

**Record of Decision**

**Remediation of Groundwater in the First Water-Bearing Zone**

**Titanium Metals Corporation (TIMET)**

**Clark County, Nevada**

**February 17, 2009**

## **Section 1.0 - Declaration**

### **1.1 Site Name and Location:**

TIMET  
181 North Water Street  
BMI Complex  
Clark County, Nevada

### **1.2 Statement and Purpose:**

This Record of Decision (ROD) presents the selected remedial alternative for groundwater in the first water-bearing zone (WBZ) at TIMET which is located in Clark County, Nevada. This decision is based upon the Administrative Record. The Nevada Division of Environmental Protection (NDEP), in its discretion under Nevada Administrative Code (NAC) 445A.2271 and 445A.2273, has selected the remedial alternative in accordance with criteria listed in the National Oil and Hazardous Substances Contingency Plan (NCP) at 40 CFR 300.430(f).

### **1.3 Assessment of the Site:**

Actual or threatened release of hazardous substances from this Site, if not addressed by implementing the remedial alternative selected in this ROD, may present an endangerment to public health, welfare or the environment. As used in this ROD, the terms "Site" or "TIMET Facility" refer only to the area within the boundaries of the TIMET property located within the BMI complex as shown on Figure 1-2 of the *Remedial Alternatives Study First Water-Bearing Zone* (hereinafter the *GW RAS*) dated September 15, 2008. References in this ROD to "contaminants" or "hazardous substances" for which TIMET is responsible for remediation mean those contaminants or hazardous substances that were directly generated or released by TIMET's operations at the Site or are derived from such contaminants or hazardous substances.

### **1.4 Description of the Selected Remedy:**

The Remedy selected in this ROD addresses the groundwater contaminated by hazardous substances in the portion of the first WBZ located within the current property boundaries of the TIMET Facility. This ROD selects a final remedy for the first WBZ addressing potential human exposures, as well as, degradation of groundwater quality. This ROD also selects measures to limit the continued migration of hazardous substances from the TIMET Facility to off-Site receptors. The TIMET Facility is one of many sources of groundwater contamination at the overall BMI Complex and surrounding areas. It is expected that additional RODs may be generated to address other media (e.g.: soils) and or other water-bearing zones, as applicable.

The remedy selected in this ROD addresses the principal threat in the first WBZ by selecting actions that will prevent the continued migration of contaminants from the

TIMET Facility that would continue to degrade groundwater quality and create risks to human health or the environment. The ROD also selects response actions to clean up hazardous substance contamination in the groundwater at the Site that had been previously released and is currently impacting the first WBZ.

The major components of the selected remedy include:

- Construction of a slurry wall to facilitate containment of the plume of contaminants;
- Groundwater extraction in various strata of the first WBZ;
- Ex-Situ treatment of the contaminated groundwater;
- Discharge of the contaminated groundwater via a NPDES permit to the Las Vegas Wash;
- Monitored Natural Attenuation (MNA) for groundwater in the first WBZ downgradient of the TIMET Facility;
- Revision to and implementation of the groundwater monitoring plan;
- Operation and maintenance of the above and related components of the remedy selected in this ROD by TIMET until the reasonable attainment of the performance standards, criteria, or other milestones that allow TIMET to demonstrate that the remedial activities addressing TIMET's contaminants under the existing June 28, 1996 Phase II Consent Agreement and the future Phase III Administrative Order on Consent (AOC) (of which this ROD is an attachment) and/or this ROD have been satisfactorily completed.

## **1.5 Administrative Determinations**

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial alternative, and is cost-effective. Components of the selected remedy satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. The remedy was selected in a manner consistent with the National Contingency Plan.

## **1.6 Signature**

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**Leo Drozdoff, P.E., Administrator**  
**Nevada Division of Environmental Protection**

## **Section 2.0 – Decision Summary**

### **2.1 Name, Location, Description**

The TIMET Facility is located within the eastern most portion of the BMI Complex. The BMI Complex is located in Clark County, Nevada and is more fully described in the *GW RAS*. The purpose of the *GW RAS* was to evaluate remedial alternatives to halt the migration of the site-related contaminants from the TIMET Facility and to reduce the concentrations of contaminants in groundwater at the Facility. The *GW RAS* is available for review in the NDEP's offices.

The TIMET Facility is located in an industrial complex within unincorporated Clark County. These parcels of land are surrounded by the City of Henderson, Nevada. The Site is generally bounded by Lake Mead Parkway to the south; Water Street to the East; Warm Springs Road to the North and the TRONOX LLC facility to the west.

This Record of Decision (ROD) addresses contaminated groundwater in the first Water-Bearing Zone (first WBZ) that is located within the current property boundaries of the TIMET Facility, described as follows. In addition, this ROD is an interim remedial decision for downgradient groundwater within the first WBZ, which will be addressed through monitored natural attention (MNA).

The entire geologic sequence beneath the TIMET Facility appears to be saturated, from shallow zones to deeper zones: the Quaternary alluvium (Qal), the transitional Muddy Creek formation (xMCf), sand zones in the MCF, and fat clay aquicludes in the MCF. The groundwater hydraulic gradient over the course of the sequence is generally up towards the ground surface, particularly between the MCf and the xMCf.

The alluvial aquifer (in the Qal) and the xMCf units are in hydraulic communication, and together comprise a "water table aquifer" of substantial thickness. This is what is referred to as the first WBZ. The first WBZ varies in thickness beneath the facility from approximately 50 to 100 feet and is first encountered at a depth between 30 and 50 feet below ground surface. This issue will be further refined during remedial design.

The first WBZ and contaminants generated by the TIMET Facility extend from the TIMET Facility over 4,000 feet downgradient. It is expected that the plume of contaminants downgradient of the facility will be addressed through MNA pursuant to this ROD (this is an interim remedial decision as noted above).

### **2.2 Site History and Enforcement Actions**

The activities discussed within this ROD are being conducted under the NDEP's authority via Nevada Revised Statutes (NRS) 445A; NRS 445B; NRS 459; CERCLA, 42 U.S.C. Sections 9601 et seq.; and the June 28, 1996 *Consent Agreement*.

The details of the investigation of the first WBZ are contained within *GW RAS*, numerous quarters of groundwater monitoring and the *Conceptual Site Model* dated April 25, 2007. In addition several rounds of additional documentation have been provided to the *Conceptual Site Model* dated December 7, 2007 and May 23, 2008. In addition, the Administrative Record provides additional details.

### **2.3 Highlights of Community Participation**

TIMET provides fact sheets to the NDEP on an annual basis. NDEP post these facts sheets on the NDEP's website at <http://ndep.nv.gov/bmi/timet.htm>.

TIMET has developed a Community Involvement Plan (CIP) which the NDEP has approved. TIMET's CIP is available for review in the NDEP's offices. In addition, TIMET is in the process of developing a web-based interface to allow the public to access documents related to the project.

NDEP will provide public notice of the intention to issue the draft ROD and will solicit public comments. If necessary, a public meeting will be held to discuss the draft ROD. Based upon the outcome of this meeting, the draft ROD will be modified before being issued as final.

### **2.4 Scope and Role of Remedial Alternative**

The ROD for the first WBZ is a final remedial decision, addressing the potential for human exposure to hazardous substances within groundwater as well as the issue of degradation of groundwater quality. It is noted that the remedy selected in this ROD pertains only to containment and treatment of groundwater in the first WBZ within the TIMET Facility. This ROD is an interim remedial decision for downgradient groundwater within the first WBZ by addressing the potential for migration of hazardous substances from within the TIMET Facility to downgradient receptors. While not expressly stated in the selected alternative, it is the NDEP's determination that MNA will be used to address downgradient groundwater in the first WBZ. This decision is based upon NDEP's review of the available downgradient groundwater quality data. In addition, the vapor intrusion pathway has been evaluated by TIMET (and others) and it has been determined that this pathway is not currently a concern. The details of the MNA portion of the remedy will be addressed via a work plan to be developed during remedial design.

The ROD does not address groundwater in deeper WBZs. TIMET is currently working under the NDEP's oversight to determine whether or not site-related contamination extends below the first WBZ.

There are numerous other areas that are sources of groundwater contamination at the BMI Complex and within the BMI Common Areas. This ROD does not make any

remedial decision concerning the groundwater beneath the first WBZ or any other area of the BMI Common Areas or BMI Complex.

It is noted that, as part of the implementation of this ROD, TIMET's remedy will interact with contaminants from off-Site sources. It is noted that it is the NDEP's expectation that the remedy shall remain in place until TIMET's reasonable attainment of the performance standards, criteria, or other milestones that allow TIMET to demonstrate that the remedial activities addressing TIMET's contaminants under the existing June 28, 1996 Phase II Consent Agreement and the future Phase III Administrative Order on Consent (AOC) (of which this ROD is an attachment) and/or this ROD have been satisfactorily completed. It is expected that TIMET and the NDEP will discuss remedy termination when TIMET-related contamination has been adequately addressed pursuant to such standards, criteria or milestones.

## **2.5 Summary of Site Characteristics**

As noted above, the TIMET Facility and the first WBZ is described fully in the *GW RAS*, numerous quarters of groundwater monitoring and the *Conceptual Site Model* dated April 25, 2007. In addition several rounds of additional documentation have been provided to the *Conceptual Site Model* dated December 7, 2007 and May 23, 2008. In addition, the Administrative Record provides additional details. These descriptions and details will not be reiterated herein. Contaminants in the first WBZ (from the TIMET Facility as well as from off-Site sources) contain primarily high levels of volatile organic compounds (VOCs), metals, radionuclides, perchlorate and total dissolved solids (TDS).

## **2.6 Summary of Site Risks**

A quantitative risk assessment has not been completed for the first WBZ; however, the levels of contaminants within the first WBZ are sufficiently elevated to present risks that are known to be unacceptable. Downgradient, private wells exist and may be in use (it is noted, however, that these wells are not currently legal). In addition, as the plume of contaminants travels downgradient it has the potential to interact with surface water. Ecological and human receptors can come into contact with this day lighting groundwater and this may pose an unacceptable risk. In addition, the levels of contaminants represent degradation of groundwater quality. Contaminants such as chloroform, tetrachloroethene, trichloroethene, arsenic, uranium, vanadium and total dissolved solids are elevated in the groundwater beneath the TIMET Facility. It is noted that some of these contaminants may source from off-Site, on-Site or a combination thereof.

Data collected within the first WBZ is described in the *GW RAS*, numerous quarters of groundwater monitoring and the *Conceptual Site Model* dated April 25, 2007. In addition several rounds of additional documentation have been provided to the *Conceptual Site Model* dated December 7, 2007 and May 23, 2008. In addition, the Administrative Record provides additional details. Data was generally compared to existing environmental quality metrics such as USEPA Maximum Contaminant Levels (MCLs); USEPA Secondary Drinking Water regulations; USEPA Region VI Medium Specific

Screening Levels (MSSLs); and Nevada Requirements to Maintain Higher Quality (RMHQs). Based on these comparisons, several of which indicate that concentrations of multiple constituents exceed applicable screening criteria, it is apparent that the materials within the first WBZ represent degradation of groundwater quality and a risk to human health or the environment.

## **2.7 Remedial Action Objectives**

The following RAOs are proposed for the Site:

1. Prevent off-Site migration of contaminants in the first WBZ;
2. Reduce concentrations of contaminants in the first WBZ to meet cleanup goals; and
3. Address downgradient contaminant plumes via MNA.

Figure 5-1 of the *GW RAS* shows the TIMET Facility and the proposed slurry wall bounding the areas where the RAOs 1 and 2 are applicable. Figure 1-2, of the *GW RAS* shows the areas downgradient (generally North and Northeast of the Site) of the TIMET Facility where RAO 3 is potentially applicable. The portions of the downgradient area where RAO 3 is expressly applicable will be determined through the development and implementation of a MNA work plan. Cleanup goals or standards that may be applicable to these RAOs include:

- USEPA MCLs;
- USEPA Region VI MSSLs;
- Nevada RMHQs; and
- Comparisons of upgradient, cross-gradient and downgradient groundwater monitoring results to determine impact from and to off-site sources or receptors.
- Final performance standards, criteria, or other milestones that allow TIMET to demonstrate that the remedial activities addressing TIMET's contaminants under the existing June 28, 1996 Phase II Consent Agreement and the future Phase III Administrative Order on Consent (AOC) (of which this ROD is an attachment) and/or this ROD have been satisfactorily completed.

The NDEP has determined that these RAOs and cleanup goals are protective based on current and future expected land uses. The current and expected future use of the land is to be heavy industrial. Groundwater is currently not used at the TIMET Facility. In addition, containment and treatment of the groundwater at the TIMET Facility will reduce the concentration and mass of contaminants downgradient of the facility. Downgradient of the facility, as noted above, groundwater may be used by private wells (as noted above, these wells are not currently legal.) In addition, downgradient groundwater represents an input to a surface water body (the Las Vegas Wash).

## **2.8 Description of Alternatives**

Nine primary alternatives were developed to reduce or eliminate the potential adverse impacts of chemicals in the first WBZ on degradation of groundwater quality, as well as,

adverse impacts to human health and the environment. Alternative 5 is further refined by options on the type of pretreatment of the extracted groundwater. These alternatives are described in detail in the *GW RAS*. These alternatives are as follows:

- Alternative 1 – baseline condition/no action,
- Alternative 2 - institutional controls,
- Alternative 3 – long term monitoring,
- Alternative 4 - MNA
- Alternative 5a – slurry wall, groundwater extraction, ex-situ treatment (pretreatment using an air stripper),
- Alternative 5b - slurry wall, groundwater extraction, ex-situ treatment (pretreatment using granular activated carbon (GAC)),
- Alternative 6 – groundwater extraction in xMCf and Qal, ex-situ treatment (pretreatment using an air stripper),
- Alternative 7 – slurry wall, collection drains, groundwater extraction in xMCf, ex-situ treatment (pretreatment using an air stripper),
- Alternative 8 – sheet piling, groundwater extraction in xMCf and Qal, ex-situ treatment (pretreatment using an air stripper),
- Alternative 9 – French drain, HDPE curtain, groundwater extraction in xMCf, ex-situ treatment (pretreatment using an air stripper).

While not expressly discussed in the *GW RAS* it is noted that Alternatives 3 and 4 will need to be implemented in a limited fashion as part of Alternatives 5a through 9. Specifically, long-term monitoring will be required on-Site and off-Site; and MNA will be required off-Site.

## **2.9 Summary of Comparative Analysis of Alternatives**

This section compares the remedial alternatives described above. The comparative analysis provides the basis for determining which alternative presents the best balance of USEPA's nine evaluation criteria provide in 40 Code of Federal Regulations (CFR) Section 300.430(f) which are presented below.

The first two cleanup evaluation criteria are considered threshold criteria that the selected remedial action must meet. The five primary balancing criteria are balanced to achieve the best overall solution. The two modifying criteria, state and community acceptance, are also considered in the remedy selection.

1. **Overall Protection of Human Health and the Environment** – addresses whether an alternative provides adequate protection from unacceptable risks posed by the Site. (Threshold Criteria)
2. **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)** – addresses whether an alternative attains specific federal and state environmental requirements and state facility siting requirements, or provides grounds for a waiver. (Threshold Criteria)
3. **Long-term Effectiveness and Permanence** – refers to the degree to which an alternative provides reliable protection of human health and the environment over time. (Primary Balancing Criteria)
4. **Reduction of Toxicity, Mobility and Volume through Treatment** – refers to the degree to which an alternative uses treatment to reduce the health hazards of contaminants, the movement of contaminants, or the quantity of contaminants at the site. (Primary Balancing Criteria)
5. **Cost** - evaluates the estimated capital, operation and maintenance, and indirect costs of each alternative in comparison to other equally protective alternatives. (Primary Balancing Criteria)
6. **Short-term Effectiveness** – addresses the degree to which human health and the environment will be adversely impacted during construction and implementation of an alternative. (Primary Balancing Criteria)
7. **Implementability** – refers to the technical and administrative feasibility of an alternative. This includes technical difficulties; uncertainties and the availability of materials and services. It also includes coordination of federal, state and local government efforts. (Primary Balancing Criteria)
8. **State Acceptance** – indicates whether the state agrees with, opposes or has concerns about the preferred alternative. (Modifying Criteria)
9. **Community Acceptance** – includes determining which components of the alternatives people in the community support, have reservations about, or opposes. (Modifying Criteria)

The strengths and weaknesses of the alternatives were weighted to identify the alternative providing the best balance with respect to the nine evaluation criteria.

The comparisons of these criteria are presented in the *GW RAS*. NDEP concurs with the comparisons presented within this document.

## **2.10 The Selected Remedy**

NDEP has determined that the most appropriate remedy for the addressing the first WBZ is Alternative 5a – slurry wall, groundwater extraction, ex-situ treatment (pretreatment using an air stripper) in conjunction with MNA for groundwater downgradient of the TIMET facility and on-site and off-site groundwater monitoring. The remedy will require the following:

- Construction of a slurry wall to facilitate containment of the plume of contaminants;
- Groundwater extraction in various strata of the first WBZ;
- Ex-Situ treatment of the contaminated groundwater;
- Discharge of the contaminated groundwater via a NPDES permit to the Las Vegas Wash;
- Monitored Natural Attenuation (MNA) for groundwater in the first WBZ downgradient of the TIMET Facility;
- Revision to and implementation of the groundwater monitoring plan;
- Operation and maintenance of the above and related components of the remedy selected in this ROD by TIMET until the reasonable attainment of the performance standards, criteria, or other milestones that allow TIMET to demonstrate that the remedial activities addressing TIMET's contaminants under the existing June 28, 1996 Phase II Consent Agreement and the future Phase III Administrative Order on Consent (AOC) (of which this ROD is an attachment) and/or this ROD have been satisfactorily completed.

The selected remedy is an interim remedial decision for downgradient groundwater within the first WBZ by addressing the potential for migration of hazardous substances from within the TIMET Facility to downgradient receptors. This ROD is an interim remedial decision for downgradient groundwater in the first WBZ because the remedy selected in this ROD pertains only to containment and treatment of groundwater in the first WBZ at the TIMET Facility.

While not expressly stated in the selected alternative, it is the NDEP's determination that MNA will be used to address downgradient groundwater in the first WBZ. This was selected as an interim remedy for the downgradient areas for a number of reasons. This decision is based upon NDEP's review of the available downgradient groundwater quality data. Also, the concentrations of contaminants from the TIMET Site appear to disperse within 4,000 feet of the Site. Plumes from other facilities in and around the BMI Complex also travel through this same area and represent a completed pathway to the Las Vegas Wash. In comparison, the TIMET plume is relatively localized. These plumes from other facilities are being addressed by three separate remedial systems. It is not clear to the NDEP at this time that it would be cost effective or necessary to address the downgradient portion of the plume. If necessary, a separate remedial alternative study and remedy will be selected for downgradient groundwater in the first WBZ.

The selected remedy does not address groundwater in deeper WBZs. TIMET is currently working to demonstrate to the NDEP that TIMET-related contamination does not extend below the first WBZ. Some of this information has been presented to the NDEP, however, additional investigation and analysis may be required.

There are numerous other areas that are sources of groundwater contamination at the BMI Complex and within the BMI Common Areas. The selected remedy does not make any remedial decision concerning the groundwater beneath the first WBZ or any other area of the BMI Common Areas or BMI Complex.

It is noted that, as part of the implementation of this ROD, TIMET's remedy will interact with contaminants from off-Site sources. It is noted that it is the NDEP's expectation that the remedy shall remain in place until TIMET's reasonable attainment of the performance standards, criteria, or other milestones that allow TIMET to demonstrate that the remedial activities addressing TIMET's contaminants under the existing June 28, 1996 Phase II Consent Agreement and the future Phase III Administrative Order on Consent (AOC) (of which this ROD is an attachment) and/or this ROD have been satisfactorily completed.

It is expected that TIMET and the NDEP will discuss remedy termination when TIMET-related contamination has been adequately addressed pursuant to such standards, criteria or milestones.

#### Description and Specification of the Remedy

Remedy 5a includes the following:

- Construction of a slurry wall generally in conformance with Figure 5-1 of the GW RAS. It is understood that the configuration and scope of this wall may be modified during remedial design. This addresses RAO 1 by containing the plume of contaminants. This helps to address RAO 2 by enhancing the extraction and treatment of these contaminants. This helps to address RAO 3 by reducing the concentration and mass of contaminants migrating from the facility.
- Installation and operation of groundwater extraction wells in the Qal and xMcf to contain the plume of contaminants. It is noted that the eastern portion of the plume of contaminants is expected to be controlled exclusively by hydraulic containment. It is understood that this issue may be refined during remedial design via modeling. This addresses RAO 1 by containing the plume of contaminants. This addresses RAO 2 through treatment of the plume of contaminants. This helps to address RAO 3 by reducing the concentration and mass of contaminants migrating from the facility.
- Installation of an air-stripper as pre-treatment to the existing Water Conservation Facility (WCF). This helps to address RAO 2 through treatment of the volatile organic compounds; radon, and some of the semi-volatile organic compounds in the plume of contaminants.
- Modification of the WCF, as necessary, to accommodate the increased solids loading. This helps to address RAO 2 through treatment of the inorganic contaminants.

- Discharge of treated groundwater through a NPDES permit to the Las Vegas Wash via the existing Pittman Bypass Pipeline. It is noted that this NPDES permit exists and will require modification.
- MNA for the portion of the contaminant plume downgradient of the slurry wall (described above). This addresses RAO 3.

These actions serve to satisfy RAOs 1 and 2 by containing and treating the plume of contaminants within the TIMET Facility boundary. This will limit or eliminate the transport of contaminants in the first WBZ in the future. The contaminants downgradient of the TIMET Facility are expected to be addressed by MNA. This addresses RAO 3.

## **2.11 Administrative Determinations**

NDEP's primary concern is to undertake remedial actions that achieve adequate protection of human health and the environment and prevent the degradation of groundwater quality. In addition, when complete the remedy must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws, unless a statutory waiver is justified. The selected remedy must also be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the NDEP has a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity or mobility of hazardous wastes. The following sections discuss how the selected remedy meets these administrative requirements.

### **Protection of Human Health and the Environment**

The selected remedy protects human health and the environment (including degradation of groundwater quality) through a combination of containment; extraction and treatment; and MNA.

Containment and treatment of the contaminants within the first WBZ reduces the risk to human health and the environment by halting the flow of contaminants off-Site and by reducing the mass of contaminants on-Site. This approach will also halt the degradation of the downgradient groundwater. As noted above, the groundwater in the first WBZ downgradient of the facility will initially be addressed by MNA. It is believed that once containment is achieved the downgradient plume will be dispersed and will become a minor concern.

### **Compliance with Applicable or Relevant and Appropriate Requirements**

The selected remedy will attain and comply with all ARARs. The ARARs considered for this decision are:

- National Oil and Hazardous Substances Contingency Plan (NCP);
- USEPA MCLs

- USEPA Region VI MSSSLs;
- Nevada Administrative Code (NAC);

### Cost-Effectiveness

A summary of costs is presented in Table 6-1 of the *GW RAS*. It is noted that the costs for the O&M phase of the various remedial alternatives have been estimated only for the initial five year period of operation of the remedy. At the end of this period TIMET anticipates reevaluating the effectiveness or completion of the various components of the remedy versus the RAOs in this ROD (and the related performance standards, criteria, or other milestones). The ultimate O&M costs will vary depending upon the period of time over which the remedy must be operated before TIMET reaches those RAOs.

The cost for the selected remedy has been classified as “moderate”. It is noted, however, that the costs for the selected remedy are the lowest of any of the remedies which meet the Evaluation Criteria. Capital costs are estimated to be \$1.0MM to \$1.5MM. Operation and Maintenance (O&M) costs are estimated to be \$1.5 to \$2.0MM. The most expensive remedy has capital costs estimated to be \$1.0MM to \$1.5MM and O&M costs estimated to be in excess of \$3.0MM. The selected remedy is believed to be as protective and effective as more expensive alternatives (alternatives 5b, 7, 8 and 9) and more protective and effective than alternative 6. All of the retained alternatives (alternatives 5a through 9) comply with ARARs equally. In addition, alternative 5b is the most similar to the selected remedy (alternative 5a), however, alternative 5b would also generate an additional waste stream (spent granular activated carbon). This is less desirable and less cost-effective.

### Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

The selected remedy will provide a permanent solution to address the principal threats associated with the first WBZ at the TIMET Facility by reducing concentrations of contaminants below ARARs and by halting the migration of the plume of contaminants. Alternative treatment technologies are not utilized, however, it is believed that that the selected remedy provides a balance of tradeoffs in terms of the selection criteria.

### Preference for Treatment

The selected remedy employs treatment as well as containment to mitigate the principal threats from these materials.

## **2.12 Documentation of Significant Changes**

Significant changes made in response to any comments received will be documented in this section in the Final ROD.

It is noted that the NDEP does not fully concur with the information presented in the *GW RAS*, however, it was found that these issues did not materially affect remedy selection. The NDEP's comments are contained in Attachment A to this ROD for clarity of the Administrative Record and to guide Remedial Design.

The schedule and scope of issues to be addressed to implement this ROD are listed in Attachment B. It is noted that every item that needs to be addressed cannot be contemplated herein and additional items may be defined by the NDEP via the June 28, 1996 *Consent Agreement*.

## Attachment A – NDEP comments on the GW RAS

Please note that these comments are provided for clarification of the Administrative Record and to guide the Remedial Design process. No response is required or desired, however, if there are questions or technical discussion it is expected that these issues will be discussed during ROD implementation.

1. General comment, TIMET discusses a “washing, disaggregating and settling” process that was used to help identify the transitional Muddy Creek formation (xMCF). Please note that this is not an approved methodology and no standard operating procedure (SOP) has been developed regarding this procedure. A similar ASTM procedure exists and should be used if this information is going to be used to support decision making. In addition, an SOP must be developed if this method is to be used in the future. This is a global comment that applies to numerous references in the subject document.
2. General comment, TIMET makes reference to the “draft hydrogeologic nomenclature provided by the NDEP”. It is noted that this document is draft and is not promulgated guidance. Hence this should not be referenced in a milestone Deliverable such as the *GW RAS*. This is a global comment that applies to numerous references in the subject document.
3. General comment, the *GW RAS* does not identify data gaps or any schedule for remedy implementation. NDEP has started this process as Attachment B to the ROD. Also, as discussed with TIMET, known data gaps can be addressed as soon as possible and need not wait for the issuance of this ROD.
4. There appear to be numerous grammatical and spelling errors throughout the document. Appendix C contains editorial instructions intended for the report writers. With a few exceptions these are not discussed further herein.
5. Section 2.5.1, page 2-8, last sentence, TIMET makes reference to horizontal seepage velocities by “BMI companies”. No reference is provided regarding the source of this information. All similar statements must be formally referenced. This is a global comment that applies to numerous references in the subject document.
6. Section 2.5.2, pg 2-8, TIMET states “However, because the permeability of even the coarsest of these zones is about 0.1 foot per day (ft/day), expected seepage velocities in the transitional MCF are anticipated to be less than or equal to approximately 10 feet per year.” Please indicate all input parameters for this calculation.
7. Section 2.5.4, pg 2-9, TIMET states “Of particular note are the low fraction results for organic carbon, less than the detection limit of 0.1 percent in all samples tested.” What analytical method was used for the analysis? Also, please note that in desert climates the fraction organic carbon is typically low (<0.001 is common).
8. Section 2.5.7, pg 2-10, TIMET states “Groundwater inflow along Lake Mead Parkway is significantly less than outflow at the northern Plant Site boundary.” However, total outflow appears to be 192 ft<sup>3</sup>/day less than total inflow. If this were true then water levels (well hydrographs) should show an increasing trend. Therefore, this represents a deficiency of the water balance.
9. Section 3.0, pg 3-2, TIMET states “The three-dimensional figures were generated by combining stratigraphic cross sections (fences) with “solid-modeled” chemical

- concentrations. The solid-model uses the “inverse-distance anisotropic” method.”  
TIMET needs to reference the software used for this analysis.
10. Section 3.1, pages 3-2 and 3-3, please note that the 10% frequency of exceeding a screening level criteria has no regulatory basis and should not be used. Additional justification should be provided or all chemicals exceeding a screening level should be discussed.
  11. Section 3.2.1.2, pg 3-5, TIMET states “...including TMMW-103 (on Lake Mead Parkway) and BRW-R1 (upgradient of suspected nitrate source areas)...” As NDEP has stated numerous times, upgradient does not necessarily equate to uncontaminated.
  12. Section 3.2.1.3, pages 3-5 and 3-6, it should be noted that TIMET has used and continues to use water from Lake Mead which contains perchlorate. In addition, perchlorate concentrations upgradient of the entire BMI Complex are in the range of 0.5 – 2.0 mg/l. This should also be further clarified relative to the screening level of 0.018 mg/l.
  13. Section 3.2.1.4, pages 3-6 and 3-7, TIMET will need to demonstrate to the NDEP the source of the off-Site contamination as well as the isolation of TIMET’s plume from these plumes. This is an issue that will be addressed as part of the termination criteria for the remedy, however, investigation and analyses can proceed at any time. This is a global comment that applies to numerous references in the subject document.
  14. Section 3.2.2.1, pg 3-8, TIMET states “A additional potential source of carbon tetrachloride was the conveyance 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 (TIMET 2007a).” Other than the grammatical error, there seems to be some explanation (discussion) missing at the start of this paragraph. Specifically, are there other sources for carbon tetrachloride than discussed here?
  15. Section 3.2.2.2, page 3-9, TIMET should also discuss converging lines of evidence regarding whether or not chloroform could be a degradation by-product from activities at the TIMET Facility.
  16. Section 3.2.2.3, page 3-10, this Section and others does not discuss the historic application of VOCs to TIMET roadways as dust palliative. This is an important CSM issue to consider in terms of source identification.
  17. Section 3.2.2.4, pg 3-10, TIMET states “Figure 3-18 indicates two areas with elevated TCE concentrations at TMPZ-107 and CMT-201. Data from both of these locations are plotted at their elevated detection limits (0.05 mg/L and 0.025 mg/L, respectively) due to matrix interference (likely chloroform), and do not represent actual effects.” Please note the mention of elevated detection limits. There does not appear to be any discussion of elevated detection limits and their potential impact on the results/findings.
  18. Section 3.3, page 3-22, TIMET states “Groundwater remedies must treat up to the western property boundary.” This statement needs additional clarification and thought. This statement should be framed in terms of the nature and extent of the groundwater plume. It appears that the plume travels north and northeast, not west. In addition, it should be clarified that all groundwater that is contaminated with TIMET’s contaminants is TIMET’s responsibility, however, this RAS deals with the on-Site issues and halting the flow of contaminants off-Site.

19. Figure 3-6, this Figure was not corrected with the comments provided by NDEP. The figure presents perchlorate contamination as not existing on-Site. This is an artifact of the data and the modeling completed by TIMET. As noted previously by NDEP, log scale should have been used or the outlier data points should have been removed from the model.
20. Section 4.1, pg 4-1, TIMET states “RAOs are medium-specific goals for protecting human health and the environment. RAOs generally include an exposure pathway and a chemical concentration in a given medium because protectiveness may be achieved in two ways: (1) limiting or eliminating the exposure pathway or (2) reducing chemical concentrations.” It should be noted that risk reduction can be accomplished by any of three ways: 1) removing or treating the source, 2) interrupting or eliminating the transport mechanisms, or 3) controlling activities at the exposure point.
21. Section 4.1, pg 4-1, TIMET states “... *and derivation of target concentrations for source areas assumed to be on the Plant Site is complicated by the hydrogeological conditions and myriad of assumptions necessary to extrapolate miles of dilution and mixing.*” TIMET needs to develop a groundwater flow and solute transport model. Admittedly, this gets complicated as groundwater flow from the TIMET site commingles with the other industrial sites, however, it is an issue commonly encountered during environmental investigations.
22. Section 4.1, pg 4-1, TIMET states “As a result, the focus shifts to limiting or eliminating the sources of solute plumes at the Plant Site boundary.” However, it is noted that the forgoing does not relieve TIMET from the responsibility to adequately characterize the extent of off-site impacts.
23. Section 4.1, pg 4-1, TIMET states “Prevent off-site migration of site-related chemicals in the first water-bearing zone.” This single RAO does not address anything that has already migrated off-site.
24. Section 4.2.2 pages 4-4 through 4-8, the NDEP has the following comments:
  - a. Page 4-7, item “d”, TIMET states that groundwater in the first water-bearing zone is not appropriate for domestic consumption ...in downgradient neighborhoods. Please note that this statement is incorrect in that private downgradient wells exist; however, they are not currently legally authorized under Nevada law for domestic consumption of water.
25. Section 5.1.7, pg 5-3, TIMET states “*Conservative* species such as chloride are not typically treated.” The word conservative should be replaced with chemical.
26. Section 5.2.2, pg 5-4, TIMET states “Consideration of this option may require fate and transport modeling and analysis of pathways.” Typically, MNA requires very detailed and analyte specific chemical analysis to determine whether biodegradation is occurring.
27. Section 5.2.2, pg 5-5, TIMET states “Three lines of evidence (primary, secondary, and optional) are generally recommended to demonstrate the viability of MNA as an appropriate remedy...” Replace “Three” with Multiple.
28. Section 5.2.3, pg 5-5, TIMET states “Although slurry wall construction to these depths is technically feasible, the cost-to-benefit ratio diminishes with increased depth because much lower seepage velocities occur in transitional MCF.” Much

lower seepage velocities are not zero; so what is the long-term impact predicted to be? This issue should be quantified.

29. Section 5.2.3, pg 5-5, TIMET states “The net result is that the containment technology will be applied to Qal groundwater and paired with hydraulic control for effects to groundwater in transitional MCF.” Low hydraulic conductivity typically means closer spaced wells to achieve hydraulic capture.
30. Section 5.4, pages 5-9 and 5-10, It should be noted that Alternatives 5 through 9 would also include Alternative 3 (long term monitoring) and, as noted in the ROD, Alternative 4 (MNA).
31. Section 5.4.4, pg 5-10. “Alternative 4 – Monitored Natural Attenuation” The NDEP does not understand how TIMET can carry this alternative through the analysis as they (TIMET) have presented no information to indicate that MNA is effective at the site.
32. Section 5.4.5, pages 5-10 and 5-11, the NDEP has the following comments:
  - a. Please note that the referenced “10 times screening levels” criteria has no regulatory basis and requires additional consideration and discussion. This is a global comment that applies to numerous references in the subject document.
  - b. TIMET discusses off-Site sources and states “Control of these sources is required prior to final design of the remedy since they will have a significant impact on the design, cost and time to reach remedial goals.” NDEP has discussed this matter with TIMET and has the following comments:
    - i. The selected remedy (Alternative 5a) will not require any additional treatment technologies to address the contaminants that at least partially source from off-Site. Specifically, air stripping will address all VOCs and the Water Conservation Facility (WCF) will address all inorganics.
    - ii. As discussed with TIMET, TIMET is responsible only for TIMET’s contaminants. Once TIMET demonstrates that all site-related contamination is addressed in on-site groundwater then TIMET should submit a request to terminate remediation to the NDEP. As discussed with TIMET, additional investigation and analyses will be necessary for this demonstration.
    - iii. As discussed with TIMET, Remedial Design can consider extending the slurry wall along the property boundary with Tronox LLC (TRX) to address some of these off-site contaminants. Also as discussed with TIMET, TIMET needs to consider the additional capital costs associated with this modification relative to the operation and maintenance costs associated with the air stripper and the WCF.
    - iv. NDEP is actively working with TRX to evaluate and optimize the capture efficiency of their remedial system. This effort is on-going.
    - v. NDEP is actively working with all BMI Companies to address source control issues.
  - c. Section 5.4.5 pp 5-10 and 5-11, TIMET states “The GRA for collection of groundwater is facilitated with groundwater extraction wells in Qal and transitional MCF. The wells screened in Qal would extract groundwater that piles up behind the slurry wall as well as provide containment hydraulically in the TMPZ-111 to TMPZ-112 area.” Before the NDEP can approve this TIMET needs

- to provide support these statements via modeling to be included in the Remedial Design.
- d. Section 5.4.5 pg 5-11, TIMET states “As discussed above, there are significant final design concerns associated with chemicals solely from offsite sources. These off-site sources must be controlled prior to implementation of the remedy in order to reasonably account for the cost of the remedy in the final evaluation and selection.” TIMET needs to provide further justification for the “design concerns.”
33. Section 6.3, pg 6-3, TIMET states “However, as discussed above, a final remedy recommendation and design cannot be made until control of the trespass chemicals is achieved because TIMET will be harmed by the chemicals coming onto TIMET’s property from off-site sources. This harm would be realized if TIMET is required to prepare a final design and implement a remedy to address these chemicals as a result of the RAS report and the Phase II Consent Agreement before NDEP acts to control them.” TIMET needs to provide further justification for the “design concerns.”
34. Section 7.0, pages 7-1 and 7-2, the NDEP has the following comments:
- a. TIMET states that “It is also noted that any remedy that must address these off-site source chemicals, if uncontrolled by NDEP, will significantly increase the cost, technical difficulty, uncertainty, and length of time of the remedial effort at the Plant Site.” TIMET needs to provide further information to substantiate these claims.
  - b. Page 7-1, 2<sup>nd</sup> paragraph, TIMET states “...it is known that elevated concentrations of perchlorate, chloroform, and hexavalent chromium are *solely* from off-site sources.” TIMET needs to provide further information to substantiate this statement.
  - c. Page 7-1, 2<sup>nd</sup> paragraph, TIMET states “It is also noted that any remedy that must address these off-site sources of chemicals, if uncontrolled by NDEP, will significantly increase the cost, technical difficulty, uncertainty, and length of time of the remedial effort at the Plant Site. Therefore, the termination of the trespass chemicals coming onto TIMET’s site from the westernmost properties must precede the final design and implementation of a selected remedy.” TIMET needs to provide further support for these conclusions.
  - d. Page 7-1, 3<sup>rd</sup> paragraph, TIMET states “Institutional control technologies retained for evaluation included property controls, long-term monitoring, and MNA.” TIMET needs to provide further justification to support the use of MNA as a GRA.
  - e. Section 7.0, pg 7-2, last paragraph, TIMET states “ In summary, while an effective approach has been selected from among the alternatives evaluated herein, a final design that takes into account the cost and length of time for implementation and operation cannot be prepared absent regulatory and physical control of the contaminants entering TIMET’s property from off-site sources. Without this control, TIMET faces considerable uncertainty regarding the technical approach, difficulty, cost, and length of time required to achieve the remedial action objectives as it would otherwise need to reach those RAOs for the chemicals at concentrations solely related to its operations at the site.” TIMET needs to provide further support for this conclusion.

35. Tables 3-1, 3-2, and 3-3. The last column on the far right appears to indicate or be some measure of when there were elevated detection limits. Using TCE (Table 3-1), for example, 21% of detections were greater than the screening level; 26% of the detections plus non-detects (NDs) were greater than the screening level. Thus, indicating that 5% of the NDs were greater than the screening level? Would not it be clearer to just indicate how many of the samples had elevated detection limits and how many of those exceeded the screening level?
36. Table 6-1, the NDEP has the following comments:
- Why were alternatives screened out in Table 5-1 included in Table 6-1?
  - There is no basis for the costs presented in Table 6-1. For example, what is the temporal basis for the operations and maintenance costs? NDEP assumes that this is an annual cost.
  - There is no discussion of the flow rates required for hydraulic capture for any of the alternatives. This is a major shortcoming of the document and this issue requires close study during Remedial Design.
37. Appendix A, the NDEP has the following comments:
- First page (no page number), 1<sup>st</sup> bullet, TIMET states “Six tests for water data consistency according to AWWA 1030-E Standard Methods.” Insert the word *quality* between water and data. More importantly, the six tests should be identified.
  - Page 2-2, 1<sup>st</sup> paragraph. Table A-2 referenced here does not identify the last two columns (right side) in terms of which one was AqQA or TIMET calculated.
  - Page 2-2, 3<sup>rd</sup> paragraph, TIMET states “Generally, meaningful presentation of Piper and Stiff diagrams requires an acceptable level of CAB; however, for the data set presented herein, cation–anion imbalance may be a function of anthropogenic impacts and/or local non-equilibrium.” This sentence appears to qualify the entire process of graphical evaluation of the water quality analysis. The explanation presented here for anion-cation imbalance seems unlikely as solutions of inorganic chemical species should have zero charge balance. Sources of errors are more likely to be analytical error, timing of certain analysis (*e.g.*, alkalinity), or an ionic species not identified (Fetter, 2002). If the analytical correctness tests as specified in Standard Methods are employed as recommended by the NDEP, then potential sources for the error can be identified.
38. Appendix C, the NDEP has the following comments:
- Apparently there were deviations in sampling and analysis from the Vertical Delineation (VD) Investigation Sampling and Analysis Plan (VDSAP) and Aquifer Testing Workplan (AQWP). Laboratory analytical methods, for example, specified in the Aquifer Testing Work Plan were not the same as those used by the laboratory. The text discussion in Appendix C explains the differences and states that there was no significant impact to the results.
    - In general, these sort of deviations are unacceptable. TIMET must provide a more detailed explanation.
    - TIMET should explain these deviations in terms of the Quality Assurance Project Plan (QAPP).
    - If these deviations are expected to continue TIMET needs to review the QAPP.

- iv. NDEP notes that the methods are generally comparable, however, TIMET states ““All water quality indicator tests were conducted as listed in Table 4, except for hardness which was calculated from ICP analyses of major cations (Method 6010). Since Method 6010 is more sensitive than the titrimetric analysis of hardness (Method 130.2), data quality is not adversely affected.”

In theory water hardness is equal to total **divalent** cations, not major cations, as monovalent cations do not impact hardness. NDEP has not seen a lot of studies that compared these two methods (all measured divalent cations using ICP versus titration). NDEP would expect the matrix (e.g. the high TDS) could impact the comparability.

## **Attachment B – Scope of Work and Schedule to Implement the ROD**

1. Schedule
  - a. The Schedule to implement each of the items below should be reviewed by TIMET. Any specific logistical constraints should be documented and submitted to the NDEP within 30 days of the date of this ROD.
2. Work Plan to address hydro-geological data gaps.
  - a. The information provided in the *GW RAS* and via discussion with TIMET shows that additional hydrogeological information is needed to refine the remedial design. Examples follow:
    - i. Installation of additional soil borings and/or groundwater wells to refine the understanding of the depth of the first WBZ; nature and extent of contamination; and soil physical properties. Examples follow:
      1. Between existing groundwater wells; and
      2. South and east of location TMPZ-110.
    - ii. Completion of additional hydraulic testing to refine the understanding of the necessary groundwater capture flow rates.
3. NDEP Bureau of Water Pollution Control Permits Modification.
  - a. Discussion with the NDEP's Bureau of Water Pollution Control should be initiated immediately.
  - b. The existing NPDES and Groundwater Protection permits will need to be modified.
  - c. Submittal of the permit modification applications within 60 days of the date of this ROD.
4. Clark County Air Permit Modification.
  - a. Submittal of the permit modification application within 60 days of the date of this ROD.
5. Completion of Remedial Design.
  - a. Within 150 days of the date of this ROD.
  - b. Please note that TIMET must investigate the feasibility of extending the slurry wall south from its easternmost extent as portrayed on Figure 5-1. It is understood that there are power lines along the northeast boundary which prevent TIMET from extending the slurry wall to location TMPZ-112, however, it is not clear why the wall could not be extended just east of the Pittman Bypass Pipeline and stilling pond.
  - c. As noted above, if TIMET is going to propose hydraulic capture south and east of location TMPZ-110 without the assistance of a slurry wall, the NDEP will require modeling to support this assumption of the Remedial Design.
  - d. Please note that TIMET should carefully consider the vertical profile of the extraction wells. For example, TIMET should carefully consider the implications of installing wells which intersects the Qal and xMCf versus wells which intersect the Qal and xMCf in separate but co-located wells. It is suggested that TIMET discuss this matter with the NDEP.

- e. Please note that the portions of the design that affect the Water Conservation Facility (e.g.: the addition of the air stripper and any other modifications to the Water Conservation Facility) will require review by the NDEP's Bureau of Water Pollution Control – Technical Services Branch.
- 6. Work Plan to address MNA in the first WBZ downgradient of the TIMET Facility.
  - a. Within 90 days of the date of this ROD.
- 7. Revisions to the existing groundwater monitoring program.
  - a. Within 90 days of the issuance of the revised Bureau of Water Pollution Control permits discussed above.