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July 11, 2022 Project No. 14-01-156

Alan Pineda, PE
Professional Engineer
Bureau of Industrial Site Cleanup
Nevada Division of Environmental Protection
375 E. Warm Springs Rd., Ste. 200
Las Vegas, NV 89119

Re: Screening Level Human Health Risk Assessment, Revision 1
Three Kids Mine, Henderson, Nevada

Dear Mr. Pineda,

Broadbent & Associates, Inc. (Broadbent) is pleased to submit this technical memorandum regarding a *Screening Level Human Health Risk Assessment, Revision 1* (SLHHRA) for the downwind portion of the River Mountain volcanics near the Three Kids Mine located in Henderson, Nevada. This technical memorandum serves as the request for a No Further Action Determination for the parcel described herein.

Please do not hesitate to contact us if you should have any questions or require additional information.

Sincerely,
BROADBENT & ASSOCIATES, INC.

Kirk Stowers, CEM
Principal Geologist

cc: JD Dotchin, NDEP
James Carlton Parker, NDEP
Joe McGinley, McGinley & Associates, Inc.
Caitlin Jelle, McGinley & Associates, Inc.
Ann Verwiel, ToxStrategies
Robert Unger, Lakemoor Ventures LLC
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Leo Drozdoff, Drozdoff Group, LLC
Karen Gastineau, Broadbent & Associates, Inc.
Cynthia Cheatwood, EA Engineering
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Dennis Smith, TMSS Inc.

Screening Level Human Health Risk Assessment, Revision 1
Three Kids Mine
Henderson, Nevada

JURAT: I, Karen Gastineau, hereby certify that I am responsible for the services 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, regulation and ordinances.

Karen Gastineau
____

July 11, 2022
Date

Karen Gastineau
Senior Hydrogeologist
Certified Environmental Manager #2468 (4/1/2023)

ATTACHMENT A

Responses to NDEP Comments made on June 14, 2022

1. **Section 2 Conceptual Site Model** – While the initial paragraphs of the memo before the introduction clearly define the "area under consideration," the discussion in Section 2 is confusing and could benefit from clearer language. Section 2 describes the "area under consideration" and the Site in a way that suggests the "area under consideration" is separate from the Site. Section 5 states that "the SLHHRA evaluated a residential exposure scenario to account for soil within the area [under consideration] that may be used as fill for future re-development of the Site." This may be helpful in clarifying the conceptual site model.

   The "area under consideration" is not part of the former mine site but has been evaluated for potential impacts because it is downwind of the former mine site. The SLHHRA includes the downwind area as well as a portion of the River Mountain volcanics background area that included several samples identified as outliers. Discussion of the former mine site, the area under consideration, and the project area as a whole were clarified in the text.

2. **Section 3.1 Criterion I: Reports to Risk Assessor** – This section states that "a description of sampling design and procedures is included in the approved Phase II SAP (Broadbent, 2021)." The SAP is cited as the source of information for sampling methods; however, that represents how samples were proposed to be collected. The citation should be for documentation that sample collection was completed as proposed. For example, Section 3.3 states that "the samples were collected in accordance with the SOPs presented in the Phase II SAP (Broadbent, 2021)." Since the samples were collected as part of the background sampling effort, perhaps it would make sense to additionally cite the NDEP-approved *Background Soil Report, Revision 2* as the document which confirms that the samples evaluated in the SLHHRA were collected in accordance with the Phase II SAP.

   A reference to the *Background Soil Report, Revision 2* was added.

3. **Section 3.4 Criterion IV: Analytical Methods and Detection Limits** – This section states that "metals were analyzed via EPA Method 6020A, rather than EPA Method 6020B as specified in the Phase II SAP." Why was a different analytical method used? And what implications, if any, does this have on the analytical results? The SLHHRA should include an explanation for this deviation from the Phase II SAP.

   EPA Methods 6020A and 6020B are typically considered to be equivalent, and the analytical laboratory is certified with EPA Method 6020A. The primary reason for selecting EPA Method 6020A was to have sufficiently low reporting limits for comparison to screening levels. Additional information is provided in Section 2.4.4 (Analytical Methods and Detection Limits) of the *Background Soil Report, Revision 2*.

4. **Section 3.6 Criterion VI: DQIs** – This section states that "the DQIs include precision, accuracy, representativeness, comparability, and completeness (PARCC)." Sections 6.3.2 and 6.3.2.1 of the NDEP-approved *Phase II Sampling and Analysis Plan, Rev. 2* also identify sensitivity as a DQI. Why is sensitivity not addressed in Section 3.6 of the *Screening Level Human Health Risk Assessment*?

> A section discussing sensitivity was added to Section 3.6.

5. **Section 4.2 Determination of Exposure Point Concentration** – It is unclear why 95% UCLs were calculated using ProUCL since individual sample results and maximum values were compared to BTVs and RSLs. Also, the results are not presented in the tables. It would be more useful to attach the output that calculated the information presented in Table 2.

> Discussion about 95% UCLs and ProUCL was removed from Section 4.2. The statistics presented on Table 2 were calculated using Excel. The Excel spreadsheet that presents the information is included as Appendix A.

6. **Section 4.3 Risk Assessment Methodology**
   a. Section 4.1 states that "for non-carcinogens, the screening values are based on a hazard quotient of 0.1, to account for potential cumulative effects of multiple contaminants affecting the same target organ." Accordingly, Table 1 lists a RSL of 180 mg/kg for manganese, based on a HQ of 0.1 as indicated by Footnote 1. Section 4.3 states that "the only COPC selected for further evaluation is manganese, which only has a non-carcinogenic toxicity endpoint." However, the HQ in Section 4.3 is calculated based on a residential soil RSL of 1,800 mg/kg (which is based on a HQ of 1.0). Please explain.
   b. It should be explained that the only difference between identifying COPCs and the screening risk assessment is to use a hazard quotient of 1 rather than 0.1. This is a very simple change that is not clearly presented. For example, the following sentence could be revised as suggested to add clarity: "The risk assessment methodology used in this SLHHRA consists of a simple comparison of maximum detected concentrations to the EPA residential soil RSL '*based on a hazard quotient of 1.0, rather than the hazard quotient of 0.1 used to identify COPCs. Because the other SRCs were not identified as COPCs (i.e., maximum concentrations were below BTVs and/or RSLs based on a hazard quotient of 0.1), they would not significantly contribute to cumulative health risks.*'"

> The explanation included in part b has been included in Section 4.3 to satisfy the comment in part a.

7. **Figure 3 Investigation Units** – Figure 3 contains many undefined acronyms. Although these have been presented in previous documents, the reader should not have to refer to a previous document to understand the figures in the SLHHRA. Please consider either defining the acronyms or removing those which are not relevant to the SLHHRA.

Figure 3 (which is now Figure 2 in the revised SLHHRA) was modified to remove the investigation units. Instead, Figure 2 shows the former mine site, the area of interest, and the downwind volcanic area.

8. **Table 1 Analytical Results and Table 2 Soil Data Summary** – Footnote 1 for Tables 1 and 2 refers to the November 2021 EPA RSLs. EPA RSLs were updated in May 2022 after issuance of the SLHHRA. Although the RSL values used in this document did not change, the reference in Footnote 1 and Section 6 should be updated.

Footnote 1 in Tables 1 and 2 was updated to refer to the May 2022 RSLs.

9. **Table 2 Soil Data Summary** – It is unclear what the relevance is of the mean for the non-detect values. Also, it would seem to be more representative to include the non-detect data in the calculation of the mean and quartiles rather than just the detected values. However, since this information is not used in the analysis, the change will not affect the conclusions and is therefore recommended but not required.

The data summary was presented in this format to remain consistent with the data summary that was presented in the *Background Soil Report, Revision 2*. Typically for risk assessment statistical summaries, the mean concentration is calculated separately for the detected and non-detected results in ProUCL. Additionally, the handling of non-detect values is based upon the data distribution and statistical method used in ProUCL. Because the summary of the non-detect results is pertinent to the data quality discussion, it is recommended that data summary statistics remain as calculated.

EA Engineering, Science,
and Technology, Inc., PBC

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11 July 2022

TECHNICAL MEMORANDUM

TO: Alan Pineda, Professional Engineer

FROM: Cynthia Cheatwood, EA Risk Assessor

SUBJECT: Screening Level Human Health Risk Assessment, Revision 1
Three Kids Mine
Henderson, Nevada

On behalf of Lakemoor Ventures LLC (Lakemoor), EA Engineering, Science, and Technology, Inc., PBC (EA), as a teaming partner with Broadbent & Associates Inc. (Broadbent), has prepared this Screening Level Human Health Risk Assessment, Revision 1 (SLHHRA) for a portion of the Three Kids Mine Site (the Site) in Henderson, Nevada. Figure 1 presents the Site location. This SLHHRA has been prepared to compile and assess sample chemical data for one of the downwind portions of the Site. Figure 2 presents the location of the area evaluated in this SLHHRA. The northern section of the area under consideration includes the downwind portion of the volcanic geologic units of the Site. These geologic units were identified as Stratum 122 in the approved Phase II Sampling and Analysis Plan, Revision 2 (SAP) for site characterization dated November 3, 2021 (Broadbent, 2021). This analysis also includes samples collected from the ridge to the south of the downwind volcanic area that were identified as outliers in the River Mountain volcanics dataset (Stratum 121) during the background study. This area combined with the downwind volcanic area make up the area under consideration in this SLHHRA.

As part of the entire Three Kids Mine Site re-development, soil within this area will be used as borrow for clean cover material throughout the Site. Additionally, future development in this area is expected to include residential housing. Based on the sample results and the SLHHRA results, a No Further Action Determination (NFAD) is requested from NDEP. This determination will allow this area to support planned future development and soil for use as borrow/clean cover material.

1. Introduction

The area under consideration is part of the Three Kids Mine project area. The Site consists of approximately 1,165 acres located approximately five miles northeast of central Henderson, Nevada, along East Lake Mead Parkway (State Road 564). Figure 1 presents the Site location. From 1917 to 1961, portions of the Site were utilized for the mining of manganese. Mine and mill operations were terminated in the summer of 1961. The Site is currently undeveloped, except for Parcels 2, 3, and 4 which contain Laker Plaza and Lake Mead Boat Storage facilities (Figure 3).

Mill building foundations are still present in part or in whole at the Site, as are remnants of eight circular flotation cells used in the manganese beneficiation process. There are three major open pits on the property: the combined A and B Pits, the Hydro Pit, and the Hulin Pit. Tailings were pumped into ponds constructed in the central and western portions of the Site. The pits, waste rock, mill site, and tailings comprise the bulk of the large features visible at the present time. Based on previous investigations and visual observation and process knowledge, it is estimated that 411 of the 1,165 total acres of the Site have been negatively impacted. These 411 acres are referred to as “the disturbed area” and are comprised of the pits, overburden, mill site, and tailings.

The area under consideration that is the focus of this SLHHRA is not part of the disturbed area of the Site (Figure 2). However, the potential for airborne deposition of site-related chemicals (SRCs) from the disturbed area of the Site may have occurred in downwind, undisturbed portions of the Site, which includes the downwind volcanic area. This technical memorandum presents the findings to evaluate whether significant deposition of SRCs has affected the area under consideration. To support these findings, the following evaluations are presented:

- Conceptual site model (CSM) for the Site and area under consideration;
- Summary of analytical data evaluated, including data quality assessment;
- Comparison of analytical data to screening levels; and
- Screening-Level Human Health Risk Assessment.

2. Conceptual Site Model

The CSM presents the potential exposure populations and exposure pathways. An exposure pathway describes a mechanism by which a population or individual may be exposed to chemicals present at a site. The CSM evaluates source areas and potential land use to evaluate who may be exposed (receptors) and how (exposure pathways).

The area under consideration is located east of the former mining operations (disturbed area) of the Site. The former mine site consists of exposed surface waste rock and tailings piles. Wind transport of fines from onsite source areas has the potential to spread SRCs to areas downwind (northeast) of the former mine site. Based upon analytical results from waste rock and tailings, SRCs that may have been transported downwind include metals (antimony, arsenic, cadmium, chromium, copper, lead, manganese, selenium, and zinc) and polycyclic aromatic hydrocarbons (PAHs).

Currently, the area under consideration is undeveloped and vacant. No surface water bodies are present in this area. Soil is the only environmental medium of concern. Because the transport mechanism is wind transport, only surface soil [0 to 1 foot (ft)] is the potentially impacted medium. Soil at depth is native volcanic rock formation of the River Mountains. As a result of current conditions, trespassers are the likely current receptors. Because the area is owned by the Bureau of Land Management (BLM), recreational users (e.g., hikers and hunters) are also possible receptors. Recreational users and trespassers generally have intermittent rates of contact with the soil medium of concern. These receptors are expected to be a low frequency contact receptor and are not expected to spend extended periods of time within the area under consideration.

Lakemoor is planning to develop the Site as a mixed-use community. Anticipated land uses include residences, schools, and recreational and commercial properties. The Site plan for the development has not been finalized at this time. Therefore, the location of the planned land uses is not known. It is also anticipated that borrow material or clean fill may be excavated from the area under consideration and used throughout the development in the future. Therefore, future receptors may include residents, school users, recreational users, commercial users, landscape/maintenance workers, and construction workers. Figure 4 presents the CSM.

Although several types of receptors are possible due to the mixed-use development, the SLHHRA focuses on the resident because this receptor represents the most conservative exposure for future use. The resident typically has the highest level of exposure for the longest duration. The residential receptor also conservatively provides an evaluation for both adults and children. Additionally, the resident is represented by the most conservative screening levels. As such, the evaluation of the resident is protective of all other potential current and future receptors.

3. Data Evaluation

Analytical results evaluated in this SLHHRA were collected in May 2021. Sample locations and analytical methods were established in the Phase II SAP (Broadbent, 2021). These eight samples were identified as Stratum 122 – Volcanic Unit of Downwind Parcels 7, 8, and 17 and samples were analyzed for SRC metals and PAHs. Sample BG-122-06-01 was excluded from this analysis because it is north of Lake Mead Parkway and not in the area under consideration. Table 1 presents the analytical results. In addition to the eight samples for Stratum 122, five additional samples from the Stratum 121 – Volcanic Unit Background were also included in this SLHHRA for evaluation. These five samples (BG-121-01-01, BG-121-02-01, BG-121-06-01, BG-121-07-01, and BG-121-24-01) were identified as outliers for Stratum 121 – Volcanic Unit Background dataset. Because these sample locations were adjacent to the Stratum 122 sample locations, these samples are included in the Stratum 122 evaluation. However, they were only analyzed for metals. Figure 2 presents the location of samples evaluated as part of this evaluation.

The primary objective of the data evaluation is to ensure data are appropriate for use in the SLHHRA. The analytical data were reviewed for applicability and usability following procedures in EPA guidance (EPA, 1989 and 1992) and the NDEP's Supplemental Guidance (NDEP, 2010). Management of samples began at the time of collection and continued throughout the analytical process. Standard Operating Procedures (SOPs) were followed to ensure that samples were collected and managed properly and consistently and to optimize the likelihood that the analytical data are valid and representative. The data were evaluated, and it was determined that all results are appropriate for use in the SLHHRA. There are no rejected data associated with the dataset for the area under consideration. Therefore, the analytical results are considered adequate in terms of quality for use in a SLHHRA.

Data usability is assessed with six criteria established by EPA and NDEP. Additionally, the NDEP's Data Usability Guidance (NDEP, 2010) includes a step for data usability analysis. Sample results were validated by a third party to Stage 2B validation, except sample location BG-122-02-01. This sample was validated to Stage 4 validation. A full discussion of the data usability and data validation can be found in the NDEP approved[1] Data Validation Summary Report (DVSR) (Broadbent, 2022a). For this SLHHRA, a brief analysis of the six criteria is provided as they relate to the SLHHRA dataset. The six criteria include the following:

- Criterion I: Reports to Risk Assessor
- Criterion II: Data Sources
- Criterion III: Documentation
- Criterion IV: Analytical Methods and Detection Limits
- Criterion V: Data Review
- Criterion VI: Data Quality Indicators (DQIs)

1 Approved via NDEP letter dated March 23, 2022

3.1 Criterion I: Reports to Risk Assessor

This criterion evaluates whether appropriate data and documentation are available for the risk assessment and other planned uses. The following information components for the determination of data usability are identified:

- A Site description provided in this Technical Memorandum identifies the location and features of the Site, the characteristics of the vicinity, and contaminant transport mechanisms.
- A Site map with sampling locations is provided on Figure 2.
- A description of sampling design and procedures is included in the approved Phase II SAP (Broadbent, 2021) and approved Background Soil Report, Revision 2 (Broadbent, 2022b).
- Analytical methods and sample quantitation limits (SQLs) are included as part of the DVSR (Broadbent, 2022a).
- A narrative of qualified data is provided with each analytical data package; the laboratory provided a narrative of QA/QC procedures and results. These narratives are included as part of the DVSR (Broadbent, 2022a).
- QC results are provided by the laboratory, including blanks, replicates, and spikes. The laboratory QC results are included as part of the DVSR (Broadbent, 2022a).
- Data flags used by the laboratory are defined adequately.
- Electronic files containing the raw data made available by the laboratory are included as part of the DVSR (Broadbent, 2022a).

3.2 Criterion II: Data Sources

The review of data sources is performed to ensure analytical results and analytical techniques used in the investigation are appropriate for risk assessment purposes. The data collection activities were developed to characterize potential SRCs that may have been transported by windblown processes downwind of the impacted areas. Analytical methods used were set forth in the Phase II SAP and were established by EPA (Broadbent, 2021). Additionally, the laboratory that performed the analyses is accredited by the State of Nevada. Therefore, the analytical methods and data sources for the chemical parameters are appropriate for use in the SLHHRA.

3.3 Criterion III: Documentation Review

The documentation review ensures that each analytical result can be traced to a sample location, and the procedure(s) used to collect the environmental samples are appropriate. The samples were collected in accordance with the SOPs presented in the Phase II SAP (Broadbent, 2021). The chain-of-custody forms prepared in the field were reviewed and compared to the analytical data results provided by the laboratory to ensure completeness of the dataset as discussed in the DVSR (Broadbent, 2022a). Field procedures included documentation of sample times, dates and locations, and other sample-specific information (e.g., sample depth). This sample collection information is part of the project sample database. Figure 2 presents the location of samples collected as part of the evaluation of the area under consideration.

The laboratory reported the analytical data in a format that provides information needed for this SLHHRA. Each laboratory report describes the analytical method used, provides results and detection limits on a sample-by sample basis, and provides the results of appropriate quality control samples.

3.4 Criterion IV: Analytical Methods and Detection Limits

For a chemical result to be usable for assessing risks, the analytical method must appropriately identify the chemical, and the sample detection limit must be at or below a concentration that is associated with risk-based benchmark levels. The analytical methods were reviewed in the Phase II SAP to ensure their detection limits were at or below risk-based screening levels (Broadbent, 2021). The laboratory reports detail the EPA analytical methods used to analyze samples and the methods are documented in the laboratory reports. Metals were analyzed via EPA Method 6020A, rather than EPA Method 6020B as specified in the Phase II SAP. The primary reason for selecting EPA Method 6020A was to have sufficiently low reporting limits for comparison to screening levels. Additional information is provided in Section 2.4.4 (Analytical Methods and Detection Limits) of the Background Soil Report, Revision 2 (Broadbent, 2022b). Analytical results were reviewed to evaluate laboratory sample quantitation limits (SQLs) to ensure they are sufficient for the intended use. Table 2 presents summary statistics for detected and non-detected analytical results. Inputs and outputs for the summary statistics are provided in Appendix A. For most of the metals analytical results, the frequency of detection (FOD) is 100 percent. For all non-detect results, the SQLs are below the risk-based screening levels. None of the chemicals analyzed are considered non-detect. All chemicals are detected in at least one sample.

3.5 Criterion V: Data Review

The data review portion of the data usability process focuses primarily on the quality of the analytical data received from the laboratory. Soil sample data were subject to third-party data validation (Broadbent, 2022a). The analytical data were validated, and the results of data validation are presented in the DVSR (Broadbent, 2022a). Data qualification is summarized below. It is noted that no data are rejected.

The following data review presents a summary of the data validation codes applied to detected analytical results. A discussion of qualifiers applied to non-detected analytical results can be found in the DVSR (Broadbent, 2022a).

<u>Holding Time Exceedances</u>

Holding time refers to the period of time between sample collection and the preparation and/or analysis of the sample. Sample results were reviewed for compliance with the holding times set forth in the Phase II SAP (Broadbent, 2021). No data are qualified due to holding time exceedances (Broadbent, 2022a).

<u>Calibration</u>

Requirements for instrument calibration ensure that the instrument is capable of producing acceptable quantitative data. Review included the instrument setup, operating conditions, initial calibration verifications, and continuing calibration verifications. None of the data are qualified due to calibration issues.

Blank Contamination

Field and laboratory blanks, consisting of contaminant-free water, were prepared and analyzed as part of standard quality assurance (QA)/quality control (QC) procedures to monitor for potential contamination of field equipment, laboratory process reagents, and sample containers. Two types of laboratory blanks were prepared and analyzed: calibration and method blanks. Two types of field QC blanks were collected: equipment rinsate blanks and source water blanks. The following table presents the sample locations and chemical results that are "J" flagged due to laboratory or field blank contamination:

Field Sample ID	Analyte	PQL (mg/kg)	SQL (mg/kg)	Results (mg/kg)	Blank Value (mg/L)
Laboratory Blank Contamination					
BG-122-02-01	Zinc	25	0.741	11.4	5.07
BG-122-03-01	Arsenic	1.02	0.102	3.67	0.5778
BG-122-07-01	Arsenic	1.02	0.102	3.79	0.5778
BG-122-09-01	Arsenic	1.02	0.102	4.59	0.5778
Field Blank Contamination					
BG-122-01-01	Arsenic	1.01	0.101	3.53	0.0154
BG-122-01-01	Lead	2.02	0.1	11.5	0.031
BG-122-01-01	Manganese	2.53	0.271	190	0.427
BG-122-01-01	Zinc	25.3	0.748	106	0.0285
BG-122-01-01	Benzo(a)anthracene	0.00605	0.00175	0.00513	0.0000425
BG-122-01-01	Benzo(a)pyrene	0.00605	0.00181	0.00202	0.0000311
BG-122-01-01	Benzo(b)fluoranthene	0.00605	0.00154	0.0098	0.0000601
BG-122-01-01	Benzo(g,h,i)perylene	0.00605	0.00179	0.00884	0.0000642
BG-122-01-01	Chrysene	0.00605	0.00234	0.0166	0.0000438
BG-122-01-01	Dibenz(a,h)anthracene	0.00605	0.00174	0.00367	0.0000654
BG-122-01-01	Indeno(1,2,3-cd)pyrene	0.00605	0.00183	0.00644	0.0000621
BG-122-01-01	Phenanthrene	0.00605	0.00233	0.00406	0.0000408
BG-122-01-01	Pyrene	0.00605	0.00202	0.0106	0.0000479
BG-122-07-01	Arsenic	1.02	0.102	3.79	0.0154
BG-122-07-01	Lead	2.04	0.101	7.39	0.031
BG-122-07-01	Manganese	2.55	0.274	109	0.427
BG-122-07-01	Zinc	25.5	0.756	80.4	0.0285
BG-122-07-01	Benzo(g,h,i)perylene	0.00607	0.00179	0.0019	0.0000642
BG-122-07-01	Chrysene	0.00607	0.00235	0.00443	0.0000438
BG-122-07-01	Pyrene	0.00607	0.00202	0.00208	0.0000479
Notes: PQL = practical quantitation limit SQL = sample quantitation limit					

As a result of the blank contamination, sample analytical results are "J" (estimated) or "J+" (estimated biased high) qualified. None of the results are "J-" (estimated biased low). As a result, the SLHHRA is not expected to underestimate potential risk concerns associated with blank contamination.

Spike Samples

Two types of spike samples were analyzed to monitor for potential interferences during analysis: matrix spike (MS) and matrix spike duplicate (MSD) samples; and blank spike samples, also known as laboratory control samples (LCS). Data are qualified if either recovery in the pair failed to meet criteria. None of the detected results are qualified based upon the spike sample analysis. One non-detect result for antimony is qualified.

Surrogate Spikes

Surrogate spikes were prepared by adding compounds similar to target compounds of interest to sample aliquots and associated QC samples for organic analyses only. Surrogate spike recoveries monitor the efficiency of contaminant extraction from the sample medium into the instrument measuring system and measure possible interferences from the sample matrix that may affect the data quality of target compound results. No data are qualified or rejected based on surrogate recoveries.

Internal Standards

Internal standards were used for quantitation of SVOCs and plasma-atomic emission spectrometry/mass spectrometry by adding compounds similar to target compounds of interest to sample aliquots. Internal standards are used in the quantitation of target compounds in the sample or sample extract. No data are qualified or rejected due to internal standard recoveries.

Duplicate Samples

Duplicate samples involved the preparation and analysis of an additional aliquot of a field sample. Results from duplicate sample analysis measure laboratory precision as well as homogeneity of contaminants in the field matrix. Spiked duplicates such as MS/MSD pairs and/or LCSDs for organic analyses and metals were used to evaluate laboratory precision and provide insight into sample matrix homogeneity. At least one duplicate analysis was performed with each batch of field samples processed in the laboratory. The laboratory calculated the relative percent difference (RPD) between the two detected values for duplicate analyses. RPD values within the acceptable limits indicate both laboratory precision and minimal matrix heterogeneity of compounds detected in the samples. No samples are qualified based upon duplicate samples.

3.6 Criterion VI: DQIs

DQIs address field and analytical data quality to ensure it is appropriate for making decisions affecting activities at the Site. The DQIs address the field and analytical data quality aspects as they affect uncertainties in the data collected. The DQIs include precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS). The Phase II SAP provides the definitions and specific criteria for assessing DQIs using field and laboratory QC samples. Data validation activities included the evaluation of PARCCS parameters, and data not meeting the established PARCCS criteria are qualified during the validation process.

Completeness Evaluation

Completeness measures the amount of useable data from the data collection activity. Analytical completeness is a measure of the number of overall accepted analytical results, including estimated values, compared to the total number of analytical results requested on samples submitted for analysis after review of the analytical data. None of the data are eliminated due to data usability concerns. The percent completeness is 100 percent.

Comparability Evaluation

Comparability is a qualitative evaluation that considers the confidence with which data are considered to be equivalent. The comparability goal is achieved through using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units. SOPs were followed for sample collection. Samples were analyzed using the same laboratory methods and reported in the same units. Additionally, SQLs for each chemical are consistent for all samples.

Representativeness Evaluation

Representativeness is the extent to which data define the true risk to human health and the environment. The results of the risk assessment will be biased to the degree that the data do, or do not, reflect the chemicals and concentrations present at exposure points for each exposure area of interest (NDEP, 2010). Samples were collected from the only medium of concern (i.e., soil) at a depth that is consistent with the CSM. Additionally, the number of samples for the area were determined in the Phase II SAP (Broadbent, 2021), were analyzed for SRCs, and were randomly located to provide an overview of the area being evaluated.

Accuracy Evaluation

Accuracy measures the overestimation or underestimation of reported concentrations and is evaluated from the results of spiked samples. To measure accuracy, a standard or reference material containing a known concentration is analyzed or measured and the result is compared to the known value. Several QC parameters are used to evaluate the accuracy of reported analytical results, including:

- Calibration limits;
- LCS percent recovery;
- MS/MSD percent recovery;
- Spike sample recovery (inorganics);
- Surrogate spike recovery (organics); and
- Blank sample results.

These data quality indicators were discussed in Section 3.5 in relation to the “J” flagged sample results. No sample results are rejected based upon analytical duplicates, LCS, MS/MSD, or blank results. All results are considered sufficiently accurate for risk assessment purposes.

Data Precision Evaluation

Precision is a measure of the degree of agreement between replicate measurements of the same source or sample. Precision is expressed by RPD between replicate measurements. Precision is generally assessed using a subset of the measurements made. The precision of the data is evaluated using several laboratory QA/QC procedures, including MS/MSD samples. No sample results are qualified or rejected based upon analytical duplicates, LCS, MS/MSD results. Results are considered sufficiently accurate for risk assessment purposes.

Sensitivity Evaluation

Sensitivity refers to the capability of a method or instrument to detect a given analyte at a given concentration and reliably quantify the analyte at that concentration. Analytical results were reviewed to evaluate laboratory SQLs to ensure they are sufficient for the intended use. Table 2 presents summary statistics for detected and non-detected analytical results. For all non-detect results, the SQLs are below the risk-based screening levels.

Data Analysis

Data validation and usability evaluations address analytical data based on individual results. NDEP also requires an analysis of the dataset as a whole. The intent of this evaluation is to identify any anomalies or unusual data trends that may indicate potential laboratory issues. This evaluation is performed by reviewing summary statistics or other visual aids. The soil dataset used for the SLHHRA is summarized in Table 1. Table 2 presents a data summary for the data evaluated in this SLHHRA. No anomalies in the dataset are identified.

A review of the data qualifications reveal that data collected for evaluation in this SLHHRA are appropriate for use. No data points are qualified as a low bias result; therefore, risks determined from this dataset are not expected to be underestimated. Additionally, no data are rejected, and all data are available for use in the risk assessment.

4. Screening Level HHRA

This SLHHRA follows the risk assessment methodology set forth in EPA's Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual (RAGS; EPA, 1989). The purpose of the SLHHRA is to evaluate whether chemical concentrations in the soils in the area under consideration are either: (1) representative of background conditions; or (2) do not pose an unacceptable risk to human health and the environment under current and anticipated future use conditions.

Based upon the results of the data validation, validated results are either qualified or unqualified. Unqualified results mean that the reported values may be used as reported. Qualified results are annotated with codes as provided in the data validation report. The inclusion or exclusion of data within the HHRA on the basis of analytical qualifiers is performed in accordance with EPA guidance (EPA, 1989 and 1992). The following procedures are followed if qualifiers are present:

- Analytical results bearing the "U" and "UJ" qualifier (indicating that the analyte is not detected at the given detection limit [DL]) are retained in the dataset and considered non-detects at the given DL.

- Analytical results for analytes bearing the "J" qualifier (indicating that the reported value is estimated due to blank contamination) and "J+" (indicating the estimated concentration may be biased high) are retained at the reported concentration.

- It is noted that none of the analytical results are "R" qualified (indicating that the data are rejected due to serious deficiencies in meeting QC criteria).

4.1 Selection of Chemicals of Potential Concern

The SRCs analyzed at the Site are considered the initial chemicals of potential concern (COPCs). From this initial selection, detected chemicals are further evaluated through the use of risk-based screening levels and a comparison to background concentrations. This additional step ensures the risk assessment focuses on chemicals that may contribute the greatest to the overall risk and are site-related (EPA, 1989).

When an analyte is detected at a concentration less than its respective risk-based criteria, exposure is not expected to result in health effects or concerns, and the analyte is not considered further. Analytes detected at concentrations that exceed their respective risk-based screening level do not necessarily represent a health concern. Instead, the results of the screening identify those analytes that warrant a more detailed, site-specific evaluation to determine whether health effects may occur. Risk-based screening is conducted by comparing maximum detected analyte concentrations to risk-based screening levels. Risk-based screening levels are presented in Table 1.

The EPA Regional Screening Levels (RSLs; EPA, 2022) are the risk-based screening levels used for the initial screening to determine COPCs. The EPA RSLs combine human health toxicity values with conservative exposure scenarios to estimate analyte concentrations in environmental media that are considered by the EPA to be protective of human exposures (including sensitive populations), over a lifetime. Soil analytical results are compared to the EPA residential soil RSLs. The residential RSL scenario assumes a standard exposure of 350 days per year over a 26-year duration. This scenario accounts for both a child and adult exposure. The screening values are based on specific, conservative, fixed levels of risk. For carcinogens, this is 10^{-6}, which is the lower bound for excess lifetime potential carcinogenic risk as defined by the NCP (EPA 1990). For non-carcinogens, the screening values are based on a hazard quotient of 0.1, to account for potential cumulative effects of multiple contaminants affecting the same target organ.

Detected analytes are also compared to the background levels established for the River Mountain Unit (Stratum 121) in the NDEP approved[2] Soil Background Report, Revision 2 (Broadbent, 2022b). Concentrations of metal SRCs are quantified in the soils of the River Mountain Units that have not been impacted by the Site. Table 1 presents the background concentrations of metals. Chemicals that exceed both the risk-based screening levels and the background concentrations are considered COPCs for this SLHHRA and are evaluated further.

As shown on Table 1, manganese is the only analyte that exceeds both the risk-based screening level and the background concentration.

4.2 Determination of Exposure Point Concentration

An exposure point concentration (EPC) is a COPC-specific and media-specific concentration. In risk assessment, the EPC is the concentration of a COPC that receptors are assumed to contact over the exposure period. For this SLHHRA, the maximum detected concentration is selected as the EPC. The maximum detected concentration is selected because it represents a conservative estimate of potential exposure.

2 Approved via NDEP letter dated April 12, 2022

4.3 Risk Assessment Methodology

The risk assessment methodology used in this SLHHRA consists of a simple comparison of maximum detected concentrations to the EPA residential soil RSL based on a hazard quotient of 1.0, rather than the hazard quotient of 0.1 used to identify COPCs. Because the other SRCs were not identified as COPCs (i.e., maximum concentrations were below BTVs and/or RSLs based on a hazard quotient of 0.1), they would not significantly contribute to cumulative health risks. The only COPC selected for further evaluation is manganese, which only has a non-carcinogenic toxicity endpoint. As a result, only non-cancer hazards are calculated and cancer risks are not evaluated.

Potential non-cancer health effects are characterized by comparing the maximum measured soil concentrations to an exposure level at which no adverse health effects are expected to occur for a long-term exposure (i.e., EPA RSLs). Maximum detected soil concentrations and RSLs are compared by dividing the maximum measured soil concentration by the RSL, as shown below:

$$Hazard\ Quotient = \frac{Maximum\ Detected\ Concentration\ (\frac{mg}{kg})}{Residential\ Soil\ RSL\ (\frac{mg}{kg})}$$

Where,

Maximum detected concentration	=	637 mg/kg
Residential soil RSL	=	1,800 mg/kg (HQ = 1.0)

A HQ less than 1.0 indicates the exposure is unlikely to be associated with a potential health concern. The resulting HQ for manganese is 0.4, which is below the acceptable level of 1.0.

4.4 Uncertainty Analysis

Risk assessments provide risk estimates that have inherent uncertainties associated with them. The uncertainties are a result of assumptions made about potential receptor exposures and chemical toxicity. The risk assessment is a means of estimating potential adverse health effects (e.g., neurological effects) that may occur in a receptor as a result of exposure to a site that assists in decision making. Conservative assumptions are used in risk assessments to guard against underestimating potential risks. For instance, risk estimates are based upon a reasonable maximum exposure that may occur at a site currently or in the future. This type of exposure represents the highest exposure that is reasonably expected to occur (EPA, 1989). Risk estimates are calculated by combining site data, assumptions about individual receptor's exposures to impacted media, and toxicity data. The uncertainties in this SLHHRA are discussed below.

The SLHHRA is based on results obtained from investigations in May 2021. Errors in sampling results can arise from the field sampling methods, laboratory analyses, and data analyses. Potential errors or data quality issues for field sampling methods and laboratory analysis are discussed in Section 3.5. Potential errors associated with these two aspects are considered very low due to use of sampling SOPs, consistent analytical methods, and data validation. Soil samples are only collected from 0 to 1 ft bgs because this is the depth expected to be impacted from windblown contamination from the Site. Because soil from the area under consideration may be used as fill across the future development, soil at depths greater than 1 ft will be excavated. However, based upon the CSM (Figure 4), any soil at depth is not expected to be impacted and represents background (i.e., naturally occurring) conditions.

The use of maximum concentrations across the area under consideration is a conservative assessment that likely overestimates potential health concerns. That is, if a similar risk assessment had been performed using the 95 percent upper confidence limit on the mean (95UCLM), then the SLHHRA would produce lower risks. Because the soil located in this area may be used as borrow material for future development, the use of maximum concentration does not assess potential mixing.

Overall, the exposure assumptions (i.e., residential exposure and use of maximum detected concentration) are considered conservative. Soil from this area will likely be used as borrow material across the future development of the Site. Although a large portion will be developed as residential housing, site redevelopment will also include recreational and commercial uses that could result in exposures less than a residential receptor. As a result, uncertainty associated with any aspect of the risk assessment process is likely low and likely to result in an overestimate rather than underestimate of potential risks.

5. Summary and Conclusions

This SLHHRA evaluates potential risks to human health associated with SRCs detected in soil at the area under consideration that was potentially impacted by windblown material from the disturbed area of the Three Kids Mine Site. Screening of the soil revealed only manganese concentrations above both risk-based screening levels and background metal concentrations. The SLHHRA evaluated a residential exposure scenario to account for soil within the area that may be used as fill for future re-development of the Site. The SLHHRA found no health concerns for soil that was potentially impacted within this area under consideration. Based on the results of the SLHHRA, soil within this area does not indicate potential human health concerns and may be used as borrow material or clean fill throughout the future development. Additionally, the SLHHRA concludes and requests that the NDEP grant an NFAD for the area under consideration as shown in Figure 2.

6. References

Broadbent, 2021. Phase II Sampling and Analysis Plan, Revision 2. Three Kids Mine, Henderson, Nevada. November 3.

Broadbent, 2022a. Data Validation Summary Report, Revision 1, Reporting of Three Kids Mine Background Study Data. Three Kids Mine, Henderson, Nevada. March 21.

Broadbent, 2022b. Background Soil Report, Revision 2, Three Kids Mine, Henderson, Nevada. April 5.

EPA, 1989. Risk Assessment Guidance for Superfund (RAGS), Volume I Human Health Evaluation Manual (Part A). Interim Final, EPA/540-1-89/002. December.

EPA, 1992. Guidelines for Data Usability in Risk Assessment (Part A). Office of Solid Waste and Emergency Response, Publication OSWER9285.7-09A.

EPA, 2022. Regional Screening Levels for Superfund Sites. May. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls.

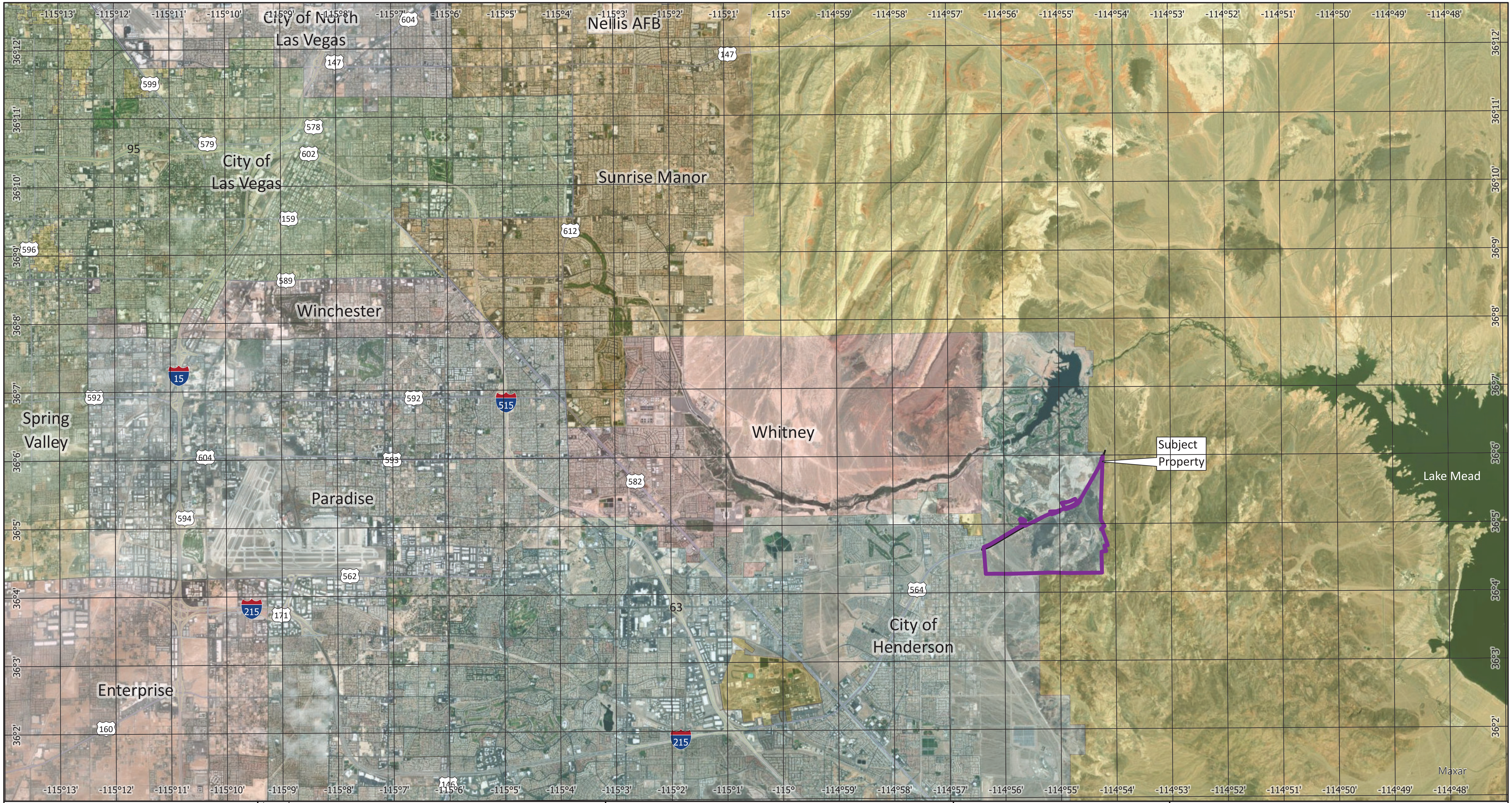
NDEP, 2010. Supplemental Guidance for Assessing Data Usability for Environmental Investigations at the BMI Complex and Common Areas in Henderson, Nevada. Bureau of Corrective Actions, Special Projects Branch. September 1.

Figures

Tables

Appendix

Figures



BROADBENT
8 West Pacific Avenue
Henderson, NV, 89015
(702) 563-0600 (P) * (702) 563-0610 (F)

Job # 14-01-156 Date: 10/7/2021

Legend:

Subject Property	Nellis AFB
City of Henderson	Paradise
City of Las Vegas	Spring Valley
City of North Las Vegas	Sunrise Manor
Unincorporated Clark County	Whitney
Enterprise	Winchester

Notes:
1. Imagery Source: Esri World Imagery
2. Datum: NAD 1983 StatePlane Nevada East FIPS 2701 Feet
3. Political Boundary Source: Clark County GIS Management Office.
4. Parcel Boundary Source: Clark County Assessor.
5. Roads Source: Nevada DOT GeoHub.
6. Geographic grid divided at every minute of latitude and longitude.

Nevada

N

1 0.5 0 1 Miles

Figure 1	
Site Location	
Three Kids Mine	
Designed	
Drawn	JCM
Approved	

Sample Location ID	Samples Collected	Total Depth Explored (ft bgs)
BG-121-01	1	Surface/Near Surface
BG-121-02	1	Surface/Near Surface
BG-121-06	1	Surface/Near Surface
BG-121-07	1	Surface/Near Surface
BG-121-24	1	Surface/Near Surface
BG-122-01	1	Surface/Near Surface
BG-122-02	1	Surface/Near Surface
BG-122-03	1	Surface/Near Surface
BG-122-04	1	Surface/Near Surface
BG-122-05	1	Surface/Near Surface
BG-122-07	1	Surface/Near Surface
BG-122-08	1	Surface/Near Surface
BG-122-09	1	Surface/Near Surface

BROADBENT

8 West Pacific Avenue
Henderson, NV, 89015
(702) 563-0600 (P) * (702) 563-0610 (F)

Job # 14-01-156 Date: 6/21/2022

Legend:
- Background Sample Location
- Area under consideration for No Further Action Determination (NFAD)
- Mine Site
- Project Area

Notes:
1. Imagery Source: Esri World Imagery (Maxar)
2. Datum: NAD 1983 StatePlane Nevada East FIPS 2701 Feet
3. Not a survey.

Nevada

N

Scale: 1:15,000

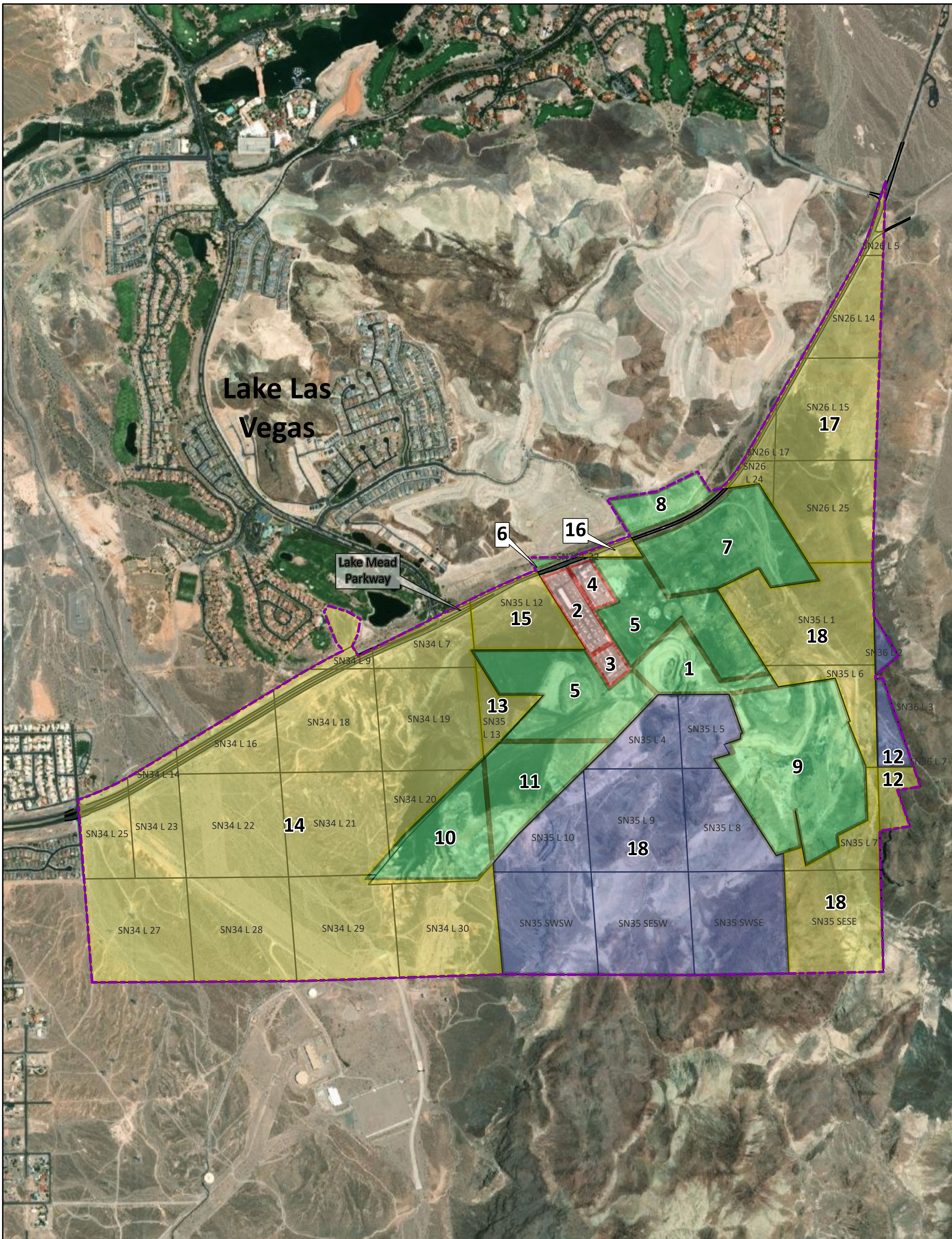
1,000 500 0 1,000 Feet

Figure 2

Downwind Volcanic Area with Sample Locations

Three Kids Mine

Designed	
Drawn	JCM
Approved	



Legend:

- Project Area
- BOR Withdrawn
- Three Kids Inc. et al. and Kings Beach Ltd.
- M&R LP and Laker Plaza Inc.
- BLM
- Public Lands Survey System (BLM, 10/29/2020)

Nevada

N

Scale: 1:15,000

1,000 500 0 1,000 Feet

Figure 3

Parcel Map

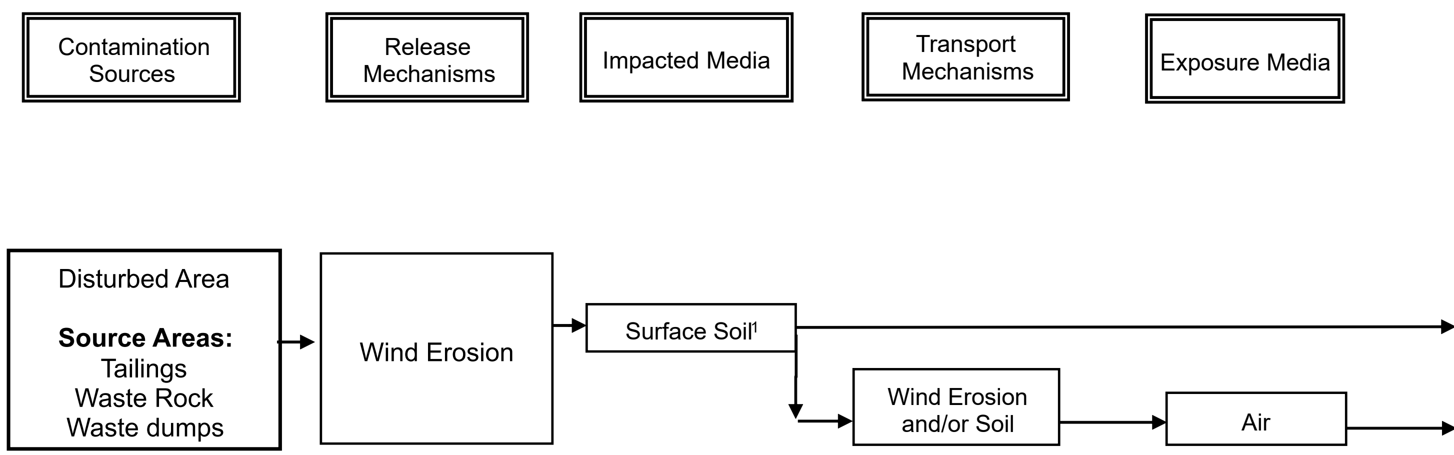
Three Kids Mine

BROADBENT
8 West Pacific Avenue
Henderson, NV, 89015
(702) 563-0600 (P) • (702) 563-0610 (F)

Job # 14-01-156 Date: 4/27/2022

Notes:
1. Imagery Source: Esri World Imagery (Maxar)
2. Datum: NAD 1983 StatePlane Nevada East FIPS 2701 Feet
3. Not a survey.
4. Parcel Source: Clark County Assessor and BLM Administrative Units.

Designed	
Drawn	JCM
Approved	



	Receptors						
Exposure Route	Construction Worker	On-Site Resident	Recreational User	Landscaper/ Maintenance Worker	Commercial User	School User	Trespasser
Ingestion	●	●	●	●	●	●	●
Dermal Contact	●	●	●	●	●	●	●
Inhalation of Fugitive Dust	●	●	●	●	●	●	●

BROADBENT
8 West Pacific Avenue
Henderson, NV, 89015
(702) 563-0600 (P) * (702) 563-0610 (F)

Job # 14-01-156 Date: 4/27/2022

Legend:
- ● Complete/Potentially Complete
- ○ Incomplete (no expected exposure)

Notes:
1. Surface soil is considered 0 to 1 feet below ground surface.

Figure 4

Conceptual Site Model

Three Kids Mine

Designed	
Drawn	JCM
Approved	

Tables

TABLE 1
ANALYTICAL RESULTS

			Location ID	BG-121-01-01	BG-121-02-01	BG-121-07-01	BG-121-24-01	BG-122-01-01	BG-122-02-01	BG-122-03-01	BG-122-04-01	BG-122-05-01
			Sample Name	BG-121-01-01	BG-121-02-01	BG-121-07-01	BG-121-24-01	BG-122-01-01	BG-122-02-01	BG-122-03-01	BG-122-04-01	BG-122-05-01
			Sample Date	5/19/2021	5/19/2021	5/19/2021	5/18/2021	5/20/2021	5/20/2021	5/20/2021	5/20/2021	5/20/2021
			Sample Depth	0-1 ft bgs	0-1 ft bgs	0-1 ft bgs	0-1 ft bgs	0-1 ft bgs	0-1 ft bgs	0-1 ft bgs	0-1 ft bgs	0-1 ft bgs
Analyte	**USEPA RSL[1]**	**BTV[2]**	**Unit**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Metals (SW6020A)												
Antimony	3.1	0.63	mg/kg	0.286 J	0.178 J	< 0.167 U	< 0.166 UJ	< 0.168 U	< 0.166 U	< 0.167 U	0.167 J	< 0.168 U
Arsenic	0.68	15.2	mg/kg	**7.48 J**	**6.35 J**	**7.89 J**	**2.94 J**	**3.53 J+**	**3.56**	**3.67**	**10.2**	**13.1**
Cadmium	0.71	0.17	mg/kg	0.11 J	0.106 J	< 0.0858 U	< 0.0857 U	< 0.0864 U	< 0.0856 U	< 0.0862 U	0.136 J	0.15 J
Chromium	12000	9.73	mg/kg	17.9 J	16.6 J	10.4 J	7.18 J	1.23 J	4.33 J	1.63 J	18.1	22.3
Copper	310	23.2	mg/kg	28.2	38.9	27.1	42.1	4.88 J	2.25 J	2.87 J	28.9	33.3
Lead	400	29.8	mg/kg	18.6	24.5	8.74	14.3	11.5 J	18.6 J	12.3	63.7	56.8
Manganese	180	481	mg/kg	**337 J**	**369 J**	**201 J**	**182 J**	**190 J**	**234 J**	129 J	**477 J**	**558 J**
Selenium	39	0.96	mg/kg	1.21 J	1.43 J	0.802 J	0.544 J	0.257 J	0.216 J	0.202 J	1.41 J	1.37 J
Zinc	2300	53	mg/kg	147 J	230 J	59.5 J	40 J	106 J	11.4 J	51.2	136	481
PAHS (SW8270C/E SIM)												
Benzo[a]anthracene	1.1	NA	mg/kg	--	--	--	--	0.00513 J+	< 0.00175 U	0.00323 J	< 0.00174 U	< 0.00174 U
Benzo[a]pyrene	0.11	NA	mg/kg	--	--	--	--	0.00202 J+	< 0.00181 U	0.00313 J	< 0.0018 U	< 0.00181 U
Benzo[b]fluoranthene	1.1	NA	mg/kg	--	--	--	--	0.0098 J+	< 0.00154 U	0.0111	0.00205 J	0.00392 J
Benzo[g,h,i]perylene	180	NA	mg/kg	--	--	--	--	0.00884 J+	0.00294 J	0.0108	0.00201 J	< 0.00179 U
Chrysene	110	NA	mg/kg	--	--	--	--	0.0166 J+	0.00361 J	0.0111	0.00394 J	0.00868
Dibenzo[a,h]anthracene	0.11	NA	mg/kg	--	--	--	--	0.00367 J+	< 0.00174 U	0.00238 J	< 0.00173 U	< 0.00173 U
Indeno[1,2,3-cd]pyrene	1.1	NA	mg/kg	--	--	--	--	0.00644 J+	0.00196 J	0.00843	< 0.00182 U	< 0.00183 U
Phenanthrene	1800	NA	mg/kg	--	--	--	--	0.00406 J+	< 0.00233 U	0.00258 J	< 0.00232 U	< 0.00233 U
Pyrene	180	NA	mg/kg	--	--	--	--	0.0106 J+	0.00223 J	0.00661	0.00223 J	0.00251 J

[1] USEPA Regional Screening Level (RSL) for Residential Soil (TR=1E-06, HQ=0.1), May 2022.
Surrogates used: chromium III for chromium, pyrene for benzo(g,h,i)perylene, and anthracene for phenanthrene.
[2] Background threshold value taken from *Background Soil Report, Revision 2* (Broadbent, 2022a).
Highlighted cells exceed both the USEPA RSL and the BTV.
Bolded cells exceed the USEPA RSL only.
-- = not analyzed
ft bgs = feet below ground surface
J = Estimated value.
J+ = Estimated value, biased high.
J- = Estimated value, biased low.
mg/kg = milligram(s) per kilogram
PAH = polycyclic aromatic hydrocarbons
U = Analyte not detected.

TABLE 1
ANALYTICAL RESULTS

			Location ID	BG-122-06-01	BG-122-07-01	BG-122-08-01
			Sample Name	BG-122-06-01	BG-122-07-01	BG-122-08-01
			Sample Date	5/21/2021	5/20/2021	5/20/2021
			Sample Depth	0-1 ft bgs	0-1 ft bgs	0-1 ft bgs
Analyte	**USEPA RSL[1]**	**BTV[2]**	**Unit**	**Result**	**Result**	**Result**
Metals (SW6020A)						
Antimony	3.1	0.63	mg/kg	0.177 J	< 0.17 U	< 0.167 U
Arsenic	0.68	15.2	mg/kg	**13.6**	**3.79 J+**	**11.2**
Cadmium	0.71	0.17	mg/kg	0.171 J	< 0.0874 U	0.0872 J
Chromium	12000	9.73	mg/kg	18.4	0.994 J	18.1
Copper	310	23.2	mg/kg	12.8	3.11 J	35.5
Lead	400	29.8	mg/kg	28.6	7.39 J+	85.4
Manganese	180	481	mg/kg	**286 J**	109 J	**637 J**
Selenium	39	0.96	mg/kg	1.28 J	0.23 J	1.25 J
Zinc	2300	53	mg/kg	90	80.4 J+	101
PAHS (SW8270C/E SIM)						
Benzo[a]anthracene	1.1	NA	mg/kg	< 0.00174 U	< 0.00175 U	0.00973
Benzo[a]pyrene	0.11	NA	mg/kg	< 0.0018 U	< 0.00181 U	0.00474 J
Benzo[b]fluoranthene	1.1	NA	mg/kg	< 0.00154 U	< 0.00155 U	0.0241
Benzo[g,h,i]perylene	180	NA	mg/kg	< 0.00178 U	0.0019 J+	0.0186
Chrysene	110	NA	mg/kg	< 0.00233 U	0.00443 J+	0.0331
Dibenzo[a,h]anthracene	0.11	NA	mg/kg	< 0.00173 U	< 0.00174 U	0.0068
Indeno[1,2,3-cd]pyrene	1.1	NA	mg/kg	< 0.00182 U	< 0.00183 U	0.0144
Phenanthrene	1800	NA	mg/kg	< 0.00232 U	< 0.00234 U	0.00598 J
Pyrene	180	NA	mg/kg	< 0.00201 U	0.00208 J+	0.0164

[1] USEPA Regional Screening Level (RSL) for Residential Soil (TR=1E-06, HQ=0.1), May 2
Surrogates used: chromium III for chromium, pyrene for benzo(g,h,i)perylene, and ant
[2] Background threshold value taken from *Background Soil Report, Revision 2* (Broadbe
Highlighted cells exceed both the USEPA RSL and the BTV.
Bolded cells exceed the USEPA RSL only.
-- = not analyzed
ft bgs = feet below ground surface
J = Estimated value.
J+ = Estimated value, biased high.
J- = Estimated value, biased low.
mg/kg = milligram(s) per kilogram
PAH = polycyclic aromatic hydrocarbons
U = Analyte not detected.

TABLE 2
SOIL DATA SUMMARY

			Detected Data							Non-Detected Data			
Lithology	Parameter	No. Samples	FOD	Min	Q1	Median	Mean	Q3	Max	Min	Mean	Max	Residential Soil RSL[1]
Volcanic Units of Downwind Parcels	Antimony	13	3/13	0.167	0.1725	0.178	0.21	0.232	0.286	0.166	0.167	0.17	3.1
	Arsenic	13	13/13	2.94	3.67	4.6	6.3	7.89	13.1				0.68
	Cadmium	13	6/13	0.0872	0.106	0.11	0.115	0.136	0.15	0.0856	0.0861	0.0874	0.71
	Chromium	13	13/13	0.994	4.33	8.62	10.35	17.9	22.3				12,000
	Copper	13	13/13	2.25	4.88	27.1	21.96	33.3	42.1				310
	Lead	13	13/13	7.39	12.3	18.6	27.16	24.5	85.4				400
	Manganese	13	13/13	109	190	234	299.9	369	637				180
	Selenium	13	13/13	0.202	0.257	0.802	0.806	1.25	1.43				39
	Zinc	13	13/13	11.4	54.2	80.4	119.8	136	481				2,300
	Benzo[a]anthracene	8	3/8	0.00323	0.00418	0.00513	0.00603	0.00743	0.00973	0.00174	0.001743	0.00175	1.1
	Benzo[a]pyrene	8	3/8	0.00202	0.00258	0.00313	0.0033	0.00394	0.00474	0.0018	0.001805	0.00181	0.11
	Benzo[b]fluoranthene	8	5/8	0.00205	0.00392	0.0098	0.0102	0.0111	0.0241	0.00154	0.001543	0.00155	1.1
	Benzo[g,h,i]perylene	8	6/8	0.0019	0.00224	0.00589	0.00752	0.103	0.0186	0.00178	0.001783	0.00179	180
	Chrysene	8	7/8	0.00361	0.00419	0.00868	0.0116	0.0139	0.0331	0.0023	0.00232	0.00234	110
	Dibenzo[a,h]anthracene	8	3/8	0.00238	0.00303	0.00367	0.00428	0.00524	0.0068	0.00173	0.001733	0.00174	0.11
	Indeno[1,2,3-cd]pyrene	8	4/8	0.00196	0.00532	0.00744	0.00781	0.00992	0.0144	0.00182	0.001824	0.00183	1.1
	Phenanthrene	8	3/8	0.00258	0.00332	0.00406	0.00421	0.00502	0.00598	0.00232	0.002328	0.00234	1,800
	Pyrene	8	7/8	0.00208	0.00223	0.00251	0.00609	0.00861	0.0164	0.00201	0.00201	0.00201	180

All concentrations reported in milligrams per kilogram.

[1] USEPA Regional Screening Level (RSL) for Residential Soil (TR=1E-06, HQ=0.1), May 2022.

Surrogates used: chromium III for chromium, pyrene for benzo(g,h,i)perylene, and anthracene for phenanthrene.

Appendix A

Summary Statistics Inputs and Outputs

APPENDIX A - SUMMARY STATISTICS INPUTS AND OUTPUTS

	Antimony	d_Antimony	Arsenic	d_Arsenic	Cadmium	d_Cadmium	Chromium	d_Chromium	Copper	d_Copper	Lead	d_Lead	Manganese
	0.166	0	2.94	1	0.0858	0	0.994	1	2.25	1	7.39	1	109
	0.167	0	3.53	1	0.0857	0	1.23	1	2.87	1	8.74	1	129
	0.166	0	3.56	1	0.0864	0	1.63	1	3.11	1	11.5	1	182
	0.166	0	3.67	1	0.0856	0	4.33	1	4.88	1	12.3	1	190
	0.168	0	3.79	1	0.0862	0	7.12	1	18.3	1	12.3	1	201
	0.167	0	4.09	1	0.0874	0	7.18	1	20.1	1	14.3	1	231
	0.168	0	4.59	1	0.0857	0	8.62	1	27.1	1	18.6	1	234
	0.17	0	6.35	1	0.101	1	10.4	1	28.2	1	18.6	1	245
	0.167	0	7.48	1	0.11	1	16.6	1	28.9	1	18.9	1	337
	0.166	0	7.89	1	0.106	1	17.9	1	33.3	1	24.5	1	369
	0.286	1	10.2	1	0.136	1	18.1	1	35.5	1	56.8	1	477
	0.178	1	11.2	1	0.15	1	18.1	1	38.9	1	63.7	1	558
	0.167	1	13.1	1	0.0872	1	22.3	1	42.1	1	85.4	1	637
Q1	0.1725		3.67		0.106		4.33		4.88		12.3		190
Q3	0.232		7.89		0.136		17.9		33.3		24.5		369
Median	0.178		4.6		0.11		8.62		27.1		18.6		234
Mean	0.2103		6.3		0.115		10.346		21.962		27.156		299.923

APPENDIX A - SUMMARY STATISTICS INPUTS AND OUTPUTS

	d_Manganese	Selenium	d_Selenium	Zinc	d_Zinc	PAHS (SW8	Benzo[a]anthracene	d_Benzo[a]anthracene	Benzo[a]pyrene	d_Benzo[a]pyrene
	1	0.202	1	11.4	1		0.00175	0	0.00181	0
	1	0.216	1	40	1		0.00174	0	0.00181	0
	1	0.23	1	51.2	1		0.00174	0	0.0018	0
	1	0.257	1	54.2	1		0.00175	0	0.00181	0
	1	0.544	1	59.4	1		0.00174	0	0.0018	0
	1	0.735	1	59.5	1		0.00513	1	0.00202	1
	1	0.802	1	80.4	1		0.00323	1	0.00313	1
	1	0.827	1	101	1		0.00973	1	0.00474	1
	1	1.21	1	106	1					
	1	1.25	1	136	1					
	1	1.37	1	147	1					
	1	1.41	1	230	1					
	1	1.43	1	481	1					
Q1		0.257		54.2			0.00418		0.00258	
Q3		1.25		136			0.00743		0.00394	
Median		0.802		80.4			0.00513		0.00313	
Mean		0.806		119.777			0.00603		0.003297	

APPENDIX A - SUMMARY STATISTICS INPUTS AND OUTPUTS

	Benzo[b]fluoranthene	d_Benzo[b]fluoranthene	Benzo[g,h,i]perylene	d_Benzo[g,h,i]perylene	Chrysene	d_Chrysene	Dibenzo[a,h]anthracene
	0.00154	0	0.00179	0	0.00234	0	0.00174
	0.00155	0	0.00178	0	0.0166	1	0.00173
	0.00154	0	0.00884	1	0.00361	1	0.00173
	0.0098	1	0.00294	1	0.0111	1	0.00174
	0.0111	1	0.0108	1	0.00394	1	0.00173
	0.00205	1	0.00201	1	0.00868	1	0.00367
	0.00392	1	0.0019	1	0.00443	1	0.00238
	0.0241	1	0.0186	1	0.0331	1	0.0068
Q1	0.00392		0.00224		0.00419		0.00303
Q3	0.0111		0.01031		0.01385		0.00524
Median	0.0098		0.00589		0.00868		0.00367
Mean	0.010194		0.00752		0.0116		0.00428

	d_Dibenzo[a,h]anthracene	Indeno[1,2,3-cd]pyrene	d_Indeno[1,2,3-cd]pyrene	Phenanthrene	d_Phenanthrene	Pyrene	d_Pyrene
	0	0.00182	0	0.00233	0	0.00201	0
	0	0.00183	0	0.00233	0	0.0106	1
	0	0.00183	0	0.00232	0	0.00223	1
	0	0.00182	0	0.00234	0	0.00661	1
	0	0.00644	1	0.00233	0	0.00223	1
	1	0.00196	1	0.00406	1	0.00251	1
	1	0.00843	1	0.00258	1	0.00208	1
	1	0.0144	1	0.00598	1	0.0164	1
Q1		0.00532		0.00332		0.00223	
Q3		0.00992		0.00502		0.008605	
Median		0.00744		0.00406		0.00251	
Mean		0.00781		0.00421		0.00609	