Revised Work Plan for Determination of Deep Quaternary Alluvium and Upper Muddy Creek Formation Background Soil Chemistry and Upgradient Alluvial Aquifer Conditions BMI Common Areas and Complex Vicinity

Submitted to:

May 30, 2007

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Responsible CEM for this Project

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and, to the best of my knowledge, comply with all applicable federal, state, and local statutes, regulations, and ordinances.

______________________________ May 30, 2007

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1. Introduction

This revised work plan presents the proposed scope of work for (1) the collection of deep background soil data, and (2) the installation (but not sampling) of upgradient groundwater monitoring wells, and (3) soil sampling for physical and chemical parameters pertaining to the Basic Management, Incorporated (BMI) Common Areas/Complex (the "Site") in Clark County, Nevada. This general scope of work has previously been addressed in discussions between the Basic Remediation Company (BRC) and Nevada Division of Environmental Protection (NDEP) representatives. Responses to NDEP's comments on previous versions of the work plan are provided in Appendix A.

Subsequent to those discussions and receipt of NDEP comments dated March 21, 2007 (Appendix A), BRC recognized a need for (1) determination of deep soil background ranges for metals and radionuclides, (2) groundwater monitoring wells that can be used to monitor the condition of groundwater upgradient of the Eastern portion of the Site, and (3) collection of additional chemical and physical parameter data, as suggested by NDEP, to evaluate soil characteristics and potential soil impacts at the drilling locations. In addition, BRC will conduct soil analyses for general chemistry anions and certain soil characteristics. The scope of work includes:

1. The collection of off-Site soil samples from background areas and the chemical analysis of these soil samples for Lindane (gamma BHC), metals, radionuclides, general chemistry anions, and soil characteristics.

2. The installation and sampling of six upgradient monitoring wells within the alluvial aquifer. Soil samples from these locations will be analyzed for selected chemicals from the Site Related Chemicals (SRC) list and for physical parameters. Groundwater samples from these monitoring wells will be subsequently used to establish upgradient water quality values for the Eastern portion of the Site.

1.1 Purposes

The purposes of this project are:

1. To collect data for metals and radionuclides in deep background soils that are comparable to deep Site soils. Physical soil parameter data will also be collected.

2. To establish groundwater monitoring locations upgradient of the Eastside portion of the Site. Physical soil parameter and selected soil chemical data from these locations will also be collected.

3. To collect data for chemical parameters to evaluate potential soil impacts at the drilling locations.

1.1.1 Collection of Deep Soil Background Data

These chemical data will be used in Site-to-background statistical comparisons. At present, insufficient background chemical data exist to evaluate whether concentrations of certain Site-related chemicals detected in deeper Site samples statistically exceed concentrations of these chemicals in background soils. While BRC and TIMET have conducted studies to establish shallow (i.e., surface to 10 feet below ground surface [bgs]) soil background levels for metals and radionuclides, BRC agrees with NDEP's expressed opinion that comparing deep Site soil concentration values to these shallow background levels may not be appropriate or accurate.

This portion of the work plan scope will provide the following information needed for soil Site-to-background comparisons:

- Soil chemical data for various depth intervals (e.g., starting at 20 feet bgs and proceeding down at 10-foot intervals within the alluvial soils and at two additional depth intervals into the shallow Muddy Creek formation). Actual depths will depend on specific locations.

- Soil chemical data for a representative range of soil map units applicable to the Site (e.g., Natural Resources Conservation Service [NRCS] mapped soil units 117, 182, and 184).

- Soil chemical data to form an adequate sample population to support future statistical comparisons of Site and background sample data sets.

- Soil chemical data to form more than one background data set, if required, based on statistical comparisons of data from different soil map units or geologic parent materials.

At the same time that chemical parameter sampling is being conducted at the deep background soil sample locations, additional samples will be collected for physical parameter analysis (Section 2.3.1).

1.1.2 Establish Site Upgradient Groundwater Monitoring Locations

Groundwater monitoring wells will be installed at locations designed to subsequently monitor the quantity and quality of groundwater flowing onto the Eastside portion of the Site from upgradient locations.

This portion of the work plan scope pertains to installation of the monitoring wells that will provide the following information:

- Soil physical data to further define the characteristics (i.e., lithology, vertical hydraulic conductivity, and other physical parameters) of the alluvial aquifer geologic materials.

- Selected soil chemical data (Section 2.3.1, Table 2).

- Future groundwater data to establish water quality within the alluvial aquifer upgradient of the Eastside portion of the Site.

This work plan proposes the drilling (with soil sampling for chemical and physical parameters), installation, and development of groundwater monitoring wells. Well sampling will be conducted after BRC completes the collection and analyses of samples during the four quarterly groundwater monitoring events currently underway on the Eastside portion of the Site. This will allow for the proper identification of the analytical suites/compounds that will need to be monitored in the upgradient wells. BRC will consult with NDEP before finalizing the analyte list and before commencing sampling.

1.2 Location and Geologic Setting

The Site is located in Clark County, Nevada, and is situated approximately 2 miles west of the River Mountains and 1 mile north of the McCullough Range (Figure 1). As seen in Figure 1, the local surface topography slopes in a westerly to northwesterly direction from the River Mountains and in a northerly to northeasterly direction from the McCullough Range. Near the Site, the surface topography slopes in a northerly direction towards the Las Vegas Wash.

1.2.1 Soils

According to the Nevada Bureau of Mines and Geology (NBMG) Las Vegas SE Folio Geologic Map (1977) and the geologic map of the Henderson Quadrangle, Nevada (Bell and Smith, 1980), the River Mountains and McCullough Range consist of volcanic rocks: dacite in the River Mountains and andesite in the McCullough Range. These rocks are the implied source area for the Quaternary alluvial sediments (Qal) deposited between the mountains and the Las Vegas Wash, the location of the Site. Soils that formed subsequently from pedogenic processes in the Qal have been identified and mapped by the NRCS in *Soils Survey of Las Vegas Valley Area, Nevada* (USDA, 1985) (hereinafter referred to as NRCS Soils Survey).

The NRCS Soils Survey also presents values for pH, cation exchange capacity, electrical conductivity of the saturated extract, and total organic matter content that characterize the general chemical characteristics of individual soil map units in the depth interval between 0 and 5 feet bgs. The ranges of these parameters for each soil map unit in proposed soil sampling areas are presented below. The values for these soil parameters are not available for depths greater than 5 feet bgs. This work plan assumes that soils at depth are derived from the same Quaternary alluvial fan deposits as the shallow (0–5 feet bgs) soils addressed by the NRCS Soils Survey and that the pedogenic factors that influence the development of soils shallower than 5 feet also similarly affect the soil development deeper than 5 feet. It is thus also assumed that the general chemical parameters as discussed above are applicable to quaternary soils deeper than 5 feet bgs. As discussed later, samples collected in this study will be analyzed for pH, cation exchange capacity, electrical conductivity of the saturated extract, and total organic matter content in order to facilitate comparisons of the general chemical characteristics between soil map units. No previously existing chemical data or information is available to assess the chemical condition of the Tertiary Muddy Creek Formation (TMCf) soils located at the background sampling locations. Soil samples collected from the TMCf will also be analyzed for pH, cation exchange capacity, electrical conductivity of the saturated extract, and total organic matter content in order to facilitate comparison of the general chemical characteristics between background sample collection areas and between soils in the background sampling area and Site soils.

The NRCS Soils Survey presents a map of the following naturally occurring soils in the areas considered for the deep background investigation in the vicinity of the Site:

Caliza (map units 184 and 187): This soil type represents the dominant soil type in the immediate vicinity of the BMI Common Areas and Complex. Map unit 184 is described as: very gravelly sandy loam; a very deep soil formed from different types of rock; forms in alluvium; generally forms on slopes of 2 to 8 percent. Map unit 187 is found in two main areas: (1) west of the map unit 184 occurrences to the west of BMI Complex and Common Areas, along the western boundary of the BMI Complex and transecting the northwestern Lower Ponds, and (2) south of the BMI Common Areas and southeast of the BMI Complex. It is similar to the description above, except that it is “extremely cobbly” sandy loam. Unit 184 is primarily located in the area downgradient of both the River Mountains and the McCullough Range, while unit 187 is located north of the McCullough Range and also in the areas east-northeast of the McCullough Range and west of the River Mountains. Data listed in the Chemical Soil Properties Table and Physical Soil Properties Table for soil map units 184 and 187 are similar. Both units have characteristic pH that ranges from 7.9 to 8.4. In the depth interval nominally 1 to 5 feet bgs (the only interval for which data are available), map unit 184 has a characteristic cation exchange capacity of 2.0 to 6.0 milliequivalents per 100 grams (meq/100 g) of soil and map unit 187 has a characteristic cation exchange capacity of 1.0 to 6.0 meq/100 g of soil. Characteristic salinity in both map units ranges from 0.0 to 2.0 mmhos/cm. Organic matter content for both units ranges from 0.0 to 0.5 percent by weight. Background sampling is proposed for map unit 184.

Caliza-Pittman-Arizo (map unit 182): This soil type is located in a thick band east of the BMI Common Areas and Complex and transects the southeastern most corner of the Upper Ponds. This soil type also occurs south and adjacent to an area of unit 184 found along the southern boundary of the BMI Complex. This soil consists of approximately 60 percent Caliza, 20 percent Pittman, and 15 percent Arizo. Caliza description: a very deep soil formed from different types of rocks; formed on erosional fan remnants. Pittman description: a moderately deep soil formed from different types of rock; forms on exposed remnants of alluvial fan deposits. Arizo description: a very deep soil formed from different types of rock; forms in channels. This complex forms on slopes of 0 to 8 percent. Unit 182 is located in areas northeast and east of the McCullough Range, as well as in areas west of the River Mountains. Map unit 182 has a characteristic pH that ranges from 7.9 to 8.4. In the depth interval nominally 1 to 5 feet bgs (the only interval for which data are available), map unit 182 has a characteristic cation exchange capacity of 1.0 to 6.0 meq/100 g of soil. Characteristic salinity in this map unit ranges from 0.0 to 2.0 mmhos/cm. Organic matter content for the map unit ranges from 0.0 to 0.5 percent by weight.

Arizo (map units 112 and 117): These soils are in localized areas south and east of the BMI Common Areas and Complex, and extend east of the Upper Ponds. They transect the Upper Ponds east of the Beta Ditch. They are very gravelly loamy sand/very gravelly fine sandy loam. These very deep soils formed on recent alluvium and in channels are formed from various types of rock; they generally form on slopes of 0 to 8 percent. Data listed in the Chemical Soil Properties Table and Physical Soil Properties Table for soil map units 112 and 117 are similar. Map unit 112 has a characteristic pH that ranges from 7.4 to 9.0, while map unit 117 has characteristic pH range of 7.4 to 8.4. In the depth interval nominally 1 to 5 feet bgs (the only interval for which data are available), map unit 112 has a characteristic cation exchange capacity of 0.8 to 4.7 meq/100 g of soil and map unit 117 has a characteristic cation exchange capacity of 1.0 to 5.0 meq/100 g of soil. Characteristic salinity in both map units ranges from 0.0 to 2.0 mmhos/cm. Organic matter content for both units ranges from 0.0 to 0.5 percent by weight. Background soil sampling is proposed in map unit 117.

Based on the published soil chemical data for the soil map units (USDA, 1985), small differences in the soil chemical and physical characteristics of the soil map units exist. In view of these small differences, the soil map units in the proposed background investigation generally appear to have similar soil characteristic chemical and physical properties.

A digitized soils map reproduced from the 2004 NRCS Soil Survey Geographic (SSURGO) database is presented in Figure 2; this map is based on the 1985 NRCS Soils Survey. The 1985 NRCS Soil Survey (and thus, the SSURGO digitized map) represents the most recent information available on the mapped, naturally occurring soils in the Site vicinity.

Based on the locations of the soil units relative to the McCullough Range and the River Mountains, the topographic slope, and the dendritic geomorphology of the soil units, it is likely that the alluvium in which these soils formed was derived from the weathered volcanic rocks of the McCullough Range and/or the River Mountains. Mineral assemblages in these source rocks would be the primary contributor to concentrations of metals and radionuclides in the native soils. The primary parent materials for soils formed beneath the BMI Common Areas and Complex are presumed to be the following:

- Soil map units 112 and 117 source material: McCullough Range and/or River Mountains (location-specific)
- Soil map unit 182 source material: McCullough Range and/or River Mountains (location-specific)
- Soil map units 184 and 187 source material: Combination of weathered rocks from both the McCullough Range and River Mountains

The McCullough Range is the primary source of materials upslope of the BMI Complex and the western hook of the Lower Ponds. Both the River Mountains and the McCullough Range are primary sources of materials upslope of the Upper Ponds. The similarity of chemical concentrations in background samples collected from soils (in both the Qal and TMCf, as described below) downslope of the McCullough Range and the River Mountains will be evaluated after collection and validation of analytical data for the deep background soil samples.

Beneath near-surface soils, there are two geologic formations encountered at the Site that are the focus of this work plan. The uppermost unit is composed of approximately 50 to 65 feet of Qal, which in turn is underlain by more than 2,000 feet of Tertiary age lacustrine sediments (TMCf). Much of the Qal underlies the depth to which soils are mapped by the NRCS Soils Survey. However, pedogenic development of soils is a direct reflection of the influence of climate, biota, geologic parent material, and topographic relief over time. As such, similarity between soil map units indicates a similarity of factors that would have influenced parent material weathering, solute leaching, and migration within the deeper Qal over the period of time since emplacement of the Qal.

The soils selected and proposed in this work plan for background sampling consist of subset of the soil map units that are reported by the NRCS (USDA, 1985). Soils that appear to have been present on the portion of the Site prior to construction of the evaporation ponds and other subsequent construction activity include map units 117, 182, 184, and a limited area of map unit 187 (Figure 2). Soils that appear to have been present on the BMI Complex portion of the Site prior to its construction include map units 184 and a limited area of map unit 187 (Figure 2). The geologic profile in the background location has a similar morphology and origin as the Site geologic profiles. Since various historical Site-related activities have impacted the Site with chemicals, comparison of the Site soils with similar soils collected from areas not subjected to the historical Site-related activities will provide a valid and defensible basis for establishing the background concentration for chemicals on the Site. Map units 117, 182, and 184 will be sampled in the background area. Based on the discussion presented for the Caliza soil, map units 184 and 187 have similar soil chemical properties and separate sampling will not be conducted in map unit 187.

Based on the similarity of soil formation on geologic materials of similar origin, the proposed background sampling locations should be comparable to the impacted soils on the Site. This work plan also proposes to conduct the sampling and analysis of soil samples using the same methodologies used to collect soil samples on the Site, in conformance with the *BRC Field Sampling and Standard Operating Procedures* (FSSOP) (MWH, 2006b). The resulting soil background data should be comparable to the data collected on the Site and be usable for future Site-to-background comparative evaluations.

1.2.2 Groundwater

The uppermost water-bearing zone is unconfined and present primarily in the alluvium (referred to as the alluvial aquifer). At some locations on portions of the Site, groundwater is first encountered in the uppermost portion of the TMCf. Groundwater generally flows in a northerly direction toward Las Vegas Wash.

No data exists to characterize the quantity and quality of groundwater flowing from upgradient locations towards the Eastern portion of the Site. Groundwater monitoring well installations are proposed in this work plan to augment the current monitoring well array on the Eastern portion of the Site and to provide data (upon subsequent sampling) to characterize the quality and quantity of groundwater at upgradient property boundary locations of the Eastern portion of the Site. The groundwater monitoring wells proposed herein are not proposed as background groundwater monitoring locations.

2. Proposed Scope of Work

This section identifies the proposed sampling locations, and presents the sampling and analysis methods to be employed.

2.1 Proposed Soil Background Sampling and Upgradient Well Locations

2.1.1 Soil Background Sampling

Because the NRCS Soil Survey (USDA, 1985) soil map provides prior information about the population to be sampled, a stratified sampling design is proposed in this work plan. The strata around which the population members are to be grouped are the soil map units. The goal of the "stratified" design (i.e. selecting samples across several map units that are present on the Site and off-Site) is to ensure representation of the different map units and the range of likely concentrations that might be observed in the subsurface within each map unit.

The stratified sampling design proposed herein is patterned after recommendations provided in U.S. EPA Guidance (U.S. EPA, 2002). When the strata are constructed to be relatively homogeneous with respect to the variable being estimated (in this case, the soil map unit), a stratified sampling design can produce estimates of overall population parameters with greater precision than estimates obtained from simple random sampling (U.S. EPA, 2002). Within each stratum, sampling locations were randomly selected. Samples are allocated to each stratum utilizing the "equal allocation" methodology (U.S. EPA, 2002).

An aerial photograph inspection of various locations close to and upgradient of the Site that could be appropriate for this deep background soil sampling and upgradient well installation program was performed. The inspection identified sampling sites within soil map units that are found both within and immediately adjacent to the Site (as discussed above: map units 117, 182, and 184) and that are located along existing roadways and appear suitable for establishing deep soil background conditions.

The potential sample locations depicted in Figure 2 will be visited to evaluate access limitations once this work plan is approved. Prior to drilling, all locations will be checked for the presence of any local land uses that may be incompatible with the goals of this data collection and for buried underground utilities through Underground Service Alert (USA). Individual proposed sampling locations may be adjusted as necessary to avoid potential hazards such as proximity to overhead electrical power lines. Subsequently, a total of 7 deep soil sampling sites (out of the 11 potential locations shown in Figure 2) within each soil unit will be finalized for the proposed investigation.

The deep soil sample locations were selected because they exhibit the following characteristics:

- They are off-Site locations on the same soil map units as soils located immediately adjacent to the Site and are in relatively close proximity to the Common Areas and the BMI Complex (Figure 2); however, they are sufficiently distant such that adverse impacts from Site or other industrial operations are not likely.

- The locations of these potential deeper background sites should not be affected by wind relationships such as might affect a shallow surface sampling program. The goal of this study is to collect deep samples starting at 20 feet bgs that are not likely to have been influenced by any windborne surface deposition mechanisms. Nonetheless, all of the locations are generally upwind or crosswind of the Site.

- They are upgradient of the Common Areas and BMI Complex and are thus unlikely to have been affected by overland transport of impacted sediments in surface water.

The Draft *Background Soil Summary Report, BMI Complex and Common Areas Vicinity* (Tetra Tech EM Inc. and MWH, 2006), submitted to the NDEP on May 15, 2006 (currently in revision) in order to establish the shallow background levels, supports the assumption that deep native soil samples collected within units 117, 182, and 184 will reflect background conditions at the Site. The proposed locations are expected to be representative of deep alluvium conditions in the immediate vicinity of the Site.

As discussed previously, soil samples will be collected at each location beginning at 20 feet bgs. Additional samples will be collected at 10-foot depth increments until the structural contact between the Qal and TMCf is encountered. Two additional samples will be collected at each location from within the TMCf at 10 feet and 20 feet below the structural contact of the Qal and the TMCf. Table 1 shows the locations that will be sampled within each NRCS soil map unit, the nomenclature that will used to identify samples from each location, and the rationale for including the sample location in the study plan.

Assuming that two sampled Qal and two sampled TMCf depth intervals will result from each boring, the minimum number of samples that will be collected from each of the Qal and the TMCf is 42 (2 samples/boring location × 7 boring locations/soil map unit × 3 soil map units). In the case of the Qal, this sample size may increase depending on the depth to the Qal/TMCf structural contact at the boring locations. The proposed sampling size is sufficient to enable estimation of the statistical properties of the population based on the assumption of a normal distribution because of the relatively large sample size (n > 30), (US EPA, 2006a). Final data adequacy demonstrations will be conducted and documented in the report that will be prepared after samples are collected and analyzed.

2.1.2 Upgradient Groundwater Monitoring Well Installations

The purpose of the upgradient well installation is to: (1) evaluate subsurface stratigraphy, (2) collect soil samples for physical parameters and subsequent chemical analyses for a list of selected chemicals from the SRC list, and (3) enable assessment of water quality upgradient of the Eastside portion of the Site in the upper, unconfined alluvial aquifer. The upgradient alluvial aquifer well locations were selected because they exhibit the following characteristics:

- They are close to the Site (Figure 2).
- As interpreted by BRC based on currently available data, they are located appropriately to characterize upgradient water quality conditions present beneath the Eastside portion of the Site (assuming the northerly direction of groundwater flow is maintained). (BRC recognizes that historical groundwater conditions may have caused hydraulic gradients to reverse and impact the vadose zone south of the proposed well locations).

The wells will be identified as alluvial aquifer Upgradient Well 1 (AA-UW1) through alluvial aquifer Upgradient Well 6 (AA-UW6), as shown on Figure 2.

2.2 Field Procedures

2.2.1 Deep Background Soil Borings and Sampling

All sampling and sample handling procedures will be consistent with the NDEP-approved *BRC Field Sampling and Standard Operating Procedures* (FSSOP) (MWH, 2006b). The standard operating procedures (SOPs) referred to in the following discussion are documented in FSSOP.

The rotary sonic drilling method will be used to allow for continuous core sampling (SOP-1), During drilling, an inner sample barrel (located at the end of the drill string) will be advanced for continuous soil core collection, and an outer larger diameter casing will be advanced as necessary to maintain the borehole in areas of unconsolidated sediments.

BRC will implement field screening using photoionization detectors (PIDs) (using two lamps) in accordance with SOP-28. If greater than 1 part per million (ppm) VOCs is detected by this screening, BRC will not proceed with drilling at a particular location. If less than 1 ppm VOCs is detected by the screening, BRC will proceed with drilling at the location.

The field geologist will prepare logs for each boring indicating the Unified Soil Classification System (USCS) soil classification (SOP-17), an estimate of field moisture content, sampling depths, progress of drilling (SOP-15), final completion depth, and the nature and resolution of any problems encountered. A representative sample from each 5-foot interval and/or change in lithology will be placed in chip trays and archived for future reference. Soil cores will be photographed to complete the documentation.

With the exception of soil samples collected for determination of physical properties, all collected soil samples from the 2-foot interval adjacent to the nominal sample depth (i.e., 19 to 21 feet bgs for the 20-foot sample, etc.) will be homogenized in a stainless steel bowl. Subsurface soil samples will be collected from the homogenized soil for laboratory analysis (SOP-7).

Three soil borings from each of the three soil map units (117, 182, and 184) targeted for background sampling will also be sampled for physical parameters. The samples will be collected from 10 feet bgs (Qal) and from 10 feet below the Qal/TMCf contact, as determined by the field geologist. Thus, nine boring locations will be sampled and two samples will be collected from each boring (18 samples total). The samples will be analyzed for the parameters listed in Section 2.3.1 and Table 2.

Because a minimum of 7 borings will be advanced within each of the three soil map units to be investigated for deep soil background sampling (as discussed in Section 2.1), soil samples will be collected from a minimum of 21 borings for analysis of chemical parameters. Soil samples will be collected at each location starting at a depth of 5 feet bgs and at subsequent 10-foot depth intervals down to the structural contact between the Qal and TMCf, as determined by the field geologist. Two additional samples will be collected at each location at 10 feet and 20 feet below the contact between the Qal and TMCf.

BRC will collect grab groundwater samples from the first-encountered water-bearing zone (above total depth) during advancement of the deep background soil borings. The samples will be collected in accordance with SOP-39 and analyzed for the parameters listed on Table 2. Based on the analysis results and after discussion with the NDEP, BRC will consider installing background wells at some of these locations.

2.2.2 Upgradient Well Construction and Soil and Water Sample Collection

A total of six upgradient wells (AA-UW1 through AA-UW6) will be installed along the southern boundary of the Eastside portion of the Site (SOP-2), with well screens that penetrate the saturated portion of the water-bearing zone present in the alluvium (SOP-20). The new wells will be screened in the first water-bearing zone encountered during well drilling. The first-encountered water-bearing zone may be in the alluvial aquifer (Aa) or in the upper TMCf or both.

Field procedures for equipment decontamination (SOP-31); soil, water, and waste disposal (SOP-34); soil borings (SOP-1 and SOP-7); logging of soil borings (SOP-17); and well installation (SOP-2) protocol are set forth in the governing standard operating procedures in FSSOP (MWH, 2006b). Project SOPs are in accordance with Nevada Department of Water Resource (NDWR) drilling regulations. General well design and construction methods are described in SOP-2. Individual well construction details will be designed and overseen by a NDEP-certified Certified Environmental Manger (CEM) such that the resulting wells are comparable in design to monitoring wells previously installed at the Site.

Soil samples for physical and chemical analysis from well borings will be collected using the same field procedures and applicable SOPs used for background soils as described in Section 2.2.1.

Well boring soil samples for physical parameters will be collected at one well location in each map unit (117, 182 and 184), at depths of 10 feet bgs (Qal) and 10-feet below the Qal/TMCf contact as determined by the field geologist. Thus, two samples will be collected from each of the three boring locations (6 samples total) according to SOP-7. The samples will be analyzed for the parameters listed in Section 2.3.1 and Table 2.

Well development will be performed using a combination of surging, bailing, and pumping (SOP-3). Field measurements of groundwater quality (pH, temperature, electrical conductivity, and turbidity) will be monitored using a portable water quality meter (SOP-5). Well development activities including well identification, date constructed, date developed, volume of water purged, well recovery rates, and other relevant information will be recorded by field personnel (SOP-15). Slug testing will also be performed on the new wells using the field procedures outlined in SOP-4.

2.2.2.1 Groundwater Sample Collection

This work plan addresses only the installation of the upgradient groundwater monitor wells. Well sampling will be conducted after BRC completes the collection and analyses of the four quarterly groundwater monitoring events currently underway on the Eastern portion of the Site. This will allow for the proper identification of the analytical suites/compounds that will need to be monitored in the upgradient wells. BRC will consult with NDEP before finalizing the analyte list and before commencing sampling.

2.3 Sample Analysis

As proposed in this work plan, the deep soil background samples will be submitted for analysis to a Nevada-certified laboratory.

2.3.1 Soil Sample Laboratory Analysis

The proposed analyte list represents a subset of the BRC SRC List as noted on Table 2. Deep subsurface background soil samples will be collected at the intervals noted above (Section 2.2.1), with the addition of 5-foot and 10-foot samples for perchlorate and volatile organic compounds (VOCs) only (Table 3). The background location samples will be analyzed for:

- Perchlorate
- VOCs
- Metals (full suite)
- Selected radionuclides
- Anions

Soil samples from the well borings will be collected at 10-foot intervals, starting at 10 feet bgs and continuing to the total boring depth (TD). These samples will be analyzed for:

- Perchlorate
- Metals (full suite)
- Organochlorine pesticides (OCPs)
- Selected radionuclides
- VOCs
- Semivolatile organic compounds (SVOCs)

As discussed in Section 2.2, selected deep background and well boring soil samples will also be analyzed for the following physical and general chemistry parameters:

- Dry bulk density
- Particle density (specific gravity)
- Calculated total porosity
- Moisture content (initial volumetric and gravimetric water content)
- Percent organic matter (total or fractional organic carbon)
- Particle size analysis (wet sieve with hydrometer analysis)
- Soil pH
- Saturated vertical hydraulic conductivity (Kv)
- Total Kjeldahl nitrogen
- Cation exchange capacity
- Electrical conductivity (of the saturated extract)

The individual analytes and analytical methods are specified in Table 2. Laboratory practical quantitation limits (PQLs) are specified in the NDEP-approved *BRC Quality Assurance Project Plan* (QAPP) (MWH, 2006a). The list of analytes and laboratory methods are consistent with the analytical program previously established for the Common Areas project with input from NDEP. For this project, the laboratory will be instructed to report analytical results to the sample-specific method detection limit (MDL), which is equivalent to the sample quantitation limit (SQL). Concentrations detected above the SQL but below the PQL will be flagged with a qualifier to indicate an "estimated" concentration. Concentrations less than the SQL will be qualified as nondetections.

Laboratory methodologies are specified in Table 2. The analytical laboratory methods used in the BRC/TIMET shallow background soil sample analyses will be used, where possible, for the deep background soil sample analyses so that data comparability objectives can be met. These data will be used to define soil characteristics and assess soil heterogeneity.

2.3.2 Groundwater Laboratory Analysis

This work plan addresses only the installation of the upgradient groundwater monitor wells. Groundwater sampling from these wells will be conducted after BRC completes the sampling and analysis of the four quarters of groundwater monitoring currently underway. Once this is completed, BRC will propose the analytical suites/compounds that should be included in the upgradient well sampling. Upon concurrence by NDEP, these samples will then be collected.

2.4 QA/QC Samples

The quality assurance/quality control (QA/QC) procedures that will be followed during the deep soils background investigation are detailed in Section B of the BRC Quality Assurance Project Plan (QAPP) (MWH, 2006a).

3. Data Evaluation

Data evaluation includes an assessment of the quality of the data, as described in the QA/QC review process in the BRC QAPP (MWH, 2006a), as well as a geochemical and statistical evaluation of the data. These two types of data evaluation are described in the following sections.

3.1 Soils

3.1.1 Data Review

The data obtained during the background sampling activities described in this work plan will undergo a QA/QC review in accordance with the procedures described in the BRC QAPP (MWH, 2006a). This section discusses procedures for verifying that the data are sufficient to meet the goals of this project. Only those data determined by the QA/QC review to be suitable for use will be considered for the background data set.

3.1.2 Statistical Evaluation

Data will be evaluated according to the U.S. EPA's data quality assessment (DQA) process to verify that the type, quality, and quantity of data collected are appropriate for their intended use. DQA methods and procedures are outlined in U.S. EPA Guidance (U.S. EPA, 2006b). U.S. EPA's statistical DQA process includes five steps: (1) review the project objectives and sampling design, (2) conduct a preliminary data review, (3) select a statistical test, (4) verify the assumptions of the statistical test, and (5) draw conclusions from the data.

The project objectives, as stated in Section 1.1, and the sampling design, as stated in Section 2.1, will be reviewed.

The data deemed suitable for use based on the QA/QC review discussed in Section 3.1 will then be subjected to statistical analysis. The same suite of statistical tests used in the BRC/TIMET Draft *Background Soil Summary Report* (Tetra Tech and MWH, 2007, currently in review), supplemented by subsequent NDEP comments and discussions with BRC, will be conducted for the data collected in this program. Statistical comparisons will be completed between Qal and TMCf data sets, as well as between soil map units, as appropriate.

Preliminary evaluation of the data will include an assessment of data characteristics through quantitative and graphical analyses. Statistical plots will be created to show characteristics of and relationships among the data, to visually evaluate fit to a normal or lognormal distribution, to identify anomalous data points or outliers, and to provide a general overview of the data. Both probability and box and whisker plots, as well as individual value plots, will be constructed as part of the data evaluation. The data will be presented and summarized by the type of geologic material (Qal vs. TMCf) from which the sample was collected and by depth interval, with data plotted for the various groupings. In addition, the comparability of data collected from the individual soil map units will be evaluated. Since the data resulting from this work plan characterizes different sampled material (deep Qal and TMCf soils), the data will also be qualitatively compared to the BRC/TIMET background data (Tetra Tech EM Inc. and MWH, 2007). A quantitative comparison will also be completed to evaluate that the deeper data are statistically different than the shallow BRC/TIMET data.

Comprehensive descriptive summary statistics will be calculated for metals, general chemistry parameters and anions, and radionuclides for data within each geologic material (deep Qal vs. TMCf soils) and for each of the geologic materials by separate soil map unit.

Descriptive statistics that will be reported include the number of detections; number of samples; detection rate as a percentage; arithmetic mean; standard deviation; median; 5th, 25th, 75th, and 95th percentiles (quantiles); minimum detected concentration; maximum detected concentration; minimum sample quantitation limit (SQL); maximum SQL; Shapiro-Wilk p-value; 95 percent upper confidence limit (UCL) and bootstrap 95 percent UCL. Detection frequency will not be used to determine if quantitative analyses will be conducted with the data set; identical analyses will be conducted on each chemical analyte.

Based on the significant difference in the silt and clay content between the Qal and TMCf (and the resulting differences in cation exchange capacity) observed in previous drilling and sampling operations conducted at the Site, it is anticipated that background samples collected in the Qal will constitute a population distinct from the samples collected in the TMCf. Statistical hypothesis testing will be conducted to quantify the statistical significance of observed differences in relevant population parameters (e.g. mean, median) from background samples collected in the Qal versus samples collected in the TMCf. If the data sets for different depths or the different studies are found to be statistically different, then the two data sets will be treated as distinct and different background data sets. If the concentrations of chemicals are found to be statistically indistinguishable, the background data will be compiled as one data set. Specifically, if any two data sets are statistically indistinguishable, the data sets may be combined. This applies to Qal and TMCf data sets and data from each soil map unit (all data sets will be compared to each other at once).

Tests that will be used to compare the various data sets for this investigation include the Wilcoxon Rank Sum (WRS) test (also known as the Mann-Whitney U test), which is a nonparametric test; the t-test, which assumes data are normally distributed and have equal variance; and the Slippage and Quantile tests. These latter two tests evaluate the data for shifts in the upper tails of the two populations being compared. The WRS and t-tests evaluate whether the measures of central tendency (median and mean) are statistically indistinguishable in two populations, or whether the difference in mean/median values of the two populations is statistically significantly different. In addition, both the parametric ANOVA and the non-parametric Kruskal-Wallace (KW) statistical tests may also be performed on the data sets. Statistical calculations will be performed using Neptune and Company's GiSdT web site for statistical analysis (Neptune and Company, 2007).

The data sets (pooled or multiple) will be assessed for possible outliers. Identified outliers will be evaluated and will be excluded from the background data set if they are found to be the result of error. As described in U.S. EPA Guidance (U.S. EPA, 2006a), outliers may result from transcription errors, data-coding errors, measurement errors or may represent true extreme values of a distribution and indicate more variability in the population than was expected. No data point will be excluded based solely on the results of a statistical test, and expert judgment will be used when assessing outliers.

3.2 Upgradient Groundwater Monitoring Well Installation

Since the scope of work under this work plan does not include sampling of installed groundwater wells, no evaluation of groundwater sampling data are presented at this time.

4. Reporting and Applicability of Results

4.1 Deep Soil Background

The results of the soil sampling and analysis will be summarized in a complete report that will be prepared and submitted to the NDEP. The report will include a tabulated summary of analytical and physical parameter data, appended laboratory reports, a data validation summary report, and the results of all of the descriptive data analyses and statistical analyses.

Applicability and use of the background data will be addressed on a case-by-case basis in future work plans. Ideally, the background data will be used in Site-to-background statistical comparisons to identify Site-related metals and radionuclides as chemicals of potential concern for further investigation.

The analytical data for deep background samples will also be used to refine the conceptual site model (CSM) for the Site, as needed.

4.2 Upgradient Groundwater Monitoring Well Installation

Boring log and well completion data will be presented in graphical and tabular format in the final report. Boring log data observed during the boring advancement to be presented will include the drilling method, USCS of logged soils, soil color, qualitative evaluation of soil moisture content (USCS), qualitative evaluation of particle size distribution, observation of mineralogical and/or other observed anomalies in the sampled soil material, depth to the contact between the Qal and TMCf, coarse- and fined-grained facies within the TMCf (if encountered), total depth of boring, depth and location at which soil physical samples are collected, chain of custody for soil physical laboratory samples, and physical laboratory results. The following well completion and development data observed during the monitoring well installation will be presented: well identification and location (northing and easting), well completion details, well development completion date, well screen interval, static water level after development completion, well screen swabbing data, sediment bailing data, purging date, purge method, purge volume, average purge rate, well recharge rate, and notes of observations made during well installation and development. Field activity logs of the boring advancement and well installation activities will be presented in an appendix. Analytical data from well borings will also be validated and summarized in the report.

5. Schedule

Field activities will be initiated upon receipt of NDEP approval to proceed and after obtaining appropriate access authorizations. It is anticipated that field activities can be completed within a 4-week period. Assuming a 6-week period for laboratory analysis and a 10-week period for data validation, data review, statistical evaluation, and report preparation, it is anticipated that the report of findings will be submitted to NDEP within 6 months of fieldwork initiation.

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Figures

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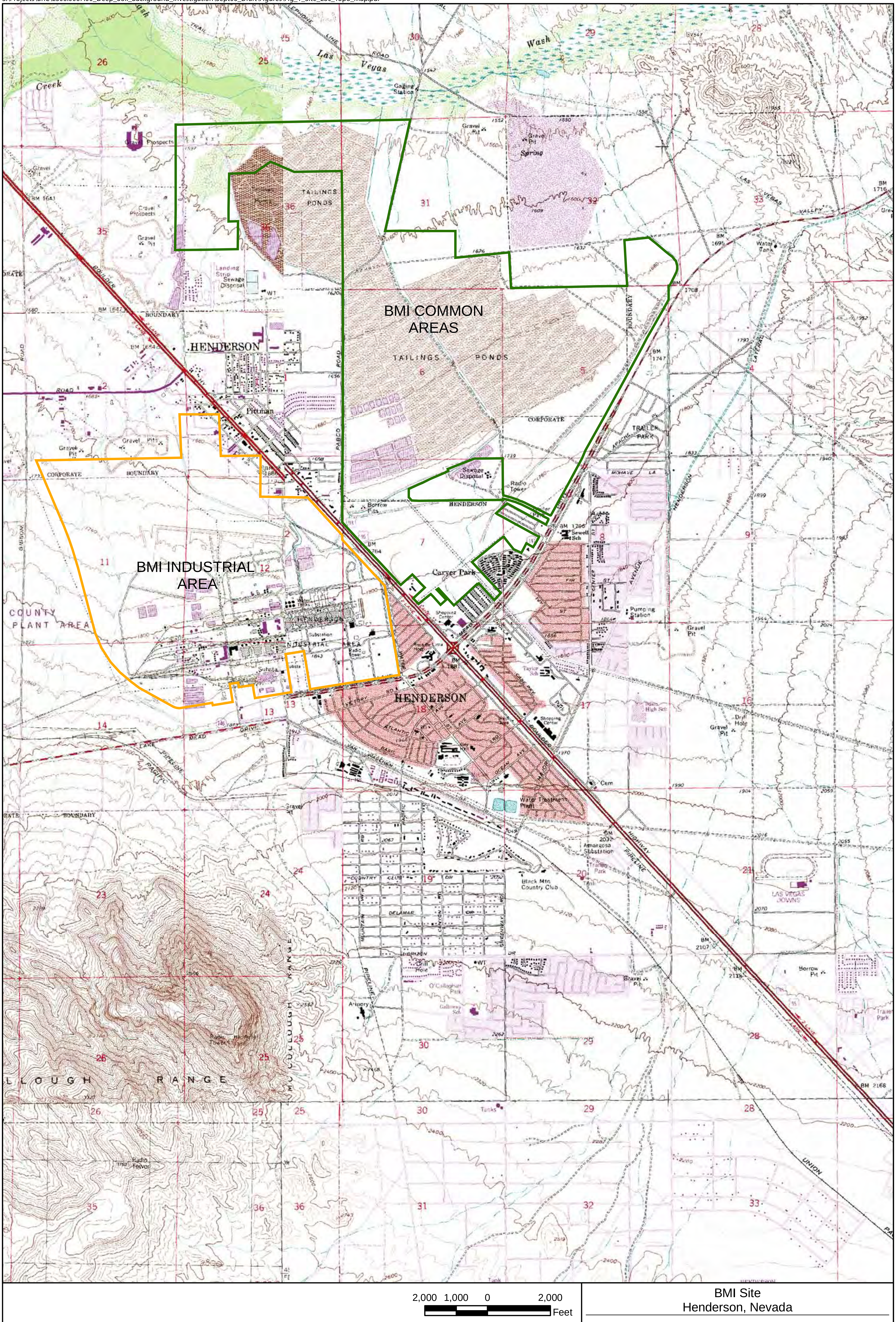

Nevada-Clark Co. 7.5 Minute Series (Topographic)
Henderson, Nevada SE, Boulder City NW, and Sloan NE Quadrangles

BMI Site
Henderson, Nevada

FIGURE 1

SITE LOCATION AND TOPOGRAPHIC MAP

Basic Remediation Company

Prepared by:	Date	JOB No. 1881262
MKJ MWH	09/28/06	FILE: GIS/BRC/BKGD_FIGURE1.MXD

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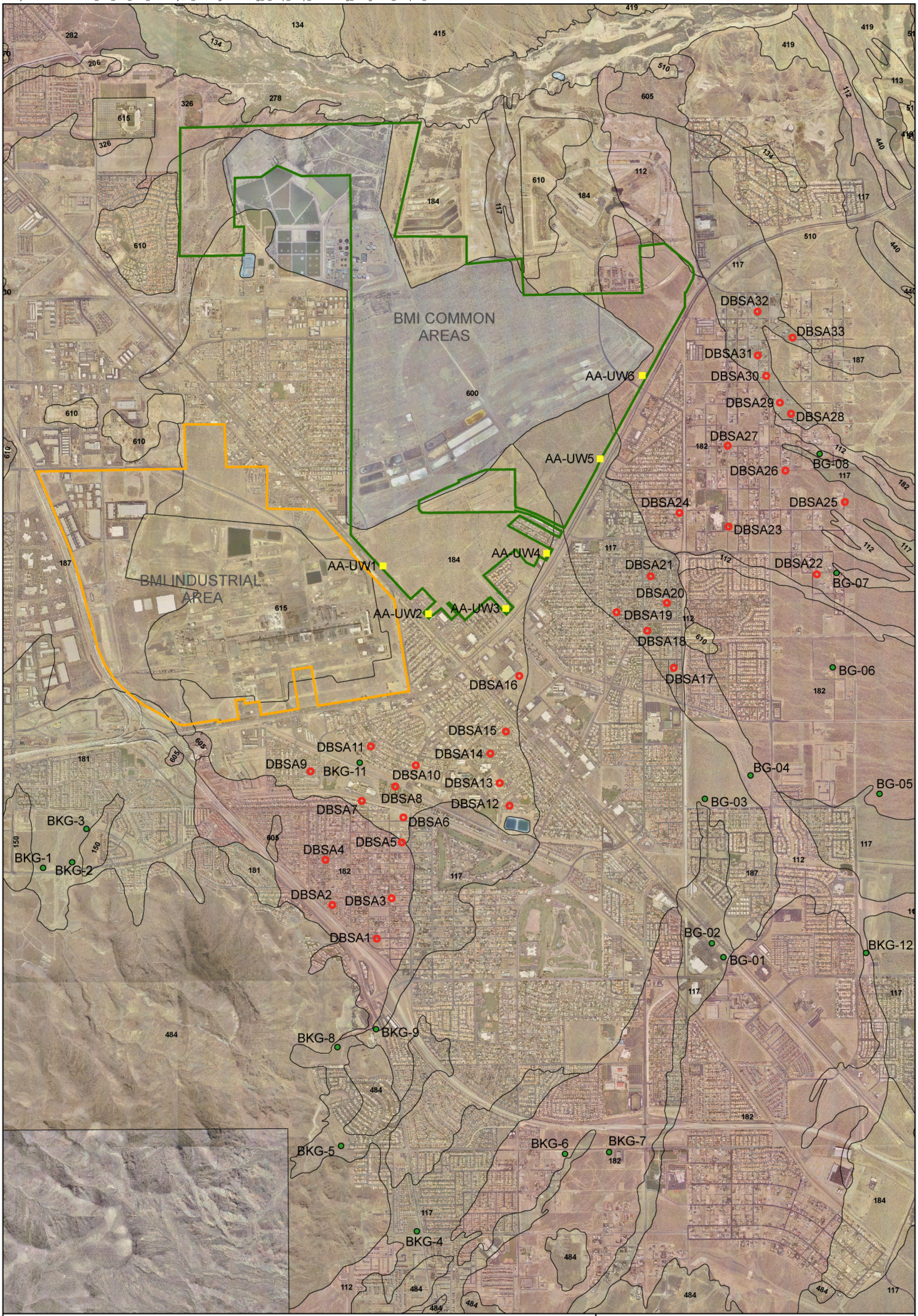

Soil Unit

112	187
117	484
150	510
181	605
182	610
184	615

2,000 1,000 0 2,000 Feet

DBSA1 = Proposed deep background sample, alluvium and Muddy Creek Formation.

AA-UW1 = Proposed upgradient well

BKG-2 =Shallow BRC/TIMET/ENVIRON background sample

Base Map: Fall 2005 Aerial Photo, Clark County GIS Management Offices

Soil Map: NRCS, Las Vegas Valley Area Soil Survey, 1985; SSURGO

N

BMI Site
Henderson, Nevada

FIGURE 2
PROPOSED LOCATIONS FOR DEEP BACKGROUND SAMPLES AND UPGRADIENT WELLS

Basic Remediation COMPANY

Prepared by: JJD (DBS&A)

Date 5/9/07

JOB No. 1881425
FILE: GIS/BRC/BKGD_FIGURE3.MXD

Tables

Table 1. Potential Sample Locations

Deep Background Sample Alluvium, Identification [a]	Soil Unit per USDA Survey	Rationale for Inclusion in Data Pool
DBSA1-Q-XX DBSA1-T-XX	182	NRCS Soil Map Unit found in the immediate vicinity of the Site. Sample locations are downslope of the McCullough Range and River Mountains
DBSA2-Q-XX DBSA2-T-XX		
DBSA3-Q-XX DBSA3-T-XX		
DBSA4-Q-XX DBSA4-T-XX		
DBSA5-Q-XX DBSA5T-XX		
DBSA22-Q-XX DBSA22-T-XX		
DBSA23-Q-XX DBSA23-T-XX		
DBSA24-Q-XX DBSA24-T-XX		
DBSA25-Q-XX DBSA25-T-XX		
DBSA26-Q-XX DBSA26-T-XX		
DBSA27-Q-XX DBSA27-T-XX		
DBSA6-Q-XX DBSA6-T-XX	184	NRCS Soil Map Unit found in the immediate vicinity of the Site. Sample locations are downslope of the McCullough Range.
DBSA7-Q-XX DBSA7-T-XX		
DBSA8-Q-XX DBSA8-T-XX		
DBSA9-Q-XX DBSA9-T-XX		
DBSA10-Q-XX DBSA10-T-XX		
DBSA11-Q-XX DBSA11-T-XX		

[a] Sample collection will be from a minimum of seven locations per soil unit. In the event that access is not granted for a minimum of seven locations, alternate sampling locations will be identified. The number of samples to be collected from the Quaternary alluvium (designated by the connotative symbol "Q" in the sample identification number) will be determined by the field geologist based on the depth to the structural contact between the Qal and TMCf. Two TMCf samples will be collected at each location from 10 feet and 20 feet below the structural contact between the Qal and TMCf. The symbol "XX" connotes the depth below ground surface at each location.

Table 1. Potential Sample Locations
Page 2 of 2

Deep Background Sample Alluvium, Identification [a]	Soil Unit per USDA Survey	Rationale for Inclusion in Data Pool
DBSA12-Q-XX DBSA12-T-XX	184	NRCS Soil Map Unit found in the immediate vicinity of the Site. Sample locations are downslope of the McCullough Range.
DBSA13-Q-XX DBSA13-T-XX		
DBSA14-Q-XX DBSA14-T-XX		
DBSA15-Q-XX DBSA15-T-XX		
DBSA16-Q-XX DBSA16-T-XX		
DBSA17-Q-XX DBSA17-T-XX	117	Unit found in the immediate vicinity of the Site. Sample locations are downslope of the River Mountains.
DBSA18-Q-XX DBSA18-T-XX		
DBSA19-Q-XX DBSA19-T-XX		
DBSA20-Q-XX DBSA20-T-XX		
DBSA21-Q-XX DBSA21-T-XX		
DBSA28-Q-XX DBSA28-T-XX		
DBSA29-Q-XX DBSA29-T-XX		
DBSA30-Q-XX DBSA30-T-XX		
DBSA31-Q-XX DBSA31-T-XX		
DBSA32-Q-XX DBSA32-T-XX		
DBSA33-Q-XX DBSA33-T-XX		

[a] Sample collection will be from a minimum of seven locations per soil unit. In the event that access is not granted for a minimum of seven locations, alternate sampling locations will be identified. The number of samples to be collected from the Quaternary alluvium (designated by the connotative symbol "Q" in the sample identification number) will be determined by the field geologist based on the depth to the structural contact between the Qal and TMCf. Two TMCf samples will be collected at each location from 10 feet and 20 feet below the structural contact between the Qal and TMCf. The symbol "XX" connotes the depth below ground surface at each location.

Table 2. Laboratory Analyte List

Parameter of Interest	SRC List Parameter?[a]	Soil analyte selected for[a]: Background Analysis?	Evaluation of Potential Soil Impacts at: Soil Boring Locations?	Evaluation of Potential Soil Impacts at: Well Locations?	Soil Characterization?	Rationale for Soil Analyte Selection	Groundwater Grab Sample Analyte?	Analytical Method	Compound List	CAS Number
Physical Parameters					X	General soil parameter		ASTM D2937	Dry bulk density	NA
					X	General soil parameter		ASTM D584/C127	Specific Gravity (Particle Density)-Fine (< 4.75 mm diameter material), Coarse (> 4.75 mm diameter material)	
					X	General soil parameter		ASTM D2435	Calculated total porosity	
					X	General soil parameter		ASTM D2216/ D4643/D2974	Moisture content (Initial volumetric and gravimetric water content)	
					X	General soil parameter		Walkley Black	Percent organic matter (Total or Fractional Organic Carbon)	
					X	General soil parameter		ASTM D422	Particle size analysis (Wet), Standard Sieves with Wash, Hydrometer (applicable when >5% fines)	
					X	General soil parameter		ASTM D4972	Soil pH	
					X	General soil parameter		ASTM D2434	Saturated vertical hydraulic conductivity (Kv) (rigid wall)	
Ions	X	X			X	Soil type parameter	X	EPA 300.0	Bromide	24959-67-9
	X	X			X	Soil type parameter	X		Bromine	7726-95-6
	X	X			X	Soil type parameter	X		Chlorate	14866-68-3
	X	X			X	Soil type parameter	X		Chloride	16887-00-6
	X	X			X	Soil type parameter	X		Chlorine (soluble)	7782-50-5
	X				X	Soil type parameter	X	EPA 300.1 (groundwater)	Chlorite	14998-27-7
	X	X			X	Soil type parameter	X		Fluoride	16984-48-8
	X	X			X	Soil type parameter	X		Nitrate (as N)	14797-55-8
	X	X			X	Soil type parameter	X		Nitrite (as N)	14797-65-0
	X	X			X	Soil type parameter	X		Orthophosphate	14265-44-2
	X	X			X	Soil type parameter	X		Sulfate	14808-79-8
	X	X			X	Soil type parameter		EPA 377.1	Sulfite	14265-45-3
	X			X	X	Site-related use	X	EPA 314.0	Perchlorate	14797-73-0
Dissolved Gases	X						X	RSK 175	Ethane	74-84-0
	X						X		Ethylene	74-85-1
	X						X		Methane	74-82-8
Chlorinated Compounds	X							VOCs by GC-ECD	Chloral	75-87-6
	X								Dichloroacetaldehyde	79-02-7
Polychlorinated Dibenzodioxins/ Dibenzofurans	X							EPA 8290	1,2,3,4,6,7,8,9-Octachlorodibenzofuran	39001-02-0
	X								1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	3268-87-9
	X								1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4
	X								1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9
	X								1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7
	X								1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9
	X								1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6
	X								1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9
	X								1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7
	X								1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9
	X								1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3
	X								1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6
	X								1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4
Polychlorinated Dibenzodioxins/ Dibenzofurans (continued)	X								2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5
	X								2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4
	X								2,3,7,8-Tetrachlorodibenzofuran	51207-31-9
	X								2,3,7,8-Tetrachlororodibenzo-p-dioxin	1746-01-6
Asbestos	X							ISO 10312 TEM	Asbestos	1332-21-4

Parameter of Interest	SRC List Parameter? [a]	Soil analyte selected for [a]: Background Analysis?	Soil analyte selected for [a]: Evaluation of Potential Soil Impacts at Soil Boring Locations?	Soil analyte selected for [a]: Evaluation of Potential Soil Impacts at Well Locations?	Soil analyte selected for [a]: Soil Characterization?	Rationale for Soil Analyte Selection	Groundwater Grab Sample Analyte?	Analytical Method	Compound List	CAS Number
General Chemistry Parameters	X						X	EPA 350.2	Ammonia (as N)	7664-41-7
	X							EPA 9010/9014	Cyanide (Total)	57-12-5
	X						X	EPA 345.1-soil EPA 300.0-groundwater (iodate)	Iodine	7553-56-2
	X					See above		EPA 9045C	pH in soil	pH
	X						X	EPA 9040B	pH in water	pH
	X							EPA 376.1/376.2	Sulfide	18496-25-8
	X	X			X	General soil parameter	X	Mod. EPA 415.1	Total inorganic carbon	7440-44-0
	X	X			X	General soil parameter	X	EPA 351.2	Total Kjeldahl nitrogen (TKN)	TKN
	X	X			X	General soil parameter	X	EPA 415.1	Total organic carbon (TOC)	7440-44-0
Metals	X	X		X		Naturally-occurring/potential Site-related use	X	EPA 6020/6010B	Aluminum	7429-90-5
	X	X		X		Naturally-occurring/potential Site-related use	X		Antimony	7440-36-0
	X	X		X		Naturally-occurring/potential Site-related use	X		Arsenic	7440-38-2
	X	X		X		Naturally-occurring/potential Site-related use	X		Barium	7440-39-3
	X	X		X		Naturally-occurring/potential Site-related use	X		Beryllium	7440-41-7
	X	X		X		Naturally-occurring/potential Site-related use	X		Boron	7440-42-8
	X	X		X		Naturally-occurring/potential Site-related use	X		Cadmium	7440-43-9
	X	X		X		Naturally-occurring/potential Site-related use	X		Calcium	7440-70-2
	X	X		X		Naturally-occurring/potential Site-related use	X		Chromium	7440-47-3
	X	X		X		Naturally-occurring/potential Site-related use	X		Cobalt	7440-48-4
	X	X		X		Naturally-occurring/potential Site-related use	X		Copper	7440-50-8
	X	X		X		Naturally-occurring/potential Site-related use	X		Iron	7439-89-6
	X	X		X		Naturally-occurring/potential Site-related use	X		Lead	7439-92-1
	X	X		X		Naturally-occurring/potential Site-related use	X		Lithium	1313-13-9
	X	X		X		Naturally-occurring/potential Site-related use	X		Magnesium	7439-95-4
	X	X		X		Naturally-occurring/potential Site-related use	X		Manganese	7439-96-5
	X	X		X		Naturally-occurring/potential Site-related use	X		Molybdenum	7439-98-7
	X	X		X		Naturally-occurring/potential Site-related use	X		Nickel	7440-02-0
	X	X		X		Naturally-occurring/potential Site-related use	X		Niobium	7440-03-1
	X	X		X		Naturally-occurring/potential Site-related use	X		Palladium	7440-05-3
	X	X		X		Naturally-occurring/potential Site-related use	X		Phosphorus	7723-14-0
	X	X		X		Naturally-occurring/potential Site-related use	X		Platinum	7440-06-4
	X	X		X		Naturally-occurring/potential Site-related use	X		Potassium	7440-09-7
	X	X		X		Naturally-occurring/potential Site-related use	X		Selenium	7782-49-2
	X	X		X		Naturally-occurring/potential Site-related use	X		Silicon	7440-21-3
	X	X		X		Naturally-occurring/potential Site-related use	X		Silver	7440-22-4
	X	X		X		Naturally-occurring/potential Site-related use	X		Sodium	7440-23-5
	X	X		X		Naturally-occurring/potential Site-related use	X	EPA 6020/6010B	Strontium	7440-24-6
	X	X		X		Naturally-occurring/potential Site-related use	X		Sulfur	7704-34-9
	X	X		X		Naturally-occurring/potential Site-related use	X		Thallium	7440-28-0
	X	X		X		Naturally-occurring/potential Site-related use	X		Tin	7440-31-5
	X	X		X		Naturally-occurring/potential Site-related use	X		Titanium	7440-32-6
	X	X		X		Naturally-occurring/potential Site-related use	X		Tungsten	7440-33-7
	X	X		X		Naturally-occurring/potential Site-related use	X		Uranium	7440-61-1
	X	X		X		Naturally-occurring/potential Site-related use	X		Vanadium	7440-62-2
	X	X		X		Naturally-occurring/potential Site-related use	X		Zinc	7440-66-6
	X	X		X		Naturally-occurring/potential Site-related use	X	EPA 6020/6010B	Zirconium	7440-67-7
	X	X		X		Naturally-occurring/potential Site-related use	X	EPA 7196A	Chromium (VI)	18540-29-9
	X	X		X		Naturally-occurring/potential Site-related use	X	EPA 7470/7471A	Mercury	7439-97-6

Parameter of Interest	SRC List Parameter? [a]	Soil analyte selected for [a]: Background Analysis?	Evaluation of Potential Soil Impacts at: Soil Boring Locations?	Well Locations?	Soil Charac-terization?	Rationale for Soil Analyte Selection	Groundwater Grab Sample Analyte?	Analytical Method	Compound List	CAS Number
Organophosphorous Pesticides	X						X	EPA 8141A	Azinphos-ethyl	264-27-19
	X						X		Azinphos-methyl	86-50-0
	X						X		Carbophenothion	786-19-6
	X						X		Chlorpyrifos	2921-88-2
	X						X		Coumaphos	56-72-4
	X						X		Demeton-O	298-03-3
	X						X		Demeton-S	126-75-0
	X						X		Diazinon	333-41-5
	X						X		Dichlorvos	62-73-7
	X						X		Dimethoate	60-51-5
	X						X		Disulfoton	298-04-4
	X						X		EPN	2104-64-5
	X						X		Ethoprop	13194-48-4
	X						X		Ethyl parathion	56-38-2
	X						X		Fampphur	52-85-7
	X						X		Fenthion	55-38-9
	X						X		Malathion	121-75-5
	X						X		Methyl carbophenothion	953-17-3
	X						X		Methyl parathion	298-00-0
	X						X		Mevinphos	7786-34-7
	X						X		Naled	300-76-5
	X						X		O,O,O-Triethyl phosphorothioate (TEPP)	297-97-2
	X						X		Phorate	298-02-2
	X						X	EPA 8141A	Phosmet	732-11-6
	X						X		Ronnel	299-84-3
	X						X		Stirophos (Tetrachlorovinphos)	22248-79-9
	X						X		Sulfotep	3689-24-5
Chlorinated Herbicides	X							EPA 8151A	2,4,5-T	93-76-5
	X								2,4,5-TP (Silvex)	93-72-1
	X								2,4-D	94-75-7
	X								2,4-DB	94-82-6
	X								Dalapon	75-99-0
	X								Dicamba	1918-00-9
	X								Dichloroprop	120-36-5
	X								Dinoseb	88-85-7
	X								MCPA	94-74-6
	X								MCPP	93-65-2
Organic Acids	X						X	HPLC	4-Chlorobenzene sulfonic acid	98-66-8
	X						X		Benzenesulfonic acid	98-11-3
	X						X		O,O-Diethylphosphorodithioic acid	298-06-6
	X						X		O,O-Dimethylphosphorodithioic acid	756-80-9
Nonhalogenated Organics	X						X	EPA 8015B	Ethylene glycol	107-21-1
	X						X		Ethylene glycol monobutyl ether	111-76-2
	X						X		Methanol	67-56-1
	X						X		Propylene glycol	57-55-6
Organochlorine Pesticides	X			X		Potential Site-related use	X	EPA 8081A	2,4-DDD	53-19-0
	X			X		Potential Site-related use	X		2,4-DDE	3424-82-6
	X			X		Potential Site-related use	X		4,4-DDD	72-54-8
	X			X		Potential Site-related use	X		4,4-DDE	72-55-9
	X			X		Potential Site-related use	X		4,4-DDT	50-29-3
	X			X		Potential Site-related use	X		Aldrin	309-00-2
	X			X		Potential Site-related use	X		alpha-BHC	319-84-6

Table 2. Laboratory Analyte List

Parameter of Interest	SRC List Parameter? [a]	Soil analyte selected for [a]: Background Analysis?	Evaluation of Potential Soil Impacts at: Soil Boring Locations?	Evaluation of Potential Soil Impacts at: Well Locations?	Soil Characterization?	Rationale for Soil Analyte Selection	Groundwater Grab Sample Analyte?	Analytical Method	Compound List	CAS Number
Organochlorine	X			X		Potential Site-related use	X	EPA 8081A	alpha-Chlordane	5103-71-9
Pesticides	X			X		Potential Site-related use	X		beta-BHC	319-85-7
(continued)	X			X		Potential Site-related use	X		Chlordane	57-74-9
	X			X		Potential Site-related use	X		delta-BHC	319-86-8
	X			X		Potential Site-related use	X		Dieldrin	60-57-1
	X			X		Potential Site-related use	X		Endosulfan I	959-98-8
	X			X		Potential Site-related use	X		Endosulfan II	33213-65-9
	X			X		Potential Site-related use	X	EPA 8081A	Endosulfan sulfate	1031-07-8
	X			X		Potential Site-related use	X		Endrin	72-20-8
	X			X		Potential Site-related use	X		Endrin aldehyde	7421-93-4
	X			X		Potential Site-related use	X		Endrin ketone	53494-70-5
	X	X	X	X		Potential Site-related use	X		gamma-BHC (Lindane)	58-89-9
	X			X		Potential Site-related use	X		gamma-Chlordane	5103-74-2
	X			X		Potential Site-related use	X		Heptachlor	76-44-8
	X			X		Potential Site-related use	X		Heptachlor epoxide	1024-57-3
	X			X		Potential Site-related use	X		Methoxychlor	72-43-5
	X			X		Potential Site-related use	X		Toxaphene	8001-35-2
Polychlorinated	X							EPA 8082	Aroclor 1016	12674-11-2
Biphenyls	X								Aroclor 1221	11104-28-2
	X								Aroclor 1232	11141-16-5
	X								Aroclor 1242	53469-21-9
	X								Aroclor 1248	12672-29-6
	X								Aroclor 1254	11097-69-1
	X								Aroclor 1260	11096-82-5
	X								PCB-77	32598-13-3
	X								PCB-81	70362-50-4
	X							EPA 8082	PCB-105	32598-14-4
	X								PCB-114	74472-37-0
	X								PCB-118	31508-00-6
	X								PCB-123	65510-44-3
	X								PCB-126	57465-28-8
	X								PCB-156	38380-08-4
	X								PCB-157	69782-90-7
	X								PCB-167	52663-72-6
	X								PCB-169	32774-16-6
	X								PCB-189	39635-31-9
	X								Acenaphthene	83-32-9
	X								Acenaphthylene	208-96-8
	X								Anthracene	120-12-7
	X								Benzo(a)anthracene	56-55-3
	X								Benzo(a)pyrene	50-32-8
	X								Benzo(b)fluoranthene	205-99-2
	X								Benzo(g,h,i)perylene	191-24-2
Polynuclear	X					Potential Site-related use		EPA 8310 [b]	Benzo(k)fluoranthene	207-08-9
Aromatic	X					Potential Site-related use			Chrysene	218-01-9
Hydrocarbons	X					Potential Site-related use			Dibenzo(a,h)anthracene	53-70-3
	X					Potential Site-related use			Indeno(1,2,3-cd)pyrene	193-39-5
	X					Potential Site-related use			Phenanthrene	85-01-8
	X					Potential Site-related use			Pyrene	129-00-0

Parameter of Interest	SRC List Parameter? [a]	Soil analyte selected for [a]: Background Analysis?	Evaluation of Potential Soil Impacts at: Soil Boring Locations?	Evaluation of Potential Soil Impacts at: Well Locations?	Soil Characterization?	Rationale for Soil Analyte Selection	Groundwater Grab Sample Analyte?	Analytical Method	Compound List	CAS Number
Radionuclides	X						X	EPA 900.0	Gross alpha (groundwater only)	G_Alpha
	X						X	or EPA 9310	Gross beta (groundwater only)	G_Beta
	X	X		X			X	EPA 901.1/HASL GA-01-R for 10% or Assume Secular Equilibrium for solid samples (1)	Actinium-228	14331-83-0
	X	X		X			X		Bismuth-212	14913-49-6
	X	X		X			X		Bismuth-214	14733-03-0
	X							Excluded from analyses	Cobalt-57	13981-50-5
	X								Cobalt-60	10198-40-0
	X	X		X			X	EPA 901.1/HASL GA-01-R for 10% or Assume Secular Equilibrium for solid samples (1)	Lead-210	14255-04-0
	X	X		X			X		Lead-211	015816-77-0
	X	X		X			X		Lead-212	15092-94-1
	X	X		X			X		Lead-214	15067-28-4
	X							Excluded from analyses	Potassium-40	13966-00-2
	X	X		X			X	EPA 901.1/HASL GA-01-R for 10% or Assume Secular Equilibrium for solid samples (1)	Thallium-208	14913-50-9
	X	X		X			X		Thorium-227	15623-47-9
	X	X		X			X		Thorium-234	15065-10-8
	X	X		X		Relatively long half life	X	HASL A-01-R	Thorium-232	7440-29-1
	X	X		X		Relatively long half life	X		Thorium-228	14274-82-9
	X	X		X		Relatively long half life	X		Thorium-230	14269-63-7
	X	X		X		Relatively long half life	X		Uranium-233/234	13966-29-5
	X	X		X		Relatively long half life	X		Uranium 235/236	15117-96-1
	X	X		X		Relatively long half life	X		Uranium-238	7440-61-1
	X	X		X		Relatively long half life	X	EPA 903.0 / 903.1	Radium-226	13982-63-3
	X	X		X		Relatively long half life	X	EPA 904.0	Radium-228	15262-20-1
	X	X		X			X	Back-quantitate from gamma spec for 10% or Assume Secular Equilibrium for solid samples (1)	Actinium-227	14952-40-0
	X	X		X			X		Bismuth-210	14331-79-4
	X	X		X			X		Bismuth-211	15229-37-5
	X	X		X			X		Polonium-210	13981-52-7
	X	X		X			X		Polonium-212	13981-52-7
	X	X		X			X		Polonium-214	15735-67-8
	X	X		X			X		Polonium-215	15706-52-2
	X	X		X			X		Polonium-216	15756-58-8
	X	X		X			X		Polonium-218	15422-74-9
	X	X		X			X		Protactinium-231	14331-85-2
	X	X		X			X		Protactinium-234	15100-28-4
	X	X		X			X		Radium-223	15623-45-7
	X	X		X			X		Radium-224	13233-32-4
	X	X		X			X		Thallium-207	14133-67-6
	X	X		X			X		Thorium-231	14932-40-2
Radon	X							FLUX	Radon-220	22481-48-7
	X								Radon-222	14859-67-7
Aldehydes	X						X	EPA 8315A	Acetaldehyde	75-07-0
	X						X		Chloroacetaldehyde	107-20-0
	X						X	SW8270C	Dichloroacetaldehyde	79-02-7
	X						X		Formaldehyde	50-00-0
	X						X	SW8270C	Trichloroacetaldehyde	75-87-6
Semivolatile Organic Compounds	X			X		Potential Site-related use	X	EPA 8270C [c]	1,2,4,5-Tetrachlorobenzene	95-94-3
	X			X		Potential Site-related use	X		1,2-Diphenylhydrazine	122-66-7
	X			X		Potential Site-related use	X		1,4-Dioxane	123-91-1
	X			X		Potential Site-related use	X		2,2'-Dichlorobenzil	3457-46-3
	X			X		Potential Site-related use	X		2,4,5-Trichlorophenol	95-95-4
	X			X		Potential Site-related use	X		2,4,6-Trichlorophenol	88-06-2
	X			X		Potential Site-related use	X		2,4-Dichlorophenol	120-83-2

Parameter of Interest	SRC List Parameter? [a]	Soil analyte selected for [a]: Background Analysis?	Evaluation of Potential Soil Impacts at: Soil Boring Locations?	Evaluation of Potential Soil Impacts at: Well Locations?	Soil Characterization?	Rationale for Soil Analyte Selection	Groundwater Grab Sample Analyte?	Analytical Method	Compound List	CAS Number
Semivolatile	X			X		Potential Site-related use	X	EPA 8270C [c]	2,4-Dimethylphenol	105-67-9
Organic	X			X		Potential Site-related use	X		2,4-Dinitrophenol	51-28-5
Compounds	X			X		Potential Site-related use	X		2,4-Dinitrotoluene	121-14-2
(continued)	X			X		Potential Site-related use	X		2,6-Dinitrotoluene	606-20-2
	X			X		Potential Site-related use	X		2-Chloronaphthalene	91-58-7
	X			X		Potential Site-related use	X		2-Chlorophenol	95-57-8
	X			X		Potential Site-related use	X		2-Methylnaphthalene	91-57-6
	X			X		Potential Site-related use	X		2-Nitroaniline	88-74-4
	X			X		Potential Site-related use	X		2-Nitrophenol	88-75-5
	X			X		Potential Site-related use	X		3,3-Dichlorobenzidine	91-94-1
	X			X		Potential Site-related use	X		3-Nitroaniline	99-09-2
	X			X		Potential Site-related use	X		4,4'-Dichlorobenzil (as 2,2'-dichlorobenzil)	3457-46-3
	X			X		Potential Site-related use	X		4-Bromophenyl phenyl ether	101-55-3
	X			X		Potential Site-related use	X		4-Chloro-3-methylphenol	59-50-7
	X			X		Potential Site-related use	X		4-Chlorophenyl phenyl ether	7005-72-3
	X			X		Potential Site-related use	X		4-Chlorothioanisole	123-09-1
	X			X		Potential Site-related use	X		4-Chlorothiophenol	106-54-7
	X			X		Potential Site-related use	X		4-Nitroaniline	100-01-6
	X			X		Potential Site-related use	X		4-Nitrophenol	100-02-7
	X			X		Potential Site-related use	X		Acenaphthene	83-32-9
	X			X		Potential Site-related use	X		Acenaphthylene	208-96-8
	X			X		Potential Site-related use	X		Acetophenone	98-86-2
	X			X		Potential Site-related use	X		Aniline	62-53-3
	X			X		Potential Site-related use	X		Anthracene	120-12-7
	X			X		Potential Site-related use	X		Azobenzene	103-33-3
	X			X		Potential Site-related use	X		Benzo(a)anthracene	56-55-3
	X			X		Potential Site-related use	X		Benzo(a)pyrene	50-32-8
	X			X		Potential Site-related use	X		Benzo(b)fluoranthene	205-99-2
	X			X		Potential Site-related use	X		Benzo(g,h,i)perylene	191-24-2
	X			X		Potential Site-related use	X		Benzo(k)fluoranthene	207-08-9
	X			X		Potential Site-related use	X		Benzoic acid	65-85-0
	X			X		Potential Site-related use	X		Benzyl alcohol	100-51-6
	X			X		Potential Site-related use	X		bis(2-Chloroethoxy)methane	111-91-1
	X			X		Potential Site-related use	X		bis(2-Chloroethyl) ether	111-44-4
	X			X		Potential Site-related use	X		bis(2-Chloroisopropyl) ether	108-60-1
	X			X		Potential Site-related use	X		bis(2-Ethylhexyl) phthalate	117-81-7
	X			X		Potential Site-related use	X		bis(Chloromethyl) ether	542-88-1
	X			X		Potential Site-related use	X		bis(p-Chlorophenyl) sulfone	80-07-9
	X			X		Potential Site-related use	X		bis(p-Chlorophenyl)disulfide	1142-19-4
	X			X		Potential Site-related use	X		Butylbenzyl phthalate	85-68-7
	X			X		Potential Site-related use	X		Carbazole	86-74-8
	X			X		Potential Site-related use	X		Chrysene	218-01-9
	X			X		Potential Site-related use	X		Dibenzo(a,h)anthracene	53-70-3
	X			X		Potential Site-related use	X		Dibenzofuran	132-64-9
	X			X		Potential Site-related use	X		Dichloromethyl ether	542-88-1
	X			X		Potential Site-related use	X		Diethyl phthalate	84-66-2
	X			X		Potential Site-related use	X		Dimethyl phthalate	131-11-3
	X			X		Potential Site-related use	X		Di-n-butyl phthalate	84-74-2
	X			X		Potential Site-related use	X		Di-n-octyl phthalate	117-84-0
	X			X		Potential Site-related use	X		Diphenyl disulfide	882-33-7
	X			X		Potential Site-related use	X		Diphenyl sulfide	139-66-2
	X			X		Potential Site-related use	X		Diphenyl sulfone	127-63-9

Table 2. Laboratory Analyte List

Parameter of Interest	SRC List Parameter? [a]	Soil analyte selected for [a]: Background Analysis?	Evaluation of Potential Soil Impacts at: Soil Boring Locations?	Evaluation of Potential Soil Impacts at: Well Locations?	Soil Charac-terization?	Rationale for Soil Analyte Selection	Groundwater Grab Sample Analyte?	Analytical Method	Compound List	CAS Number
Semivolatile	X			X		Potential Site-related use	X	EPA 8270C [c]	Fluoranthene	206-44-0
Organic	X			X		Potential Site-related use	X		Fluorene	86-73-7
Compounds	X			X		Potential Site-related use	X		Hexachlorobenzene	118-74-1
(continued)	X			X		Potential Site-related use	X		Hexachlorobutadiene	87-68-3
	X			X		Potential Site-related use	X		Hexachlorocyclopentadiene	77-47-4
	X			X		Potential Site-related use	X		Hexachloroethane	67-72-1
	X			X		Potential Site-related use	X		Hydroxymethyl phthalimide	118-29-6
	X			X		Potential Site-related use	X		Indeno(1,2,3-cd)pyrene	193-39-5
	X			X		Potential Site-related use	X		Isophorone	78-59-1
	X			X		Potential Site-related use	X		m,p-Cresol	106-44-5
	X			X		Potential Site-related use	X		Naphthalene	91-20-3
	X			X		Potential Site-related use	X		Nitrobenzene	98-95-3
	X			X		Potential Site-related use	X		N-nitrosodi-n-propylamine	621-64-7
	X			X		Potential Site-related use	X		N-nitrosodiphenylamine	86-30-6
	X			X		Potential Site-related use	X		o-Cresol	95-48-7
	X			X		Potential Site-related use	X		Octachlorostyrene	29082-74-4
	X			X		Potential Site-related use	X		p-Chloroaniline (4-Chloroaniline)	106-47-8
	X			X		Potential Site-related use	X		p-Chlorobenzenethiol	106-54-7
	X			X		Potential Site-related use	X		Pentachlorobenzene	608-93-5
	X			X		Potential Site-related use	X		Pentachlorophenol	87-86-5
	X			X		Potential Site-related use	X		Phthalic acid	88-99-3
	X			X		Potential Site-related use	X		Phenanthrene	85-01-8
	X			X		Potential Site-related use	X		Phenol	108-95-2
	X			X		Potential Site-related use	X		Pyrene	129-00-0
	X			X		Potential Site-related use	X		Pyridine	110-86-1
	X			X		Potential Site-related use	X		Thiophenol	108-98-5
	X			X		Potential Site-related use	X		Tentatively Identified Compounds (TICs)	
Volatile	X			X		Potential Site-related use	X	EPA 8260B	1,1,1,2-Tetrachloroethane	630-20-6
Organic	X			X		Potential Site-related use	X		1,1,1-Trichloroethane	71-55-6
Compounds	X			X		Potential Site-related use	X		1,1,2,2-Tetrachloroethane	79-34-5
	X			X		Potential Site-related use	X		1,1,2-Trichloroethane	79-00-5
	X			X		Potential Site-related use	X		1,1-Dichloroethane	75-34-3
	X			X		Potential Site-related use	X		1,1-Dichloroethene	75-35-4
	X			X		Potential Site-related use	X		1,1-Dichloropropene	563-58-6
	X			X		Potential Site-related use	X		1,2,3-Trichlorobenzene	87-61-6
	X			X		Potential Site-related use	X		1,2,3-Trichloropropane	96-18-4
	X			X		Potential Site-related use	X		1,2,4-Trichlorobenzene	120-82-1
	X			X		Potential Site-related use	X		1,2,4-Trimethylbenzene	95-63-6
	X			X		Potential Site-related use	X		1,2-Dichlorobenzene	95-50-1
	X			X		Potential Site-related use	X		1,2-Dichloroethane	107-06-2
	X			X		Potential Site-related use	X		1,2-Dichloroethene	540-59-0
	X			X		Potential Site-related use	X		1,2-Dichloropropane	78-87-5
	X			X		Potential Site-related use	X		1,3,5-Trichlorobenzene	108-70-3
	X			X		Potential Site-related use	X		1,3,5-Trimethylbenzene	108-67-8
	X			X		Potential Site-related use	X		1,3-Dichlorobenzene	541-73-1
	X			X		Potential Site-related use	X		1,3-Dichloropropene	542-75-6
	X			X		Potential Site-related use	X		1,3-Dichloropropane	142-28-9
	X			X		Potential Site-related use	X		1,4-Dichlorobenzene	106-46-7
	X			X		Potential Site-related use	X		2,2-Dichloropropane	594-20-7
	X			X		Potential Site-related use	X		2,2-Dimethylpentane	590-35-2
	X			X		Potential Site-related use	X		2,2,3-Trimethylbutane	464-06-2
	X			X		Potential Site-related use	X		2,3-Dimethylpentane	565-59-3

Parameter of Interest	SRC List Parameter?[a]	Soil analyte selected for [a]: Background Analysis?	Evaluation of Potential Soil Impacts at: Soil Boring Locations?	Evaluation of Potential Soil Impacts at: Well Locations?	Soil Characterization?	Rationale for Soil Analyte Selection	Groundwater Grab Sample Analyte?	Analytical Method	Compound List	CAS Number
Volatile	X			X		Potential Site-related use	X	EPA 8260B	2,4-Dimethylpentane	108-08-7
Organic	X			X		Potential Site-related use	X		2-Chlorotoluene	95-49-8
Compounds	X			X		Potential Site-related use	X		2-Hexanone	591-78-6
(continued)	X			X		Potential Site-related use	X		2-Methylhexane	591-76-4
	X			X		Potential Site-related use	X		2-Nitropropane	79-46-9
	X			X		Potential Site-related use	X		3,3-Dimethylpentane	562-49-2
	X			X		Potential Site-related use	X		3-Ethylpentane	617-78-7
	X			X		Potential Site-related use	X		3-Methylhexane	589-34-4
	X			X		Potential Site-related use	X		4-Chlorobenzene	108-90-7
	X			X		Potential Site-related use	X		4-Chlorotoluene	106-43-4
	X			X		Potential Site-related use	X		4-Methyl-2-pentanone (MIBK)	108-10-1
	X			X		Potential Site-related use	X		Acetone	67-64-1
	X			X		Potential Site-related use	X		Acetonitrile	75-05-8
	X			X		Potential Site-related use	X		Benzene	71-43-2
	X			X		Potential Site-related use	X		Bromobenzene	108-86-1
	X			X		Potential Site-related use	X		Bromodichloromethane	75-27-4
	X			X		Potential Site-related use	X		Bromoform	75-25-2
	X			X		Potential Site-related use	X		Bromomethane	74-83-9
	X			X		Potential Site-related use	X		Carbon disulfide	75-15-0
	X			X		Potential Site-related use	X		Carbon tetrachloride	56-23-5
	X			X		Potential Site-related use	X		Chlorobenzene	108-90-7
	X			X		Potential Site-related use	X		Chlorobromomethane	74-97-5
	X			X		Potential Site-related use	X		Chlorodibromomethane	124-48-1
	X			X		Potential Site-related use	X		Chloroethane	75-00-3
	X			X		Potential Site-related use	X		Chloroform	67-66-3
	X			X		Potential Site-related use	X		Chloromethane	74-87-3
	X			X		Potential Site-related use	X		cis-1,2-Dichloroethene	156-59-2
	X			X		Potential Site-related use	X		cis-1,3-Dichloropropene	10061-01-5
	X			X		Potential Site-related use	X		Cymene (Isopropyltoluene)	99-87-6
	X			X		Potential Site-related use	X		Dibromochloroethane	73506-94-2
	X			X		Potential Site-related use	X		Dibromochloromethane	124-48-1
	X			X		Potential Site-related use	X		Dibromochloropropane	96-12-8
	X			X		Potential Site-related use	X		Dibromomethane	74-95-3
	X			X		Potential Site-related use	X		Dichlorobenzene	25321-22-6
	X			X		Potential Site-related use	X		Dichloromethane (Methylene chloride)	75-09-2
	X			X		Potential Site-related use	X		Dimethyldisulfide	624-92-0
	X			X		Potential Site-related use	X		Ethanol	64-17-5
	X			X		Potential Site-related use	X		Ethylbenzene	100-41-4
	X			X		Potential Site-related use	X		Freon-11(Trichlorofluoromethane)	75-69-4
	X			X		Potential Site-related use	X		Freon-113(1,1,2-trichloro-1,2,2-trifluoroethane)	76-13-1
	X			X		Potential Site-related use	X		Freon-12(Dichlorodifluoromethane)	75-71-8
	X			X		Potential Site-related use	X		Heptane	142-82-5
	X			X		Potential Site-related use	X		Isoheptane	31394-54-4
	X			X		Potential Site-related use	X		Isopropylbenzene	98-82-8
	X			X		Potential Site-related use	X		m,p-Xylene	mp-XYL
	X			X		Potential Site-related use	X		Methyl ethyl ketone (2-Butanone)	78-93-3
	X			X		Potential Site-related use	X		Methyl iodide	74-88-4
	X			X		Potential Site-related use	X		MTBE (Methyl tert-butyl ether)	1634-04-4
	X			X		Potential Site-related use	X		n-Butyl benzene	104-51-8
	X			X		Potential Site-related use	X		n-Propylbenzene	103-65-1
	X			X		Potential Site-related use	X		Nonanal	124-19-6
	X			X		Potential Site-related use	X		o-Xylene	95-47-6
	X			X		Potential Site-related use	X		sec-Butylbenzene	135-98-8

Table 2. Laboratory Analyte List

Parameter of Interest	SRC List Parameter? [a]	Soil analyte selected for [a]: Background Analysis?	Evaluation of Potential Soil Impacts at: Soil Boring Locations?	Evaluation of Potential Soil Impacts at: Well Locations?	Soil Characterization?	Rationale for Soil Analyte Selection	Groundwater Grab Sample Analyte?	Analytical Method	Compound List	CAS Number
Volatile	X			X		Potential Site-related use	X	EPA 8260B	Styrene	100-42-5
Organic	X			X		Potential Site-related use	X		tert-Butyl benzene	98-06-6
Compounds	X			X		Potential Site-related use	X		Tetrachloroethene	127-18-4
(continued)	X			X		Potential Site-related use	X		Toluene	108-88-3
	X			X		Potential Site-related use	X		trans-1,2-Dichloroethene	156-60-5
	X			X		Potential Site-related use	X		trans-1,3-Dichloropropene	10061-02-6
	X			X		Potential Site-related use	X		Trichloroethane	71-55-6
	X			X		Potential Site-related use	X		Trichloroethene	79-01-6
	X			X		Potential Site-related use	X		Vinyl acetate	108-05-4
	X			X		Potential Site-related use	X		Vinyl chloride	75-01-4
	X			X		Potential Site-related use	X		Xylenes (total)	1330-20-7
	X			X		Potential Site-related use	X		Tentatively Identified Compounds (TICs)	
Water	X						X	EPA 120.1	Conductivity	COND
Quality	X						X	EPA 130.2	Hardness, total	Hardness
Parameters	X						X	EPA 160.1	Total dissolved solids	TDS
	X						X	EPA 160.2	Total suspended solids	TSS
	X						X	EPA 310.1	Alkalinity, total(as calcium carbonate)	ALK
	X								Bicarbonate alkalinity	71-52-3
	X								Carbonate alkalinity	3812-32-6
	X								Hydroxide alkalinity	OH-ALK
Flashpoint	X						X	EPA 1010	Flammables	NA
Total Petroleum	X							EPA 8015	Diesel	64742-46-7
Hydrocarbons	X								Gasoline	8006-61-9
	X								Grease	68153-81-1
	X								Mineral Spirits	NA
White Phosphorus	X							EPA 7580M	White phosphorus	12185-10-3
Methyl Mercury	X							EPA 1630	Methyl mercury	22967-92-6

[a] X = Parameter included in analyte list
[b] Method 8270C is the primary analytical method, but Method 8310 may be used if nec
[c] Method 3540 for extraction and Method 3640 for cleanup are to be used as appropria

Reporting Limits - Based on laboratory limits for primary laboratory (STL).
Laboratory limits are subject to matrix interferences and may not always be achieved in all samples.
The laboratory will be instructed to report the top 25 Tentatively Identified Compounds (TICs) under method 8260B and 8270C.

NA = Not applicable

[1] Equilibrium can be demonstrated using data collected to date or by using 10% of the samples in the next sampling round. For groundwater, equilibrium will not apply, major radionuclides will be compared to background and MCLs. Radon 222 may be required in the future depending upon groundwater results.
Solid data will be compared to background and risk assessment will assume secular equilibrium if this has been verified. Risk calculations will include the decay chain parent activity and the activity of the highest measured daughter for a conservative approach.

Table 3. Summary of Soil Sampling Program

Boring/Well	Location	No. of Borings	NRCS Soil Map Unit	Objective	Depth Interval	Metals	Radionuclides	Perchlorate	VOCs	SVOCs	Organochlorine Pesticides	Ions (except Perchlorate)	General Chemistry Parameters	Physical Parameters (except grain size)	Grain Size
Chemical Parameter Samples															
DBSA-1 to DBSA-5 & DBSA-22 to DBSA-27	Background Location	7	182	Off-site Impact Evaluation	5 feet & 10 feet bgs			X	X						
DBSA-6 to DBSA-16	Background Location	7	184					X	X						
DBSA-17 to DBSA-21 & DBSA-28 to DBSA-33	Background Location	7	117					X	X						
AA-UW1 to AA-UW6	Upgradient Well	6	---	On-site Impact Evaluation	5 feet & 10 feet bgs, then 10-foot intervals until upper unconfined water-bearing zone is encountered	X	X	X	X	X	X				
DBSA-1 to DBSA-5 & DBSA-22 to DBSA-27	Background Location	7	182	Background Soil Characterization	20 feet bgs, then 10-foot intervals to Qal/TMCf contact; 10 and 20 feet below Qal/TMCf contact	X	X					X	X		
DBSA-6 to DBSA-16	Background Location	7	184			X	X					X	X		
DBSA-17 to DBSA-21 & DBSA-28 to DBSA-33	Background Location	7	117			X	X					X	X		
Physical Parameter Samples															
DBSA-4,22,27	Background Location	3	182	Soil Map Unit Hydrologic Characterization	10 feet bgs & 10 feet below Qal/TMCf contact									X	X
DBSA-8,11,14	Background Location	3	184											X	X
DBSA-17,18,21	Background Location	3	117											X	X
AA-UW1, AA-UW-5, AA-UW-6	Upgradient Well	3	---									X	X	X	X
Sample Type															
Sleeve Sample	---	---	---	---	See above			X	X	X	X	X	X	X	
Composite	---	---	---	---	All soil samples collected from the 2-foot interval adjacent to the nominal sample depth (i.e 19-21 feet bgs for the 20-foot sample)	X	X								X

--- = Parameter not applicable
X = Parameter to be analyzed

Appendix A

Responses to Comments

Appendix A1

April 25, 2007 Comments

<u>Attachment - Response to Comments (RTC) from NDEP dated April 25, 2007</u>

Revised Work Plan for Determination of Deep Quaternary Alluvium and Upper Muddy Creek Formation Background Soil Chemistry and Upgradient Alluvial Aquifer Conditions
dated April 9, 2007

1. Section 2.3 and Table 2, the NDEP has the following comments:
    a. Section 2.3.1, page 16, in the 5 foot and 10 foot samples BRC proposes to analyze for Lindane (gamma-BHC) to assess the potential for anthropogenic impacts to deep soils. Lindane is not very mobile in the soil matrix and does not represent a good choice for assessing these impacts. NDEP requests that the full suite of organochlorine pesticides, VOCs, SVOCs and perchlorate be analyzed for in the sub-surface. This will be consistent with the remainder of the deeper samples and should not be cost prohibitive.

Response: *BRC agrees that Lindane may not be suitable as an indicator of whether Site compounds may have impacted a particular background location. However, many of the SVOC and organochlorine pesticide compounds have relatively high octanol-carbon coefficient (Koc) values and/or relatively low solubility values and/or low vapor pressure. As a result, these compounds are also relatively immobile in soil and are similarly not representative indicator compounds. Please see Table A-1 showing the Koc, solubility, and vapor pressure values for SVOCs and organochlorine pesticides. Although VOCs can also be attributed to other off-site sources, many of these compounds, like perchlorate, are relatively more mobile. Therefore, perchlorate and VOCs will be added to the indicator compound analyte list as suggested. However, since perchlorate is ubiquitous in this area, it is BRC's opinion that detection of perchlorate, by itself, should not invalidate a particular sampling location as a suitable deep background sample location. For VOCs, BRC will implement field screening using photoionization detectors (PIDs) (using two lamps). If greater than 1 ppm VOC is detected by this screening, BRC will not proceed with drilling at a particular location. If less than 1 ppm VOC is detected by screening, BRC will proceed with drilling at the location and will subject the deep samples to VOC laboratory analysis using Method 8260.*

    b. Section 2.3.1, pages 16 and 17, BRC lists the physical and general chemical parameters that will be analyzed and refers the reader to Section 2.2. Based upon a review of Section 2.2, the Tables and the Figures it is nearly impossible to determine where physical data will be collected or what the basis is for the selection of the locations where the physical data is proposed to be collected. A table must be developed and submitted to the NDEP which contains the following information:
        i. Sample location ID;
        ii. Expected depth intervals to be sampled;
        iii. Physical and chemical parameters to be analyzed at <u>each depth interval for each location</u>;
        iv. This table will provide the necessary transparency for the document.

Response: *A sampling summary table has been added to the work plan.*

2. Section 3.1.2, the NDEP has the following comments:

a. General comment on Section 3.1.2 and response to comment 13 (Appendix A1), it is suggested that BRC discuss the data with the NDEP prior to initiating detailed statistical analyses. At this time the applicability of specific statistical tests can be discussed. The content and format of this meeting should be discussed at a later time. BRC should anticipate presenting: basic summary statistics; box and whiskers plots and other interpretations, as appropriate.

Response: *BRC will discuss the data with NDEP as described above and will anticipate presenting summary statistics and box-and-whisker plots as suggested.*

b. Page 20, BRC states "the data will also be qualitatively compared to the BRC/TIMET background data". It would seem logical that a quantitative comparison would also be appropriate. BRC should demonstrate that the deeper data are statistically different that the shallow data.

Response: *The data will be compared as described above. The work plan has been revised to reflect this clarification.*

c. Page 21, BRC states that "if any two data sets are statistically indistinguishable, the data sets may be combined." The NDEP believes that BRC has likely mis-stated this issue. As written, BRC implies that each data set will only be compared to one other data set, at a time. It is expected that all soil units will be compared to each other at once. Please clarify.

Response: *All subject data sets will be compared to the remaining data sets for a full comparison as described by NDEP. The work plan has been revised to reflect this clarification.*

3. Table 2, the NDEP has the following comments:
   a. Additional comments may be generated by the NDEP once the table requested in the comments for Section 2.3.1 is completed.

Response: *Comment noted.*

b. It appears that this table does not match the text. For example, Section 2.3.1 indicates that metals will be analyzed in the soil column, however, this column does not have an "X" on Table 2. Please explain. The same comment applies for organochlorine pesticides, SVOCs, and VOCs.

Response: *Column 3 of Table 2 indicates background analytes. Column 4 refers to evaluation of potential site-related soil impacts at background boring locations, not evaluation of background concentrations. For example, metals will be analyzed as shown on Table 2, page 2 for background analysis, not for an evaluation of site-related impacts. Table 2 has been revised to clarify the analyses.*

c. This table should specify that the remainder of the radionuclides will be back quantitated.

Response: *Please see attached the revised Table 2 showing how the radionuclides will be analyzed. This is based on recent discussions on this topic between BRC and NDEP.*

d. It is requested that "ions"; "general chemistry parameters"; and "water quality parameters" be included (as appropriate for the media of concern) in the soil characterization column.

Response: *The edit to Table 2 has been made as suggested.*

4. Appendix A1, the NDEP has the following comments:
   a. Response to Comment (RTC) 2, as well as Figure 2, it appears that BRC continues to disagree with installation of wells that would truly represent "background". As NDEP has noted previously, this is acceptable at this time. To address this issue please provide a revised project schedule with the response to comments letter which identifies when wells that truly represent "background" will be installed. NDEP is concerned that BRC's continued delay of this issue will impact the project schedule and Site closure.

Response: *It is BRC's intent to collect grab samples from the first-encountered water bearing zone (above total depth) during advancement of the deep soil background borings and, based on results and after discussion with the NDEP, to consider installing background wells at some of these locations. Thus, the timing of installation would be approximately 90 to 120 days after the collection and analysis of data relating to the deep soil investigation.*

   b. RTC 6, BRC still does not recognize that historic conditions may have caused hydraulic gradients to reverse and impact the vadose zone above the proposed upgradient wells. This transparency is necessary.

Response: *BRC recognized this potential historical condition during work plan development, and the selected well locations are based on interpretation of currently available water level and flow direction data. Clarification to explicitly state this has been added to the work plan.*

   c. RTC 7, NDEP does not concur with BRC's proposal to eliminate horizontal hydraulic conductivity analyses. BRC is proposing to use data from a separate investigation (Aquifer Testing Work Plan) to provide horizontal hydraulic conductivity data and use this data to compare to the vertical hydraulic conductivity analyses collected during this investigation. NDEP requests that, at a minimum, slug tests be conducted as part of this work plan.

Response: *Each new well will be slug tested as requested. The work plan has been modified to reflect this change.*

d. RTC 21b, NDEP does not agree with BRC's response, however, it appears that additional discussion on this matter is not productive.

Response: *Comment noted.*

e. RTC 21c, again, NDEP does not agree with BRC's response, however, it appears that additional discussion on this matter is not productive. In addition, BRC references "additional well installation efforts associated with adjacent plants that may be useful for this effort." NDEP is not aware of any background well installations planned by any of the plant sites at this time. In addition, BRC's schedule is accelerated versus the investigation and remediation efforts at the Plant Sites. NDEP included this comments because NDEP is attempting to identify issues that can affect project schedule and Site closure.

Response: *Comment noted.*

Table A-1. Summary of Koc, Solubility and Vapor Pressure Values
Organochlorine Pesticides

	CAS #	K_{oc} mL/g	Ref	Solubility mg/L 25 °C	Ref	Vapor Pressure mm Hg 25 °C	°C	Ref
Aldrin	309-00-2	407	1	0.011 - 0.18	1	6.0E-06		1
α-BHC	319-84-6	1,901	1	2.0	1	2.5E-05	20	1
β-BHC	319-85-7	2,100 - 3,575	1	0.24 - 0.7	1	2.8E-07	20	1
γ-BHC (Lindane)	58-89-9	650 - 3,300	8	7.3 - 7.8	8	6.7E-05		1
δ-BHC	319-86-8	1,901	1	21.3 - 31.4	1	1.7E-05		1
Chlordane (nos)	57-74-9	140,000 - 370,000	1	0.009	1	1.0E-05		1
α-Chlordane	5103-71-9	250,000 - 1,000,000	1	0.051	1	2.5E-05		5
γ-Chlordane	5103-74-2	300,000 - 1,000,000	1	NA	1	2.5E-05		5
2,4-DDD	53-19-0	NA		0.1	9	1.9E-06		9
2,4-DDE	3424-82-6	NA		0.14	9	6.20E-06		9
4,4' -DDD	72-54-8	44 000 - 80,500	1	0.02 - 0.09	1	1.02E-06	30	1
4,4'-DDE	72-55-9	240,000 - 1,000,000	1	0.0013 - .012	1	6.49E-06	30	1
4,4' -DDT	50-29-3	140,000 - 1,800,000	1	0.0012 - 0.0034	1	1.9E-07		1
Dieldrin	60-57-1	12,000 - 35,000	1	0.195 - 0.20	1	1.87E-07		1
Endosulfan I	959-98-8	2,040	1	0.530	1	1.0E-05		1
Endosulfan II	33213-65-9	2,340	1	0.28	1	1.0E-05		1
Endosulfan Sulfate	1031-07-8	2,340	1	0.117	1	1.0E-05		8
Endrin	72-20-8	8,300	1	0.26	1	2.0E-07		1
Endrin aldehyde	7421-93-4	26,900	1	0.26	1	2.0E-07		1
Endrin ketone	53494-70-5	NA		NA		NA		
Heptachlor	76-44-8	22,000	1	0.056 - 0.180	1	4.0E-04 - 4.0E-03		1
Heptachlor epoxide	1024-57-3	21,000	1	0.275	1	2.6E-06	20	1
Hexachlorobenzene	118-74-1	363 - 34,700	1	0.0047 - 0.006	1	1.1E-05	20	1
Methoxychlor	72-43-5	89,000	1	0.045 - 0.1	1	NA		1
Toxaphene	8001-35-2	1,500 - 210,000	1	0.74 - 1.75	1	3.3E-05		1

Ref See references
NA Not available in references or not applicable
mL/g milliliters/gram
mg/L milligrams/Liter
mm Hg millimeters of mercury
Koc Organic carbon partition coefficient
°C Degrees Celsius
calc. Calculated

Table A-1. Summary of Koc, Solubility and Vapor Pressure Values
Semivolatile Organic Compounds

	CAS #	K_{oc} mL/g	Ref	solubility mg/L 25 °C	°C	Ref	Vapor Pressure mm Hg 25 °C	°C	Ref
Acenaphthene	83-32-9	4,600	6	3.47 - 3.93		1	0.00155		1
Acenaphthylene	208-96-8	4,790	1	3.93		1	0.029	20	1
Acetophenone	98-86-2	10	8	6,130		8	0.397		8
Aniline	62-53-3	43.8 - 497.7	8	36,070		2	0.489		2
Anthracene	120-12-7	16,000 - 26,000	1	0.030 - 0.1125		1	1.7E-05 - 1.95E-04		1
Azobenzene	103-33-3	6,600	8	6.4		8	3.60E-04		8
Benzo(a)anthracene	56-55-3	1,400,000	1	0.0094 - 0.014		1	1.1E-07		1
Benzo(b)fluoranthene	205-99-2	550,000	1	0.0012		1	5.0E-07		1
Benzo(g,h,i)perylene	191-24-2	7,800,000	1	0.00026		1	1.01E-10		1
Benzo(k)fluoranthene	207-08-9	4,400,000	1	0.00055		1	9.59E-11		1
Benzo(a)pyrene	50-32-8	398,000 - 1,900,000	1	0.0038 - 0.004		1	5.49E-09		1
Benzoic acid	65-85-0	30 - 501	1	3400		1	0.0045		1
Benzyl alcohol	100-51-6	95	1	42900		1	1.0	58	1
Bis(2-chloroethoxy)methane	111-91-1	115	1	81,000		1	1	53	1
Bis(2-chloroethyl)ether	111-44-4	14	1	10,200		1	1.4 - 1.55		1
Bis(2-chloroisopropyl)ether	108-60-1	62	1	1,700	20	1	0.85	20	1
bis(Chloromethyl) ether	542-88-1	NA		NA			30	22	2
bis(p-Chlorophenyl) sulfone	80-07-9	7600	8	NA		8	8.1E-07		8
bis(p-Chlorophenyl)disulfide	1142-19-4	NA		0.242		9	3.64E-06		9
Bis(2-ethylhexyl)phthalate	117-81-7	100,000	1	0.047 - 0.4		1	6.2E-08		1
4-Bromophenyl-phenylether	101-55-3	87,100	1	NA			0.0015	20	1
Butylbenzylphthalate	85-68-7	50,000.00	8	0.71		8	8.3E-06		8
Carbazole	86-74-8	NA		insoluble			NA		
4-Chloroaniline	106-47-8	95 - 1,514	1	3,900		1	0.025		1
4-Chloro-3-methylphenol	59-50-7	776	1	3,850		1	0.05		1
2-Chloronaphthalene	91-58-7	8,511	1	6.74		1	0.017		1
2-Chlorophenol	95-57-8	363	1	11,350 - 28,000		1	1.42		1
4-Chlorophenyl-phenylether	7005-72-3	3,981	1	3.3		1	0.0027		1
4-Chlorothioanisole	123-09-1	NA		NA			NA		
4-Chlorothiophenol	106-54-7	NA		115		9	0.232		9
Chrysene	218-01-9	240,000	1	0.0018 - 0.006		1	6.3E-09		1
Dibenzofuran	132-64-9	8,100 - 13,000	1	10		1	3.37E-05		4
Dibenzo(a,h)anthracene	53-70-3	1,700,000	1	0.0005 - 0.00249		1	~10E-10	20	1
3,3'-Dichlorobenzidine	91-94-1	1,995	1	3.11		1	1.0E-05 - 4.2E-07		1
2,2'-Dichlorobenzil	3457-46-3	1,100	8	10	20	8	2.20E-06		8
2,4-Dichlorophenol	120-83-2	871	1	4,500		1	0.089		1
Diethylphthalate	84-66-2	69	1	680 - 1,200		1	0.0035		7
2,4-Dimethylphenol	105-67-9	117	1	7,868		1	0.098		1
Dimethylphthalate	131-11-3	8 -70	1	3,960 - 45,000		1	0.00308		8
Di-n-butylphthalate	84-74-2	1,380	1	9.2 - 4,500		1	1.4E-05		1
4,6-Dinitro-2-methylphenol	534-52-1	436	1	250		1	5.2E-05		1
2,4-Dinitrophenol	51-28-5	18	1	6,000		1	3.9E-04		
2,4-Dinitrotoluene	121-14-2	62	1	270		1	1.0E+00 - 1.1E-04	20	1
2,6-Dinitrotoluene	606-20-2	62	1	300		1	3.5E-04	20	1
Di-n-octylphthalate	117-84-0	977,000,000	1	3		1	1.4E-04		1
1,4-Dioxane	123-91-1	29	8	miscible		b	38		2
Diphenyl disulfide	882-33-7	NA		6.020		9	NA		
Diphenyl sulfide	139-66-2	NA		8.120		9	NA		
Diphenyl sulfone	127-63-9	NA		314		9	1.53E-05		9
1,2-Diphenylhydrazine	122-66-7	660	1	221		1	2.6E-05		1
Fluoranthene	206-44-0	42,000	1	0.206 - 0.373		1	5.0E-06		1
Fluorene	86-73-7	5,000	1	1.66 - 1.98		1	0.0010 - 0.010	20	1
Hexachlorobenzene	118-74-1	363 - 34,700	1	0.0047 - 0.006		1	1.1E-05	20	1
Hexachlorobutadiene	87-68-3	4,700	1	3.23		1	0.15	20	1
Hexachlorocyclopentadiene	77-47-4	4,300	1	1.8		1	0.081		1
Hexachloroethane	67-72-1	2,200	1	27.2 - 50		1	0.18	20	1
Hydroxymethyl phthalimide	118-29-6	NA		NA			NA		
Indeno(1,2,3-cd)pyrene	193-39-5	31,000,000	1	0.062		1	1.0E-09		1

Table A-1. Summary of Koc, Solubility and Vapor Pressure Values
Semivolatile Organic Compounds

	CAS #	K_{oc} mL/g	Ref	solubility mg/L 25 °C	°C	Ref	Vapor Pressure mm Hg 25 °C	°C	Ref
Isophorone	78-59-1	31	1	12,000		1	0.38	20	1
2-Methylnaphthalene	91-57-6	7,400 - 8,500	1	25		1	0.0681		8
2-Methylphenol (o-Cresol)	95-48-7	22	1	25,000		1	0.24		1
4-Methylphenol (p-Cresol)	106-44-5	49	1	18,000 - 23,000		1	0.080 - .013		1
Naphthalene	91-20-3	550 - 3,160	1	30 - 34		1	0.23 - 0.87		1
2-Nitroaniline	88-74-4	17 - 42	1	1,260		1	8.1		1
3-Nitroaniline	99-09-2	18.2	1	890		1	3.6E-05		8
4-Nitroaniline	100-01-6	12	1	728	30	1	1.5E-03	20	1
Nitrobenzene	98-95-3	229	1	2,000 - 2,100		1	0.28		1
2-Nitrophenol	88-75-5	37	1	2,000 - 2,500		1	0.12 - 0.20		1
4-Nitrophenol	100-02-7	55 -214	1	16,000 - 25,000		1	1.0E-04	20	1
N-nitrosodiphenylamine	86-30-6	575	1	35.1		1	0.10		1
N-Nitroso-di-n-propylamine	621-64-7	133	8	9,900		1	0.086	20	8
Octachlorostyrene	29082-74-4	200,000 - 10,000,000	8	NA			1.3E-05		8
Pentachlorobenzene	608-93-5	3,200 - 126,000	8	1.33		8	0.0065		8
Pentachloronitrobenzene	82-68-8	20,000 - 21,877	8	0.055		8	5.0E-05		8
Pentachlorophenol	87-86-5	900	1	20 - 25		1	1.7E-05	23	1
Phenanthrene	85-01-8	5,250 - 38,900	1	0.71 - 1.29		1	6.80E-04		1
Phenol	108-95-2	17 - 27	1	67,000 - 93,000		1	0.34		1
Phthalic acid	88-99-3	2 - 31	8	6,250.00		8	5.86		8
Pyrene	129-00-0	46,000 - 135,000	1	0.013 - 0.171		1	6.85E-07 - 2.5E-06		1
Pyridine	110-86-1	50	8	miscible	20	8	20.8		8
1,2,4,5-Tetrachlorobenzene	95-94-3	1,600 - 7950	8	0.595		8	0.005		8
Thiophenol	108-98-5	560	8	836		8	1.93		8
1,2,4-Trichlorobenzene	120-82-1	500 - 9,500	1	30 - 48.8		1	0.29		1
2,4,5-Trichlorophenol	95-95-4	710 - 3,200	1	1,200		1	0.022		1
2,4,6-Trichlorophenol	88-06-2	1071	1	800		1	0.0084 - 0.017		1

mL/g milliliters/gram
mg/L milligrams/Liter
mm Hg millimeters of Mercury
Koc Organic carbon partition coefficient.
°C Degrees Celsius.
calc. Calculated.
NA Not available in references or not applicable

Table A-1. References for Koc, Solubility and Vapor Pressure Values

No.	Citation
1	Montgomery, J.H., and and L.M. Welkom, 1990. Ground Water Chemical Desk Reference. Lewis Publisher, Inc., Chelsea, MI. 640 pp.
2	Howard, P.H., 1989; 1990; 1991; 1993; Handbook of Environmental Fate and Exposure Data for Organic Chemicals. v. I, II, Lewis Publishers.
3	Verschueren K, Ed. 1983. Handbook of Environmental Data on Organic Chemicals, 2nd ed. Van Nostrand Reinhold Company, New York
4	Lyman, W.J., W. F. Rheel, and D. H. Rosenblatt, 1990. Handbook of Chemical Property Estimation Methods. McGraw-Hill, Inc. New York.
5	Bidleman, T.F., W.N. Billings, and W.T. Foreman, 1986. Vapor-particle partitioning of semi-volatile organic compounds: Estimates from field collections.
	Environmental Science Technology, 10:1038 AL
6	Mackay, D., W.Y. Shiu, J. Billington, and G.L. Huang, 1983. Physical Chemical Properties of Polychlorinated Biphenyls.
	In: Physical Behavior of PCBs in the Great Lakes, Ann Arbor Science, Ann Arbor, Michigan.
7	Mabey, W.R., J.H. Smith, R.T. Podoll, H.L. Johnson, T. Mill, T.W. Chou, J. Gates, I.W. Patridge, H. Jaber, and D. Vandenberg, 1982. Aquatic Fate
	Process Data for Organic Priority Pollutants. Office of Water Regulations and Standards, Washington DC
8	TOXNET, 1992. U.S. Department of Health and Human Services, Specialized Information Services Division, National Library of Medicine, Bethesda, Maryland.
	Hazardous Substance Database. http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB
9	TOXNET, 1992. U.S. Department of Health and Human Services, Specialized Information Services Division, National Library of Medicine, Bethesda, Maryland.
	ChemIDplus. http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?CHEM

Appendix A2

March 21, 2007 Comments

Attachment A
Response to Comments provided in NDEP Letter dated March 21, 2007

1. General comment, this document does not specifically address the issue of comparability of data in terms of the analytical methods that are used to analyze the data. This is important for the types of comparisons that are envisioned. That is, comparison of deep background soil data to the BMI/TIMET background data set. We do not expect sampling methods to be the same (surface vs. subsurface), but the analytical methods should be comparable, and for distributional comparisons of any kind, this is important.

Response: The analytical laboratory methods used in the BRC/TIMET/Environ shallow background soil sample analyses will be utilized, where possible, for the deep soil sample analyses so data comparability objectives can be met. This text has been added to Section 2.3.1 of the revised work plan.

2. Section 1.0, page 1, please note that it will be necessary to develop groundwater monitoring well locations that can be demonstrated to be beyond the bound of influence of Site operations. NDEP does not object to the installation of the proposed upgradient monitoring wells, however, these wells may be of limited utility. Once the analytical results are received this issue can be discussed further. NDEP will not repeat these comments for the remainder of the document.

Response: Comment noted. The proposed well locations were selected to characterize the quality of groundwater at the perimeter of the Eastside Area.

3. Section 1.1, page 2, this section should include a discussion of how the data to be collected will be used; this would help identify objectives for the project. Two purposes are listed but do not include the collection of physical soil parameters, but yet samples are collected for that purpose, please refer to Section 1.1.2 for examples.

Response: Sections 1.1 and 1.1.1 have been edited to clarify the revised objectives of the project.

4. Section 1.1.2, page 3, the NDEP has the following comment:
    a. BRC indicates that lithology and vertical hydraulic conductivity will be evaluated as part of the installation of the upgradient monitoring wells. Perhaps other physical parameters should also be evaluated as follows:
        i. Dry bulk density
        ii. Specific gravity
        iii. Moisture content (specify basis volumetric versus gravimetric)
        iv. Percent organic matter
        v. Particle size analysis including fraction less than 200 mesh
        vi. Soil pH

Response: The suggested parameters (with laboratory methods noted) have been added to the analyte list for the upgradient well boring soil samples. The physical parameter data set collected during this task will also be supplemented with soil samples collected across the Eastside portion of the Site for physical parameter analyses during field work for the Eastside aquifer testing (Revised Aquifer Testing Work Plan, BMI Common Area Eastside, Henderson, NV, January 9, 2007).

b. It is not clear to the NDEP why soil chemical data would not also be collected as part of the installation of these monitoring wells. This chemical data may provide valuable insight into potential impacts to the soil column.

Response: The SRC list and previous investigation data have been reviewed to develop an analyte list for additional sampling to evaluate potential impacts at the background soil and upgradient well locations. The additional sampling is presented in Section 2.3 of the revised work plan.

c. The NDEP requests that broad suite analyses be conducted in these upgradient wells during the next available quarterly sampling event. It is the belief of the NDEP that this information will provide valuable insight into Site-related and/or off-Site impacts at the Site.

Response: The new wells will be added to the next available round of groundwater sampling at the Site.

5. Section 1.2.1, pages 4 through 8, the NDEP has the following comments:
    a. Page 4, last paragraph, please consider the following additional physical parameters for analyses:
        i. Dry bulk density
        ii. Specific gravity
        iii. Moisture content (specify basis volumetric versus gravimetric)
        iv. Particle size analysis including fraction less than 200 mesh

Response: The text in Section 1.1 (Purpose) and Section 1.2.1 (Geologic Setting, Soils) has been revised to state that physical parameter analyses will be conducted on soil samples collected from well borings, and a specific list of analyses and methods has been included in Section 2.3. As discussed in the response to Comment 4a above, the requested additional physical parameters have also been added to the analyte list for soil samples collected from well borings.

6. Section 2.1.1, page 12, please note that the NDEP does not concur with the characteristics that BRC has presented regarding the upgradient sampling locations. It is the belief of the NDEP that BRC has not provided adequate justification in this document or others to substantiate these claims.

Response: Regarding Section 2.1.2, page 12: Currently available potentiometric surface data indicate that the direction of shallow and deep groundwater flow in the vicinity of the Eastside Area is broadly directed northerly, and regionally, groundwater flow is directed northerly to the Las Vegas Wash. As a result, upgradient wells have been located along the southern property boundary and wells would not be appropriately located on the northern property boundary. The text in this section has been revised to indicate that the locations are currently located hydraulically upgradient as interpreted by BRC based on currently available data. The word "future" has also been eliminated from the text for clarity.

7. Section 2.2.1, pages 13 and 14, BRC should specify the method to be used to determine vertical hydraulic conductivity. Also, please note that the NDEP does not believe that an unconsolidated soil sample can be "subsampled" successfully for horizontal hydraulic conductivity testing. If an objective of this work plan is to determine horizontal hydraulic conductivity then either an aquifer test or slug test should be conducted.

Response: Horizontal hydraulic conductivity (Kh) analyses have been omitted from this work plan. Kh analyses calculated from the upcoming aquifer testing tasks will be supplemented with laboratory vertical hydraulic conductivity (Kv) analyses from soil cores collected during drilling for the aquifer test. An estimate of anisostropy will be calculated by the ratio of Kh/Kv.

8. Section 2.2.2, page 14, please verify if the saturated thickness to be screened will include the applicable portions of the upper portion of the Muddy Creek Formation (MCF). It is likely that the locations selected may only be saturated in the MCF.

Response: As discussed in the revised work plan Section 2.2.2, the new wells will be designed to be comparable to existing wells at the Site and screened in the first water-bearing zone encountered during well drilling. The first-encountered water-bearing zone may be in the alluvial aquifer (Aa) or in the upper Tertiary Muddy Creek formation (TMCf) or both.

9. Section 2.3.1, page 15, the NDEP has the following comments:
    a. It maybe useful to complete analyses for organic compounds (e.g.: VOCs, SVOCs, pesticides, etc.) to determine if the selected background locations have been impacted by Site or off-Site operations.

Response: The SRC list and previous investigation data have been reviewed to develop an analyte list for additional sampling to evaluate potential impacts at the background soil and upgradient well locations. The additional sampling is presented in revised work plan Section 2.3. Although Lindane (gamma BHC) may have been widely applied in the off-site area as a pesticide, it is detected relatively frequently in Site soil samples and is considered to be a usable indicator of potential site-related impacts.

    b. Soil texture analysis is listed in this Section but is not listed in Table 2. Please clarify if by soil texture BRC means grain size analysis, if so, BRC should list methods to be employed. In addition, BRC should consider the following analyses:
        i. Dry bulk density
        ii. Specific gravity

iii. Moisture content (specify basis volumetric versus gravimetric)
iv. Percent organic matter
v. Particle size analysis including fraction less than 200 mesh
vi. Soil pH

Response: The revised work plan text (Section 2.3.1) and Table 2 specify the list of physical parameter analyses and the associated laboratory methods for both types of soil samples (deep background soil and upgradient well boring) that will be collected during field implementation of this work plan. The additional physical parameter analyses have been included (for both types of soil samples) as suggested. The term soil texture refers to grain size analysis, as clarified in the revised work plan.

10. Section 2.3.2, page 16, as discussed previously, the NDEP does not concur with the timing of the analysis for groundwater samples.

Response: The new upgradient wells will be added to the next round of groundwater sampling at the Site (see NDEP Comment 4c and Response to NDEP comment 4c).

11. Section 3.1.2, page 17, second paragraph, first sentence states, "The project objectives, as stated in Section 1.1, and the sampling design, as stated in Section 2.1, will be reviewed." After examining the first several sentences of section 2.1.1, it is not clear exactly why a stratified sampling design is useful in the context of the work presented here. The statements made about the impact of stratification on the variance of overall population parameter estimates are true (if there are strata differences); however, we would like to emphasize that in order to obtain these benefits, the specific formulae for analyzing data from stratified designs need to be used. Additionally, if these data are to be analyzed as if they come from a stratified sampling design, it needs to be stated what additional benefit this provides in the context of the work presented here (i.e. beyond a potential reduction in the variance of estimators of population parameters). Additional benefits could include potentially being able to compare data from these different soil strata, or simply ensuring some representation of the different strata to cover the range of likely concentrations that might be observed in the subsurface. In the former case, some objectives need to be stated (comparison of concentrations between strata), whereas, in the latter some explanation on those lines would be helpful.

Response: It is suspected that each soil map unit may have unique characteristics. As stated above (latter case), the goal of the "stratified" design, i.e. selecting samples across several map units that are present on the Site and off-Site, is to ensure some representation of the different map units and the range of likely concentrations that might be observed in the subsurface within each map unit.

If the datasets are analyzed as stratified datasets, the appropriate formulae will be utilized. Work plan Section 2.1.1 has been revised to clarify this point with regard to the discussion of "stratified" sampling design.

12. Section 3.1.2, page 17, second paragraph, second sentence states, "The goal of this data evaluation step is to develop and present an estimate of the range of the chemical analytic parameters of interest for the background sampling locations, as stated in Section 2.3." The goal of this step is not to

develop and present an estimate of the range of the data. It is not clear that the data are evaluated in this step.

Response: The text has been revised to omit the reference to Section 2.3 in Section 3.1.2.

13. Section 3.1.2, page 18, BRC states that statistical tests identical to those performed in the BRC/TIMET Background Report will be used. Some clarification is needed. Some of these tests might be identical in the sense that in both cases, for example, a t-test is used. However, using the term "identical" here seems inappropriate. Perhaps use "The same set (or suite) of statistical tests will be used" instead. In addition, reference is made later to ANOVA and Kruskal-Wallis tests. It is not clear in which context these tests will be used. It seems that the objectives are to compare data from the Qa1 and TMCf formations, meaning 2-sample tests that can be handled with t-tests, Wilcoxon tests and the tail tests. If other comparisons are envisioned it would be helpful to know (for example, perhaps data from the 3 different soil-type areas will be compared).

Response: The text has been revised to clarify that the same suite of statistical tests will be utilized. Statistical comparisons will be completed between Qal and TMCf datasets, as well as between soil map units, as appropriate.

14. Section 3.1.2, page 18, BRC states that the data will qualitatively be compared to the Environ data set. It is anticipated that the Environ data set will be combined with the BRC/TIMET data set, therefore, this statement may not be necessary.

Response: This statement has been edited to clarify the comparison as suggested.

15. Section 3.1.2, page 18, last sentence states, "Reduced evaluation and reporting, as appropriate, will be conducted for chemical analytes that are not detected in significant portions of the samples collected." Please note that identical quantitative analyses should be presented regardless of detection frequency.

Response: As suggested, the revised work plan has been edited to clarify that detection frequency will not be utilized to determine if quantitative analyses will be conducted with the dataset; identical analyses will be conducted on each chemical analyte.

16. Section 3.1.2, page 19, second sentence states, "Statistical testing will be conducted to test this expectation." This should be changed to "Statistical hypothesis testing will be conducted to quantify the statistical significance of observed differences in relevant population parameters (e.g. mean, median) from background samples collected in the Qal versus samples collected in the TMCf.

Response: The revised text has been edited as suggested.

17. Section 3.1.2, page 19, BRC states that data sets may be combined. The specific combinations that may be anticipated should be discussed.

Response: If any two datasets are statistically indistinguishable, the datasets may be combined. This applies to Qal and TMCf datasets and data from each soil map unit. The revised work plan text has been edited to clarify this point.

18. Section 3.1.2, page 19 second paragraph, first sentence states, "Tests that will be used to compare the various data sets for this investigation include the Wilcoxon Rank Sum (WRS) test (also known as the Mann-Whitney U test), which is a nonparametric test; the t-test, which assumes data are normally distributed and have equal variance; and the Slippage and Quantile tests." Please note that the t-test can accommodate inequality of the variances through the estimation of a pooled variance and corresponding modification of the degrees of freedom. This is the Welsh modification of the t-test.

Response: Comment noted.

19. Section 4.2, pages 21 and 22, it is suggested that the following soil physical parameters also be collected:
    a. Dry bulk density
    b. Specific gravity
    c. Moisture content (specify basis volumetric versus gravimetric)
    d. Percent organic matter
    e. Particle size analysis including fraction less than 200 mesh
    f. Soil pH

Response: The additional physical parameters have been added as suggested (for both deep background soil samples and for well boring samples). See responses to Comments 4 and 5 above.

20. Figure 2, the NDEP has the following comments:
    a. It is not clear to the NDEP why BRC has located the proposed borings in close proximity to Site operations. It would seem prudent to attempt to locate these samples in proximity to the shallow background soil samples. There are areas in both locations which can provide easy access (e.g.: City right-of-ways and streets). It is requested that BRC consider relocating many of these samples to locations closer to the shallow background soil samples.

Response: The deep background soil sample locations were originally located, in part, because boring log data indicate that the thickness of the Qal thins upslope along the longitudinal axis of the alluvial fan in the area. As a result, the deep background sample data set would likely consist mainly of TMCf data, when deep Qa data are also needed for Site-to-background comparisons. In addition, the locations were selected to represent the soil map units interpreted to be present both off-Site and on the Site, as depicted on Figure 2. For example, samples were not located in soil map unit 187 because this unit is not interpreted to be present at the Site.

BRC has no record of Site-related operations in the off-Site areas where borings have been selected. The sample location (as originally proposed) closest to the Site is approximately 700 feet from the BRC property line. However, BRC agrees that some samples could be located farther from Site operations but still within the appropriate soil map units. The new sample locations are shown on revised Figure 2.

b. It is not clear to the NDEP that the selected locations will interface with the first fine grained facies (fg1) of the Muddy Creek Formation (MCF). Please discuss how any chemical differences between the fg1 MCF and the first coarse grained facies (cg1) of the MCF will be addressed going forward. Please discuss if BRC has attempted to locate off-Site fg1MCF locations that would be applicable to this investigation.

Response: Lithologic logging will be conducted during drilling, and the presence of fg1 and cg1 will be noted accordingly. Off-Site boring logs that can be used to determine where fg1 and/or cg1 will be encountered at the proposed soil boring locations are not available.

21. Table 2, please discuss how this table relates to the site-related chemical (SRC) list. Specifically, please identify any SRCs that are excluded from the chemical classes that are proposed for analyses.

Response: Table 2 has been revised to show the entire SRC list, the analytes selected for this work plan, and the objectives and rationale used in the selection of analytes.

a. RTC 4.d.ii, it is not clear to the NDEP how the discussion relating to the analytical mounding calculations are "unnecessary". If the "upgradient" wells have been impacted by historic Site operations that is important to discuss. Also, this knowledge would assist BRC in determining an appropriate suite of chemicals to be addressed. Since BRC has chosen to exclude this discussion and thought process the NDEP has requested broad suite analyses based upon a review of the analytical mounding calculations. In addition, the understanding and discussion of the analytical mounding calculations will certainly affect the interpretation of the results.

Response: BRC recognizes that these wells are located where historical mounding may have occurred. However, it is considered appropriate based on current data that these locations can be used for upgradient data (see also Response to Comment 6).

The SRC list and previous investigation data have been reviewed to develop an analyte list for additional sampling to evaluate potential impacts, such as from mounding, at the well locations. The additional sampling is presented in revised work plan Section 2.3.

b. RTC 4.d.iii, the NDEP disagrees with BRC's response for similar reasons as listed for the response to RTC 4.d.ii. The "upgradient" wells are located on property which was historically part of the BMI Complex and is currently referred to as Parcel 4A and 4B. These Parcels are subject to additional investigation and it is not clear to the NDEP how this discussion is "unnecessary" when BRC is attempting to present these locations as "upgradient" of Site influence.

Response: BRC recognizes that the proposed wells are located on parcels that have been or are now part of the BMI complex; however, the wells are located along the upgradient property perimeter as based on BRC's interpretation of currently available data. See also Comment 6 and the Response to Comment 6.

c. RTC 4.d.v, BRC's responses is not responsive to the NDEP's original comment. Please re-read the comment and respond explicitly.

<u>Original NDEP comment</u>: It is suggested that BRC investigate the possibility of installing upgradient wells in some of the locations that are being proposed for background soils investigations.

Response: Based on current data, it is considered premature to install additional monitoring wells at this time. The hydrogeologic and analytical data collected from the background soil sample locations may be used later to best locate and design additional wells. Also, BRC is aware of additional well installation efforts associated with adjacent plants that may be useful for this effort. The data from those adjacent plants will be evaluated and used as appropriate and where possible before additional wells are installed.

Appendix A3

November 9, 2006 Comments

Appendix A
Response to Comments Provided in NDEP Letter dated November 9, 2006

1. General comment, it is not clear to the NDEP that the DQO process is being used appropriately in this work plan. If the DQO process is not going to be used appropriately the DQO language should be removed from the document. If BRC desires to use the DQO process (please note that the NDEP supports this), comments are provided below. Additional discussion on this matter is likely necessary.
   a. For example, the DQO process steps do not appear to adequately match what is proposed, the intent of what is proposed, or why it is proposed.

Response: *The DQO section has been deleted.*

   b. Please note that USEPA's latest version of the DQO process guidance (Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA/240/B-06/00, February 2006) does not require use of the classical hypothesis testing framework for sample size calculations, which also involves specification of decision error tolerances, etc. It requires use of this framework only if the decision context is clear (and dichotomous). If the decision context is not clear, then this revised guidance document offers more flexibility in systematic planning for data collection. In particular, for this current project, for which the exact nature of the decision context is not known (i.e., exactly which statistical procedures might apply to the data are not known), it makes more sense to appeal to the updated version of the DQO process as specified by the USEPA and to document clearly what data are being collected, and why, and not try to force-fit a statistical framework for the sample size calculations. In the guidance document the goal can be estimation or basic description (characterization in this case), which appears to make more sense.

Response: *NDEP's comments are acknowledged and appreciated.*

2. General comment, please note that the NDEP believes that the work plan does not adequately reference BRC's approved SOPs for implementation. It is suggested that BRC list the SOPs that will be used and incorporate these via reference to the approved document.

Response: *The document has been revised to reference the appropriate SOPs.*

3. Section 1.0, page 1, the first paragraph suggests that this Work Plan is about subsurface soil data collection only. The last paragraph in the Introduction section then indicates that "In addition, …" some upgradient wells will also be sampled. The point is that there are two very different objectives presented in the same Work Plan, but one objective (subsurface soil) is often addressed in more detail than the other objective. These two objectives need to be better separated, but the text also needs to address them equally. For example, the first sentence should address both aspects of this Work Plan, not just the subsurface soil data

collection. This is an issue that exists throughout the document and should be addressed in the remainder of the sections.

Response: *Comment acknowledged. The document has been revised as requested.*

4. Section 1.1, pages 1 and 2, the NDEP has the following comments:
   a. Page 1, the discussion concerning the number of samples at the bottom of Page 1 is not well presented and the NDEP cannot verify that the work has been completed as described. The NDEP suggests deleting the sentence, or moving it to a section that does address sample size calculations in the context of the DQO process, if the classical DQO process will be used.

Response: *The sentence has been removed and the DQO section has been deleted.*

   b. Page 2, Please clarify in the bullets the type of data (chemical, physical, etc.) to be collected.

Response: *The work plan has been modified to clarify the type of data to be collected.*

   c. Page 2, please note that the statistical methods detailed in TetraTech and MWH, 2006 may, or may not, apply to this investigation. For example, it would seem very reasonable for borehole data to use different graphical presentations. There will be a need to explore the subsurface soil data for population differences (e.g.: alluvium versus Muddy Creek Formation). This issue was not necessary in the cited report, although the hypothesis testing procedures might be similar. In addition, it seems doubtful that the same methods will be used on the groundwater data as for soils data. It would be better to explain the statistical analyses or comparisons that are expected to be performed on these data (both the subsurface soil and the groundwater). Specification of statistical methods is not necessary, but a general presentation of the methods is needed (e.g., which populations will be compared, which parameters will be estimated, etc.). Some of this appears in the following bullets, but the context is different – the context is what data will be collected rather than which questions will be answered. The DQO process requires that objectives are fully identified, including presenting the questions that will be answered. This should be accomplished with DQO Steps 1 and 2.

Response: *The work plan has been modified to present a more detailed discussion of the methods as requested.*

   d. BRC states that the study will provide information needed for Site-to-background comparisons. One of the criteria listed is "Data to establish background water quality within the alluvial aquifer upgradient of the Eastside portion of the Site." The NDEP has the following comments:
      i. Based upon a review of Figure 2, the NDEP does not believe that the locations selected will be representative of "background water quality within the alluvial

aquifer upgradient of the Eastside portion of the Site". BRC does not provide adequate justification for the selection of these locations.

Response: *The word "background" has been replaced by the word "upgradient." Rationale for selection of the well locations has been provided.*

ii. Please discuss how the selected locations relate to the analytical mounding calculations performed. It appears to the NDEP that these locations are within the boundary of the historic mound.

Response: *With reference to the proposed groundwater monitoring wells, the word "background" has been replaced by the word "upgradient." Rationale for selection of the well locations and the intended use of the resulting data has been provided. In light of the response to 4.d.i above, the discussion relative to the analytic mounding calculations appears unnecessary.*

iii. Please discuss how the selected locations relate to historic ownership of the property that the wells are located on. It is the understanding of the NDEP that all wells presented on Figure 2 are located on land currently or historically owner by BMI. These areas may have been impacted by historic BMI operations.

Response: *With reference to the proposed groundwater monitoring wells, the word "background" has been replaced by the word "upgradient." Rationale for selection of the well locations and the intended use of the resulting data has been provided. In light of the response to 4.d.i above, the requested discussion appears unnecessary.*

iv. Some wells are located in areas that are known to be impacted. It is not clear how this will provide data that will be representative of "background water quality within the alluvial aquifer upgradient of the Eastside portion of the Site".

Response: *See response to comment number 4.d.i above.*

v. It is suggested that BRC investigate the possibility of installing upgradient wells in some of the locations that are being proposed for background soils investigations.

Response: *Comment acknowledged. See response to comment number 4.d.i above.*

e. BRC states that the study will provide information needed for Site-to-background comparisons. One of the criteria listed is "Data for a representative range of soil units applicable to the Site (e.g., NRCS mapped Soil units 117, 182, 184 and 615)."
   i. As an aside, NRCS was not previously defined in this document; all abbreviations should defined prior to their first use.

Response: *The definitions have been inserted into the revised work plan.*

ii. Section 1.3, pages 4 and 5, BRC discusses naturally occurring soil types in the vicinity of the Site in relation to a 1977 Nevada Bureau of Mines and Geology map. Soil types 184, 187, 182, 112 and 117 are listed. It is not clear why this list does not match the list presented in Section 1.1. Please rectify this discrepancy.

Response: *The discrepancy has been reconciled in the revised work plan.*

iii. Section 1.3, pages 5 and 6, BRC then references a 2004 USDA Soil Survey Geographic database and lists three soil types of interest (soil types 117, 182 and 184). This does not match either previous listing in the document.

Response: *The discrepancy has been reconciled in the revised work plan.*

iv. BRC provides no justification for why the 2004 figure was found to be more suitable than the 1977 figure. No justification was provided for similarities in soil chemistry for units 112 and 117 or units 184 and 187. This should be made explicitly clear. The only statement provided in the subject document was that in reference to units 184 and 187, unit 187 is described as being similar to unit 184 "except that it is "extremely cobbly" sandy loam." BRC should discuss how this relates to soil chemistry.

Response: *BRC has provided the requested discussion, along with a discussion of the relevance of the Natural Resources Conservation Service (NRCS) mapping unit delineation system. A discussion of soil chemistry issues has been added.*

5. Section 1.2, NDEP suggests that this Section be removed as it does not add value to the work plan.

Response: *The section has been removed.*

6. Section 1.3, the description of the location and geologic setting is adequate, but is not presented in the context of the problems at the site, or, in the context of the conceptual site model. The reason this is important is so that the NDEP can get a better sense of where background locations are, both for the background subsurface soils sampling campaign and for the reference groundwater sampling campaign. Some details should be added to demonstrate why the selected borehole and well locations are appropriate, and hence to support the discussion in Section 2.

Response: *The requested discussion has been included in the revised work plan.*

7. Section 2.1, pages 7 and 8, the NDEP has the following comments:
   a. As noted above it appears that some of the proposed background locations may be located in areas that have been affected by historical use of the Site. Please review these

locations with respect to the analytical groundwater mounding calculations. Please discuss this issue in the revised work plan and relocate sample locations as necessary.

Response: *With reference to the proposed groundwater monitoring wells, the word "background" has been replaced by the word "upgradient." Rationale for selection of the well locations and the intended use of the resulting data has been provided. In light of the response to 4.d.i above, the requested discussion appears unnecessary.*

b. Page 7, second paragraph, last sentence. It is not clear how the number of samples was obtained. The DQO process requires some explanation of how this number was derived. Note that there is more flexibility in the new DQO process guidance for how the sample size can be specified.

Response: *A discussion of the adequacy of the number of samples has been added to the revised work plan in Section 2.1.1.*

c. Page 8, middle paragraph, these samples and their locations need to be developed through the DQO process.

Response: *As requested in Comment No. 5, reference to the DQO process has been eliminated. However, the requested discussion of the logic and planning of the soil sample location and depth selection process has been provided.*

8. Sections 2.2.1 and 2.2.2, pages 9 through 11, the methodology in these sections should be consistent with the SOPs developed by BRC and approved by the NDEP. It is suggested that BRC explicitly reference and list the approved SOPs and eliminate the remainder of the text in these sections.

Response: *The work plan has been revised as requested.*

9. Section 2.3, pages 11 and 12, the NDEP has the following comments:
   a. BRC does not specify the analyses that will be completed. BRC states "a full suite of metals, anions…perchlorate, and radionuclides." will be completed. It is necessary to include a table that lists the specific analytes and methods to be used. BRC should discuss how this relates to the list of site-related chemicals for the classes of chemicals that are proposed to be analyzed.

Response: *A table that lists the specific analytes and methods to be used has been added to the work plan. A discussion of how this relates to the list of site-related chemicals has also been added.*

   b. This section does not address data quality needs in terms of background comparisons that will be performed in the future. Specifically, the sampling and analysis methods must be similar between background and site data collection efforts per USEPA's comparability criteria. This section should address data comparability. The methods should be the same, preferably the labs would be the same but that may not be possible, and the basis for detection limits should be the same.

Response: *The work plan text has been revised to address data comparability as requested. See Section 1.2.1*

c. This section addresses subsurface soils to a greater extent than it does groundwater. For example, BRC does not list the analytical suites and analytes for the groundwater samples.

Response: *This work plan does not propose work to collect groundwater samples. The text of the work plan has been modified to clarify that fact.*

10. Section 2.4, page 12, the section is termed QA/QC samples, but all references in the main paragraph are to QC samples. No explanation of the difference between QA and QC is provided. A reference is provided to BRC's QAPP and that is all that is required. The content of this section should be significantly reduced.

Response: *The content of this section has been reduced and referenced as requested.*

11. Section 3.1, page 13, the NDEP has the following comments:

a. It is requested that BRC specifically perform the following analyses as part of Data Review: anion-cation balance; comparison of measured TDS versus calculated TDS; and a comparison of measured TDS to the EC ratio. These quality checks are all listed in Standard Methods for the Examination of Water and Wastewater. The laboratory may complete these checks, however, it is requested that BRC verify and discuss this issue in the reporting.

Response: *This work plan does not propose work to collect groundwater samples or evaluate groundwater chemical data. The text of the workplan has been modified to clarify that fact.*

b. It is requested that BRC reference EPA's DQA guidance (Data Quality Assessment: A Reviewer's Guide, EPA/240/B-06/002, February 2006 and Data Quality Assessment: Statistical Tools for Practitioners, EPA/240/B-06/003, February 2006) rather than EPA's DQO guidance for DQA activities. Note also that the reference to EPA's DQO process is out of date. The 5 steps cited should be reviewed to make sure they are consistent with the latest guidance. Some discussion associated with each step would also be helpful. For example, what type of data review will be performed (which graphics, for example), what types of tests will be performed, etc.

Response: *The references have been utilized and cited as requested in the work plan. Though reference to the DQO process has been eliminated, the suggested materials have been reviewed as suggested. Discussion has been added to the work plan describing the logic and planning of the data collection and statistical evaluation.*

12. Section 3.2, pages 13 and 14, the NDEP has the following comments:

a. BRC should

Response: *It has been noted in the work plan that once the data are collected it may be necessary to discuss statistical evaluation of the data with the NDEP.*

b. This section is incomplete as it only describes some aspects of the approach that will be taken for subsurface soils. There is no discussion about the groundwater data that is also the subject of this Work Plan.

Response: *This work plan does not propose work to collect groundwater samples or evaluate groundwater chemical data. The text of the work plan has been modified to clarify that fact.*

c. In general, the discussion in this section should correspond to the presentation in Table 1.

Response: *Table 1 has been deleted from the report as suggested in Comment No. 15.*

d. General comment, DQA and statistical analysis of environmental data are essentially synonymous. That is, EPA's DQA guidance basically describes the types of statistical methods that can be used on environmental data. It is suggested that the DQA discussion be moved into Section 3.2 and Sections 3.1 and 3.2 should be re-titled.

Response: *Movement of the DQA discussion to the indicated section has been accomplished into the revised work plan. Though the acronym DQA was not incorporated into the title, DQA guidance and procedures were consulted, followed, and referenced in the work plan.*

e. The paragraph on outliers is too detailed compared to the rest of the document. It seems out of place given the comparatively little technical detail provided for other statistical aspects of planning for data collection.

Response: *Additional technical detail has been provided throughout the work plan and in this section for other statistical aspects of this workplan.*

f. Page 13, second full paragraph, second sentence. The statistical tests to be applied need to be presented and their application briefly discussed as part of the DQO process.

Response: *The work plan has been revised to discuss the statistical tests to be applied and their application.*

g. Page 13, second full paragraph, third sentence. It needs to be stated here that these tests will be performed on a per analyte basis. Please clarify if this is what is intended.

Response: *The work plan text has been revised to indicate that the statistical tests will be applied on a per analyte basis.*

h. Page 14, 1st full paragraph, this paragraph implies that some sample size calculations were performed pursuant to specification of numeric DQOs (reference to confidence and power goals). This is not evident in Table 1 as suggested. Not only are there no numerical inputs to the DQO process, but no statistical tests are referenced, without which sample size calculations cannot be performed.

Response: *This section of the work plan has been revised to discuss the validity of the number of proposed samples to be collected.*

13. Section 4, page 16, it is suggested that BRC initiate the access agreement process as soon as possible and concurrent with the revision of this document.

Response: *Comment acknowledged.*

14. Figure 2, the NDEP has the following comments:
    a. This figure contains no reference other than "Fall 2005 Aerial", all figures should appropriately reference source data. In this case the figure should reference the 2004 USDA document discussed above.

Response: *The figure has been revised as requested.*

b. It would be helpful if the shallow soil background locations were presented on this figure.

Response: *Figure 2 has been revised to illustrate the locations of the shallow soil background locations.*

c. Soil types seem to be represented on this Figure, but they are not easy to discern. It would be helpful if the locations were related to the conceptual site model. This would help the NDEP evaluate the appropriateness of the suggested locations. Figures that present the sample locations matched to relevant conceptual site model aspects would be helpful.

Response: *A discussion referencing the conceptual site model has been added to the work plan.*

15. Table 1, NDEP suggests that this Table be removed from the revised work plan, unless the DQO process is going to be completed appropriately. If the table is to be retained the NDEP offers the following comments:
    a. The DQOs are described in this Table, but reference and cross-reference in the text is inadequate. The main text describing the DQO process steps should match what is in this Table. In many cases it does not. For example, there are no statistical calculations for sample size.

Response: *The table has been removed from the work plan as suggested.*

b. Identify the decisions – Item (1) – the relevance is not entirely clear. How will these aspects of comparability be measured or evaluated? How will the comparability decisions be made? Note also that comparability goes beyond these geologic issues, and includes sampling and analysis issues as well. The sampling and analysis procedures across studies need to be similar.

Response: *See response to comment 15.a. above.*

c. Identify the decisions – Item (4) – this does not seem necessary in this document. Data are not being collected with this purpose in mind at this time. A clearer distinction should be made between the direct purpose of this project (background characterization) and other potential uses of the data (background comparisons). A similar comment applies under DQO Steps 4 and 5.

Response: *See response to comment 15.a. above.*

d. Specify Tolerable Limits on Errors, as specified this step is a repeat of Step 5. There is no information in here that is related to tolerable limits on decision errors. The null hypothesis belongs in DQO Step 5. Step 6 is about specification of tolerable decision errors if the full DQO process is applied. Since statistical sample size calculations do not appear to be intended in this study, it would be reasonable instead to describe any budgetary constraints on sample collection. Then Step 7 can finish the process by indicating how many samples are likely to be collected. Issues such as locations of the samples could also be addressed here, along with statistical issues such as independence, random allocation of sample locations, or spatial correlation.

Response: *See response to comment 15.a. above.*

e. DQA is not part of the DQO process, in which case the DQA language in Step 7 should be removed. The DQA process should be addressed in a separate table that is not titled DQO steps.

Response: *See response to comment 15.a. above.*

f. Table 1 covers subsurface soils only. It does not cover collection of groundwater data. Collection of upgradient groundwater data is also a subject of this Work Plan, but the purpose, objectives, and statistical design have not been addressed in a DQO context.

Response: *See response to comment 15.a. above.*