassers, off-site residents, and future construction workers). As mentioned previously, environmental contractors working to evaluate the TIMET site are not included because their personal protective equipment and special training precludes exposure to any COPC. Each of these receptors is detailed in Section 5.5.

The environmental media or pathways by which each receptor group might be exposed to COPCs associated with the TIMET site are described in the following sections. Figures 5-1 through 5-5 conceptualize the site releases and ultimate exposures to potential receptors.

5.3.1 Outdoor Air

COPCs are potentially present in outdoor air that has volatilized from soil or groundwater (VOCs, including radon, only) or been resuspended into outdoor air with soil particulates (SVOCs and nonvolatile COPCs only). COPCs that enter outdoor air are expected to dilute in air rapidly under normal conditions; therefore, COPCs in outdoor air are not expected to contribute greatly to overall exposure values and are only considered qualitatively for the relevant human receptors associated with the TIMET site. Under certain construction scenarios, such as when a worker might work in a narrow excavation, exposures to COPCs in outdoor air might occur. However, mitigation measures such as air monitoring would likely be implemented during this type of activity on the TIMET site to reduce the likelihood that a construction worker would be exposed to hazardous concentrations of COPCs in outdoor air.

5.3.2 Indoor Air

The indoor air pathway(s) is only relevant for areas improved with structures, such as homes or commercial developments, and overlie subsurface and/or groundwater impacted with VOCs. In such cases, VOCs can migrate vertically in soil gas through the soil profile and through building foundations or basements into indoor air space. Volatile chemicals can also volatilize into indoor air during use of impacted groundwater. The only VOCs associated with the TIMET facility that have the potential to migrate into indoor air are PCE and TCE (see Figures 4-44 and 4-47). At this time, indoor air pathways

are only relevant in areas with structures over the PCE and TCE groundwater plumes, such as off-site and downgradient residential and commercial industrial areas north of the TIMET facility. Areas on the TIMET facility that are above the TCE and PCE plumes and that are developed with structures are concentrated in areas close to the center of the TIMET property, where groundwater is approximately 48 to 50 feet bgs (MW-5 depths in Table 2-1) and where vapors would have much farther to travel and disperse relative to areas where groundwater is shallower, such as the northern portion of the TIMET facility where structures are not present and residential and commercial/industrial areas north of the TIMET property.

5.3.3 Shallow Soil

For purposes of the CSM evaluation, shallow soil is considered soil between 0 and 1 foot from the ground surface. For purposes of simplicity, exposures to shallow soil are also considered representative of exposures to (dried) industrial sludge for the TIMET site. Shallow soil is associated with several important exposure pathways at the TIMET site because (1) large areas of surface soil are present at the site and (2) current and historical operations at the facility resulted in discharges of solid, liquid, and slurried wastes (see Section 5.1) directly to the soil surface, resulting in residual and potentially persistent impacts to surface soil. Direct exposures to COPCs in shallow soil are possible through contact and inhalation of COPCs suspended as particulates in outdoor air or that have volatilized from soil. In addition, water-soluble COPCs present in shallow soil can infiltrate and percolate to groundwater.

5.3.4 Subsurface Soil

For purposes of the CSM evaluation, subsurface soil is considered soil between 1 and 10 feet bgs. Subsurface soil at the TIMET site has been subject to impacts from residual solid wastes or sludge placed in the subsurface and/or infiltration of COPCs from the ground surface and shallow soil. For purposes of the CSM evaluation, it is not considered likely that direct exposure to subsurface soil by human receptors associated with the TIMET facility would occur, other than by construction workers involved in excavation activities. Impacted subsurface soil is only present within the TIMET property boundaries; volatilization of VOCs from subsurface soil (via soil gas) and into indoor air is a relevant pathway for areas with impacts to surface soil from VOCs that are improved with structures, such as the central portions of the TIMET property.

5.3.5 Soil Leaching to Groundwater

As has been previously indicated, water-soluble COPCs present in soil can leach to groundwater, where lateral and vertical migration may occur.

5.3.6 Groundwater

Groundwater beneath parts of the TIMET facility and adjacent areas (particularly to the north) has been impacted by current and historical activities associated with the TIMET facility, as evidenced by several contamination plumes delineated in the area of the site (see Section 4.3). Volatile, semivolatile, or nonvolatile COPCs in groundwater are of particular concern when they are present in aquifers from which domestic, drinking water, or irrigation water is extracted for human consumption or use (such as irrigation) or in areas where groundwater discharges to surface water or soil. Therefore, hypothetical residences and commercial/industrial facilities located in areas potentially impacted by the various groundwater plumes and that use groundwater for drinking, industrial, or domestic purposes could be exposed to COPCs from the TIMET site in groundwater. However, no residential or industrial wells exist in the area because municipal water is widely available.

Volatile COPCs are also of concern when they are present in relatively shallow aquifers underlying structures because they can migrate via soil gas through the soil profile and into indoor air. In addition, volatile COPCs can volatilize from impacted groundwater during household or industrial uses such as showering, dish washing, industrial cooling, and so forth; however, no residential wells exist in the area because residents rely upon the municipal water supply. Groundwater is at least 25 feet bgs on the TIMET site, thus workers are not expected to come in contact with groundwater during excavation or other construction activities on the TIMET site; however, the possibility exists that shallow (perched) groundwater may be present in isolated areas. Precautionary measures should be taken to identify perched groundwater during any construction activities and to ensure that contact is avoided until the groundwater can be characterized with respect to COPCs. Groundwater contact by persons on the TIMET site is considered unlikely because no industrial production wells are on the site and TIMET would not install potable wells in an impacted aquifer on the property; TIMET groundwater monitoring wells on and off the property are locked except during sampling events. Due to the presence of seeps, groundwater impacted by COPCs associated with the BMI Complex has the potential to migrate to, and discharge into, the Wash, an effluent-dependent surface water body located approximately 2.8 miles north of the TIMET site.

5.3.7 Surface Water

The TIMET site is located in a very arid region with few natural surface water bodies; however, surface water is occasionally present in areas of the TIMET site, such as settling ponds and ditches, where process wastewater, NCCW, or other water is pooled or discharged. Many of these surface water discharges contain COPCs (see Section 5.1). Surface water also is present following storm events; COPCs can dissolve or run off in stormwater and migrate to other areas and deposit onto sediment upon evaporation or pooling of storm- or discharge water. Historically, stormwater runoff in certain areas in the northern portion of the TIMET property (such as the Surface Drainage Ditches and NSA Source Area) has the potential to migrate off site via existing drainage features, including those shown on Figure 2-4. In addition, surface water in the Wash, located approximately 2.8 miles north of the TIMET property, has the potential to receive groundwater impacted with COPCs associated with the TIMET site and other facilities in the region. Commercial/industrial workers are busy on the current operational areas of the site and would not frequently enter, if at all, Source Areas 1 through 4, thus a potential for post-storm worker access exists only on Source Area 5.

5.3.8 Sediment

COPCs associated with the TIMET site may be present in sediments deposited onto surfaces inundated with surface water, such as ponds, ditches, or surface depressions. Sediments impacted by COPCs have the potential to re-enter surface water in stormwater or discharge water or to leach to the subsurface.

5.4 EXPOSURE ROUTES

Human and ecological receptors may be exposed to COPCs associated with the TIMET site via several routes, or manners of entry, as discussed in the following sections.

5.4.1 Potential Human Exposure Pathways

Human receptors could be exposed to COPCs associated with the TIMET site by three major routes: inhalation, ingestion, and dermal contact. Details of these potential exposure routes are provided in the following sections.

5.4.1.1 Inhalation

Inhalation is taking a material (solid [dust], vapor, gas, and so forth) into the body by breathing it in via the lungs. Humans could potentially be exposed to COPCs associated with the TIMET site that are

present in indoor air (VOCs only, for areas near or above groundwater plumes, where buildings exist) or outdoor air (suspended with soil particles or dust). Although VOCs might be present in outdoor air, they are not likely to bind to soil particles and would disperse rapidly under normal conditions. Construction workers could be exposed to VOCs in outdoor air while working in an excavation or trench. However, health and safety precautions such as air monitoring for harmful vapors would be used during any excavation work at the TIMET site to reduce risks from exposures to VOCs in outdoor air. Inhalation exposure to VOCs in indoor air is possible for persons working or living in structures over the PCE and TCE plumes. Because no residential or industrial wells are installed in the PCE or TCE plumes, exposures to VOCs while using groundwater extracted from a plume (such as during bathing, dish washing, industrial processes, and so forth) are not expected at present or in the future.

5.4.1.2 Ingestion

Human receptors could be exposed to COPCs associated with the TIMET site by inadvertently or incidentally ingesting them. COPCs present in soil or sediment could be ingested by persons through hand-to-mouth contact or inadvertent ingestion of dust or soil particles. COPCs in groundwater could be ingested if groundwater extracted from a well installed in one of the plumes associated with the TIMET site was consumed; however, no residential wells exist in the area because residents rely upon the municipal water supply. Humans could also ingest COPCs diluted in surface water, such as water pooled in an on-site feature such as a pond or ditch or that is carried away from the northern portion of the TIMET site in stormwater runoff.

5.4.1.3 Dermal Contact

Human receptors could be exposed to COPCs associated with the TIMET site through absorption through the skin. COPCs present in soil, sediment, groundwater, or surface water could be absorbed following contact with skin. COPCs in groundwater could be ingested if groundwater extracted from a well installed in one of the plumes associated with the TIMET site was used domestically. Should they come into contact with it for a long enough time, humans could also hypothetically absorb COPCs from surface water, such as water pooled in an on-site feature such as a pond or ditch, or that is carried away from the northern portion of the TIMET site in stormwater runoff.

5.4.2 Potential Ecological Exposure Routes

COPCs associated with the TIMET site are present in groundwater plumes that could potentially migrate to, and discharge into, the Wash, an effluent-dependent surface water feature located approximately 2.8

miles north of the site. Should such discharges occur, ecological receptors could be exposed to the COPCs via inhalation, ingestion, or dermal contact.

5.4.2.1 Inhalation

Ecological receptors at the Wash could inhale VOCs that volatilize from surface water to outdoor air. Because the Wash runs perennially, it is not considered likely that semivolatile or nonvolatile COPCs that deposit in sediment would be suspended in outdoor air under normal conditions. Further, EPA guidance has not yet been established to suggest how wildlife may be estimated to experience toxic exposures.

5.4.2.2 Ingestion

Ecological receptors that come into contact with COPCs in surface water or sediment in the Wash could ingest COPCs through feeding, respiration, preening, and other activities. Further, for any COPCs that bioaccumulate, ingestion of dietary items (such as vegetation or prey) could result in additional (potentially biomagnified) COPC ingestion.

5.4.2.3 Dermal Contact

Ecological receptors that come into contact with COPCs in surface water or sediment in the Wash could dermally absorb COPCs through direct contact with surface water or sediment, or during feeding, preening, and other activities.

5.5 POTENTIAL RECEPTORS

The following sections describe the potential human and ecological receptors that could be exposed to COPCs associated with the TIMET site.

5.5.1 Potential Human Receptors

Human receptors for whom exposure to COPCs associated with the TIMET site could be relevant include: current and future on-site commercial/industrial workers, current and future off-site residents, current and future on-site trespassers, and future construction workers. These potential receptors are described below.

5.5.1.1 Current and Future Commercial/Industrial Worker

For the current and future commercial/industrial worker exposure scenario, chemical exposures for an adult worker are considered relevant for the following exposure pathways:

- Ingestion of surface soil
- Dermal contact with surface soil
- Inhalation of chemicals bound to airborne soil particulates (SVOCs and nonvolatile chemicals only)
- Inhalation of vapor-phase chemicals in outdoor air (relevant for volatile chemicals only)
- Inhalation of vapor-phase chemicals in indoor air that migrate from soil (relevant for volatile chemicals only)
- Inhalation of vapor-phase chemicals in indoor air that migrate from groundwater (relevant for volatile chemicals only, and only where structures exist such as on Source Area 5).

Exposure to groundwater is not anticipated because potable wells are not currently present nor would be installed on the TIMET property. Some contact with surface water in ponds or stormwater is possible, but expected to be minimal, because workers are likely to spend minimal amounts of time in areas where surface water would collect, such as a pond or ditch.

Current and future off-site commercial/industrial workers may be present in the vicinity of the TIMET site (such as the areas north of the TIMET site over the groundwater plumes). However, any risks to these receptors would be represented by the off-site resident, who would have longer exposure duration and frequency.

5.5.1.2 Current and Future Off-Site Resident

Future residential use of the TIMET facility is not anticipated. However, residents in current and future residential developments north of the TIMET property could be exposed to COPCs associated with the TIMET facility that migrate off-site in groundwater and/or storm water runoff (from the NSA and Drainage Ditch Source Area only). For the off-site resident exposure scenario, both an adult and child are potential receptors, and the following exposure pathway is relevant:

- Inhalation of vapor-phase chemicals in indoor air that migrate from groundwater (relevant for volatile chemicals only for all shallow groundwater units) during passive migration upward from an underlying plume

No residential wells exist in the area because residents rely upon the municipal water supply, so direct contact during whole-house well water use is not a complete pathway. Inhalation of chemicals bound to airborne soil particulates or that volatilize from soil are not considered relevant pathways due to the distance of the residences from the TIMET property and likely dilution in air.

Given the scarcity of residential land, desert climate, and widespread water shortages in the area, projected off-site residential uses north of the TIMET site are not likely to include land-intensive pathways, such as residential gardening using impacted groundwater. Therefore, installation of future shallow residential groundwater wells and exposures from future hypothetical homegrown produce are considered to be incomplete for the purposes of this evaluation. Exposures from ingestion of future hypothetical homegrown produce would be highly variable because of the long list of exposure assumptions and extrapolations necessary to predict risk. Further, inclusion of the homegrown produce consumption pathway often results in unrealistically elevated risk estimates that have the potential to drive risk because of the pathway's inherent uncertainty.

5.5.1.3 Current and Future Trespasser

During previous site investigations, observations have been made indicating that the TIMET site, including the NSA and potentially the Surface Ditch Areas, is occasionally entered illegally by trespassers. Although the frequency and duration of visits to the site by trespassers are not known, it is assumed that exposure to COPCs associated with TIMET source areas may be relevant for the following exposure pathways, including a discussion of sources and release mechanisms:

- Ingestion of surface soil
- Dermal contact with surface soil
- Inhalation of chemicals bound to airborne soil particulates (nonvolatile chemicals only)
- Inhalation of vapor-phase chemicals in outdoor air (volatile chemicals from soil and groundwater)

Due to the nature of trespasser scenarios, exposures to COPCs associated with the TIMET site would be short in duration and infrequent relative to the commercial/industrial worker. It is expected that for a trespasser, exposure pathways related to ingestion or dermal contact with surface water and sediment in on-site ponds, ditches, and other features, while potentially complete, would be infrequent and short in

duration and therefore quantifiably negligible. The trespasser would not spend time indoors on the TIMET site; therefore, inhalation of volatile COPCs in indoor air is not applicable.

5.5.1.4 Future Construction Worker

For the construction worker exposure scenario, chemical exposure for an adult worker will be evaluated, and the following exposure pathways are relevant:

- Ingestion of surface soil
- Ingestion of subsurface soil (for excavations only)
- Dermal contact with surface soil
- Dermal contact with subsurface soil (for excavations only)
- Inhalation of chemicals bound to airborne soil particulates (nonvolatile chemicals only)
- Inhalation of vapor-phase chemicals in outdoor air (volatile chemicals from soil and groundwater)

The same pathways evaluated for the commercial/industrial workers are relevant for the construction worker, except for the indoor air pathway (which is incomplete because of the outdoor nature of a construction worker's daily activities) and the subsurface soil pathways (which are potentially complete for a construction worker engaged in excavation activities but are not for commercial/industrial workers). While construction workers may also have skin contact with surface water and/or ditch or pond sediment following storm events, or groundwater during short initiation periods as part of construction activities that intercept the water table, construction in saturated trench conditions is generally avoided and dewatering is quickly implemented for effective construction or repair activities. Further, the water table is generally at depths of over 25 feet bgs (below reasonable utility construction depths). Therefore, surface water- and groundwater-related pathways of exposure for a construction worker are potentially complete, but are expected to be quantitatively negligible relative to all other pathways and relative to the risks projected for the future economically beneficial land uses (commercial/industrial development and/or maintenance activities). The outdoor construction worker would not spend time indoors on the TIMET site; therefore, inhalation of volatiles COPCs in indoor air is not applicable.

As a contingency, if a "hot spot" in groundwater is determined for yet-unidentified shallow (less than 10 feet bgs) groundwater with significant volatile concentrations, a trench worker box model or direct volatilization model may be applied to assess acute and short-term (subchronic) construction worker risks,

to ensure that construction workers who may redevelop or conduct maintenance activities on the land are protected. However, it is anticipated that this site-specific condition will not exist.

5.5.2 Ecological Receptors

Ecological receptors have not been identified as part of the CSM, given that while site investigations continue, the TIMET source areas do not present attractive habitat for ecological species. Only potentially toxic and bioaccumulative COPCs would be of concern for potentially chronically exposed receptors, given that the TIMET site is in the heart of the Henderson industrial/commercial district. The necessity for the identification of site-specific (or indicator) ecological species to include in a site-specific ecological assessment at the site will be determined at a later date.

FIGURES

PRIMARY SOURCE	PRIMARY RELEASE MECHANISM	SECONDARY SOURCE	SECONDARY RELEASE MECHANISM	TERTIARY SOURCE	TERTIARY RELEASE MECHANISM	QUATERNARY SOURCE	EXPOSURE ROUTE	POTENTIAL RECEPTORS: Current/Future: Trespasser [c]	Current/Future: On-Site Commercial/ Industrial Worker [d]	Current/Future: Off-Site Resident [e]	Future: On-Site Construction Worker [f]
PSA 1, 11 (Northern Storage Area; Former Drainage Ditches on Active BMI Complex)	Deposition of Residual Solid Waste/Sludge	Stormwater Runoff [a]					Ingestion	C	I (1,8)	I (1)	I (1)
							Dermal	C	I (1,8)	I (1)	I (1)
		Surface Water in On-Site Ditches and Ponds					Ingestion	C	I (1,8)	I (3)	C
							Dermal	C	I (1,8)	I (3)	C
			Deposition	Sediment			Ingestion	C	I (1)	I (3)	C
							Dermal	C	I (1)	I (3)	C
		Surface Soil [b,g]					Ingestion	C	I (8)	I (3)	C
							Dermal	C	I (8)	I (3)	C
			Volatilization	Outdoor Air (Volatiles)			Inhalation	C	I (8)	I (3)	C
			Wind Suspension	Outdoor Air (Particulate)			Inhalation	C	I (8)	I (3)	C
PSA 10 (Releases from Subsurface Piping)	Infiltration and Percolation	Subsurface [h] Soil	Infiltration and Percolation	Groundwater	Volatilization (Vapor Intrusion)	Indoor Air (VOCs)	Inhalation	I (5)	I (7)	C (3)	I (5)
							Ingestion	I (2)	I (2)	I (3)	C
							Dermal	I (2)	I (2)	I (3)	C
			Volatilization	Soil Gas Vapor	Vapor Intrusion	Indoor Air (VOCs)	Inhalation	I (5)	I (7)	I (3)	I (4)
Impacted Groundwater from Upgradient Areas	Migration of Plume	Saturated Zone Off-Site Residential Area	Volatilization	Soil Gas Vapor	Vapor Intrusion	Indoor Air (VOCs)	Inhalation	I (5)	I (7)	C (6)	I (4)

LEGEND

I	Incomplete or negligible exposure pathway
C	Potentially complete exposure pathway; evaluated quantitatively
C	Potentially complete exposure pathway; evaluated qualitatively

DEFINITIONS

bgs	Below ground surface
BMI	Black Mountain Industrial Complex
PSA	Potential source area
VOC	Volatile organic compound

a Assumes that stormwater runoff can leave site during normal storm events. Stormwater does not run off site from this area in surface ditches: some stormwater from Tronox goes to the Pitman Lateral, but runoff to residential areas does not occ
b VOCs assumed present in surface soil (as they are in BMI Waste Streams)
c The site is fenced; however, during the site investigations, it was noted that the site appears to be accessed illegally by trespassers on occasion. For direct soil contact, trespasser exposure is assumed for shallow surface soil (0 to 1 feet bg
d The site will continue to be used for commercial/industrial purposes for many years. The commercial/industrial workers are not expected to spend significant amounts of time in this source are
e The groundwater plume extends off site. Although private wells in the off-site areas could potentially be contaminated, no residential wells exist in the area because residents rely upon the municipal water sup
f A construction worker may be present at the site in the future; however, this receptor is not evaluated quantitatively in the human health risk assessment. The evaluation of the current/futu on-site commercial/industrial worker is more conservative than the construction worker pathway (due to 25-year duration and daily exposure assumed).
g Exposure to soil was evaluated at the following depths: 0 to 1 foot bgs for shallow soil, and 1 to 10 feet bgs for subsurface soil. Evaluation at the shallow depths assumes that no disturbance of soil occurs; evaluation of subsurface soil (that is, depths greater than 1 foot bgs) assumes mixing of soil in the futu
h BMI Waste Streams (part of PSA 11) include VOCs and petroleum hydrocarbons.
1 Surface water is expected to appear only intermittently in the existing ponds and ditches following storm events. In the event that this site is redeveloped with structures, it is assumed that these features would be backfilled. For the construction worker, ditch contents would be managed with a stormwater pollution prevention plan, minimizing or eliminating contact.
2 No direct contact with subsurface soil would be expected by any receptor other than the construction worker, assuming that excavation activities occur.
3 The nearest off-site residence is approximately 500 feet from the site, although future residences could be built just north of Boulder Highway approximately 250 feet from the site. Off-site residen were not assumed to access the on-site portions of the site as a separate receptor because the trespasser scenario is protective of such exposures. Particulate and vapors are not likely to trav any material distance in outdoor air without significant wind dilution. However, the leading edge of the VOC plume exits from the Northern Storage Area, so vapor migration upward from groundwater could occ
4 Groundwater does not discharge at the surface and all groundwater monitoring wells are locked; thus, there is no point of exposure for a trespasser that may access the site. Due to the depth of groundwater (approximately 25 feet bgs), infiltration of groundwater into a construction trench is unlikely; therefore, incidental ingestion or dermal contact with groundwater was not considered a complete exposure pathway. TIMET would not install potable wells in the plum
5 The trespasser and the construction worker were not assumed to spend any time inside an enclosed building on site, and none currently exists; therefore, exposure to volatile chemicals that migrate to indoor air via the vapor intrusion pathway is not a complete exposure pathwa
6 The trichloroethene and tetrachlorethene plumes extend below this source area at concentrations above screening criteria. The saturated zone is approximately 25 feet bgs in the northern portion of the TIMET si therefore, vapor intrusion to indoor air is a potentially complete pathwa
7 No structures exist on Source Area 1. The future commercial/industrial worker scenario would be complete for vapor intrusion into indoor air if structures are built on any PSA in the futu
8 Workers at the TIMET facility enter this source area very infrequently, if at all.

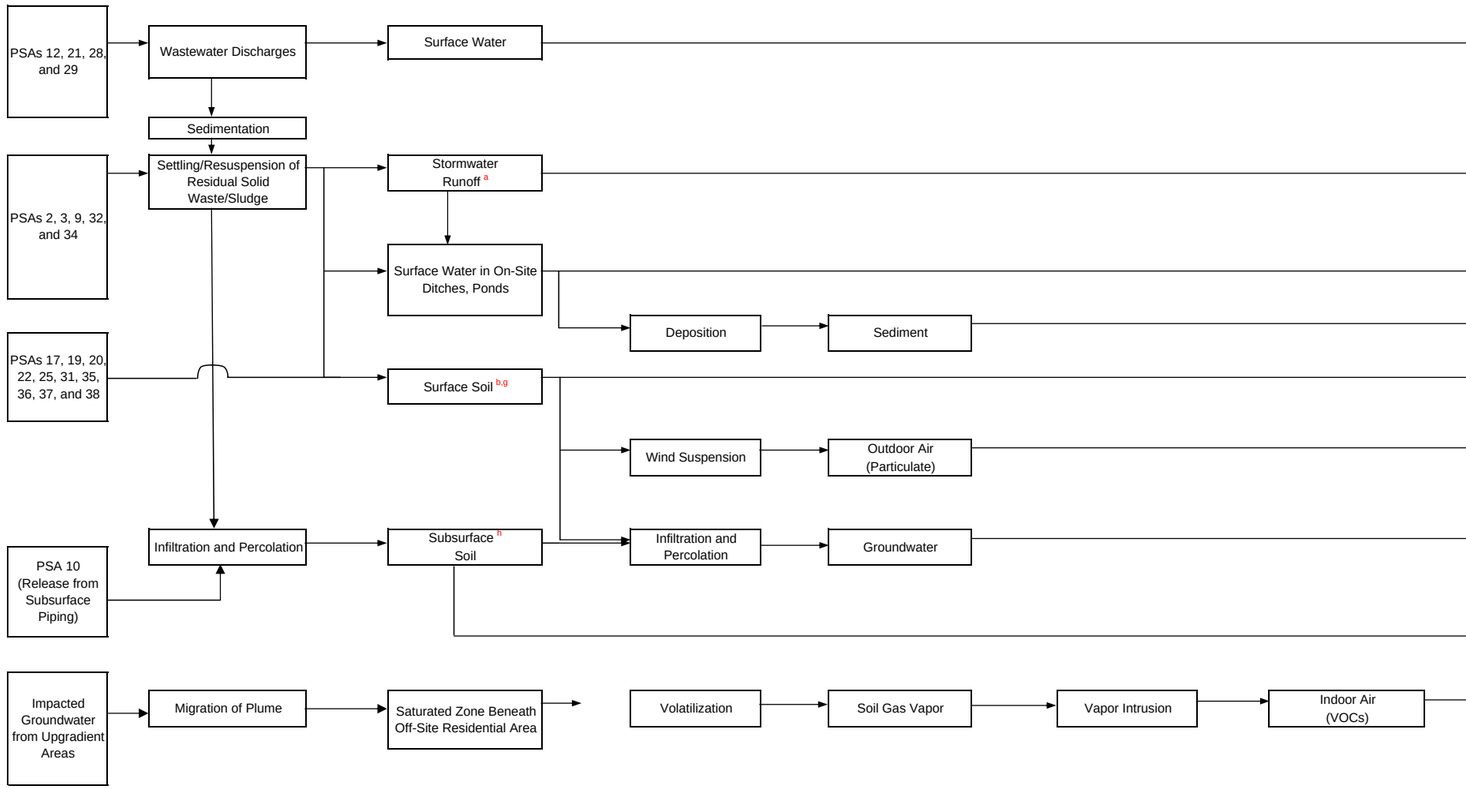
TIMET SITE - SOURCE AREA 1

NORTHERN STORAGE AREA AND SURFACE DITCHES
HENDERSON, NEVADA

FIGURE 5-1
CONCEPTUAL SITE MODEL

PREPARED FOR:

TIMET



EXPOSURE ROUTE	POTENTIAL RECEPTORS: Current/Future: Trespasser c	Current/Future: On-Site Commercial/ Industrial Worker d	Current/Future: Off-Site Resident e	Future: On-Site Construction Worker f
Ingestion	C	I (8)	I (a)	I (1)
Dermal	C	I (8)	I (a)	I (1)
Ingestion	C	I (1,8)	I (a)	I (1)
Dermal	C	I (1,8)	I (a)	I (1)
Ingestion	C	I (1,8)	I (3)	C
Dermal	C	I (1,8)	I (3)	C
Ingestion	C	I (8)	I (3)	C
Dermal	C	I (8)	I (3)	C
Ingestion	C	C	I (3)	C
Dermal	C	C	I (3)	C
Inhalation	C	C	I (3)	C
Ingestion	I (4)	I (4)	I (e)	I (4)
Dermal	I (4)	I (4)	I (e)	I (4)
Ingestion	I (2)	I (2)	I (3)	C
Dermal	I (2)	I (2)	I (3)	C
Inhalation	I (5)	I (7)	C (6)	I (4)

LEGEND

I	Incomplete or negligible exposure pathway
C	Potentially complete exposure pathway; evaluated quantitatively
C	Potentially complete exposure pathway; evaluated qualitatively

DEFINITIONS

bgs	Below ground surface
BMI	Black Mountain Industrial Complex
PSA	Potential source area
VOC	Volatile organic compound

a Assumes that stormwater runoff cannot leave site during normal storm events.
b Residual petroleum hydrocarbons in the Back Ditch, which has been backfilled, are derived from weathered hydraulic oils and not likely to contain VOCs
c The site is fenced; however, during the site investigations, it was noted that the site appears to be accessed illegally by trespassers on occasion. For direct soil contact, trespasser exposure is assumed for shallow surface soil (0 to 1 foot bgs
d The site will continue to be used for commercial/industrial purposes for many years. The commercial/industrial workers are not expected to spend significant amounts of time in this source area
e The groundwater plume extends off site. Although private wells in the off-site areas could potentially be contaminated, no residential wells exist in the area because residents rely upon the municipal water suppl
f A construction worker may be present at the site in the future; however, this receptor was not evaluated quantitatively in the human health risk assessment. The evaluation of the current/futur on-site commercial/industrial worker is more conservative than the construction worker pathway (due to 25-year tenure and daily exposure assumed).
g Exposure to soil was evaluated at the following depths: 0 to 1 foot bgs for shallow soil, and 1 to 10 feet bgs for subsurface soil. Evaluation at the shallow depths assumes that no disturbance of soil occurs; evaluation of subsurface soil (that is, depths greater than 1 foot bgs) assumes mixing of soil in the future

1 Surface water is expected to appear only intermittently in the existing ponds and ditches following storm events. In the event that this site is redeveloped with structures, it is assumed that these features would be backfilled.
2 No direct contact with subsurface soil would be expected by any receptor other than the construction worker, assuming that excavation activities occur
3 The nearest off-site residence is approximately 500 feet from the site, although future residences could be built just north of Boulder Highway approximately 250 feet from the site. Off-site recsidents were not assumed to access the on-site portions of the site as a separate receptor because the trespasser scenario is protective of such exposures. Particulate and vapors are not likely to trave any material distance in outdoor air without significant wind dilution.
4 Groundwater does not discharge at the surface and all groundwater monitoring wells are locked; thus, there is no point of exposure for a trespasser that may access the site. Due to the depth of groundwater (greater than 25 feet bgs), infiltration of groundwater into a construction trench is unlikely; therefore, incidental ingestion or dermal contact with groundwater was not considered a complete exposure pathway
5 The trespasser and the construction worker were not assumed to spend any time inside an enclosed building on site, and none currently exists; therefore, exposure to volatile chemicals that migrate to indoor air via the vapor intrusion pathway is not a complete exposure pathway.
6 The trichloroethene and tetrachloroethene plumes appear to extend below this source area at concentrations above screening criteria. The saturated zone is approximately 25 feet bgs in the northern portio of the TIMET site; therefore, vapor intrusion to indoor air is a potentially complete pathway
7 No structures exist on Source Area 2. The future commercial/industrial worker scenario would be complete for vapor intrusion into indoor air if structures are built on any PSA in the future
8 Workers at the TIMET plant not expected to enter ditches, channels, or ponds regularly.

TIMET SITE - SOURCE AREA 2

NEAR-SURFACE SOILS
HENDERSON, NEVADA

FIGURE 5-2
CONCEPTUAL SITE MODEL

PREPARED FOR:

TIMET

PRIMARY SOURCE	PRIMARY RELEASE MECHANISM	SECONDARY SOURCE	SECONDARY RELEASE MECHANISM	TERTIARY SOURCE	TERTIARY RELEASE MECHANISM	QUATERNARY SOURCE	EXPOSURE ROUTE	POTENTIAL RECEPTORS: Current/Future: Trespasser [c]	Current/Future: On-Site Commercial/ Industrial Worker [d]	Current/Future: Off-Site Resident [e]	Future: On-Site Construction Worker [e,f]
PSAs 5, 8, and 27 (Pond SW-1, Old Caustic Pond; BMI J-9 Tailings Pond)	Settling/Resuspension of Residual Solid Waste/Sludge	Stormwater Runoff [a]									
		Surface Water in Ponds Following Storm Events					Ingestion	*C*	I (8)	I (3)	I (1)
							Dermal	*C*	I (8)	I (3)	I (1)
		Surface Soil [b,g]					Ingestion	C	I (8)	I (3)	*C*
							Dermal	C	I (8)	I (3)	*C*
PSAs 2, 6, and 7 (CSD North and South Ponds; Site Ponds HP-1 and HP-6; contents removed) [h]			Wind Suspension	Outdoor Air (Particulate)			Inhalation	*C*	*C*	I (3)	*C*
	Infiltration and Percolation	Subsurface Soil [b,g]	Infiltration and Percolation	Groundwater			Ingestion	I (4)	I (4)	I (e)	I (4)
							Dermal	I (4)	I (4)	I (e)	I (4)
PSA 10 (Releases from Subsurface Piping)							Ingestion	I (2)	I (2)	I (3)	C
							Dermal	I (2)	I (2)	I (3)	C
Impacted Groundwater from Upgradient Areas	Migration of Plume	Saturated Zone Beneath Off-Site Residential Area	Volatilization	Soil Gas Vapor	Vapor Intrusion	Indoor Air (VOCs)	Inhalation	I (5)	I (7)	C (6)	I (5)

LEGEND

I	Incomplete or negligible exposure pathway
C	Potentially complete exposure pathway; evaluated quantitatively
C	Potentially complete exposure pathway; evaluated qualitatively

DEFINITIONS

bgs	Below ground surface
COPC	Chemical of potential concern
CSD	Continuous Sludge Drier
PSA	Potential source area
VOC	Volatile organic compound

a Assumes that stormwater runoff generally collects in ponds and does not leave pond areas during normal storm events.
b No VOCs remain present in surface or subsurface soil (such as solids remaining in PSAs 5, 8, and 27).
c The site is fenced; however, during the site investigations, it was noted that the site appears to be accessed illegally by trespassers on occasion. For direct soil contact, trespasser exposure is assumed for shallow surface soil (0 to 1 foot bgs
d The site will continue to be used for commercial/industrial purposes for many years. The commercial/industrial workers are not expected to spend significant amounts of time in this source area.
e The groundwater plume extends off site. Although private wells in the off-site areas could potentially be contaminated, no residential wells exist in the area because residents rely upon the municipal water supply.
f A construction worker may be present at the site in the future; however, this receptor was not evaluated quantitatively in the human health risk assessment. The evaluation of the current/futur
on-site commercial/industrial worker is more conservative than the construction worker pathway (due to 25-year tenure and daily exposure assumed)
g Exposure to soil was evaluated at the following depths: 0 to 1 foot bgs for shallow soil, and 1 to 10 feet bgs for subsurface soil
Evaluation at the shallow depths assumes that no disturbance of soil occurs; evaluation of subsurface soil (that is, depths greater than 1 foot bgs) assumes mixing of soil in the future
h Current features equipped with liners on top of previous unlined ponds. Any percolation/infiltration would be associated with residual impacts to subsurface soi
1 Surface water is expected to appear only intermittently in the existing ponds following storm events. In the event that this site is redeveloped with structures, it is assumed that the ponds would be backfillec
2 No direct contact with subsurface soil would be expected by any receptor other than the construction worker, assuming that excavation activities occu
3 The nearest off-site residence is approximately 500 feet from the site, although future residences could be built just north of Boulder Highway approximately 250 feet from the site. Off-site resident
were not assumed to access the on-site portions of the site as a separate receptor because the trespasser scenario is protective of such exposures. Particulate and vapors are not likely to trave
any material distance in outdoor air without significant wind dilution.
4 Groundwater does not discharge at the surface and all groundwater monitoring wells are locked; thus, there is no point of exposure for a trespasse
that may access the site. Due to the depth of groundwater (greater than 25 feet bgs), infiltration of groundwater into a construction trench is unlikely; therefore, incidental ingestior
or dermal contact with groundwater was not considered a complete exposure pathway. TIMET would not install potable wells in the plume
5 The trespasser and the construction worker were not assumed to spend any time inside an enclosed building on site, and none currently exists; therefore, exposure to volatile chemicals
that migrate to indoor air via the vapor intrusion pathway is not a complete exposure pathway
6 The trichloroethene plume does not currently extend below these PSAs at concentrations above screening criteria. The tetrachloroethene plume may extend below this source area;
therefore, vapor intrusion to indoor air is a potentially complete pathway for off-site residences above or near the tetrachloroethene plume.
7 No structures exist on the PSAs in Source Area 3. The future commercial/industrial worker scenario would be complete for vapor intrusion into indoor air if structures are built on any PSA in the future.
8 Workers at the TIMET facility enter this source area very infrequently, if at all.

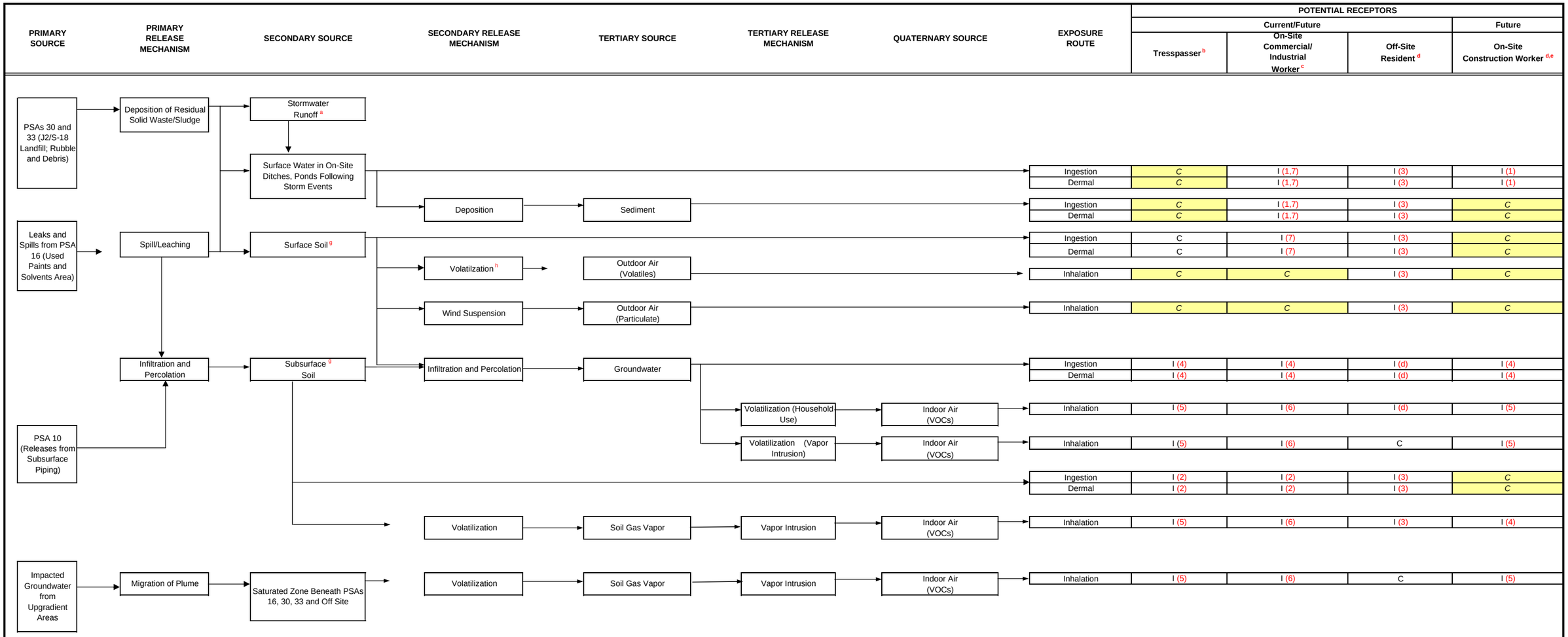
TIMET SITE - SOURCE AREA 3

PONDS AREA
HENDERSON, NEVADA

FIGURE 5-3
CONCEPTUAL SITE MODEL

PREPARED FOR:

TIMET



LEGEND

I	Incomplete or negligible exposure pathway
C	Potentially complete exposure pathway; evaluated quantitatively
C	Potentially complete exposure pathway; evaluated qualitatively

DEFINITIONS

bgs	Below ground surface
PSA	Potential source area
VOC	Volatile organic compound

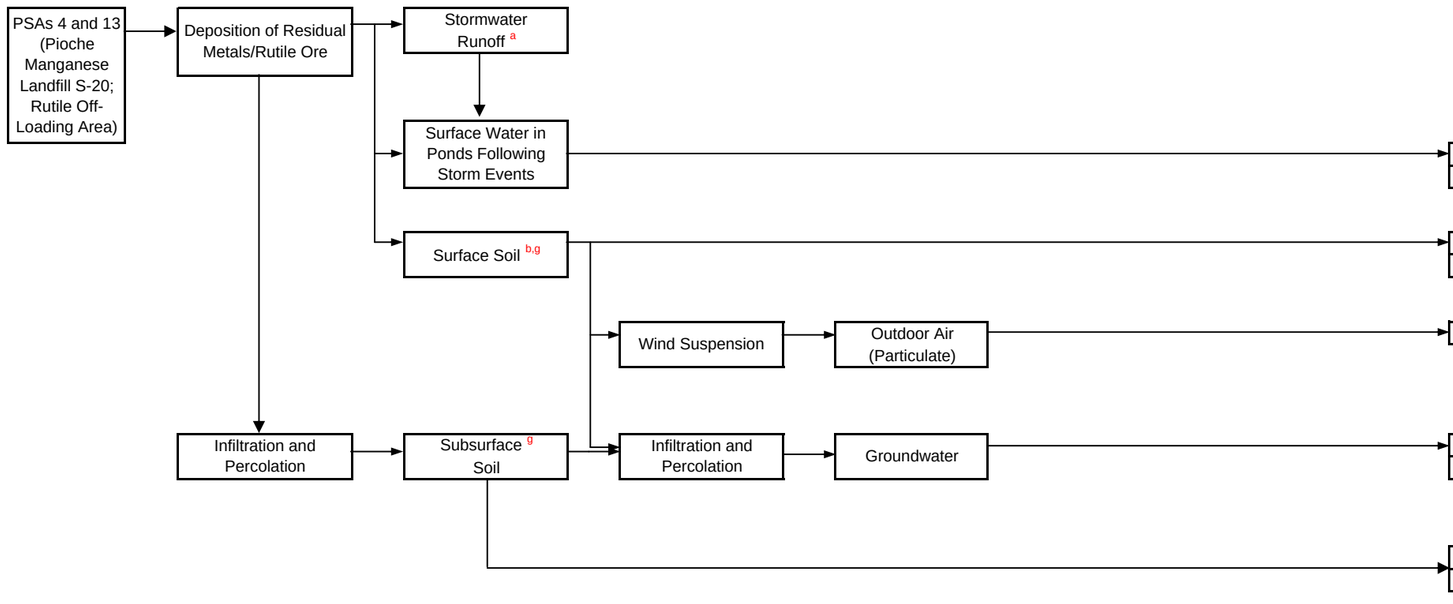
a Assumes that stormwater runoff generally collects in ponds and does not leave the site during normal storm events.
b The site is fenced; however, during the site investigations, it was noted that the site appears to be accessed illegally by trespassers on occasion. For direct soil contact, trespasser exposure is assumed for shallow surface soil (0 to 1 foot bgs).
c The site will continue to be used for commercial/industrial purposes for many years. The commercial/industrial workers are not expected to spend significant amounts of time in this source area.
d The groundwater plume extends off site. Although private wells in the off-site areas could potentially be contaminated, no residential wells exist in the area because residents rely upon the municipal water supply.
e A construction worker may be present at the site in the future; however, this receptor was not evaluated quantitatively in the human health risk assessment. The evaluation of the current/future on-site commercial/industrial worker is more conservative than the construction worker pathway (due to 25-year tenure and daily exposure assumed).
f Exposure to soil was evaluated at the following depths: 0 to 1 foot bgs for shallow soil, and 1 to 10 feet bgs for subsurface soil. Evaluation at the shallow depths assumes that no disturbance of soil occurs; evaluation of subsurface soil (that is, depths greater than 1 foot bgs) assumes mixing of soil in the future.
g Paint shop solvents (part of PSA 16) include VOCs.
h Shallow soil samples were collected and analyzed for VOCs but are not expected to (and so far do not) reflect contamination because they are in equilibrium with the ambient air
1 Surface water is expected to appear only intermittently in the existing ponds and ditches following storm events. In the event that this site is redeveloped with structures, it is assumed that these features would be backfilled.
2 No direct contact with subsurface soil would be expected by any receptor other than the construction worker, assuming that excavation activities occur.
3 The nearest off-site residence is approximately 500 feet from the site, although future residences could be built just north of Boulder Highway approximately 250 feet from the site. Off-site residents were not assumed to access the on-site portions of the site as a separate receptor because the trespasser scenario is protective of such exposures. Particulate and vapors are not likely to travel any material distance in outdoor air without significant wind dilution.
4 Groundwater does not discharge at the surface and all groundwater monitoring wells are locked; thus, there is no point of exposure for a trespasser that may access the site. Due to the depth of groundwater (greater than 25 feet bgs), infiltration of groundwater into a construction trench is unlikely; therefore, incidental ingestion or dermal contact with groundwater was not considered a complete exposure pathway. TIMET would not install potable wells in the plume
5 The trespasser and the construction worker were not assumed to spend any time inside an enclosed building on site, and none currently exists; therefore, exposure to volatile chemicals that migrate to indoor air via the vapor intrusion pathway is not a complete exposure pathway
6 No structures exist in Source Area 4. The future commercial/industrial worker scenario would be complete for vapor intrusion into indoor air if structures are built on any PSA in the future
7 Workers at the TIMET facility enter this source area very infrequently, if at all.

TIMET SITE - SOURCE AREA 4

J2 LANDFILL AREA
HENDERSON, NEVADA

FIGURE 5-4
CONCEPTUAL SITE MODEL

PREPARED FOR:



EXPOSURE ROUTE	POTENTIAL RECEPTORS: Current/Future: Trespasser [c]	Current/Future: On-Site Commercial/ Industrial Worker [d]	Current/Future: Off-Site Resident [e]	Future: On-Site Construction Worker [e,f]
Ingestion	I (7)	C	I (3)	I (1)
Dermal	I (7)	C	I (3)	I (1)
Ingestion	I (7)	C	I (3)	C
Dermal	I (7)	C	I (3)	C
Inhalation	I (7)	C	I (3)	C
Ingestion	I (4,7)	I (4)	I (e)	I (4)
Dermal	I (4,7)	I (4)	I (e)	I (4)
Ingestion	I (2,7)	I (2)	I (3)	C
Dermal	I (2,7)	I (2)	I (3)	C

LEGEND

I	Incomplete or negligible exposure pathway
C	Potentially complete exposure pathway; evaluated quantitatively
C	Potentially complete exposure pathway; evaluated qualitatively

DEFINITIONS

bgs	Below ground surface
PSA	Potential source area
VOC	Volatile organic compound

a Assumes that stormwater runoff generally collects in ponds and does not leave pond areas during normal storm events; in addition, PSA 13 has a stormwater pollution prevention plan that further limits off-site releases.
b No VOCs assumed present in surface or subsurface soil (such as solids remaining in PSAs 4 and13), based on waste streams.
c Given plant security measures, trespassers not expected to enter operational areas.
d It is assumed that the site will continue to be used for commercial/industrial purposes for many years.
e The groundwater plume extends off site, but plumes do not occur beneath this portion of the TIMET site. Further, no residential wells exist in the area because residents rely upon the municipal water supply.
f A construction worker may be present at the site in the future; however, this receptor was not evaluated quantitatively in the human health risk assessment. The evaluation of the current/future on-site commercial/industrial worker is more conservative than the construction worker pathway (due to 25-year tenure and daily exposure assumed).
g Exposure to soil was evaluated at the following depths: 0 to 1 foot bgs for shallow soil, and 1 to 10 feet bgs for subsurface soil. Evaluation at the shallow depths assumes that no disturbance of soil occurs; evaluation of subsurface soil (that is, depths greater than 1 foot bgs) assumes mixing of soil in the future.
1 Surface water is expected to appear only intermittently in in this source area following storm events.
2 No direct contact with subsurface soil would be expected by any receptor other than the construction worker, assuming that excavation activities occur.
3 The nearest off-site residence is approximately 500 feet from the site, although future residences could be built just north of Boulder Highway approximately 250 feet from the site. Off-site residents were not assumed to access the on-site portions of the site as a separate receptor because the trespasser scenario is protective of such exposures. Particulate and vapors are not likely to travel any material distance in outdoor air without significant wind dilution.
4 Groundwater does not discharge at the surface and all groundwater monitoring wells are locked; thus, there is no point of exposure for a trespasser that may access the site. Due to the depth of groundwater (greater than 25 feet bgs), infiltration of groundwater into a construction trench is unlikely; therefore, incidental ingestion or dermal contact with groundwater was not considered a complete exposure pathway. TIMET will not install potable wells on the property.
5 The trespasser and the construction worker were not assumed to spend any time inside an enclosed building on site; therefore, exposure to volatile chemicals that migrate to indoor air via the vapor intrusion pathway was not considered a complete exposure pathway.
6 Neither the trichloroethene nor the tetrachloroethene plume currently extends below this source area at concentrations above screening criteria. In addition, the saturated zone is greater than 25 feet bgs; therefore, vapor intrusion to indoor air is not considered a complete pathway.
7 Trespassers are not expected to enter operations areas.

TIMET SITE - SOURCE AREA 5

CURRENT/HISTORICAL OPERATIONAL AREAS
HENDERSON, NEVADA

FIGURE 5-5
CONCEPTUAL SITE MODEL

PREPARED FOR:

TIMET

6.0 DATA GAPS

The CSM's complexity is a direct result of the complexity of the site: (1) the site remains an active industrial facility; (2) areas are undergoing development; and (3) the NSA and Ditches have been and, in some instances, continue to be impacted by other facilities within the BMI Complex. Over 10 years of investigational records and data have been synthesized into the development of this CSM and as additional information is gathered and assessed, the model will continue to be refined. The document in its current form, however, will be a valuable tool for identifying data needs and guiding future sampling activities. A brief synopsis of what is known and unknown about a particular study item has been provided with respective proposed actions. This list is not intended to be comprehensive of all data needs for each source area but rather will provide the framework by which future data needs and objectives are developed. Table 6-1 presents principal data needs in the form of study questions.

TABLES

Table 6-1 (continued)
Principal Data Gaps

Problem Statement	What We Know	What We Don't Know	Proposed Action
Do we have enough PCB data in shallow soil in former ditches in the Northern storage area (including boneyard) to eliminate PCB as a site related chemical?	(1) A soil sample (RP2-0.0-0.5CompA) was collected from the surface (0-0.5 ft bgs) interval and analyzed for PCBs. Results were reported as nondetect; however, one sample is insufficient to claim we have no PCBs in shallow soils. (2) NDEP stated that no further characterization is required with the exception of one large transformer observed in the area on June 3, 1993. TIMET moved the non-PCB transformer to the transformer storage area (LOU 25).	The spatial distribution of PCBs in shallow soil and in former ditches.	The collection of shallow soil samples for PCBs in the in the Northern Storage Area.
No PAH data exist from the Northern Plant Site.	Soil samples collected in TRECO area (18 locations) were analyzed for SVOCs and PAHs (lower detection limits). Less than three detections were reported for PAH compounds with none exceeding the screening level.	Surface soil concentrations of PAHs in areas where they are listed as a SRC: the Northern Storage Area, former ditches on Active BMI Complex, Drum Storage Area, Rubble and Debris Pile in the J2 landfill area.	The collecton of shallow soil samples for PAHs in conjunction with a PCBs sampling event to identify areas that may be impacted with PAHs.
Asbestos was identified in the ECI in Northern Storage Area.	Evidence for asbestos in the NSA is based upon information gathered during the ESA. No asbestos sampling has been conducted.	Whether asbestos exists in shallow soil.	Suvery NSA for visual ACM. If warranted, collect shallow samples for asbestos analysis.
Did the excavation in the back ditch result in clean closure?	(1) The Back Ditch was sampled for TPH and metals in 1997. (2) TIMET excavated contaminated soils from the ditch in 1999. (3) Confirmation samples collected and analyzed for TPH were reported as nondetect.	The concentration of metals in the soils left in-place after the excavation.	The collection of confirmation samples in subsurface soils.
Has stormwater runoff from the drainage basin at the WAPA Site Yard 3 impacted the Alpha Ditch with PCBs?	1) The section of the Alpha Ditch before the Stilling Pond was sampled for PCBs in 1997 (AD-01). Unvalidated results recorded hits of Aroclor 1254 and 1260 (1.7 and 19.9 mg/kg, respectively). This portion of the ditch was excavated. No confirmation samples were collected. 2) Soil samples collected at the top of the bank of the Alpha Ditch (OWS-1) were collected. The surface (0-1 ft bgs) and	(1) If the excavation activities removed all impacted soils which are now overlaid with the discharge pipe. (2) Have PCBs migrated to depth in subsurface soil?	The performance of subsurface soil sampling along the pipeline that replaced the Alpha Ditch. Analyze groundwater samples from groundwater wells for PCBs to eliminate PCBs in groundwater as SRC.
Has the former dust abatement and dust suppresant study impacted interior roadways?	Magnesium chloride from leach liquor was applied to interior roadways to develop a commerical dust suppressant. On some roadways waste oil may have been applied as a dust suppressant.	The depth to which applicable SRCs (in particular chloride) may have leached to depth beneath roadways.	The collection of subsurface soil samples along road alignments to evaluate leaching to depth.
The former unlined ponds in the Ponds Area are known to have had releases to the subsurface.	Chloride profiles suggest the soil leaching to groundwater pathway is complete in the Ponds Area. Have other principal chemicals migrated completely to groundwater in this area?	Insufficient vertical concentration profiles for principal chemicals exist in and around the Ponds Area to fully ascertain impacts to groundwater.	Obtain additional vertical soil profiles for principal chemicals.

Table 6-1 (continued)
Principal Data Gaps

Problem Statement	What We Know	What We Don't Know	Proposed Action
Are there residual impacts from the storage of chlorinator dust and CSD solids (Francy's Mountain) on surface soils?	Chlorinator dust and CSD solids contain metals, radionuclides, and inorganic ions.	Surface and subsurface soil concentrations in the footprint of the storage of these wastes.	Sample metals, radionuclides, and inorganic ions in shallow soil within footprint. Assess the need for subsurface soil samples.
Chloride profiles suggest the soil leaching to groundwater pathway is complete in areas of the J2 landfill. Have other principal chemicals migrated completely to groundwater in this area?	A number of solid wastes have been disposed in the unlined portion of the J2 landfill over the operational period. Therefore, sources for principal chemicals exist in the J2 landfill. Chloride profiles indicate leachate has migrated to the water table. However, the vertical profiles from soil borings in this study do not suggest migration to substantial depth of principal chemicals (other than chloride).	Do we have a sufficient number of vertical profiles to state that principal chemicals have not migrated to groundwater out of the J2 landfill.	Obtain additional vertical soil profiles for principal chemicals.
Are there PSAs identified that have had no known release?	(1) No known releases have occurred in the following Potential Source Areas: Area of Stained Soil Between Units 8 and 9 (LOU 24), Vicinity of Northwest Corner of Unit 7	We have no environmental sample data to verify that there have been releases of SRC in these areas.	(1) Collect shallow and subsurface soil samples (where appropriate) for applicable
There appears to be sourcing of the arsenic solute plume in the vicinity of the Pioche Manganese landfill, although the highest concentratins occur along the western fenceline and in the vicinity of the Pioche Manganese landfill.	(1) Elevated arsenic is observed in some waste and soil samples in the Pioche Manganese and J2 landfills. (2) Vertical concentration profiles for arsenic show no migration of arsenic out of waste zones.	Whether or not an area exists where arsenic has leached to depth in the vicinity of groundwater monitoring wells J2U1, J2U2, and MW-5. What are the concentrations of arsenic in monitoring wells to the west of the Plant Site and related source areas?	Perform vertical soil profiling in the area of Pioche Manganese landfill. Obtain and review data from Tronox's recent site investigation.
Uranium is above MCL in the Northern Plant Site and south of groundwater monitoring well MW-3. A source of uranium to groundwater has not been identified.	(1) Uranium is present in TIMET's ore. (2) Uranium concentrations in shallow soil are related to waste disposal. (3) Uranium concentrations in sursurface soil of the J2 landfill do not suggest significant leaching to groundwater has occurred. (4) Vertical profiling at the CSD ponds does not suggest significant vertical leaching of uranium. (5) No industrial processes or waste disposal practices are located in the vicinity groundwater monitoring well MW-3.	(1) Specific areas where the soil leaching to groundwater pathway is complete. (2) What is causing elevated uranium concentrations in groundwater monitoring well MW-3?	Perform additional vertical soil profiling in suspected source areas.
Where is the source of the PCE plume?	(1) Quantifiable occurrences of PCE in subsurface soil are located in and around the J2 landfill, Ponds Area and adjacent Near Surface Soil Areas. However, concentrations are just above the detection limit and do not indicate of a source of PCE. (2) The PCE groundwater plume is well defined and appears to emanate from the Used Paint and Solvent Area located in the southwest portion of the J2 Landfill.	(1) Is PCE migrating to groundwater by vapor transport based upon low concentrations reported in groundwater? (2) What are the PCE concentrations in waste or soil within the boundaries of the Used Paint and Solvent Area?	Soil gas sampling (if possible) may be necessary to pinpoint PCE.

Table 6-1 (continued)
Principal Data Gaps

Problem Statement	What We Know	What We Don't Know	Proposed Action
How is the TCE plume being sourced; by reductive dechlorination or a separate TCE release?	Several detections (just above the detection level) are observed in the J2 Landfill and Ponds Area. These concentrations are not indicative of a source of the TCE plume.	Is TCE a primary waste or a transformation product of PCE?	Soil gas sampling (if possible) may be necessary to pinpoint PCE.
Where is the source of nitrates in groundwater?	(1) Lined ponds HP-1 and SW-1 were constructed over former unlined North and South Nitrate Ponds. (2) Nitrate in surface soils exceed background in the Beta Ditch, Northern Storage Area, and the Pioche Manganese Landfill. (3) Nitrate in subsurface soils exceed the screening level in only one boring just north of SW-1. (4) Vertical profiling do not suggest a significant source to groundwater (TMSB-109). (5) Groundwater appears elevated for nitrate under the Ponds Area and J2 Landfill. (6) Groundwater concentrations of nitrate increase downgradient from the Plant Site.	(1) Soil concentrations of nitrate related to unlined North and South Nitrate ponds which are currently overlain by HP-1 and SW-1 ponds. (2) Other sources to the nitrate plume which would cause concentrations to increase downgradient of Plant Site.	Installation of carefully placed soil borings for vertical profiling in the vicinity of the unlined nitrate ponds without compromising the HP-1 and SW-1 lined ponds.
Do we have sufficient data to support speciation of chromium in groundwater?	(1) Waste streams containing chromium are vastly trivalent at TIMET. (2) Chromium detections in soil samples are mostly trivalent. (3) In samples where hexavalent chromium was detected it constitutes 2 - 3 % total chromium (on-site). (4) Chromium detections in groundwater from Plant Site wells that have been speciated indicate hexavalent chromium.	There are insufficient vertical concentration profiles in Ponds Area to support a conclusion.	Add speciated chromium analysis to the vertical delineation regime. Add chromium speciation to all Plant Site groundwater monitoring wells.
Have groundwater plumes been adequately characterized vertically?	Groundwater plumes under the Plant Site are solute plumes. There is not indication of DNAPL (in the case of PCE) or disposal of dense brines (in the case of chloride and TDS). BMI Complex-wide data suggest an upward head gradient from water bearing zones at depth in the MCF. The low permeability of the MCF suggests low potential for vertical migration of solute.	The basis for lack of vertical migration is sound based on hydraulic considerations. However, no nested wells exist on the Plant Site to determine if Qal plumes have migrated into transitional MCF and henceforth into the MCF.	Installation of nested monitor wells in key locations screened at the base of transitional MCF and upper MCF and limited chloride profiling into MCF to evaluate impacts at depth.
Have the solute plumes been adequately delineated horizontally?	The network of Plant Site and downgradient monitoring wells is sufficient to delineate solute plumes for some SRCs (e.g. PCE). Other SRCs (e.g. arsenic, TDS) exceed screening levels across the entire BMI Complex (including Common Areas).	Because of the wide-spread nature of some groundwater impacts (e.g. TDS) the degree of comingling and, therefore, the definition of the study area from the perspective of CSM development is problematic.	Continued cooperation of groundwater monitoring and data sharing.
Has sufficient data been collected to determine background for anions, radionuclides, and metals in the Qal aquifer?	Background dataset has been developed for Qal soils. Surface and subsurface soil samples were collected at TMMW-101 through TMMW-104.	Are soil concentrations collected at TMMW-101 through TMMW-104 representative of background? If so, what conclusions can be made regarding groundwater in these wells.	Conduct statistics necessary on soil dataset. Review data from Tronox upgradient investigation.

Table 6-1 (continued)
Principal Data Gaps

Problem Statement	What We Know	What We Don't Know	Proposed Action
Perchlorate concentrations in groundwater entering the Plant Site from Lake Mead are elevated by an unknown source.	A perchlorate solute plume is sourced from the Tronox operational area. Subsurface soil concentrations in North Plant Site borings do appear to be a contributing source to groundwater. Groundwater concentrations at the North Plant site are elevated.	What is the source of upgradient perchlorate?	Monitor perchlorate in Plant Site wells. Asses data from Tronox's upgradient investigation.

Notes:

ACM	Asbestos-containing material
bgs	Below ground surface
BMI	Basic Management, Inc.
CSD	Continuous sludge dryer
CSM	Conceptual site model
DNAPL	Dense nonaqueous-phase liquid
ECI	Environmental conditions investigation
ESA	Environmental site assessment
LOU	Letter of understanding
MCF	Muddy Creek Formation
MCL	Maximum contaminant level
NDEP	Nevada Division of Environmental Protection
NSA	Northern Storage Area
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
PSA	Potential source area
SVOC	Semivolatile organic compound
TCE	Trichloroethene
TDS	Total dissolved solids
WAPA	Western Area Power Administration

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