

HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR THE PARCEL 9 SOUTH SUB-AREA

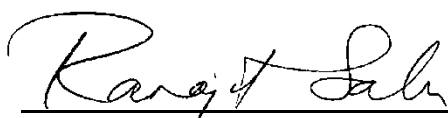
**BMI COMMON AREAS (EASTSIDE)
CLARK COUNTY, NEVADA**

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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. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.



September 22, 2015

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	ES-1
1.0 INTRODUCTION.....	1-1
1.1 PURPOSE OF THE RISK ASSESSMENT.....	1-2
1.2 METHODOLOGY AND REGULATORY GUIDANCE	1-5
1.3 REPORT ORGANIZATION	1-6
2.0 SITE DESCRIPTION.....	2-1
2.1 SITE HISTORY	2-1
2.2 ENVIRONMENTAL SETTING.....	2-2
2.2.1 Site Location, Climate and Physical Attributes	2-2
2.2.2 Geology/Hydrology	2-4
2.2.3 Surface Water.....	2-5
2.3 SUMMARY OF HISTORICAL INVESTIGATIONS	2-6
2.4 HISTORICAL REMEDIAL ACTIVITIES	2-6
2.5 CONCEPTUAL SITE MODEL.....	2-6
2.5.1 Impacted Environmental Media.....	2-8
2.5.2 Inter-Media Transfers	2-8
2.5.3 Potential Human Exposure Scenarios.....	2-9
3.0 CONFIRMATION DATA PROCESS AND SUMMARY	3-1
3.1 INITIAL CONFIRMATION SOIL SAMPLING	3-1
3.2 CHEMICALS SELECTED FOR ANALYSIS	3-3
3.3 INTERMEDIATE SAMPLING AND CLEANUP.....	3-4
3.4 FINAL CONFIRMATION DATASET	3-5
3.5 FINAL CONFIRMATION DATA SUMMARY.....	3-6
3.6 SURFACE FLUX SAMPLING.....	3-16
3.7 LEACHATE DATA.....	3-18
4.0 DATA EVALUATION	4-1
4.1 CRITERION I – REPORTS TO RISK ASSESSOR (AVAILABILITY OF INFORMATION ASSOCIATED WITH SITE DATA).....	4-2
4.2 CRITERION II – DOCUMENTATION REVIEW	4-3
4.3 CRITERION III – DATA SOURCES	4-4
4.4 CRITERION IV – ANALYTICAL METHODS AND DETECTION LIMITS.....	4-5
4.5 CRITERION V – DATA REVIEW	4-6

4.5.1	Holding Time Exceedances / Sample Condition Qualifications.....	4-6
4.5.2	Blank Contamination	4-8
4.5.3	Sample/Duplicate Differences Outside Permissible Range or Greater than Permissible Values.....	4-9
4.5.4	Internal Standards Outside Acceptance Criteria	4-12
4.5.5	Surrogate Percent Recoveries Outside Laboratory Control Limit.....	4-12
4.5.6	Calibrations Outside Laboratory Control Limits	4-13
4.5.7	Tentatively Identified Compounds	4-15
4.5.8	Data Review Summary	4-16
4.6	CRITERION VI – DATA QUALITY INDICATORS	4-16
4.6.1	Evaluation of Data Precision	4-17
4.6.2	Evaluation of Data Accuracy	4-17
4.6.3	Evaluation of Data Representativeness.....	4-20
4.6.4	Evaluation of Data Completeness.....	4-21
4.6.5	Evaluation of Data Comparability	4-21
4.7	DATA ANALYSIS	4-22
5.0	SELECTION OF CHEMICALS OF POTENTIAL CONCERN.....	5-1
5.1	EVALUATION OF CONCENTRATIONS/ACTIVITIES RELATIVE TO BACKGROUND CONDITIONS	5-1
5.2	ESSENTIAL NUTRIENTS	5-6
5.3	COMPARISON TO WORKER SOILS BCLs	5-6
5.4	SUMMARY OF SELECTION OF COPCS	5-7
6.0	HUMAN HEALTH RISK ASSESSMENT.....	6-1
6.1	DETERMINATION OF EXPOSURE POINT CONCENTRATIONS	6-2
6.1.1	Soil	6-3
6.1.2	Indoor Air.....	6-6
6.1.3	Outdoor Air.....	6-9
6.2	EXPOSURE ASSESSMENT.....	6-11
6.2.1	Exposure Parameters.....	6-11
6.2.2	Quantification of Exposure	6-11
6.2.3	Asbestos	6-13
6.2.4	Radionuclides.....	6-14
6.3	TOXICITY ASSESSMENT	6-15
6.3.1	Toxicity Values.....	6-15

6.3.2	Non-Carcinogenic Health Effects	6-16
6.3.3	Carcinogenic Health Effects	6-17
6.3.4	Asbestos	6-18
6.4	RISK CHARACTERIZATION	6-18
6.4.1	Methods for Assessing Cancer Risks.....	6-18
6.4.2	Methods for Assessing Non-Cancer Health Effects	6-19
6.4.3	Methods for Assessing Asbestos Risks.....	6-20
6.4.4	Risk Assessment Results.....	6-22
7.0	UNCERTAINTY ANALYSIS.....	7-1
7.1	ENVIRONMENTAL SAMPLING.....	7-2
7.2	ESTIMATES OF EXPOSURE	7-4
7.2.1	Aggregation of Exposure Areas.....	7-4
7.2.2	Types of Exposures Examined.....	7-4
7.2.3	Intake Assumptions Used	7-4
7.3	TOXICITY ASSESSMENT	7-6
7.3.1	COPCs Lacking Toxicological Data.....	7-6
7.3.2	Uncertainties in Animal and Human Studies.....	7-6
7.3.3	Non-Carcinogenic Toxicity Criteria	7-7
7.3.4	Sub-Chronic Non-Carcinogenic Toxicity Criteria.....	7-7
7.3.5	Carcinogenic Toxicity Criteria	7-7
7.3.6	Uncertainties with the Asbestos Risk Assessment.....	7-9
7.3.7	Uncertainties with the Radionuclide Risk Assessment.....	7-9
7.4	CUMULATIVE EFFECT OF UNCERTAINTIES	7-9
8.0	SUMMARY OF RESULTS	8-1
8.1	CONSTRUCTION WORKERS	8-1
8.2	COMMERCIAL (INDOOR) WORKERS	8-1
8.3	MAINTENANCE (OUTDOOR) WORKERS.....	8-2
9.0	DATA QUALITY ASSESSMENT	9-1
10.0	SUMMARY	10-1
11.0	REFERENCES.....	11-1

FIGURES

- 1 Parcel 9 South Sub-Area Location
- 2 Site Plan with Monitoring Wells
- 3 Parcel 9 South Sub-Area Cross-Section A-A'
- 4 Parcel 9 South Sub-Area Cross-Section B-B'
- 5 Conceptual Site Model Diagram for Potential Human Exposures
- 6 Initial Soil and Surface Flux Sampling Locations
- 7 Sample Depth Rules Schematic
- 8 Parcel 9 South Sub-Area Soil Remediation Areas
- 9 Final Soil and Surface Flux Sampling Locations
- 10 Parcel 9 South Sub-Area Lithologies

TABLES

- ES-1 Summary of Human Health Risk Assessment Calculations
- 3-1 Sample-Specific Collection Depths
- 3-2 Site-Related Chemicals and Initial Sample Analyses and Depths
- 3-3 Final Confirmation Soil Sample Locations and Analyses
- 3-4 Final Human Health Risk Assessment Soil Dataset Results Summary
- 3-5 Iron LBCL_{DAFI} Exceedances Greater Than Background
- 3-6 Selenium LBCL_{DAFI} Exceedances Greater Than Background
- 3-7 Surface Flux Sample Analyses
- 3-8 Soil Vapor Flux Sample Results Summary
- 4-1 Chromium (VI) Samples Qualified Due to Holding Time Exceedances
- 4-2 Metals Most Frequently Censored During Blank Sample Evaluation
- 4-3 Metals Samples Qualified Due to Recoveries Outside Acceptance Criteria
- 4-4 Results Qualified Due to Sample/Laboratory Duplicate Differences Outside Acceptance Criteria
- 4-5 Dioxin/Furan Soil Sample Results Qualified Due to Internal Standards Outside Acceptance Criteria
- 4-6 Results Qualified Due to Surrogate Recoveries Outside Laboratory Control Limit
- 4-7 Summary of Semi-Volatile Organic Compound Results Qualified Due to Calibrations Outside Laboratory Control Limit
- 4-8 Summary of Organochlorine Pesticide Results Qualified Due to Calibrations Outside Laboratory Control Limit
- 4-9 Summary of Volatile Organic Compound Results Qualified Due to Low Instrument Response
- 4-10 Summary of Volatile Organic Compound (TO-15) Surface Flux Sample Results Qualified Due to Calibrations Outside Laboratory Control Limit
- 4-11 Summary of Volatile Organic Compound (TO-15 SIM) Surface Flux Sample Results Qualified Due to Calibrations Outside Laboratory Control Limit
- 4-12 Summary of Soil Analytes Censored During Blank Sample Evaluation
- 4-13 Summary of Surface Flux Analytes Censored During Blank Sample Evaluation
- 4-14 Low Detection Analytes Exhibiting SQL Differences Between Background and Site Samples
- 5-1 Background Comparison Summary

TABLES

5-2	Summary of Statistical Background Comparison Evaluation
5-3	Example Differences in Site and Background Median Concentrations for Chemicals Statistically Greater than Background
5-4	Equivalence Test for Secular Equilibrium
5-5	Results of Comparison to Worker Soil BCLs
5-6	Selection of Chemicals of Potential Concern (COPCs)
6-1	Exposure Point Concentrations in Soil
6-2	Asbestos Results and Analytical Sensitivities
6-3	Soil Properties Results for Site and Comparison Study Area
6-4	Exposure Point Concentrations from Surface Flux
6-5	Particulate Emission Factor (PEF) for Non-Construction Scenario
6-6	Particulate Emission Factor (PEF) for Construction Scenario
6-7	Outdoor Air Exposure Point Concentrations from Soil
6-8	Workers Exposure Factors
6-9	Toxicity Criteria for Surface Flux
6-10	Non-Cancer Toxicity Criteria for Soil
6-11	Cancer Toxicity Criteria for Soil
6-12	Chemical Risk Summary for Construction Worker Receptors
6-13	Chemical Risk Summary for Commercial (Indoor) Worker Receptors
6-14	Chemical Risk Summary for Maintenance (Outdoor) Worker Receptors
6-15	Asbestos Risk Summary
6-16	Radionuclide Risk Summary
7-1	Uncertainty Analysis
9-1	Data Quality Assessment

APPENDICES

- A NDEP Comments and BRC's Response to Comments [placeholder]
- B Parcel 9 South Sub-Area Investigation Data Tables (Note that all report files, including the database, are on the report CD included in this appendix)
- C GES Field Reports (on the report CD in Appendix B)
- D Surface Flux Chamber Testing Investigator's Report (on the report CD in Appendix B)
- E Data Usability Tables (on the report CD in Appendix B)
- F Data Validation Summary Reports (provided electronically on separate discs)
- G Cumulative Probability Plots and Boxplots for Metals and Radionuclides, and Scatterplots for Metals
- H Human Health Risk Assessment Calculation Spreadsheets (on the report CD in Appendix B)
- I Metals Distribution Plots, and Metals and Chemicals of Potential Concern Intensity Plots
- J Vapor Intrusion Tier 2 Assessment and Comparison Study Area Results (model files on the report CD in Appendix B)
- K Legal Description of the Parcel 9 South Sub-Area

ACRONYMS AND ABBREVIATIONS

$\mu\text{g/L}$	microgram per liter
$\mu\text{g/m}^2, \text{min}^{-1}$	micrograms per square meter per minute
μm	micrometer
$\mu\text{g/m}^3$	microgram per cubic meter
Aa	alluvial aquifer
ADD	average daily dose
AOC3	Settlement Agreement and Administrative Order on Consent: BMI Common Areas, Phase 3
ARR	asbestos-related risk
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
BCL	Basic Comparison Level
bgs	below ground surface
BMI	Basic Management, Inc.
BRC	Basic Remediation Company
CAMU	Corrective Action Management Unit
CD	compact disc
cm	centimeter
cm^3	cubic centimeter
CoH	City of Henderson
COPC	chemical of potential concern
CSF	cancer slope factor
CSM	conceptual site model
DAF	dilution attenuation factor
DBS&A	Daniel B. Stephens & Associates, Inc.
DOE	U.S. Department of Energy
DQIs	data quality indicators
DQOs	data quality objectives
DVSR	Data Validation Summary Report
EC	exposure concentration
ECI	Environmental Conditions Investigation
ERM	Environmental Resources Management
FSSOP	Field Sampling and Standard Operating Procedures
g	gram
GC/MS	gas chromatograph/mass spectrometry
GES	Geotechnical and Environmental Services
GiSdT [®]	Guided Interactive Statistical Decision Tools
HEAST	Health Effects Assessment Summary Tables

ACRONYMS AND ABBREVIATIONS (Continued)

HHRA	Human Health Risk Assessment
HI	hazard index
HQ	hazard quotient
IEUBK	Integrated Exposure Uptake Biokinetic Model
ILCR	incremental lifetime cancer risk
IRIS	Integrated Risk Information System
IRM	interim remedial measure
IUR	inhalation unit risk
J	USEPA data qualifier, which indicates an estimated value
LADD	lifetime average daily dose
LBCL	BCLs for protection of groundwater
LCS/LCSD	laboratory control sample/laboratory control sample duplicate
LMS	linearized multi-stage
LOAEL	lowest-observed-adverse-effect-level
m ³ /kg	cubic meter per kilogram
MDA	minimum detectable activities
mg/kg-d	milligram per kilogram per day
mg/kg	milligram per kilogram
mg/L	milligram per liter
mg/m ³	milligram per cubic meter
MS/MSD	matrix spike/matrix spike duplicate
msl	mean sea level
NDEP	Nevada Division of Environmental Protection
NERT	Nevada Environmental Response Trust
NFAD	No Further Action Determination
NOAEL	no-observable-adverse-effect-level
ORNL	Oak Ridge National Laboratory
PAH	polynuclear aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, comparability, and completeness
PCB	polychlorinated biphenyl
pCi/g	picoCurie per gram
PEF	particulate emission factor
PPRTVs	Provisional Peer Reviewed Toxicity Values
ppt	part per trillion
PQL	practical quantitation limit
QA/QC	quality assurance/quality control
Qal	Quaternary alluvium
QAPP	Quality Assurance Project Plan

ACRONYMS AND ABBREVIATIONS (Continued)

R	rejected
RAGS	Risk Assessment Guidance for Superfund
RAS	Remedial Alternatives Study
RAWP	Removal Action Work Plan
RfC	reference concentration
RfD	reference dose
RIB	Rapid Infiltration Basin
ROD	Record of Decision
RPD	relative percent difference
SAP	Sampling and Analysis Plan
sec	second
SIM	selective ion mode
SOP	Standard Operating Procedure
SPLP	synthetic precipitation leaching procedure
SQL	sample quantitation limit
SRC	Site-related chemical
SVOC	semi-volatile organic compound
TCDD	tetrachlorodibenzo- <i>p</i> -dioxin
TEF	toxicity equivalency factor
TEQ	toxicity equivalency
TIC	tentatively identified compound
TIMET	Titanium Metals Corporation
TMCf	Tertiary Muddy Creek Formation
TPH	total petroleum hydrocarbon
U	undetected
UCL	upper confidence limit
UJ	USEPA data qualifier, which indicates a non-detect estimated value
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WRF	Water Reclamation Facility
WRS	Wilcoxon Rank Sum

EXECUTIVE SUMMARY

Basic Remediation Company LLC (BRC) has prepared this Human Health Risk Assessment (HHRA) and Closure Report for Parcel 9 South (Site) of the Basic Management, Inc. (BMI) Common Areas (Eastside) in Clark County, Nevada. The Site is located immediately adjacent to and west of Boulder Highway from the remainder of the Eastside properties, which have been addressed in separate documents. The purpose of this report is to support a request for a No Further Action Determination (NFAD) by the Nevada Division of Environmental Protection (NDEP) for the Site.

The HHRA evaluates the potential for adverse human health impacts that may occur as a result of potential exposures to residual concentrations of chemicals in soil, groundwater, and air following remediation of the Site. If the residual risks do not pose an unacceptable risk to human health and the environment, then an NFAD will be requested from the NDEP. Upon issuance of an NFAD by the NDEP, redevelopment of the Site is expected to proceed in a manner consistent with the Environmental Covenant (Instrument 201102030002818 Clark County Records Office) that is attached to the property. This report also describes the various remediation actions that were performed and presents the subsequent confirmation data collected between 2010 and 2012 at the Site.

BACKGROUND

Initial confirmation sampling investigations were conducted at the Site in 2010 in accordance with BRC's Sampling and Analysis Plan for the Staging Sub-Area and Parcel 9 South (SAP, approved by the NDEP on May 10, 2010). The SAP addressed sampling procedures such that remaining contaminants and their potential impacts to future Site uses (as discussed in Section 1.1 of the *BRC Closure Plan* for the BMI Common Areas [BRC, Environmental Resources Management (ERM), and Daniel B. Stephens & Associates, Inc. (DBS&A) 2007¹]) can be determined. The Site investigations involved collection of soil matrix and surface flux samples from throughout the Site. The sampling plan performed for this purpose, as described in Section 4 of the SAP (BRC 2010a), was consistent with the approach presented in Section 2 of the *Statistical Methodology Report* (NewFields 2006). The *Statistical Methodology Report* describes the statistical methods that are used to confirm the final soils closure at Parcel 9 South

¹ The *BRC Closure Plan* was finalized and approved by NDEP in 2007. Subsequent to this date, revisions were made to Section 9 of the *BRC Closure Plan* (Risk Assessment Methodology–Human Health). The latest revision to Section 9 is March 2010. No other sections of the *BRC Closure Plan* have been revised since 2007.

as well as each of the Eastside sub-areas of the BMI Common Areas. Two subsequent rounds of soil remediation and confirmation sampling were performed. The final number of samples collected was determined to be adequate for the completion of a statistically robust dataset upon which to perform an HHRA.

CONCEPTUAL SITE MODEL

The conceptual site model for the Site considers current and potential future land-use conditions. Currently, the Site is undeveloped. Current receptors that may be exposed to Site chemicals of potential concern (COPCs) include on-site trespassers and off-site residents. Future receptors identified as “on-site receptors” are defined as receptors located within the current Site boundaries (Figure 1), while future “off-site receptors” are those located outside the current Site boundaries. A redevelopment plan has not been generated for the Site; the expected land use is industrial/commercial. For the evaluation in this Closure Report, the focus is for retail/commercial land use and the HHRA assumes future receptors will include indoor commercial workers, outdoor maintenance workers, and construction workers.

Due to the requirement for use of default reasonable maximum exposure parameters for future receptors, exposures to future receptors are greater than current exposures. Accordingly, only future receptors were assessed in the HHRA. Potential exposures to off-site residents were qualitatively evaluated. The HHRA conforms to the methodology included in Section 9 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010).

The entire Site will be enhanced by restoration and redevelopment once remediation is complete. Therefore, there is no exposure to ecological receptors, because the Site will be prepared for retail/commercial land use.

DATA REVIEW AND USABILITY EVALUATION

A data review and usability evaluation was performed to identify appropriate data for use in the HHRA. The results of the data usability evaluation indicate that the data collected between 2010 and 2012 are adequate in terms of quality for use in a risk assessment.

HUMAN HEALTH RISK ASSESSMENT

An HHRA was conducted to determine if chemical concentrations in Site soils are either: (1) representative of background conditions; or (2) do not pose an unacceptable risk to human health and the environment under current and potential future use conditions. The HHRA followed the procedures outlined in U.S. Environmental Protection Agency (USEPA) and the

NDEP guidance documents. As noted above, the HHRA also conforms to the methodology presented in Section 9 of the NDEP-approved *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010) and includes all COPCs for the Site. Results of the HHRA are summarized below.

**TABLE ES-1: SUMMARY OF HUMAN HEALTH
RISK ASSESSMENT CALCULATIONS**

	Construction Worker	Commercial (Indoor) Worker	Maintenance (Outdoor) Worker
Site Chemical Non-Cancer HI ¹	0.1	0.009	0.02
Site Chemical Cancer Risk ²	1×10^{-7}	4×10^{-7}	7×10^{-7}
Site Radionuclide Cancer Risk ^{2,3}	--	8×10^{-5}	2×10^{-4}
Background Radionuclide Risk ^{2,3}	--	8×10^{-5}	2×10^{-4}
Asbestos Risk ^{3,4}	0 to 1×10^{-6}	0 to 2×10^{-7}	0 to 4×10^{-7}

1 – HI = hazard index; the value presented is the total cumulative non-cancer HI.

2 – Cancer risk is the maximum theoretical upper-bound incremental lifetime cancer risk (ILCR).

3 – Consistent with the NDEP-approved BRC Closure Plan (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010), chemical, radionuclide, and asbestos risks are calculated separately.

4 – Asbestos risk refers to the sum of cancer risks for mesothelioma and lung cancer. Asbestos risks represent the cumulative chrysotile and cumulative amphibole asbestos risks for chrysotile and amphibole fibers, respectively. Risks shown are the higher of the risks for chrysotile or amphibole fibers. Asbestos risks are not included in Site Cancer Risk (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010).

Air exposures to volatile organic compounds are evaluated on a sample-by-sample basis, per NDEP requirements, using the surface flux data measurements. Because of this, the minimum and maximum surface flux risks and HI estimates are summed with the soil risk and HI estimates to provide a range of cumulative risks and HIs. The risk estimates shown above incorporate the maximum surface flux risks. Primary risk contributors are discussed in the main body of the report.

EVALUATION OF UNCERTAINTIES

Risk estimates are values that have uncertainties associated with them. These uncertainties, which arise at every step of a risk assessment, are evaluated in the report to provide an indication of the uncertainty associated with a risk estimate. Uncertainties from different sources are compounded in the HHRA. Because the uncertainties are compounded and because the exposure assumptions and toxicity criteria used are considered conservative, the risk estimates calculated in this HHRA are likely to overestimate rather than underestimate potential risks. A detailed discussion of these uncertainties is provided in the Uncertainty Analysis (Section 7) of the report.

POTENTIAL IMPACTS TO GROUNDWATER

As noted in a letter dated September 17, 2012, from Greg Lovato, NDEP, to Mark Paris, BRC, HHRA reports for the project no longer evaluate the potential leaching impacts to groundwater for any Eastside sub-area. This issue will be addressed in the Eastside groundwater remedial alternatives study. As provided for in Section XVII of the Phase III Administrative Order on Consent, No Further Action Determinations issued for the BMI Common Areas are subject to Continuing Work to Address Water Pollution Conditions, Operation and Maintenance, Maintenance of Existing Institutional Controls, and/or Efficacy Review.

SUMMARY

Based on the results of the 2010 to 2012 sampling, the HHRA, and the conclusions presented there from in this report, exposures to residual levels of chemicals in soil at Parcel 9 South should not result in adverse health effects to any of the future receptors evaluated. As a result, an NFAD for Parcel 9 South is warranted, given the following provisos:

1. The NFAD does not pertain to groundwater. BRC retains the responsibility to address any environmental impacts to groundwater beneath the Site, pursuant to the *Settlement Agreement and Administrative Order on Consent: BMI Common Areas, Phase 3* (NDEP 2006). As such, additional investigation may be necessary on the Site as it relates to BRC's responsibilities for groundwater. BRC must be granted access to the Site for activities such as well or soil boring installations or other investigative or remedial efforts.
2. The soils beneath 10 feet below ground surface of the Recorded Environmental Covenant (Instrument 201102030002818 Clark County Records Office) redevelopment grading plan for the Site have not been evaluated to date. Accordingly, the NFAD does not pertain to soil below the top 10 feet of the final grading plan for the Site. The property owner should note that these soils should not be disturbed without additional investigation or evaluation. BRC understands that this provision will be reflected in an Environmental Covenant for the Site.
3. The property owner should ensure that activities at the Site do not exacerbate existing, sub-surface, environmental conditions. Any grading plan that is prepared for redevelopment of the Site will incorporate an Environmental Covenant for the Site to control subsurface excavation.
4. Site use is otherwise suitable for purposes as retail/commercial land use.

1.0 INTRODUCTION

Basic Remediation Company LLC (BRC) has prepared this Human Health Risk Assessment (HHRA) and Closure Report for Parcel 9 South (Site; Figure 1) of the Basic Management, Inc. (BMI) Common Areas (Eastside) in Clark County, Nevada. The purpose of this report is to support a request for a No Further Action Determination (NFAD) by the Nevada Division of Environmental Protection (NDEP) for the Site. As presented in Section XVII.1.a. of the *Settlement Agreement and Administrative Order on Consent: BMI Common Areas, Phase 3* (AOC3; NDEP 2006), the NDEP acknowledges that discrete Eastside areas may be issued an NFAD as remedial actions are completed for selected environmental media. Any such NFAD request shall identify the remedial actions and other work completed at the property in question, the results of such remedial actions and other work, the proposed land use(s), and the reasons supporting the eligibility of the property for an NFAD. This report provides this information for the Site.

BRC recognizes that the following conditions will be included in a Recorded Environmental Covenant (Instrument 201102030002818 Clark County Records Office) as a condition to receiving an NFAD from the NDEP:

1. The NFAD does not pertain to groundwater. BRC retains the responsibility to address any environmental impacts to groundwater beneath the Site, pursuant to the AOC3. As such, additional investigation may be necessary on the Site as it relates to BRC's responsibilities for groundwater. BRC must be granted access to the Site for activities such as well or soil boring installations or other investigative or remedial efforts.
2. The soils beneath 10 feet below ground surface (bgs) for the Site have not been evaluated to date. Accordingly, the NFAD does not pertain to soil below the top 10 feet of the Site. The property owner should note that these soils should not be disturbed without additional investigation or evaluation.
3. The property owner should ensure that activities at the Site do not exacerbate existing, sub-surface, environmental conditions. A grading plan will be developed for redevelopment of the Site, and incorporated as an Environmental Covenant for the Site to control subsurface excavation.
4. Site use is otherwise suitable for purposes as retail/commercial land use.

Consistent with Section VI of the NDEP's *Record of Decision, Remediation of Soils and Sediments in the Upper and Lower Ponds at the BMI Complex* (ROD; NDEP 2001), cleanup of the Site proceeded under Alternative 4B (soils transferred from the Site to a dedicated Corrective Action Management Unit [CAMU] within the BMI Complex),² as identified and described in Section 9 of the Remedial Alternatives Study (RAS) for the Eastside. The *Remedial Alternatives Study for Soils and Sediments in the Upper and Lower Ponds at the BMI Complex* (Environmental Resources Management [ERM] 2000) was submitted to the NDEP in March 2000. The RAS is documented via issuance of the ROD, dated November 2, 2001, by the NDEP.

This report is consistent in format with prior closure reports for other Eastside study areas, and incorporates comments received from the NDEP on those reports. Appendix A has been reserved for potential future NDEP comments on this report and BRC's response to these comments. An electronic version of the entire report, as well as original format files (MS Word and MS Excel) of all text, tables, modeling, and risk calculations are included on the report compact disc (CD) in Appendix B.

1.1 PURPOSE OF THE RISK ASSESSMENT

The purpose of the HHRA is to evaluate the potential for adverse human health impacts that may occur as a result of potential exposures to residual concentrations of chemicals in soil, groundwater, and air following remediation, and to assess whether any additional remedial actions are necessary in order to request an NFAD from the NDEP to allow redevelopment of the Site to proceed. The results of the risk assessment provide risk managers an understanding of the potential human health risks associated with background conditions and additional risks associated with past Site activities.³ Pending issuance of an NFAD by the NDEP, redevelopment of the Site is expected to proceed in a manner consistent with the Recorded Environmental Covenant attached to the property.

² Under this alternative, the Site could be developed in accordance with the current development plan and the recorded Environmental Covenant for the Site that assures appropriate management of soils beneath 10 feet bgs (post-graded), should they need to be disturbed in the future.

³ The HHRA presents total Site-related risk. Background risk is the risk to which a population is normally exposed, and does not include risks from Site contamination. Total Site-related risk includes both incremental (Site only) and background risks. Because naturally occurring constituents are typically included in a risk assessment (i.e., metals and radionuclides), the total Site-related risk will have some element of total risk included. However, because risks are only calculated for a subset of metal and radionuclides, a 'total' risk is not calculated. In instances where the total Site-related risk is calculated to exceed a cancer risk of 10^{-5} (typically when radionuclides are included in the risk assessment calculations) or a non-cancer hazard index greater than 1.0, then a background risk, only including those naturally occurring constituents included in the risk assessment, will also be calculated to provide context to the risk assessment results.

As presented in Section 2.5 of the *Sampling and Analysis Plan for the Staging Sub-Area and Parcel 9 South, BMI Common Areas (Eastside) Clark County, Nevada* (BRC 2010a; hereinafter “SAP”; approved by the NDEP on May 10, 2010), no remediation activities were conducted at the Site prior to sampling in accordance with the SAP.

When the sampling conducted in accordance with the SAP was performed, areas within the Site that warranted remediation were identified, as discussed in Section 3.3. These areas have been addressed. The overall goal of the risk assessment presented in this report, therefore, is to confirm that residual chemical concentrations are: (1) either representative of background conditions; or (2) do not pose an unacceptable risk to human health and the environment under current and potential future land use conditions. Findings of the HHRA are intended to support the Site closure process. While, in general, human health protection, BRC’s overall goal is to remediate Site soils such that they are suitable for residential uses, that is not appropriate nor necessary for this Site since its intended use is as retail/commercial land use.

Project-specific risk level and remediation goals consistent with USEPA precedents and guidelines have been established, as summarized below. It should be noted that: (1) all comparisons to risk or chemical-specific goals are made on an exposure area basis consistent with likely exposure assumptions; and (2) these comparisons are demonstrated through the use of spatial statistical analysis to apply to each one-eighth-acre exposure area.

Human health risks are represented by estimated theoretical upper-bound cancer risks and non-cancer hazards derived in accordance with standard USEPA and NDEP methods. If the carcinogenic risks or non-cancer hazards exceed USEPA acceptable levels or NDEP risk goals, then remedial action alternatives must be considered. The acceptable risk levels defined by USEPA for the protection of human health, as identified in Section 9.1.1 of the *BRC Closure Plan* (BRC, ERM, and Daniel B. Stephens & Associates, Inc. [DBS&A] 2007; Section 9 revised March 2010), are:

- Post-NFAD chemical and radionuclide concentrations in Site soils are targeted to have an associated residual, cumulative theoretical upper-bound incremental lifetime cancer risk (ILCR) level point of departure of 10^{-6} . This is the target risk goal for the project. For cases where the NDEP identifies this goal to be unfeasible, it is BRC’s understanding that the NDEP will re-evaluate the goal in accordance with USEPA (1991a) guidance. In no case will the residual, cumulative theoretical upper-bound carcinogenic risk levels exceed those allowed per USEPA guidance.

- Post-NFAD chemical concentrations in Site soils are targeted to have an associated cumulative, non-carcinogenic hazard index (HI) of 1.0 or less. If the screening HI is determined to be greater than 1.0, target organ-specific HIs will be calculated for primary and secondary organs. The final risk goal will be to achieve target organ-specific non-carcinogenic HIs of 1.0 or less.
- Where background levels exceed risk level goals or chemical-specific remediation goals, metal concentrations and radionuclide activities in Site soils are targeted to have risks no greater than those associated with background conditions.

In addition to the risk goals discussed above, chemical-specific remediation goals have been established for lead and dioxins/furans. The target goal for lead is 400 milligrams per kilogram (mg/kg) for residential land use, which is a residential soil concentration identified by USEPA (based on the Integrated Exposure Uptake Biokinetic Model [IEUBK] model) as protective of any exposure scenario (USEPA 2004a).

For dioxins/furans and polychlorinated biphenyl (PCB) congeners, the USEPA toxicity equivalency (TEQ) procedure, developed to describe the cumulative toxicity of these compounds, is used. This procedure involves assigning individual toxicity equivalency factors (TEFs) to the 2,3,7,8 substituted dioxin/furan and PCB congeners. TEFs are estimates of the toxicity of dioxin-like compounds relative to the toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), which is assigned a TEF of 1.0. Calculating the TEQ of a mixture involves multiplying the concentration of individual congeners by their respective TEF. One-half the detection limit is used for calculating the TEQ for individual congeners that are non-detect in a particular sample. The sum of the TEQ concentrations for the individual congeners is the TCDD TEQ concentration for the mixture. TEFs from USEPA (2010) are used.⁴ The calculation of the TCDD TEQs are included in the data file on the report CD in Appendix B. Consistent with the Agency for Toxic Substances and Disease Registry (ATSDR) *Update to the ATSDR Policy Guideline for Dioxins and Dioxin-Like Compounds in Residential Soil* (2008), the target goal for retail/commercial land use is the ATSDR screening value and the NDEP worker Basic Comparison Level (BCL; NDEP 2013) of 1,000 parts per trillion (ppt) TCDD TEQ.

⁴ Consistent with the letter dated November 9, 2010, from Greg Lovato, NDEP, to Mark Paris, BRC. BRC will revise the *BRC Closure Plan* accordingly.

1.2 METHODOLOGY AND REGULATORY GUIDANCE

This risk assessment follows procedures outlined in USEPA *Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual* (RAGS; USEPA 1989), and conforms to Section 9 (Risk Assessment Methodology–Human Health) of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010) which was approved by the NDEP on July 16, 2007. Various NDEP guidance documents are also relied on for the risk assessment (as referenced throughout this report). In addition, the NDEP’s BCLs (NDEP 2013) are used for comparison of Site characterization data to provide for an initial screening evaluation, assist in the evaluation of data usability, and aid in determination of extent of contamination. A full list of guidance documents consulted is provided in Section 6 and the References section at the end of this document.

This report also relies upon methodology and information provided in the NDEP-approved *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010). The main text of the *BRC Closure Plan* provides discussions of the following elements relative to the BMI Common Areas project as a whole:

- The project history, including cleanup goals and project objective (Closure Plan Sections 1 and 2);
- The list of Site-related chemicals (SRCs; Closure Plan Section 3);
- The conceptual site model (CSM) addressing potential contaminant sources, the nature and extent of chemical of potential concern (COPC) occurrence, and potential exposure pathways (Closure Plan Section 4; a CSM discussion specific to the Site is provided in Section 5 of this report);
- Data verification and validation procedures (Closure Plan Section 5);
- The procedures used to evaluate the usability and adequacy of data for use in the risk assessment (Closure Plan Sections 6 and 9 [2010 revision]);

- The data quality objectives (DQOs; Closure Plan Section 7⁵);
- The RAS process for the Site (Closure Plan Section 8);
- Risk assessment procedures that will be used for Site closure (Closure Plan Section 9 for human health [2010 revision] and Section 10 for ecological); and
- Data quality assessment (Closure Plan Section 5).

As discussed in this report, the risk assessment for the Site is conducted primarily using the data collected during implementation of the Site-specific SAPs and subsequent confirmation sampling events, which have been designed to produce data representative of the conditions to which current (non-remediation workers) and future users would be exposed.

1.3 REPORT ORGANIZATION

The closure report is composed of 11 sections, as outlined below:

- This section (Section 1) presents the purpose of the risk assessment and the methods used in this assessment.
- Section 2 presents Site background, the environmental setting for the Site, and a summary of previous investigations. Section 2 also presents the CSM for the risk assessment. This includes identification of potentially exposed populations, and the potential pathways of human exposure.
- Section 3 presents the confirmation data collected between 2010 and 2014, as well as discussions on the various remedial actions conducted at the Site.
- Section 4 presents data evaluation procedures, including statistical analysis of background concentrations, and data usability and quality.
- Section 5 presents the selection of COPCs recommended for further assessment, including comparisons of Site metals and radionuclides to background conditions.

⁵ As noted in the *BRC Closure Plan*, per discussions with the NDEP, the DQO process is addressed, on an Eastside sub-area by sub-area basis (for soils), in the respective sub-area SAPs developed for each sub-area relating to the soils cleanup. Therefore, the DQO process for the Site is presented in the SAP and is not repeated here. This DQO process was incorporated in the data usability/data adequacy evaluation for the Site data used in the risk assessment.

- Section 6 presents the HHRA. This includes relevant statistical analyses, determination of representative exposure point concentrations, applicable fate and transport modeling, exposure assessment, toxicity assessment, and risk characterization.
- In Section 7, the uncertainties associated with the risk assessment are discussed.
- A summary of the risk assessment results is provided in Section 8.
- The data quality assessment for the risk assessment is presented in Section 9.
- A summary of the HHRA and Closure Report is provided in Section 10.
- A list of references is provided in Section 11.

Smaller tables with supporting information are inserted in the text at the place of reference. The text is followed by the figures, larger tables, and appendices.

2.0 SITE DESCRIPTION

This section presents a description of the Site, including Site background and history, the environmental setting, and a summary of previous investigations. The area known as the “BMI Common Areas,” of which Parcel 9 South is a part, is delineated in Appendix A of the AOC3. The subject Site is near the BMI Industrial Complex, in Clark County, Nevada, approximately 13 miles southeast of Las Vegas, within the City of Henderson (CoH) corporate limits, northeast of the City Hall (Figure 1). Parcel 9 South is approximately 8.7 acres in size⁶, and is located to the west and across Boulder Highway from the remainder of the Eastside property. The Site was previously defined in Figure 1-2 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010) as including a small parcel north of Warm Springs Road. As subsequently modified in the Staging sub-area and Parcel 9 South SAP (BRC 2010a), the property north of Warm Springs Road was removed from Parcel 9 South; that property was granted an NFAD in September 27, 1999.

The Site is an irregularly shaped area immediately south of the Warm Springs Road right-of-way and west of Boulder Highway. The Joker’s Wild Casino is located north of the Site, beyond Warm Springs Road and Boulder Highway; vacant land and a parking lot are present to the northwest. The Site is bounded to the southwest by the Titanium Metals Corporation [TIMET] industrial facility. A strip of landscaped vacant land and Boulder Highway bound the Site to the east.

The Site is undeveloped, with the exception of several utility poles along the southwestern and eastern boundaries. The Site also contains or contained features associated with historical effluent discharge within Eastside. Specifically, portions of the Western, Alpha, and Beta ditches traverse or formerly traversed the Site (Figures 1 and 2). These ditches were unlined, open air drainage ditches that carried effluent from the former BMI Complex to unlined effluent ponds on the other side of Boulder Highway, within Eastside. Use of these ditches was discontinued in 1976.

2.1 SITE HISTORY

Approximately 400 of the more than 2,200 acres comprising the BMI Common Areas contained a network of ditches, canals, flumes, and unlined ponds that were used for the disposal of

⁶ The northern portion of Parcel 9 was granted an NFAD on September 27, 1999.

aqueous waste from the original magnesium plant and, later, other industrial plants and the adjacent municipality. Effluent wastes discharged to the ponds of the BMI Common Areas from the war-time Basic Magnesium operations can be characterized as salts from the production process (chloride salts of a variety of metals and radionuclides), organic solids, and inorganic solids and dissolved components of various types. Chlorinated organic chemicals were included in the effluent. Notable processes that contributed to the waste stream from the plants that succeeded Basic Magnesium included effluents from the manufacture of the following types of products: chlorine and sodium hydroxide (caustic soda); a variety of chlorate and perchlorate compounds, and halogenated boron compounds; manganese dioxide; titanium and related compounds; and a variety of pesticides. Among these wastes were salts, organic and inorganic chemicals, and metals. A more detailed description of these processes and their effluents is found in Sections 2.2 and 2.3 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010).

2.2 ENVIRONMENTAL SETTING

The BMI Common Areas and Complex are located in Clark County, Nevada, and are situated approximately 2 miles west of the River Mountains and 1 mile north of the McCullough Range. 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 BMI Common Areas and Complex, the surface topography slopes north toward the Las Vegas Wash. The River Mountains and McCullough Range consist of volcanic rocks: dacite in the River Mountains and andesite in the McCullough Range (Umhoefer et al. 2010).

The Site (Figure 2) comprises 8.7 acres of undeveloped land with little surface relief that is gently sloping to the northeast. The Site is currently undeveloped, except for the previously noted ditch segment. The native soils are compacted, poorly sorted, non-plastic, light brown to red silty sand with varying amounts of gravel.

2.2.1 Site Location, Climate and Physical Attributes

The Site is in the northeastern quarter of Section 5, Township 22 South, Range 63 East Mount Diablo Base and Meridian. The Site is in the Las Vegas Valley, a broad alluvial valley that occupies a structural basin in the Basin and Range Physiographic Province. The valley is about 1,550 square miles in size, and the structural and topographical axis is aligned approximately northwest to southeast. The eastern edge of the valley is about 5 miles west of Lake Mead, a major multipurpose artificial reservoir on the Colorado River. The Las Vegas Valley is

surrounded mostly by mountains, ranging from 2,000 to 10,000 feet higher than the valley floor. The valley floor ranges in elevation from about 3,000 feet above mean sea level (msl), in the west at the mountain front, to 1,500 feet above msl, in the east at the Wash (Clark County GIS Management Office 2003). The surrounding mountain ranges are:

- Sheep Range to the north;
- Frenchman and Sunrise Mountains to the northeast;
- River Range to the east;
- McCullough Range to the south; and
- Spring Mountains and Sierra Nevada mountain range of California to the west.

The Site is within the CoH corporate limits, northeast of the City Hall, and approximately 13 miles southeast of the city of Las Vegas (Figure 1). At its closest point, the Site is approximately 2.5 miles south of the Las Vegas Wash.

The Site is situated in a natural desert area, where evaporation/evapotranspiration rates are high, due to high temperatures, high winds, and low humidity. Precipitation in this area averages approximately 0.4 inch per month or 4.8 inches per year (Western Regional Climate Center 2008). As discussed in the *Sources/Sinks and Input Parameters for Groundwater Flow Model Revised Technical Memorandum* (DBS&A 2009), in arid settings, recharge from precipitation is typically a small percentage of annual precipitation. Based on values from Scanlon et al. (2006), recharge as a percentage of annual precipitation for the Site area was estimated to be between 0.1 and 5 percent. Recharge is thus estimated to be between 0.0048 and 0.24 inch per year.

According to the Southern Nevada Water Authority's document entitled *Extent and Potential Use of the Shallow Aquifer and Wash Flow in Las Vegas Valley, Nevada* (1996), annual potential evapotranspiration exceeds 86 inches. Pan evaporation data measured from 1985 through 1988 were as high as 17 inches per month; the months with the highest evaporation (May through September) coincide with those months with the highest intensity of rainfall (Law Engineering 1993). However, evaporation and evapotranspiration are functions of vegetation type and density and other Site-specific conditions (especially anthropogenic conditions). Therefore, Site-specific evaporation/evapotranspiration may vary from these regional conditions. These climatic parameters may be appreciably influenced by future redevelopment (e.g., vegetation removal, pavement extent, and construction).

Wind flow patterns are fairly consistent from one month to another, but vary slightly between measurement stations (McCarran International Airport and a station within the BMI Complex adjacent to the employee parking lot at the TIMET plant entrance). For the McCarran station, the prevailing wind direction is from the southwest. The TIMET station also showed a predominant wind direction from the southwest, with southeasterly components. Wind velocity at both locations tends to be the highest in the spring and early summer months (April through July).

2.2.2 Geology/Hydrology

As is common throughout the Las Vegas Valley, Site soils are primarily sand and gravel, with occasional cobbles. This is consistent with the depositional environment of an alluvial fan. The Site is located on alluvial fan sediments, with a surface that slopes to the north-northeast at a gradient of approximately 0.02 foot per foot towards the Las Vegas Wash. Regional drainage is generally to the east.

The uppermost strata beneath the Site consist primarily of alluvial sands and gravels derived from the volcanic source rocks in the McCullough Range, located southwest of the Site. These uppermost alluvial sediments were deposited within the last 2 million years and are of Quaternary Age, and are thus mapped and referred to as the Quaternary alluvium (Qal; Carlsen et al. 1991). The Qal is typically on the order of 50 feet thick at the Site with variations due, in part, to the non-uniform contact between the Qal and the underlying Tertiary Muddy Creek Formation (TMCf).

The TMCf underlies the Qal. The Muddy Creek formation, of which the TMCf is the uppermost part, is a lacustrine deposition from the Tertiary Age, and it underlies much of the Las Vegas Valley. It is more than 2,000 feet thick in places. The lithology of the TMCf underlying the Site is typically fine-grained (sandy silt and clayey silt), although layers with increased sand content are sporadically encountered. These TMCf materials have typically low permeability, with hydraulic conductivities on the order of 10^{-6} to 10^{-8} centimeters per second (Weston 1993). The TMCf in the vicinity of the Site was encountered to the maximum explored depth of 430 feet bgs. Lithologic cross sections are shown on Figures 3 and 4 (note that lithologic cross sections are based on those presented for the nearby Triangle Commercial sub-area).

Two distinct, laterally continuous water-bearing zones are present within the upper 400 feet of the Site subsurface: (1) an upper, unconfined water-bearing zone primarily within the Qal referred to herein as the alluvial aquifer (Aa); and (2) a deep, confined water-bearing zone that occurs in a sandier depth interval within the silts of the deeper TMCf. Both of these water-

bearing zones contain high concentrations of total dissolved solids. Between these two distinct water-bearing zones, a series of saturated sand stringers was sporadically and unpredictably encountered during drilling.

The Aa is an unconfined, shallower, water-bearing zone that occurs across the Site. For the most part, water in the Aa occurs in the Qal. The water surface in the Aa generally follows topography, with the water surface sloping towards the Las Vegas Wash. The depth from the surface to first groundwater at the Site is approximately 32 to 39 feet bgs (Figure 2). Wells completed in the Aa are not highly productive, with sustainable flows typically less than 5 gallons per minute.

2.2.3 Surface Water

Surface water flow occurs for brief periods of time during periodic precipitation events. The Las Vegas Wash collects storm water, shallow groundwater, urban runoff, and treated municipal wastewater. It is the receiving water body for all major Las Vegas area discharges. In dry weather, flow in the Wash comprises mainly treated effluent from the Clark County Water Reclamation District City of North Las Vegas, City of Las Vegas Water Pollution Control Facility, and the CoH Water Reclamation Facility (WRF). The CoH contributes smaller amounts. Aggregate flow is in excess of 160 million gallons per day (Las Vegas Wash Coordination Committee 2000). Discharge from these sources is sufficient to maintain surface flows in the Wash throughout the year. In winter, low-intensity rains fall over broad areas; in the spring and fall, thunderstorms provide short periods of high-intensity rainfall. The latter creates high run-off conditions. Run-off is also affected by human development, which tends to (1) create conduits for surface water flow and (2) decrease infiltration into native soils by covering them with man-made structures or materials (e.g., pavement).

Under current conditions, it is unlikely that ephemeral surface waters generated within the Site will migrate via overland transport to the Las Vegas Wash from the Site due to (1) the distance to the Wash (greater than 2 miles); (2) the intervening presence of the existing berms associated with the former effluent ponds, the CoH WRF, the CoH Northern RIB Ponds, and Weston Hills and Tuscany residential developments between the Site and the Wash. However, the presence of the drainage ditches suggests the current potential for rainfall to be carried from those portions of the Site to the Wash. After redevelopment, when the ditches have been removed, there will be an even lower likelihood that ephemeral surface waters generated within the Site will migrate via overland transport to the Las Vegas Wash from the Site because of the proposed design of the

future storm water facilities and the regional requirement that nuisance flows not be discharged directly into the Las Vegas Wash unless they do so under existing conditions. (Flows from future development do not meet this criterion.)

Groundwater seeps currently exist at various locations north of the BMI Common Areas near the Las Vegas Wash. No seeps currently exist within the Site. An evaluation of historical aerial photos taken between 1964 and 1970 indicates apparent historical seeps within Eastside and at nearby off-site locations in association with past effluent infiltration at the Eastside ponds and with infiltration of municipal wastewater at the southern RIBs. Evidence of seeps was not observed within the Site in these aerial photographs.

2.3 SUMMARY OF HISTORICAL INVESTIGATIONS

Historical field investigations have not been conducted at the Site to characterize the nature and extent of chemical occurrence in Site soils and groundwater.

The data collected as part of the SAP (as discussed in Section 3) are considered representative of current Site conditions⁷ and are relied upon for risk assessment purposes as described in this report.

2.4 HISTORICAL REMEDIAL ACTIVITIES

Remediation activities were not conducted at the Site prior to sampling in accordance with the SAP.

2.5 CONCEPTUAL SITE MODEL

The CSM is a tool used in risk assessment to describe relationships between chemicals and potentially exposed human receptor populations, thereby delineating the relationships between the suspected sources of chemicals identified at the Site, the mechanisms by which the chemicals might be released and transported in the environment, and the means by which the receptors could come in contact with the chemicals. The CSM provides a basis for defining DQOs, guiding Site characterization, and developing exposure scenarios. The Site history; land uses; climate; physical attributes, including geology and hydrogeology; and various field investigations are described in Sections 2.1 through 2.4 of this HHRA. The history and environmental conditions

⁷ This determination is also based on the data usability evaluation summarized in Section 4.2.

of the BMI Common Areas are described in Sections 2 and 4 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010), and in the Sitewide CSM (in preparation).

The HHRA evaluates current and potential future land-use conditions. The Site is currently undeveloped with the exception of several utility poles. The potential on- and off-site receptors are currently trespassers and off-site residents. Exposures to current receptors are being managed through Site access control. A redevelopment plan has not been generated for the Site; the expected land use is industrial/commercial. Therefore, for the evaluation in this Closure Report, the HHRA assumes future receptors will include indoor commercial workers, outdoor maintenance workers, and construction workers.

The entire Site will be enhanced by restoration and redevelopment once remediation is complete. Therefore, exposures to ecological receptors will be mitigated or removed. Future receptors identified as “on-site receptors” are defined as receptors located within current Site boundaries (Figure 1), while future “off-site receptors” are those located outside current Site boundaries. Many potential human receptors are possible at the Site in the period during and after redevelopment. The potentially exposed populations and their potential routes of exposure are discussed in Section 2.5.3.

To construct retail/commercial buildings, roads, parking, landscaping and associated features, the land will be cut and/or filled and nurtured with imported top soils⁸ as needed.

The CSM includes the planned redevelopment of the Site. All potential transfer pathways are included in the CSM. The human health aspects of the CSM for the Site are presented on Figure 5.

Numerous release mechanisms influence chemical behavior in environmental media. Under both current and future land use conditions at the Site, the principal release mechanisms involved are:

- Vertical migration in the vadose zone;
- Storm/surface water runoff into surface water and sediments;

⁸ Imported soil data are not included in risk assessment calculations because imported soils are not expected to be used. However, the chemical data for fill material from a given site within the Eastside property may be useful for evaluating sub-areas to receive fill from that site. Any soil that is imported to a sub-area will be from a sub-area that has received an NFAD.

- Fugitive dust generation and transport; and
- Vapor emission and transport.

Although these release mechanisms are identified here, no quantitative modeling is presented in this section. Instead, those primary release mechanisms identified for particular receptors are presented in this section, and are quantitatively evaluated in Section 6.

2.5.1 Impacted Environmental Media

Environmental media at the Site consist of five categories: surface soil, subsurface soil, groundwater, indoor air, and ambient outdoor air. Samples relative to Site baseline conditions have been collected at the Site for soil. Generally, impacted soil is the source of chemical exposures for other media at the Site.

Because the background water quality of groundwater beneath the Site and in the surrounding area is generally poor (viz., high total dissolved solids concentration) and because BRC has placed Environmental Covenants in the form of a deed restriction to prevent future users from utilizing groundwater beneath the Site, the use of private water wells by businesses for drinking water, irrigation water, or other non-potable uses (e.g., washing cars, filling swimming pools) will not occur in the post-redevelopment phase. Furthermore, there is no anticipated groundwater uses associated with the proposed retail/commercial land use. Therefore, exposure pathways relating to this type of use are incomplete, as defined by USEPA (1989).

Although direct exposures to groundwater will not occur; indirect exposures are possible. The primary indirect exposure pathway from groundwater is the infiltration of VOCs from soil and groundwater to indoor air. In addition, residual levels of chemicals in soil may leach and impact groundwater quality beneath the Site.

2.5.2 Inter-Media Transfers

Exposure to Site chemicals may be direct, as in the case of impacted surface soil, or indirect following inter-media transfers. Impacted soil is the initial source for inter-media transfers at the Site, which can be primary or secondary. For example, upward migration of VOCs from impacted subsurface soil into ambient air thereby reaching a point of human inhalation represents a secondary inter-media transfer.

These inter-media transfers represent the potential migration pathways that may transport one or more chemicals to an area away from the Site where a human receptor could be exposed. Discussions of each of the identified potential transfer pathways are presented below. Figure 5 presents a conceptualized diagram of the inter-media transfers and fate and transport modeling for the Site.

Five initial transfer pathways for which chemicals can migrate from impacted soil to other media have been identified. The first of these pathways is volatilization from soil and upward migration from soil into ambient air. Ambient air can be both indoor and outdoor air. The pathway of volatilization from both soil and groundwater and upward migration into ambient air was evaluated using the surface flux measurements collected. The secondary transfer pathway is downward migration of chemicals from soil to groundwater. The third transfer pathway is migration of chemicals in surface soil via surface runoff to sediments or surface water bodies. However, as discussed in Section 2.2.3, because of the distance to the Wash (greater than 2 miles) and the intervening presence of the existing berms associated with the former effluent ponds, and the CoH WRF, it is unlikely that surface waters (which are ephemeral) will drain to the Las Vegas Wash from the Site. Therefore, the surface water pathway was not evaluated in this risk assessment. The fourth transfer pathway is on-site fugitive dust generation. Finally, chemicals in soil can be transferred to plants grown on the Site via uptake through the roots. However, the plant uptake pathway is only evaluated for residential receptors, and therefore is not included for the Site.

2.5.3 Potential Human Exposure Scenarios

The following subsections summarize land use and the human exposure scenarios that are assessed herein.

2.5.3.1 Current and Future Land Use

Current receptors that may use the Site include trespassers and off-site residents. Current exposures to native soils at the Site are minimal, but exposures to future receptors will be much greater. For example, future receptors evaluated in the HHRA include on-site workers who are assumed to be exposed to soil at the Site for 250 days per year for 25 years, which is much greater than any current exposure scenario. In addition, as discussed above, exposures to current receptors are limited through Site access control. Therefore, a current land use scenario is not quantitatively evaluated in this risk assessment.

USEPA risk assessment guidance (1989) states that potential future land use should be considered in addition to current land use when evaluating the potential for human exposure at a site. As indicated above, the Site will be used for retail/commercial land use, including parking and landscaping. The entire Eastside property will be redeveloped in several phases. Throughout the redevelopment process, the sub-areas of the Site will be redeveloped sequentially. Future receptors identified as “on-site receptors” are defined as receptors located within the current Site boundaries (Figure 1), while future “off-site receptors” are those located outside the current Site boundaries. “On-site receptors” are those future receptors that will be located within the Site under evaluation. “Off-site receptors” are those future receptors that will be located outside the Site under evaluation that may have complete exposure pathways associated with sources within the Site. As noted above, remediation of the Site is to on-site indoor/outdoor/construction worker standards. Consequently, risks to off-site receptors are addressed qualitatively in this risk assessment.

2.5.3.2 Identification of Potentially Exposed Populations and Pathways

Many potential human receptors are possible at the Site in the period during and after redevelopment. The potentially exposed populations and their potential routes of exposure are presented on Figure 5 and summarized below. For a complete exposure pathway to exist, each of the following elements must be present (USEPA 1989):

- A source and mechanism for chemical release;
- An environmental transport medium (i.e., air, water, soil);
- A point of potential human contact with the medium; and
- A route of exposure (e.g., inhalation, ingestion, dermal contact).

As presented in Section 9 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010), the following are the primary exposure pathways for each of the potential receptors following remediation and redevelopment at the Site.

- Indoor commercial workers
 - Incidental soil ingestion*
 - External exposure from soil[†]
 - Indoor inhalation of VOCs from soil and groundwater

- Outdoor maintenance workers
 - Incidental soil ingestion*
 - External exposure from soil[†]
 - Dermal contact with soil
 - Outdoor inhalation of dust*[‡]
 - Outdoor inhalation of VOCs from soil and groundwater
- Construction workers
 - Incidental soil ingestion*
 - External exposure from soil[†]
 - Dermal contact with soil
 - Outdoor inhalation of dust*[‡]
 - Outdoor inhalation of VOCs from soil and groundwater

*Includes radionuclide exposures

[†]Only radionuclide exposures

[‡]Includes asbestos exposures

Although trespassers/recreational users and downwind off-site residents are another potential receptor identified in the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010), exposures for these receptors are less than those evaluated above. As noted in Sections 9.1.1 and 9.7.1 of the *Closure Plan*, potential exposures for trespassers/recreational users will only be evaluated in areas of the BMI Common Areas that are designated as recreational end use (specifically the Western Hook-Open Space sub-area shown on Figure 1). Also, as noted in Section 9.5.4 of the *Closure Plan*, off-site dust levels based on USEPA's model are much lower than those generated for on-site, construction-related activities. Therefore, risks evaluated for an on-site construction worker, as performed in this HHRA, are considered protective of off-site residents.

3.0 CONFIRMATION DATA PROCESS AND SUMMARY

Based on the historical data for the Site, no remediation was proposed prior to implementing the sampling prescribed in the SAP. Decisions for excavation during SAP implementation were based on the initial data (discussed below) in accordance with the Risk Assessment Methodology provided in the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010). The following is the initial scope of work for investigating the Site and meeting the SAP objectives. Much of the discussion below regarding confirmation soil sampling is taken from the *Statistical Methodology Report* (NewFields 2006).

3.1 INITIAL CONFIRMATION SOIL SAMPLING

As per Section 2 of the *Statistical Methodology Report*, the initial confirmation sampling at the Site was conducted on the basis of combined random and biased (judgmental) sampling, as follows:

- **Stratified Random Locations:** For this purpose, the Site was covered by a 3-acre cell grid network. Within each 3-acre cell, a sampling location was randomly selected. Sampling locations were randomly selected within both full and partial grid cells if they were greater than 50 percent of the total grid cell area (based on the project-wide grid cell network and the Site boundaries; those partial grid cells that contain less than 50 percent of their area within the Site were included in the adjacent sub-area SAPs). The main objective of this stratified random sampling was to provide uniform coverage of each Site within the Eastside property.
- **Biased Locations:** Additional sampling locations were selected within or near small-scale contamination points of interests, including but not limited to former conveyance ditches. For this purpose, the randomly selected location within a corresponding 3-acre cell was adjusted in some cases to cover a nearby point of interest. In the event that currently unknown impacted areas were identified during remediation, the presence of these areas were drawn to the NDEP's attention, the need for additional biased sampling points to address those areas was evaluated, and the sampling program modified as needed.

Biased sampling was conducted along the length of the ditch, at approximately 200-foot linear spacing (three locations within the Site). Figure 6 and accompanying Table 3-1 (see Tables section) show the sampling locations within the Site.

The following discusses the multi-depth soil samples that were collected and analyzed for the SRC list at each selected location. As noted previously, a grading plan has not yet been developed for the Site. Therefore, samples were collected at existing surface (0 foot bgs) and 10 feet bgs at each sample location. The analytical sample results were then divided into surface and subsurface (10-foot depth) layers. A schematic example of these rules is shown on Figure 7 (note that this schematic applies to samples collected as part of the Eastside property as a whole, are not entirely applicable to the Site. The sample-specific collection depths are presented in Table 3-1 (Tables section).

As noted above, soil samples were generally collected over a 2- to 3-foot depth interval. This was because of volume of soil required for completion of all analyses. The 10 feet bgs samples were collected in 2- to 3-foot intervals centered on 10 feet (or centered on the deeper sampling depth as indicated in Table 3-1). Confirmation samples, which usually have a shortened analyte list, were collected over a smaller sampling interval. Contamination by the historical manufacturing processes upgradient is usually found predominantly in surface soils. The objective of remedial actions at the Site was to remove surface soils that were impacted by surface releases of off-site chemicals. Therefore, higher concentrations are expected—and have been generally observed—in surface samples. However, to adequately characterize the vertical extent of possible contamination, one or more deeper samples were also collected at each sampling location, as described above.

As discussed in Section 6.1.1, these samples were classified into two different exposure depths: surface and all (surface and subsurface) depths. These different soil exposure depth classifications are considered to represent all possible exposure potential for all receptors, and thus a reasonable worst-case scenario has been assessed.

Initial sampling for the Site was conducted in June 2010. All soil samples were tagged in the database with numeric designations of their corresponding assigned soil layer grouping based on the rules presented above. During these initial sampling events (Table 3-1), 22 soil samples were collected from 10 locations (including field duplicates.).⁹ This included seven “random”¹⁰ and

⁹ Note that in Table 3-4, which summarizes the analyses performed on Site samples, the number of samples reported in that table for a given analysis does not always equal 22. This is due to (1) inclusion in the final dataset of supplemental samples collected to assess the extent of chemical impacts in certain areas; (2) certain analytes were not included in the subsurface samples, as noted in the following section; some samples were remediated for particular analytes, and confirmation samples collected, and (3) rejected data are not included in the statistical summary in Table 3-4.

¹⁰ As noted before, in some cases, random sampling locations were shifted slightly to address points of interest.

three “biased” sample locations. At these locations, BRC initially collected 12 surface samples (one at each location, and duplicates at two locations in accordance with the duplicate frequency specified in the *BRC Quality Assurance Project Plan* (QAPP; BRC and ERM 2009a) and 10 subsurface soil samples. All sampling results are presented electronically on the report CD in Appendix B, and in Tables B-1 through B-11.

3.2 CHEMICALS SELECTED FOR ANALYSIS

The analyte list for soil samples collected during the initial 2010 investigation comprised the BRC project SRC list, and was consistent with the analytical program presented in Section 3 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010)¹¹ and Table 3-2 (Tables section), with the following exceptions for this Site:

- Asbestos and dioxins/furans were only analyzed for in surface soil samples.¹²
- USEPA Method 8141A for organophosphorus pesticides was not conducted. There have been only 47 detections of these compounds in over 10,000 soil sample records (<0.5 percent) from throughout the Eastside. The few detections are well below the NDEP BCLs.
- USEPA Method 8151A for chlorinated herbicides was not conducted. There have been no detections of these compounds in over 1,400 soil sample records from throughout the Eastside. Detection limits are below the NDEP BCLs.
- HPLC Method for organic acids was not conducted. There have been only three detections of these compounds in 567 soil sample records (<0.5 percent) from throughout the Eastside. Moreover, the NDEP has not established BCLs for these compounds.
- USEPA Method 8015B for non-halogenated organics (e.g., methanol and glycols) was not conducted. There have been only five detections of these compounds in 420 soil sample records (1 percent) from throughout the Eastside. The few detections have been well below the NDEP BCLs.

¹¹ Specific analytes and analyte-specific reporting limits for each analysis are listed in Table 4 of the QAPP.

¹² Note that all samples collected at the Site were discrete samples, with the exception of asbestos samples, which were composite samples collected as per the NDEP-approved Standard Operating Procedure [SOP]-12 as provided in the *Field Sampling and Standard Operating Procedures* [FSSOP; BRC, ERM and MWH 2009]).

- USEPA Method 8015 for total petroleum hydrocarbons (TPH) was not conducted. There have been only three detections of these compounds in over 299 soil sample records (1 percent) from throughout the Eastside. The few detections have been below 100 mg/kg, which is the typical low-end aesthetic threshold used for these compounds. There are no indications of possible TPH source areas (e.g., abandoned vehicles, dumping of oils/hydraulic fluids) at the Site. While TPH was not analyzed for, its components were via other methods. In addition, TPH cannot be included in a risk assessment while its components can.
- Consistent with the current project analyte list, the following radionuclides were analyzed for: radium-226, radium-228, thorium-228, thorium-230, thorium-232, uranium-233/234, uranium-235/236, and uranium-238.

The soil analyte list consisted of 272 of the 418 compounds (including water-only parameters) on the project SRC list. The analytical and preparatory methods (Table 3-2) used in accordance with the SAP adhered to the most recent version of the BRC QAPP (BRC and ERM 2009a; see Section B4, Table 4 of that document). As noted in Section 3.6, the analyte list for surface flux samples was composed of the list specified in the NDEP-approved Standard Operating Procedure (SOP)-16, as provided in the *Field Sampling and Standard Operating Procedures* (FSSOP; BRC, ERM and MWH 2009). Surface flux samples were analyzed for VOCs by USEPA Method TO-15 full scan, plus selective ion mode (SIM) analyses for a subset of the analytes.

3.3 INTERMEDIATE SAMPLING AND CLEANUP

All initial data were reviewed and a determination made, in consultation with the NDEP, as to whether localized soil removals were warranted. BRC conducted two rounds of remediation at the Site as follows:

- The first round of remediation occurred in the summer of 2012, and consisted of excavating shallow soils at sample locations 1) P9S1-AH11 within the northern portion of the Site, and 2) P9S1-JD02/P9S1-AG15 in the vicinity of the ditch. These excavations were triggered by asbestos (P9S1-AH11), metals (P9S1-AG15), PCBs (P9S1-AH11 and P9S1-JD02), and dioxin/furan (P9S1-AH11 and P9S1-JD02) exceedances.
- The second round of excavation occurred in the winter of 2012, and involved expansion of the initial P9S1-AH11 excavation area. This excavation was triggered by PCBs and dioxin/furan exceedances.

Remediation involved excavation and removal of impacted soils to the CAMU. The extent of the excavations is depicted on Figure 8.

The non-ditch remediation areas (P9S1-AG15 and P9S1-AH11) were developed based on a Thiessen map overlaid across the Site. Thiessen maps are constructed from a series of polygons formed around each sampling location. Thiessen polygons are created so that every location within a polygon is closer to the sampling location in that polygon than any other sampling location. These polygons do not take into account the respective concentrations at each location. These polygons were used as the basis for the areal extent of remediation for these locations.

For the ditch location (P9S1-JD02), the remediation area was centered about the initial sampling location that triggered remediation. The extent of excavation at this area was a 50-foot-wide segment of the ditch, extended such that the limits of excavation reached half the distance to the adjacent ditch samples to the north and south. Given the proximity to P9S1-AG15, these two excavation areas were merged into a single excavation.

Following remediation, confirmation surface soil samples were collected at each of the original sample locations associated with the remediation area polygons and ditch segments described above.¹³ All sampling locations are shown on Figure 9. The analyte list was composed of those analytes (metals, asbestos or dioxins/furans/PCBs) that triggered the remediation at each sampling location.

3.4 FINAL CONFIRMATION DATASET

Post-scrape analyses associated with follow-up rounds of remediation focused on the constituents triggering that additional remediation and, therefore, did not include the full suite analyses of the original analytical program. Analytical results from the original SAP dataset were retained for all constituents except those that were re-analyzed after additional scraping. The final confirmation dataset included the following sampling results:

- SAP sampling data, retaining the results that were not superseded by subsequent sampling;
- Supplemental data collected subsequent to the initial SAP sampling; and

¹³ The naming convention for confirmation samples uses the same sample identification as the initial (pre-remediation) sample, with an updated numerical prefix. For example, confirmation samples associated with P9S1-AH11 are named P9S6-AH11 (after the first round of confirmation sampling) and P9S7-AH11 (after the second round of confirmation sampling).

- Additional samples collected for confirmation after completion of remediation activities.

The soil dataset was subjected to a series of statistical analyses to determine representative exposure concentrations for the sub-area, as described in Sections 4 and 5 of the NDEP-approved *Statistical Methodology Report* (NewFields 2006). Consistent with the project *Statistical Methodology Report*, kriging or geostatistical analysis was not performed on the data because each measurement was assumed to be equally representative for that chemical at any point in each sub-area of the Eastside property. Hence, calculation of the 95 percent upper confidence limit (UCL) by exposure area directly from the data is considered reasonable.

As discussed in Section 4, all data have been validated. Results of all confirmation sampling and analysis are presented in Appendix B, and electronically on the report CD in Appendix B, as is the dataset used in the HHRA for the Site. All confirmation sampling locations for the Site are shown on Figure 9. Table 3-3 (Tables section) provides a matrix of which analytical suite was analyzed for in each of the samples collected from the Site. Geotechnical and Environmental Services (GES) conducted all fieldwork at the Site. The GES field reports, including boring logs, for each investigation are provided electronically in Appendix C (included on the report CD in Appendix B).

3.5 FINAL CONFIRMATION DATA SUMMARY

Using the compound-specific information presented in Table 2 of the QAPP (BRC and ERM 2009a), the comparison levels for each chemical included in the investigation were compiled for comparison to Site data. Specific soil comparison levels used for this effort were as follows:

- NDEP BCLs for worker soil (NDEP 2013; lower of either indoor or outdoor worker BCLs were used);
- NDEP BCLs for protection of groundwater (LBCL), assuming dilution attenuation factors (DAF) of 1 and 20 (NDEP 2013); and
- The maximum background concentration (for metals and radionuclides only), derived from the shallow Qal McCullough background soil dataset presented in Section 5.¹⁴

¹⁴ This value, for the shallow Qal McCullough background dataset, is used for comparison only; as discussed in Section 5.1, background comparisons were performed for the Site dataset using statistical tests.

A DAF of 1 is used when little or no dilution or attenuation of soil leachate concentrations is expected, and a DAF of 20 may be used when significant attenuation of the leachate is expected due to Site-specific conditions. For the Site, the LBCLs based on a DAF of 1 were used for discussion purposes. Data for the Site, including the number of instances in which chemical concentrations exceed each of the comparison levels, are listed in Table 3-4 (Tables section),¹⁵ and summarized. It is important to note that these comparisons are used to provide for an initial screening evaluation, assist in the evaluation of data usability, and determine the extent of contamination. They are not used for decision-making purposes or as an indication of the risks associated with the Site.

Aluminum

Aluminum was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). All of the detections were lower than the 100,000 mg/kg BCL, but were higher than the 75 mg/kg LBCL_{DAF1}. None of the samples exceeded the 15,300 mg/kg maximum shallow Qal McCullough background level.

Arsenic

Arsenic was detected in 15 of the 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). All of the detections were higher than the 1.77 mg/kg BCL and the 1 mg/kg LBCL_{DAF1}. Of these 15 exceedances, only one was higher than the maximum shallow Qal McCullough background level (7.2 mg/kg), P9S1-AH11 from 10 feet bgs (7.3 mg/kg). The reporting limits for the six non-detect samples were above the comparison levels, but below the background level; thus exceedances of background would have been detectable, if any.

Barium

Barium was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). All of the detections were lower than the 100,000 mg/kg BCL, but were higher than the 82 mg/kg LBCL_{DAF1}. However, none of the detections were higher than the maximum shallow Qal McCullough background level (445 mg/kg).

¹⁵ Pre-scraper data for the target constituents are not included in Table 3-4. That is, these have been replaced by post-scraper data; however, pre-scraper data for the non-target constituents are included in Table 3-4. Because of this, the total number of analyses does not always coincide with the total number of analyses reported in the tables in Appendix B, which include all data, regardless of status.

Boron

Boron was detected in one of the 21 soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). All of the detections were lower than the 100,000 mg/kg BCL, with one sample higher than the 23.4 mg/kg LBCL_{DAFI}. The one sample above the LBCL_{DAFI} also exceeded the 11.6 mg/kg maximum shallow Qal McCullough background level, surface sample P9S1-AG13 (24.6 J mg/kg). The reporting limits for the non-detect samples were lower the comparison levels; thus exceedances would have been detectable, if any.

Cobalt

Cobalt was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). None of the detections were higher than the 337 mg/kg BCL, but all detections were higher than the 0.495 mg/kg LBCL_{DAFI}. None of the detections exceeded the 16.3 mg/kg mg/kg maximum shallow Qal McCullough background level.

Copper

Copper was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). None of the detections were higher than the 42,200 mg/kg BCL; however, one of the detections was higher than the 45.8 mg/kg LBCL_{DAFI} (a surface sample collected at P9S1-JD02; 78.7 J+ mg/kg). That exceedance was also higher than the 25.9 mg/kg maximum shallow Qal McCullough background level.

Iron

Iron was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). None of the detections were higher than the 100,000 mg/kg BCL, but all detections were higher than the 7.56 mg/kg LBCL_{DAFI}. Of these, 10 detections were higher than the 19,700 mg/kg maximum shallow Qal McCullough background level, as listed in Table 3-5.

TABLE 3-5: IRON LBCL_{DAFI} EXCEEDANCES GREATER THAN BACKGROUND

Sample ID	Depth (ft bgs)	Reported Value (mg/kg)	Sample ID	Depth (ft bgs)	Reported Value (mg/kg)
P9S1-JD01	10	23700 J	P9S1-JD02	0	22100 J
P9S1-AH14	0	23100 J	P9S1-JD03	10	21600 J
P9S1-AG13	10	22700 J	P9S1-AH12	0	21000 J
P9S1-AG14	10	22200 J	P9S1-AH14	10	20100 J
P9S1-AG13	0	22100 J	P9S1-JD01	0	20000 J

Lithium

Lithium was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). None of the detections were higher than the 2,270 mg/kg BCL; however, one of the detections was higher than the 21.9 mg/kg LBCL_{DAF1} and the 26.5 mg/kg maximum shallow Qal McCullough background level. This one exceedance occurred at the surface sample from location P9S1-JD03 (31 mg/kg).

Magnesium

Magnesium was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). None of the detections were higher than the 100,000 mg/kg BCL, but all detections were higher than the 973 mg/kg LBCL_{DAF1}. However, all but one of the magnesium detections were lower than the 17,500 mg/kg maximum shallow Qal McCullough background level. The one exceedance was associated with surface soil sample collected from P9S1-AG13 (17,800 J mg/kg).

Manganese

Manganese was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). Of these detections, none were higher than the 24,900 mg/kg BCL; however, all detections were higher than the 1.3 mg/kg LBCL_{DAF1}. Of these, two detections were higher than the 863 mg/kg maximum shallow Qal McCullough background level: surface samples P9S1-AG13 and P9S1-AG14 with concentrations of 1,540 J mg/kg and 882 J mg/kg, respectively.

Nickel

Nickel was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). Of these detections, none were higher than the 21,800 mg/kg BCL; however, all detections were higher than the 7.0 mg/kg LBCL_{DAF1}. None of these detections were higher than the 30 mg/kg maximum shallow Qal McCullough background level.

Selenium

Selenium was detected in 10 of the 21 soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). None of the detections were higher than the 5,680 mg/kg BCL, but all of the detections were higher than the 0.3 mg/kg LBCL_{DAF1}. These 10 detections

were also higher than the 0.6 mg/kg maximum shallow Qal McCullough background level, as listed in Table 3-6.

**TABLE 3-6: SELENIUM LBCL_{DAF1} EXCEEDANCES GREATER THAN
BACKGROUND**

Sample ID	Depth (ft bgs)	Reported Value (mg/kg)	Sample ID	Depth (ft bgs)	Reported Value (mg/kg)
P9S6-AG15	0	2.4 J	P9S1-AH13	10	1.6 J+
P9S1-AG13	10	2.3 J+	P9S1-AG13	0	1.4 J+
P9S1-AH12	0	2 J+	P9S1-AH11	0	1.4 J+
P9S1-AH11	10	1.8 J+	P9S1-AH12	10	1.3 J+
P9S1-AH13	0	1.8 J+	P9S1-AH11	0	1.2 J+

The analytical reporting limits for the non-detections were higher than the LBCL_{DAF1} and background.

Thallium

Thallium was detected in two of the 21 soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). Of these detections, none were higher than the 74.9 mg/kg BCL. Both detections were higher than the 0.4 mg/kg LBCL_{DAF1}. Neither of these two detections were higher than the 1.8 mg/kg maximum shallow Qal McCullough background level. The analytical reporting limits for the non-detections were generally lower than the LBCL_{DAF1} and background, and exceedances would have been detectable, if any.

Other Inorganics

As seen in Table 3-4 (Tables section) and Tables B-3 and B-4 in Appendix B, several inorganic constituents in addition to those listed above were routinely detected in soil samples. None of these additional inorganic constituents were detected at concentrations in excess of the BCL. The following three compounds were detected in excess of their established LBCL_{DAF1}:

- Chlorate detections exceeded the 1.13 mg/kg LBCL_{DAF1} in nine samples;
- Nitrate detections exceeded the 7.0 mg/kg LBCL_{DAF1} in six samples; and
- Perchlorate detections exceeded the 0.0185 mg/kg LBCL_{DAF1} in all of the samples in which it was detected (20 samples).

The analytical reporting limits for these additional inorganic constituents were all lower than their established BCL and LBCL_{DAFI} values.

Organochlorine Pesticides

Organochlorine pesticides were analyzed for in 22 soil samples (12 surface and 10 subsurface samples; Table B-5). The following constituents were detected in at least one sample.

- 2,4-DDE
- 4,4-DDE
- 4,4-DDT
- Aldrin
- beta-BHC

Of these five organochlorine pesticides, none exceeded its BCL and only beta-BHC exceeded its LBCL_{DAFI}. Three beta-BHC detections that exceeded the 0.00596 mg/kg LBCL_{DAFI}, as listed below.

- P9S1-AH13, 0 ft bgs, 0.023 J+ mg/kg
- P9S1-AH11, 10 ft bgs, 0.0082 J+ mg/kg
- P9S1-AH11, 0 ft bgs, 0.011 J mg/kg

Aside from dieldrin, the analytical reporting limits for organochlorine pesticides were lower than the comparison levels.

Volatile Organic Compounds

VOCs were analyzed for in 22 soil samples (12 surface and 10 subsurface samples; Table B-10). As seen in Table 3-4 and Table B-10, 1,2-dichlorobenzene, 1,4-dichlorobenzene, acetone, carbon disulfide, and dichloromethane were detected in at least one sample.

Acetone was detected the most frequently in seven of the 22 (~32 percent) samples in which it was analyzed. None of the detections were above the BCL. With the exception of dichloromethane, the VOC detections were also lower than the LBCL_{DAFI}. The two detections of dichloromethane were higher than the 0.001 LBCL_{DAFI}, and were associated with surface samples P9S1-JD03 (0.063 mg/kg) and P9S1-AG15 (0.03 J mg/kg).

It should be noted that the analytical reporting limits for dichloromethane were higher than the LBCL_{DAFI}. For the other VOCs, the standard reporting limits were lower than the BCL and LBCL_{DAFI}.

Semi-Volatile Organic Compounds

SVOCs were analyzed for in 22 soil samples (12 surface and 10 subsurface samples; Table B-9). As seen in Table 3-4 and Table B-9, all of the SVOCs were non-detect. The standard reporting limits were lower than the BCL, except for dichloromethyl ether, which routinely had analytical reporting limits higher than the BCL.

For several other SVOC non-detections, the analytical reporting limits are higher than the $LBCL_{DAFI}$, and it is unknown whether these constituents are present in those samples at concentrations in excess of the $LBCL_{DAFI}$. The constituents with reporting limits routinely higher than the $LBCL_{DAFI}$ are as follows:

- 2,2'-Dichlorobenzil
- 2,4,6-Trichlorophenol
- 2,4-Dichlorophenol
- 2,4-Dinitrophenol
- 2,4-Dinitrotoluene
- 2,6,-Dinitrotoluene
- 3,3-Dichlorobenzidine
- bis(2-Chloroethyl)ether
- Hexachloroethane
- Isophorone
- Nitrobenzene
- N-nitrosodi-n-propylamine
- p-Chloroaniline
- Pentachlorophenol

Dioxins and Furans

For dioxins/furans, as discussed in Section 1.1, the USEPA TEQ procedure, developed to describe the cumulative toxicity of these compounds, is used. Dioxins and furans were analyzed for in 11 surface soil samples¹⁶ (Table B-2). All of the individual dioxins and furans congeners analyzed were reported as detections in at least one sample. None of the samples analyzed had calculated TCDD TEQ concentrations in excess of the NDEP worker BCL of 1,000 ppt. $LBCL_{DAFI}$ values have not been established for dioxin/furans, thus the potential for impacts to groundwater quality due to their presence could not be assessed by comparisons to the $LBCL_{DAFI}$.

¹⁶ This tally includes field duplicates and confirmation samples.

Polychlorinated Biphenyls

PCBs were analyzed for in 11 surface soil samples¹⁷ (individual PCB congeners) (Table B-7). All of the PCB congeners were detected in at least one sample. BCL values have not been established for individual congeners. PCB congeners are included in the calculation of the TCDD TEQ, and are evaluated in this manner, not on an individual congener basis. LBCL_{DAFI} values have not been established for individual PCB congeners.

Polynuclear Aromatic Hydrocarbons

PAHs were analyzed for in 22 soil samples (12 surface and 10 subsurface samples; Table B-6). PAHs were non-detect in all 22 of the samples. The PAH detections did not exceed either the BCL or the LBCL_{DAFI} where established. The standard PAH analytical reporting limits were lower than the BCL and the LBCL_{DAFI}, thus concentrations in excess of these comparison levels, if present, would have been reported.

Aldehydes

Aldehydes were analyzed for in 22 soil samples (12 surface and 10 subsurface samples; Table B-9). Acetaldehyde was detected in all 22 samples, and formaldehyde was detected in all but one of the 22 samples. None of the detections exceeded the BCL. LBCL_{DAFI} values have not been established for these compounds.

Radionuclides

Radionuclides were detected in all 22 of the soil samples analyzed (12 surface, 10 subsurface samples; Table B-8). Exceedances of comparison levels for radionuclides are shown in Table 3-4 for the eight radionuclides currently included in the project analyte list (radium-226, radium-228, thorium-228, thorium-230, thorium-232, uranium-233/234, uranium-235/236, and uranium-238). Of those activities greater than comparison levels, the majority are lower than the maximum shallow Qal McCullough background activity, as shown in Table 3-4. As seen in that table, all radionuclides except uranium-233/234 and uranium-235/236 were reported at activities higher than their respective BCL and LBCL_{DAFI}. Thorium-228, thorium-232, and uranium-235/236 were detected above background. Radionuclide exceedances are summarized below.

¹⁷ This tally includes field duplicates and confirmation samples.

Radium-226 activities in 21 of the 22 samples were higher than the 0.023 pCi/g BCL and the 0.016 pCi/g LBCL_{DAFI}. None of the detections were higher than the 2.36 pCi/g maximum soil background activity.

Radium-228 activities in 18 of the 21 samples were higher than the 0.041 pCi/g BCL and the 0.016 pCi/g LBCL_{DAFI}. None of the detections were higher than the 2.92 pCi/g maximum soil background activity.

Thorium-232 activities in all 22 samples were higher than the 0.025 pCi/g BCL and the 0.0023 pCi/g LBCL_{DAFI}. Of these, the following six detections were higher than the 2.28 pCi/g maximum soil background activity:

- P9S1-AH11, 0 ft bgs, 3.08 J pCi/g
- P9S1-AH14, 0 ft bgs, 2.46 pCi/g
- P9S1-AG15, 0 ft bgs, 2.93 J pCi/g
- P9S1-AH12, 10 ft bgs, 2.38 J pCi/g
- P9S1-JD01, 10 ft bgs, 2.76 pCi/g
- P9S1-AG13, 0 ft bgs, 2.34 J pCi/g

Thorium-230 activities in 20 of the 22 samples were higher than the 0.00084 pCi/g LBCL_{DAFI}. None of the samples were above the 8.3 pCi/g BCL or the 3.01 pCi/g maximum soil background activity.

Thorium-232 activities in all 22 samples were higher than the 0.0029 pCi/g LBCL_{DAFI}. None of the samples were above the 7.4 pCi/g BCL. Only one of the detections exceeded the 2.23 pCi/g maximum soil background activity, surface sample from location P9S1-JD01, which had a detected concentration of 2.75 pCi/g.

Uranium-238 activities for four of the 22 samples for which it was analyzed were above the 1.4 pCi/g BCL. No LBCL_{DAFI} has been established for this compound. All of the detections above the BCL were lower than the 2.37 pCi/g maximum soil background activity.

As presented in NDEP guidance (NDEP 2009a), as part of the process used to evaluate radionuclide data for the BMI Common Areas, BRC assessed whether radionuclides are in secular equilibrium. As discussed in Section 5.1, secular equilibrium is an indication of background conditions. The data indicate that not all radionuclides are in secular equilibrium at the Site. Specifically, the mean radioactivities for the thorium-232 decay chain (i.e., thorium-232, radium-228, and thorium-232) are comparable (1.7, 1.6, and 1.9 pCi/g, respectively). However, the mean values for the uranium-238 decay chain (uranium-238, uranium-233/234,

thorium-230, and radium-226) are not comparable, ranging from 0.75 to 1.3 pCi/g. All of the mean values are lower than their respective maximum background activity levels. A quantitative evaluation of secular equilibrium is presented in Section 5.1.

Summary of Soil Exceedances

As summarized above and in the associated data tables (Table 3-4 and Appendix B), some BCL and LBCL_{DAFI} exceedances are currently observed in Site soils. The following constituents were reported at concentrations higher than the worker BCL and the maximum shallow Qal McCullough background level (where applicable):

- Arsenic (one sample)
- Thorium-228 (six samples)

The following constituents were reported at concentrations higher than the LBCL_{DAFI} and the maximum shallow Qal McCullough background level (where applicable):

- Arsenic (one sample)
- Boron (one sample)
- Copper (one sample)
- Iron (10 samples)
- Manganese (two samples)
- Nitrate (six samples)
- Selenium (10 samples)
- Thorium-232 (one sample)
- beta-BHC (three samples)
- Chlorate (nine samples)
- Dichloromethane (two samples)
- Lithium (one sample)
- Magnesium (one sample)
- Perchlorate (20 samples)
- Thorium-228 (six samples)

Elevated chemical concentrations (e.g., asbestos, arsenic, selenium, magnesium, manganese, sodium, TCDD TEQ, thorium-228, beta-BHC), have been detected in the four western-most sample locations (P9S1-AH12, P9S1-AH-13, P9S1-AG13, and in particular the surface sample at P9S1-AH11, which had the highest levels of asbestos, TCDD TEQ, and thorium-228). All of these detections except one arsenic detection (7.3 mg/kg) at 10 feet bgs and the thorium-228 detections were below their respective worker BCLs and/or maximum background level. Therefore, because of this, and given the nature of the exposures for non-residential receptors (that is, exposures will not be exclusive to one particular area), separate exposure areas were not evaluated in the HHRA; that is, the Site was evaluated as a single exposure area, consistent with the project *Statistical Methodology Report* (NewFields 2006), and as discussed further in Section 6.1.1.

The limited number of BCL and LBCL_{DAFI} exceedances indicates that there is a low likelihood of adverse impacts to human health and the environment due to residual chemical concentrations in Site soils. Consistent with the methodology in the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010), an HHRA was conducted to further evaluate this possibility, as discussed in subsequent sections of this report.

3.6 SURFACE FLUX SAMPLING

Concurrent with the confirmation soil sampling, BRC implemented surface flux sampling across the Site. This sampling conformed to the most recent NDEP-approved version of SOP-16 (BRC, ERM, and MWH 2009). The sampling procedure for the effort included the USEPA surface emission isolation flux chamber (flux chamber) sampling to support an air pathway analysis for the Site.

Noted that BRC submitted a technical memorandum to the NDEP (BRC 2010b), in which the results of radon testing performed in groundwater and indoor air samples were presented. Based on the findings of this memorandum, the NDEP concluded that HHRAs for Eastside property sub-areas do not need to evaluate the pathway of radon migration from groundwater to indoor air for sub-areas with a separation distance of at least 15 feet between any current or future building structure base and the high water table (letter dated November 9, 2010, from Greg Lovato, NDEP, to Mark Paris, BRC). Based on this conclusion and given the depth to groundwater at the Site is at least 32 feet bgs, the intrusion of radon into indoor air is not evaluated in the HHRA.

The flux chamber sample collection rationale was based on the project goal of obtaining a representative dataset of air emissions per sub-area. Flux chamber samples were collected from seven locations (Figure 9): five random sampling locations and two biased locations (and one duplicate P9S1-JD03 A/B). This density of sample collection is considered adequate for sub-area characterization given the biased nature of the sample locations, the size of the sub-area, and the number of sample locations suggested by the USEPA (1986) in the flux chamber User's Guide for assessing zones of homogeneous site properties.

The analyte list for surface flux samples is composed of the list provided in the most recent NDEP-approved version of SOP-16 (BRC, ERM, and MWH 2009). This analyte list is provided in Table 3-7 (Tables section), and consists of the USEPA Method TO-15 full scan, plus SIM analyses for a subset of the analytes. The analytical results are summarized in Table B-11

(Appendix B), and the principal investigator Report of Findings (which includes descriptions of sampling procedures) is provided in Appendix D (included on the report CD in Appendix B).¹⁸ It should be noted that, in addition to VOC data for the Site, the flux chamber report also contains data for the Staging sub-area outside the Site boundaries. Data collected from outside the Site boundaries are not included in this HHRA. A data summary for the flux chamber sample results is provided in Table 3-8 (Tables section).

As seen in Tables 3-8 and B-11, 15 of the 67 organic constituents included in the TO-15 scan were detected in at least one surface flux sample. The most commonly detected constituents were as follows:

- Chloroform was detected in seven of eight samples;
- Acetone was detected in seven of seven samples;
- Methyl-ethyl ketone (2-butanone) was detected in six of seven samples; and
- Chloromethane were detected in six of seven samples.

The highest reported concentrations were as follows:

- Acetone: 2.29 micrograms per square meter per minute [$\mu\text{g}/\text{m}^2, \text{min}^{-1}$] at P9S1-AH13;
- Ethanol: 0.873 J- $\mu\text{g}/\text{m}^2, \text{min}^{-1}$ at P9S1-AH13;
- Methyl ethyl ketone (2-butanone): 0.345 $\mu\text{g}/\text{m}^2, \text{min}^{-1}$ at P9S1-AH13; and
- Dichloromethane: 0.236 $\mu\text{g}/\text{m}^2, \text{min}^{-1}$ at P9S1-AH-11.

As discussed in Section 4, all data have been validated. The HHRA surface flux dataset for the Site is included on the report CD in Appendix B. Surface flux sample locations are shown on Figure 9.

¹⁸ Note that this report was prepared prior to data validation; therefore, data qualifiers may differ from those in the remainder of this report.

3.7 LEACHATE DATA

No samples collected within the Site during the confirmation sampling events included synthetic precipitation leaching procedure (SPLP) analysis. Findings from SPLP samples within the adjacent Eastside property are applicable to the Site as well. The potential leaching impacts to groundwater will be addressed in the Eastside groundwater remedial alternatives study.

4.0 DATA EVALUATION

This section describes the procedures used to evaluate the acceptability of data for use in the risk assessment. Overall quality of sample results is a function of proper sample management. Management of samples began at the time of collection and continued throughout the analytical process. SOPs were followed to ensure that samples were collected and managed properly and consistently and to optimize the likelihood that the resultant data are valid and representative.

The primary objective of the data review and usability evaluation was to identify appropriate data for use in the HHRA. The analytical data were reviewed for applicability and usability following procedures in USEPA's *Guidance for Data Usability in Risk Assessment (Part A)* (1992a) and *Risk Assessment Guidance for Superfund: Volume I* (1989), and the NDEP's *Supplemental Guidance for Assessing Data Usability for Environmental Investigations at the BMI Complex and Common Areas* (2008a). A quality assurance/quality control (QA/QC) review of the analytical results was conducted during the sampling events. According to the USEPA Data Usability Guidance, there are six principal evaluation criteria by which data are judged for usability in risk assessment. The six criteria are:

- Reports to risk assessor (availability of information associated with Site data);
- Documentation;
- Data sources;
- Analytical methods and detection limits;
- Data review; and
- Data quality indicators (DQIs), including precision, accuracy, representativeness, comparability, and completeness (PARCC).

A summary of these six criteria for determining data usability is provided below. In addition to the six principal evaluation criteria, the NDEP's Data Usability Guidance includes a step for data usability analysis, which is discussed after these six USEPA evaluation criteria. Data usability evaluation tables are provided electronically in Appendix E (included on the report CD in Appendix B).

4.1 CRITERION I – REPORTS TO RISK ASSESSOR (AVAILABILITY OF INFORMATION ASSOCIATED WITH SITE DATA)

The usability analysis of the site characterization data requires the availability of sufficient data for review. The required information is available from documentation associated with the Site data and data collection efforts. Data have been validated as described in the following Data Validation Summary Report (DVSRs), which are provided electronically in Appendix F:

- *Data Validation Summary Report, Staging Sub-Area Soil Investigation – May-June 2010 (Dataset 66)* (BRC and ERM 2010a), approved by the NDEP on January 9, 2012;
- *Data Validation Summary Report, Eastside North Surface Flux Investigations (Remaining Sub-Areas) – July through August 2010 (Dataset 71)* (BRC and ERM 2011), approved by the NDEP on July 25, 2011; and
- *Eastside Confirmation/Supplemental Sampling Events – July 2012 Through February 2014 (Dataset 72f)* (BRC and ERM 2014) approved by the NDEP on January 15, 2015.

The information sources and the availability of such information for the data usability process are as follows:

- A Site description provided in this report and the NDEP-approved SAP identify 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 9.
- Sampling design and procedures were provided in the NDEP-approved SAP.
- Analytical methods and sample quantitation limits (SQLs) are provided in the dataset file included on the report CD in Appendix B.
- A complete dataset is provided in the dataset file included on the report CD in Appendix B.
- 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 DVSRs (BRC and ERM 2010a, 2011, 2014).

- QC results are provided by the laboratory, including blanks, replicates, and spikes. The laboratory QC results are included as part of the DVSRs (BRC and ERM 2010a, 2011, 2014).
- Data flags used by the laboratory were defined adequately.
- Electronic files containing the raw data made available by the laboratory are included as part of the DVSRs (BRC and ERM 2010a, 2011, 2014).

4.2 CRITERION II – DOCUMENTATION REVIEW

The objective of the documentation review is to confirm that the analytical results provided are associated with a specific sampling location and collection procedure, using available documentation. For the purposes of this data usability analysis, 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 DVSRs (BRC and ERM 2010a, 2011, 2014). Based on the documentation review, all samples analyzed by the laboratory were correlated to the correct geographic location at the Site, as shown on Figure 9. The samples were collected in accordance with the SAP (BRC 2010a), and the SOPs developed for the BMI Common Areas as provided in the FSSOP (BRC, ERM, and MWH 2009). Field procedures included documentation of sample times, dates, and locations; other sample-specific information such as sample depth was also recorded. Information from field forms generated during sample collection activities was imported into the project database.

The analytical data were reported in a format that provides adequate information for evaluation, including appropriate QC measures and acceptance criteria. Each laboratory report describes the analytical method used; provides results on a sample-by-sample basis, along with sample-specific SQLs; and provides the results of appropriate QC samples such as laboratory control spike samples, sample surrogates and internal standards, and matrix spike samples. All laboratory reports, except for asbestos, were prepared as provided by the documentation required by USEPA's Contract Laboratory Program (USEPA 2003a, 2004b,c) which includes chain-of-custody records; calibration data; QC results for blanks, duplicates, and spike samples from the field and laboratory; and all supporting raw data generated during sample analysis were also included. Reported analytical results were imported into the project database.

Measurement of asbestos was conducted consistent with the NDEP's *Technical Guidance for the Calculation of Asbestos-Related Risk in Soils* (2011a). The recommended method for providing asbestos data that are useful for risk assessment purposes was performed by EMSL Analytical,

Inc., in Westmont, New Jersey. Although this laboratory is not currently certified in Nevada, it does have State of California and U.S. accreditation for asbestos analysis. Because many of the QC procedures associated with other analyses do not apply to asbestos analysis (e.g., laboratory blanks, duplicates and spikes), data validation of the asbestos laboratory reports involved a somewhat lesser level of effort than for other analyses (consistent with the NDEP's 2012 *Guidance on Data Validation for Asbestos Data in Soils*).

4.3 CRITERION III – DATA SOURCES

The review of data sources is performed to determine whether the analytical techniques used in the site characterization process (i.e., SAP sampling) are appropriate for risk assessment purposes. The data collection activities specified in the SAP were developed to characterize a broad spectrum of chemicals potentially present on the Site, including asbestos, aldehydes, general chemistry and ions, VOCs, SVOCs, metals, dioxins/furans, PAHs, organochlorine pesticides, radionuclides, and PCBs (SRCs and analyses performed under SAP implementation are listed in Table 3-2, and Table 3-7 for surface flux samples).¹⁹ Because of the soil removals that have occurred on the Site, data collected prior to SAP implementation had significant gaps and inconsistencies in analytical methodology, and as discussed in Section 2, those historical data are not evaluated further in the data usability process, or the HHRA. Only post-remediation data collected under the SAP (and subsequent confirmation sampling events) are being used in the HHRA, and these were subjected to the formal data usability evaluation described in this section. Figure 9 demonstrates that samples collected in accordance with the SAP are situated across the entire Site; analyses associated with these samples are summarized in Tables 3-2 (soil) and 3-7 (surface flux).

The State of Nevada is in the process of certifying the laboratories used to generate the analytical data. As such, standards of practice in these laboratories follow the quality program developed by the Nevada Revised Statutes and are within the guidelines of the analytical methodologies established by the USEPA. Based on the review of the available information, the data sources for chemical and physical parameter measurements are adequate for use in a risk assessment.

¹⁹ Although radon samples were collected and analyzed for the Site, radon has been evaluated through a separate process and is not considered further in the data usability process (Section 3.6).

4.4 CRITERION IV – ANALYTICAL METHODS AND DETECTION LIMITS

In addition to the appropriateness of the analytical techniques evaluated as part of Criterion III, it is necessary to evaluate if the detection limits are low enough to allow adequate characterization of risks. At a minimum, this data usability criterion can be met through the determination that routine USEPA and U.S. Department of Energy (DOE) reference analytical methods were used in analyzing samples collected from the Site. The USEPA and DOE methods that were used in conducting the laboratory analysis of soil and surface flux samples are identified in the dataset file included on the report CD in Appendix B. Each of the identified methods is considered the most appropriate method for the respective constituent class and each was approved by the NDEP as part of the SAP (BRC 2010a). As recommended by NDEP's guidance on *Detection Limits and Data Reporting* (NDEP 2008b), the laboratory-reported SQL was used in evaluating detection limits.

Laboratory practical quantitation limits (PQLs) were based on those outlined in the reference method, the SAP (BRC 2010a), and the project QAPP. In accordance with respective laboratory SOPs, the analytical processes included performing instrument calibration, laboratory method blanks, and other verification standards used to ensure QC during the analyses of collected samples.

The range of SQLs achieved in field samples was compared to NDEP BCLs (NDEP 2013). As seen in the summary of the Site dataset provided in Tables 3-4 (soil) and 3-8 (surface flux), of the standard analytes, only five constituents had SQLs that exceeded their respective worker soil BCLs. The SQLs exceedances of NDEP BCLs are discussed below.

- The radium-226 in one of 22 samples and radium-228 in four of 22 samples had minimum detectable activities (MDA) higher than the BCL; the uranium-235/236 MDA in six of 22 sample analyses were higher than the BCL.
- Arsenic SQLs exceeding the PQL were identified in all six non-detect results. All six non-detects were due to blank contamination where the non-detect value was raised to the PQL.
- The only organic analytes with a SQL higher than the BCL was dichloromethyl ether in all 22 samples analyzed. Dichloromethyl ether was not detected in any sample. The dichloromethyl ether SQL is greater than 100 times the BCL and a reduction in the SQL is not likely to be achieved by the laboratory. This chemical is further discussed in the Uncertainty Analysis section (Section 7.1).

As discussed in the 2008 *Supplemental Shallow Soil Background Report* (BRC and ERM 2009b), there are differences in SQLs among datasets that may affect data comparability for datasets comprised primarily of non-detect values. For these datasets, left-censored data can result in difficulties in differentiating whether datasets are actually different or merely an artifact of detection limits.

4.5 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 and surface flux sample data were subject to data validation. DVSRs were prepared as separate deliverables (BRC and ERM 2010a, 2011, 2014; Appendix F). The analytical data were validated according to the internal procedures using the principles of USEPA National Functional Guidelines (USEPA 1999, 2004d, 2005a, 2008) and were designed to ensure completeness and adequacy of the dataset. Additionally, the DVSRs were issued utilizing the NDEP's two *Supplemental Guidance on Data Validation* documents (NDEP 2009b,c). Any analytical errors and/or limitations in the data have been addressed and an explanation for data qualification is provided in the respective data tables. The results of ERM's data review for these issues are presented in the DVSRs and are summarized below.

A limited number of results for certain analytes/samples (eight data points, all non-detections) were rejected as unusable for the following reasons:

- The heptachlor results for eight samples, P9S1-AG15-0, P9S1-AG15-0-DUP, P9S1-AG15-10, P9S1-JD01-0, P9S1-JD01-10, P9S1-JD02-0, P9S1-JD02-10, and P9S1-JD03-0, were rejected due calibration violations.

Data qualifications are discussed in the subsections that follow.

4.5.1 Holding Time Exceedances / Sample Condition Qualifications

Holding time refers to the period of time between sample collection and the preparation and/or analysis of the sample. The accuracy of analytical results may depend upon analysis within specified holding times and sample temperature. In general, a longer holding time is assumed to result in a less accurate measurement due to the potential for loss or degradation of the analyte over time. Sample temperature is of greatest concern for VOCs that may volatilize from the sample at higher temperatures. As described in the DVSRs (BRC and ERM 2010a, 2011, 2014),

sample results were reviewed for compliance with the method-prescribed preparation and analysis holding times.

USEPA guidance for validation allows professional judgment to be used in evaluating qualification due to holding time exceedances. Sample results that were generated after the required holding time, but less than two times after the holding time, were qualified as estimated (J- or UJ flagged). If the samples were prepared after two times the holding time was exceeded, non-detect results were qualified as rejected (R) and detections were qualified as estimated (J-). Qualifications to 21 samples (dataset 66) were made on the basis of exceeded holding times (see Table 2-2 of DVSR 66 [BRC and ERM 2010a], Appendix F), as follows:

- Chromium (VI) results for 20 soil samples were qualified as estimated (J-/UJ) due to holding time exceedances. The lengths of time between sample preparation and analysis for these batches varied between 5 and 6 days (1 to 2 days beyond the method-prescribed 4-day period). The samples qualified are listed in Table 4-1.

**TABLE 4-1: CHROMIUM (VI) SAMPLES QUALIFIED
DUE TO HOLDING TIME EXCEEDANCES**

Sample ID	Lab ID	Sample ID	Lab ID
P9S1-AG13-0	F0F100463001	P9S1-AG13-10	F0F100463002
P9S1-AH11-0	F0F100463007	P9S1-AH11-0-DUP	F0F100463008
P9S1-AH11-10	F0F100463009	P9S1-AH12-0	F0F100463005
P9S1-AH12-10	F0F100463006	P9S1-AH13-0	F0F100463003
P9S1-AH13-10	F0F100463004	P9S1-AG14-0	F0F090529010
P9S1-AG14-10	F0F090529011	P9S1-AG15-10	F0F090529003
P9S1-AH14-0	F0F090529012	P9S1-AH14-10	F0F090529013
P9S1-JD01-0	F0F090529004	P9S1-JD01-10	F0F090529005
P9S1-JD02-0	F0F090529006	P9S1-JD02-10	F0F090529007
P9S1-JD03-0	F0F090529008	P9S1-JD03-10	F0F090529009

- The Aldrin result for one soil sample, P9S1-AH14-0, was qualified as estimated (J-) due to holding time exceedances. The length of time between sample collection and extraction for this sample was 22 days (8 days beyond the method-prescribed 28-day period).

As noted in the DVSRs (BRC and ERM 2010a, 2011, 2014), all samples were received at the laboratory within the required temperatures range of $4^{\circ} \pm 2^{\circ}$ Celsius. No sample results were qualified based on sample temperatures.

4.5.2 Blank Contamination

Blanks are artificial samples designed to evaluate the nature and extent of contamination of environmental samples that may be introduced by field or laboratory procedures. Field and laboratory blanks, consisting of contaminant-free water, were prepared and analyzed as part of standard QA/QC procedures to monitor for potential contamination of field equipment, laboratory process reagents, and sample containers. As presented in the DVSRs (BRC and ERM 2010a, 2011, 2014), 172 results were qualified as undetected (U) or estimated (J or J+) due to laboratory or field blank contamination, as discussed below. Of these, the majority, 162 results, were qualified as undetected (U). Detections of constituents qualified as non-detections due to comparable detections in laboratory or field blanks are known as “censored” data, and are presented in Tables 2-5 and 2-6 of DVSR 66, Tables 2-3 and 2-4 of DVSR 71, and Tables 2-4 and 2-5 of DVSR 72f (Appendix F). In these cases, non-detections are represented in the database as “< [the PQL]” in the case of inorganics detected below the PQL, or as “<[result value]” for all others.²⁰

These censored data are summarized in Appendix E, Table E-14 (included on the report CD in Appendix B) by compound class. As seen in that table, analytes were initially reported as detections in samples, but were later qualified as non-detections based on the presence of comparable concentrations of that analyte in blank samples. As seen in Appendix E, compounds most often censored for soil results included the following:

- Ammonia (as N) (12 samples)
- Cadmium (19 samples)
- Molybdenum (12 samples)
- Tin (16 samples)
- Orthophosphate (11 samples)
- Mercury (18 samples)
- Selenium (11 samples)
- Dichloromethane (11 samples)

In addition, dibromochloropropane (eight of eight results) was censored in all flux samples.

Table 4-2 presents the metals most likely to be affected by this issue.

²⁰ Although NDEP has issued recent guidance regarding qualifying data due to blank contamination (NDEP 2011c); BRC has addressed this issue in the *Technical Memorandum – BRC Comments on NDEP Blank Contamination Guidance* (BRC 2011) and, consistent with this Technical Memorandum, no changes were made to the Site dataset.

**TABLE 4-2: METALS MOST FREQUENTLY CENSORED
DURING BLANK SAMPLE EVALUATION**

Metal	Number of Detects	Number of Samples	Number of Censored Results	Max Non-Detect (mg/kg)	NDEP Worker BCL (mg/kg)
Cadmium	3	21	19	0.29	1,110
Mercury	1	21	18	0.0389	341
Molybdenum	4	21	12	2.9	5,680
Selenium	10	21	11	2.9	5,680
Tin	5	21	16	1.2	100,000

What this table demonstrates is that while the number of censored results is numerous for some metals compared to the number of detections, the censored values are still much lower than soil BCLs.

4.5.3 Sample/Duplicate Differences Outside Permissible Range or Greater than Permissible Values

During the data validation process, sample/duplicate results are evaluated to determine whether differences in those results suggest potential issues with data quality. Specifically, the analyst evaluates the following:

- Matrix spike/matrix spike duplicate (MS/MSD) relative percent difference (RPD), to determine if the RPDs are outside acceptance limits;
- Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) RPD, to determine if the RPDs are outside acceptance limits;
- Sample/field duplicate results to determine if differences are greater than the permissible value; and
- Sample/laboratory duplicate results to determine if differences are greater than the permissible value.

4.5.3.1 Qualifications Due to Matrix Spike/Matrix Spike Duplicate Recoveries Outside Acceptance Criteria

As discussed in the DVSRs (BRC and ERM 2010a, 2011, 2014), 232 inorganic sample results and no organic sample results were qualified as estimated (either UJ for non-detections or J for detections; “+” or “–” added to denote potential high or low bias, respectively) based on MS/MSD recoveries. No results were rejected due to MS/MSD recoveries. The qualifications applied on the basis of MS/MSD recoveries were as follows:

- The Total Kjeldahl Nitrogen result for one soil sample (P9S1-JD03-0) was qualified as estimated due to recoveries below than the acceptance criteria of 75 to 125 percent.
- Metals results for soil samples in various laboratory data packages were qualified due to recoveries outside the acceptance criteria of 75 to 125 percent, as summarized in Table 4-3.

TABLE 4-3: METALS SAMPLES QUALIFIED DUE TO RECOVERIES OUTSIDE ACCEPTANCE CRITERIA

Lab Data Package	Antimony	Arsenic	Barium	Beryllium	Chromium	Cobalt	Copper	Nickel	Potassium	Selenium	Silver	Sodium	Strontium	Tungsten	Vanadium	Zinc
160-336-1	-	+	+		+	+	+	+	+		-	+	+	-	+	+
F0F090529	-	+	+	+	+	+	+		+	+		+	+	-	+	+
F0F100463	-		+						+	+		+	+	-		

+ = Recovery greater than the acceptance limits

- = Recovery less than the acceptance limits

Blank entry signifies that the recovery was within the acceptance limits

Appendix E, Table E-11 (included on the report CD in Appendix B) lists the samples and associated analytes exhibiting MS/MSD percent recoveries below the laboratory control limits. In cases in which the recoveries were higher than the acceptance criteria, the results have the potential of being similarly biased high, and using these data in the HHRA could result in risks being calculated that are higher than would be associated with actual Site conditions. Of more concern for the HHRA is underestimation of risk, which could be associated with the use of data that are biased low.

As indicated in that table, reported detections and non-detects for soil data were flagged as estimated (“J-” or “UJ,” respectively) due to low MS/MSD recoveries (*i.e.*, from 30 to 74 percent for metals).²¹ Non-detects associated with “very low” MS/MSD recoveries (*i.e.*, less than 30 percent for metals), are generally rejected as unusable. No results were rejected due to MS/MSD recoveries. The data flagged as estimated based on low MS/MSD recoveries were subjected to further review in terms of data usability for the Site, as discussed in Section 4.6.2.3.

²¹ If additional validation criteria (aside from the MS/MSD recoveries) did not suggest a low bias for a given result, the sample result was flagged with “J” (no bias inferred).

4.5.3.2 Qualifications Due to Laboratory Control Sample/Laboratory Control Sample Duplicate Recoveries Outside Acceptance Criteria

Inorganic constituent results for 11 soil samples were qualified as estimated (J+) for selenium (P9S1-AG14-0, P9S1-AG14-10, P9S1-AG15-10, P9S1-AH14-0, P9S1-AH14-10, P9S1-JD01-0, P9S1-JD01-10, P9S1-JD02-0, P9S1-JD02-10, P9S1-JD03-0, and P9S1-JD03-10). These results were further qualified as non-detect due to field blank contamination. No organics were qualified and no data were rejected due to LCS recoveries.

As noted above, recoveries below the lower laboratory limits are of the most concern in terms of data usability. No results were flagged as estimated due to low LCS/LCSD percent recoveries, therefore, no further review is necessary.

4.5.3.3 Qualifications Due to Sample/Field Duplicate Differences Outside Acceptance Criteria

The following two soil field duplicates were collected during the sampling activities:

- P9S1-AG15-0-DUP
- P9S1-AH11-0-DUP

No surface flux field duplicates were associated with this dataset.

If field duplicate results are less than five times the PQL, results are qualified if the absolute difference between the two results is greater than the PQL. If results are greater than five times the PQL, results are compared to a precision goal of ≤ 50 percent RPD. Field duplicate differences in excess of acceptance limits were noted in both field duplicate pairs of soil samples. The differences are presented in Appendix E, Table E-12 (included on the report CD in Appendix B). All associated data were flagged as estimated (J/UJ). No data were rejected on the basis of sample/field duplicate differences.

4.5.3.4 Qualifications Due to Sample/Laboratory Duplicate Differences Outside Acceptance Criteria

Of the samples representing post-remediation conditions (i.e., not including those data points associated with samples from soil intervals subsequently removed from the Site), results for the one soil sample (one data point) identified in Table 4-4 had a sample/laboratory duplicate difference greater than the permissible value (i.e., for radionuclides, absolute difference greater than 1 pCi/g).

**TABLE 4-4: RESULTS QUALIFIED DUE TO SAMPLE/LABORATORY
DUPLICATE DIFFERENCES OUTSIDE ACCEPTANCE CRITERIA**

Field Sample ID	Lab Sample ID	Analyte	Result	Unit	RPD or Difference
P9S1-AH11-0-DUP	254446008	Thorium-228	1.32 J	pCi/g	Difference=1.01

The above data flagged as estimated based on sample/laboratory duplicate differences were subjected to further review in terms of data usability for the Site, as discussed in Section 4.6.2.3.

4.5.4 Internal Standards Outside Acceptance Criteria

Internal standards are prepared for certain organic gas chromatograph/mass spectrometry (GC/MS) and inductively coupled plasma/mass spectrometry analyses 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. The evaluation of internal standards involved comparing the instrument response and retention time from the target compounds in the sample with the response and retention time of specific internal standards added to the sample extract prior to analysis. No data were rejected due to internal standard recoveries.

As presented in the DVSRs (BRC and ERM 2010a, 2011, 2014), the following results were qualified as estimated (J/UJ) due to internal standard exceedances:

- Dioxins/furans results for five soil samples were qualified as estimated (J/UJ) due to low or high internal standard recoveries if the percent recovery was below 40 percent or above 135 percent. Qualified samples are presented in Table 4-5.

**TABLE 4-5: DIOXIN/FURAN SOIL SAMPLE RESULTS QUALIFIED DUE
TO INTERNAL STANDARDS OUTSIDE ACCEPTANCE CRITERIA**

Laboratory Data Package #	Sample ID	
F0F090468	P9S1-JD01-0 P9S1-JD03-0	P9S1-AG14-0
F0F100459	P9S1-AG13-0	P9S1-AH13-0

4.5.5 Surrogate Percent Recoveries Outside Laboratory Control Limit

As discussed in the DVSRs (BRC and ERM 2010a, 2011, 2014), surrogate spikes were added to each of the samples submitted for organic analysis to monitor potential interferences from the matrix. Results associated with unacceptable surrogate recoveries were qualified as estimated

(J+, J- or UJ). Generally, when surrogate recoveries are less than 10 percent, associated non-detect results are qualified as rejected (R) because false negatives are a possibility. No sample results were rejected due to surrogate recoveries. The soil samples listed in Table 4-6 were qualified due to surrogate recovery exceedances.

TABLE 4-6: RESULTS QUALIFIED DUE TO SURROGATE RECOVERIES OUTSIDE LABORATORY CONTROL LIMIT

Sample ID	Lab ID	Analysis	Recovery	Acceptable Range
P9S1-AH11-0	F0F100463007	Organochlorine Pesticides	263%	36-150
P9S1-AH11-10	NTF1083-09	Aldehydes	26%	39-134
P9S1-AH11-10	F0F100463009	Organochlorine Pesticides	254%	36-150
P9S1-AH13-0	F0F100463003	Organochlorine Pesticides	284%	36-150
P9S1-AH14-0	F0F090529012	Organochlorine Pesticides	49%	53-120
P9S1-JD01-10	F0F090529005	Organochlorine Pesticides	46%	53-120
P9S1-JD02-0	F0F090529006	Organochlorine pesticides	41%	53-120
P9S1-JD02-10	F0F090529007	Organochlorine pesticides	248%	36-150
P9S1-JD02-10	F0F090529007	Organochlorine pesticides	43%	53-120
P9S1-JD03-0	F0F090529008	Organochlorine Pesticides	52%	53-120

Several surrogate recoveries outside the acceptance criteria were below the lower laboratory control limit. Further review of low surrogate recoveries is necessary in terms of data usability for the Site, as discussed in Section 4.6.2.3.

4.5.6 Calibrations Outside Laboratory Control Limits

Requirements for instrument calibration ensure that the instrument is capable of producing acceptable quantitative data. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run. Continuing calibration checks document satisfactory maintenance and adjustment of the instrument on a day-to-day basis. As presented in the DVSRs (BRC and ERM 2010a, 2011, 2014), certain data were qualified due to initial or continuing calibration issues. Of specific concern, are analytes with a final qualifier indicating a low bias due to calibration. In the following tables, the percentage of analyte recovered is based on the percent difference of the actual amount and recovered amount reported from the continuing calibration. As the percentage decreases, the potential for false negatives increases.

Table 4-7 summarizes the SVOC results that were qualified during the evaluation of the continuing calibrations.

**TABLE 4-7: SUMMARY OF SEMI-VOLATILE ORGANIC
COMPOUND RESULTS QUALIFIED DUE TO CALIBRATIONS
OUTSIDE LABORATORY CONTROL LIMIT**

Analyte	# of Samples Qualified	Percent of Qualified Non- Detect	Percentage of Analyte Recovered as Indicated by Outlier
2,4-Dinitrophenol	22	100%	73-74.9%
Benzyl alcohol	13	100%	73%
Carbazole	9	100%	74.2%
Hexachlorocyclopentadiene	13	100%	56%
Phthalic Acid	9	100%	74%

Note: The control limits are 75-125% (%D \leq 25%). Detected and non-detected results associated with calibration recoveries below the lower control limit were qualified as estimated (J-/UJ).

Table 4-8 summarizes the organochlorine pesticide results that were qualified due to continuing calibrations.

**TABLE 4-8: SUMMARY OF ORGANOCHLORINE PESTICIDE
RESULTS QUALIFIED DUE TO CALIBRATIONS
OUTSIDE LABORATORY CONTROL LIMIT**

Analyte	# of Samples Qualified	Percent of Qualified Non- detect	Percentage of Analyte Recovered as Indicated by Outlier
Heptachlor	5	100%	29%

Note: The control limits are 85-115% (%D \leq 15%). Detected and non-detected results associated with calibration recoveries below the lower control limit were qualified as estimated (J-/UJ). Detected results associated with calibration recoveries above the upper control limit were qualified as estimated (J+).

Low instrument response was noted for 2-nitropropane, acetonitrile, and ethanol as indicated by the relative response factor (Table 4-9).

**TABLE 4-9: SUMMARY OF VOLATILE ORGANIC COMPOUND RESULTS
QUALIFIED DUE TO LOW INSTRUMENT RESPONSE**

Analyte	# of Samples Qualified	Percent of Qualified Non- detect	Range of RRFs
2-Nitropropane	9	100%	0.04687
Acetonitrile	22	100%	0.00985-0.02464
Ethanol	22	100%	0.00124-0.00366

Note: The control limit for RRFs, or relative response factors, is ≥ 0.05 .

Table 4-10 summarizes the VOC (TO-15) results that were qualified in surface flux samples due to continuing calibrations.

**TABLE 4-10: SUMMARY OF VOLATILE ORGANIC COMPOUND (TO-15)
SURFACE FLUX SAMPLE RESULTS QUALIFIED DUE TO CALIBRATIONS
OUTSIDE LABORATORY CONTROL LIMIT**

Analyte	# of Samples Qualified	Percent of Qualified Non-detect	Percentage of Analyte Recovered as Indicated by Outlier
1,2,4-Trichlorobenzene	7	100%	53-69.7%
1,2-Dichlorobenzene	6	100%	60-64%
1,3-Dichlorobenzene	1	100%	60%
2-Hexanone	5	100%	69.8%
Acetonitrile	7	100%	63-68%
Ethanol	7	86%	56-67%
Naphthalene	7	100%	53-62%

Note: The control limits are 70-130% (%D ≤ 30%). Detected and non-detected results associated with calibration recoveries below the lower control limit were qualified as estimated (J-/UJ).

Table 4-11 summarizes the VOC (TO-15 SIM) results that were qualified in surface flux samples due to continuing calibrations.

**TABLE 4-11: SUMMARY OF VOLATILE ORGANIC COMPOUND (TO-15 SIM)
SURFACE FLUX SAMPLE RESULTS QUALIFIED DUE TO CALIBRATIONS
OUTSIDE LABORATORY CONTROL LIMIT**

Analyte	# of Samples Qualified	Percent of Qualified Non-detect	Percentage of Analyte Recovered as Indicated by Outlier
1,1,2,2-Tetrachloroethane	6	100%	63%
Dibromochloropropane	6	100%	54-65%
Hexachlorobutadiene	5	100%	64%

Note: The control limits are 70-130% (%D ≤ 30%). Detected and non-detected results associated with calibration recoveries below the lower control limit were qualified as estimated (J-/UJ). Detected results associated with calibration recoveries above the upper control limit were qualified as estimated (J+).

4.5.7 Tentatively Identified Compounds

For the GC/MS methods, a list and estimated concentrations for tentatively identified compounds (TICs) was provided by the laboratory if detected. Most of the reported TICs were identified as “unknown” or “unknown aldol condensate.” Others were as follows:

- 1,1,2,2-Tetrachloroethane
- Chloriodomethane
- Eicosane

In addition to the above, an unknown aldol condensate was also reported by the laboratory as being present in 22 samples; as previously noted, the reported concentrations were flagged “U”

due to blank contamination. Eicosane is indicative of column breakdown and is not likely site related. 1,1,2,2-Tetrachloroethane has already been characterized in VOC samples. Chloriodomethane was identified in four samples and does not have any toxicity criteria established.

4.5.8 Data Review Summary

For 941 of the 6,211 analytical results in the final HHRA dataset, quality criteria were not met and various data qualifiers were added to indicate limitations and/or bias in the data. The definitions for the data qualifiers, or data validation flags, used during validation are those defined in SOP-40 (BRC, ERM and MWH 2009) and the project QAPP (BRC and ERM 2009a). Sample results are rejected based on findings of significant deficiencies in the ability to properly collect or analyze the sample and meet QC criteria. Only rejected data are considered unusable for decision-making purposes, and rejected analytical results are not used in the HHRA.

As noted above, eight sample results were rejected in the Site dataset and excluded from the HHRA for the reasons previously noted. Other data points were excluded from the risk assessment not due to data quality issues, but for one of the following reasons: (1) the sample was reanalyzed by the laboratory, or (2) the sample location was removed during a remedial action.

4.6 CRITERION VI – DATA QUALITY INDICATORS

DQIs are used to verify that sampling and analytical systems used in support of project activities are in control and the quality of the data generated for this project is appropriate for making decisions affecting future activities. The DQIs address the field and analytical data quality aspects as they affect uncertainties in the data collected for site characterization and risk assessment. The DQIs include PARCC. The project QAPP provides the definitions and specific criteria for assessing DQIs using field and laboratory QC samples and is the basis for determining the overall quality of the dataset. Data validation activities included the evaluation of PARCC parameters, and all data not meeting the established PARCC criteria were qualified during the validation process using the guidelines presented in the National Functional Guidelines for Laboratory Data Review for Organics, Inorganics, and Dioxin/Furans (USEPA 1999, 2004d, 2005a, 2008).

4.6.1 Evaluation of Data Precision

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. Replicate measurements can be made on the same sample or on two samples from the same source. Precision is generally assessed using a subset of the measurements made. The precision of the data was evaluated using several laboratory QA/QC procedures. Based on BRC's review of the results of these procedures, the overall level of precision for the Site data and the background data (BRC and ERM 2009b) does not limit the usability of a particular analyte, sample, method, or dataset as a whole.

4.6.2 Evaluation of Data Accuracy

Accuracy measures the level of bias that an analytical method or measurement exhibits. 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:

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

Detailed discussions of specific exceedances to precision and accuracy (with tables) are provided in the DVSRs (BRC and ERM 2010a, 2011, 2014) and data qualified as a result of this evaluation are presented with qualifiers in the data usability tables in Appendix E (included on the report CD in Appendix B). As presented in Section 4.5, eight sample results were rejected in the Site dataset and excluded from the HHRA. The remaining results were considered sufficiently accurate for risk assessment purposes, as discussed below.

4.6.2.1 Holding Time Exceedances/Sample Condition

There is a potential for analyte loss if the holding time for a sample is exceeded. As discussed in Section 4.5.1, holding times were exceeded in 20 soil samples for chromium (VI) analysis (95 percent of the samples analyzed for that constituent) and one aldrin samples (less than 5 percent of the aldrin samples). All of the samples were qualified as estimated. Holding time violations affect the majority of chromium (VI) samples. However, reported results were also significantly less than their respective BCLs. Sixty percent of the qualified chromium (VI) results were detected. Chromium (VI) is further discussed in the uncertainty section.

As presented in the DVSRs (BRC and ERM 2010a, 2011, 2014), all Site samples with temperature requirements were received at the laboratory within the required range of $4^{\circ}\pm 2^{\circ}$ Celsius. No sample results were qualified based on sample temperatures or due to lack of proper preservation.

4.6.2.2 Calibration Violations Indicating a Low Bias

The instrument calibration checks that resulted in a low bias are summarized in the tables presented in Section 4.5.6. One organochlorine pesticide, heptachlor, had recoveries below 50 percent in five of 14 samples. Heptachlor was not detected in any sample. The maximum SQL was compared to the soil BCL for heptachlor. It is unlikely, even with a potential for a false negative, that the bias could affect the result to such a degree that the analyte is present at the Site in excess of the BCL.

4.6.2.3 Matrix Spike/Matrix Spike Duplicate or Laboratory Control Sample/Laboratory Control Sample Duplicate Recoveries below Acceptance Criteria

During the data usability review, results associated with MS/MSD and/or LCS/LCSD recoveries that were only slightly lower than the lower acceptance limit (i.e., 50 to 75 percent recoveries for inorganics) were accepted as usable without further evaluation. Samples with lower percent recoveries (i.e., recoveries lower than 50 percent for inorganics and one-half the lower limit or 30 percent, whichever is greater, for organics) were reviewed more closely to assess if it was appropriate to use them in the HHRA. In this HHRA, no results were below 50 percent for inorganics and no organics were qualified due to MS/MSD outliers.

Given the limited number of samples for the inorganics involved, these data points are not likely to have a significant effect on risk assessment. No LCS/LCSD recoveries were lower than the lower laboratory control limit.

4.6.2.4 Surrogate Percent Recoveries below Laboratory Control Limit

Surrogate recoveries were below the laboratory control limit in one of 22 aldehyde samples and five of the 22 organochlorine samples and all results were qualified as estimated (J-/UJ). Given that low surrogate recoveries affected less than 10 percent of the aldehyde samples, it is unlikely to bias the dataset for aldehydes. For the organochlorines, the maximum SQLs were compared to the soil BCLs. It is unlikely, even with a potential for a false negative, that the bias could affect the result to such a degree that the analyte is present at the Site in excess of the BCL.

4.6.2.5 Blank Contamination

As noted in Section 4.5.2, certain detections were flagged during the data review as being non-detections or estimated with a high bias due to laboratory or field blank contamination. If the associated constituent qualified as being a non-detection was, in fact, present in the samples related to the affected blank sample, revising its status to non-detect could result in risk underestimation. In the dataset for the Site, 162 results were censored due to blank contamination. Affected soil analytes are listed in Table 4-12.

TABLE 4-12: SUMMARY OF SOIL ANALYTES CENSORED DURING BLANK SAMPLE EVALUATION

Analyte	# of Censored Results	Analyte	# of Censored Results
Ammonia (as N)	12	Arsenic	6
Orthophosphate as P	11	Mercury	18
Cadmium	19	Selenium	11
Molybdenum	12	Thallium	1
Tin	16	Tungsten	6
PCB 118	1	Thorium-230	2
1,2,4-Trichlorobenzene	1	1,2,4-Trimethylbenzene	9
Acetone	5	Chlorobenzene	1
Dichloromethane	11		

In addition, there were several TICs qualified due to blank contamination. See discussion of TICs in Section 4.5.7. Affected surface flux analytes are listed in Table 4-13.

**TABLE 4-13: SUMMARY OF SURFACE FLUX ANALYTES CENSORED
DURING BLANK SAMPLE EVALUATION**

Analyte	# of Censored Results	Analyte	# of Censored Results
Benzene	6	Carbon tetrachloride	3
Dibromochloropropane	8	Hexachlorobutadiene	3

The constituents for which this potential concern has the most bearing in risk assessment are those in soil samples for which the detections are close to or exceed either (1) background conditions, or (2) relevant human health comparison levels (e.g., NDEP BCLs). As determined during that evaluation, qualification of detections as non-detections based on blank contamination are not likely to have an appreciable effect on the risk estimates, as discussed below.

Censored results that are less than the maximum background concentration and $1/10^{\text{th}}$ the soil BCL have a negligible impact on risk assessment findings. If a portion of the result reflects an actual Site concentration, then the uncertainty related to the censored result is low. However, data censored at values at or above background or greater than $1/10^{\text{th}}$ the soil BCLs, may pose a potential underestimation of human health risks. Therefore, censored results at values in excess of $1/10^{\text{th}}$ the soil BCL (or the maximum background concentration, if higher) were evaluated further. None of the soil data censored due to blank contamination were in excess of $1/10^{\text{th}}$ the soil BCL (and background).

Surface flux data are not comparable with BCLs. Dibromochloropropane is associated with eight censored data points and benzene is associated with six censored data points; the remaining censored analytes were associated with three or fewer surface flux samples.

4.6.2.6 Data Usability Summary

As discussed above, because the qualifications with the potential for low bias were small in number, the data usability evaluation determined it was unlikely that they could lead to significant risk underestimation. Furthermore, the small amount of rejected data points does not represent a significant data gap in terms of risk assessment.

4.6.3 Evaluation of Data Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of the population at a sampling point or an environmental condition (USEPA 2002a). There is no standard method or formula for evaluating representativeness, which is a qualitative term.

Representativeness is achieved through selection of sampling locations that are appropriate relative to the objective of the specific sampling task, and by collection of an adequate number of samples from the relevant types of locations. The sampling locations at the Site were based on both systematic sampling with random point placement within each grid cell, as well as focused samples collected from specific areas to further investigate potential areas of concern.

The samples were analyzed for a broad spectrum of chemical classes across the Site. Samples were delivered to the laboratory in coolers packed with ice to minimize the loss of analytes. In a few instances, such as samples being analyzed slightly beyond the holding time, the representativeness of the associated data is in question; however, there were few instances of this, as noted in Section 4.5.1. As previously noted, no sample results were qualified based on sample temperatures or preservation. Sample-specific results are discussed in the DVSRs. A discussion of representativeness for the background dataset is provided in each of the background investigation reports.

4.6.4 Evaluation of Data Completeness

Completeness is commonly expressed as a percentage of measurements that are valid and usable relative to the total number of measurements made. 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. Some of the data were eliminated due to data usability concerns. The percent completeness for the Site is 99.9 percent and includes the surface flux chamber data. The percent completeness for the soil only dataset is 99.9 percent. The percent completeness for the background dataset used in the HHRA is 98.8 percent.

4.6.5 Evaluation of Data Comparability

Comparability is a qualitative characteristic expressing the confidence with which one dataset can be compared with another. The desire for comparability is the basis for specifying the analytical methods; these methods are generally consistent with those used in previous investigations of the Site. The comparability goal is achieved through using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units. The ranges of detected sample results from the current investigation are generally comparable to recent results at the Eastside, as well as to the Site background datasets (Section 5).

One exception may be uranium-235/236, which has reported activities that are slightly elevated compared to background and other reported isotopes of uranium. The laboratory that performed the Site radionuclide analysis has indicated that the activities for uranium-235/236 hover around the noise level of the instrument and secular equilibrium is generally still achieved. Therefore, activities at the noise level of the instrument may vary between the instruments used.

There are differences in SQLs among datasets that may affect data comparability for datasets comprised primarily of non-detect values. Examples of the differences in SQLs at the Site and in background soil for several analytes with low detection frequency are provided in Table 4-14.

**TABLE 4-14: LOW DETECTION ANALYTES EXHIBITING SQL DIFFERENCES
BETWEEN BACKGROUND AND SITE SAMPLES**

Analyte	Background Min SQL	Background Max SQL	Site Min SQL	Site Max SQL²²
Antimony	0.3298	0.3298	0.83	0.96
Boron	3.2	3.2	17	19.5
Selenium	0.1579	0.1579	2.6	2.9
Thallium	0.5428	0.5428	0.31	1.1
Tungsten	0.0175	0.0175	0.43	2.9

All results in units of mg/kg.

Cumulative probability plots and side-by-side boxplots for the background and Site datasets are included in Appendix G. For these datasets, left-censored data can result in difficulties in differentiating whether datasets are actually different or merely an artifact of detection limits. Note that for constituents with SQLs that meet project limit requirements, comparisons between Site and background may be less important, as these left-censored data are likely to indicate conditions that pose an “acceptable” risk and further evaluation is not necessary.

4.7 DATA ANALYSIS

Data validation and usability evaluations tend to look at the data on a result-by-result basis. The data analysis step is intended to take a step back and look at the dataset as a whole. The intent of this is to identify any anomalies or unusual data trends that may indicate any potential laboratory issues. This is performed by reviewing summary statistics, cumulative probability plots and side-by-side boxplots, or other visual aids. The soil dataset used for the HHRA is summarized in tabular format in Table 3-4. While it is not feasible to present all the detected analytes in a

²² The SQLs reported here may differ from the detection limits reported elsewhere (e.g., background comparisons). Detection limits may be raised due to blank contamination.

graphical format, cumulative probability plots and side-by-side boxplots are provided in Appendix G for the analytes included in the background comparisons (that is, metals and radionuclides). No anomalies in the dataset were identified.

As discussed in Section 4.5, the data validation process resulted in numerous sample results being qualified as estimated, with only the above-listed results being rejected. Sample results qualified as estimated are likely to be quantitatively biased to some degree; estimated analytical results are used in the HHRA. Data qualified as anomalous, as defined in the DVSRs, refers to data that were qualified (“U”) due to blank contamination, and are used in the HHRA. These data usability decisions follow the guidelines provided in the *Guidance for Data Usability in Risk Assessment (Part A)* (USEPA 1992a).

For the HHRA, all soil data associated with post-remediation conditions that were not rejected during data validation, replaced by reanalysis results, or removed during a soil remedial action were included. Some data were qualified as estimated due to recoveries being outside the acceptance criteria. In cases where the recoveries were higher than the acceptance criteria, the results have the potential of being similarly biased high, and using these data in the risk assessment could result in risks being calculated that are higher than would be associated with actual Site conditions. Of more concern for the HHRA is underestimation of risk, which could be associated with the use of data that are biased low. Results associated with the following QA/QC issues could lead to results that are biased low, and were subjected to further scrutiny during the data usability evaluation:

- Results associated with holding time exceedances;
- Detections qualified during the data review as being non-detections due to laboratory or field blank contamination;
- Results associated with calibration violations indicating a low bias;
- Results associated with MS/MSD or LCS/LCSD recoveries below acceptance criteria; and/or
- Results associated with surrogate percent recoveries below laboratory control limits.

Such data, which are listed above in Section 4.5, were evaluated during the data usability process to determine whether it was appropriate to use them in the risk assessment. The data usability evaluation determined that the estimated results listed in Section 4.5 were appropriate for use in the risk assessment and that the rejected data did not constitute significant data gaps and/or were not otherwise likely to lead to an underestimation of risk, as discussed in Section 4.6.2.

5.0 SELECTION OF CHEMICALS OF POTENTIAL CONCERN

The broad suite of analytes sampled for was the initial list of potential COPCs at the Site. However, to ensure that a risk assessment focuses on those substances that contribute the greatest to the overall risk (USEPA 1989), the following procedures were used to eliminate analytes as COPCs for quantitative evaluation in the risk assessment:²³

- Identification of chemicals with detected levels similar to background concentrations (where applicable) (Section 5.1);
- Chemicals that are considered essential nutrients (Section 5.2); and
- Chemicals with maximum concentrations below risk-based comparison levels (i.e., below one-tenth of the worker soil BCLs) (Section 5.3).

Following USEPA guidance (1989), compounds reliably associated with Site activities based on historical information were not eliminated from the risk assessment, even if the results of the procedures given in this section indicate that such elimination is possible. The procedures for evaluating COPCs relative to background conditions and further selection of COPCs based on the other procedures are presented below.

5.1 EVALUATION OF CONCENTRATIONS/ACTIVITIES RELATIVE TO BACKGROUND CONDITIONS

Some chemicals at the Site, particularly metals and radionuclides, are known to be naturally occurring constituents of soils and groundwater. A risk assessment should consider the contribution of background concentrations to overall Site risks, as differentiated from those concentrations associated with historical Site operations or regional anthropogenic conditions. Therefore, it is necessary to establish Site-specific background conditions to support the risk assessment.

²³ Note that these procedures for selection of COPCs deviate somewhat from those presented in the *BRC Closure Plan*, but are consistent with discussions between BRC and NDEP and their consultants in a December 9, 2010, meeting. BRC will use these procedures for all subsequent risk assessments. BRC intends to revise the *BRC Closure Plan* accordingly to make it consistent with these procedures.

As indicated in the *Background Soil Compilation Report* (BRC and ERM 2010b), the Site is in an area of McCullough lithology (see Figure 10, Qh₁ label).²⁴ Therefore, comparison of Site-related soil concentrations to background levels was conducted using the shallow Qal McCullough background dataset presented in the *Background Soil Compilation Report* (BRC and ERM 2010b). The background dataset used is included in the dataset file on the enclosed report CD in Appendix B.

Background comparisons were performed using the Quantile test, Slippage test, the *t*-test, and the Wilcoxon Rank Sum (WRS) test with Gehan modification. The Guided Interactive Statistical Decision Tools (GiSdT[®]) library (Neptune and Company 2009) run from within the R statistical computer software program was used to perform all background comparison statistics. A weight-of-evidence approach is utilized to interpret the results of these analyses. If the detection frequency in both Site and background datasets is greater than 40 percent, then the following rationale is used for evaluation: (1) where one or two results fail one or more of the statistical tests, the remaining testing and statistical information (boxplots, summary statistics) are reviewed to support decision-making regarding whether or not the chemical should be considered consistent with background (as described by the rationale in the table below); and (2) where three or more statistical tests fail, the constituent is considered inconsistent with background. If the detection frequency is less than 40 percent in either the background or Site datasets, then the constituent is evaluated based on boxplots and summary statistics.

For samples with primary and field duplicate results, the Site sample and field duplicate²⁵ are treated as independent samples and both are included in all subsequent data analyses, regardless of whether one or both are non-detect. This is considered appropriate because field duplicate samples represent a discrete and unique measurement of soil chemical conditions proximal to the primary sample (unlike split samples). The field duplicates were compared to the primary sample during the course of data validation. The variances were not out of the line with the variance in results across the Site. Therefore, as distinct soil chemical measurements, they are treated as unique samples in the analyses.

²⁴ As noted in a letter dated September 17, 2012, from Greg Lovato, NDEP, to Mark Paris, BRC, the 2003 soil background dataset collected by Environ for the City of Henderson is not used for background soil comparison purposes.

²⁵ Field duplicates are shown in Appendix B and indicated with the “FD” qualifier under the column entitled “Sample Type.”

The shallow Qal McCullough background dataset was compared to the Site HHRA dataset as a whole. The results of the background comparison evaluation are presented in Table 5-1 (Tables section), and summarized in Table 5-2 below.

**TABLE 5-2: SUMMARY OF STATISTICAL
 BACKGROUND COMPARISON EVALUATION**

Chemical	Greater than Background?	Basis
Aluminum	YES	Multiple tests
Antimony	YES	Multiple tests
Arsenic	YES	WRS test
Barium	YES	Multiple tests
Beryllium	YES	Multiple tests
Boron	YES	Multiple tests
Cadmium	YES	Multiple tests
Calcium	NO	Multiple tests
Chromium	YES	Multiple tests
Chromium (VI)	YES	Quantile test
Cobalt	YES	Multiple tests
Copper	YES	Multiple tests
Iron	YES	Multiple tests
Lead	YES	Multiple tests
Lithium	YES	Multiple tests
Magnesium	YES	Multiple tests
Manganese	YES	Multiple tests
Mercury	YES	WRS test
Molybdenum	YES	Multiple tests
Nickel	YES	Multiple tests
Potassium	YES	Multiple tests
Selenium	YES	Multiple tests
Silver	NO	Multiple tests
Sodium	YES	Multiple tests

**TABLE 5-2: SUMMARY OF STATISTICAL
 BACKGROUND COMPARISON EVALUATION**

Chemical	Greater than Background?	Basis
Strontium	YES	WRS test
Thallium	NO	Multiple tests
Tin	YES	Multiple tests
Titanium	YES	Multiple tests
Tungsten	YES	Multiple tests
Uranium	YES	Multiple tests
Vanadium	YES	Multiple tests
Zinc	YES	Multiple tests
Radium-226	NO	Multiple tests
Radium-228	NO	Multiple tests
Thorium-228	YES	Slippage test
Thorium-230	NO	Multiple tests
Thorium-232	NO	Multiple tests
Uranium-233/234	NO	Multiple tests
Uranium-235/236	NO	all results near noise level of instrument
Uranium-238	NO	Multiple tests

Cumulative probability plots and side-by-side boxplots²⁶ were also prepared and are included in Appendix G. These plots give a visual indication of the similarities and differences between the Site and background datasets. The results of this comparison indicate that a number of metals are statistically significant (greater than) with respect to background levels. Due to the large number of sample data in both the Site and background datasets, even small differences between the two are identified as statistically significant. For example, although there were small differences in median concentrations, cobalt, magnesium, and uranium were found to be statistically greater than background, as shown in Table 5-3.

²⁶ Site and background boxplots were segregated by depth (and all data). This is different than how the data were segregated in the development of exposure point concentrations as presented in Section 6.1.

**TABLE 5-3: EXAMPLE DIFFERENCES IN SITE AND BACKGROUND
MEDIAN CONCENTRATIONS FOR CHEMICALS STATISTICALLY
GREATER THAN BACKGROUND**

Metal	Site Median	Background Median	Difference¹
Cobalt	11	9.0	2.0 mg/kg
Uranium	1.1	0.97	0.13 mg/kg
Thorium-228	1.7	1.8	-0.1 pCi/g
1 These differences in median concentrations were small relative to both background median concentrations and worker soil BCLs.			

It should be noted that statistically significant differences may not represent scientifically and technically relevant differences.

Secular Equilibrium for Radionuclides. For radionuclides, secular equilibrium exists when the quantity of a radioactive isotope remains constant because its production rate (due to the decay of a parent isotope) is equal to its decay rate. In theory, if secular equilibrium exists, the parent isotope activity should be equivalent to the activity of all daughter radionuclides. Pure secular equilibrium is not expected in environmental samples because of the effect of natural chemical and physical processes. However, approximate secular equilibrium is expected under background conditions (NDEP 2009d). Only the thorium-232 chain was determined to be in approximate secular equilibrium following equivalence testing outlined in the NDEP's *Guidance for Evaluating Secular Equilibrium at the BMI Complex and Common Areas February* (NDEP 2009d). The results of the equivalence testing for secular equilibrium are provided in Table 5-4.

TABLE 5-4: EQUIVALENCE TEST FOR SECULAR EQUILIBRIUM

Chain	Equivalence Test		Secular Equilibrium?	Mean Proportion			
	Delta	p-value		Ra-226	Th-230	U-233/234	U-238
U-238	0.1	0.5	No	0.1867	0.3333	0.2192	0.2607
				Ra-228	Th-228	Th-232	
Th-232	0.1	0.0228	Yes	0.2954	0.3655	0.3391	

Therefore, since thorium-228 failed background tests and radionuclides are not in secular equilibrium, all radionuclides are conservatively considered to be COPCs, and are therefore evaluated in the HHRA.

5.2 ESSENTIAL NUTRIENTS

An essential nutrient is a chemical required for normal body functioning that either cannot be synthesized by the body at all, or cannot be synthesized in amounts adequate for good health, and thus must be obtained from a dietary source. USEPA (1989) states that “Chemicals that are (1) essential human nutrients, (2) present at low concentrations (i.e., only slightly elevated above naturally occurring levels), and (3) toxic only at very high doses (i.e., much higher than those that could be associated with contact at the Site) need not be considered further in the quantitative risk assessment. Examples of such chemicals are calcium, iron, magnesium, potassium, and sodium.” As discussed with and approved by the NDEP²⁷ and consistent with guidance and standard practices, no further quantitative evaluations are required for these essential nutrients.

5.3 COMPARISON TO WORKER SOILS BCLs

Soil BCLs for workers are chemical-specific, risk-based concentrations in soils that are protective of a commercial land use scenario (NDEP 2013). As discussed with and approved by the NDEP (see footnote 23), if the maximum detected concentration for a constituent is less than one-tenth of the worker soil BCL, then no further quantitative evaluation is required for that constituent. For those constituents with 100 percent non-detect values, if the maximum non-detect concentration²⁸ for a constituent is less than one-tenth of the worker soil BCL, no further evaluation will be conducted. If the maximum non-detect concentration is greater than one-tenth of the worker soil BCL, no further quantitative evaluation will be conducted; however, a discussion is provided in the Uncertainty Analysis (Section 7) for these constituents.

Consistent with the Closure Plan, if the TCDD TEQ concentrations do not exceed the NDEP worker BCL of 1,000 ppt for any sample within the Site,²⁹ dioxins/furans and PCB congeners are not retained as COPCs. Therefore, because this criterion is met for the Site, dioxins/furans and PCB congeners are not considered COPCs, and are not evaluated further in the HHRA. Lead was also not evaluated further in the HHRA since all concentrations were below its target goal of 400 mg/kg for residential land use.

²⁷ Meeting with NDEP on December 9, 2010.

²⁸ The non-detect value is equal to the SQL.

²⁹ See Section 2.5 for a discussion on future land use for the Parcel 9 South Sub-Area.

The results of comparisons to one-tenth of the worker soil BCL are presented in Table 5-5 (Tables section). One organic compound, four metals, and one radionuclide were found to exceed their respective one-tenth of the worker soil BCL (asbestos does not have a BCL, but does have relevant and available toxicity criteria).

5.4 SUMMARY OF SELECTION OF COPCS

The procedures for COPC selection were discussed above. Results of the selection of COPCs, including the rationale for excluding chemicals as COPCs are presented in Table 5-6 (Tables section). The resulting COPCs for soil are summarized below.

- Asbestos
- Aluminum
- Arsenic
- Acetaldehyde
- Radionuclides

These procedures apply to soil results. Ambient air exposures for VOCs are evaluated on a sample-by-sample basis, per NDEP requirements, using the surface flux data measurements. See Section 6.1.2 regarding selection of COPCs for the surface flux data. Therefore, the maximum surface flux risk estimates are summed with the soil risk estimates to provide an upper-bound risk for each receptor.

6.0 HUMAN HEALTH RISK ASSESSMENT

This section presents the HHRA of all COPCs identified in Section 5 for all receptors of concern via all complete pathways. The methods used in the risk assessment follow standard USEPA guidance. Specifically, the methods used in the risk assessment followed basic procedures outlined in the USEPA's *Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual* (USEPA 1989). Other guidance documents consulted include:

- *Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual. Supplemental Guidance: Standard Default Exposure Factors* (USEPA 1991b).
- *Guidelines for Exposure Assessment* (USEPA 1992b).
- *Soil Screening Guidance: Technical Background Document* (USEPA 1996).
- *Exposure Factors Handbook, Volumes I-III* (USEPA 1997).
- *Soil Screening Guidance for Radionuclides* (USEPA 2000).
- *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA 2002b).
- *Technical Support Document for a Protocol to Assess Asbestos-Related Risk. Final Draft* (USEPA 2003b).
- *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)* (USEPA 2004e).
- *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment)* (USEPA 2009).

Various NDEP guidance documents are also relied on for the HHRA. These include:

- *Supplemental Guidance for Assessing Data Usability for Environmental Investigations at the BMI Complex and Common Areas in Henderson, Nevada* (NDEP 2008a).
- *Guidance for Evaluating Radionuclide Data for the BMI Plant Sites and Common Areas Projects* (NDEP 2009a).

- *Technical Guidance for the Calculation of Asbestos-Related Risk in Soils for the Basic Management Incorporated (BMI) Complex and Common Areas* (NDEP 2011a) and *Workbook for the Calculation of Asbestos-Related Risk in Soils* (NDEP 2011b).
- *Supplemental Guidance on Data Validation* (NDEP 2009b,c).
- *Guidance for Evaluating Secular Equilibrium at the BMI Complex and Common Areas* (NDEP 2009d).

The risk assessment is a deterministic risk assessment, meaning that single values based on conservative assumptions are used for all modeling, exposure parameters, and toxicity criteria. These conservative estimates compound each other so that the calculated risks likely exceed the true risks at the Site.

The method used in the risk assessment consists of several steps. The first step is the calculation of exposure point concentrations representative of the particular area, for each medium of concern. This step includes fate and transport modeling to predict concentrations that may be present when direct measurements are not available. The second step is the exposure assessment for the various receptors present in the particular areas. The next step is to define the toxicity values for each COPC. The final step is risk characterization where theoretical upper-bound cancer risks and non-cancer HIs are calculated.

6.1 DETERMINATION OF EXPOSURE POINT CONCENTRATIONS

A representative exposure concentration is a COPC-specific and media-specific concentration value. In risk assessment, these exposure concentrations are values incorporated into the exposure assessment equations from which potential baseline human exposures are calculated. As described below, the methods, rationale, and assumptions employed in deriving these concentration values follow USEPA guidance and reflect Site-specific conditions.

Chemical, physical, and biological processes may affect the fate and transport of chemicals in water, soil, and air. Chemical processes include solubilization, hydrolysis, oxidation-reduction, and photolysis. Physical processes include advection and hydrodynamic dispersion; volatilization; dispersion; and sorption/desorption to soil, sediment, and other solid surfaces. Biological processes include biodegradation, bioaccumulation, and bioconcentration. All of these processes are dependent upon the physical and chemical properties of the chemicals; the physical and chemical properties of the soil and water; and other environmental factors such as

temperature, humidity, and the conditions of water recharge and movement. The net effect of these environmental factors is a time-dependent reduction of chemical concentrations in water, soil, and air. The determination of exposure point concentrations for media other than soil take into account chemical-specific physical parameters and inter-media transfers as discussed below. All modeling input parameters, calculations, and results are presented in Appendix H (included on the report CD in Appendix B).

6.1.1 Soil

Due to the uncertainty associated with determining the true average concentration at a site, where direct measurements of the site average are infeasible and unavailable, the USEPA recommends using the lower of the maximum detected concentration or the 95 percent UCL as the concentration of a chemical to which an individual could be exposed over time (USEPA 1992b). For the 95 percent UCL concentration approach, the 95 percent UCL was computed to represent the area-wide exposure point concentrations. The 95 percent UCL is a statistic that quantifies the uncertainty associated with the sample mean. If randomly drawn subsets of Site data are collected and the UCL is computed for each subset, the UCL equals or exceeds the true mean roughly 95 percent of the time. The purpose for using the 95 percent UCL is to derive a conservative, upper-bound estimate of the mean concentration, which takes into account the different concentrations to which a person may be exposed at the Site. That is, an individual will be exposed to a range of concentrations that exist at an exposure area, from non-detect to the maximum concentration, over an entire exposure period.

A 95 percent UCL was calculated using the `summary.stats()` function in the GiSdT[®] package (Neptune and Company 2009) in R (R Core Team 2012). Section 5.1 outlines the treatment of sample locations with field duplicates prior to the 95 percent UCL statistical calculations described in this section. For these calculations, chemical non-detect results are assigned a value of one-half the SQL. The formulas for calculating the 95 percent UCL COPC concentration (as the representative exposure concentration) are presented in USEPA (1992c, 2002c) and GiSdT[®] (Neptune and Company 2009). Three UCL methods are employed in the GiSdT[®] library. They include the Student's t UCL, the bootstrap percentile UCL, and the bootstrap BCa UCL. The maximum UCL of these three methods was used as the exposure point concentration, unless the maximum UCL of the three methods was greater than the maximum detected concentration. In these cases, the maximum detected concentration was selected as the exposure point concentration.

The representativeness of the 95 percent UCLs for the exposure area, that is, a Sitewide mean concentration is valid for all receptors at the Site, is further supported by the intensity plot figures included in Appendix I. Figures for each of the COPCs are included in Appendix I (in addition to figures developed for all metals). A figure is also presented for TCDD TEQ. Although not a COPC for the Site, TCDD TEQ is a primary chemical of interest for the project. Based on the results of the background comparison tests, a review of the probability plots, boxplots, and distribution and intensity plot figures, data across the Site are assumed to be uncorrelated, that is, there is no discernable spatial correlation.³⁰ Thus, the assumption is made for statistical testing purposes that the data are not spatially correlated.³¹ This results in lower p-values and hence a greater number of statistical differences than would be the case if spatial correlation were accounted for. Ignoring correlation therefore causes conservatism, and the need to further evaluate spatial correlation is not warranted. Therefore consistent with the project *Statistical Methodology Report* (NewFields 2006), each measurement is assumed to be equally representative for that chemical at any point in the Site and calculation of the 95 percent UCL is appropriate. The data were also reviewed for the presence of hot spots, and as discussed in Section 3.5, no potential hot spots were identified at the Site; therefore, separate exposure areas were not evaluated in the HHRA.

Representative exposure concentrations for soil are based on the potential exposure depth for each of the receptors. For all receptors, two different exposure depths are considered, based on the sample depth rules schematic presented in Section 3: all data (surface and subsurface), and data classified as surface soil. These different soil exposure classifications are considered to represent all possible exposure potential for all receptors, based on the future grade and use of Site soils. Ninety-five percent UCLs are calculated for each exposure depth scenarios. To be conservative, the higher of these values was used in the risk estimates for each COPC. The 95 percent UCL for each COPC is presented in Table 6-1 (Tables section). For indirect exposures, this concentration was used in fate and transport modeling.

³⁰ Although the *Statistical Methodology Report* states that confirmation measurements of each chemical in a given soil layer will be used to compute variograms, as noted in the text above, this was not conducted for the Site, which is a deviation from the *BRC Closure Plan* methodology.

³¹ Some variability of the data is expected; if there was perfect homogeneity then only one sample would be needed to represent the Site. This natural variability is demonstrated by the background datasets for the project. As shown on the probability and boxplots in Appendix G, the data generally follow a normal distribution, and their variability are similar to the background data.

The exposure point concentrations for asbestos (USEPA 2003b, NDEP 2011a) were based on the pooled analytical sensitivity of the dataset. The asbestos data and analytical sensitivities are presented in Table 6-2 (Tables section). Therefore, asbestos exposure point concentrations are determined differently than those for the other COPCs. The pooled analytical sensitivity is calculated as follows:

$$\text{Pooled Analytical Sensitivity} = 1 / \left[\sum_i (1 / \text{analytical sensitivity for trial } i) \right]$$

Two estimates of the asbestos concentration were evaluated, best estimate and upper bound, as defined in the draft methodology (USEPA 2003b). The best estimate concentration is similar to a central tendency estimate, while the upper bound concentration is comparable to a reasonable maximum exposure estimate. The pooled analytical sensitivity is multiplied by the number of chrysotile or amphibole structures to estimate concentration:

$$\text{Estimated Bulk Concentration (10}^6 \text{ s/gPM10)} = \text{Long fiber count} \times \text{Pooled analytical sensitivity}$$

For the best estimate, the number of fibers measured across all samples is incorporated into the calculation above. The upper bound of the asbestos concentration was also evaluated. It is calculated as the 95 percent UCL of the Poisson distribution mean, where the Poisson mean was estimated as the total number of structures detected across all samples. In Microsoft Excel, the following equation may be employed to calculate this value:

$$\text{95 percent UCL of Poisson Distribution Mean} = \text{CHIINV}(1 - \text{upper confidence percentile}, 2 \times (\text{Long fiber count} + 1)) / 2$$

This value is then multiplied by the pooled analytical sensitivity to estimate the upper bound concentration. The intent of the risk assessment methodology is to predict the risk associated with airborne asbestos. In order to quantify the airborne asbestos concentration, the estimated dust levels or particulate emission factors (PEFs) were used:

$$\text{Estimated Airborne Concentration (s/cm}^3\text{)} = \text{Estimated bulk concentration (10}^6 \text{ s/gPM10)} \times \text{Estimated dust level (ug/cm}^3\text{)}$$

Further explanation of the asbestos risk calculations and estimates are provided in the NDEP's *Technical Guidance for the Calculation of Asbestos-Related Risk in Soils* (2011a) and *Workbook for the Calculation of Asbestos-Related Risk in Soils* (2011b).

6.1.2 Indoor Air

USEPA's 2002 Vapor Intrusion Guidance

BRC has reviewed USEPA's 2002 Vapor Intrusion Guidance (2002d), and believes that the approach used for the Site conforms to this guidance. The guidance recommends, and BRC has followed, a tiered approach to address vapor intrusion for each of the Eastside sub-areas, including the Parcel 9 South Sub-Area. First, in each of the sub-area SAPs, including that for the Site, BRC has identified each of the chemicals (VOCs and volatile SVOCs) to be evaluated further in each sub-area (that is, a Tier 1 assessment).

Second, BRC explicitly compared the existing groundwater data for wells that are located within (or adjacent to) that sub-area with the USEPA 2002 Tier 2 comparison values (provided in lookup tables in the guidance document). Thus, this Tier 2 assessment was done in the NDEP-approved SAPs for each of the sub-areas. The Tier 2 comparison table for the Site is provided in Appendix J (Table J-1; note that groundwater concentrations have been updated with the most recent groundwater monitoring event for VOCs in August 2012). As shown in this table, with the exception of chloroform (see discussion below), carbon tetrachloride, and tetrachloroethene, all VOCs and volatile SVOCs pass a Tier 2 assessment.

Third, BRC has conducted a site-specific human health risk assessment for vapor intrusion using surface flux data on a sample-by-sample basis, per NDEP recommendations (that is, a Tier 3 assessment; see below). As noted in USEPA's 2002 guidance for a Tier 3 site-specific assessment: "If buildings are not available or not appropriate for sampling, for example in cases where future potential impacts need to be evaluated, other more direct measures of potential impacts, such as emission flux chambers or soil gas surveys, may need to be conducted in areas underlain by subsurface contamination." Thus flux measurements are allowed under USEPA's guidance.

Fourth, BRC has also evaluated the various factors pertaining to vapor intrusion, including depth to groundwater, the nature of the soil column from ground surface to groundwater (see Table 6-3 below), and, water quality (*i.e.*, the constituents likely to be present in groundwater and which might pose any vapor intrusion concerns). BRC has performed a more detailed site-specific evaluation of vapor intrusion potential at a comparison study area within the Eastside property. Based on site-specific conditions, including depth to groundwater, VOC concentrations in groundwater (which are generally similar near the Site - for example, chloroform concentration in groundwater of 5.4 to 1,100 µg/L in the vicinity of the Site versus 180 to 1,200 µg/L at the comparison study area), and expected similar soil physical property, the comparison study area

presents a similar potential for vapor intrusion than the Site (and as shown below, in all cases ILCRs and non-cancer HIs are at or below acceptable levels). See the table below for various parameters.

**TABLE 6-3: SOIL PROPERTIES RESULTS FOR SITE
AND COMPARISON STUDY AREA**

Parameter	Comparison Study Area	Parcel 9 South Sub-Area	Units
Particle Density ¹	2.7	2.7	g/cm ³
Gravimetric Soil Moisture ¹	4.46	7.6	percent
Porosity ¹	33.8	35.8	percent
Permeability ¹	0.0019	0.0060	cm/sec
Bulk Density ¹	1.8	1.8	g/cm ³
Organic Carbon Content ¹	1.1	2.8	percent
USCS Soil Types	SM/GM/GW/ML	SM/GM/GW/ML	--
Depth to Groundwater	49 to 60	32 to 47	ft bgs
Chloroform in Groundwater	180 to 1,200	5.4 to 1,100	µg/L

¹Values presented from the nearby Triangle Commercial sub-area, and are averages for each area. For example, the range of permeabilities in the vicinity of the Site are 0.00066 to 0.0096 centimeters per second (cm/sec), while those for the comparison study area are 0.00029 to 0.0065 cm/sec.

g/cm³ = grams per cubic centimeter

USCS = Unified Soil Classification System

BRC has performed a detailed evaluation of vapor intrusion risk assessments for chloroform at the comparison study area location, showing that risks were acceptable (residential indoor ILCRs ranged from 1×10^{-8} to 9×10^{-7} , and non-cancer HIs were well below 1.0).³² The comparison study area risk estimate calculations are provided electronically in Appendix J (included on the report CD in Appendix B). Input parameters and results for the indoor air calculations for the comparison study area location are also provided in Appendix J (Tables J-2 through J-6).

Finally, BRC is aware of USEPA's recent *Review of the Draft 2002 Subsurface Vapor Intrusion Guidance*. Issues and recommendations identified in this document, as well as the USEPA Office of Inspector General's *Evaluation Report—Lack of Final Guidance on Vapor Intrusion Impedes Efforts to Address Indoor Air Risks* (December 14, 2009), focus primarily on Tier 1 and Tier 2 assessments, and ultimately will not affect how indoor air exposures have been evaluated for the Site.

³² For comparison, chloroform residential indoor ILCRs for the Site were 1×10^{-8} to 3×10^{-6} and non-cancer HIs were well below 1.0; and vapor intrusion ILCRs for the Mohawk sub-area were 4×10^{-8} to 9×10^{-7} and non-cancer HIs were well below 1.0.

Site-Specific Tier 3 Assessment

Concentrations of volatile constituents (VOCs and certain SVOCs) in soil and groundwater that may infiltrate buildings to be constructed at the Site through cracks in the foundations are estimated using USEPA surface emission isolation flux chamber (flux chamber) measurements collected at the Site in accordance with USEPA (1986) guidance and the Flux Chamber SOP-16 (BRC, ERM, and MWH 2009). The flux chamber is used to measure the emission rates from surfaces emitting gas species. Use of the flux chamber reduces the need for modeling surface flux rates, which potentially reduces the uncertainty in the air representative exposure concentrations and the risk characterization. Because the flux chamber measurements were conducted outdoors on open soil, an “infiltration factor” is applied to the outdoor surface flux data to generate data supporting the inhalation of indoor air exposure pathway. The infiltration factor is based on the factors found in the American Society for Testing and Materials (ASTM) *Standard Guide for Risk-Based Corrective Action* (2000). The indoor air concentrations are determined from the surface flux measurements using the following mixing equation:

$$C_a = \frac{J \times \eta}{L \times ER}$$

where:

- C_a = indoor air concentration (milligram per cubic meter [mg/m^3])
- J = measured flux of chemical (milligram per square meter per minute [$\text{mg}/\text{m}^2\text{-min}$])
- η = foundation crack fraction (unitless)
- L = enclosed space volume/infiltration area ratio (meter [m])
- ER = enclosed space air exchange rate (1/min)

Default parameter values from ASTM (2000) for commercial buildings were used (as presented in Section 9 of the NDEP-approved *BRC Closure Plan* [BRC, ERM, and DBS&A 2007; Section 9 revised March 2010]). These default parameters are presented in the electronic indoor air calculation files in Appendix J (included on the report CD in Appendix B). As noted in Section 5.4, indoor air exposures are evaluated on a sample by sample basis, per NDEP requirements, using the surface flux data measurements.

Those VOCs and volatile SVOCs that did not pass the Tier 2 assessment (see above) are evaluated at each individual surface flux location. However, to be consistent with the selection of COPCs for soil; one-tenth of the groundwater Tier 2 comparison values were used. Based on

this, carbon tetrachloride, chloroform, tetrachloroethene, and trichloroethene were evaluated further in the vapor intrusion Tier 3 assessment.

Indoor air concentrations based on the surface flux data measurements are shown in the electronic indoor air calculation files in Appendix H (included on the report CD in Appendix B) and are summarized in Table 6-4 (Tables section). In all cases the maximum of the two flux chamber measurements (TO-15 full scan and TO-15 SIM) is used.

6.1.3 Outdoor Air

Long-term exposure to COPCs bound to dust particles is evaluated using the USEPA's PEF approach (USEPA 2002b). The PEF relates concentrations of a chemical in soil to the concentration of dust particles in the air. The Q/C (Site-Specific Dispersion Factor) values in this equation are for Las Vegas, Nevada (Appendix D of USEPA 2002b). The equation used is:

$$PEF = Q/C_{wind} \times \frac{3,600 \text{ sec/hr}}{0.036 \times (1 - V) \times (U_m / U_t)^3 \times F(x)}$$

where:

- PEF = Particulate emission factor (cubic meter per kilogram [m^3/kg])
- Q/C_{wind} = Inverse of the ratio of the geometric mean air concentration to the emission flux at the center of a square source ($\text{g}/\text{m}^2\text{-s}$ per kg/m^3)
- V = Fraction of vegetative cover (unitless)
- U_m = Mean annual windspeed (m/s)
- U_t = Equivalent threshold value of windspeed at 7m (m/s)
- $F(x)$ = Function dependent on U_m/U_t derived using USEPA (1985) (unitless)

and

$$Q/C_{wind} = A \times \exp \frac{(\ln A_{site} - B)^2}{C}$$

where

- A_{site} = Source Area (acre)
- A, B, C = Air Dispersion Constants for LV (unitless)

The dust model and parameters utilized to generate the PEF are presented in Table 6-5 (Tables section).

The USEPA guidance for dust generated by construction activities (USEPA 2002b) was used for assessing short-term construction worker exposures:

$$PEF = \frac{I}{\left(\left(\frac{I}{PEF_{sc}} \right) + \left(\frac{I}{PEF_{sc_road}} \right) \right)}$$

where:

PEF_{sc} = Subchronic particulate emission factor for construction activities (m^3/kg)

PEF_{sc_road} = Subchronic particulate emission factor for unpaved road traffic (m^3/kg)

Input soil concentrations for the model are the exposure point concentrations as described above. The construction dust model and all relevant equations and parameters utilized to generate the construction worker PEF from this guidance are provided in Table 6-6 (Tables section). Site-specific surface soil moisture data were collected in December-January and May-July. The average of the surface soil data is 7.6 percent. This is considered an adequate representation of the annual average; therefore, this value is used for the percent moisture in dry road surface parameter instead of the NDEP model default value.

In addition, for receptors with indoor exposures (i.e., indoor commercial workers), a dilution factor is applied to obtain an indoor air concentration of dust particles, based on USEPA (2000).

The flux chamber measurements as described in Section 6.1.2 above are used for exposures to VOCs and volatile SVOCs in outdoor air if the chemical was present in the TO-15 analyte list and selected as a COPC as described in Section 6.1.2. If the VOC or volatile SVOC was measured in soil, but not on the TO-15 analyte list, then the exposure point concentration was estimated using USEPA's volatilization factor. Outdoor surface flux data are divided by the dispersion factor for volatiles (Q/C_{vol} for Las Vegas; from USEPA 2002b) for use in the outdoor air exposure pathway. The same dispersion factor is used for all scenarios. The dispersion factor for the construction worker is not adjusted to account for soil intrusion activities. Outdoor air concentrations based on soil data for all receptors are shown in Table 6-7 (Tables section). Outdoor air concentrations based on the surface flux data measurements are shown in the electronic indoor air calculation files in Appendix H (included on the report CD in Appendix B) and are summarized in Table 6-4.

6.2 EXPOSURE ASSESSMENT

In a risk assessment, the possible exposures of populations are examined to determine if the chemicals at a site could pose a threat to the health of identified receptors. The risks associated with exposure to chemicals depend not only on the concentration of the chemicals in the media, but also on the duration and frequency of exposure to those media. For example, the risks associated with exposure to chemicals for 1 hour a day are less than those associated with exposure to the same chemicals at the same concentrations for 2 hours a day. Potential health impacts from chemicals in a medium can occur via one or more exposure pathways. The exposure assessment step of a risk assessment combines information regarding impacted media at a site with assumptions about the people who could come into contact with these media. The result is an estimation of a person's potential rate of contact with impacted media from the Site. The intake rates are evaluated in the risk characterization step to estimate the risks they could pose.

In this section, assumptions regarding people's activities, such as the frequency with which a person could come into contact with impacted media, are discussed. Finally, the daily doses at the points of potential human contact were estimated using these assumptions, the models described in Section 6.1, and the chemical concentrations reported for soil and surface flux samples collected from the Site.

6.2.1 Exposure Parameters

In this section, the assumptions regarding the extent of exposure are presented for each of the exposure pathways for each medium of concern at the Site. Table 6-8 (Tables section) presents each of the exposure parameters used in the risk assessment for each receptor and each pathway. Many of the assumptions regarding the extent of exposure are default factors developed by USEPA's Superfund program. Default values were modified to reflect Site-specific conditions, where possible. The exposure parameters used in the risk assessment were those defined in Tables 9-2 through 9-5 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010).

6.2.2 Quantification of Exposure

In this section, the concentrations of COPCs at the points of potential human exposure are combined with assumptions about the behavior of the populations potentially at risk to estimate the dose of COPCs that may be taken in by the exposed individuals. Later, in the risk

characterization step of the assessment, the doses are combined with toxicity parameters for COPCs to estimate whether the calculated intake levels pose a threat to human health.

The method used to estimate the average daily dose (ADD) for non-carcinogens COPCs via each of the complete exposure pathways is based on USEPA (1989, 1992b) guidance. For carcinogens, lifetime ADD (LADD) estimates are based on chronic lifetime exposure, extrapolated over the estimated average lifetime (assumed to be 70 years). This establishes consistency with cancer slope factors (CSFs), which are based on chronic lifetime exposures. For non-carcinogens, ADD estimates are averaged over the estimated exposure period. ADDs and LADDs were calculated for each exposure scenario using the following generic equation:

$$Dose = \frac{C \times IR \times ED \times EF}{BW \times AT \times 365 \text{ d/yr}}$$

where:

- Dose = ADD for non-carcinogens and LADD for carcinogens (in mg/kg-day)
- C = chemical concentration in the contact medium (e.g., mg/kg soil)
- IR = intake rate (e.g., mg/day soil ingestion and dermal contact [requires a conversion factor of 10^{-6} kilograms per milligram [kg/mg]]);
- ED = exposure duration (years of exposure)
- EF = exposure frequency (number of days per year)
- BW = average body weight over the exposure period (kilograms)
- BIO = relative bioavailability (unitless)
- AF = absorption fraction (percent)
- AT = averaging time; same as the ED for non-carcinogens and 70 years (average lifetime) for carcinogens

Risk estimates for inhalation exposures follow USEPA's *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment)* (USEPA 2009). That is, the concentration of a chemical in air is used as the exposure metric (e.g., mg/m³), rather than inhalation intake of a chemical in air based on inhalation rate and body weight (e.g., mg/kg-day). The generic equation for calculating inhalation exposures is:

$$EC = \frac{C_{air} \times ET \times ED \times EF}{AT}$$

where:

- EC = exposure concentration (in mg/m^3)
- C_{air} = chemical concentration in air (in mg/m^3)
- ET = exposure time (hours per day)
- ED = exposure duration (years of exposure)
- EF = exposure frequency (number of days per year)
- AT = averaging time; same as the ED for non-carcinogens and 613,200 hours (i.e., 70 years; average lifetime) for carcinogens

Pathway-specific equations for calculating ADDs and LADDs are provided in Table 9-6 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010). For conservatism, the relative oral bioavailability (BIO) of all COPCs was assumed to be 100 percent, except for arsenic. Consistent with the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010), an arsenic oral bioavailability of 30 percent is used.

Chemical-specific dermal absorption values from USEPA guidance (USEPA 2004e [Part E RAGS]) were used in the risk assessment. USEPA does not recommend absorption factors for VOCs based on the rationale that VOCs from the soil are volatilized on skin and exposure is accounted for via inhalation routes. In addition, RAGS Part E (USEPA 2004e) states “For inorganics, the speciation of the compound is critical to the dermal absorption and there are too little data to extrapolate a reasonable default value.” Therefore, dermal absorption factors are also not used for inorganics. The NDEP and its consultants have concurred with this decision.

Exposure levels of potentially carcinogenic and non-carcinogenic chemicals are calculated separately because different exposure assumptions apply (i.e., ADD for non-carcinogens and LADD for carcinogens). Exposure levels are estimated for each relevant exposure pathway (i.e., soil, air, and water), and for each exposure route (i.e., oral, inhalation, and dermal). Daily doses for the same route of exposure are summed. The total dose of each chemical is the sum of doses across all applicable exposure routes.

6.2.3 Asbestos

Although final USEPA guidance is unavailable at this time, USEPA recommends that site-specific risk assessments be performed for asbestos (USEPA 2004f). Risks associated with asbestos in soil are evaluated using the NDEP’s *Technical Guidance for the Calculation of*

Asbestos-Related Risk in Soils (2011a) and *Workbook for the Calculation of Asbestos-Related Risk in Soils* (2011b), and the draft methodology proposed by USEPA (2003b). This methodology is an update of the method described in *Methodology for Conducting Risk Assessments at Asbestos Superfund Sites-Part 1: Protocol* and *Part 2: Technical Background Document* (Berman and Crump 1999a,b). Because the risk assessment methodology for asbestos is unlike that for other COPCs, asbestos risks are evaluated separately from other chemical risks.

The intent of the risk assessment methodology is to predict the amount of airborne asbestos, which causes an unacceptable risk to a human receptor. Asbestos concentrations are measured in soil, and are then used to predict airborne asbestos concentrations using a dust emissions model. Asbestos data are collected from the top 2 inches of soil. While asbestos might exist below the top 2 inches of soil due to soil turnover, the concentrations in the surface soil are likely to be greater than concentrations beneath the surface, and exposure to the top 2 inches of soil is the most likely point of contact for asbestos. Therefore, the “shallow” surface soils asbestos concentration estimate is used to represent the potential exposure to asbestos.

To interpret measurements of asbestos in soils, it is necessary to establish the relationship between the asbestos concentrations observed in soils and concentrations that will occur in air when such soil is disturbed by natural or anthropogenic forces. This is because asbestos is a hazard when inhaled (see, for example, Berman and Crump 2001; USEPA 2003b). Indeed, the Modified Elutriator Method (Berman and Kolk 2000), which was the method employed to perform the analyses presented in this report, was designed specifically to facilitate prediction of airborne asbestos exposures based on bulk measurements (see, for example, Berman and Chatfield 1990).

Briefly, the Modified Elutriator Method incorporates a procedure for isolating and concentrating asbestos structures as part of the respirable dust fraction of a sample, and analytical measurements are reported as the number of asbestos structures per mass of respirable dust in the sample. This turns out to be precisely the dimensions required to combine such measurements with published dust emission and dispersion models to convert them to asbestos emission and dispersion models. These models can be combined with measurements from the Modified Elutriator Method to predict airborne exposures and assess the attendant risks.

6.2.4 Radionuclides

For radionuclides, the risk assessment approach consists of a comparison of 95 percent UCL soil concentrations to both NDEP indoor and outdoor worker BCLs. Radionuclides have a cancer

endpoint only. Therefore, when utilizing BCLs, carcinogenic risks are evaluated based on the following:

$$\text{Cancer Risk} = \frac{95\% \text{ UCL Soil Concentration}}{\text{Outdoor (or Indoor) Worker BCL}} \times 10^{-6}$$

In this fashion the BCL converts a measured concentration to incremental risk of an individual developing cancer from exposure to radionuclides. See Section 7.3.7 for a further discussion on the use of this simplified approach for radionuclides.

6.3 TOXICITY ASSESSMENT

This section describes the toxicity of the COPCs at the Site. Numerical toxicity values were developed for use in the calculation of the hazard quotients (HQs; for non-carcinogens) and risks (for carcinogens).

6.3.1 Toxicity Values

Toxicity values, when available, are published by the USEPA in the on-line Integrated Risk Information System [IRIS]; USEPA 2015). CSFs (in units of milligrams per kilogram per day [mg/kg-d]⁻¹) are chemical-specific and experimentally derived potency values that are used to calculate the risk of cancer resulting from exposure to potentially carcinogenic chemicals. Inhalation unit risks (IURs) represent the upper-bound excess lifetime cancer risk from continuous exposure to a chemical at a concentration of 1 microgram per cubic meter (µg/m³). A higher value implies a more potent carcinogenic potential. Reference dosages (RfDs) are experimentally derived “no-effect” levels used to quantify the extent of toxic effects other than cancer due to exposure to chemicals (in units of mg/kg-d). Similarly, a reference concentration (RfC) is the derived “no-effect” concentration for a lifetime of continuous inhalation exposure (in units of mg/m³). With RfDs or RfCs, a lower value implies a more potent toxicant. These criteria are generally developed by USEPA risk assessment work groups and listed in the USEPA risk assessment guidance documents and databases. Available toxicity values for all Site COPCs used in the risk assessment were obtained using the following hierarchy for selecting toxicity criteria (based on USEPA 2003c):

1. IRIS;
2. USEPA’s Provisional Peer Reviewed Toxicity Values (PPRTVs);

3. National Center for Environmental Assessment (or other current USEPA sources);
4. Health Effects Assessment Summary Tables (HEAST);
5. USEPA Criteria Documents (e.g., drinking water criteria documents, drinking water Health Advisory summaries, ambient water quality criteria documents, and air quality criteria documents);
6. ATSDR toxicological profiles;
7. USEPA's Environmental Criteria and Assessment Office; and
8. Peer-reviewed scientific literature.

In addition, toxicity criteria and toxicological surrogates recommended by the NDEP are used in the risk assessment. Toxicity criteria are consistent with those used in the development of the NDEP's BCLs (NDEP 2013), unless newer values are available from USEPA. Toxicity criteria have not been developed by BRC for elements or compounds that do not have criteria published in the above sources.

Although USEPA has developed toxicity criteria for the oral and inhalation routes of exposure, it has not developed toxicity criteria for the dermal route of exposure. USEPA has proposed a method for extrapolating oral toxicity criteria to the dermal route in the *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)* (USEPA 2004e). USEPA states that the adjustment of the oral toxicity factor for dermal exposures is necessary only when the oral-gastrointestinal absorption efficiency of the chemical of interest is less than 50 percent (due to the variability inherent in absorption studies). For COPCs to which dermal exposure might occur at the Site, the oral-gastrointestinal absorption efficiencies are greater than 50 percent. Therefore, it was not necessary to use the USEPA-indicated adjustment of the oral toxicity criteria to generate dermal criteria.

6.3.2 Non-Carcinogenic Health Effects

For non-carcinogenic health effects, USEPA assumes that a dose threshold exists, below which adverse effects are not expected to occur. A chronic RfD or RfC of a chemical is an estimate of a lifetime daily dose to humans that is likely to be without appreciable deleterious non-carcinogenic health effects. To derive an RfD or RfC, a series of professional judgments is made

to assess the quality and relevance of the human or animal data and to identify the critical study and the most critical toxic effect. Data typically used in developing the RfD or RfC are the highest no-observable-adverse-effect-levels (NOAELs) for the critical studies and effects of the non-carcinogen. For each factor representing a specific area of uncertainty inherent in the extrapolation from the available data, an uncertainty factor is applied. Uncertainty factors generally consist of multiples of 10, although values less than 10 are sometimes used.

Four major types of uncertainty factors are typically applied to NOAELs in the derivation of RfDs or RfCs. Uncertainty factors of 10 are used to (1) account for the variability between humans, (2) extrapolate from animals to humans, (3) account for a NOAEL based on a subchronic study instead of a chronic study, and (4) extrapolate from a lowest-observed-adverse-effect-level (LOAEL) to a NOAEL, if necessary. In addition, a modifying factor can be used to account for adequacy of the database. Typically, the modifying factor is set equal to one.

To obtain the RfD or RfC, all uncertainty factors associated with the NOAEL are multiplied together, and the NOAEL is divided by the total uncertainty factor. Therefore, each uncertainty factor adds a degree of conservatism (usually one order of magnitude) to the RfD or RfC. An understanding of the uncertainties associated with RfDs or RfCs is important in evaluating the significance of the HIs calculated in the risk characterization portion of the risk assessment. When available, sub-chronic RfDs or RfCs were used to evaluate construction worker exposures. The COPCs in this assessment with USEPA-established oral/dermal and inhalation RfDs or RfCs are presented in Tables 6-9 and 6-10 (Tables section), for surface flux and soil COPCs, respectively.

6.3.3 Carcinogenic Health Effects

USEPA develops CSFs and IURs from chronic animal studies or, where possible, epidemiological data. Because animal studies use much higher doses over shorter periods of time than the exposures generally expected for humans, the data from these studies are adjusted, typically using a linearized multi-stage (LMS) mathematical model. To ensure protectiveness, CSFs/IURs are typically derived from the 95th percentile UCL of the slope, and thus the actual risks are unlikely to be higher than those predicted using the CSF/IUR, and may be considerably lower. The COPCs in this assessment with USEPA-established oral/dermal and inhalation CSFs/IURs are presented in Tables 6-9 and 6-11 (Tables section), for surface flux and soil COPCs, respectively.

6.3.4 Asbestos

Asbestos toxicity criteria were obtained from Table 8-1 of Berman and Crump's (2001) document and Tables 8-2 and 8-3 in the USEPA (2003b) guidance. The toxicity criteria vary based on fiber type, endpoint (lung cancer, mesothelioma, or combined) and percent of fibers longer than 10 micrometers (μm) and less than 0.4 μm in width. For this risk assessment the toxicity criteria were based on a combined endpoint of lung cancer and mesothelioma averaged over the smokers and non-smokers of the population, with the assumption that 50 percent of fibers are greater than 10 μm in length (Berman and Crump 2001). The resulting unit risk factors (structures/cubic centimeter) are presented in Appendix H (included on the report CD in Appendix B). A complete discussion on issues associated with risk estimates for asbestos is presented in the NDEP's *Technical Guidance for the Calculation of Asbestos-Related Risk in Soils* (2011a).

6.4 RISK CHARACTERIZATION

In the last step of a risk assessment, the estimated rate at which a receptor intakes a chemical is compared with information about the toxicity of that COPC to estimate the potential risks posed by exposure to the COPC. This step is known as risk characterization. The methods used for assessing cancer risks and non-cancer adverse health effects are discussed below.

6.4.1 Methods for Assessing Cancer Risks

In the risk characterization, carcinogenic risk is estimated separately as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to chemicals and asbestos. Carcinogenic risks for chemicals were evaluated by multiplying the estimated average exposure rate (i.e., LADD calculated in the exposure assessment) by the chemical's CSF or IUR. The CSF converts estimated daily doses averaged over a lifetime to incremental risk of an individual developing cancer. Because cancer risks are averaged over a person's lifetime, longer-term exposure to a carcinogen results in higher risks than shorter-term exposure to the same carcinogen, if all other exposure assumptions are constant. Theoretical risks associated with low levels of exposure in humans are assumed to be directly related to an observed cancer incidence in animals associated with high levels of exposure while the IUR converts estimated exposure concentrations averaged over a lifetime to incremental risk of an individual developing cancer. According to USEPA (1989), this approach is appropriate for theoretical upper-bound ILCRs of less than 1×10^{-2} . The following equations were used to calculate COPC-specific risks and total risks:

$$Risk = EC \times IUR \text{ or } LADD \times CSF$$

where:

LADD = lifetime average daily dose (mg/kg-d)
EC = exposure concentration (mg/m³)
IUR = inhalation unit risk (mg/m³)⁻¹
CSF = cancer slope factor (mg/kg-d)⁻¹

and:

$$Total\ Carcinogenic\ Risk = \Sigma Individual\ Risk$$

It is assumed that cancer risks for different chemicals and from multiple exposure routes are additive, which introduces a protective bias in the result of the cancer risk assessment. A similar approach is used for radionuclides:

$$Total\ Radionuclide\ Risk = \Sigma Individual\ Radionuclide\ Risk$$

Carcinogenic risk estimates were compared to the USEPA acceptable, incremental risk range of 1 in 10,000 (10⁻⁴) and 1 in 1 million (10⁻⁶) and the NDEP's acceptable, incremental level of 10⁻⁶. If the estimated incremental risk falls within or below this risk range, the chemical is considered unlikely to pose an unacceptable carcinogenic risk to individuals under the given exposure conditions. A risk level of 1 × 10⁻⁵ (1 E-5) represents an incremental probability of one in 100,000 that an individual could develop cancer from exposure to the potential carcinogen under a defined set of exposure assumptions.

6.4.2 Methods for Assessing Non-Cancer Health Effects

Non-cancer adverse health effects are estimated by comparing the estimated average exposure rate (i.e., ADDs estimated in the exposure assessment) with an exposure level at which no adverse health effects are expected to occur for a long period of exposure (e.g., the RfDs or RfCs). ADDs (or exposure concentrations [ECs]) and RfDs (or RfCs) are compared by dividing the ADD by the RfD (or EC by the RfC) to obtain the ADD:RfD (EC:RfC) ratio, as follows:

$$HQ = \frac{EC}{RfC} \text{ or } \frac{ADD}{RfD}$$

where:

HQ	=	hazard quotient
ADD	=	average daily dose (mg/kg-d)
EC	=	exposure concentration (mg/m ³)
RfD	=	reference dose (mg/kg-d)
RfC	=	reference concentration (mg/m ³)

The ADD-to-RfD (EC-to-RfC) ratio is known as an HQ. If a person's average exposure is less than the RfD or RfC (i.e., if the HQ is less than 1), the chemical is considered unlikely to pose a significant non-carcinogenic health hazard to individuals under the given exposure conditions. Unlike carcinogenic risk estimates, an HQ is not expressed as a probability. Therefore, while both cancer and non-cancer risk characterizations indicate a relative potential for adverse effects to occur from exposure to a chemical, a non-cancer adverse health effect estimate is not directly comparable with a cancer risk estimate.

If more than one pathway is evaluated, the HQs for each pathway are summed to determine whether exposure to a combination of pathways poses a health concern. This sum of the HQs is known as an HI.

$$\text{Hazard Index} = \Sigma \text{Hazard Quotients}$$

Any HI less than or equal to 1.0 indicates the exposure is unlikely to be associated with a potential health concern. If the HI is greater than 1.0, then the HQs are summed by the specific target organs affected by a particular chemical or chemicals. This is also summed across pathways and chemicals. Target organs are identified primarily by the source of the toxicity criteria (e.g., IRIS). Since a chemical may affect more than one organ, in addition to the source of the toxicity criteria Oak Ridge National Laboratory's (ORNL) Risk Assessment Information System's toxicity profiles were also searched for target organ information (ORNL 2013).

6.4.3 Methods for Assessing Asbestos Risks

For assessing asbestos risks, Table 8-2 (Based on Optimum Risk Coefficients) of USEPA (2003b) was used. Table 8-2 presents best estimate risks optimized based upon separation of fiber type, size and endpoint (mesothelioma/lung cancer), thereby reducing apparent variation between the studies utilized. The values in Table 8-2 are used because they are the authors' "best" estimates of potency based upon all the available data (whereas the "conservative values"

presented in Table 8-3 present only the most conservative, and best “behaved” data). As described in USEPA (2003b), because the asbestos risks to male and female smokers/non-smokers are different, population averaged risks are evaluated based on Eqn. 8-1 of USEPA (2003b):

$$URF = 0.5 \times ((0.786 \times (NSM + NSF)) + ((0.214 \times (SM + SF)) \times CF)$$

where:

- URF = Population Averaged Unit Risk Factor (risk per fibers/cubic centimeter [cm^3])
- NSM = risk for male non-smokers
- NSF = risk for male non-smokers
- SM = risk for male smokers
- SF = risk for female smokers
- CF = factor to convert risk from risk per 100,000 to risk per 1,000,000

This equation considers male smokers, male non-smokers, female smokers, and female non-smokers. In addition, because both chrysotile and amphibole have been detected at the BMI Common Areas, both amphibole and chrysotile fibers are evaluated in the risk assessments, regardless of if either was detected within an exposure area (as calculated using the 95 percent UCL of the mean of the assumed underlying Poisson distribution).

The basic equation for assessing inhalation cancer risk for asbestos is analogous to that recommended by USEPA for other inhalation carcinogens. As shown in Equation 11 of *Risk Assessment Guidance for Superfund, Part F* (USEPA 2009) inhalation cancer risk is the product of an IUR factor and an exposure concentration. The exposure concentration is a function of the asbestos air concentration, the length of time an individual is exposed, and the averaging time for which carcinogenic effects are evaluated for the unit risk factor. This calculation of asbestos related risk (ARR) is also consistent with application of Berman and Crump (2003) to risk calculations described in Berman (2003a,b; 2005). The risk equation used in performing an asbestos inhalation risk assessment is:

$$ARR = \frac{C_{air} \times URF \times ET \times EF \times ED}{AT}$$

where:

- C_{air} = air concentration of asbestos (f/cm^3) (fibers per centimeter cubed)
- ET = exposure time (hours/day)

EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
AT	=	averaging time (hours)
URF	=	unit risk factor (risk per f/cm ³)

Asbestos risk estimates are compared to the USEPA acceptable, incremental risk range for carcinogens of 1 in 10,000 (10^{-4}) and 1 in 1 million (10^{-6}) and the NDEP's acceptable, incremental level of 10^{-6} , although the risk estimates represent the probability of death from mesothelioma or lung cancer rather than the probability of contracting cancer. If the estimated asbestos risk falls within or below this risk range, asbestos is considered unlikely to pose an unacceptable risk to individuals under the given exposure conditions. A risk level of 1×10^{-5} (1 E-5) represents a probability of one in 100,000 that an individual could die from contracting mesothelioma or lung cancer from exposure to asbestos under a defined set of exposure assumptions.

6.4.4 Risk Assessment Results

The calculation of theoretical upper-bound ILCRs and non-cancer health effects are presented by receptor in Tables 6-12 through 6-14 (Tables section) and are discussed in Section 8. These tables present the theoretical upper-bound ILCRs and non-cancer health effects calculations for construction worker, commercial (indoor) worker, and maintenance (outdoor) worker receptors. The risk of death from lung cancer or mesothelioma as a consequence of exposure to asbestos on a Site-wide basis is presented in Table 6-15 (Tables section). The calculation of theoretical upper-bound ILCRs for radionuclides for both the Site and background are presented in Table 6-16. All calculation spreadsheets are provided in Appendix H (included on the report CD in Appendix B).

7.0 UNCERTAINTY ANALYSIS

Risk estimates are values that have uncertainties associated with them. These uncertainties, which arise at every step of a risk assessment, are evaluated to provide an indication of the uncertainty associated with a risk estimate. Risk assessments are not intended to estimate the true risk to a receptor associated with exposure to chemicals in the environment. In fact, estimating the true risk is impossible because of the variability in the exposed or potentially exposed populations. There are always gaps in knowledge because a true exposure for every individual human being cannot be measured. Therefore, risk assessment is a means of estimating the probability that an adverse health effect (e.g., cancer, impaired reproduction) will occur in a receptor to assist in decision-making regarding the protection of human health. The use of conservative values for a majority of the assumptions in risk assessments helps guard against the underestimation of risks.

Risk estimates are calculated by combining Site data, assumptions about individual receptor's exposures to impacted media, and toxicity data. The uncertainties in this HHRA can be grouped into four main categories that correspond to these steps:

- Uncertainties in environmental sampling and analysis;
- Uncertainties in fate and transport modeling;
- Uncertainties in assumptions concerning exposure scenarios; and
- Uncertainties in toxicity data and dose-response extrapolations.

General uncertainties associated with the HHRA for the Site are summarized in Table 7-1. In this table, "Low," "Moderate," and "High" are qualitative indicators as to whether the source of uncertainty will likely have a small, medium, or large effect on the risk calculations, respectively. In general, the scenarios and parameters evaluated and used in this HHRA are considered conservative based on how the Site will be developed. This is a large source of potential conservative bias in this HHRA. Additional discussion on the uncertainties associated with the HHRA is provided below.

7.1 ENVIRONMENTAL SAMPLING

The HHRA for the Site was based on the sampling results obtained from investigations conducted in 2010 through 2012. Errors in sampling results can arise from the field sampling, laboratory analyses, and data analyses.

The environmental sampling at the Site is one source of uncertainty in the evaluation. However, the number of sampling locations and events is large, widespread and spatially distributed, with consistent analytical results (i.e., no hot spots), and sampling was performed using approved procedures; therefore, the sampling and analytical data are sufficient to characterize the impacts and the associated potential risks.

Because of the surface soil removal undertaken for certain chemicals, the new surface layer of the Site could have different chemical concentrations than those measured prior to soil removal. Because only the trigger constituents were reanalyzed for in the post-scrape samples, the original measured surface soil data at the Site for all other chemicals was retained for further evaluation. However, it is reasonable to assume that the concentrations are now lower for some chemicals (e.g., metals, if due to contamination), because of the removal of some soil.

The laboratory data are another potential source of uncertainty. Maximum SQLs for dichloromethyl ether exceeded one-tenth its worker soil BCL. This chemical was not evaluated quantitatively in the HHRA as it was not detected in any Site samples. This may result in an underestimation of risk.

The types of analyses were chosen based on historical knowledge of the Site and BMI Common Areas. The data validation and data usability evaluations provided documentation that the HHRA database is adequate to support HHRA conclusions (Section 4 and Appendix E). Based on the data validation and data usability, the risk estimates are likely to be overestimated rather than underestimated.

Holding times were exceeded in 20 soil samples for chromium (VI) analysis (95 percent of the samples analyzed for that constituent). Chromium (VI) was not selected as a COPC because reported results were significantly less than its worker BCL (less than 100 times the BCL). Sixty percent of the qualified hexavalent chromium results were detected. The significant numbers of biased low data have the potential to underestimate the chromium (VI) results. However, qualifications of chromium (VI) data due to holding time exceedances are not likely to result in underestimation of the total Site risk.

NDEP has issued recent guidance regarding qualifying data due to blank contamination (NDEP 2011c). As noted in the guidance, NDEP requires that data validated before June 2011 and impacted by blank contamination be discussed in any report that uses such data. In so doing, a semi-quantitative comparison of the potential differences between approaches taken previously and the requirements specified in the guidance will be described and explained. The discussion below provides this semi-quantitative comparison for data impacted by blank contamination for the Site.

The initial data for the Site were collected and validated prior to June 2011; therefore, data were qualified using existing USEPA and NDEP guidance. The issue of blank contamination is not one that affects the typical primary risk drivers for the project, including those for the Site. The primary risk drivers for the Site are aluminum and arsenic; only one of which, arsenic, had blank contamination issues. There were six arsenic results, out of 21 for the Site, affected by blank contamination, with initial reported values (3.7 to 4.9 mg/kg) slightly less than the qualified values used in the HHRA (5.3 to 5.5 mg/kg). Therefore, the impact of these samples on the background comparison statistics for arsenic is unlikely to be significant. The following other metals had samples qualified non-detect due to blank contamination: cadmium (20 samples), mercury (18 samples), molybdenum (12 samples), selenium (11 samples), silver (one sample), thallium (two samples), tin (17 samples), tungsten (seven samples), and zinc (five samples). Given the number of samples qualified due to blank contamination for several of these, this may have an impact on the background comparison statistics. However, in all cases, the maximum detected concentrations for these metals are less than one-tenth their respective BCLs (and their maximum non-detect concentrations are also less than one-tenth their BCLs). Therefore, this issue has no material effect on the selection of COPCs and the results of the HHRA for the Site.

Uncertainties are also introduced into the risk assessment by assumptions that are made regarding the grading plan. As described in Section 3.1, a grading plan has not yet been developed for the Site. Because of this, the data were subdivided by depth intervals as described in Section 3.1, and the maximum of the UCLs for the two subsets of data was used as the exposure point concentration. There is some uncertainty in the choice of subsetting on the concentrations of interest, and there is a potential small overestimation of risk by choosing the maximum of the two UCLs as the exposure point concentration. The effects are likely to be small given the data, since there is not much variation in the different UCLs.

7.2 ESTIMATES OF EXPOSURE

The selection of exposure pathways is a process, often based on best professional judgment, which attempts to identify the most probable potentially harmful exposure scenarios. In a risk assessment, it is possible that risks are not calculated for all of the exposure pathways that may occur, possibly causing some underestimation of risk.

7.2.1 Aggregation of Exposure Areas

Although land use is not residential, default residential exposure areas are one-eighth-acre in size. However, sampling has not been performed at the frequency of guaranteeing at least one sample per every one-eighth-acre exposure area. Instead, sampling has been performed at the scale of approximately once every three acres. This is considered sufficient if the concentration distribution for COPCs appears similar across the Site. To the extent that this assumption is not valid the risk assessment might underestimate risks. However, considering the sampling protocols employed and the physical remediation activities performed, the risk estimates are considered both reasonable from this perspective and unlikely to have resulted in an underestimation of risk at the Site.

7.2.2 Types of Exposures Examined

In an evaluation, risks are sometimes not calculated for all of the exposure pathways that may occur, possibly causing some underestimation of risk. However, in this case, all principal potential exposure pathways were evaluated. In this assessment, risks were estimated for future worker receptors. Risks for the most likely routes of exposure to these receptors were estimated. For example, risks to workers were estimated for soil ingestion, skin contact with soil, and inhalation of outdoor air (including dust generation). Although it is possible that other exposure routes could exist (e.g., downwind off-site residents), these exposures are expected to be lower than the risks associated with the pathways considered.

7.2.3 Intake Assumptions Used

The risks calculated depend largely on the assumptions used to calculate the rate of COPC intake. For this assessment, standard default values developed by USEPA are used for reasonable maximum exposures frequency and exposure duration for all receptors. These estimates are conservative values, and the possibility that they underestimate the risk is low. The uncertainties associated with particular parameters used in this risk assessment are described below.

The amount of COPCs the human body absorbs may be different from the amount of a COPC contacted, and the percentage absorbed may vary from one person to another. In this HHRA, with the exception of arsenic, absorption of ingested and inhaled COPCs is conservatively assumed to be 100 percent.

Current USEPA guidance (USEPA 2004e) states that “There are no default dermal absorption values presented for volatile organic compounds nor inorganic classes of compounds. The rationale for this is that in the considered soil exposure scenarios, volatile organic compounds would tend to be volatilized from the soil on skin and should be accounted for via inhalation routes in the combined exposure pathway analysis. For inorganics, the speciation of the compound is critical to the dermal absorption and there are too little data to extrapolate a reasonable default value.” While USEPA guidance does not specifically state that this pathway should be dismissed, consistent with the approach utilized in current USEPA guidance, the risk estimates in this HHRA do not include a dermal absorption value for VOCs or inorganics (unless a specific value has been identified). Thus, the risks presented in this assessment could be underestimated as a result.

The construction activity dust emissions did not take into account dust control measures that would reduce the amount of dust generated to below those levels used in the HHRA. The Clark County Department of Air Quality and Environmental Management has dust control permitting requirements, and an inhalable particulate matter action level of $50 \mu\text{g}/\text{m}^3$. The construction activity dust emissions predicted and used in the HHRA exceeded this level. Therefore, dust suppression activities would need to be implemented, thus reducing dust levels and exposures.

The dispersion factor for the construction worker is not adjusted to account for soil intrusion activities. Because these activities may cause increased air concentrations than that evaluated, risks to VOCs in soil may be underestimated for this receptor. However, VOCs are primarily associated with groundwater, this potential underestimation is considered low.

Using a process similar to the selection of COPCs for soil, only those VOCs and volatile SVOCs that did not pass the Tier 2 assessment in Section 6.1.2 were evaluated at each individual surface flux location. Based on this, only four of the 67 chemicals analyzed for in surface flux samples were included in the cumulative risks associated with the inhalation of VOCs (note that only two of these four chemicals were detected in surface flux data). Therefore, the cumulative risks associated with the inhalation of VOCs for all exposure scenarios are underestimated in the HHRA; however, this underestimation is considered low.

7.3 TOXICITY ASSESSMENT

The availability and quality of toxicological data is another source of uncertainty in the risk assessment. Uncertainties associated with animal and human studies may have influenced the toxicity criteria. Carcinogenic criteria are classified according to the amount of evidence available that suggests human carcinogenicity. In the establishment of the non-carcinogenic criteria, conservative safety factors, known as uncertainty and modifying factors, are used.

7.3.1 COPCs Lacking Toxicological Data

Toxicity criteria have not been established for some of the chemicals detected at the Site. These chemicals were not quantitatively evaluated in the HHRA. For example, potassium is an analyte for which no USEPA toxicity criteria have been established. The health effects and levels of concern for potassium in soil are not known. While not including potassium may have resulted in a low degree of underestimation of quantitative Site risk estimates, the available toxicological information suggests that this underestimation will not likely affect the decisions made relative to Site risks.

Because of the inconclusive nature of TICs as potentially SRCs, non-cancer surrogate toxicity criteria were not applied. Non-cancer surrogate toxicity criteria were not applied to the inorganic chemicals because of the complexity of ion and metal toxicity. A quantitative estimation of risk was not conducted for these COPCs. Thus, the risks presented in this assessment could be underestimated as a result.

7.3.2 Uncertainties in Animal and Human Studies

Extrapolation of toxicological data from animal tests is one of the largest sources of uncertainty in a risk assessment. There may be important, but unidentified, differences in uptake, metabolism, and distribution of chemicals in the body between the test species and humans. For the most part, these uncertainties are addressed through use of conservative assumptions in establishing values for RfDs, RfCs, CSFs, and IURs, which results in the likelihood that the risk is overstated.

Typically, test animals are administered high doses (e.g., maximum tolerated dose) of a chemical in a standard diet or in air. Humans are generally exposed to much lower doses in the environment, which may affect the toxicity of the chemical. In these studies, test animals, often laboratory rodents, are exposed daily to the chemical agent for various periods of time up to their

2-year lifetimes. Humans have an average 70-year lifetime and may be exposed either intermittently or regularly for an exposure period ranging from weeks to a full lifetime. Because of these differences, it is not surprising that extrapolation error is a large source of uncertainty in a risk assessment.

7.3.3 Non-Carcinogenic Toxicity Criteria

In the establishment of the non-carcinogenic criteria, conservative safety factors, known as uncertainty factors, are used. Most of the chronic non-carcinogenic toxicity criteria that were located in the IRIS database have uncertainty factors of 1,000. This means that the dose corresponding to a toxicological effect level (e.g., LOAEL) is divided by 1,000 to deem a safe, or “reference,” dose. The purpose of the uncertainty factor is to account for the extrapolation of toxicity data from animals to humans and to ensure the protection of sensitive individuals.

7.3.4 Sub-Chronic Non-Carcinogenic Toxicity Criteria

Construction worker exposures are evaluated for an exposure duration of 1 year, which is more representative of a sub-chronic exposure rather than a chronic exposure. As such, where available, sub-chronic RfDs were used to characterize non-cancer effects for the construction worker. However, for many COPCs, a sub-chronic RfD was not available and the chronic RfD was used. This likely presented an overestimation of non-cancer health risks to the construction worker.

7.3.5 Carcinogenic Toxicity Criteria

Uncertainty due to extrapolation of toxicological data for potential carcinogens tested in animals to human response is commonly the case for potentially carcinogenic chemicals. USEPA frequently uses the LMS model, or other non-threshold low-dose extrapolation models, to extrapolate the toxicological data to estimate human response. These low-dose extrapolation models assume that there is no threshold for carcinogenic substances; that is, exposure to even one molecule, fiber, or picocurie of a carcinogen is sufficient to cause cancer. This is a highly conservative assumption, because the body has several mechanisms to protect against cancer.

The use of the LMS model to extrapolate is a well-recognized source of significant uncertainty in the development of carcinogenic toxicity criteria and, subsequently, theoretical carcinogenic risk estimates. At high levels of exposure, there may indeed be a risk of cancer regardless of whether or not the effect occurs via a threshold mechanism. An animal bioassay cannot determine what

happens at low levels of exposure, however, which are generally typical of human exposure levels.

At low levels of exposure, the probability of cancer cannot be measured but must be extrapolated from higher dosages. To do this, test animals are typically exposed to carcinogens at levels that are orders of magnitude greater than those likely to be encountered by humans in the environment. It would be difficult, if not impossible, to perform animal experiments with a large enough number of animals to directly estimate the level of risk at the low exposure levels typically encountered by humans. Thus, to estimate the risk to humans exposed at low levels, dose-response data derived from animals given high dosages are extrapolated downward using mathematical models such as the LMS model, which assumes that there is no threshold of response. The dose-response curve generated by the model is known as the maximum likelihood estimate. The slope of the 95 percent lower confidence interval (i.e., upper-bound limit) curve, which is a function of the variability in the input animal data, is taken as the CSF. CSFs are then used directly in cancer risk assessment.

The U.S. federal government, including USEPA itself, has acknowledged the limitations of the high-to-low dose extrapolation models, particularly the LMS model (USEPA 1991c). In fact, this aspect of cancer risk assessment has been criticized by many scientists (including regulatory scientists) in recent years. USEPA has recently released revised cancer risk assessment guidelines (USEPA 2005b).

Even for genotoxic (i.e., non-threshold) substances, there are two major sources of bias embedded in the LMS model: (1) its inherent conservatism at low doses and (2) the routine use of the linearized form in which the 95 percent upper confidence interval is used instead of the unbiased maximum likelihood estimate. The inherent conservatism at low doses is due in part to the fact that the LMS model ignores all of the numerous biological factors that argue against a linear dose-response relationship for genotoxic effects (e.g., DNA repair, immunosurveillance, toxicokinetic factors).

Several other factors inherent in the LMS model result in overestimated carcinogenic potency: (1) any exaggerations in the extrapolation that can be produced by some high dose responses (if they occur) are generally neglected; (2) UCLs on the actual response observed in the animal study are used rather than the actual response, resulting in upper-bound low dose extrapolations, which can greatly overestimate risk; and (3) non-genotoxic chemicals (i.e., threshold carcinogens) are modeled in the same manner as highly genotoxic chemicals.

7.3.6 Uncertainties with the Asbestos Risk Assessment

For the risk assessment, asbestos concentrations were presented two ways, as a best estimate and upper bound based upon the UCL of the mean of the Poisson distribution. Asbestos risk estimates are highly dependent on the number of samples to increase or decrease the pooled analytical sensitivity. That is, a larger number of non-detect samples with similar individual analytical sensitivity results in a lower pooled analytical sensitivity and subsequently a lower estimated ARR, whereas a smaller number of non-detect samples results in a higher ARR. Uncertainty is, thus, reduced as more samples are collected.

7.3.7 Uncertainties with the Radionuclide Risk Assessment

For radionuclides, a simple comparison to NDEP indoor and outdoor worker BCLs was conducted. This differs from the approach used for other COPCs; however, it is considered a conservative approach for the Site. There are BCLs established for indoor and outdoor workers, but not construction workers. However, carcinogenic risks to construction workers for other COPCs (besides asbestos) is lower than for the other receptors, generally due to their shorter exposure duration. The same would also be the case for radionuclides. Therefore, not including the construction worker receptor for radionuclides will not impact the decisions made relative to Site risks. Another factor to consider is that radionuclide risks are estimated for both the Site and background conditions. Therefore, ultimately, regardless of how the risks are estimated for radionuclides, differences between the Site and background will remain constant, as the exposure concentrations remain the same. Thus, again, the simple comparison approach used for radionuclides will not impact the decisions made relative to Site risks.

7.4 CUMULATIVE EFFECT OF UNCERTAINTIES

Uncertainties from different sources are compounded in the HHRA. For example, if a person's daily intake rate for a chemical is compared to an RfD to determine potential health risks, the uncertainties in the concentration measurements, exposure assumptions, and toxicities are all expressed in the result. Because the exposure assumptions and toxicity criteria are considered conservative, the risk estimates calculated in this HHRA are likely to overestimate rather than underestimate potential risks.

8.0 SUMMARY OF RESULTS

This HHRA has evaluated potential risks to human health associated with chemicals and asbestos detected in soil at the Parcel 9 South Sub-Area located within the BMI Common Areas in Clark County, Nevada. All calculation spreadsheets for this HHRA are presented in Appendix H (on the report CD in Appendix B), including calculations of chemical theoretical upper-bound ILCRs and non-cancer health effects and asbestos risk calculations.

The risk estimates are based on reasonable maximum exposure scenarios, which results in estimates of the potential reasonable maximum, or high-end, risks associated with the Site. The calculated chemical theoretical upper-bound ILCRs and HIs are presented in Table 6-12 through 6-14 for construction worker, commercial (indoor) worker, and maintenance (outdoor) worker receptors, respectively. Asbestos estimated risk of death from lung cancer or mesothelioma on a Sitewide basis is presented in Table 6-15. The calculation of theoretical upper-bound ILCRs for radionuclides for both the Site and background are presented in Table 6-16.

8.1 CONSTRUCTION WORKERS

For chemical exposures, the total cumulative non-cancer HI for construction worker receptors at the Site is 0.1 (including the surface flux air risk estimates) (Table 6-12), with metals soil exposures via the oral ingestion pathway being the primary contributors. The HI does not exceed the target HI of 1.0. As a result, BRC did not evaluate target organ or background non-cancer HI values.

The maximum theoretical upper-bound ILCR for construction worker receptors at the Site is 1×10^{-7} (including the surface flux air risk estimates see Table 6-12) with arsenic soil exposures via the oral ingestion pathway the primary contributor. The theoretical upper-bound ILCRs are all below the low end of the risk goal of 1×10^{-6} .

The estimated risks for death from lung cancer or mesothelioma for asbestos exposures to construction workers were at or below 1×10^{-6} . For construction workers receptors, the best estimate and upper bound concentrations for chrysotile fibers are 1×10^{-8} and 3×10^{-8} ; and 0 and 1×10^{-6} for amphibole fibers (Table 6-15). These estimated risks are at or below the low end of the risk goal of 1×10^{-6} .

8.2 COMMERCIAL (INDOOR) WORKERS

For chemical exposures, the total cumulative non-cancer HI for commercial (indoor) worker receptors at the Site is 0.009 (including the surface flux air risk estimates) (Table 6-13), with

metals soil exposures via the oral ingestion pathway being the primary contributors. The HI does not exceed the target HI of 1.0. As a result, BRC did not evaluate background non-cancer HI values.

The maximum theoretical upper-bound ILCR for commercial (indoor) worker receptors at the Site is 4×10^{-7} (including the surface flux air risk estimates see Table 6-13) with the soil theoretical upper-bound ILCRs for arsenic via the oral ingestion and dermal contact pathways the primary contributor. The theoretical upper-bound ILCRs are all below the low end of the risk goal of 1×10^{-6} .

The estimated risks for death from lung cancer or mesothelioma for asbestos exposures to commercial (indoor) workers were below 1×10^{-6} . For commercial (indoor) worker receptors, the best estimate and upper bound concentrations for chrysotile fibers are 2×10^{-9} and 4×10^{-9} ; and 0 and 2×10^{-7} for amphibole fibers (Table 6-15). These estimated risks are below the low end of the risk goal of 1×10^{-6} .

The maximum theoretical upper-bound ILCR for commercial (indoor) worker receptors exposure to radionuclides at the Site is 8×10^{-5} (Table 6-16). Although the theoretical upper-bound ILCR is greater than the low end of the risk goal of 1×10^{-6} , it is the same as the background ILCR for radionuclides of 8×10^{-5} (Table 6-16).

8.3 MAINTENANCE (OUTDOOR) WORKERS

For chemical exposures, the total cumulative non-cancer HI for maintenance (outdoor) worker receptors at the Site is 0.02 (including the surface flux air risk estimates) (Table 6-14), with metals soil exposures via the oral ingestion pathway being the primary contributors. The HI does not exceed the target HI of 1.0. As a result, BRC did not evaluate background non-cancer HI values.

The maximum theoretical upper-bound ILCR for maintenance (outdoor) worker receptors at the Site is 7×10^{-7} (including the surface flux air risk estimates see Table 6-14) with the soil theoretical upper-bound ILCRs for arsenic via the oral ingestion and dermal contact pathways the primary contributor. The theoretical upper-bound ILCRs are below the low end of the risk goal of 1×10^{-6} .

The estimated risks for death from lung cancer or mesothelioma for asbestos exposures to maintenance (outdoor) workers were below 1×10^{-6} . For maintenance (outdoor) worker receptors, the best estimate and upper bound concentrations for chrysotile fibers are 4×10^{-9} and

9×10^{-9} ; and 0 and 4×10^{-7} for amphibole fibers (Table 6-15). These estimated risks are below the low end of the risk goal of 1×10^{-6} .

The maximum theoretical upper-bound ILCR for maintenance (outdoor) worker receptors exposure to radionuclides at the Site is 2×10^{-4} (Table 6-16). Although the theoretical upper-bound ILCR is greater than the low end of the risk goal of 1×10^{-6} , it is the same as the background ILCR for radionuclides of 2×10^{-4} (Table 6-16).

9.0 DATA QUALITY ASSESSMENT

Sample size calculations were conducted for the four selected COPCs for the Site (with thorium-228 representative of radionuclides),³³ as well as TCDD TEQ. TCDD TEQ was included because it is a chemical of primary concern for the overall project.

The formula used here for calculation of sample size is based on a non-parametric test (the Wilcoxon signed rank test), and on simulation studies performed by Pacific Northwest National Laboratories (2009) that formed the basis for an approximate formula that is based on the normal distribution. Essentially, the formula is the one that would be used if a normal-based test were being performed, but an adjustment is made (multiply by 1.16) to account for the intent to perform a non-parametric test. The formula is as follows:

$$n = 1.16 \left[\frac{s^2}{\Delta^2} (z_{1-\alpha} + z_{1-\beta(\mu)})^2 + 0.5 z_{1-\alpha}^2 \right]$$

where:

- n = number of samples
- s = estimated standard deviation of concentrations/fibers
- Δ = width of the gray region (the difference between the threshold value stated in the null hypothesis and the point at which β is specified)
- α = significance level or Type I error tolerance
- $\beta(\mu)$ = Type II error tolerance; and
- z = quantile from the standard normal distribution

For each chemical, inputs for the calculations include an estimate of the variance from the measured data, a desired significance level, and desired power of the test that must be specified at a concentration of interest (which determines the tolerable difference from the threshold value). For arsenic, the Site mean concentration exceeds its BCL based on the target cancer risk level of 10^{-6} . It is not appropriate to apply this calculation where the threshold value is less than the mean concentration. Therefore, an adjustment of the threshold value was used based the maximum background concentration. The same is true for thorium-228. In this case, an

³³ Note that benzo(a)pyrene was selected as a COPC based on exceeding the one-tenth BCL criteria. Other carcinogenic PAHs were also selected as COPCs because of benzo(a)pyrene. Therefore, sample size calculations were only performed for benzo(a)pyrene, as representative of PAHs.

adjustment of the threshold value was used based on the background cancer risk level of 2×10^{-4} . The calculations provided here cover a range of Type I and Type II error tolerances, and the point at which the Type II error is specified. Results are presented in Table 9-1. In this table, various combinations of input values are used, including values of α of 5, 10, and 15 percent; values of β of 15, 20, and 25 percent; and a gray region of width 10, 20, and 30 percent of the threshold level. It is clear from Table 9-1 that the number of samples collected is adequate for the Site. That is, calculated adequate sample numbers are generally less than those actually collected at the Site for use in the HHRA.

Note also that there are 12 samples collected for asbestos analysis. Amphibole was not detected in any of these samples; however, because of the number of samples collected, the ARR is at or less than 1×10^{-6} . Consequently, sufficient samples have been collected to address ARRs.

10.0 SUMMARY

BRC has prepared this HHRA and Closure Report for the Site. The purpose of this report is to request an NFAD by the NDEP. The NDEP acknowledges that discrete portions of the Eastside may be issued an NFAD as remedial actions are completed for selected environmental media (NDEP 2006). The portion of the Eastside for which the NFAD is being requested based on this HHRA and Closure Report is shown in red on Figure 1. The legal description of the Site is provided in Appendix K.

The HHRA evaluated the potential for adverse human health impacts that may occur as a result of potential exposures to residual concentrations of chemicals in soil, groundwater, and air following remediation, and assessed whether any additional remedial actions are necessary in order to obtain an NFAD from the NDEP to allow redevelopment of the Site to proceed. The results of the risk assessment provide risk managers with an understanding of the potential human health risks associated with background conditions and additional risks associated with past Site activities.

For human health protection, and given the proposed land use for the Site, BRC's goal is to remediate the Site soils such that they are suitable for retail/commercial land use. Human health risks are represented by estimated theoretical upper-bound cancer risks and non-cancer hazards derived in accordance with standard USEPA and NDEP methods. If the carcinogenic risks or non-cancer hazards exceed USEPA acceptable levels or NDEP risk goals, then remedial action alternatives must be considered. Findings of the HHRA are intended to support the Site closure process. The major findings of this report are the following:

- Data collected for use in the HHRA are adequate and usable for their intended purpose;
- All relevant and reasonable exposure scenarios and pathway have been evaluated; and
- Construction worker, commercial (indoor) worker, and maintenance (outdoor) worker cancer and non-cancer risk estimates are within or below the risk goals for the project.

Therefore, based on the results of the HHRA, and the conclusions in this report, exposures to residual levels of chemicals in soil at the Parcel 9 South Sub-Area do not result in adverse health effects to all future receptors. Therefore, BRC concludes that an NFAD for the Parcel 9 South Sub-Area is warranted and requests that the NDEP issue the NFAD (see Appendix K for the legal description of the Site).

11.0 REFERENCES

- Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Update to the ATSDR Policy Guideline for Dioxins and Dioxin-Like Compounds in Residential Soil. U.S. Department of Health and Human Services, Public Health Service. November.
- American Society for Testing and Materials (ASTM). 2000. Standard Guide for Risk-Based Corrective Action. E2081-00.
- Basic Remediation Company (BRC). 2010a. Sampling and Analysis Plan for the Staging Sub-Area and Parcel 9 South, BMI Common Areas (Eastside), Clark County, Nevada. April.
- BRC. 2010b. Technical Memorandum – Correlation of Radon Activities in Indoor Air and Shallow Zone Groundwater, BMI Common Areas (Eastside) Site, Clark County, Nevada. August 30.
- BRC. 2011. BRC Comments on NDEP Blank Contamination Guidance. Technical Memorandum. Draft. August 15.
- BRC and Environmental Resources Management (ERM). 2009a. BRC Quality Assurance Project Plan. BMI Common Areas, Clark County, Nevada. May.
- BRC and ERM. 2009b. 2008 Supplemental Shallow Soil Background Report. BMI Common Areas (Eastside), Clark County, Nevada. September.
- BRC and ERM. 2010a. Data Validation Summary Report, Staging Sub-Area Soil Investigation – May-June 2010 (Dataset 66). BMI Common Areas (Eastside), Clark County, Nevada. October.
- BRC and ERM. 2010b. Background Soil Compilation Report. BMI Complex and Common Areas, Clark County, Nevada. April.
- BRC and ERM. 2011. Data Validation Summary Report, Eastside North Surface Flux Investigations (Remaining Sub-Areas) – July through August 2010 (Dataset 71). BMI Common Areas (Eastside), Clark County, Nevada. July.
- BRC and ERM. 2014. Eastside Confirmation/Supplemental Sampling Events – July 2012 Through February 2014 (Dataset 72f). BMI Common Areas (Eastside), Clark County, Nevada. June.

- BRC, ERM, and Daniel B. Stephens & Associates, Inc. (DBS&A). 2007. BRC Closure Plan, BMI Common Areas, Clark County, Nevada. May. [Section 9 revised March 2010]
- BRC, ERM, and MWH. 2009. BRC Field Sampling and Standard Operating Procedures, BMI Common Areas, Clark County, Nevada. December.
- Berman D.W. 2003a. Analysis and Interpretation of Measurements for the Determination of Asbestos in Core Samples Collected at the Southdown Quarry in Sparta, New Jersey, November 12.
- Berman D.W. 2003b. Evaluation of Asbestos Measurements and Assessment of Risks Attendant to Excavation and Use of Soils Within the Proposed Borrow Area of the BRC Corrective Action Management Unit, Henderson, NV, November 25.
- Berman D.W. 2005. Draft Preliminary Evaluation of the Implications of Airborne Asbestos Exposure Concentrations Observed During Simulation of a Selected Set of Common, Outdoor Residential Activities Conducted at the North Ridge Estates Site, Klamath Falls, Oregon, February 18.
- Berman, D.W., and E.J. Chatfield. 1990. Interim Superfund Method for the Determination of Asbestos in Ambient Air. Part 2: Technical Background Document, Office of Solid Waste and Remedial Response, U.S. EPA, Washington, D.C., EPA/540/2-90/005b, May.
- Berman, D.W., and K. Crump. 1999a. Methodology for Conducting Risk Assessments at Asbestos Superfund Sites—Part 1: Protocol. Interim Version. Prepared for USEPA Region 9, February 15.
- Berman, D.W., and K. Crump. 1999b. Methodology for Conducting Risk Assessments at Asbestos Superfund Sites—Part 2: Technical Background Document. Interim Version. Prepared for USEPA Region 9, February 15.
- Berman, D.W., and K.S. Crump. 2001. Technical Support Document for a Protocol to Assess Asbestos-Related Risk. Prepared for Mark Raney, Volpe Center, U.S. Department of Transportation, 55 Broadway, Kendall Square, Cambridge, MA 02142. Under EPA Review.
- Berman D.W., and K.S. Crump. 2003. Final draft: Technical support document for a protocol to assess asbestos-related risk. Prepared for Mark Follensbee, Syracuse Research Corporation,

Syracuse, NY, and the Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, DC. USEPA #9345.4-06. Limited revision draft.

Berman, D.W., and A. Kolk. 2000. Modified Elutriator Method for the Determination of Asbestos in Soils and Bulk Material. May (Revision 1).

Carlsen, C.L., R.C. Lunnis, and D.E. Prudie. 1991. Changes in water levels and water quality in shallow groundwater, Pittman-Henderson Area, Clark County, Nevada, Resulting from diversion of industrial cooling water from ditch to pipeline in 1985. U.S. Geological Survey Water-Resources Investigation Report 89-4093. Carson City, Nevada.

Clark County GIS Management Office. 2003. 5 Foot Contours for the Las Vegas Valley, Mesquite and Laughlin. Fall 2003 Flight of Clark County.

Daniel B. Stephens & Associates, Inc. (DBS&A). 2009. Revised Technical Memorandum: Sources/Sinks and Input Parameters for Groundwater Flow Model, BMI Common Areas, Eastside Area.

Environmental Remediation Management (ERM). 2000. Remedial Alternatives Study for Soils and Sediments in the Upper and Lower Ponds at the BMI Complex. Henderson, Nevada. March 1.

Las Vegas Wash Coordination Committee. 2000. The Las Vegas Wash Comprehensive Adaptive Management Plan. <http://www.lvwash.org/resources/docs/lvwcamp.html>.

Law Engineering Inc. 1993. Final Report of Phase I Environmental Condition Assessment, Titanium Metals Corporation (TIMET) - Henderson, Nevada.

Neptune and Company. 2009. Guided Interactive Statistical Decision Tools (GiSdT). www.gisdt.org.

Nevada Division of Environmental Protection (NDEP). 2001. Record of Decision, Remediation of Soils and Sediments in the Upper and Lower Ponds at the BMI Complex. Henderson, Nevada. November 2.

NDEP. 2006. Settlement Agreement and Administrative Order on Consent: BMI Common Areas, Phase 3 (AOC3).

- NDEP. 2008a. 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. October 22.
- NDEP. 2008b. Detection Limits and Data Reporting. Bureau of Corrective Actions, Special Projects Branch. December 3.
- NDEP. 2009a. Guidance for Evaluating Radionuclide Data for the BMI Plant Sites and Common Areas Projects. February 6.
- NDEP. 2009b. Supplemental Guidance on Data Validation. March 19.
- NDEP. 2009c. Supplemental Guidance on Data Validation. April 13.
- NDEP. 2009d. Guidance for Evaluating Secular Equilibrium at the BMI Complex and Common Areas. BMI Plant Sites and Common Areas Projects, Henderson, Nevada. February 6.
- NDEP. 2011a. Technical Guidance for the Calculation of Asbestos-Related Risk in Soils for the Basic Management Incorporated (BMI) Complex and Common Areas. February.
- NDEP. 2011b. Workbook for the Calculation of Asbestos-Related Risk in Soils for the Basic Management Incorporated (BMI) Complex and Common Areas.
- NDEP. 2011c. July 2011 Guidance on Qualifying Data due to Blank Contamination. BMI Plant Sites and Common Areas Projects, Henderson, Nevada.
- NDEP. 2012. Guidance on Data Validation for Asbestos Data in Soils. BMI Plant Sites and Common Areas Projects, Henderson, Nevada. July.
- NDEP. 2013. User's Guide and Background Technical Document for Nevada Division of Environmental Protection (NDEP) Basic Comparison Levels (BCLs) for Human Health for the BMI Complex and Common Areas. August.
- NewFields Companies, LLC (NewFields). 2006. Statistical Methodology Report, BMI Common Areas (Eastside), Henderson, Nevada. August.
- Oak Ridge National Laboratory (ORNL). 2013. Risk Assessment Information System (RAIS) Toxicity Profiles. http://rais.ornl.gov/tools/tox_profiles.html

Pacific Northwest National Laboratory. 2009. Visual Sample Plan. <http://vsp.pnl.gov>.

Scanlon, B.R., K.E. Keese, A.L. Flint, L.E. Flint, C.B. Gaye, W.M. Edmunds, and I. Simmers. 2006. Global synthesis of groundwater recharge in semiarid and arid regions. *Hydrological Processes Hydrol. Process.* 20(15):3335–3370.

Southern Nevada Water Authority. 1996. Extent and Potential Use of the Shallow Aquifer and Wash Flow in Las Vegas Valley, Nevada.

Umhoefer, P.J., L.S. Beard, and M.A. Lamb. eds. 2010. Miocene Tectonics of the Lake Mead Region, Central Basin and Range. Geological Society of America. Special Paper 463.

U.S. Environmental Protection Agency (USEPA). 1985. Rapid Assessment of Exposure to Particulate Emissions From Surface Contamination Sites. EPA/600/8-85/002. Office of Health and Environmental Assessment. Washington, DC.

USEPA. 1986. Measurement of Gaseous Emission Rates From Land Surfaces Using an Emission Isolation Flux Chamber, Users Guide. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada, EPA Contract No. 68-02-3889, Radian Corporation, February.

USEPA. 1989. Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response, Washington, DC. USEPA/540/1-89/002. December.

USEPA. 1991a. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions. Memorandum from D.R. Clay, Assistant Administrator, USEPA. OSWER Directive 9355.0-30, April.

USEPA. 1991b. Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual. Supplemental Guidance ‘Standard Default Exposure Factors’. Office of Emergency and Remedial Response, Washington, DC. OSWER Directive 9285.3-03. March.

USEPA. 1991c. Current Regulatory Issues in Risk Assessment and Risk Management. Executive Office of the President. Government Printing Office, Washington, DC. S/N 041 001 00354 1.

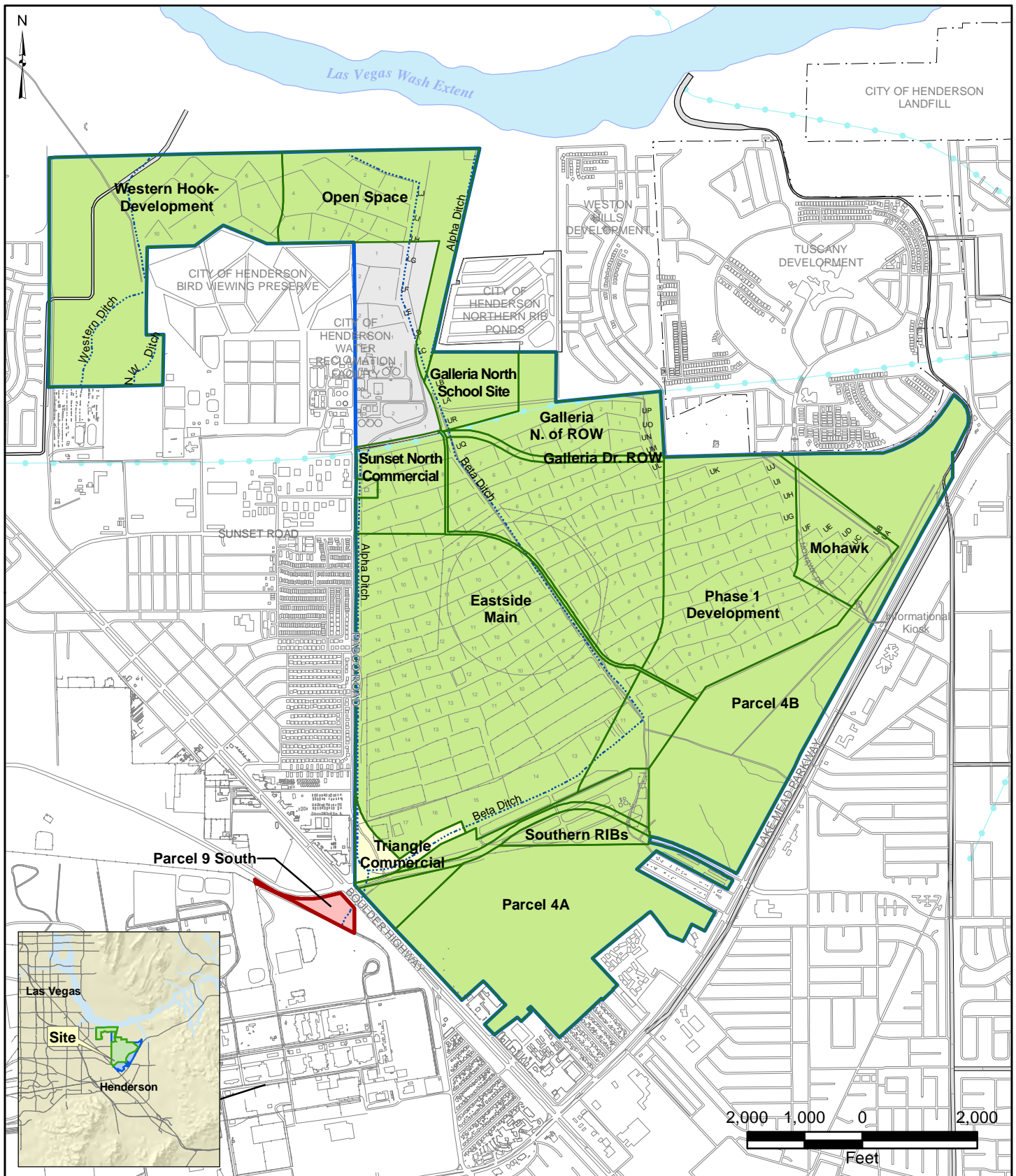
USEPA. 1992a. Guidance for Data Usability in Risk Assessment. Part A. Office of Emergency and Remedial Response, Washington DC. Publication 9285.7-09A. PB92-963356. April.

- USEPA. 1992b. Guidelines for Exposure Assessment. Federal Register, 57(104):22888-22938. May 29.
- USEPA. 1992c. Supplemental Guidance to RAGS: Calculating the Concentration Term. Office of Emergency and Remedial Response, Washington, DC. Publication 9285.7-08I. May.
- USEPA. 1996. Soil Screening Guidance: Technical Background Document. Office of Emergency and Remedial Response, Washington, DC. USEPA/540/R-96/018. April.
- USEPA. 1997. Exposure Factors Handbook. Office of Research and Development, Washington DC. USEPA/600/P-95/002Fa-c. August.
- USEPA. 1999. National Functional Guidelines for Organic Data Review. EPA 540/R-99-008. OSWER 9240.1-05A-P. October.
- USEPA. 2000. Soil Screening Guidance for Radionuclides. Office of Radiation and Indoor Air, Washington, DC. USEPA/540-R-00-007 and USEPA/540-R-00-006.
- USEPA. 2002a. Guidance for Quality Assurance Project Plans. EPA QA/G-5. Office of Environmental Information, Washington, DC. December.
- USEPA. 2002b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response, Washington, DC. OSWER 9355.4-24. December.
- USEPA. 2002c. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. Office of Emergency and Remedial Response, Washington, DC. OSWER 9285.6-10. December.
- USEPA. 2002d. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance) EPA 530-f-02-052. November.
- USEPA. 2003a. Contract Laboratory Program Statement of Work for Organic Analysis: Multi-media, Multi-concentration. OLM04.3. Office of Emergency and Remedial Response. March.
- USEPA. 2003b. Technical Support Document for a Protocol to Assess Asbestos-Related Risk. Final Draft. Office of Solid Waste and Emergency Response, Washington, DC.

- USEPA. 2003c. Memorandum on Human Health Toxicity Values in Superfund Risk Assessments, from Michael B. Cook, Director, Office of Superfund Remediation and Technology Innovation to Superfund Remediation Policy Managers, Regions 1 - 10, dated December 5. OSWER Directive 9285.7-53.
- USEPA. 2004a. Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Solid Waste and Emergency Response.
- USEPA. 2004b. Contract Laboratory Program Statement of Work for Organic Analysis: Multimedia, Multi-concentration. SOM01.0. Office of Emergency and Remedial Response. October.
- USEPA. 2004c. Contract Laboratory Program Statement of Work for Inorganic Analysis: Multimedia, Multi-concentration. ILM05.3. Office of Emergency and Remedial Response. March.
- USEPA. 2004d. National Functional Guidelines for Inorganic Data Review. EPA 540-R-04-004. OSWER 9240.1-45. October.
- USEPA. 2004e. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. Office of Emergency and Remedial Response, Washington, DC. EPA/540/R/99/005. July.
- USEPA. 2004f. Memorandum on Clarifying Cleanup Goals and Identification of New Assessment Tools for Evaluating Asbestos at Superfund Cleanups, from Michael B. Cook, Director, Office of Superfund Remediation and Technology Innovation to Superfund Remediation Policy Managers, Regions 1-10, August. OSWER Directive 9345.4-05.
- USEPA. 2005a. National Functional Guidelines for Chlorinated Dioxin/Furan Data Review. EPA 540-R-05-001. OSWER 9240.1-51. September.
- USEPA. 2005b. Guidelines for Carcinogen Risk Assessment. Risk Assessment Forum, Washington, DC. March.
- USEPA. 2008. National Functional Guidelines for Superfund Organic Methods Data Review. EPA 540-R-08-01. OSWER 9240.1-48. June.

- USEPA. 2009. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). EPA-540-R-070-002. <http://www.epa.gov/oswer/riskassessment/ragsf/>.
- USEPA. 2010. Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds. Risk Assessment Forum, Washington, DC. EPA/600/R-10/005.
- USEPA. 2015. Integrated Risk Information System. USEPA on-line database: <http://www.epa.gov/iris/index.html>.
- Western Regional Climate Center. 2008. Monthly average precipitation for Las Vegas. Desert Research Institute. <<http://www.wrcc.dri.edu/summary/Climsmnv.html>>.
- Weston. 1993. Site Conceptual Model, Stauffer/Pioneer/Montrose Site, Henderson, Nevada, September.

FIGURES



- | | |
|---------------------------|-------------------------|
| Site AOC3 Boundary | Parcel 9 South Sub-Area |
| Flood Conveyance Channels | Eastside Sub-Areas |
| Laterals | NFA Areas |
| | CoH WRF* |

*Not part of the Closure Plan for soils.

BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE 1

**PARCEL 9 SOUTH
SUB-AREA LOCATION**





- Parcel 9 South Sub-Area
- Site AOC3 Boundary
- Eastside Soil Sub-Areas

Monitoring Wells

- Alluvial Wells with Groundwater Data
- Other Monitoring Wells

BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE 2

SITE PLAN WITH MONITORING WELLS



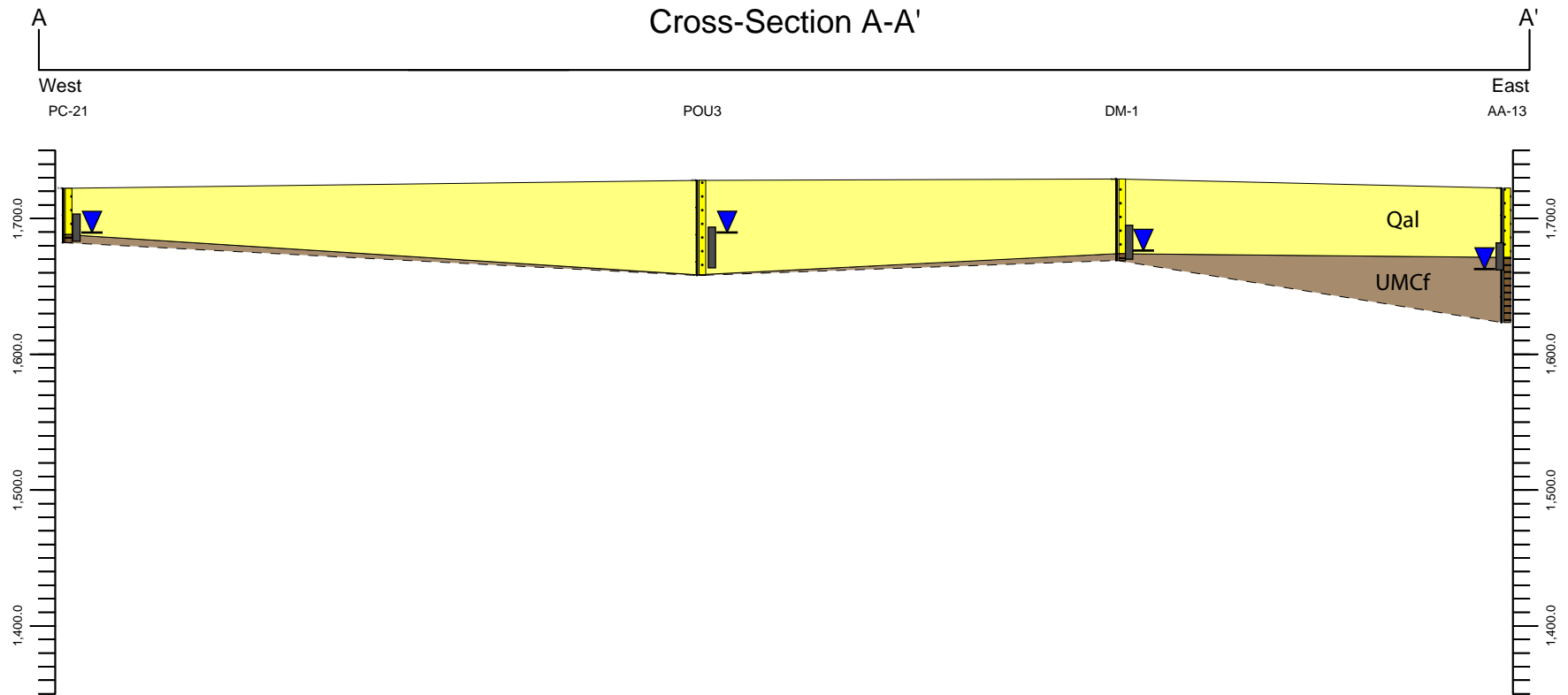
Prepared by
MKJ (ERM)



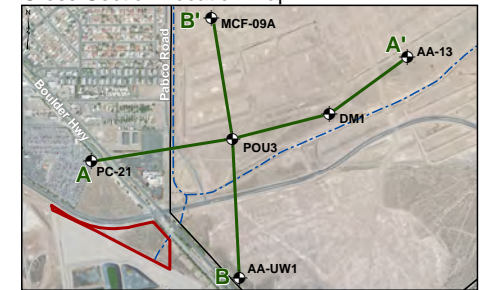
Date
02/03/15

JOB No. 0064276
FILE: GIS/BRC/PARCEL_9S/FIGURES2.10.MXD

Cross-Section A-A'



Cross-Section Location Map



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE 3

PARCEL 9 SOUTH
SUB-AREA
CROSS-SECTION A-A'

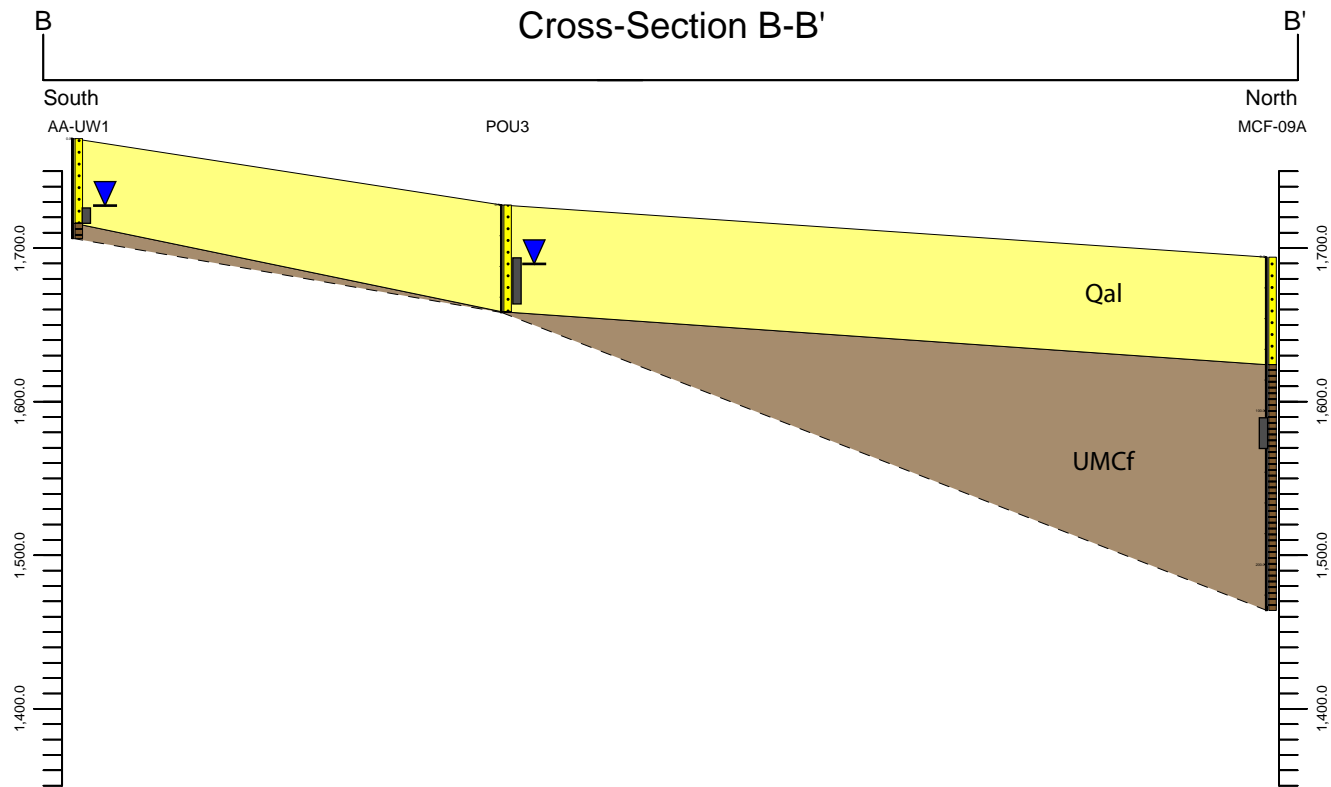


- = Screen Interval
- ▼ = Shallow Zone Water Level (August 2009)
- = Qal = Quaternary alluvium
- = UMCf = Upper Muddy Creek formation

Vertical Scale = 5x Horizontal Scale

For soil lithology details, please see the individual boring logs.

See Figure 3 of the *Human Health Risk Assessment and Closure Report for the Triangle Commercial Sub-Area* for cross-section location.



Cross-Section Location Map



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE 4

PARCEL 9 SOUTH
SUB-AREA
CROSS-SECTION B-B'



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FILE: GIS/BRC/PARCEL_9S/FIGURE4.AI

■ = Screen Interval

▼ = Shallow Zone Water Level (August 2009)

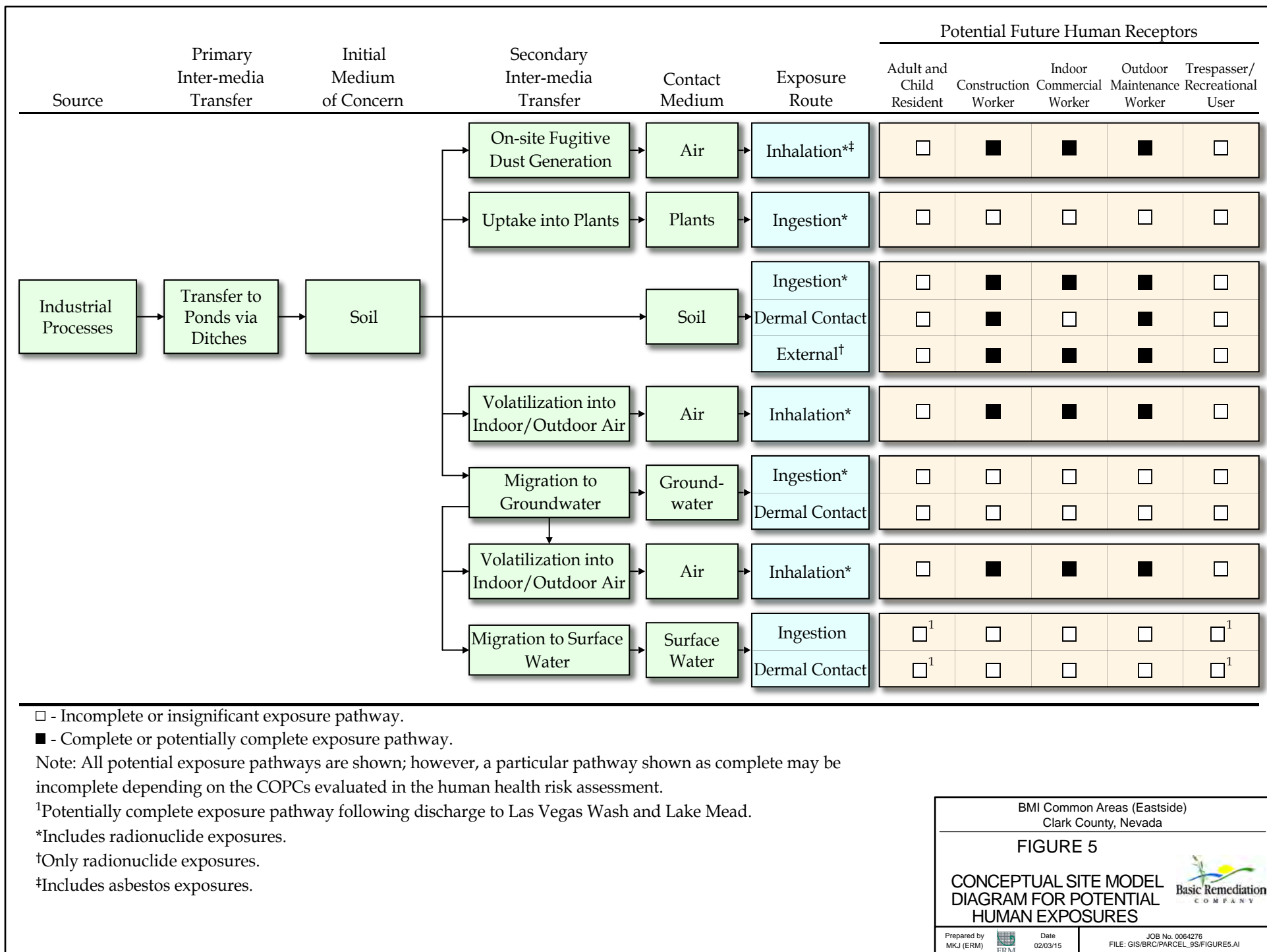
■ = Qal = Quaternary alluvium

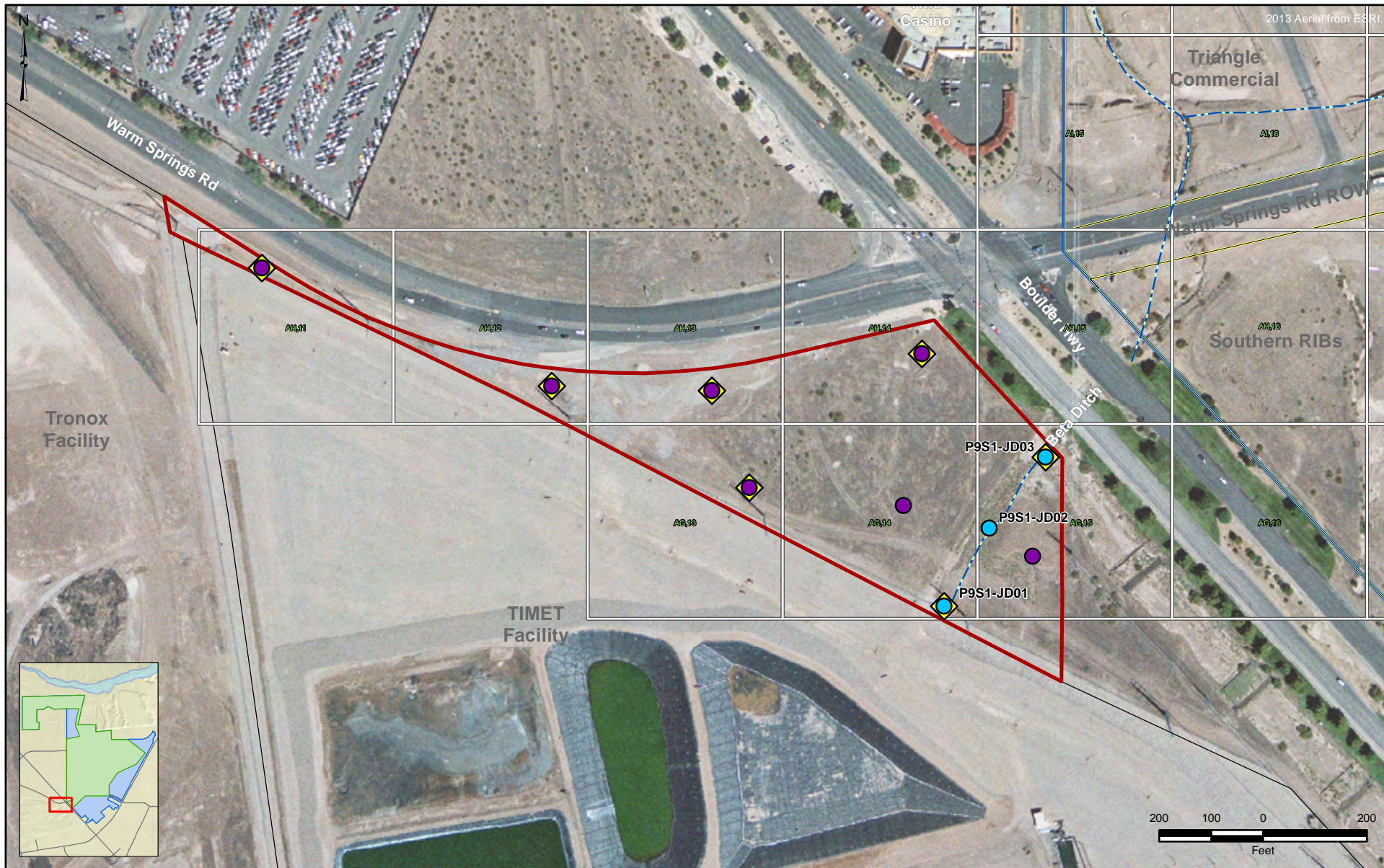
■ = UMCf = Upper Muddy Creek formation

Vertical Scale = 5x Horizontal Scale

For soil lithology details, please see the individual boring logs.

See Figure 3 of the *Human Health Risk Assessment and Closure Report for the Triangle Commercial Sub-Area* for cross-section location.





- | | | | |
|--|--|--|------------------------------|
| | Eastside 3-Acre Random Sampling Grid (Grid ID = "XX,##") | | Random Sample Location |
| | Parcel 9 South Sub-Area | | Ditch Sample Location |
| | Site AOC3 Boundary | | Surface Flux Sample Location |
| | Eastside Soil Sub-Areas | | |

Note: Sample ID's are shown for ditch sample locations. Sample ID's for random samples correspond to the grid cell ID.

BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE 6

INITIAL SOIL AND SURFACE FLUX SAMPLING LOCATIONS

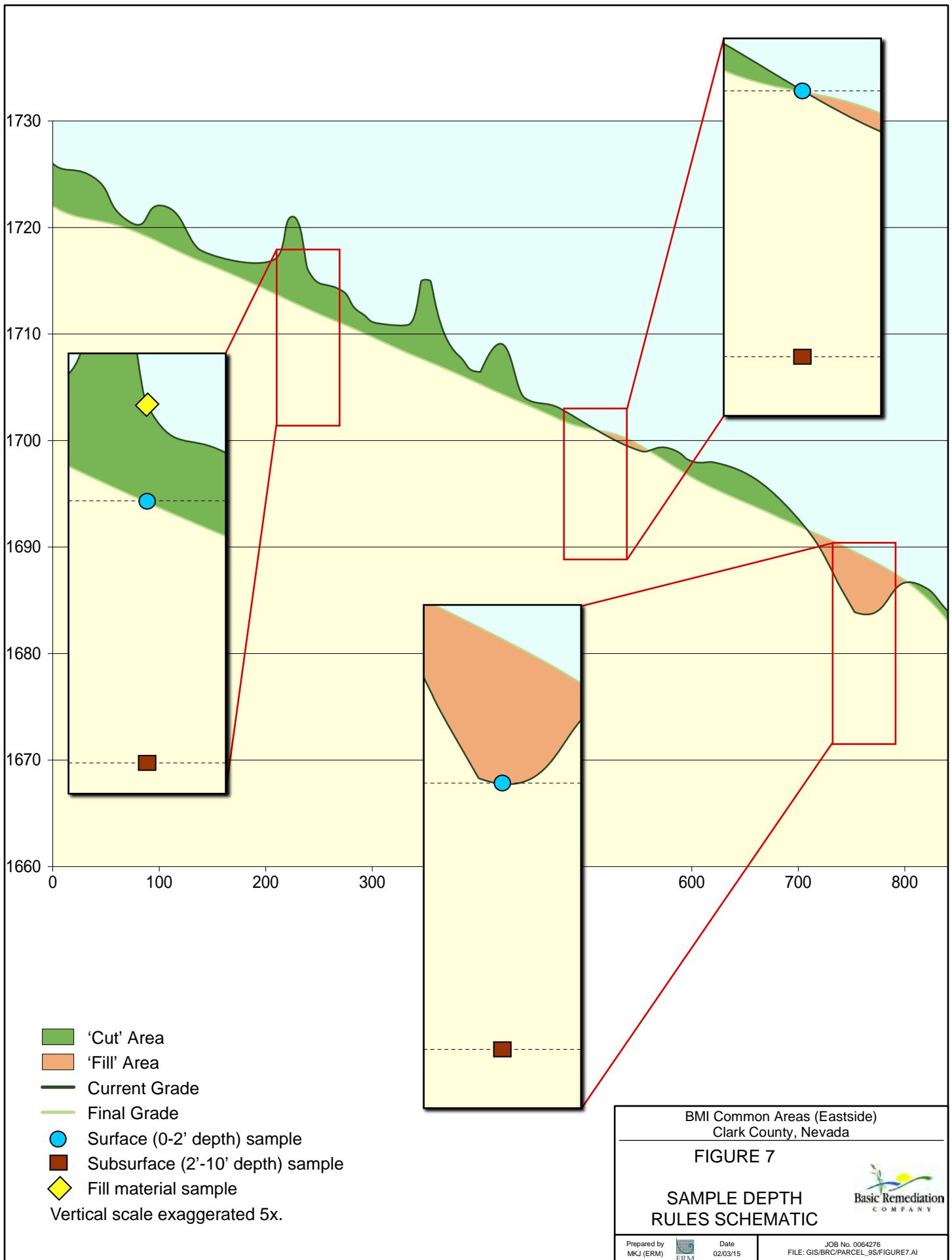


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FILE: GIS/BC/PARCEL_9S/FIGURE6.MXD





- | | |
|---|---|
| Parcel 9 South Sub-Area | First Round Remediation |
| Site AOC3 Boundary | Second Round Remediation |
| Eastside Soil Sub-Areas | |
| NFA Areas | |

BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE 8

PARCEL 9 SOUTH SUB-AREA SOIL REMEDATION AREAS

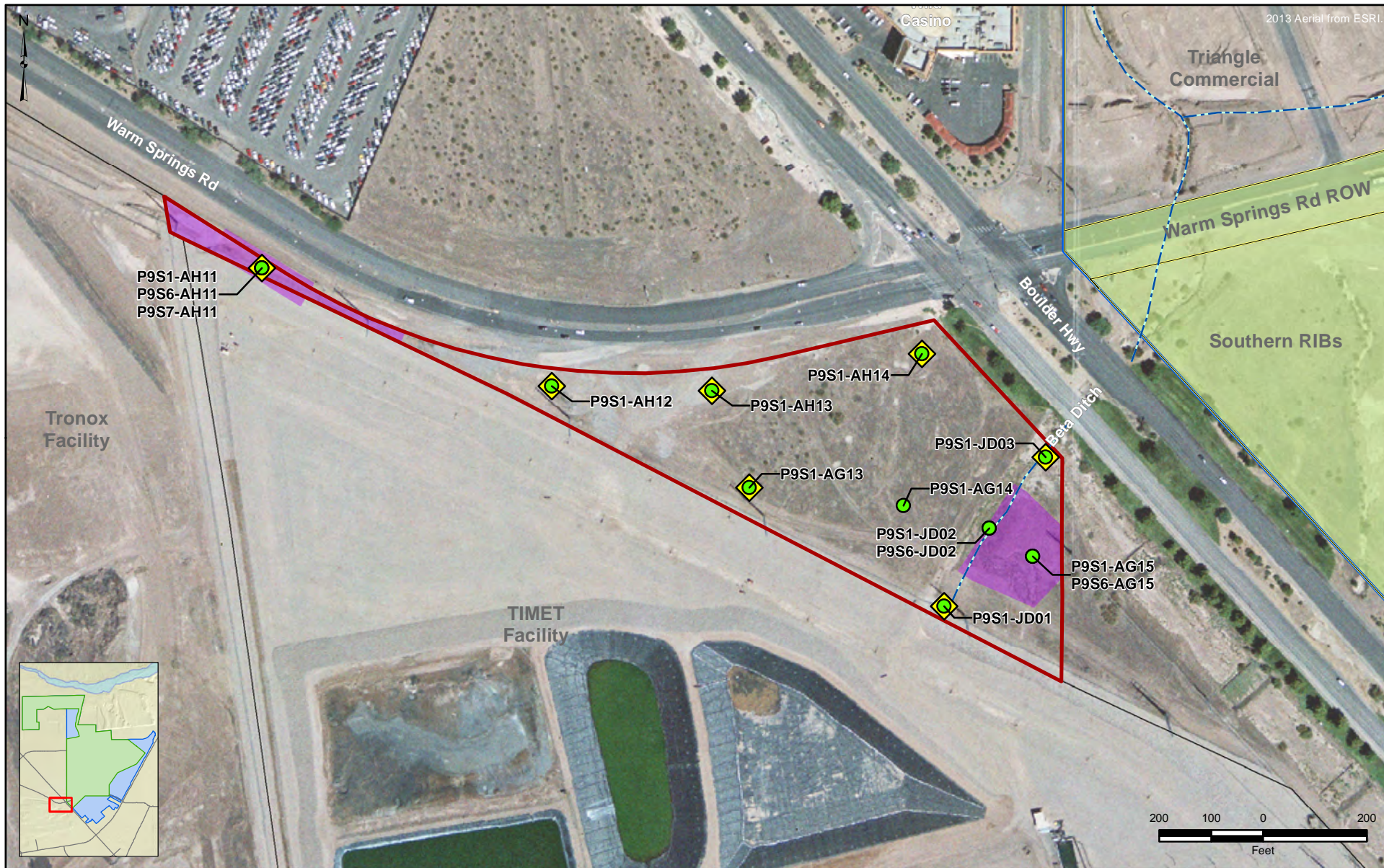


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FILE: GIS/BRC/PARCEL_9S/FIGURE8.MXD



- | | |
|--|--|
| Parcel 9 South Sub-Area | Remediation Areas |
| Site AOC3 Boundary | ● Soil Sample Location ⁽¹⁾ |
| Eastside Soil Sub-Areas | Surface Flux Sample Location |
| NFA Areas | |

(1) Although soil removal would affect the concentrations of all analytes, confirmatory sampling only analyzed for the constituent suites that triggered the soil removal. Therefore, in the absence of post-scrape data, the pre-scrape data are used for all other analytes in the human health risk assessment (see text).

BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE 9

FINAL SOIL AND SURFACE FLUX SAMPLING LOCATIONS

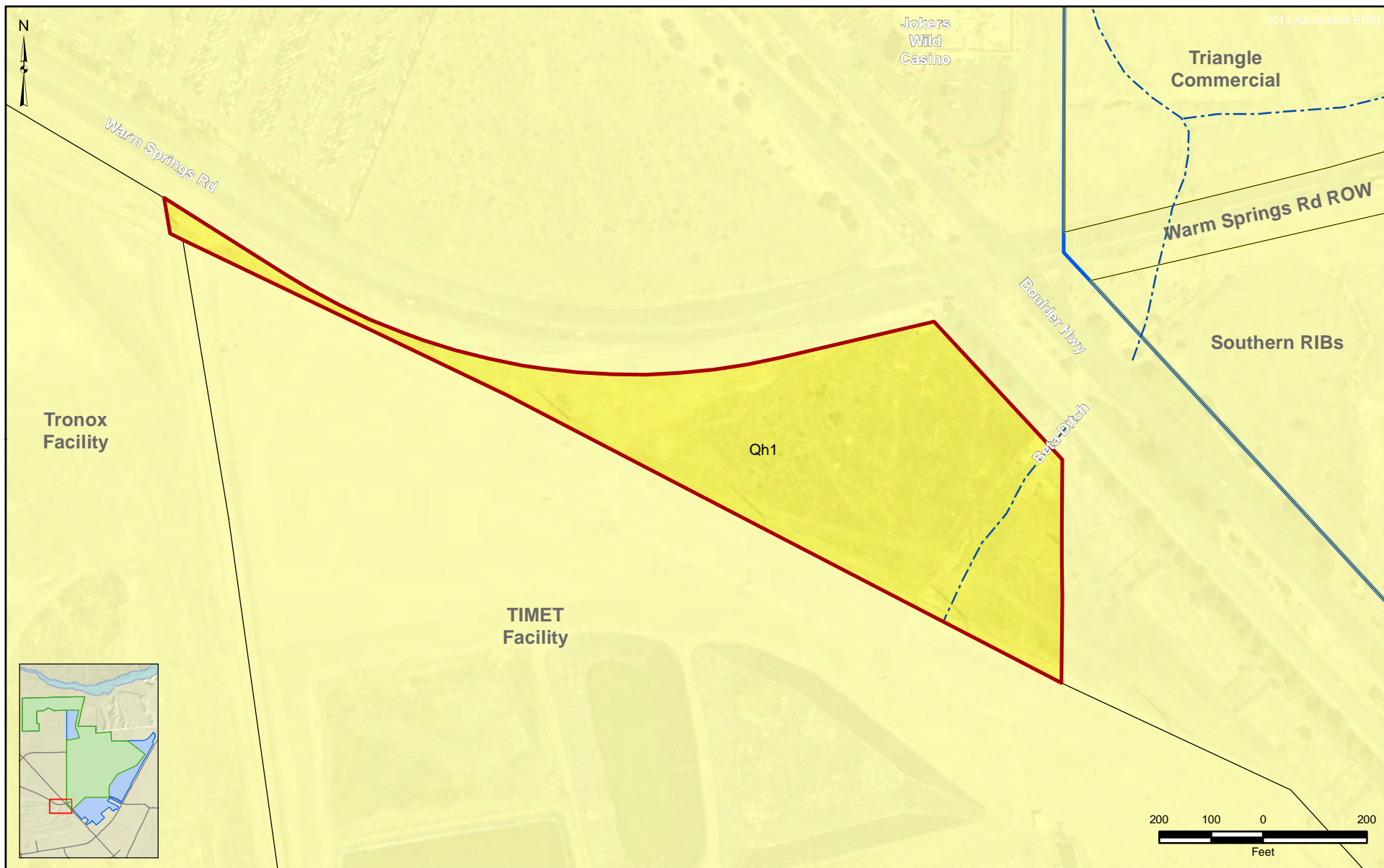


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FILE: GIS/BC/PARCEL_9S/FIGURE9.MXD



- Parcel 9 South Sub-Area
- Site AOC3 Boundary
- Eastside Soil Sub-Areas

Lithology

- Qh1-McCullough

BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE 10

**PARCEL 9 SOUTH
SUB-AREA LITHOLOGIES**



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02/03/15

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TABLES

TABLE 3-1
SAMPLE-SPECIFIC COLLECTION DEPTHS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Sample Location	Sample Type	Grading Plan	Sample Depth 1	Sample Depth 2	Sample Depth 3
<u>Initial Sampling Events</u>					
P9S1-AG13	Random with Flux	-- 0	0 (Surface)	10 (Subsurface)	--
P9S1-AG14	Random	-- 0	0 (Surface)	10 (Subsurface)	--
P9S1-AG15	Random	-- 0	0 (Surface)	10 (Subsurface)	--
P9S1-AH11	Random with Flux	-- 0	0 (Surface)	10 (Subsurface)	--
P9S1-AH12	Random with Flux	-- 0	0 (Surface)	10 (Subsurface)	--
P9S1-AH13	Random with Flux	-- 0	0 (Surface)	10 (Subsurface)	--
P9S1-AH14	Random with Flux	-- 0	0 (Surface)	10 (Subsurface)	--
P9S1-JD01	Ditch with Flux	-- 0	0 (Surface)	10 (Subsurface)	--
P9S1-JD02	Ditch	-- 0	0 (Surface)	10 (Subsurface)	--
P9S1-JD03	Ditch with Flux	-- 0	0 (Surface)	10 (Subsurface)	--
<u>Confirmation/Supplemental Sampling Events</u>					
P9S6-AG15	Confirmation	--	0 (Surface)	--	--
P9S6-AH11	Confirmation	--	0 (Surface)	--	--
P9S6-JD02	Confirmation	--	0 (Surface)	--	--
P9S7-AH11	Confirmation	--	0 (Surface)	--	--

Note: Because sample collection was over a two to three foot depth interval, sample locations with an anticipated cut depth less than three feet only sampled at the surface and one post-grade subsurface depth. Depths are in feet bgs (current grade).

TABLE 3-2
SITE-RELATED CHEMICALS AND INITIAL SAMPLE ANALYSES AND DEPTHS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 11)

Parameter of Interest	Preparation Method	Analytical Method	Compound List	CAS Number	Sample Depth (from Table 3-1)		
					Depth 1	Depth 2/3	Deep
Ions	EPA 300.0	EPA 300.0	Bromide	24959-67-9	✓	✓	(d)
			Chlorate	14866-68-3	✓	✓	(d)
			Chloride	16887-00-6	✓	✓	(d)
			Fluoride	16984-48-8	✓	✓	(d)
			Nitrate (as N)	14797-55-8	✓	✓	(d)
			Nitrite (as N)	14797-65-0	✓	✓	(d)
			Orthophosphate	14265-44-2	✓	✓	(d)
			Sulfate	14808-79-8	✓	✓	(d)
	EPA 314.0	EPA 314.0	Perchlorate	14797-73-0	✓	✓	(d)
Chlorinated Compounds	EPA 551.1	EPA 551.1	Chloral	75-87-6	(e)	(e)	(d)
			Dichloroacetaldehyde	79-02-7	(e)	(e)	(d)
Polychlorinated Dibenzodioxins/ Dibenzofurans	EPA 8290	EPA 8290	1,2,3,4,6,7,8,9-Octachlorodibenzofuran	39001-02-0	✓	(b)	(b)
			1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	3268-87-9	✓	(b)	(b)
			1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	✓	(b)	(b)
			1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	✓	(b)	(b)
			1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	✓	(b)	(b)
			1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	✓	(b)	(b)
			1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	✓	(b)	(b)
			1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	✓	(b)	(b)
			1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	✓	(b)	(b)
			1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	✓	(b)	(b)
			1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	✓	(b)	(b)
			1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	✓	(b)	(b)
			1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	✓	(b)	(b)
			2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	✓	(b)	(b)
			2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	✓	(b)	(b)
			2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	✓	(b)	(b)
			2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	✓	(b)	(b)
Asbestos	Elutator	Elutriator/TEM	Asbestos	1332-21-4	✓	(c)	(c)
General Chemistry Parameters	EPA 350.1	EPA 350.2	Ammonia (as N)	7664-41-7	✓	✓	(d)
	EPA 9012A	EPA 9010/9014	Cyanide (Total)	57-12-5	✓	✓	(d)
	NA	EPA 9045C	pH in soil	pH	✓	✓	✓
	EPA 376.1/376.2	EPA 376.1/376.2	Sulfide	18496-25-8	✓	✓	(d)
	Mod. EPA 415.1	Mod. EPA 415.1	Total inorganic carbon	7440-44-0	✓	✓	(d)
	EPA 351.2	EPA 351.2	Total Kjeldahl nitrogen (TKN)	TKN	✓	✓	(d)
	EPA 9060	EPA 415.1	Total organic carbon (TOC)	7440-44-0	✓	✓	✓

TABLE 3-2
SITE-RELATED CHEMICALS AND INITIAL SAMPLE ANALYSES AND DEPTHS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 11)

Parameter of Interest	Preparation Method	Analytical Method	Compound List	CAS Number	Sample Depth (from Table 3-1)		
					Depth 1	Depth 2/3	Deep
Metals	EPA 3050M	EPA 6020/6010B	Aluminum	7429-90-5	✓	✓	(d)
			Antimony	7440-36-0	✓	✓	(d)
			Arsenic	7440-38-2	✓	✓	(d)
			Barium	7440-39-3	✓	✓	(d)
			Beryllium	7440-41-7	✓	✓	(d)
			Boron	7440-42-8	✓	✓	(d)
			Cadmium	7440-43-9	✓	✓	(d)
			Calcium	7440-70-2	✓	✓	(d)
			Chromium	7440-47-3	✓	✓	(d)
			Cobalt	7440-48-4	✓	✓	(d)
			Copper	7440-50-8	✓	✓	(d)
			Iron	7439-89-6	✓	✓	(d)
			Lead	7439-92-1	✓	✓	(d)
			Lithium	1313-13-9	✓	✓	(d)
			Magnesium	7439-95-4	✓	✓	(d)
			Manganese	7439-96-5	✓	✓	(d)
			Molybdenum	7439-98-7	✓	✓	(d)
			Nickel	7440-02-0	✓	✓	(d)
			Niobium	7440-03-1	(e)	(e)	(d)
			Palladium	7440-05-3	(e)	(e)	(d)
			Phosphorus	7723-14-0	(e)	(e)	(d)
			Platinum	7440-06-4	(e)	(e)	(d)
			Potassium	7440-09-7	✓	✓	(d)
			Selenium	7782-49-2	✓	✓	(d)
			Silicon	7440-21-3	(e)	(e)	(d)
			Silver	7440-22-4	✓	✓	(d)
			Sodium	7440-23-5	✓	✓	(d)
			Strontium	7440-24-6	✓	✓	(d)
			Sulfur	7704-34-9	(e)	(e)	(d)
			Thallium	7440-28-0	✓	✓	(d)
			Tin	7440-31-5	✓	✓	(d)
			Titanium	7440-32-6	✓	✓	(d)
			Tungsten	7440-33-7	✓	✓	(d)
			Uranium	7440-61-1	✓	✓	(d)
			Vanadium	7440-62-2	✓	✓	(d)
			Zinc	7440-66-6	✓	✓	(d)

TABLE 3-2
SITE-RELATED CHEMICALS AND INITIAL SAMPLE ANALYSES AND DEPTHS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 3 of 11)

Parameter of Interest	Preparation Method	Analytical Method	Compound List	CAS Number	Sample Depth (from Table 3-1)		
					Depth 1	Depth 2/3	Deep
Metals (continued)	EPA 3050M	EPA 6020/6010B	Zirconium	7440-67-7	(e)	(e)	(d)
	EPA 3060A	EPA 7196A	Chromium (VI)	18540-29-9	✓	✓	(d)
	EPA 7471A	EPA 7470/7471A	Mercury	7439-97-6	✓	✓	(d)
Organophosphorous Pesticides	EPA 8141A	EPA 8141A	Azinphos-ethyl	264-27-19	(a)	(a)	(a)
			Azinphos-methyl	86-50-0	(a)	(a)	(a)
			Carbophenothion	786-19-6	(a)	(a)	(a)
			Chlorpyrifos	2921-88-2	(a)	(a)	(a)
			Coumaphos	56-72-4	(a)	(a)	(a)
			Demeton-O	298-03-3	(a)	(a)	(a)
			Demeton-S	126-75-0	(a)	(a)	(a)
			Diazinon	333-41-5	(a)	(a)	(a)
			Dichlorvos	62-73-7	(a)	(a)	(a)
			Dimethoate	60-51-5	(a)	(a)	(a)
			Disulfoton	298-04-4	(a)	(a)	(a)
			EPN	2104-64-5	(a)	(a)	(a)
			Ethoprop	13194-48-4	(a)	(a)	(a)
			Ethyl parathion	56-38-2	(a)	(a)	(a)
			Famphur	52-85-7	(a)	(a)	(a)
			Fenthion	55-38-9	(a)	(a)	(a)
			Malathion	121-75-5	(a)	(a)	(a)
			Methyl carbophenothion	953-17-3	(a)	(a)	(a)
			Methyl parathion	298-00-0	(a)	(a)	(a)
			Mevinphos	7786-34-7	(a)	(a)	(a)
			Naled	300-76-5	(a)	(a)	(a)
			O,O,O-Triethyl phosphorothioate (TEPP)	297-97-2	(a)	(a)	(a)
			Phorate	298-02-2	(a)	(a)	(a)
			Phosmet	732-11-6	(a)	(a)	(a)
			Ronnel	299-84-3	(a)	(a)	(a)
			Stirophos (Tetrachlorovinphos)	22248-79-9	(a)	(a)	(a)
			Sulfotep	3689-24-5	(a)	(a)	(a)
Chlorinated Herbicides	EPA 8151A	EPA 8151A	2,4,5-T	93-76-5	(a)	(a)	(a)
			2,4,5-TP (Silvex)	93-72-1	(a)	(a)	(a)
			2,4-D	94-75-7	(a)	(a)	(a)
			2,4-DB	94-82-6	(a)	(a)	(a)
			Dalapon	75-99-0	(a)	(a)	(a)
			Dicamba	1918-00-9	(a)	(a)	(a)

TABLE 3-2
SITE-RELATED CHEMICALS AND INITIAL SAMPLE ANALYSES AND DEPTHS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 4 of 11)

Parameter of Interest	Preparation Method	Analytical Method	Compound List	CAS Number	Sample Depth (from Table 3-1)		
					Depth 1	Depth 2/3	Deep
Chlorinated Herbicides (continued)	EPA 8151A	EPA 8151A	Dichloroprop	120-36-5	(a)	(a)	(a)
			Dinoseb	88-85-7	(a)	(a)	(a)
			MCPA	94-74-6	(a)	(a)	(a)
			MCPP	93-65-2	(a)	(a)	(a)
Organic Acids	HPLC	HPLC	4-Chlorobenzene sulfonic acid	98-66-8	(a)	(a)	(a)
			Benzenesulfonic acid	98-11-3	(a)	(a)	(a)
			O,O-Diethylphosphorodithioic acid	298-06-6	(a)	(a)	(a)
			O,O-Dimethylphosphorodithioic acid	756-80-9	(a)	(a)	(a)
Nonhalogenated Organics	EPA 8015B	EPA 8015B	Ethylene glycol	107-21-1	(a)	(a)	(a)
			Ethylene glycol monobutyl ether	111-76-2	(a)	(a)	(a)
			Methanol	67-56-1	(a)	(a)	(a)
			Propylene glycol	57-55-6	(a)	(a)	(a)
Organochlorine Pesticides	EPA 3550B	EPA 8081A	2,4-DDD	53-19-0	✓	✓	(d)
			2,4-DDE	3424-82-6	✓	✓	(d)
			4,4-DDD	72-54-8	✓	✓	(d)
			4,4-DDE	72-55-9	✓	✓	(d)
			4,4-DDT	50-29-3	✓	✓	(d)
			Aldrin	309-00-2	✓	✓	(d)
			alpha-BHC	319-84-6	✓	✓	(d)
			alpha-Chlordane	5103-71-9	✓	✓	(d)
			beta-BHC	319-85-7	✓	✓	(d)
			Chlordane	57-74-9	✓	✓	(d)
			delta-BHC	319-86-8	✓	✓	(d)
			Dieldrin	60-57-1	✓	✓	(d)
			Endosulfan I	959-98-8	✓	✓	(d)
			Endosulfan II	33213-65-9	✓	✓	(d)
			Endosulfan sulfate	1031-07-8	✓	✓	(d)
			Endrin	72-20-8	✓	✓	(d)
			Endrin aldehyde	7421-93-4	✓	✓	(d)
			Endrin ketone	53494-70-5	✓	✓	(d)
			gamma-BHC (Lindane)	58-89-9	✓	✓	(d)
			gamma-Chlordane	5103-74-2	✓	✓	(d)
			Heptachlor	76-44-8	✓	✓	(d)
			Heptachlor epoxide	1024-57-3	✓	✓	(d)
			Methoxychlor	72-43-5	✓	✓	(d)
			Toxaphene	8001-35-2	✓	✓	(d)

TABLE 3-2
SITE-RELATED CHEMICALS AND INITIAL SAMPLE ANALYSES AND DEPTHS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 5 of 11)

Parameter of Interest	Preparation Method	Analytical Method	Compound List	CAS Number	Sample Depth (from Table 3-1)		
					Depth 1	Depth 2/3	Deep
Polychlorinated Biphenyls	EPA 3510C	EPA 8082	Aroclor 1016	12674-11-2	✓	(b)	(b)
			Aroclor 1221	11104-28-2	✓	(b)	(b)
			Aroclor 1232	11141-16-5	✓	(b)	(b)
			Aroclor 1242	53469-21-9	✓	(b)	(b)
			Aroclor 1248	12672-29-6	✓	(b)	(b)
			Aroclor 1254	11097-69-1	✓	(b)	(b)
			Aroclor 1260	11096-82-5	✓	(b)	(b)
		EPA 1668	PCB-77	32598-13-3	✓	(b)	(b)
			PCB-81	70362-50-4	✓	(b)	(b)
			PCB-105	32598-14-4	✓	(b)	(b)
			PCB-114	74472-37-0	✓	(b)	(b)
			PCB-118	31508-00-6	✓	(b)	(b)
			PCB-123	65510-44-3	✓	(b)	(b)
			PCB-126	57465-28-8	✓	(b)	(b)
			PCB-156	38380-08-4	✓	(b)	(b)
			PCB-157	69782-90-7	✓	(b)	(b)
			PCB-167	52663-72-6	✓	(b)	(b)
			PCB-169	32774-16-6	✓	(b)	(b)
			PCB-189	39635-31-9	✓	(b)	(b)
			PCB-209	2051-24-3	✓	(b)	(b)
Polynuclear Aromatic Hydrocarbons	EPA 3550	EPA 8310 or EPA 8270SIM	Acenaphthene	83-32-9	✓	✓	(d)
			Acenaphthylene	208-96-8	✓	✓	(d)
			Anthracene	120-12-7	✓	✓	(d)
			Benzo(a)anthracene	56-55-3	✓	✓	(d)
			Benzo(a)pyrene	50-32-8	✓	✓	(d)
			Benzo(b)fluoranthene	205-99-2	✓	✓	(d)
			Benzo(g,h,i)perylene	191-24-2	✓	✓	(d)
			Benzo(k)fluoranthene	207-08-9	✓	✓	(d)
			Chrysene	218-01-9	✓	✓	(d)
			Dibenzo(a,h)anthracene	53-70-3	✓	✓	(d)
			Indeno(1,2,3-cd)pyrene	193-39-5	✓	✓	(d)
			Phenanthrene	85-01-8	✓	✓	(d)
			Pyrene	129-00-0	✓	✓	(d)
Radionuclides	HASL 3003	EPA 903.0 / 903.1	Radium-226	13982-63-3	✓	✓	(d)
		EPA 904.0	Radium-228	15262-20-1	✓	✓	(d)

TABLE 3-2
SITE-RELATED CHEMICALS AND INITIAL SAMPLE ANALYSES AND DEPTHS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 6 of 11)

Parameter of Interest	Preparation Method	Analytical Method	Compound List	CAS Number	Sample Depth (from Table 3-1)		
					Depth 1	Depth 2/3	Deep
Radionuclides (continued)	HASL 300 (Total Dissolution)	HASL A-01-R	Thorium-228	7440-29-1	✓	✓	(d)
			Thorium-230	14274-82-9	✓	✓	(d)
			Thorium-232	14269-63-7	✓	✓	(d)
	HASL 300 (Total Dissolution)		Uranium-233/234	13966-29-5	✓	✓	(d)
			Uranium-235/236	15117-96-1	✓	✓	(d)
			Uranium-238	7440-61-1	✓	✓	(d)
Aldehydes	EPA 8315A	EPA 8315A	Acetaldehyde	75-07-0	✓	✓	(d)
			Chloroacetaldehyde	107-20-0	(e)	(e)	(d)
			Dichloroacetaldehyde	79-02-7	(e)	(e)	(d)
			Formaldehyde	50-00-0	✓	✓	(d)
			Trichloroacetaldehyde	75-87-6	(e)	(e)	(d)
Semivolatile Organic Compounds	EPA 3550B	EPA 8270C	1,2,4,5-Tetrachlorobenzene	95-94-3	✓	✓	(d)
			1,2-Diphenylhydrazine	122-66-7	✓	✓	(d)
			1,4-Dioxane	123-91-1	✓	✓	(d)
			2,2'/4,4'-Dichlorobenzil	3457-46-3	✓	✓	(d)
			2,4,5-Trichlorophenol	95-95-4	✓	✓	(d)
			2,4,6-Trichlorophenol	88-06-2	✓	✓	(d)
			2,4-Dichlorophenol	120-83-2	✓	✓	(d)
			2,4-Dimethylphenol	105-67-9	✓	✓	(d)
			2,4-Dinitrophenol	51-28-5	✓	✓	(d)
			2,4-Dinitrotoluene	121-14-2	✓	✓	(d)
			2,6-Dinitrotoluene	606-20-2	✓	✓	(d)
			2-Chloronaphthalene	91-58-7	✓	✓	(d)
			2-Chlorophenol	95-57-8	✓	✓	(d)
			2-Methylnaphthalene	91-57-6	✓	✓	(d)
			2-Nitroaniline	88-74-4	✓	✓	(d)
			2-Nitrophenol	88-75-5	✓	✓	(d)
			3,3-Dichlorobenzidine	91-94-1	✓	✓	(d)
			3-Nitroaniline	99-09-2	✓	✓	(d)
			4,4'-Dichlorobenzil	3457-46-3	✓	✓	(d)
			4-Bromophenyl phenyl ether	101-55-3	✓	✓	(d)
			4-Chloro-3-methylphenol	59-50-7	✓	✓	(d)
			4-Chlorophenyl phenyl ether	7005-72-3	✓	✓	(d)
			4-Chlorothiobanisole	123-09-1	✓	✓	(d)
			4-Chlorothiophenol	106-54-7	✓	✓	(d)

TABLE 3-2
SITE-RELATED CHEMICALS AND INITIAL SAMPLE ANALYSES AND DEPTHS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 7 of 11)

Parameter of Interest	Preparation Method	Analytical Method	Compound List	CAS Number	Sample Depth (from Table 3-1)		
					Depth 1	Depth 2/3	Deep
Semivolatile Organic Compounds (continued)	EPA 3550B	EPA 8270C	4-Nitroaniline	100-01-6	✓	✓	(d)
			4-Nitrophenol	100-02-7	✓	✓	(d)
			Acetophenone	98-86-2	✓	✓	(d)
			Aniline	62-53-3	✓	✓	(d)
			Azobenzene	103-33-3	✓	✓	(d)
			Benzoic acid	65-85-0	✓	✓	(d)
			Benzyl alcohol	100-51-6	✓	✓	(d)
			bis(2-Chloroethoxy)methane	111-91-1	✓	✓	(d)
			bis(2-Chloroethyl) ether	111-44-4	✓	✓	(d)
			bis(2-Chloroisopropyl) ether	108-60-1	✓	✓	(d)
			bis(2-Ethylhexyl) phthalate	117-81-7	✓	✓	(d)
			bis(Chloromethyl) ether	542-88-1	✓	✓	(d)
			bis(p-Chlorophenyl) sulfone	80-07-9	✓	✓	(d)
			bis(p-Chlorophenyl)disulfide	1142-19-4	✓	✓	(d)
			Butylbenzyl phthalate	85-68-7	✓	✓	(d)
			Carbazole	86-74-8	✓	✓	(d)
			Dibenzofuran	132-64-9	✓	✓	(d)
			Dichloromethyl ether	542-88-1	✓	✓	(d)
			Diethyl phthalate	84-66-2	✓	✓	(d)
			Dimethyl phthalate	131-11-3	✓	✓	(d)
			Di-n-butyl phthalate	84-74-2	✓	✓	(d)
			Di-n-octyl phthalate	117-84-0	✓	✓	(d)
			Diphenyl disulfide	882-33-7	✓	✓	(d)
			Diphenyl sulfide	139-66-2	✓	✓	(d)
			Diphenyl sulfone	127-63-9	✓	✓	(d)
			Fluoranthene	206-44-0	✓	✓	(d)
			Fluorene	86-73-7	✓	✓	(d)
			Hexachlorobenzene	118-74-1	✓	✓	(d)
			Hexachlorobutadiene	87-68-3	✓	✓	(d)
			Hexachlorocyclopentadiene	77-47-4	✓	✓	(d)
			Hexachloroethane	67-72-1	✓	✓	(d)
			Hydroxymethyl phthalimide	118-29-6	✓	✓	(d)
			Isophorone	78-59-1	✓	✓	(d)
			m,p-Cresols	106-44-5	✓	✓	(d)
			Naphthalene	91-20-3	✓	✓	(d)
			Nitrobenzene	98-95-3	✓	✓	(d)

TABLE 3-2
SITE-RELATED CHEMICALS AND INITIAL SAMPLE ANALYSES AND DEPTHS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 8 of 11)

Parameter of Interest	Preparation Method	Analytical Method	Compound List	CAS Number	Sample Depth (from Table 3-1)		
					Depth 1	Depth 2/3	Deep
Semivolatile Organic Compounds (continued)	EPA 3550B	EPA 8270C	N-nitrosodi-n-propylamine	621-64-7	✓	✓	(d)
			N-nitrosodiphenylamine	86-30-6	✓	✓	(d)
			o-Cresol	95-48-7	✓	✓	(d)
			Octachlorostyrene	29082-74-4	✓	✓	(d)
			p-Chloroaniline (4-Chloroaniline)	106-47-8	✓	✓	(d)
			p-Chlorobenzenethiol	106-54-7	✓	✓	(d)
			Pentachlorobenzene	608-93-5	✓	✓	(d)
			Pentachlorophenol	87-86-5	✓	✓	(d)
			Phenol	108-95-2	✓	✓	(d)
			Phthalic acid	88-99-3	✓	✓	(d)
			Pyridine	110-86-1	✓	✓	(d)
			Thiophenol	108-98-5	✓	✓	(d)
			Tentatively Identified Compounds (TICs)		✓	✓	(d)
Volatile Organic Compounds	EPA 5030B/ EPA 5035	EPA 8260B	1,1,1,2-Tetrachloroethane	630-20-6	✓	✓	(d)
			1,1,1-Trichloroethane	71-55-6	✓	✓	(d)
			1,1,2,2-Tetrachloroethane	79-34-5	✓	✓	(d)
			1,1,2-Trichloroethane	79-00-5	✓	✓	(d)
			1,1-Dichloroethane	75-34-3	✓	✓	(d)
			1,1-Dichloroethene	75-35-4	✓	✓	(d)
			1,1-Dichloropropene	563-58-6	✓	✓	(d)
			1,2,3-Trichlorobenzene	87-61-6	✓	✓	(d)
			1,2,3-Trichloropropane	96-18-4	✓	✓	(d)
			1,2,4-Trichlorobenzene	120-82-1	✓	✓	(d)
			1,2,4-Trimethylbenzene	95-63-6	✓	✓	(d)
			1,2-Dichlorobenzene	95-50-1	✓	✓	(d)
			1,2-Dichloroethane	107-06-2	✓	✓	(d)
			1,2-Dichloroethene	540-59-0	✓	✓	(d)
			1,2-Dichloropropane	78-87-5	✓	✓	(d)
			1,3,5-Trichlorobenzene	108-70-3	✓	✓	(d)
			1,3,5-Trimethylbenzene	108-67-8	✓	✓	(d)
			1,3-Dichlorobenzene	541-73-1	✓	✓	(d)
			1,3-Dichloropropene	542-75-6	✓	✓	(d)
			1,3-Dichloropropane	142-28-9	✓	✓	(d)
			1,4-Dichlorobenzene	106-46-7	✓	✓	(d)
			2,2-Dichloropropane	594-20-7	✓	✓	(d)
			2,2-Dimethylpentane	590-35-2	✓	✓	(d)

TABLE 3-2
SITE-RELATED CHEMICALS AND INITIAL SAMPLE ANALYSES AND DEPTHS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 9 of 11)

Parameter of Interest	Preparation Method	Analytical Method	Compound List	CAS Number	Sample Depth (from Table 3-1)		
					Depth 1	Depth 2/3	Deep
Volatile Organic Compounds (continued)	EPA 5030B/ EPA 5035	EPA 8260B	2,2,3-Trimethylbutane	464-06-2	✓	✓	(d)
			2,3-Dimethylpentane	565-59-3	✓	✓	(d)
			2,4-Dimethylpentane	108-08-7	✓	✓	(d)
			2-Chlorotoluene	95-49-8	✓	✓	(d)
			2-Hexanone	591-78-6	✓	✓	(d)
			2-Methylhexane	591-76-4	✓	✓	(d)
			2-Nitropropane	79-46-9	✓	✓	(d)
			3,3-Dimethylpentane	562-49-2	✓	✓	(d)
			3-Ethylpentane	617-78-7	✓	✓	(d)
			3-Methylhexane	589-34-4	✓	✓	(d)
			4-Chlorobenzene	108-90-7	✓	✓	(d)
			4-Chlorotoluene	106-43-4	✓	✓	(d)
			4-Methyl-2-pentanone (MIBK)	108-10-1	✓	✓	(d)
			Acetone	67-64-1	✓	✓	(d)
			Acetonitrile	75-05-8	✓	✓	(d)
			Benzene	71-43-2	✓	✓	(d)
			Bromobenzene	108-86-1	✓	✓	(d)
			Bromodichloromethane	75-27-4	✓	✓	(d)
			Bromoform	75-25-2	✓	✓	(d)
			Bromomethane	74-83-9	✓	✓	(d)
			Carbon disulfide	75-15-0	✓	✓	(d)
			Carbon tetrachloride	56-23-5	✓	✓	(d)
			Chlorobenzene	108-90-7	✓	✓	(d)
			Chlorobromomethane	74-97-5	✓	✓	(d)
			Chlorodibromomethane	124-48-1	✓	✓	(d)
			Chloroethane	75-00-3	✓	✓	(d)
			Chloroform	67-66-3	✓	✓	(d)
			Chloromethane	74-87-3	✓	✓	(d)
			cis-1,2-Dichloroethene	156-59-2	✓	✓	(d)
			cis-1,3-Dichloropropene	10061-01-5	✓	✓	(d)
			Cymene (Isopropyltoluene)	99-87-6	✓	✓	(d)
			Dibromochloroethane	73506-94-2	✓	✓	(d)
			Dibromochloromethane	124-48-1	✓	✓	(d)
			Dibromochloropropane	96-12-8	✓	✓	(d)
			Dibromomethane	74-95-3	✓	✓	(d)
			Dichloromethane (Methylene chloride)	75-09-2	✓	✓	(d)

TABLE 3-2
SITE-RELATED CHEMICALS AND INITIAL SAMPLE ANALYSES AND DEPTHS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 10 of 11)

Parameter of Interest	Preparation Method	Analytical Method	Compound List	CAS Number	Sample Depth (from Table 3-1)		
					Depth 1	Depth 2/3	Deep
Volatile Organic Compounds (continued)	EPA 5030B/ EPA 5035	EPA 8260B	Dimethyldisulfide	624-92-0	✓	✓	(d)
			Ethanol	64-17-5	✓	✓	(d)
			Ethylbenzene	100-41-4	✓	✓	(d)
			Freon-11	75-69-4	✓	✓	(d)
			Freon-113	76-13-1	✓	✓	(d)
			Freon-12	75-71-8	✓	✓	(d)
			Heptane	142-82-5	✓	✓	(d)
			Isoheptane	31394-54-4	✓	✓	(d)
			Isopropylbenzene	98-82-8	✓	✓	(d)
			m,p-Xylene	mp-XYL	✓	✓	(d)
			Methyl ethyl ketone (2-Butanone)	78-93-3	✓	✓	(d)
			Methyl iodide	74-88-4	✓	✓	(d)
			MTBE (Methyl tert-butyl ether)	1634-04-4	✓	✓	(d)
			n-Butylbenzene	104-51-8	✓	✓	(d)
			n-Propylbenzene	103-65-1	✓	✓	(d)
			Nonanal	124-19-6	✓	✓	(d)
			o-Xylene	95-47-6	✓	✓	(d)
			sec-Butylbenzene	135-98-8	✓	✓	(d)
			Styrene	100-42-5	✓	✓	(d)
			tert-Butylbenzene	98-06-6	✓	✓	(d)
			Tetrachloroethene	127-18-4	✓	✓	(d)
			Toluene	108-88-3	✓	✓	(d)
			trans-1,2-Dichloroethene	156-60-5	✓	✓	(d)
			trans-1,3-Dichloropropene	10061-02-6	✓	✓	(d)
			Trichloroethene	79-01-6	✓	✓	(d)
			Vinyl acetate	108-05-4	✓	✓	(d)
			Vinyl chloride	75-01-4	✓	✓	(d)
			Xylenes (total)	1330-20-7	✓	✓	(d)
			Tentatively Identified Compounds (TICs)		✓	✓	(d)
Flashpoint	NA	EPA 1010	Flammables	NA	(a)	(a)	(a)
Total Petroleum Hydrocarbons	EPA 3550 EPA 3550 EPA 1664A	EPA 8015	Diesel	64742-46-7	(a)	(a)	(a)
			Gasoline	8006-61-9	(a)	(a)	(a)
			Grease	68153-81-1	(a)	(a)	(a)
			Mineral Spirits	NA	(a)	(a)	(a)
White Phosphorus	EPA 7580M	EPA 7580M	White phosphorus	12185-10-3	(a)	(a)	(a)

TABLE 3-2
SITE-RELATED CHEMICALS AND INITIAL SAMPLE ANALYSES AND DEPTHS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 11 of 11)

Parameter of Interest	Preparation Method	Analytical Method	Compound List	CAS Number	Sample Depth (from Table 3-1)		
					Depth 1	Depth 2/3	Deep
Methyl Mercury	EPA 1630	EPA 1630	Methyl mercury	22967-92-6	(a)	(a)	(a)
Soil Physical Parameters	NA	ASTM D2937/ MOSA1Ch .13	Dry bulk density	NA	(d)	✓	✓
		ASTM D2435/ MOSA1Ch .18	Total porosity	NA	(d)	✓	✓
		ASTM D5084	Soil permeability/saturated hydraulic cond.	NA	(d)	✓	✓
		ASTM D854	Specific gravity of soils	NA	(d)	✓	✓
		SW846 Method 9081	Cation exchange capacity	NA	(d)	✓	✓
		ASTM D2216/D4643/D2974	Volumetric water content	NA	(d)	✓	✓
		ASTM D422	Grain size analysis by sieve and hydrometer	NA	(d)	✓	✓
		EPA 415.1/ASTM 2947	Fractional organic carbon content	NA	(d)	✓	✓

Notes:

Laboratory limits are subject to matrix interferences and may not always be achieved in all samples.

The laboratory was instructed to report the top 25 Tentatively Identified Compounds (TICs) under method 8260B and 8270C.

NA = Not applicable.

a - Removed based on rationale provided in the text.

b - Dioxins/furans and PCBs analyzed for in fill and surface soil samples only.

c - Asbestos analyzed for in current grade surface soil samples only.

d - Soil physical parameters collected from at-depth samples only; from three sample locations (see Table 3-1).

e - Removed based on Revisions to the Analyte List Technical Memorandum approved by NDEP on 10/16/2008.

TABLE 3-3
FINAL CONFIRMATION SOIL SAMPLE LOCATIONS AND ANALYSES
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 1 of 1)

Sample Location	Sample Depth	Sample Type	Scraped?	Asbestos	Aldehydes	Dioxins	Gen Chem	Metals	OCPs	PAHs	PCBs	Rads	SVOCs	VOCs
P9S1-AG13	0	Initial		X	X	X	X	X	X	X	X	X	X	X
	10	Initial			X		X	X	X	X		X	X	X
P9S1-AG14	0	Initial		X	X	X	X	X	X	X	X	X	X	X
	10	Initial			X		X	X	X	X		X	X	X
P9S1-AG15	0	Initial	YES	X	X	X	X	X	X	X	X	X	X	X
P9S6-AG15	0	Confirmation						X						
P9S1-AG15	10	Initial			X		X	X	X	X		X	X	X
P9S1-AH11	0	Initial	YES	X	X	X	X	X	X	X	X	X	X	X
P9S6-AH11	0	Confirmation	YES	X		X					X			
P9S7-AH11	0	Confirmation				X					X			
P9S1-AH11	10	Initial			X		X	X	X	X		X	X	X
P9S1-AH12	0	Initial		X	X	X	X	X	X	X	X	X	X	X
	10	Initial			X		X	X	X	X		X	X	X
P9S1-AH13	0	Initial		X	X	X	X	X	X	X	X	X	X	X
	10	Initial			X		X	X	X	X		X	X	X
P9S1-AH14	0	Initial		X	X	X	X	X	X	X	X	X	X	X
	10	Initial			X		X	X	X	X		X	X	X
P9S1-JD01	0	Initial		X	X	X	X	X	X	X	X	X	X	X
	10	Initial			X		X	X	X	X		X	X	X
P9S1-JD02	0	Initial	YES	X	X	X	X	X	X	X	X	X	X	X
P9S6-JD02	0	Confirmation				X					X			
P9S1-JD02	10	Initial			X		X	X	X	X		X	X	X
P9S1-JD03	0	Initial		X	X	X	X	X	X	X	X	X	X	X
	10	Initial			X		X	X	X	X		X	X	X

= Location removed. As noted in the text, post-scrape analyses associated with follow-up rounds of remediation focused on the analytes triggering that additional remediation, and did not include the full suite analyses of the original analytical program. Therefore, analytical results from the original SAP dataset were retained for all analytes except those that were re-run after additional scraping.

TABLE 3-4
FINAL HUMAN HEALTH RISK ASSESSMENT SOIL DATASET RESULTS SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 6)

Parameter of Interest	Compound List	Units	Total Count	Detect Freq.	Censored (Non-Detect) Data							Detected Data ⁽¹⁾							Worker Soil BCL	Count of Detects > BCL	LBCL (DAF 1)	Count of Detects > DAF 1	LBCL (DAF 20)	Count of Detects > DAF 20	Max. Bkgnd ⁽²⁾	Count of Detects > Bkgnd
					Count	Min	Q1	Median	Mean	Q3	Max	Count	Min	Q1	Median	Mean	Q3	Max								
Asbestos ⁽³⁾	Amphibole	Structures	12	0%	12	--	--	--	--	--	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Chrysotile	Structures	12	8.3%	11	--	--	--	--	--	--	1	--	--	--	--	--	3	--	--	--	--	--	--	--	--
Aldehydes	Acetaldehyde	mg/kg	22	100%	0	--	--	--	--	--	--	22	0.512	1	1.8	2.5	2.9	12.3	69.9	0	--	--	--	--	--	--
	Formaldehyde	mg/kg	22	95.5%	1	0.22	--	0.22	0.22	--	0.22	21	0.26	0.34	0.42	0.53	0.64	1.42	67000	0	--	--	--	--	--	--
Dioxins/Furans	1,2,3,4,6,7,8-Heptachlorodibenzofuran ⁽⁴⁾	pg/g	11	63.6%	4	0.47	0.53	0.85	1	1.7	1.9	7	24	48	70	250	150	1300	--	--	--	--	--	--	--	--
	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin ⁽⁴⁾	pg/g	11	63.6%	4	0.18	0.19	0.26	0.27	0.38	0.4	7	5.3	5.5	53	57	120	150	--	--	--	--	--	--	--	--
	1,2,3,4,7,8,9-Heptachlorodibenzofuran ⁽⁴⁾	pg/g	11	63.6%	4	0.27	0.28	0.35	0.43	0.67	0.76	7	8.2	16	33	110	62	590	--	--	--	--	--	--	--	--
	1,2,3,4,7,8-Hexachlorodibenzofuran ⁽⁴⁾	pg/g	11	63.6%	4	0.28	0.31	0.42	0.66	1.2	1.5	7	8.6	21	34	140	78	780	--	--	--	--	--	--	--	--
	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin ⁽⁴⁾	pg/g	11	27.3%	8	0.063	0.088	0.49	0.61	1.1	1.5	3	0.32	0.32	3.2	9.2	24	24	--	--	--	--	--	--	--	--
	1,2,3,6,7,8-Hexachlorodibenzofuran ⁽⁴⁾	pg/g	11	63.6%	4	0.19	0.19	0.21	0.36	0.69	0.84	7	5.5	11	21	82	34	460	--	--	--	--	--	--	--	--
	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin ⁽⁴⁾	pg/g	11	45.5%	6	0.07	0.075	0.09	0.7	1.9	2.1	5	0.68	2	3.8	13	29	49	--	--	--	--	--	--	--	--
	1,2,3,7,8,9-Hexachlorodibenzofuran ⁽⁴⁾	pg/g	11	54.5%	5	0.083	0.086	0.11	0.38	0.82	1.3	6	0.68	2.3	3	14	21	71	--	--	--	--	--	--	--	--
	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin ⁽⁴⁾	pg/g	11	27.3%	8	0.053	0.079	0.65	0.95	2	2.1	3	0.54	0.54	5.8	17	46	46	--	--	--	--	--	--	--	--
	1,2,3,7,8-Pentachlorodibenzofuran ⁽⁴⁾	pg/g	11	63.6%	4	0.13	0.14	0.16	0.26	0.48	0.58	7	4.2	10	16	75	31	430	--	--	--	--	--	--	--	--
	1,2,3,7,8-Pentachlorodibenzo-p-dioxin ⁽⁴⁾	pg/g	11	18.2%	9	0.062	0.076	0.38	0.7	1.3	1.9	2	3.1	--	18	18	--	33	--	--	--	--	--	--	--	--
	2,3,4,6,7,8-Hexachlorodibenzofuran ⁽⁴⁾	pg/g	11	54.5%	5	0.076	0.087	0.16	0.58	1.3	2.4	6	1.3	3.6	4.5	22	34	110	--	--	--	--	--	--	--	--
	2,3,4,7,8-Pentachlorodibenzofuran ⁽⁴⁾	pg/g	11	63.6%	4	0.078	0.083	0.1	0.12	0.16	0.18	7	2.2	6.5	8.6	42	20	240	--	--	--	--	--	--	--	--
	2,3,7,8-Tetrachlorodibenzofuran ⁽⁴⁾	pg/g	11	72.7%	3	0.23	0.23	0.37	0.32	0.37	0.37	8	0.75	3.9	12	35	27	200	--	--	--	--	--	--	--	--
	2,3,7,8-Tetrachlorodibenzo-p-dioxin ⁽⁴⁾	pg/g	11	36.4%	7	0.046	0.047	0.054	0.19	0.38	0.39	4	0.12	0.24	0.8	3.2	8.5	11	--	--	--	--	--	--	--	--
	Octachlorodibenzodioxin ⁽⁴⁾	pg/g	11	63.6%	4	0.26	0.47	1.4	1.7	3.4	3.9	7	6.3	22	96	490	730	1900	--	--	--	--	--	--	--	--
	Octachlorodibenzofuran ⁽⁴⁾	pg/g	11	72.7%	3	2.5	2.5	2.5	3.2	4.6	4.6	8	13	210	430	850	1400	3000	--	--	--	--	--	--	--	--
	TCDD TEQ	pg/g	11	-- ⁽⁴⁾	--	--	--	--	--	--	--	11	0.14	0.18	11	40	21	330	1000	0	--	--	--	--	--	--
General Chemistry/ Ions	Ammonia (as N)	mg/kg	22	4.5%	21	0.098	0.099	0.52	0.35	0.54	0.56	1	2	--	2	2	--	2	100000	0	--	--	--	--	--	--
	Bromide	mg/kg	22	18.2%	18	0.26	0.27	0.27	0.27	0.27	0.29	4	0.29	0.49	1.2	1.3	2.1	2.4	100000	0	95.6	0	1910	0	--	--
	Chlorate	mg/kg	22	50.0%	11	0.37	0.38	0.39	0.39	0.4	0.42	11	0.63	1.2	1.6	8.5	4.5	70.1	34100	0	1.13	9	22.6	1	--	--
	Chloride	mg/kg	22	100%	0	--	--	--	--	--	--	22	4.9	13	52	180	230	970	--	--	--	--	--	--	--	--
	Cyanide, Total	mg/kg	22	0%	22	0.12	0.12	0.12	0.12	0.12	0.13	0	--	--	--	--	--	--	27.8	--	2	--	40	--	--	--
	Fluoride	mg/kg	22	100%	0	--	--	--	--	--	--	22	0.19	0.71	1.1	1.2	1.2	4.1	41000	0	--	--	--	--	--	--
	Nitrate	mg/kg	22	100%	0	--	--	--	--	--	--	22	0.32	0.81	2.4	5.7	11	31.9	100000	0	7	6	140	0	--	--
	Nitrite	mg/kg	22	0%	22	0.034	0.035	0.035	0.036	0.036	0.039	0	--	--	--	--	--	--	100000	--	--	--	--	--	--	--
	Orthophosphate as P	mg/kg	22	4.5%	21	0.57	0.58	5.2	3.1	5.4	5.8	1	8.3	--	8.3	8.3	--	8.3	--	--	--	--	--	--	--	--
	Perchlorate	mg/kg	22	90.9%	2	0.0106	--	0.011	0.011	--	0.0106	20	0.0368	0.17	0.53	1.7	2.9	8.45	795	0	0.0185	20	0.371	12	--	--
	Sulfate	mg/kg	22	100%	0	--	--	--	--	--	--	22	7.8	24	94	240	210	1780	--	--	--	--	--	--	--	--
	Sulfide	mg/kg	22	0%	22	0.86	0.89	0.89	0.9	0.91	0.97	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Kjeldahl Nitrogen (TKN)	mg/kg	22	100%	0	--	--	--	--	--	--	22	34.4	44	57	59	74	88.6	--	--	--	--	--	--	--	--	
Metals	Aluminum	mg/kg	21	100%	0	--	--	--	--	--	--	21	9590	11000	11000	12000	13000	14100	100000	0	75	21	1500	21	15300	0
	Antimony	mg/kg	21	0%	21	0.83	0.87	0.88	0.88	0.89	0.96	0	--	--	--	--	--	--	454	--	0.3	--	6	--	0.5	--
	Arsenic	mg/kg	21	71.4%	6	5.3	5.3	5.3	5.4	5.4	5.5	15	3.5	3.9	4.9	4.9	5.6	7.3	1.77	15	1	15	20	0	7.2	1
	Barium	mg/kg	21	100%	0	--	--	--	--	--	--	21	164	170	210	230	270	377	100000	0	82	21	1640	0	445	0
	Beryllium	mg/kg	21	100%	0	--	--	--	--	--	--	21	0.64	0.71	0.76	0.77	0.84	0.94	2230	0	3	0	60	0	0.89	2
	Boron	mg/kg	21	4.8%	20	17	18	18	18	18	19.5	1	24.6	--	25	25	--	24.6	100000	0	23.4	1	467	0	11.6	1
	Cadmium	mg/kg	21	9.5%	19	0.26	0.27	0.27	0.27	0.27	0.29	2	0.19	--	0.27	0.27	--	0.34	1110	0	0.4	0	8	0	0.1291	2
	Calcium	mg/kg	21	100%	0	--	--	--	--	--	--	21	11800	22000	28000	27000	34000	46500	--	--	--	--	--	--	82800	0
	Chromium	mg/kg	21	100%	0	--	--	--	--	--	--	21	11.5	15	16	18	18	28.3	100000	0	--	--	--	--	16.7	7
	Chromium (VI)	mg/kg	21	57.1%	9	0.1	0.11	0.11	0.11	0.11	0.12	12	0.12	0.16	0.22	0.25	0.31	0.58	1230	0	2	0	40	0	0.32	2
	Cobalt	mg/kg	21	100%	0	--	--	--	--	--	--	21	9	10	11	11	12	15	337	0	0.495	21	9.9	17	16.3	0
	Copper	mg/kg	21	100%	0	--	--	--	--	--	--	21	17.3	22	24	27	26	78.7	42200	0	45.8	1	915	0	25.9	4
	Iron	mg/kg	21	100%	0	--	--	--	--	--	--	21	16900	18000	20000	20000	22000	23700	100000	0	7.56	21	151	21	19700	10
	Lead	mg/kg	21	100%	0	--	--	--	--	--	--	21	8.6	9.7	10	13	12	45.9	--	--	--	--	--	--	35.1	1
	Lithium	mg/kg	21	100%	0	--	--	--	--	--	--	21	11	14	16	17	19	31	2270	0	21.9	1	438	0	26.5	1
	M																									

TABLE 3-4
FINAL HUMAN HEALTH RISK ASSESSMENT SOIL DATASET RESULTS SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 6)

Parameter of Interest	Compound List	Units	Total Count	Detect Freq.	Censored (Non-Detect) Data							Detected Data ⁽¹⁾							Worker Soil BCL	Count of Detects > BCL	LBCL (DAF 1)	Count of Detects > DAF 1	LBCL (DAF 20)	Count of Detects > DAF 20	Max. Bkgrnd ⁽²⁾	Count of Detects > Bkgrnd	
					Count	Min	Q1	Median	Mean	Q3	Max	Count	Min	Q1	Median	Mean	Q3	Max									
Metals	Manganese	mg/kg	21	100%	0	--	--	--	--	--	--	21	332	470	530	600	630	1540	24900	0	1.3	21	26.1	21	863	2	
	Mercury	mg/kg	21	4.8%	20	0.0064	0.035	0.036	0.033	0.036	0.0389	1	0.025	--	0.025	0.025	--	0.025	341	0	0.104	0	2.09	0	0.11	0	
	Molybdenum	mg/kg	21	19.0%	17	0.41	0.41	2.7	2	2.7	2.9	4	0.51	0.61	1.8	1.9	3.2	3.3	5680	0	3.69	0	73.7	0	2	2	
	Nickel	mg/kg	21	100%	0	--	--	--	--	--	--	21	16	20	21	21	23	25.4	21800	0	7	21	140	0	30	0	
	Potassium	mg/kg	21	100%	0	--	--	--	--	--	--	21	2000	2200	2400	2500	2700	3510	--	--	--	--	--	--	3890	0	
	Selenium	mg/kg	21	47.6%	11	2.6	2.7	2.7	2.7	2.8	2.9	10	1.2	1.4	1.7	1.7	2.1	2.4	5680	0	0.3	10	6	0	0.6	10	
	Silver	mg/kg	21	38.1%	13	0.042	0.043	0.043	0.044	0.045	0.047	8	0.044	0.049	0.058	0.069	0.074	0.15	5680	0	0.85	0	17	0	0.2609	0	
	Sodium	mg/kg	21	100%	0	--	--	--	--	--	--	21	381	500	760	900	1000	3040	--	--	--	--	--	--	1320	2	
	Strontium	mg/kg	21	100%	0	--	--	--	--	--	--	21	168	200	240	260	300	446	100000	0	--	--	--	--	--	808	0
	Thallium	mg/kg	21	9.5%	19	0.31	0.31	0.31	0.36	0.32	1.1	2	0.68	--	1.1	1.1	--	1.5	74.9	0	0.4	2	8	0	1.8	0	
	Tin	mg/kg	21	23.8%	16	1.1	1.1	1.1	1.1	1.1	1.2	5	0.78	0.94	1.3	1.4	2	2.2	100000	0	--	--	--	--	0.8	4	
	Titanium	mg/kg	21	100%	0	--	--	--	--	--	--	21	730	930	1000	1000	1100	1390	100000	0	146000	0	2920000	0	1010	9	
	Tungsten	mg/kg	21	9.5%	19	0.43	0.44	0.44	1.2	2.7	2.9	2	2.5	--	3.6	3.6	--	4.7	8510	0	41.1	0	822	0	0.0175	2	
	Uranium	mg/kg	21	100%	0	--	--	--	--	--	--	21	0.83	0.99	1.1	1.2	1.3	1.8	3400	0	13.5	0	270	0	2.7	0	
	Vanadium	mg/kg	21	100%	0	--	--	--	--	--	--	21	42	52	56	57	61	79.3	5680	0	300	0	6000	0	59.1	5	
Zinc	mg/kg	21	100%	0	--	--	--	--	--	--	21	38.8	46	48	54	58	97.2	100000	0	620	0	12400	0	121	0		
Organochlorine Pesticides	2,4-DDD	mg/kg	22	0%	22	0.00023	0.00024	0.00024	0.00024	0.00024	0.00026	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	2,4-DDE	mg/kg	22	13.6%	19	0.00032	0.00033	0.00034	0.00034	0.00034	0.00037	3	0.0048	0.0048	0.0057	0.0095	0.018	0.018	--	--	--	--	--	--	--	--	
	4,4-DDD	mg/kg	22	0%	22	0.000085	0.000087	0.000088	0.000089	0.00009	0.000096	0	--	--	--	--	--	--	11.1	--	0.8	--	16	--	--	--	
	4,4-DDE	mg/kg	22	18.2%	18	0.0004	0.00042	0.00042	0.00042	0.00042	0.00046	4	0.0022	0.0033	0.0094	0.0097	0.017	0.018	7.81	0	3	0	60	0	--	--	
	4,4-DDT	mg/kg	22	18.2%	18	0.00065	0.00067	0.00067	0.00068	0.00068	0.00073	4	0.0022	0.0025	0.0039	0.007	0.015	0.018	7.81	0	2	0	40	0	--	--	
	Aldrin	mg/kg	22	4.5%	21	0.00032	0.00033	0.00033	0.00033	0.00034	0.00036	1	0.002	--	0.002	0.002	--	0.002	0.113	0	0.02	0	0.4	0	--	--	
	alpha-BHC	mg/kg	22	0%	22	0.00014	0.00014	0.00014	0.00014	0.00015	0.00016	0	--	--	--	--	--	--	270	--	0.0291	--	0.583	--	--	--	
	alpha-Chlordane	mg/kg	22	0%	22	0.00059	0.0006	0.00061	0.00061	0.00062	0.00066	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	beta-BHC	mg/kg	22	18.2%	18	0.00031	0.00032	0.00032	0.00033	0.00033	0.00035	4	0.0022	0.0037	0.0096	0.011	0.02	0.023	53.9	0	0.00596	3	0.119	0	--	--	
	Chlordane	mg/kg	22	0%	22	0.0039	0.004	0.004	0.004	0.0041	0.0044	0	--	--	--	--	--	--	7.19	--	0.5	--	10	--	--	--	
	delta-BHC	mg/kg	22	0%	22	0.00025	0.00026	0.00026	0.00026	0.00027	0.00028	0	--	--	--	--	--	--	270	--	30.8	--	615	--	--	--	
	Dieldrin	mg/kg	22	0%	22	0.00022	0.00023	0.00023	0.00023	0.00024	0.00025	0	--	--	--	--	--	--	0.12	--	0.0002	--	0.004	--	--	--	
	Endosulfan I	mg/kg	22	0%	22	0.00059	0.00061	0.00061	0.00062	0.00063	0.00067	0	--	--	--	--	--	--	4100	--	0.9	--	18	--	--	--	
	Endosulfan II	mg/kg	22	0%	22	0.00024	0.00025	0.00025	0.00025	0.00026	0.00027	0	--	--	--	--	--	--	4100	--	0.9	--	18	--	--	--	
	Endosulfan sulfate	mg/kg	22	0%	22	0.00026	0.00027	0.00027	0.00027	0.00027	0.00029	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	Endrin	mg/kg	22	0%	22	0.00014	0.00015	0.00015	0.00015	0.00015	0.00016	0	--	--	--	--	--	--	205	--	0.05	--	1	--	--	--	
	Endrin aldehyde	mg/kg	22	0%	22	0.0004	0.00041	0.00042	0.00042	0.00043	0.00045	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	Endrin ketone	mg/kg	22	0%	22	0.00031	0.00032	0.00032	0.00032	0.00033	0.00035	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	gamma-BHC (Lindane)	mg/kg	22	0%	22	0.00017	0.00018	0.00018	0.00018	0.00018	0.0002	0	--	--	--	--	--	--	8.98	--	0.0005	--	0.01	--	--	--	
	gamma-Chlordane	mg/kg	22	0%	22	0.00016	0.00017	0.00017	0.00017	0.00017	0.00018	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	Heptachlor	mg/kg	14	0%	14	0.000098	0.0001	0.0001	0.0001	0.0001	0.00011	0	--	--	--	--	--	--	0.426	--	1	--	20	--	--	--	
	Heptachlor epoxide	mg/kg	22	0%	22	0.00044	0.00046	0.00046	0.00046	0.00047	0.0005	0	--	--	--	--	--	--	0.21	--	0.03	--	0.6	--	--	--	
	Methoxychlor	mg/kg	22	0%	22	0.00074	0.00077	0.00077	0.00078	0.00079	0.00084	0	--	--	--	--	--	--	3420	--	8	--	160	--	--	--	
	Toxaphene	mg/kg	22	0%	22	0.016	0.016	0.016	0.016	0.017	0.018	0	--	--	--	--	--	--	1.74	--	2	--	40	--	--	--	
	Polynuclear Aromatic Hydrocarbons	Acenaphthene	mg/kg	22	0%	22	0.00172	0.0018	0.0018	0.0018	0.0018	0.00183	0	--	--	--	--	--	--	2350	--	29	--	580	--	--	--
		Acenaphthylene	mg/kg	22	0%	22	0.00172	0.0018	0.0018	0.0018	0.0018	0.00183	0	--	--	--	--	--	--	147	--	--	--	--	--	--	--
		Anthracene	mg/kg	22	0%	22	0.00172	0.0018	0.0018	0.0018	0.0018	0.00183	0	--	--	--	--	--	--	9060	--	590	--	11800	--	--	--
Benzo(a)anthracene		mg/kg	22	0%	22	0.00172	0.0018	0.0018	0.0018	0.0018	0.00183	0	--	--	--	--	--	--	2.34	--	0.08	--	1.6	--	--	--	
Benzo(a)pyrene		mg/kg	22	0%	22	0.00172	0.0018	0.0018	0.0018	0.0018	0.00183	0	--	--	--	--	--	--	0.234	--	0.4	--	8	--	--	--	
Benzo(b)fluoranthene		mg/kg	22	0%	22	0.00172	0.0018	0.0018	0.0018	0.0018	0.00183	0	--	--	--	--	--	--	2.34	--	0.2	--	4	--	--	--	
Benzo(g,h,i)perylene		mg/kg	22	0%	22	0.00172	0.0018	0.0018	0.0018	0.0018	0.00183	0	--	--	--	--	--	--	34100	--	--	--	--	--	--	--	
Benzo(k)flu																											

TABLE 3-4
FINAL HUMAN HEALTH RISK ASSESSMENT SOIL DATASET RESULTS SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 3 of 6)

Parameter of Interest	Compound List	Units	Total Count	Detect Freq.	Censored (Non-Detect) Data							Detected Data ⁽¹⁾							Worker Soil BCL	Count of Detects > BCL	LBCL (DAF 1)	Count of Detects > DAF 1	LBCL (DAF 20)	Count of Detects > DAF 20	Max. Bkgnd ⁽²⁾	Count of Detects > Bkgnd
					Count	Min	Q1	Median	Mean	Q3	Max	Count	Min	Q1	Median	Mean	Q3	Max								
Polynuclear Aromatic Hydrocarbons	Indeno(1,2,3-cd)pyrene	mg/kg	22	0%	22	0.00172	0.0018	0.0018	0.0018	0.0018	0.00183	0	--	--	--	--	--	--	2.34	--	0.7	--	14	--	--	--
	Phenanthrene	mg/kg	22	0%	22	0.00172	0.0018	0.0018	0.0018	0.0018	0.00183	0	--	--	--	--	--	--	24.5	--	--	--	--	--	--	--
	Pyrene	mg/kg	22	0%	22	0.00172	0.0018	0.0018	0.0018	0.0018	0.00183	0	--	--	--	--	--	--	19300	--	210	--	4200	--	--	--
Polychlorinated Biphenyls	PCB 105 ⁽⁴⁾	pg/g	11	100%	0	--	--	--	--	--	--	11	2.2	7.1	64	460	820	1900	--	--	--	--	--	--	--	--
	PCB 114 ⁽⁴⁾	pg/g	11	54.5%	5	0.12	0.13	0.17	0.18	0.24	0.29	6	5.8	6.2	23	28	50	63	--	--	--	--	--	--	--	--
	PCB 118 ⁽⁴⁾	pg/g	11	90.9%	1	6.4	--	6.4	6.4	--	6.4	10	6.6	19	320	1100	2200	3900	--	--	--	--	--	--	--	--
	PCB 123 ⁽⁴⁾	pg/g	11	18.2%	9	0.12	0.16	0.24	0.26	0.37	0.44	2	26	--	59	59	--	92	--	--	--	--	--	--	--	--
	PCB 126 ⁽⁴⁾	pg/g	11	54.5%	5	0.13	0.14	0.17	0.18	0.22	0.25	6	4.7	7.3	26	34	57	99	--	--	--	--	--	--	--	--
	PCB 156 ⁽⁴⁾	pg/g	10	80.0%	2	0.11	--	0.12	0.12	--	0.13	8	2.2	6.3	74	280	710	810	--	--	--	--	--	--	--	--
	PCB 156/157 ⁽⁴⁾	pg/g	1	100%	0	--	--	--	--	--	--	1	170	--	170	170	--	170	--	--	--	--	--	--	--	
	PCB 157 ⁽⁴⁾	pg/g	10	60.0%	4	0.1	0.1	0.12	0.14	0.18	0.2	6	2.9	5.7	110	150	260	480	--	--	--	--	--	--	--	--
	PCB 167 ⁽⁴⁾	pg/g	11	72.7%	3	0.13	0.13	0.14	0.14	0.15	0.15	8	3.3	6.2	70	110	250	290	--	--	--	--	--	--	--	--
	PCB 169 ⁽⁴⁾	pg/g	11	27.3%	8	0.11	0.13	0.19	0.22	0.32	0.36	3	2.7	2.7	8.9	8.5	14	14	--	--	--	--	--	--	--	--
	PCB 189 ⁽⁴⁾	pg/g	11	63.6%	4	0.098	0.11	0.14	0.13	0.16	0.16	7	4.6	5.5	23	43	88	110	--	--	--	--	--	--	--	--
	PCB 209 ⁽⁴⁾	pg/g	11	90.9%	1	0.096	--	0.096	0.096	--	0.096	10	22	210	2200	5000	8600	19000	--	--	--	--	--	--	--	--
	PCB 77 ⁽⁴⁾	pg/g	11	18.2%	9	0.1	0.15	0.18	0.43	0.34	2.2	2	35	--	47	47	--	58	--	--	--	--	--	--	--	--
	PCB 81 ⁽⁴⁾	pg/g	11	9.1%	10	0.097	0.14	0.16	0.19	0.27	0.35	1	24	--	24	24	--	24	--	--	--	--	--	--	--	--
Radionuclides	Radium-226	pCi/g	22	95.5%	1	--	--	--	--	--	--	21	0.374	0.6	0.75	0.75	0.89	1.19	0.023	21	0.016	21	0.32	21	2.36	0
	Radium-228	pCi/g	22	81.8%	4	--	--	--	--	--	--	18	0.939	1	1.5	1.6	2.1	2.35	0.041	18	0.016	18	0.32	18	2.92	0
	Thorium-228	pCi/g	22	100%	0	--	--	--	--	--	--	22	0.982	1.5	1.7	1.9	2.4	3.08	0.025	22	0.0023	22	0.045	22	2.28	6
	Thorium-230	pCi/g	22	90.9%	2	--	--	--	--	--	--	20	0.672	1.1	1.3	1.3	1.5	2.51	8.3	0	0.00084	20	0.017	20	3.01	0
	Thorium-232	pCi/g	22	100%	0	--	--	--	--	--	--	22	1.07	1.5	1.7	1.7	1.9	2.75	7.4	0	0.0029	22	0.058	22	2.23	1
	Uranium-233/234	pCi/g	22	95.5%	1	--	--	--	--	--	--	21	0.239	0.77	0.8	0.89	1.1	1.46	11	0	--	--	--	--	2.84	0
	Uranium-235/236	pCi/g	22	9.1%	20	--	--	--	--	--	--	2	0.182	0.24	0.29	0.31	0.36	0.515	0.35	0	--	--	--	--	0.21	2
	Uranium-238	pCi/g	22	100%	0	--	--	--	--	--	--	22	0.511	0.85	0.9	1.1	1.3	1.6	1.4	4	--	--	--	--	2.37	0
Semivolatile Organic Compounds	1,2,4,5-Tetrachlorobenzene	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	205	--	--	--	--	--	--	--
	1,2-Diphenylhydrazine	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	2.39	--	--	--	--	--	--	--
	1,4-Dioxane	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	19.2	--	--	--	--	--	--	--
	2,2'-Dichlorobenzil	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	341	--	0.0003	--	0.006	--	--	--
	2,4,5-Trichlorophenol	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	68400	--	14	--	280	--	--	--
	2,4,6-Trichlorophenol	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	174	--	0.008	--	0.16	--	--	--
	2,4-Dichlorophenol	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	2050	--	0.05	--	1	--	--	--
	2,4-Dimethylphenol	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	13700	--	0.4	--	8	--	--	--
	2,4-Dinitrophenol	mg/kg	22	0%	22	0.131	0.13	0.14	0.14	0.14	0.139	0	--	--	--	--	--	--	1370	--	0.01	--	0.2	--	--	--
	2,4-Dinitrotoluene	mg/kg	22	0%	22	0.0345	0.035	0.036	0.036	0.036	0.0366	0	--	--	--	--	--	--	6.18	--	0.00004	--	0.0008	--	--	--
	2,6-Dinitrotoluene	mg/kg	22	0%	22	0.0345	0.035	0.036	0.036	0.036	0.0366	0	--	--	--	--	--	--	684	--	0.00003	--	0.0006	--	--	--
	2-Chloronaphthalene	mg/kg	22	0%	22	0.0121	0.012	0.013	0.012	0.013	0.0128	0	--	--	--	--	--	--	351	--	--	--	--	--	--	--
	2-Chlorophenol	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	1670	--	0.2	--	4	--	--	--
	2-Methylnaphthalene	mg/kg	22	0%	22	0.00689	0.007	0.0071	0.0071	0.0072	0.00733	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2-Nitroaniline	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	2050	--	--	--	--	--	--	--
	2-Nitrophenol	mg/kg	22	0%	22	0.0345	0.035	0.036	0.036	0.036	0.0366	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3,3-Dichlorobenzidine	mg/kg	22	0%	22	0.103	0.11	0.11	0.11	0.11	0.11	0	--	--	--	--	--	--	4.26	--	0.0003	--	0.006	--	--	--
	3-Nitroaniline	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4-Bromophenyl phenyl ether	mg/kg	22	0%	22	0.0345	0.035	0.036	0.036	0.036	0.0366	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4-Chloro-3-methylphenol	mg/kg	22	0%	22	0.0345	0.035	0.036	0.036	0.036	0.0366	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4-Chlorophenyl phenyl ether	mg/kg	22	0%	22	0.0345	0.035	0.036	0.036	0.036	0.0366	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4-Chlorothioanisole	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4-Nitroaniline	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4-Nitrophenol	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	5470	--	--	--	--	--	--	--
	Acetophenone	mg/kg	22	0%	22	0.0345	0.035	0.036	0.036	0.036	0.0366	0	--	--	--	--	--	--	1740	--	--	--	--	--	--	--
	Aniline	mg/kg	22	0%	22	0.121	0.12	0.13	0.12	0.13	0.128	0	--	--	--	--	--	--	336	--	--	--	--	--	--	--

TABLE 3-4
FINAL HUMAN HEALTH RISK ASSESSMENT SOIL DATASET RESULTS SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 4 of 6)

Parameter of Interest	Compound List	Units	Total Count	Detect Freq.	Censored (Non-Detect) Data							Detected Data ⁽¹⁾							Worker Soil BCL	Count of Detects > BCL	LBCL (DAF 1)	Count of Detects > DAF 1	LBCL (DAF 20)	Count of Detects > DAF 20	Max. Bkgnd ⁽²⁾	Count of Detects > Bkgnd		
					Count	Min	Q1	Median	Mean	Q3	Max	Count	Min	Q1	Median	Mean	Q3	Max										
Semivolatile Organic Compounds	Benzenethiol	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Benzoic acid	mg/kg	22	0%	22	0.172	0.18	0.18	0.18	0.18	0.183	0	--	--	--	--	--	--	100000	--	20	--	400	--	--	--	--	--
	Benzyl alcohol	mg/kg	22	0%	22	0.103	0.11	0.11	0.11	0.11	0.11	0	--	--	--	--	--	--	100000	--	--	--	--	--	--	--	--	--
	bis(2-Chloroethoxy)methane	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	bis(2-Chloroethyl) ether	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	1.3	--	0.00002	--	0.0004	--	--	--	--
	bis(2-Chloroisopropyl) ether	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	18	--	--	--	--	--	--	--	--
	bis(2-Ethylhexyl) phthalate	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	137	--	180	--	3600	--	--	--	--
	bis(p-Chlorophenyl) sulfone	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	bis(p-Chlorophenyl)disulfide	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Butylbenzyl phthalate	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	240	--	810	--	16200	--	--	--	--
	Carbazole	mg/kg	22	0%	22	0.0103	0.011	0.011	0.011	0.011	0.011	0.011	0	--	--	--	--	--	--	95.8	--	0.03	--	0.6	--	--	--	--
	Dibenzofuran	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	2270	--	--	--	--	--	--	--	--
	Dichloromethyl ether	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	--	0.00127	--	--	--	--	--	--	--	--
	Diethyl phthalate	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	100000	--	--	--	--	--	--	--	--
	Dimethyl phthalate	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	100000	--	--	--	--	--	--	--	--
	Di-n-butyl phthalate	mg/kg	22	0%	22	0.0345	0.035	0.036	0.036	0.036	0.0366	0	--	--	--	--	--	--	--	68400	--	270	--	5400	--	--	--	--
	Di-n-octyl phthalate	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Diphenyl disulfide	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Diphenyl sulfide	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Diphenyl sulfone	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	--	2050	--	--	--	--	--	--	--	--
	Diphenylamine	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	17100	--	--	--	--	--	--	--	--
	Fluoranthene	mg/kg	22	0%	22	0.0103	0.011	0.011	0.011	0.011	0.011	0.011	0	--	--	--	--	--	--	24400	--	210	--	4200	--	--	--	--
	Fluorene	mg/kg	22	0%	22	0.0103	0.011	0.011	0.011	0.011	0.011	0.011	0	--	--	--	--	--	--	3440	--	28	--	560	--	--	--	--
	Hexachlorobenzene	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	1.2	--	0.1	--	2	--	--	--	--
	Hexachlorobutadiene	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	24.6	--	0.1	--	2	--	--	--	--
	Hexachlorocyclopentadiene	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	4090	--	20	--	400	--	--	--	--
	Hexachloroethane	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	137	--	0.02	--	0.4	--	--	--	--
	Hydroxymethyl phthalimide	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Isophorone	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	2020	--	0.03	--	0.6	--	--	--	--
	m,p-Cresols	mg/kg	22	0%	22	0.138	0.14	0.14	0.14	0.14	0.147	0	--	--	--	--	--	--	--	34200	--	0.8	--	16	--	--	--	--
	Naphthalene	mg/kg	22	0%	22	0.0103	0.011	0.011	0.011	0.011	0.011	0.011	0	--	--	--	--	--	--	15.6	--	4	--	80	--	--	--	--
	Nitrobenzene	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	13.6	--	0.007	--	0.14	--	--	--	--
	N-nitrosodi-n-propylamine	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	0.274	--	0.000002	--	0.00004	--	--	--	--
	o-Cresol	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	34200	--	0.8	--	16	--	--	--	--
	Octachlorostyrene	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	p-Chloroaniline	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	9.58	--	0.03	--	0.6	--	--	--	--
p-Chlorobenzenethiol	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Pentachlorobenzene	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	547	--	--	--	--	--	--	--	--	
Pentachlorophenol	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	3	--	0.001	--	0.02	--	--	--	--	
Phenol	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	100000	--	5	--	100	--	--	--	--	
Phthalic acid	mg/kg	22	0%	22	0.114	0.12	0.12	0.12	0.12	0.121	0	--	--	--	--	--	--	--	100000	--	--	--	--	--	--	--	--	
Pyridine	mg/kg	22	0%	22	0.0689	0.07	0.071	0.071	0.071	0.072	0.0733	0	--	--	--	--	--	--	667	--	--	--	--	--	--	--	--	
Volatile Organic Compounds	1,1,1,2-Tetrachloroethane	mg/kg	22	0%	22	0.00039	0.0004	0.0004	0.00041	0.00041	0.00044	0	--	--	--	--	--	--	19.9	--	--	--	--	--	--	--	--	
	1,1,1-Trichloroethane	mg/kg	22	0%	22	0.00024	0.00025	0.00025	0.00025	0.00026	0.00027	0	--	--	--	--	--	--	1390	--	0.1	--	2	--	--	--	--	
	1,1,2,2-Tetrachloroethane	mg/kg	22	0%	22	0.00046	0.00047	0.00047	0.00048	0.00048	0.00051	0	--	--	--	--	--	--	2.54	--	0.0002	--	0.004	--	--	--	--	
	1,1,2-Trichloroethane	mg/kg	22	0%	22	0.00037	0.00038	0.00038	0.00039	0.00039	0.00042	0	--	--	--	--	--	--	5.51	--	0.0009	--	0.018	--	--	--	--	
	1,1-Dichloroethane	mg/kg	22	0%	22	0.00038	0.00039	0.00039	0.0004	0.0004	0.00043	0	--	--	--	--	--	--	21.4	--	1	--	20	--	--	--	--	
	1,1-Dichloroethene	mg/kg	22	0%	22	0.00024	0.00025	0.00025	0.00025	0.00026	0.00027	0	--	--	--	--	--	--	1270	--	0.003	--	0.06	--	--	--	--	

TABLE 3-4
FINAL HUMAN HEALTH RISK ASSESSMENT SOIL DATASET RESULTS SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 5 of 6)

Parameter of Interest	Compound List	Units	Total Count	Detect Freq.	Censored (Non-Detect) Data						Detected Data ⁽¹⁾						Worker Soil BCL	Count of Detects > BCL	LBCL (DAF 1)	Count of Detects > DAF 1	LBCL (DAF 20)	Count of Detects > DAF 20	Max. Bkgnd ⁽²⁾	Count of Detects > Bkgnd		
					Count	Min	Q1	Median	Mean	Q3	Max	Count	Min	Q1	Median	Mean									Q3	Max
Volatile Organic Compounds	1,2,4-Trichlorobenzene	mg/kg	22	0%	22	0.00032	0.00033	0.00033	0.00034	0.00033	0.00044	0	--	--	--	--	--	--	110	--	0.3	--	6	--	--	--
	1,2,4-Trimethylbenzene	mg/kg	22	0%	22	0.00041	0.00042	0.00045	0.00062	0.00084	0.0012	0	--	--	--	--	--	--	604	--	--	--	--	--	--	--
	1,2-Dichlorobenzene	mg/kg	22	4.5%	21	0.00037	0.00038	0.00038	0.00039	0.00039	0.00042	1	0.00053	--	0.00053	0.00053	--	0.00053	373	0	0.9	0	18	0	--	--
	1,2-Dichloroethane	mg/kg	22	0%	22	0.00033	0.00034	0.00034	0.00035	0.00035	0.00038	0	--	--	--	--	--	--	2.24	--	0.001	--	0.02	--	--	--
	1,2-Dichloroethene	mg/kg	22	0%	22	0.00064	0.00066	0.00067	0.00067	0.00068	0.00073	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	1,2-Dichloropropane	mg/kg	22	0%	22	0.00038	0.00039	0.00039	0.0004	0.0004	0.00043	0	--	--	--	--	--	--	4.29	--	0.001	--	0.02	--	--	--
	1,3,5-Trichlorobenzene	mg/kg	22	0%	22	0.00052	0.00054	0.00054	0.00055	0.00056	0.00059	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	1,3,5-Trimethylbenzene	mg/kg	22	0%	22	0.00026	0.00027	0.00027	0.00027	0.00027	0.00029	0	--	--	--	--	--	--	246	--	--	--	--	--	--	--
	1,3-Dichlorobenzene	mg/kg	22	0%	22	0.00045	0.00046	0.00047	0.00047	0.00048	0.00051	0	--	--	--	--	--	--	373	--	--	--	--	--	--	--
	1,3-Dichloropropane	mg/kg	22	0%	22	0.00043	0.00044	0.00044	0.00044	0.00045	0.00048	0	--	--	--	--	--	--	64.6	--	0.001	--	0.02	--	--	--
	1,4-Dichlorobenzene	mg/kg	22	4.5%	21	0.00032	0.00033	0.00033	0.00033	0.00034	0.00036	1	0.00073	--	0.00073	0.00073	--	0.00073	13.6	0	0.1	0	2	0	--	--
	2,2,3-Trimethylbutane	mg/kg	22	0%	22	0.00054	0.00056	0.00056	0.00057	0.00058	0.00061	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,2-Dichloropropane	mg/kg	22	0%	22	0.00032	0.00033	0.00033	0.00033	0.00033	0.00036	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,2-Dimethylpentane	mg/kg	22	0%	22	0.00054	0.00056	0.00056	0.00057	0.00058	0.00061	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,3-Dimethylpentane	mg/kg	22	0%	22	0.00045	0.00046	0.00046	0.00047	0.00047	0.00051	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,4-Dimethylpentane	mg/kg	22	0%	22	0.0005	0.00052	0.00052	0.00052	0.00053	0.00056	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2-Chlorotoluene	mg/kg	22	0%	22	0.00035	0.00036	0.00036	0.00036	0.00037	0.00039	0	--	--	--	--	--	--	511	--	--	--	--	--	--	--
	2-Hexanone	mg/kg	22	0%	22	0.00029	0.0003	0.0003	0.0003	0.00031	0.00033	0	--	--	--	--	--	--	1930	--	--	--	--	--	--	--
	2-Methylhexane	mg/kg	22	0%	22	0.00052	0.00053	0.00054	0.00054	0.00055	0.00059	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2-Nitropropane	mg/kg	22	0%	22	0.00033	0.00034	0.00034	0.00034	0.00035	0.00037	0	--	--	--	--	--	--	0.0591	--	--	--	--	--	--	--
	3,3-Dimethylpentane	mg/kg	22	0%	22	0.00049	0.00051	0.00051	0.00051	0.00052	0.00056	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3-Ethylpentane	mg/kg	22	0%	22	0.00046	0.00047	0.00048	0.00048	0.00049	0.00052	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3-Methylhexane	mg/kg	22	0%	22	0.00048	0.0005	0.0005	0.0005	0.00051	0.00054	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4-Chlorotoluene	mg/kg	22	0%	22	0.00026	0.00027	0.00027	0.00027	0.00027	0.00029	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4-Methyl-2-pentanone (MIBK)	mg/kg	22	0%	22	0.00032	0.00033	0.00033	0.00033	0.00034	0.00036	0	--	--	--	--	--	--	17200	--	--	--	--	--	--	--
	Acetone	mg/kg	22	31.8%	15	0.0067	0.0069	0.0071	0.0078	0.0093	0.01	7	0.011	0.011	0.012	0.016	0.015	0.037	100000	0	0.8	0	16	0	--	--
	Acetonitrile	mg/kg	22	0%	22	0.0036	0.0037	0.0037	0.0038	0.0038	0.0041	0	--	--	--	--	--	--	6150	--	--	--	--	--	--	--
	Benzene	mg/kg	22	0%	22	0.00034	0.00035	0.00035	0.00035	0.00036	0.00038	0	--	--	--	--	--	--	4.21	--	0.002	--	0.04	--	--	--
	Bromobenzene	mg/kg	22	0%	22	0.00039	0.0004	0.0004	0.0004	0.00041	0.00044	0	--	--	--	--	--	--	695	--	--	--	--	--	--	--
	Bromodichloromethane	mg/kg	22	0%	22	0.00033	0.00034	0.00034	0.00034	0.00035	0.00037	0	--	--	--	--	--	--	3.36	--	0.03	--	0.6	--	--	--
	Bromoform	mg/kg	22	0%	22	0.00043	0.00044	0.00044	0.00044	0.00045	0.00048	0	--	--	--	--	--	--	242	--	0.04	--	0.8	--	--	--
	Bromomethane	mg/kg	22	0%	22	0.00041	0.00042	0.00042	0.00043	0.00043	0.00046	0	--	--	--	--	--	--	39.1	--	0.01	--	0.2	--	--	--
	Carbon disulfide	mg/kg	22	9.1%	20	0.00028	0.00029	0.00029	0.0003	0.0003	0.00032	2	0.00038	--	0.00039	0.00039	--	0.0004	721	0	2	0	40	0	--	--
Carbon tetrachloride	mg/kg	22	0%	22	0.00031	0.00032	0.00032	0.00033	0.00033	0.00035	0	--	--	--	--	--	--	3.84	--	0.003	--	0.06	--	--	--	
Chlorobenzene	mg/kg	22	0%	22	0.00031	0.00032	0.00032	0.00034	0.00033	0.00076	0	--	--	--	--	--	--	695	--	0.07	--	1.4	--	--	--	
Chlorobromomethane	mg/kg	22	0%	22	0.00045	0.00046	0.00046	0.00047	0.00047	0.00051	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Chloroethane	mg/kg	22	0%	22	0.00032	0.00033	0.00033	0.00033	0.00034	0.00036	0	--	--	--	--	--	--	1100	--	--	--	--	--	--	--	
Chloroform	mg/kg	22	0%	22	0.00037	0.00038	0.00038	0.00038	0.00039	0.00041	0	--	--	--	--	--	--	1.55	--	0.03	--	0.6	--	--	--	
Chloromethane	mg/kg	22	0%	22	0.00028	0.00029	0.00029	0.00029	0.0003	0.00032	0	--	--	--	--	--	--	8.05	--	--	--	--	--	--	--	
cis-1,2-Dichloroethene	mg/kg	22	0%	22	0.00034	0.00035	0.00035	0.00036	0.00036	0.00039	0	--	--	--	--	--	--	737	--	0.02	--	0.4	--	--	--	
cis-1,3-Dichloropropene	mg/kg	22	0%	22	0.00024	0.00025	0.00025	0.00025	0.00026	0.00027	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Cymene (Isopropyltoluene)	mg/kg	22	0%	22	0.00027	0.00027	0.00028	0.00028	0.00028	0.0003	0	--	--	--	--	--	--	647	--	--	--	--	--	--	--	
Dibromochloromethane	mg/kg	22	0%	22	0.0003	0.00031	0.00031	0.00031	0.00032	0.00034	0	--	--	--	--	--	--	6.03	--	0.02	--	0.4	--	--	--	
Dibromochloropropane	mg/kg	22	0%	22	0.00061	0.00063	0.00063	0.00064	0.00065	0.00069	0	--	--	--	--	--	--	0.0529	--	--	--	--	--	--	--	
Dibromomethane	mg/kg	22	0%	22	0.00035	0.00037	0.00037	0.00037	0.00038	0.0004	0	--	--	--	--	--	--	191	--	--	--	--	--	--	--	
Dichloromethane (Methylene chloride)	mg/kg	22	9.1%	20	0.0024	0.0025	0.014	0.013	0.023	0.026	2	0.03	--	0.047	0.047	--	0.063	58.5	0	0.001	2	0.02	2	--	--	
Dimethyldisulfide	mg/kg	22	0%	22	0.																					

TABLE 3-4
FINAL HUMAN HEALTH RISK ASSESSMENT SOIL DATASET RESULTS SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 6 of 6)

Parameter of Interest	Compound List	Units	Total Count	Detect Freq.	Censored (Non-Detect) Data						Detected Data ⁽¹⁾						Worker Soil BCL	Count of Detects > BCL	LBCL (DAF 1)	Count of Detects > DAF 1	LBCL (DAF 20)	Count of Detects > DAF 20	Max. Bkgrnd ⁽²⁾	Count of Detects > Bkgrnd
					Count	Min	Q1	Median	Mean	Q3	Max	Count	Min	Q1	Median	Mean	Q3	Max						
Volatile Organic Compounds	Freon-12 (Dichlorodifluoromethane)	mg/kg	22	0%	22	0.00025	0.00026	0.00026	0.00027	0.00027	0.00029	0	--	--	--	--	--	340	--	--	--	--	--	--
	Heptane	mg/kg	22	0%	22	0.00038	0.0004	0.0004	0.0004	0.00041	0.00043	0	--	--	--	--	--	220	--	0.03	--	0.6	--	--
	Isopropylbenzene	mg/kg	22	0%	22	0.00029	0.0003	0.0003	0.0003	0.00031	0.00033	0	--	--	--	--	--	647	--	--	--	--	--	--
	m,p-Xylene	mg/kg	22	0%	22	0.00047	0.00048	0.00048	0.00049	0.00049	0.00053	0	--	--	--	--	--	214	--	10	--	200	--	--
	Methyl ethyl ketone (2-Butanone)	mg/kg	22	0%	22	0.00059	0.00061	0.00061	0.00062	0.00062	0.00066	0	--	--	--	--	--	34100	--	--	--	--	--	--
	Methyl iodide	mg/kg	22	0%	22	0.0004	0.00041	0.00041	0.00042	0.00042	0.00045	0	--	--	--	--	--	1510	--	--	--	--	--	--
	MTBE (Methyl tert-butyl ether)	mg/kg	22	0%	22	0.00048	0.00049	0.00049	0.0005	0.00051	0.00054	0	--	--	--	--	--	208	--	--	--	--	--	--
	n-Butylbenzene	mg/kg	22	0%	22	0.0003	0.00031	0.00031	0.00032	0.00032	0.00034	0	--	--	--	--	--	237	--	--	--	--	--	--
	Nonanal	mg/kg	22	0%	22	0.00037	0.00038	0.00039	0.00039	0.00039	0.00042	0	--	--	--	--	--	--	--	--	--	--	--	--
	n-Propylbenzene	mg/kg	22	0%	22	0.00028	0.00029	0.00029	0.00029	0.0003	0.00032	0	--	--	--	--	--	237	--	--	--	--	--	--
	o-Xylene	mg/kg	22	0%	22	0.00024	0.00025	0.00025	0.00025	0.00026	0.00027	0	--	--	--	--	--	282	--	9	--	180	--	--
	sec-Butylbenzene	mg/kg	22	0%	22	0.00033	0.00034	0.00034	0.00035	0.00035	0.00038	0	--	--	--	--	--	223	--	--	--	--	--	--
	Styrene	mg/kg	22	0%	22	0.00021	0.00022	0.00022	0.00022	0.00023	0.00024	0	--	--	--	--	--	1730	--	0.2	--	4	--	--
	tert-Butylbenzene	mg/kg	22	0%	22	0.00023	0.00024	0.00024	0.00024	0.00025	0.00026	0	--	--	--	--	--	393	--	--	--	--	--	--
	Tetrachloroethene	mg/kg	22	0%	22	0.00048	0.00049	0.00049	0.0005	0.00051	0.00054	0	--	--	--	--	--	3.28	--	0.003	--	0.06	--	--
	Toluene	mg/kg	22	0%	22	0.00025	0.00025	0.00026	0.00026	0.00026	0.00028	0	--	--	--	--	--	521	--	0.6	--	12	--	--
	trans-1,2-Dichloroethene	mg/kg	22	0%	22	0.00035	0.00036	0.00036	0.00036	0.00037	0.00039	0	--	--	--	--	--	547	--	0.03	--	0.6	--	--
	trans-1,3-Dichloropropene	mg/kg	22	0%	22	0.00018	0.00019	0.00019	0.00019	0.00019	0.00021	0	--	--	--	--	--	--	--	--	--	--	--	--
	Trichloroethene	mg/kg	22	0%	22	0.00027	0.00028	0.00028	0.00028	0.00029	0.00031	0	--	--	--	--	--	5.49	--	0.003	--	0.06	--	--
	Vinyl acetate	mg/kg	22	0%	22	0.00039	0.0004	0.00041	0.00041	0.00042	0.00044	0	--	--	--	--	--	2710	--	8	--	160	--	--
	Vinyl chloride	mg/kg	22	0%	22	0.00033	0.00034	0.00034	0.00035	0.00035	0.00038	0	--	--	--	--	--	1.86	--	0.0007	--	0.014	--	--
	Xylenes (total)	mg/kg	22	0%	22	0.00066	0.00068	0.00068	0.00069	0.0007	0.00074	0	--	--	--	--	--	214	--	10	--	200	--	--

Notes:

This table includes only data included in the risk assessment. Because of this, the total number of analyses does not always coincide with the total number of analyses reported in the tables in Appendix B, which include all data, regardless of status.

The values used are simply a comparison to NDEP BCL values for information purposes only.

Because both non-detect and detected radionuclides have reported activity levels, calculated summary statistics (and exceedances of comparison levels) are presented as detected regardless of the lab detect flag. Lab detect flags are represented by the censored (non-detect) and detect count fields in the table.

Values for Q1, median, mean, and Q3 are rounded to 2 significant figures. BCLs are rounded to 3 significant figures.

BCL = Basic Comparison Levels (BCLs) from NDEP 2013.

LBCL = Leaching-based BCLs from NDEP 2013.

Max = Maximum

Min = Minimum

Q1 = 1st quartile (25th percentile)

Q3 = 3rd quartile (75th percentile)

(1) Range of detections include estimated values of detect results between the detection limit and reporting limit. As such some minimum detected concentrations may be below the minimum reporting limit. In these cases the respective sample results are flagged in the dataset.

(2) Comparisons are for information purposes only. See Chapter 5 for statistical background comparisons, and the background dataset used.

(3) Asbestos results shown are for long protocol structures (>10um). The minimum and maximum values represent the number of protocol structures in an individual sample. The detect count represents the number of samples with at least one detected protocol structure, not the total number of structures.

(4) TCDD TEQ values are calculated from congener-specific (dioxins, furans, and PCBs) concentrations. An individual TCDD TEQ value may include detect and non-detect congeners. Therefore, the number of detects and non-detects, and a frequency of detection for TCDD TEQ are not presented.

-- = Not applicable or no value has been established.

TABLE 3-7
SURFACE FLUX SAMPLE ANALYSES
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 1 of 3)

Parameter of Compound	CAS Number	MDL ppbv	RL ppbv	MDL µg/m ³	RL µg/m ³
List of Compounds for USEPA Method TO-15 Full Scan Mode Operation and MDLs					
1,1,1,2-Tetrachloroethane	630-20-6	0.1	0.51	0.72	3.62
1,1,1-Trichloroethane	71-55-6	0.1	0.52	0.58	2.89
1,1,2-Trichloroethane	79-00-5	0.1	0.51	0.57	2.86
1,1-Dichloroethane	75-34-3	0.1	0.52	0.43	2.15
1,1-Dichloroethene	75-35-4	0.1	0.52	0.42	2.13
1,1-Dichloropropene	563-58-6	0.1	0.49	0.46	2.3
1,2,3-Trichloropropane	96-18-4	0.11	0.55	0.68	3.39
1,2,4-Trichlorobenzene	120-82-1	0.1	0.52	0.79	3.94
1,2,4-Trimethylbenzene	95-63-6	0.1	0.52	0.52	2.61
1,2-Dichlorobenzene	95-50-1	0.1	0.52	0.64	3.2
1,2-Dichloropropane	78-87-5	0.1	0.52	0.49	2.46
1,3,5-Trimethylbenzene	108-67-8	0.1	0.52	0.53	2.64
1,3-Dichlorobenzene	541-73-1	0.1	0.52	0.64	3.2
1,3-Dichloropropane	142-28-9	0.11	0.54	0.52	2.58
1,4-Dioxane	123-91-1	0.09	0.44	0.33	1.64
2,2-Dichloropropane	594-20-7	0.11	0.53	0.5	2.53
2-Hexanone	591-78-6	0.09	0.44	0.37	1.86
4-Methyl-2-pentanone (MIBK)	108-10-1	0.09	0.46	0.38	1.95
Acetone	67-64-1	0.09	0.45	0.22	1.1
Acetonitrile	75-05-8	0.22	1.12	0.48	2.39
Benzene	71-43-2	0.1	0.52	0.34	1.7
Bromodichloromethane	75-27-4	0.08	0.4	0.55	2.77
Bromoform	75-25-2	0.09	0.47	0.99	4.96
Bromomethane	74-83-9	0.1	0.51	0.41	2.04
Carbon disulfide	75-15-0	0.09	0.45	0.29	1.45
Chlorobenzene	108-90-7	0.1	0.52	0.5	2.48
Chlorobromomethane	74-97-5	0.1	0.51	0.55	2.76
Chloroethane	75-00-3	0.1	0.51	0.28	1.39

TABLE 3-7
SURFACE FLUX SAMPLE ANALYSES
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 3)

Parameter of Compound	CAS Number	MDL ppbv	RL ppbv	MDL µg/m³	RL µg/m³
Chloromethane	74-87-3	0.1	0.51	0.22	1.09
cis-1,2-Dichloroethene	156-59-2	0.1	0.52	0.42	2.11
cis-1,3-Dichloropropene	10061-01-5	0.1	0.52	0.48	2.41
Cymene (Isopropyltoluene)	99-87-6	0.11	0.55	0.62	3.12
Dibromomethane	74-95-3	0.11	0.55	0.97	4.84
Dichloromethane (Methylene chloride)	75-09-2	0.1	0.52	0.37	1.86
Ethanol	64-17-5	0.22	1.12	0.44	2.18
Ethylbenzene	100-41-4	0.1	0.52	0.46	2.33
Freon-11 (Trichlorofluoromethane)	75-69-4	0.1	0.51	0.59	2.95
Freon-113 (1,1,2-Trifluoro-1,2,2-trichloroethane)	76-13-1	0.1	0.52	0.81	4.07
Freon-12 (Dichlorodifluoromethane)	75-71-8	0.1	0.51	0.52	2.61
Heptane	142-82-5	0.08	0.42	0.35	1.78
Isopropylbenzene	98-82-8	0.11	0.57	0.58	2.89
Methyl ethyl ketone (2-Butanone)	78-93-3	0.09	0.43	0.26	1.31
Methyl iodide	74-88-4	0.19	0.94	1.13	5.67
MTBE (Methyl tert-butyl ether)	1634-04-4	0.08	0.39	0.29	1.45
Naphthalene	91-20-3	0.22	1.09	1.19	5.9
n-Butylbenzene	104-51-8	0.1	0.52	0.59	2.95
n-Propylbenzene	103-65-1	0.11	0.54	0.55	2.74
o-Xylene	95-47-6	0.1	0.52	0.46	2.31
sec-Butylbenzene	135-98-8	0.11	0.52	0.59	2.95
Styrene	100-42-5	0.1	0.52	0.45	2.26
tert-Butylbenzene	98-06-6	0.11	0.52	0.59	2.85
Tetrachloroethene	127-18-4	0.1	0.52	0.72	3.61
Toluene	108-88-3	0.1	0.52	0.4	2
trans-1,2-Dichloroethene	156-60-5	0.09	0.44	0.36	1.8
trans-1,3-Dichloropropene	10061-02-6	0.1	0.52	0.48	2.41
Trichloroethene	79-01-6	0.1	0.52	0.57	2.85
Vinyl acetate	108-05-4	0.09	0.43	0.31	1.56

TABLE 3-7
SURFACE FLUX SAMPLE ANALYSES
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 3 of 3)

Parameter of Compound	CAS Number	MDL ppbv	RL ppbv	MDL $\mu\text{g}/\text{m}^3$	RL $\mu\text{g}/\text{m}^3$
Vinyl chloride	75-01-4	0.1	0.51	0.27	1.35
Xylenes (total)	108-38-3	0.21	1.03	0.92	4.61
List of Compounds for USEPA Method TO-15 Selective Ion Mode (SIM) Operation and MDLs					
1,1,2,2-Tetrachloroethane	79-34-5	0.005	0.026	0.035	0.18
1,2-Dichloroethane	107-06-2	0.005	0.026	0.021	0.11
1,4-Dichlorobenzene	106-46-7	0.005	0.026	0.031	0.16
Carbon tetrachloride	56-23-5	0.005	0.026	0.032	0.17
Chloroform	67-66-3	0.005	0.026	0.025	0.13
Dibromochloromethane	124-48-1	0.005	0.026	0.043	0.23
Dibromochloropropane	96-12-8	0.01	0.026	0.098	0.26
Hexachlorobutadiene	87-68-3	0.01	0.026	0.108	0.28

Note:

The actual reported MDL may vary based on Canister dilution or matrix interferences.

CAS - Chemical abstract system

MDL - Method detection limit

RL - Reporting limit

ppbv - Parts per billion by volume

$\mu\text{g}/\text{m}^3$ - microgram per cubic meter

TABLE 3-8
SOIL VAPOR FLUX SAMPLE RESULTS SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 2)

Parameter of Interest	Compound List	Units	Total Count	Detect Freq.	Censored (Non-Detect) Data							Detected Data ⁽¹⁾						
					Count	Min	Q1	Median	Mean	Q3	Max	Count	Min	Q1	Median	Mean	Q3	Max
Volatile Organic Compounds	1,1,1,2-Tetrachloroethane	µg/m ² .min ⁻¹	7	0%	7	0.0104	0.0104	0.0108	0.0144	0.0112	0.0365	0	--	--	--	--	--	--
	1,1,1-Trichloroethane	µg/m ² .min ⁻¹	7	0%	7	0.0219	0.0219	0.0227	0.0304	0.0238	0.0773	0	--	--	--	--	--	--
	1,1,2,2-Tetrachloroethane	µg/m ² .min ⁻¹	8	0%	8	0.00277	0.00277	0.00279	0.00283	0.00287	0.003	0	--	--	--	--	--	--
	1,1,2-Trichloroethane	µg/m ² .min ⁻¹	7	0%	7	0.0219	0.0219	0.0227	0.0304	0.0238	0.0773	0	--	--	--	--	--	--
	1,1-Dichloroethane	µg/m ² .min ⁻¹	7	0%	7	0.0162	0.0162	0.0165	0.0224	0.0177	0.0569	0	--	--	--	--	--	--
	1,1-Dichloroethene	µg/m ² .min ⁻¹	7	0%	7	0.0158	0.0158	0.0165	0.022	0.0173	0.0558	0	--	--	--	--	--	--
	1,1-Dichloropropene	µg/m ² .min ⁻¹	7	0%	7	0.0108	0.0108	0.0112	0.015	0.0119	0.0381	0	--	--	--	--	--	--
	1,2,3-Trichloropropane	µg/m ² .min ⁻¹	7	0%	7	0.0108	0.0108	0.0112	0.015	0.0119	0.0381	0	--	--	--	--	--	--
	1,2,4-Trichlorobenzene	µg/m ² .min ⁻¹	7	0%	7	0.122	0.122	0.125	0.168	0.132	0.425	0	--	--	--	--	--	--
	1,2,4-Trimethylbenzene	µg/m ² .min ⁻¹	7	0%	7	0.0796	0.0796	0.0819	0.11	0.0865	0.279	0	--	--	--	--	--	--
	1,2-Dichlorobenzene	µg/m ² .min ⁻¹	7	0%	7	0.0954	0.0954	0.0981	0.132	0.104	0.334	0	--	--	--	--	--	--
	1,2-Dichloroethane	µg/m ² .min ⁻¹	8	13%	7	0.00165	0.00165	0.00165	0.00168	0.00169	0.00181	1	0.00419	--	0.00419	0.00419	--	0.00419
	1,2-Dichloropropane	µg/m ² .min ⁻¹	7	0%	7	0.0188	0.0188	0.0196	0.0261	0.0204	0.0662	0	--	--	--	--	--	--
	1,3,5-Trimethylbenzene	µg/m ² .min ⁻¹	7	0%	7	0.0208	0.0208	0.0212	0.0285	0.0223	0.0723	0	--	--	--	--	--	--
	1,3-Dichlorobenzene	µg/m ² .min ⁻¹	7	0%	7	0.0973	0.0973	0.1	0.134	0.106	0.341	0	--	--	--	--	--	--
	1,3-Dichloropropane	µg/m ² .min ⁻¹	7	0%	7	0.0112	0.0112	0.0115	0.0153	0.0119	0.0388	0	--	--	--	--	--	--
	1,4-Dichlorobenzene	µg/m ² .min ⁻¹	8	0%	8	0.00242	0.00242	0.00244	0.00248	0.00253	0.00265	0	--	--	--	--	--	--
	1,4-Dioxane	µg/m ² .min ⁻¹	7	0%	7	0.0269	0.0269	0.0277	0.0371	0.0292	0.0942	0	--	--	--	--	--	--
	2,2-Dichloropropane	µg/m ² .min ⁻¹	7	0%	7	0.015	0.015	0.0154	0.0207	0.0162	0.0527	0	--	--	--	--	--	--
	2-Hexanone	µg/m ² .min ⁻¹	7	0%	7	0.0108	0.0108	0.0108	0.0147	0.0115	0.0373	0	--	--	--	--	--	--
	4-Methyl-2-pentanone (MIBK)	µg/m ² .min ⁻¹	7	0%	7	0.0112	0.0112	0.0115	0.0156	0.0123	0.0396	0	--	--	--	--	--	--
	Acetone	µg/m ² .min ⁻¹	7	100%	0	--	--	--	--	--	--	7	0.226	0.286	0.499	0.811	1.05	2.29
	Acetonitrile	µg/m ² .min ⁻¹	7	0%	7	0.0135	0.0135	0.0138	0.0187	0.0146	0.0477	0	--	--	--	--	--	--
	Benzene	µg/m ² .min ⁻¹	7	14%	6	0.015	0.0173	0.0212	0.0211	0.0241	0.0281	1	0.0808	--	0.0808	0.0808	--	0.0808
	Bromodichloromethane	µg/m ² .min ⁻¹	7	0%	7	0.01	0.01	0.01	0.0137	0.0108	0.0346	0	--	--	--	--	--	--
	Bromoform	µg/m ² .min ⁻¹	7	0%	7	0.01	0.01	0.0104	0.014	0.0112	0.0354	0	--	--	--	--	--	--
	Bromomethane	µg/m ² .min ⁻¹	7	0%	7	0.0162	0.0162	0.0165	0.0222	0.0173	0.0562	0	--	--	--	--	--	--
	Carbon disulfide	µg/m ² .min ⁻¹	7	71%	2	0.0104	--	0.0106	0.0106	--	0.0108	5	0.0142	0.0246	0.0565	0.0652	0.11	0.156
	Carbon tetrachloride	µg/m ² .min ⁻¹	8	63%	3	0.00377	0.00377	0.00438	0.00427	0.00465	0.00465	5	0.00446	0.00527	0.00877	0.0106	0.0168	0.0208
	Chlorobenzene	µg/m ² .min ⁻¹	7	0%	7	0.0188	0.0188	0.0192	0.0258	0.0204	0.0654	0	--	--	--	--	--	--
	Chlorobromomethane	µg/m ² .min ⁻¹	7	0%	7	0.0104	0.0104	0.0108	0.0143	0.0112	0.0362	0	--	--	--	--	--	--
	Chloroethane	µg/m ² .min ⁻¹	7	0%	7	0.0108	0.0108	0.0112	0.015	0.0119	0.0381	0	--	--	--	--	--	--
	Chloroform	µg/m ² .min ⁻¹	8	88%	1	0.00215	--	0.00215	0.00215	--	0.00215	7	0.00242	0.00373	0.00527	0.00936	0.0151	0.0272
	Chloromethane	µg/m ² .min ⁻¹	7	86%	1	0.0292	--	0.0292	0.0292	--	0.0292	6	0.0165	0.0232	0.045	0.0484	0.071	0.0958
	cis-1,2-Dichloroethene	µg/m ² .min ⁻¹	7	0%	7	0.0162	0.0162	0.0165	0.0224	0.0177	0.0569	0	--	--	--	--	--	--
	cis-1,3-Dichloropropene	µg/m ² .min ⁻¹	7	0%	7	0.0192	0.0192	0.0196	0.0264	0.0208	0.0669	0	--	--	--	--	--	--
	Cymene (Isopropyltoluene)	µg/m ² .min ⁻¹	7	0%	7	0.0138	0.0138	0.0142	0.0192	0.015	0.0488	0	--	--	--	--	--	--
	Dibromochloromethane	µg/m ² .min ⁻¹	8	13%	7	0.00127	0.00127	0.00127	0.00129	0.00131	0.00135	1	0.0015	--	0.0015	0.0015	--	0.0015

TABLE 3-8
SOIL VAPOR FLUX SAMPLE RESULTS SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 2)

Parameter of Interest	Compound List	Units	Total Count	Detect Freq.	Censored (Non-Detect) Data							Detected Data ⁽¹⁾						
					Count	Min	Q1	Median	Mean	Q3	Max	Count	Min	Q1	Median	Mean	Q3	Max
Volatile Organic Compounds	Dibromochloropropane	µg/m ² .min ⁻¹	8	0%	8	0.00304	0.0109	0.0144	0.0146	0.0207	0.0215	0	--	--	--	--	--	--
	Dibromomethane	µg/m ² .min ⁻¹	7	0%	7	0.00962	0.00962	0.01	0.0135	0.0108	0.0342	0	--	--	--	--	--	--
	Dichloromethane (Methylene chloride)	µg/m ² .min ⁻¹	7	29%	5	0.0142	0.0142	0.0146	0.0218	0.0329	0.0504	2	0.0288	--	0.132	0.132	--	0.236
	Ethanol	µg/m ² .min ⁻¹	7	14%	6	0.103	0.103	0.105	0.106	0.108	0.112	1	0.873	--	0.873	0.873	--	0.873
	Ethylbenzene	µg/m ² .min ⁻¹	7	0%	7	0.0181	0.0181	0.0185	0.0248	0.0196	0.0627	0	--	--	--	--	--	--
	Freon-11 (Trichlorofluoromethane)	µg/m ² .min ⁻¹	7	29%	5	0.0231	0.0231	0.0235	0.0353	0.0533	0.0812	2	0.0354	--	0.0485	0.0485	--	0.0615
	Freon-113 (1,1,2-Trifluoro-1,2,2-trichloroethane)	µg/m ² .min ⁻¹	7	0%	7	0.0312	0.0312	0.0319	0.0429	0.0338	0.109	0	--	--	--	--	--	--
	Freon-12 (Dichlorodifluoromethane)	µg/m ² .min ⁻¹	7	29%	5	0.0208	0.0208	0.0215	0.0315	0.0473	0.0723	2	0.0423	--	0.0727	0.0727	--	0.103
	Heptane	µg/m ² .min ⁻¹	7	14%	6	0.00923	0.00923	0.00923	0.0131	0.0155	0.0319	1	0.103	--	0.103	0.103	--	0.103
	Hexachlorobutadiene	µg/m ² .min ⁻¹	8	0%	8	0.00435	0.00439	0.00462	0.00494	0.00547	0.00638	0	--	--	--	--	--	--
	Isopropylbenzene	µg/m ² .min ⁻¹	7	0%	7	0.0138	0.0138	0.0142	0.0189	0.015	0.0477	0	--	--	--	--	--	--
	Methyl ethyl ketone (2-Butanone)	µg/m ² .min ⁻¹	7	86%	1	0.0112	--	0.0112	0.0112	--	0.0112	6	0.0319	0.0325	0.0529	0.108	0.188	0.345
	Methyl iodide	µg/m ² .min ⁻¹	7	0%	7	0.00692	0.00692	0.00731	0.00961	0.00769	0.0242	0	--	--	--	--	--	--
	MTBE (Methyl tert-butyl ether)	µg/m ² .min ⁻¹	7	0%	7	0.00962	0.00962	0.01	0.0133	0.0104	0.0338	0	--	--	--	--	--	--
	Naphthalene	µg/m ² .min ⁻¹	7	0%	7	0.0185	0.0185	0.0188	0.0253	0.02	0.0642	0	--	--	--	--	--	--
	n-Butylbenzene	µg/m ² .min ⁻¹	7	0%	7	0.0131	0.0131	0.0135	0.018	0.0142	0.0458	0	--	--	--	--	--	--
	n-Propylbenzene	µg/m ² .min ⁻¹	7	0%	7	0.0135	0.0135	0.0138	0.0186	0.0146	0.0473	0	--	--	--	--	--	--
	o-Xylene	µg/m ² .min ⁻¹	7	0%	7	0.0177	0.0177	0.0181	0.0243	0.0192	0.0615	0	--	--	--	--	--	--
	sec-Butylbenzene	µg/m ² .min ⁻¹	7	0%	7	0.0142	0.0142	0.0146	0.0195	0.0154	0.0496	0	--	--	--	--	--	--
	Styrene	µg/m ² .min ⁻¹	7	0%	7	0.0173	0.0173	0.0181	0.0241	0.0188	0.0612	0	--	--	--	--	--	--
	tert-Butylbenzene	µg/m ² .min ⁻¹	7	0%	7	0.0135	0.0135	0.0138	0.0185	0.0146	0.0465	0	--	--	--	--	--	--
	Tetrachloroethene	µg/m ² .min ⁻¹	7	0%	7	0.0273	0.0273	0.0281	0.0379	0.03	0.0962	0	--	--	--	--	--	--
	Toluene	µg/m ² .min ⁻¹	7	29%	5	0.0154	0.0154	0.0158	0.0234	0.0352	0.0538	2	0.0669	--	0.0875	0.0875	--	0.108
	trans-1,2-Dichloroethene	µg/m ² .min ⁻¹	7	0%	7	0.0104	0.0104	0.0108	0.0144	0.0115	0.0365	0	--	--	--	--	--	--
	trans-1,3-Dichloropropene	µg/m ² .min ⁻¹	7	0%	7	0.0188	0.0188	0.0192	0.0259	0.0204	0.0658	0	--	--	--	--	--	--
	Trichloroethene	µg/m ² .min ⁻¹	7	0%	7	0.0219	0.0219	0.0227	0.0303	0.0238	0.0769	0	--	--	--	--	--	--
	Vinyl acetate	µg/m ² .min ⁻¹	7	0%	7	0.0454	0.0454	0.0465	0.0625	0.0492	0.158	0	--	--	--	--	--	--
	Vinyl chloride	µg/m ² .min ⁻¹	7	0%	7	0.0104	0.0104	0.0108	0.0145	0.0115	0.0369	0	--	--	--	--	--	--
	Xylenes (total)	µg/m ² .min ⁻¹	7	0%	7	0.0354	0.0354	0.0365	0.0489	0.0385	0.124	0	--	--	--	--	--	--

Notes:

Values for Q1, median, mean, and Q3 are rounded to 3 significant figures.

Max = Maximum

Min = Minimum

Q1 = 1st quartile (25th percentile)

Q3 = 3rd quartile (75th percentile)

(1) Range of detections include estimated values of detect results ("J" flagged values).

-- = Not applicable or no value has been established.

TABLE 5-1
BACKGROUND COMPARISON SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 6)

Chemical	Parcel 9 South Sub-Area															
	Total Count	Detect Freq.	Censored (Non-Detect) Data							Detected Data ⁽¹⁾						
			Count	Min	Q1	Median	Mean	Q3	Max	Count	Min	Q1	Median	Mean	Q3	Max
Aluminum	21	100%	0	--	--	--	--	--	--	21	9590	11000	11000	12000	13000	14100
Antimony	21	0%	21	0.83	0.87	0.88	0.88	0.89	0.96	0	--	--	--	--	--	--
Arsenic	21	71%	6	5.3	5.3	5.3	5.4	5.4	5.5	15	3.5	3.9	4.9	4.9	5.6	7.3
Barium	21	100%	0	--	--	--	--	--	--	21	164	170	210	230	270	377
Beryllium	21	100%	0	--	--	--	--	--	--	21	0.64	0.71	0.76	0.77	0.84	0.94
Boron	21	5%	20	17	18	18	18	18	19.5	1	24.6	--	25	25	--	24.6
Cadmium	21	10%	19	0.26	0.27	0.27	0.27	0.27	0.29	2	0.19	--	0.27	0.27	--	0.34
Calcium	21	100%	0	--	--	--	--	--	--	21	11800	22000	28000	27000	34000	46500
Chromium	21	100%	0	--	--	--	--	--	--	21	11.5	15	16	18	18	28.3
Chromium (VI)	21	57%	9	0.1	0.11	0.11	0.11	0.11	0.12	12	0.12	0.16	0.22	0.25	0.31	0.58
Cobalt	21	100%	0	--	--	--	--	--	--	21	9	10	11	11	12	15
Copper	21	100%	0	--	--	--	--	--	--	21	17.3	22	24	27	26	78.7
Iron	21	100%	0	--	--	--	--	--	--	21	16900	18000	20000	20000	22000	23700
Lead	21	100%	0	--	--	--	--	--	--	21	8.6	9.7	10	13	12	45.9
Lithium	21	100%	0	--	--	--	--	--	--	21	11	14	16	17	19	31
Magnesium	21	100%	0	--	--	--	--	--	--	21	9430	11000	12000	12000	13000	17800
Manganese	21	100%	0	--	--	--	--	--	--	21	332	470	530	600	630	1540
Mercury	21	5%	20	0.0064	0.035	0.036	0.033	0.036	0.0389	1	0.025	--	0.025	0.025	--	0.025
Molybdenum	21	19%	17	0.41	0.41	2.7	2	2.7	2.9	4	0.51	0.61	1.8	1.9	3.2	3.3
Nickel	21	100%	0	--	--	--	--	--	--	21	16	20	21	21	23	25.4
Potassium	21	100%	0	--	--	--	--	--	--	21	2000	2200	2400	2500	2700	3510
Selenium	21	48%	11	2.6	2.7	2.7	2.7	2.8	2.9	10	1.2	1.4	1.7	1.7	2.1	2.4
Silver	21	38%	13	0.042	0.043	0.043	0.044	0.045	0.047	8	0.044	0.049	0.058	0.069	0.074	0.15
Sodium	21	100%	0	--	--	--	--	--	--	21	381	500	760	900	1000	3040

TABLE 5-1
BACKGROUND COMPARISON SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 6)

Chemical	Parcel 9 South Sub-Area															
	Total Count	Detect Freq.	Censored (Non-Detect) Data							Detected Data ⁽¹⁾						
			Count	Min	Q1	Median	Mean	Q3	Max	Count	Min	Q1	Median	Mean	Q3	Max
Strontium	21	100%	0	--	--	--	--	--	--	21	168	200	240	260	300	446
Thallium	21	10%	19	0.31	0.31	0.31	0.36	0.32	1.1	2	0.68	--	1.1	1.1	--	1.5
Tin	21	24%	16	1.1	1.1	1.1	1.1	1.1	1.2	5	0.78	0.94	1.3	1.4	2	2.2
Titanium	21	100%	0	--	--	--	--	--	--	21	730	930	1000	1000	1100	1390
Tungsten	21	10%	19	0.43	0.44	0.44	1.2	2.7	2.9	2	2.5	--	3.6	3.6	--	4.7
Uranium	21	100%	0	--	--	--	--	--	--	21	0.83	0.99	1.1	1.2	1.3	1.8
Vanadium	21	100%	0	--	--	--	--	--	--	21	42	52	56	57	61	79.3
Zinc	21	100%	0	--	--	--	--	--	--	21	38.8	46	48	54	58	97.2
Radium-226	22	95%	1	--	--	--	--	--	--	21	0.374	0.6	0.75	0.75	0.89	1.19
Radium-228	22	82%	4	--	--	--	--	--	--	18	0.939	1	1.5	1.6	2.1	2.35
Thorium-228	22	100%	0	--	--	--	--	--	--	22	0.982	1.5	1.7	1.9	2.4	3.08
Thorium-230	22	91%	2	--	--	--	--	--	--	20	0.672	1.1	1.3	1.3	1.5	2.51
Thorium-232	22	100%	0	--	--	--	--	--	--	22	1.07	1.5	1.7	1.7	1.9	2.75
Uranium-233/234	22	95%	1	--	--	--	--	--	--	21	0.239	0.77	0.8	0.89	1.1	1.46
Uranium-235/236	22	9%	20	--	--	--	--	--	--	2	0.182	0.24	0.29	0.31	0.36	0.515
Uranium-238	22	100%	0	--	--	--	--	--	--	22	0.511	0.85	0.9	1.1	1.3	1.6

Note: Background comparison t-tests were performed using one-half the detection limit for metals and using GiSDT[®] (Neptune and Company 2009). The non-parametric Gehan, quantile and slippage tests make no adjustment for detection limits, since their algorithms account for non-detects through Gehan ranking.

Max = Maximum

Min = Minimum

Q1 = 1st quartile (25th percentile)

Q3 = 3rd quartile (75th percentile)

(1) Range of detections include estimated values of detect results between the detection limit and reporting limit. As such some minimum detected concentrations may be below the minimum reporting limit. In these cases the respective sample results are flagged in the dataset.

BOLD with Highlight indicates Site concentrations are greater than background.

WRS = Wilcoxon Rank Sum Test with the Gehan Modification

N/A = Not applicable.

TABLE 5-1
BACKGROUND COMPARISON SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 3 of 6)

Chemical	Shallow Qal McCullough Background															
	Total Count	Detect Freq.	Censored (Non-Detect) Data							Detected Data ⁽¹⁾						
			Count	Min	Q1	Median	Mean	Q3	Max	Count	Min	Q1	Median	Mean	Q3	Max
Aluminum	95	100%	0	--	--	--	--	--	--	95	3740	6700	8400	9000	11000	15300
Antimony	95	45%	52	0.3298	0.33	0.33	0.33	0.33	0.3298	43	0.12	0.15	0.22	0.24	0.29	0.5
Arsenic	95	100%	0	--	--	--	--	--	--	95	2.5	3.4	4	4.2	5	7.2
Barium	95	100%	0	--	--	--	--	--	--	95	73	140	170	180	220	445
Beryllium	95	100%	0	--	--	--	--	--	--	95	0.16	0.46	0.57	0.59	0.73	0.89
Boron	95	36%	61	3.2	3.2	3.2	3.2	3.2	3.2	34	5.2	5.8	6.8	7.1	8.3	11.6
Cadmium	95	0%	95	0.1291	0.13	0.13	0.13	0.13	0.1291	0	--	--	--	--	--	--
Calcium	95	100%	0	--	--	--	--	--	--	95	9440	18000	25000	29000	37000	82800
Chromium	95	100%	0	--	--	--	--	--	--	95	2.6	6.8	9	9.1	11	16.7
Chromium (VI)	95	0%	95	0.25	0.25	0.26	0.26	0.26	0.32	0	--	--	--	--	--	--
Cobalt	95	100%	0	--	--	--	--	--	--	95	3.7	7.3	9	8.8	10	16.3
Copper	95	100%	0	--	--	--	--	--	--	95	10.2	15	18	18	20	25.9
Iron	95	100%	0	--	--	--	--	--	--	95	5410	11000	13000	13000	16000	19700
Lead	95	100%	0	--	--	--	--	--	--	95	3	6	7.2	8.2	9.3	35.1
Lithium	95	100%	0	--	--	--	--	--	--	95	7.5	11	13	14	17	26.5
Magnesium	95	100%	0	--	--	--	--	--	--	95	4690	8500	10000	10000	13000	17500
Manganese	95	100%	0	--	--	--	--	--	--	95	151	320	410	410	500	863
Mercury	95	77%	22	0.0072	0.0072	0.0072	0.0072	0.0072	0.0072	73	0.0084	0.012	0.018	0.023	0.028	0.11
Molybdenum	95	100%	0	--	--	--	--	--	--	95	0.3	0.41	0.49	0.55	0.61	2
Nickel	95	100%	0	--	--	--	--	--	--	95	7.9	14	16	16	19	30
Potassium	95	100%	0	--	--	--	--	--	--	95	625	1200	1600	1800	2200	3890
Selenium	95	35%	62	0.1579	0.16	0.16	0.16	0.16	0.1579	33	0.23	0.28	0.31	0.33	0.36	0.6
Silver	95	0%	95	0.2609	0.26	0.26	0.26	0.26	0.2609	0	--	--	--	--	--	--
Sodium	95	100%	0	--	--	--	--	--	--	95	128	210	490	500	690	1320

TABLE 5-1
BACKGROUND COMPARISON SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 4 of 6)

Chemical	Shallow Qal McCullough Background															
	Total Count	Detect Freq.	Censored (Non-Detect) Data							Detected Data ⁽¹⁾						
			Count	Min	Q1	Median	Mean	Q3	Max	Count	Min	Q1	Median	Mean	Q3	Max
Strontium	95	100%	0	--	--	--	--	--	--	95	75.5	140	190	230	270	808
Thallium	95	22%	74	0.5428	0.54	0.54	0.54	0.54	0.5428	21	1.1	1.2	1.4	1.4	1.7	1.8
Tin	95	100%	0	--	--	--	--	--	--	95	0.24	0.41	0.51	0.5	0.57	0.8
Titanium	95	100%	0	--	--	--	--	--	--	95	262	460	540	560	660	1010
Tungsten	95	0%	95	0.0175	0.018	0.018	0.018	0.018	0.0175	0	--	--	--	--	--	--
Uranium	94	100%	0	--	--	--	--	--	--	94	0.62	0.84	0.97	1	1.1	2.7
Vanadium	95	100%	0	--	--	--	--	--	--	95	20.2	34	38	39	45	59.1
Zinc	95	100%	0	--	--	--	--	--	--	95	15.4	30	38	38	43	121
Radium-226	95	96%	4	--	--	--	--	--	--	91	0.494	0.95	1.1	1.1	1.3	2.36
Radium-228	81	80%	16	--	--	--	--	--	--	65	0.946	1.6	1.9	1.9	2.2	2.92
Thorium-228	95	100%	0	--	--	--	--	--	--	95	1.15	1.5	1.8	1.7	1.9	2.28
Thorium-230	95	100%	0	--	--	--	--	--	--	95	0.73	1	1.2	1.3	1.5	3.01
Thorium-232	95	100%	0	--	--	--	--	--	--	95	1.22	1.4	1.7	1.7	1.9	2.23
Uranium-233/234	95	47%	50	--	--	--	--	--	--	45	0.63	0.9	1.1	1.2	1.2	2.84
Uranium-235/236	95	44%	53	--	--	--	--	--	--	42	0.0009	0.045	0.06	0.07	0.092	0.21
Uranium-238	95	100%	0	--	--	--	--	--	--	95	0.65	0.94	1.1	1.2	1.4	2.37

Note: Background comparison t-tests were performed using one-half the detection limit for metals and using GiSDT[®] (Neptune and Company 2009). The non-parametric Gehan, quantile and slippage tests make no adjustment for detection limits, since their algorithms account for non-detects through Gehan ranking.

Max = Maximum

Min = Minimum

Q1 = 1st quartile (25th percentile)

Q3 = 3rd quartile (75th percentile)

(1) Range of detections include estimated values of detect results between the detection limit and reporting limit. As such some minimum detected concentrations may be below the minimum reporting limit. In these cases the respective sample results are flagged in the dataset.

BOLD with Highlight indicates Site concentrations are greater than background.

WRS = Wilcoxon Rank Sum Test with the Gehan Modification

N/A = Not applicable.

TABLE 5-1
BACKGROUND COMPARISON SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 5 of 6)

Chemical	T Test <i>p</i>	Quantile Test <i>p</i>	Suppage Test <i>p</i>	WRS Test <i>p</i>	Greater than Background?	Units	Basis
Aluminum	8.5 E-9	5.7 E-2	1.0 E+0	5.1 E-5	YES	mg/kg	Multiple tests
Antimony	5.4 E-54	1.0 E+0	1.0 E+0	3.2 E-14	YES	mg/kg	Multiple tests
Arsenic	4.0 E-1	2.1 E-1	1.8 E-1	6.4 E-4	YES	mg/kg	WRS test
Barium	8.0 E-4	6.0 E-3	1.0 E+0	2.7 E-4	YES	mg/kg	Multiple tests
Beryllium	8.2 E-10	1.8 E-2	3.1 E-2	3.3 E-6	YES	mg/kg	Multiple tests
Boron	1.4 E-8	1.0 E+0	1.0 E-2	5.1 E-15	YES	mg/kg	Multiple tests
Cadmium	2.8 E-8	1.6 E-23	NA	0.0 E+0	YES	mg/kg	Multiple tests
Calcium	7.9 E-1	9.4 E-1	1.0 E+0	4.0 E-1	NO	mg/kg	Multiple tests
Chromium	6.6 E-9	1.2 E-12	2.5 E-6	8.9 E-12	YES	mg/kg	Multiple tests
Chromium (VI)	1.2 E-1	5.1 E-10	NA	1.0 E+0	YES	mg/kg	Quantile test
Cobalt	4.3 E-8	4.2 E-5	1.0 E+0	3.1 E-7	YES	mg/kg	Multiple tests
Copper	2.5 E-3	4.1 E-8	8.4 E-4	1.1 E-8	YES	mg/kg	Multiple tests
Iron	2.5 E-16	1.2 E-12	4.3 E-9	7.7 E-12	YES	mg/kg	Multiple tests
Lead	7.9 E-3	2.6 E-3	1.8 E-1	5.9 E-7	YES	mg/kg	Multiple tests
Lithium	4.4 E-3	3.9 E-2	1.8 E-1	9.3 E-4	YES	mg/kg	Multiple tests
Magnesium	6.2 E-4	5.7 E-1	1.8 E-1	5.3 E-3	YES	mg/kg	Multiple tests
Manganese	1.9 E-3	2.6 E-3	3.1 E-2	1.5 E-5	YES	mg/kg	Multiple tests
Mercury	7.3 E-1	1.0 E+0	1.0 E+0	5.1 E-7	YES	mg/kg	WRS test
Molybdenum	8.5 E-4	9.3 E-1	6.7 E-3	1.0 E-5	YES	mg/kg	Multiple tests
Nickel	4.4 E-9	4.1 E-8	1.0 E+0	1.1 E-7	YES	mg/kg	Multiple tests
Potassium	2.0 E-8	6.0 E-3	1.0 E+0	3.3 E-6	YES	mg/kg	Multiple tests
Selenium	6.4 E-15	1.1 E-2	3.5 E-14	3.9 E-15	YES	mg/kg	Multiple tests
Silver	1.0 E+0	1.0 E+0	NA	1.0 E+0	NO	mg/kg	Multiple tests
Sodium	3.1 E-3	2.6 E-3	3.1 E-2	1.1 E-4	YES	mg/kg	Multiple tests

TABLE 5-1
BACKGROUND COMPARISON SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 6 of 6)

Chemical	T Test <i>p</i>	Quantile Test <i>p</i>	Slippage Test <i>p</i>	WRS Test <i>p</i>	Greater than Background?	Units	Basis
Strontium	9.6 E-2	2.4 E-1	1.0 E+0	1.0 E-2	YES	mg/kg	WRS test
Thallium	1.0 E+0	8.7 E-1	1.0 E+0	1.0 E+0	NO	mg/kg	Multiple tests
Tin	7.4 E-3	6.5 E-1	1.3 E-6	4.3 E-13	YES	mg/kg	Multiple tests
Titanium	8.9 E-14	1.4 E-14	3.9 E-8	2.8 E-12	YES	mg/kg	Multiple tests
Tungsten	9.2 E-4	3.2 E-7	NA	0.0 E+0	YES	mg/kg	Multiple tests
Uranium	1.5 E-2	4.1 E-2	1.0 E+0	2.0 E-3	YES	mg/kg	Multiple tests
Vanadium	8.0 E-10	5.8 E-11	1.3 E-4	3.1 E-10	YES	mg/kg	Multiple tests
Zinc	2.9 E-5	7.7 E-6	1.0 E+0	3.1 E-8	YES	mg/kg	Multiple tests
Radium-226	1.0 E+0	1.0 E+0	1.0 E+0	1.0 E+0	NO	pCi/g	Multiple tests
Radium-228	1.0 E+0	7.1 E-1	1.0 E+0	1.0 E+0	NO	pCi/g	Multiple tests
Thorium-228	8.1 E-2	5.1 E-2	2.4 E-5	1.7 E-1	YES	pCi/g	Slippage test
Thorium-230	3.9 E-1	4.4 E-1	1.0 E+0	2.6 E-1	NO	pCi/g	Multiple tests
Thorium-232	1.3 E-1	4.4 E-1	1.9 E-1	1.4 E-1	NO	pCi/g	Multiple tests
Uranium-233/234	1.0 E+0	9.4 E-1	1.0 E+0	1.0 E+0	NO	pCi/g	Multiple tests
Uranium-235/236	3.2 E-12	4.6 E-18	2.8 E-22	1.6 E-13	NO	pCi/g	All results near noise level of instrument (see text)
Uranium-238	9.5 E-1	6.9 E-1	1.0 E+0	9.5 E-1	NO	pCi/g	Multiple tests

Note: Background comparison t-tests were performed using one-half the detection limit for metals and using GiSDT[®] (Neptune and Company 2009). The non-parametric Gehan, quantile and slippage tests make no adjustment for detection limits, since their algorithms account for non-detects through Gehan ranking.

Max = Maximum

Min = Minimum

Q1 = 1st quartile (25th percentile)

Q3 = 3rd quartile (75th percentile)

(1) Range of detections include estimated values of detect results between the detection limit and reporting limit. As such some minimum detected concentrations may be below the minimum reporting limit. In these cases the respective sample results are flagged in the dataset.

BOLD with Highlight indicates Site concentrations are greater than background.

WRS = Wilcoxon Rank Sum Test with the Gehan Modification

N/A = Not applicable.

TABLE 5-5
RESULTS OF COMPARISON TO WORKER SOIL BCLs
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 8)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Max. Detect	Greater than Background?	Worker Soil BCL	1/10th Worker Soil BCL	Max. Detect Greater than 1/10th Worker BCL
<i>Asbestos</i>									
Asbestos	Structures	1	12	8.3%	3	--	--	--	--
<i>Aldehydes</i>									
Acetaldehyde	mg/kg	22	22	100.0%	12.3	--	69.9	6.99	YES
Formaldehyde	mg/kg	21	22	95.5%	1.42	--	67,000	6,700	NO
<i>Dioxins / Furans</i>									
1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/g	7	11	63.6%	1300	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/g	7	11	63.6%	150	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/g	7	11	63.6%	590	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran	pg/g	7	11	63.6%	780	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/g	3	11	27.3%	24	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran	pg/g	7	11	63.6%	460	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/g	5	11	45.5%	49	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran	pg/g	6	11	54.5%	71	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/g	3	11	27.3%	46	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran	pg/g	7	11	63.6%	430	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/g	2	11	18.2%	33	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran	pg/g	6	11	54.5%	110	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran	pg/g	7	11	63.6%	240	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran	pg/g	8	11	72.7%	200	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/g	4	11	36.4%	11	--	--	--	--
Octachlorodibenzodioxin	pg/g	7	11	63.6%	1900	--	--	--	--
Octachlorodibenzofuran	pg/g	8	11	72.7%	3000	--	--	--	--
TCDD TEQ	pg/g	11	11	100%	330	--	1,000	--	--
<i>General Chemistry/Ions</i>									
Ammonia (as N)	mg/kg	1	22	4.5%	2	--	100,000	10,000	NO
Bromide	mg/kg	4	22	18.2%	2.4	--	100,000	10,000	NO
Chlorate	mg/kg	11	22	50.0%	70.1	--	34,100	3,410	NO
Chloride	mg/kg	22	22	100%	970	--	--	--	--
Cyanide, Total	mg/kg	0	22	0.0%	--	--	27.8	2.78	--
Fluoride	mg/kg	22	22	100%	4.1	--	41,000	4,100	NO
Nitrate	mg/kg	22	22	100.0%	31.9	--	100,000	10,000	NO
Nitrite	mg/kg	0	22	0.0%	--	--	100,000	10,000	--
Orthophosphate as P	mg/kg	1	22	4.5%	8.3	--	--	--	--
Perchlorate	mg/kg	20	22	90.9%	8.45	--	795	79.5	NO
Sulfate	mg/kg	22	22	100.0%	1780	--	--	--	--
Sulfide	mg/kg	0	22	0%	--	--	--	--	--

TABLE 5-5
RESULTS OF COMPARISON TO WORKER SOIL BCLs
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 8)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Max. Detect	Greater than Background?	Worker Soil BCL	1/10th Worker Soil BCL	Max. Detect Greater than 1/10th Worker BCL
Total Kjeldahl Nitrogen (TKN)	mg/kg	22	22	100%	88.6	--	--	--	--
<i>Metals</i>									
Aluminum	mg/kg	21	21	100%	14100	YES	100,000	10,000	YES
Antimony	mg/kg	0	21	0.0%	--	YES	454	45.4	--
Arsenic	mg/kg	15	21	71.4%	7.3	YES	1.77	0.177	YES
Barium	mg/kg	21	21	100%	377	YES	100,000	10,000	NO
Beryllium	mg/kg	21	21	100.0%	0.94	YES	2,230	223	NO
Boron	mg/kg	1	21	4.8%	24.6	YES	100,000	10,000	NO
Cadmium	mg/kg	2	21	9.5%	0.34	YES	1,110	111	NO
Calcium	mg/kg	21	21	100%	46500	NO	--	--	--
Chromium	mg/kg	21	21	100%	28.3	YES	100,000	10,000	NO
Chromium (VI)	mg/kg	12	21	57.1%	0.58	YES	1,230	123	NO
Cobalt	mg/kg	21	21	100%	15	YES	337	33.7	NO
Copper	mg/kg	21	21	100.0%	78.7	YES	42,200	4,220	NO
Iron	mg/kg	21	21	100%	23700	YES	100,000	10,000	YES
Lead	mg/kg	21	21	100%	45.9	YES	--	--	--
Lithium	mg/kg	21	21	100%	31	YES	2,270	227	NO
Magnesium	mg/kg	21	21	100%	17800	YES	100,000	10,000	YES
Manganese	mg/kg	21	21	100%	1540	YES	24,900	2,490	NO
Mercury	mg/kg	1	21	4.8%	0.025	YES	341	34.1	NO
Molybdenum	mg/kg	4	21	19.0%	3.3	YES	5,680	568	NO
Nickel	mg/kg	21	21	100%	25.4	YES	21,800	2,180	NO
Potassium	mg/kg	21	21	100%	3510	YES	--	--	--
Selenium	mg/kg	10	21	47.6%	2.4	YES	5,680	568	NO
Silver	mg/kg	8	21	38.1%	0.15	NO	5,680	568	--
Sodium	mg/kg	21	21	100%	3040	YES	--	--	--
Strontium	mg/kg	21	21	100%	446	YES	100,000	10,000	NO
Thallium	mg/kg	2	21	9.5%	1.5	NO	74.9	7.49	--
Tin	mg/kg	5	21	23.8%	2.2	YES	100,000	10,000	NO
Titanium	mg/kg	21	21	100%	1390	YES	100,000	10,000	NO
Tungsten	mg/kg	2	21	9.5%	4.7	YES	8,510	851	NO
Uranium	mg/kg	21	21	100.0%	1.8	YES	3,400	340	NO
Vanadium	mg/kg	21	21	100%	79.3	YES	5,680	568	NO
Zinc	mg/kg	21	21	100%	97.2	YES	100,000	10,000	NO
<i>Organochlorine Pesticides</i>									
2,4-DDD	mg/kg	0	22	0.0%	--	--	--	--	--
2,4-DDE	mg/kg	3	22	13.6%	0.018	--	--	--	--

TABLE 5-5
RESULTS OF COMPARISON TO WORKER SOIL BCLs
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 3 of 8)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Max. Detect	Greater than Background?	Worker Soil BCL	1/10th Worker Soil BCL	Max. Detect Greater than 1/10th Worker BCL
4,4-DDD	mg/kg	0	22	0.0%	--	--	11.1	1.11	--
4,4-DDE	mg/kg	4	22	18.2%	0.018	--	7.81	0.781	NO
4,4-DDT	mg/kg	4	22	18.2%	0.018	--	7.81	0.781	NO
Aldrin	mg/kg	1	22	5%	0.002	--	0.113	0.0113	NO
alpha-BHC	mg/kg	0	22	0.0%	--	--	270	27	--
alpha-Chlordane	mg/kg	0	22	0.0%	--	--	--	--	--
beta-BHC	mg/kg	4	22	18.2%	0.023	--	53.9	5.39	NO
Chlordane	mg/kg	0	22	0.0%	--	--	7.19	0.719	--
delta-BHC	mg/kg	0	22	0%	--	--	270	27	--
Dieldrin	mg/kg	0	22	0%	--	--	0.12	0.012	--
Endosulfan I	mg/kg	0	22	0%	--	--	4,100	410	--
Endosulfan II	mg/kg	0	22	0%	--	--	4,100	410	--
Endosulfan sulfate	mg/kg	0	22	0%	--	--	--	--	--
Endrin	mg/kg	0	22	0%	--	--	205	20.5	--
Endrin aldehyde	mg/kg	0	22	0.0%	--	--	--	--	--
Endrin ketone	mg/kg	0	22	0.0%	--	--	--	--	--
gamma-BHC (Lindane)	mg/kg	0	22	0%	--	--	8.98	0.898	--
gamma-Chlordane	mg/kg	0	22	0.0%	--	--	--	--	--
Heptachlor	mg/kg	0	14	0%	--	--	0.426	0.0426	--
Heptachlor epoxide	mg/kg	0	22	0%	--	--	0.21	0.021	--
Methoxychlor	mg/kg	0	22	0%	--	--	3,420	342	--
Toxaphene	mg/kg	0	22	0%	--	--	1.74	0.174	--
<i>Polynuclear Aromatic Hydrocarbons</i>									
Acenaphthene	mg/kg	0	22	0.0%	--	--	2,350	235	--
Acenaphthylene	mg/kg	0	22	0.0%	--	--	147	14.7	--
Anthracene	mg/kg	0	22	0.0%	--	--	9,060	906	--
Benzo(a)anthracene	mg/kg	0	22	0.0%	--	--	2.34	0.234	--
Benzo(a)pyrene	mg/kg	0	22	0.0%	--	--	0.234	0.0234	--
Benzo(b)fluoranthene	mg/kg	0	22	0.0%	--	--	2.34	0.234	--
Benzo(g,h,i)perylene	mg/kg	0	22	0.0%	--	--	34,100	3,410	--
Benzo(k)fluoranthene	mg/kg	0	22	0.0%	--	--	23.4	2.34	--
Chrysene	mg/kg	0	22	0.0%	--	--	234	23.4	--
Dibenzo(a,h)anthracene	mg/kg	0	22	0.0%	--	--	0.234	0.0234	--
Indeno(1,2,3-cd)pyrene	mg/kg	0	22	0.0%	--	--	2.34	0.234	--
Phenanthrene	mg/kg	0	22	0.0%	--	--	24.5	2.45	--
Pyrene	mg/kg	0	22	0.0%	--	--	19,300	1,930	--

TABLE 5-5
RESULTS OF COMPARISON TO WORKER SOIL BCLs
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 4 of 8)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Max. Detect	Greater than Background?	Worker Soil BCL	1/10th Worker Soil BCL	Max. Detect Greater than 1/10th Worker BCL
<i>Polychlorinated Biphenyls</i>									
PCB 105	pg/g	11	11	100.0%	1900	--	--	--	--
PCB 114	pg/g	6	11	54.5%	63	--	--	--	--
PCB 118	pg/g	10	11	90.9%	3900	--	--	--	--
PCB 123	pg/g	2	11	18.2%	92	--	--	--	--
PCB 126	pg/g	6	11	54.5%	99	--	--	--	--
PCB 156	pg/g	8	10	80.0%	810	--	--	--	--
PCB 156/157	pg/g	1	1	100%	170	--	--	--	--
PCB 157	pg/g	6	10	60.0%	480	--	--	--	--
PCB 167	pg/g	8	11	72.7%	290	--	--	--	--
PCB 169	pg/g	3	11	27.3%	14	--	--	--	--
PCB 189	pg/g	7	11	63.6%	110	--	--	--	--
PCB 209	pg/g	10	11	90.9%	19000	--	--	--	--
PCB 77	pg/g	2	11	18.2%	58	--	--	--	--
PCB 81	pg/g	1	11	9.1%	24	--	--	--	--
<i>Radionuclides</i>									
Radium-226	pCi/g	21	22	95.5%	1.19	NO	0.023	0.0023	--
Radium-228	pCi/g	18	22	81.8%	2.35	NO	0.041	0.0041	--
Thorium-228	pCi/g	22	22	100.0%	3.08	YES	0.025	0.0025	YES
Thorium-230	pCi/g	20	22	90.9%	2.51	NO	8.3	0.83	--
Thorium-232	pCi/g	22	22	100.0%	2.75	NO	7.4	0.74	--
Uranium-233/234	pCi/g	21	22	95.5%	1.46	NO	11	1.1	--
Uranium-235/236	pCi/g	2	22	9.1%	0.515	NO	0.35	0.035	--
Uranium-238	pCi/g	22	22	100%	1.6	NO	1.4	0.14	--
<i>Semi-Volatile Organic Compounds</i>									
1,2,4,5-Tetrachlorobenzene	mg/kg	0	22	0%	--	--	205	20.5	--
1,2-Diphenylhydrazine	mg/kg	0	22	0%	--	--	2.39	0.239	--
1,4-Dioxane	mg/kg	0	22	0%	--	--	19.2	1.92	--
2,2'-Dichlorobenzil	mg/kg	0	22	0.0%	--	--	341	34.1	--
2,4,5-Trichlorophenol	mg/kg	0	22	0%	--	--	68,400	6,840	--
2,4,6-Trichlorophenol	mg/kg	0	22	0%	--	--	174	17.4	--
2,4-Dichlorophenol	mg/kg	0	22	0%	--	--	2,050	205	--
2,4-Dimethylphenol	mg/kg	0	22	0%	--	--	13,700	1,370	--
2,4-Dinitrophenol	mg/kg	0	22	0%	--	--	1,370	137	--
2,4-Dinitrotoluene	mg/kg	0	22	0%	--	--	6.18	0.618	--
2,6-Dinitrotoluene	mg/kg	0	22	0%	--	--	684	68.4	--
2-Chloronaphthalene	mg/kg	0	22	0%	--	--	351	35.1	--

TABLE 5-5
RESULTS OF COMPARISON TO WORKER SOIL BCLs
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 5 of 8)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Max. Detect	Greater than Background?	Worker Soil BCL	1/10th Worker Soil BCL	Max. Detect Greater than 1/10th Worker BCL
2-Chlorophenol	mg/kg	0	22	0%	--	--	1,670	167	--
2-Methylnaphthalene	mg/kg	0	22	0%	--	--	--	--	--
2-Nitroaniline	mg/kg	0	22	0%	--	--	2,050	205	--
2-Nitrophenol	mg/kg	0	22	0%	--	--	--	--	--
3,3-Dichlorobenzidine	mg/kg	0	22	0%	--	--	4.26	0.426	--
3-Nitroaniline	mg/kg	0	22	0%	--	--	--	--	--
4-Bromophenyl phenyl ether	mg/kg	0	22	0%	--	--	--	--	--
4-Chloro-3-methylphenol	mg/kg	0	22	0%	--	--	--	--	--
4-Chlorophenyl phenyl ether	mg/kg	0	22	0%	--	--	--	--	--
4-Chloroethoxyanisole	mg/kg	0	22	0%	--	--	--	--	--
4-Nitroaniline	mg/kg	0	22	0%	--	--	--	--	--
4-Nitrophenol	mg/kg	0	22	0%	--	--	5,470	547	--
Acetophenone	mg/kg	0	22	0%	--	--	1,740	174	--
Aniline	mg/kg	0	22	0%	--	--	336	33.6	--
Benzenethiol	mg/kg	0	22	0%	--	--	--	--	--
Benzoic acid	mg/kg	0	22	0%	--	--	100,000	10,000	--
Benzyl alcohol	mg/kg	0	22	0%	--	--	100,000	10,000	--
bis(2-Chloroethoxy)methane	mg/kg	0	22	0%	--	--	--	--	--
bis(2-Chloroethyl) ether	mg/kg	0	22	0%	--	--	1.3	0.13	--
bis(2-Chloroisopropyl) ether	mg/kg	0	22	0%	--	--	18	1.8	--
bis(2-Ethylhexyl) phthalate	mg/kg	0	22	0%	--	--	137	13.7	--
bis(p-Chlorophenyl) sulfone	mg/kg	0	22	0%	--	--	--	--	--
bis(p-Chlorophenyl)disulfide	mg/kg	0	22	0%	--	--	--	--	--
Butylbenzyl phthalate	mg/kg	0	22	0%	--	--	240	24	--
Carbazole	mg/kg	0	22	0%	--	--	95.8	9.58	--
Dibenzofuran	mg/kg	0	22	0%	--	--	2,270	227	--
Dichloromethyl ether	mg/kg	0	22	0%	--	--	0.00127	0.000127	--
Diethyl phthalate	mg/kg	0	22	0%	--	--	100,000	10,000	--
Dimethyl phthalate	mg/kg	0	22	0%	--	--	100,000	10,000	--
Di-n-butyl phthalate	mg/kg	0	22	0%	--	--	68,400	6,840	--
Di-n-octyl phthalate	mg/kg	0	22	0%	--	--	--	--	--
Diphenyl disulfide	mg/kg	0	22	0%	--	--	--	--	--
Diphenyl sulfide	mg/kg	0	22	0%	--	--	--	--	--
Diphenyl sulfone	mg/kg	0	22	0%	--	--	2,050	205	--
Diphenylamine	mg/kg	0	22	0%	--	--	17,100	1,710	--
Fluoranthene	mg/kg	0	22	0.0%	--	--	24,400	2,440	--
Fluorene	mg/kg	0	22	0%	--	--	3,440	344	--

TABLE 5-5
RESULTS OF COMPARISON TO WORKER SOIL BCLs
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 6 of 8)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Max. Detect	Greater than Background?	Worker Soil BCL	1/10th Worker Soil BCL	Max. Detect Greater than 1/10th Worker BCL
Hexachlorobenzene	mg/kg	0	22	0.0%	--	--	1.2	0.12	--
Hexachlorobutadiene	mg/kg	0	22	0%	--	--	24.6	2.46	--
Hexachlorocyclopentadiene	mg/kg	0	22	0%	--	--	4,090	409	--
Hexachloroethane	mg/kg	0	22	0%	--	--	137	13.7	--
Hydroxymethyl phthalimide	mg/kg	0	22	0%	--	--	--	--	--
Isophorone	mg/kg	0	22	0%	--	--	2,020	202	--
m,p-Cresols	mg/kg	0	22	0%	--	--	34,200	3,420	--
Naphthalene	mg/kg	0	22	0%	--	--	15.6	1.56	--
Nitrobenzene	mg/kg	0	22	0%	--	--	13.6	1.36	--
N-nitrosodi-n-propylamine	mg/kg	0	22	0%	--	--	0.274	0.0274	--
o-Cresol	mg/kg	0	22	0%	--	--	34,200	3,420	--
Octachlorostyrene	mg/kg	0	22	0%	--	--	--	--	--
p-Chloroaniline	mg/kg	0	22	0%	--	--	9.58	0.958	--
p-Chlorobenzenethiol	mg/kg	0	22	0%	--	--	--	--	--
Pentachlorobenzene	mg/kg	0	22	0%	--	--	547	54.7	--
Pentachlorophenol	mg/kg	0	22	0%	--	--	3	0.3	--
Phenol	mg/kg	0	22	0%	--	--	100,000	10,000	--
Phthalic acid	mg/kg	0	22	0%	--	--	100,000	10,000	--
Pyridine	mg/kg	0	22	0%	--	--	667	66.7	--
<i>Volatile Organic Compounds</i>									
1,1,1,2-Tetrachloroethane	mg/kg	0	22	0%	--	--	19.9	1.99	--
1,1,1-Trichloroethane	mg/kg	0	22	0%	--	--	1,390	139	--
1,1,2,2-Tetrachloroethane	mg/kg	0	22	0%	--	--	2.54	0.254	--
1,1,2-Trichloroethane	mg/kg	0	22	0%	--	--	5.51	0.551	--
1,1-Dichloroethane	mg/kg	0	22	0%	--	--	21.4	2.14	--
1,1-Dichloroethene	mg/kg	0	22	0%	--	--	1,270	127	--
1,1-Dichloropropene	mg/kg	0	22	0%	--	--	--	--	--
1,2,3-Trichlorobenzene	mg/kg	0	22	0.0%	--	--	--	--	--
1,2,3-Trichloropropane	mg/kg	0	22	0%	--	--	0.106	0.0106	--
1,2,4-Trichlorobenzene	mg/kg	0	22	0.0%	--	--	110	11	--
1,2,4-Trimethylbenzene	mg/kg	0	22	0.0%	--	--	604	60.4	--
1,2-Dichlorobenzene	mg/kg	1	22	4.5%	0.00053	--	373	37.3	NO
1,2-Dichloroethane	mg/kg	0	22	0%	--	--	2.24	0.224	--
1,2-Dichloroethene	mg/kg	0	22	0%	--	--	--	--	--
1,2-Dichloropropane	mg/kg	0	22	0%	--	--	4.29	0.429	--
1,3,5-Trichlorobenzene	mg/kg	0	22	0%	--	--	--	--	--
1,3,5-Trimethylbenzene	mg/kg	0	22	0%	--	--	246	24.6	--

TABLE 5-5
RESULTS OF COMPARISON TO WORKER SOIL BCLs
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 7 of 8)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Max. Detect	Greater than Background?	Worker Soil BCL	1/10th Worker Soil BCL	Max. Detect Greater than 1/10th Worker BCL
1,3-Dichlorobenzene	mg/kg	0	22	0.0%	--	--	373	37.3	--
1,3-Dichloropropane	mg/kg	0	22	0%	--	--	64.6	6.46	--
1,4-Dichlorobenzene	mg/kg	1	22	4.5%	0.00073	--	13.6	1.36	NO
2,2,3-Trimethylbutane	mg/kg	0	22	0%	--	--	--	--	--
2,2-Dichloropropane	mg/kg	0	22	0%	--	--	--	--	--
2,2-Dimethylpentane	mg/kg	0	22	0%	--	--	--	--	--
2,3-Dimethylpentane	mg/kg	0	22	0%	--	--	--	--	--
2,4-Dimethylpentane	mg/kg	0	22	0%	--	--	--	--	--
2-Chlorotoluene	mg/kg	0	22	0%	--	--	511	51.1	--
2-Hexanone	mg/kg	0	22	0%	--	--	1,930	193	--
2-Methylhexane	mg/kg	0	22	0%	--	--	--	--	--
2-Nitropropane	mg/kg	0	22	0%	--	--	0.0591	0.00591	--
3,3-Dimethylpentane	mg/kg	0	22	0%	--	--	--	--	--
3-Ethylpentane	mg/kg	0	22	0%	--	--	--	--	--
3-Methylhexane	mg/kg	0	22	0%	--	--	--	--	--
4-Chlorotoluene	mg/kg	0	22	0%	--	--	--	--	--
4-Methyl-2-pentanone (MIBK)	mg/kg	0	22	0%	--	--	17,200	1,720	--
Acetone	mg/kg	7	22	31.8%	0.037	--	100,000	10,000	NO
Acetonitrile	mg/kg	0	22	0%	--	--	6,150	615	--
Benzene	mg/kg	0	22	0.0%	--	--	4.21	0.421	--
Bromobenzene	mg/kg	0	22	0%	--	--	695	69.5	--
Bromodichloromethane	mg/kg	0	22	0%	--	--	3.36	0.336	--
Bromoform	mg/kg	0	22	0%	--	--	242	24.2	--
Bromomethane	mg/kg	0	22	0%	--	--	39.1	3.91	--
Carbon disulfide	mg/kg	2	22	9%	0.0004	--	721	72.1	NO
Carbon tetrachloride	mg/kg	0	22	0%	--	--	3.84	0.384	--
Chlorobenzene	mg/kg	0	22	0.0%	--	--	695	69.5	--
Chlorobromomethane	mg/kg	0	22	0%	--	--	--	--	--
Chloroethane	mg/kg	0	22	0%	--	--	1,100	110	--
Chloroform	mg/kg	0	22	0.0%	--	--	1.55	0.155	--
Chloromethane	mg/kg	0	22	0%	--	--	8.05	0.805	--
cis-1,2-Dichloroethene	mg/kg	0	22	0%	--	--	737	73.7	--
cis-1,3-Dichloropropene	mg/kg	0	22	0%	--	--	--	--	--
Cymene (Isopropyltoluene)	mg/kg	0	22	0%	--	--	647	64.7	--
Dibromochloromethane	mg/kg	0	22	0%	--	--	6.03	0.603	--
Dibromochloropropane	mg/kg	0	22	0%	--	--	0.0529	0.00529	--
Dibromomethane	mg/kg	0	22	0%	--	--	191	19.1	--

TABLE 5-5
RESULTS OF COMPARISON TO WORKER SOIL BCLs
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 8 of 8)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Max. Detect	Greater than Background?	Worker Soil BCL	1/10th Worker Soil BCL	Max. Detect Greater than 1/10th Worker BCL
Dichloromethane (Methylene chloride)	mg/kg	2	22	9.1%	0.063	--	58.5	5.85	NO
Dimethyldisulfide	mg/kg	0	22	0%	--	--	--	--	--
Ethanol	mg/kg	0	22	0%	--	--	100,000	10,000	--
Ethylbenzene	mg/kg	0	22	0%	--	--	19.6	1.96	--
Freon-11 (Trichlorofluoromethane)	mg/kg	0	22	0%	--	--	1,980	198	--
Freon-113 (1,1,2-Trifluoro-1,2,2-trichloroethane)	mg/kg	0	22	0%	--	--	5,550	555	--
Freon-12 (Dichlorodifluoromethane)	mg/kg	0	22	0%	--	--	340	34	--
Heptane	mg/kg	0	22	0%	--	--	220	22	--
Isopropylbenzene	mg/kg	0	22	0%	--	--	647	64.7	--
m,p-Xylene	mg/kg	0	22	0%	--	--	214	21.4	--
Methyl ethyl ketone (2-Butanone)	mg/kg	0	22	0%	--	--	34,100	3,410	--
Methyl iodide	mg/kg	0	22	0%	--	--	1,510	151	--
MTBE (Methyl tert-butyl ether)	mg/kg	0	22	0%	--	--	208	20.8	--
n-Butylbenzene	mg/kg	0	22	0%	--	--	237	23.7	--
Nonanal	mg/kg	0	22	0.0%	--	--	--	--	--
n-Propylbenzene	mg/kg	0	22	0%	--	--	237	23.7	--
o-Xylene	mg/kg	0	22	0%	--	--	282	28.2	--
sec-Butylbenzene	mg/kg	0	22	0%	--	--	223	22.3	--
Styrene	mg/kg	0	22	0%	--	--	1,730	173	--
tert-Butylbenzene	mg/kg	0	22	0%	--	--	393	39.3	--
Tetrachloroethene	mg/kg	0	22	0%	--	--	3.28	0.328	--
Toluene	mg/kg	0	22	0%	--	--	521	52.1	--
trans-1,2-Dichloroethene	mg/kg	0	22	0%	--	--	547	54.7	--
trans-1,3-Dichloropropene	mg/kg	0	22	0%	--	--	--	--	--
Trichloroethene	mg/kg	0	22	0%	--	--	5.49	0.549	--
Vinyl acetate	mg/kg	0	22	0%	--	--	2,710	271	--
Vinyl chloride	mg/kg	0	22	0%	--	--	1.86	0.186	--
Xylenes (total)	mg/kg	0	22	0%	--	--	214	21.4	--

mg/kg - milligrams per kilogram

pCi/g - picoCuries per gram

ppt - parts per trillion

-- - Not available or not applicable

Chemical with at least one detection was compared to it's respective BCL.

Dioxin/furans and PCB congeners are evaluated as TCDD TEQs. These constituents, as well as lead, are evaluated using a separate process (see text).

Highlight indicates metals exceeding background and other inorganic/organic chemicals exceeding 1/10th worker BCLs.

TABLE 5-6
SELECTION OF CHEMICALS OF POTENTIAL CONCERN (COPCs)
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 9)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Min ND	Max ND	Min Detect	Max Detect	Mean	Standard Deviation	Greater than Background?	PBT(1) or Class A Carcinogen?	COPC?	Rationale
<i>Asbestos</i>														
Asbestos	Structures	1	12	8.3%	--	--	3	3	--	--	--	Yes	Yes	(1)
<i>Aldehydes</i>														
Acetaldehyde	mg/kg	22	22	100%	--	--	0.512	12.3	2.5	2.60	--	No	Yes	(5)(14)
Formaldehyde	mg/kg	21	22	95.5%	0.22	0.22	0.26	1.42	0.52	0.31	--	No	No	(5)(13)
<i>Dioxins / Furans</i>														
1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/g	7	11	63.6%	0.47	1.9	24	1300	160	380	--	Yes	No	(1)(3)
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/g	7	11	63.6%	0.18	0.4	5.3	150	36	53	--	Yes	No	(1)(3)
1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/g	7	11	63.6%	0.27	0.76	8.2	590	71	170	--	Yes	No	(1)(3)
1,2,3,4,7,8-Hexachlorodibenzofuran	pg/g	7	11	63.6%	0.28	1.5	8.6	780	91	230	--	Yes	No	(1)(3)
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/g	3	11	27.3%	0.063	1.5	0.32	24	2.9	7	--	Yes	No	(1)(3)
1,2,3,6,7,8-Hexachlorodibenzofuran	pg/g	7	11	63.6%	0.19	0.84	5.5	460	52	140	--	Yes	No	(1)(3)
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/g	5	11	45.5%	0.07	2.1	0.68	49	6.3	14	--	Yes	No	(1)(3)
1,2,3,7,8,9-Hexachlorodibenzofuran	pg/g	6	11	54.5%	0.083	1.3	0.68	71	7.9	21	--	Yes	No	(1)(3)
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/g	3	11	27.3%	0.053	2.1	0.54	46	5.5	14	--	Yes	No	(1)(3)
1,2,3,7,8-Pentachlorodibenzofuran	pg/g	7	11	63.6%	0.13	0.58	4.2	430	48.0	130	--	Yes	No	(1)(3)
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/g	2	11	18.2%	0.062	1.9	3.1	33	3.9	9.7	--	Yes	No	(1)(3)
2,3,4,6,7,8-Hexachlorodibenzofuran	pg/g	6	11	54.5%	0.076	2.4	1.3	110	12	32	--	Yes	No	(1)(3)
2,3,4,7,8-Pentachlorodibenzofuran	pg/g	7	11	63.6%	0.078	0.18	2.2	240	27	71	--	Yes	No	(1)(3)
2,3,7,8-Tetrachlorodibenzofuran	pg/g	8	11	72.7%	0.23	0.37	0.75	200	26	59	--	Yes	No	(1)(3)
2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/g	4	11	36.4%	0.046	0.39	0.12	11	1.3	3.2	--	Yes	No	(1)(3)
Octachlorodibenzodioxin	pg/g	7	11	63.6%	0.26	3.9	6.3	1900	310	590	--	Yes	No	(1)(3)
Octachlorodibenzofuran	pg/g	8	11	72.7%	2.5	4.6	13	3000	620	930	--	Yes	No	(1)(3)
TCDD TEQ	pg/g	11	11	100%	--	--	0.14	330	40	97	--	Yes	No	(1)(3)
<i>General Chemistry/Ions</i>														
Ammonia (as N)	mg/kg	1	22	4.5%	0.098	0.56	2	2	0.43	0.41	--	No	No	(4)(13)
Bromide	mg/kg	4	22	18.2%	0.26	0.29	0.29	2.4	0.45	0.51	--	No	No	(9)
Chlorate	mg/kg	11	22	50.0%	0.37	0.42	0.63	70.1	4.4	15.0	--	No	No	(5)(13)
Chloride	mg/kg	22	22	100%	--	--	4.9	970	180	280	--	No	No	(9)
Cyanide, Total	mg/kg	0	22	0%	0.12	0.13	--	--	0.12	0.00	--	No	No	(2)
Fluoride	mg/kg	22	22	100%	--	--	0.19	4.1	1.2	0.84	--	No	No	(5)(13)
Nitrate	mg/kg	22	22	100%	--	--	0.32	31.9	5.7	7.8	--	No	No	(5)(13)
Nitrite	mg/kg	0	22	0%	0.034	0.039	--	--	0.036	0.0012	--	No	No	(2)
Orthophosphate as P	mg/kg	1	22	4.5%	0.57	5.8	8.3	8.3	3.4	2.7	--	No	No	(4)(9)

TABLE 5-6
SELECTION OF CHEMICALS OF POTENTIAL CONCERN (COPCs)
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 9)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Min ND	Max ND	Min Detect	Max Detect	Mean	Standard Deviation	Greater than Background?	PBT(1) or Class A Carcinogen?	COPC?	Rationale
Perchlorate	mg/kg	20	22	90.9%	0.0106	0.0106	0.0368	8.45	1.5	2.3	--	No	No	(5)(13)
Sulfate	mg/kg	22	22	100%	--	--	7.8	1780	240	410	--	No	No	(9)
Sulfide	mg/kg	0	22	0%	0.86	0.97	--	--	0.9	0.028	--	No	No	(2)(9)
Total Kjeldahl Nitrogen (TKN)	mg/kg	22	22	100%	--	--	34.4	88.6	59	16	--	No	No	(9)
<i>Metals</i>														
Aluminum	mg/kg	21	21	100%	--	--	9590	14100	12000	1300	YES	No	Yes	(8)(14)
Antimony	mg/kg	0	21	0%	0.83	0.96	--	--	0.88	0.031	YES	No	No	(2)(8)
Arsenic	mg/kg	15	21	71.4%	5.3	5.5	3.5	7.3	5.1	0.98	YES	Yes	Yes	(1)(8)(14)
Barium	mg/kg	21	21	100%	--	--	164	377	230	61	YES	No	No	(8)(13)
Beryllium	mg/kg	21	21	100%	--	--	0.64	0.94	0.77	0.086	YES	No	No	(8)(13)
Boron	mg/kg	1	21	4.8%	17	19.5	24.6	24.6	18	1.5	YES	No	No	(8)(13)
Cadmium	mg/kg	2	21	9.5%	0.26	0.29	0.19	0.34	0.27	0.025	YES	No	No	(8)(13)
Calcium	mg/kg	21	21	100%	--	--	11800	46500	27000	8500	NO	No	No	(6)(12)
Chromium	mg/kg	21	21	100%	--	--	11.5	28.3	18	4.4	YES	No	No	(8)(13)
Chromium (VI)	mg/kg	12	21	57.1%	0.1	0.12	0.12	0.58	0.19	0.12	YES	Yes	No	(8)(13)
Cobalt	mg/kg	21	21	100%	--	--	9	15	11	1.5	YES	No	No	(8)(13)
Copper	mg/kg	21	21	100%	--	--	17.3	78.7	27	13	YES	No	No	(8)(13)
Iron	mg/kg	21	21	100%	--	--	16900	23700	20000	2100	YES	No	No	(8)(12)
Lead	mg/kg	21	21	100%	--	--	8.6	45.9	13	8.2	YES	Yes	No	(11)
Lithium	mg/kg	21	21	100%	--	--	11	31	17	4.2	YES	No	No	(8)(13)
Magnesium	mg/kg	21	21	100%	--	--	9430	17800	12000	1800	YES	No	No	(8)(12)
Manganese	mg/kg	21	21	100%	--	--	332	1540	600	250	YES	No	No	(8)(13)
Mercury	mg/kg	1	21	4.8%	0.0064	0.0389	0.025	0.025	0.033	0.009	YES	No	No	(8)(13)
Molybdenum	mg/kg	4	21	19.0%	0.41	2.9	0.51	3.3	2	1.1	YES	No	No	(8)(13)
Nickel	mg/kg	21	21	100%	--	--	16	25.4	21	2.5	YES	No	No	(8)(13)
Potassium	mg/kg	21	21	100%	--	--	2000	3510	2500	400	YES	No	No	(8)(12)
Selenium	mg/kg	10	21	47.6%	2.6	2.9	1.2	2.4	2.3	0.59	YES	No	No	(8)(13)
Silver	mg/kg	8	21	38.1%	0.042	0.047	0.044	0.15	0.053	0.024	NO	No	No	(6)
Sodium	mg/kg	21	21	100%	--	--	381	3040	900	590	YES	No	No	(8)(12)
Strontium	mg/kg	21	21	100%	--	--	168	446	260	83	YES	No	No	(8)(13)
Thallium	mg/kg	2	21	9.5%	0.31	1.1	0.68	1.5	0.43	0.31	NO	No	No	(6)
Tin	mg/kg	5	21	23.8%	1.1	1.2	0.78	2.2	1.2	0.28	YES	No	No	(8)(13)
Titanium	mg/kg	21	21	100%	--	--	730	1390	1000	150	YES	No	No	(8)(13)
Tungsten	mg/kg	2	21	9.5%	0.43	2.9	2.5	4.7	1.4	1.3	YES	No	No	(8)(13)

TABLE 5-6
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HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 3 of 9)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Min ND	Max ND	Min Detect	Max Detect	Mean	Standard Deviation	Greater than Background?	PBT(1) or Class A Carcinogen?	COPC?	Rationale
Uranium	mg/kg	21	21	100%	--	--	0.83	1.8	1.2	0.26	YES	No	No	(8)(13)
Vanadium	mg/kg	21	21	100%	--	--	42	79.3	57	8.6	YES	No	No	(8)(13)
Zinc	mg/kg	21	21	100%	--	--	38.8	97.2	54	14	YES	No	No	(8)(13)
<i>Organochlorine Pesticides</i>														
2,4-DDD	mg/kg	0	22	0%	0.00023	0.00026	--	--	0.00024	0.0000077	--	Yes	No	(2)
2,4-DDE	mg/kg	3	22	13.6%	0.00032	0.00037	0.0048	0.018	0.0016	0.0039	--	Yes	No	(1)(5)(13)
4,4-DDD	mg/kg	0	22	0%	0.000085	0.000096	--	--	0.000089	0.000003	--	Yes	No	(2)
4,4-DDE	mg/kg	4	22	18.2%	0.0004	0.00046	0.0022	0.018	0.0021	0.0045	--	Yes	No	(1)(5)(13)
4,4-DDT	mg/kg	4	22	18.2%	0.00065	0.00073	0.0022	0.018	0.0018	0.00	--	Yes	No	(1)(5)(13)
Aldrin	mg/kg	1	22	4.5%	0.00032	0.00036	0.002	0.002	0.00041	0.00036	--	Yes	No	(4)(13)
alpha-BHC	mg/kg	0	22	0%	0.00014	0.00016	--	--	0.00014	0.00001	--	No	No	(2)
alpha-Chlordane	mg/kg	0	22	0%	0.00059	0.00066	--	--	0.00061	0.000019	--	Yes	No	(2)
beta-BHC	mg/kg	4	22	18.2%	0.00031	0.00035	0.0022	0.023	0.0023	0.0054	--	No	No	(5)(13)
Chlordane	mg/kg	0	22	0%	0.0039	0.0044	--	--	0.004	0.00013	--	Yes	No	(2)
delta-BHC	mg/kg	0	22	0%	0.00025	0.00028	--	--	0.00026	0.0000077	--	No	No	(2)
Dieldrin	mg/kg	0	22	0%	0.00022	0.00025	--	--	0.00023	0.0000077	--	Yes	No	(2)
Endosulfan I	mg/kg	0	22	0%	0.00059	0.00067	--	--	0.00062	0.000021	--	No	No	(2)
Endosulfan II	mg/kg	0	22	0%	0.00024	0.00027	--	--	0.00025	0.0000077	--	No	No	(2)
Endosulfan sulfate	mg/kg	0	22	0%	0.00026	0.00029	--	--	0.00027	0.00001	--	No	No	(2)
Endrin	mg/kg	0	22	0%	0.00014	0.00016	--	--	0.00015	0.0000056	--	No	No	(2)
Endrin aldehyde	mg/kg	0	22	0%	0.0004	0.00045	--	--	0.00042	0.000013	--	No	No	(2)
Endrin ketone	mg/kg	0	22	0%	0.00031	0.00035	--	--	0.00032	0.000011	--	No	No	(2)
gamma-BHC (Lindane)	mg/kg	0	22	0%	0.00017	0.0002	--	--	0.00018	0.0000069	--	No	No	(2)
gamma-Chlordane	mg/kg	0	22	0%	0.00016	0.00018	--	--	0.00017	0.0000053	--	Yes	No	(2)
Heptachlor	mg/kg	0	14	0%	0.000098	0.00011	--	--	0.0001	0.0000044	--	No	No	(2)
Heptachlor epoxide	mg/kg	0	22	0%	0.00044	0.0005	--	--	0.00046	0.000015	--	No	No	(2)
Methoxychlor	mg/kg	0	22	0%	0.00074	0.00084	--	--	0.00078	0.000026	--	No	No	(2)
Toxaphene	mg/kg	0	22	0%	0.016	0.018	--	--	0.016	0.00066	--	Yes	No	(2)
<i>Polynuclear Aromatic Hydrocarbons</i>														
Acenaphthene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	No	No	(2)
Acenaphthylene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	No	No	(2)
Anthracene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	No	No	(2)
Benzo(a)anthracene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	No	No	(2)
Benzo(a)pyrene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	Yes	No	(2)

TABLE 5-6
SELECTION OF CHEMICALS OF POTENTIAL CONCERN (COPCs)
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 4 of 9)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Min ND	Max ND	Min Detect	Max Detect	Mean	Standard Deviation	Greater than Background?	PBT(1) or Class A Carcinogen?	COPC?	Rationale
Benzo(b)fluoranthene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	No	No	(2)
Benzo(g,h,i)perylene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	No	No	(2)
Benzo(k)fluoranthene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	No	No	(2)
Chrysene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	No	No	(2)
Dibenzo(a,h)anthracene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	No	No	(2)
Indeno(1,2,3-cd)pyrene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	No	No	(2)
Phenanthrene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	No	No	(2)
Pyrene	mg/kg	0	22	0%	0.00172	0.00183	--	--	0.0018	0.000029	--	No	No	(2)
<i>Polychlorinated Biphenyls</i>														
PCB 105	pg/g	11	11	100%	--	--	2.2	1900	460	710	--	Yes	No	(1)(3)
PCB 114	pg/g	6	11	54.5%	0.12	0.29	5.8	63	15	22	--	Yes	No	(1)(3)
PCB 118	pg/g	10	11	90.9%	6.4	6.4	6.6	3900	960	1500	--	Yes	No	(1)(3)
PCB 123	pg/g	2	11	18.2%	0.12	0.44	26	92	11	28	--	Yes	No	(1)(3)
PCB 126	pg/g	6	11	54.5%	0.13	0.25	4.7	99	19	31	--	Yes	No	(1)(3)
PCB 156	pg/g	8	10	80.0%	0.11	0.13	2.2	810	220	340	--	Yes	No	(1)(3)
PCB 156/157	pg/g	1	1	100%	--	--	170	170	170	#DIV/0!	--	Yes	No	(1)(3)
PCB 157	pg/g	6	10	60.0%	0.1	0.2	2.9	480	90	160	--	Yes	No	(1)(3)
PCB 167	pg/g	8	11	72.7%	0.13	0.15	3.3	290	80	110	--	Yes	No	(1)(3)
PCB 169	pg/g	3	11	27.3%	0.11	0.36	2.7	14	2.5	4.6	--	Yes	No	(1)(3)
PCB 189	pg/g	7	11	63.6%	0.098	0.16	4.6	110	28	40	--	Yes	No	(1)(3)
PCB 209	pg/g	10	11	90.9%	0.096	0.096	22	19000	4500	6500	--	Yes	No	(1)(3)
PCB 77	pg/g	2	11	18.2%	0.1	2.2	35	58	8.8	19	--	Yes	No	(1)(3)
PCB 81	pg/g	1	11	9.1%	0.097	0.35	24	24	2.4	7.2	--	Yes	No	(1)(3)
<i>Radionuclides</i>														
Radium-226	pCi/g	21	22	95.5%	--	--	0.374	1.19	0.75	0.22	NO	Yes	Yes	(6)(15)
Radium-228	pCi/g	18	22	81.8%	--	--	0.939	2.35	1.6	0.5	NO	Yes	Yes	(6)(15)
Thorium-228	pCi/g	22	22	100%	--	--	0.982	3.08	1.9	0.57	YES	Yes	Yes	(8)(14)
Thorium-230	pCi/g	20	22	90.9%	--	--	0.672	2.51	1.3	0.38	NO	Yes	Yes	(6)(15)
Thorium-232	pCi/g	22	22	100%	--	--	1.07	2.75	1.7	0.34	NO	Yes	Yes	(6)(15)
Uranium-233/234	pCi/g	21	22	95.5%	--	--	0.239	1.46	0.89	0.29	NO	Yes	Yes	(6)(15)
Uranium-235/236	pCi/g	2	22	9.1%	--	--	0.182	0.515	0.31	0.086	NO	Yes	Yes	(6)(15)
Uranium-238	pCi/g	22	22	100%	--	--	0.511	1.6	1.1	0.3	NO	Yes	Yes	(6)(15)
<i>Semi-Volatile Organic Compounds</i>														
1,2,4,5-Tetrachlorobenzene	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
1,2-Diphenylhydrazine	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)

TABLE 5-6
SELECTION OF CHEMICALS OF POTENTIAL CONCERN (COPCs)
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BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 5 of 9)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Min ND	Max ND	Min Detect	Max Detect	Mean	Standard Deviation	Greater than Background?	PBT(1) or Class A Carcinogen?	COPC?	Rationale
1,4-Dioxane	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
2,2'-Dichlorobenzil	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
2,4,5-Trichlorophenol	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
2,4,6-Trichlorophenol	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
2,4-Dichlorophenol	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
2,4-Dimethylphenol	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
2,4-Dinitrophenol	mg/kg	0	22	0%	0.131	0.139	--	--	0.14	0.0022	--	No	No	(2)
2,4-Dinitrotoluene	mg/kg	0	22	0%	0.0345	0.0366	--	--	0.036	0.00056	--	No	No	(2)
2,6-Dinitrotoluene	mg/kg	0	22	0%	0.0345	0.0366	--	--	0.036	0.00056	--	No	No	(2)
2-Chloronaphthalene	mg/kg	0	22	0%	0.0121	0.0128	--	--	0.012	0.00019	--	No	No	(2)
2-Chlorophenol	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
2-Methylnaphthalene	mg/kg	0	22	0%	0.00689	0.00733	--	--	0.0071	0.00011	--	No	No	(2)
2-Nitroaniline	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
2-Nitrophenol	mg/kg	0	22	0%	0.0345	0.0366	--	--	0.036	0.00056	--	No	No	(2)
3,3-Dichlorobenzidine	mg/kg	0	22	0%	0.103	0.11	--	--	0.11	0.0017	--	No	No	(2)
3-Nitroaniline	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
4-Bromophenyl phenyl ether	mg/kg	0	22	0%	0.0345	0.0366	--	--	0.036	0.00056	--	No	No	(2)
4-Chloro-3-methylphenol	mg/kg	0	22	0%	0.0345	0.0366	--	--	0.036	0.00056	--	No	No	(2)
4-Chlorophenyl phenyl ether	mg/kg	0	22	0%	0.0345	0.0366	--	--	0.036	0.00056	--	No	No	(2)
4-Chlorothioanisole	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
4-Nitroaniline	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
4-Nitrophenol	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Acetophenone	mg/kg	0	22	0%	0.0345	0.0366	--	--	0.036	0.00056	--	No	No	(2)
Aniline	mg/kg	0	22	0%	0.121	0.128	--	--	0.12	0.0019	--	No	No	(2)
Benzenethiol	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
Benzoic acid	mg/kg	0	22	0%	0.172	0.183	--	--	0.18	0.0029	--	No	No	(2)
Benzyl alcohol	mg/kg	0	22	0%	0.103	0.11	--	--	0.11	0.0017	--	No	No	(2)
bis(2-Chloroethoxy)methane	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	Yes	No	(2)
bis(2-Chloroethyl) ether	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
bis(2-Chloroisopropyl) ether	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
bis(2-Ethylhexyl) phthalate	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
bis(p-Chlorophenyl) sulfone	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
bis(p-Chlorophenyl)disulfide	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
Butylbenzyl phthalate	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Carbazole	mg/kg	0	22	0%	0.0103	0.011	--	--	0.011	0.00017	--	No	No	(2)

TABLE 5-6
SELECTION OF CHEMICALS OF POTENTIAL CONCERN (COPCs)
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 6 of 9)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Min ND	Max ND	Min Detect	Max Detect	Mean	Standard Deviation	Greater than Background?	PBT(1) or Class A Carcinogen?	COPC?	Rationale
Dibenzofuran	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Dichloromethyl ether	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
Diethyl phthalate	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Dimethyl phthalate	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Di-n-butyl phthalate	mg/kg	0	22	0%	0.0345	0.0366	--	--	0.036	0.00056	--	No	No	(2)
Di-n-octyl phthalate	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Diphenyl disulfide	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
Diphenyl sulfide	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
Diphenyl sulfone	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
Diphenylamine	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Fluoranthene	mg/kg	0	22	0%	0.0103	0.011	--	--	0.011	0.00017	--	No	No	(2)
Fluorene	mg/kg	0	22	0%	0.0103	0.011	--	--	0.011	0.00017	--	No	No	(2)
Hexachlorobenzene	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.001	--	Yes	No	(2)
Hexachlorobutadiene	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Hexachlorocyclopentadiene	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Hexachloroethane	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Hydroxymethyl phthalimide	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
Isophorone	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
m,p-Cresols	mg/kg	0	22	0%	0.138	0.147	--	--	0.14	0.0023	--	No	No	(2)
Naphthalene	mg/kg	0	22	0%	0.0103	0.011	--	--	0.011	0.00017	--	No	No	(2)
Nitrobenzene	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
N-nitrosodi-n-propylamine	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	Yes	No	(2)
o-Cresol	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Octachlorostyrene	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
p-Chloroaniline	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
p-Chlorobenzenethiol	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
Pentachlorobenzene	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Pentachlorophenol	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Phenol	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
Phthalic acid	mg/kg	0	22	0%	0.114	0.121	--	--	0.12	0.0018	--	No	No	(2)
Pyridine	mg/kg	0	22	0%	0.0689	0.0733	--	--	0.071	0.0011	--	No	No	(2)
<i>Volatile Organic Compounds</i>														
1,1,1,2-Tetrachloroethane	mg/kg	0	22	0%	0.00039	0.00044	--	--	0.00041	0.000014	--	No	No	(2)
1,1,1-Trichloroethane	mg/kg	0	22	0%	0.00024	0.00027	--	--	0.00025	0.0000077	--	No	No	(2)
1,1,2,2-Tetrachloroethane	mg/kg	0	22	0%	0.00046	0.00051	--	--	0.00048	0.000015	--	No	No	(2)

TABLE 5-6
SELECTION OF CHEMICALS OF POTENTIAL CONCERN (COPCs)
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 7 of 9)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Min ND	Max ND	Min Detect	Max Detect	Mean	Standard Deviation	Greater than Background?	PBT(1) or Class A Carcinogen?	COPC?	Rationale
1,1,2-Trichloroethane	mg/kg	0	22	0%	0.00037	0.00042	--	--	0.00039	0.0000130	--	No	No	(2)
1,1-Dichloroethane	mg/kg	0	22	0%	0.00038	0.00043	--	--	0.0004	0.000013	--	No	No	(2)
1,1-Dichloroethene	mg/kg	0	22	0%	0.00024	0.00027	--	--	0.00025	0.0000077	--	No	No	(2)
1,1-Dichloropropene	mg/kg	0	22	0%	0.00023	0.00026	--	--	0.00024	0.0000098	--	No	No	(2)
1,2,3-Trichlorobenzene	mg/kg	0	22	0%	0.00047	0.00053	--	--	0.00049	0.000016	--	No	No	(2)
1,2,3-Trichloropropane	mg/kg	0	22	0%	0.0005	0.00056	--	--	0.00052	0.000016	--	No	No	(2)
1,2,4-Trichlorobenzene	mg/kg	0	22	0%	0.00032	0.00044	--	--	0.00034	0.000026	--	No	No	(2)
1,2,4-Trimethylbenzene	mg/kg	0	22	0%	0.00041	0.0012	--	--	0.00062	0.00024	--	No	No	(2)
1,2-Dichlorobenzene	mg/kg	1	22	4.5%	0.00037	0.00042	0.00053	0.00053	0.00039	0.000033	--	No	No	(4)(13)
1,2-Dichloroethane	mg/kg	0	22	0%	0.00033	0.00038	--	--	0.00035	0.0000120	--	No	No	(2)
1,2-Dichloroethene	mg/kg	0	22	0%	0.00064	0.00073	--	--	0.00067	0.000022	--	No	No	(2)
1,2-Dichloropropane	mg/kg	0	22	0%	0.00038	0.00043	--	--	0.0004	0.000014	--	No	No	(2)
1,3,5-Trichlorobenzene	mg/kg	0	22	0%	0.00052	0.00059	--	--	0.00055	0.000018	--	No	No	(2)
1,3,5-Trimethylbenzene	mg/kg	0	22	0%	0.00026	0.00029	--	--	0.00027	0.0000081	--	No	No	(2)
1,3-Dichlorobenzene	mg/kg	0	22	0%	0.00045	0.00051	--	--	0.00047	0.000016	--	No	No	(2)
1,3-Dichloropropane	mg/kg	0	22	0%	0.00043	0.00048	--	--	0.00044	0.000014	--	No	No	(2)
1,4-Dichlorobenzene	mg/kg	1	22	4.5%	0.00032	0.00036	0.00073	0.00073	0.00035	0.000085	--	No	No	(4)(13)
2,2,3-Trimethylbutane	mg/kg	0	22	0%	0.00054	0.00061	--	--	0.00057	0.000018	--	No	No	(2)
2,2-Dichloropropane	mg/kg	0	22	0%	0.00032	0.00036	--	--	0.00033	0.000011	--	No	No	(2)
2,2-Dimethylpentane	mg/kg	0	22	0%	0.00054	0.00061	--	--	0.00057	0.000018	--	No	No	(2)
2,3-Dimethylpentane	mg/kg	0	22	0%	0.00045	0.00051	--	--	0.00047	0.000016	--	No	No	(2)
2,4-Dimethylpentane	mg/kg	0	22	0%	0.0005	0.00056	--	--	0.00052	0.000016	--	No	No	(2)
2-Chlorotoluene	mg/kg	0	22	0%	0.00035	0.00039	--	--	0.00036	0.000012	--	No	No	(2)
2-Hexanone	mg/kg	0	22	0%	0.00029	0.00033	--	--	0.0003	0.000011	--	No	No	(2)
2-Methylhexane	mg/kg	0	22	0%	0.00052	0.00059	--	--	0.00054	0.000017	--	No	No	(2)
2-Nitropropane	mg/kg	0	22	0%	0.00033	0.00037	--	--	0.00034	0.000011	--	No	No	(2)
3,3-Dimethylpentane	mg/kg	0	22	0%	0.00049	0.00056	--	--	0.00051	0.000017	--	No	No	(2)
3-Ethylpentane	mg/kg	0	22	0%	0.00046	0.00052	--	--	0.00048	0.000017	--	No	No	(2)
3-Methylhexane	mg/kg	0	22	0%	0.00048	0.00054	--	--	0.0005	0.000016	--	No	No	(2)
4-Chlorotoluene	mg/kg	0	22	0%	0.00026	0.00029	--	--	0.00027	0.0000084	--	No	No	(2)
4-Methyl-2-pentanone (MIBK)	mg/kg	0	22	0%	0.00032	0.00036	--	--	0.00033	0.000011	--	No	No	(2)
Acetone	mg/kg	7	22	31.8%	0.0067	0.01	0.011	0.037	0.01	0.0064	--	No	No	(5)(13)
Acetonitrile	mg/kg	0	22	0%	0.0036	0.0041	--	--	0.0038	0.00012	--	No	No	(2)
Benzene	mg/kg	0	22	0%	0.00034	0.00038	--	--	0.00035	0.000012	--	Yes	No	(2)
Bromobenzene	mg/kg	0	22	0%	0.00039	0.00044	--	--	0.0004	0.000013	--	No	No	(2)

TABLE 5-6
SELECTION OF CHEMICALS OF POTENTIAL CONCERN (COPCs)
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 8 of 9)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Min ND	Max ND	Min Detect	Max Detect	Mean	Standard Deviation	Greater than Background?	PBT(1) or Class A Carcinogen?	COPC?	Rationale
Bromodichloromethane	mg/kg	0	22	0%	0.00033	0.00037	--	--	0.00034	0.000011	--	No	No	(2)
Bromoform	mg/kg	0	22	0%	0.00043	0.00048	--	--	0.00044	0.000014	--	No	No	(2)
Bromomethane	mg/kg	0	22	0%	0.00041	0.00046	--	--	0.00043	0.000014	--	No	No	(2)
Carbon disulfide	mg/kg	2	22	9.1%	0.00028	0.00032	0.00038	0.0004	0.0003	0.00003	--	No	No	(5)(13)
Carbon tetrachloride	mg/kg	0	22	0%	0.00031	0.00035	--	--	0.00033	0.000011	--	No	No	(2)
Chlorobenzene	mg/kg	0	22	0%	0.00031	0.00076	--	--	0.00034	0.000093	--	No	No	(2)
Chlorobromomethane	mg/kg	0	22	0%	0.00045	0.00051	--	--	0.00047	0.000016	--	No	No	(2)
Chloroethane	mg/kg	0	22	0%	0.00032	0.00036	--	--	0.00033	0.000011	--	No	No	(2)
Chloroform	mg/kg	0	22	0%	0.00037	0.00041	--	--	0.00038	0.000012	--	No	No	(2)
Chloromethane	mg/kg	0	22	0%	0.00028	0.00032	--	--	0.00029	0.00001	--	No	No	(2)
cis-1,2-Dichloroethene	mg/kg	0	22	0%	0.00034	0.00039	--	--	0.00036	0.000012	--	No	No	(2)
cis-1,3-Dichloropropene	mg/kg	0	22	0%	0.00024	0.00027	--	--	0.00025	0.0000077	--	No	No	(2)
Cymene (Isopropyltoluene)	mg/kg	0	22	0%	0.00027	0.0003	--	--	0.00028	0.0000097	--	No	No	(2)
Dibromochloromethane	mg/kg	0	22	0%	0.0003	0.00034	--	--	0.00031	0.000011	--	No	No	(2)
Dibromochloropropane	mg/kg	0	22	0%	0.00061	0.00069	--	--	0.00064	0.000021	--	No	No	(2)
Dibromomethane	mg/kg	0	22	0%	0.00035	0.0004	--	--	0.00037	0.000012	--	No	No	(2)
Dichloromethane (Methylene chloride)	mg/kg	2	22	9.1%	0.0024	0.026	0.03	0.063	0.016	0.015	--	No	No	(5)(13)
Dimethyldisulfide	mg/kg	0	22	0%	0.00049	0.00056	--	--	0.00051	0.000017	--	No	No	(2)
Ethanol	mg/kg	0	22	0%	0.064	0.072	--	--	0.067	0.0022	--	No	No	(2)
Ethylbenzene	mg/kg	0	22	0%	0.0003	0.00034	--	--	0.00031	0.000011	--	No	No	(2)
Freon-11 (Trichlorofluoromethane)	mg/kg	0	22	0%	0.00031	0.00035	--	--	0.00033	0.00001	--	No	No	(2)
Freon-113 (1,1,2-Trifluoro-1,2,2-trichloroethane)	mg/kg	0	22	0%	0.00025	0.00029	--	--	0.00027	0.000011	--	No	No	(2)
Freon-12 (Dichlorodifluoromethane)	mg/kg	0	22	0%	0.00025	0.00029	--	--	0.00027	0.000011	--	No	No	(2)
Heptane	mg/kg	0	22	0%	0.00038	0.00043	--	--	0.0004	0.000013	--	No	No	(2)
Isopropylbenzene	mg/kg	0	22	0%	0.00029	0.00033	--	--	0.0003	0.000011	--	No	No	(2)
m,p-Xylene	mg/kg	0	22	0%	0.00047	0.00053	--	--	0.00049	0.000016	--	No	No	(2)
Methyl ethyl ketone (2-Butanone)	mg/kg	0	22	0%	0.00059	0.00066	--	--	0.00062	0.000019	--	No	No	(2)
Methyl iodide	mg/kg	0	22	0%	0.0004	0.00045	--	--	0.00042	0.000014	--	No	No	(2)
MTBE (Methyl tert-butyl ether)	mg/kg	0	22	0%	0.00048	0.00054	--	--	0.0005	0.000017	--	No	No	(2)
n-Butylbenzene	mg/kg	0	22	0%	0.0003	0.00034	--	--	0.00032	0.000011	--	No	No	(2)
Nonanal	mg/kg	0	22	0%	0.00037	0.00042	--	--	0.00039	0.000013	--	No	No	(2)
n-Propylbenzene	mg/kg	0	22	0%	0.00028	0.00032	--	--	0.00029	0.00001	--	No	No	(2)
o-Xylene	mg/kg	0	22	0%	0.00024	0.00027	--	--	0.00025	0.0000077	--	No	No	(2)
sec-Butylbenzene	mg/kg	0	22	0%	0.00033	0.00038	--	--	0.00035	0.000013	--	No	No	(2)
Styrene	mg/kg	0	22	0%	0.00021	0.00024	--	--	0.00022	0.0000077	--	No	No	(2)

TABLE 5-6
SELECTION OF CHEMICALS OF POTENTIAL CONCERN (COPCs)
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 9 of 9)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Min ND	Max ND	Min Detect	Max Detect	Mean	Standard Deviation	Greater than Background?	PBT(1) or Class A Carcinogen?	COPC?	Rationale
tert-Butylbenzene	mg/kg	0	22	0%	0.00023	0.00026	--	--	0.00024	0.0000077	--	No	No	(2)
Tetrachloroethene	mg/kg	0	22	0%	0.00048	0.00054	--	--	0.0005	0.000017	--	No	No	(2)
Toluene	mg/kg	0	22	0%	0.00025	0.00028	--	--	0.00026	0.000009	--	No	No	(2)
trans-1,2-Dichloroethene	mg/kg	0	22	0%	0.00035	0.00039	--	--	0.00036	0.000011	--	No	No	(2)
trans-1,3-Dichloropropene	mg/kg	0	22	0%	0.00018	0.00021	--	--	0.00019	0.0000073	--	No	No	(2)
Trichloroethene	mg/kg	0	22	0%	0.00027	0.00031	--	--	0.00028	0.00001	--	No	No	(2)
Vinyl acetate	mg/kg	0	22	0%	0.00039	0.00044	--	--	0.00041	0.000013	--	No	No	(2)
Vinyl chloride	mg/kg	0	22	0%	0.00033	0.00038	--	--	0.00035	0.000012	--	No	No	(2)
Xylenes (total)	mg/kg	0	22	0%	0.00066	0.00074	--	--	0.00069	0.000022	--	No	No	(2)

mg/kg - milligrams per kilogram

pCi/g - picoCuries per gram

ppt - parts per trillion

-- - Not available or not applicable.

ND - Not detected.

Highlight indicates selected as COPC.

(1) Persistent, Bioaccumulative, and Toxic (PBT) Program.

(2) Not detected.

(3) Dioxin and PCB congeners are not evaluated separately. Dioxin and PCB congeners are evaluated as TCDD TEQs. The maximum TCDD TEQ was less than the 1,000 ppt worker BCL (see text).

(4) Chemical detected in less than 5 percent of the samples and is not a PBT or Class A carcinogen.

(5) Chemical detected in greater than 5 percent of samples.

(6) Chemical concentrations are equivalent to background.

(7) Chemical detected in less than 5 percent of the samples, but is a PBT or Class A carcinogen.

(8) Based on statistical tests, Site concentrations are elevated compared to background.

(9) No toxicity criteria or applicable surrogate criteria are available.

(10) At least one carcinogenic polynuclear aromatic hydrocarbon (PAH) is a COPC, therefore all detected carcinogenic PAHs are COPCs.

(11) Lead was not selected as a COPC because the maximum concentration is below 400 mg/kg.

(12) USEPA (1989) states that “Chemicals that are (1) essential human nutrients, (2) present at low concentrations (i.e., only slightly elevated above naturally occurring levels), and (3) toxic only at very high doses (i.e., much higher than those that could be associated with contact at the site) need not be considered further in the quantitative risk assessment. Examples of such chemicals are iron, magnesium, calcium, potassium, and sodium.”

(13) Maximum detected site concentration below one-tenth worker BCL.

(14) Maximum detected site concentration greater than one-tenth worker BCL.

(15) At least one radionuclide is a COPC, therefore all radionuclides are COPCs.

TABLE 6-1
EXPOSURE POINT CONCENTRATIONS IN SOIL
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 2)

Chemical	Units	Number of Detects	Total Count	Detect Freq.	Min ND	Max ND	Min Detect	Max Detect	Mean	Standard Deviation
<i>Inorganics</i>										
Aluminum	mg/kg	21	21	100%	--	--	9590	14100	12000	1300
Arsenic	mg/kg	15	21	71%	5.3	5.5	3.5	7.3	5.1	0.98
<i>Aldehydes</i>										
Acetaldehyde	mg/kg	22	22	100%	--	--	0.512	12.3	2.5	2.6
<i>Radionuclides - Site</i>										
Radium-226	pCi/g	21	22	95%	--	--	0.374	1.19	0.75	0.22
Radium-228	pCi/g	18	22	82%	--	--	0.939	2.35	1.6	0.50
Thorium-228	pCi/g	22	22	100%	--	--	0.982	3.08	1.9	0.57
Thorium-230	pCi/g	20	22	91%	--	--	0.672	2.51	1.3	0.38
Thorium-232	pCi/g	22	22	100%	--	--	1.07	2.75	1.7	0.34
Uranium-233/234	pCi/g	21	22	95%	--	--	0.239	1.46	0.89	0.29
Uranium-235/236	pCi/g	2	22	9%	--	--	0.182	0.515	0.31	0.086
Uranium-238	pCi/g	22	22	100%	--	--	0.511	1.6	1.1	0.30
<i>Radionuclides - Background</i>										
Radium-226	pCi/g	91	95	96%	--	--	0.494	2.36	1.1	0.34
Radium-228	pCi/g	65	81	80%	--	--	0.946	2.92	1.9	0.39
Thorium-228	pCi/g	95	95	100%	--	--	1.15	2.28	1.7	0.26
Thorium-230	pCi/g	95	95	100%	--	--	0.73	3.01	1.3	0.40
Thorium-232	pCi/g	95	95	100%	--	--	1.22	2.23	1.7	0.26
Uranium-233/234	pCi/g	45	95	47%	--	--	0.63	2.84	1.2	0.47
Uranium-235/236	pCi/g	42	95	44%	--	--	0.0009	0.21	0.070	0.038
Uranium-238	pCi/g	95	95	100%	--	--	0.65	2.37	1.2	0.36

(1) The EPC is either the maximum of the All or Surface 95 UCLs unless it exceeds the maximum detection concentration, then it is the maximum detected concentration.

EPC - Exposure point concentration.

UCL - Upper Confidence Limit

NA - Not applicable.

TABLE 6-1
EXPOSURE POINT CONCENTRATIONS IN SOIL
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 2)

Chemical	Units	All		Surface		EPC ¹
		95% UCL	UCL Calc Method	95% UCL	UCL Calc Method	
Inorganics						
Aluminum	mg/kg	12000	Student's-t UCL	12000	Bootstrap BCa UCL	12000
Arsenic	mg/kg	4.8	Student's-t UCL	4.6	Bootstrap BCa UCL	4.8
Aldehydes						
Acetaldehyde	mg/kg	4.0	Bootstrap BCa UCL	5.4	Bootstrap BCa UCL	5.4
Radionuclides - Site						
Radium-226	pCi/g	0.84	Bootstrap BCa UCL	0.78	Student's-t UCL	0.84
Radium-228	pCi/g	1.7	Student's-t UCL	1.9	Student's-t UCL	1.9
Thorium-228	pCi/g	2.1	Bootstrap BCa UCL	2.3	Bootstrap BCa UCL	2.3
Thorium-230	pCi/g	1.5	Student's-t UCL	1.4	Student's-t UCL	1.5
Thorium-232	pCi/g	1.9	Bootstrap BCa UCL	2.0	Bootstrap BCa UCL	2.0
Uranium-233/234	pCi/g	1.0	Student's-t UCL	0.90	Student's-t UCL	1.0
Uranium-235/236	pCi/g	0.34	Bootstrap BCa UCL	0.31	Student's-t UCL	0.34
Uranium-238	pCi/g	1.2	Student's-t UCL	1.1	Student's-t UCL	1.2
Radionuclides - Background						
Radium-226	pCi/g	1.2	Bootstrap BCa UCL	1.1	Student's-t UCL	1.2
Radium-228	pCi/g	2.0	Bootstrap Percentile UCL	2.0	Student's-t UCL	2.0
Thorium-228	pCi/g	1.8	Student's-t UCL	1.9	Student's-t UCL	1.9
Thorium-230	pCi/g	1.4	Bootstrap BCa UCL	1.2	Student's-t UCL	1.4
Thorium-232	pCi/g	1.7	Bootstrap Percentile UCL	1.8	Student's-t UCL	1.8
Uranium-233/234	pCi/g	1.3	Bootstrap BCa UCL	0.97	Bootstrap BCa UCL	1.3
Uranium-235/236	pCi/g	0.077	Bootstrap Percentile UCL	0.075	Bootstrap BCa UCL	0.077
Uranium-238	pCi/g	1.2	Bootstrap BCa UCL	1.0	Bootstrap BCa UCL	1.2

(1) The EPC is either the maximum of the All or Surface 95 UCLs unless it exceeds the maximum detection concentration, then it is the maximum detected concentration.

EPC - Exposure point concentration.

UCL - Upper Confidence Limit

NA - Not applicable.

TABLE 6-2
ASBESTOS RESULTS AND ANALYTICAL SENSITIVITIES
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Analytical Sensitivity (10 ⁶ s/gPM ₁₀)	Concentration		Number of			
					Protocol Structures ⁽¹⁾		Protocol Structures ⁽²⁾			
					Chrysotile (10 ⁶ s/gPM ₁₀)	Amphibole (10 ⁶ s/gPM ₁₀)	Chrysotile		Amphibole	
							Total	Long	Total	Long
P9S1-AG13	0	NORM	06/11/10	3.000	< 8.970 E+6	< 8.970 E+6	0	0	0	0
P9S1-AG14	0	NORM	06/11/10	2.990	< 8.930 E+6	< 8.930 E+6	0	0	0	0
P9S1-AH14	0	NORM	06/11/10	2.980	< 8.920 E+6	< 8.920 E+6	0	0	0	0
P9S1-AG15	0	NORM	06/11/10	2.970	< 8.880 E+6	< 8.880 E+6	0	0	0	0
P9S1-JD02	0	NORM	06/11/10	2.970	< 8.890 E+6	< 8.890 E+6	0	0	0	0
P9S1-JD03	0	NORM	06/11/10	2.990	< 8.930 E+6	< 8.930 E+6	0	0	0	0
P9S1-JD01	0	NORM	06/11/10	3.000	< 8.960 E+6	< 8.960 E+6	0	0	0	0
P9S1-JD01	0	FD	06/11/10	2.970	< 8.870 E+6	< 8.870 E+6	0	0	2	0
P9S1-AH12	0	NORM	06/11/10	2.970	< 8.890 E+6	< 8.890 E+6	0	0	9	0
P9S1-AH13	0	NORM	06/11/10	2.980	< 8.900 E+6	< 8.900 E+6	0	0	1	0
P9S6-AH11	0	NORM	07/20/12	3.000	< 8.960 E+6	< 8.960 E+6	0	0	2	0
P9S6-AH11	0	FD	07/20/12	2.990	8.960 E+6	< 8.930 E+6	3	3	0	0

⁽¹⁾Fiber dimensions are presented in the respective analytical reports for each sample.

⁽²⁾Protocol structures include structures >5 µm in length and < 0.4 µm in width. Only long structures (>10µm in length) present a potential risk and are used for estimating asbestos risks. Total protocol structure counts are presented for informational purposes only.

TABLE 6-4
EXPOSURE POINT CONCENTRATIONS FROM SURFACE FLUX
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Chemical	P9S1-AG13			P9S1-AH11		
	Method	Commercial Indoor Air	Outdoor Air	Method	Commercial Indoor Air	Outdoor Air
Carbon tetrachloride	S	2.1 E-6	1.8 E-6		--	--
Chloroform	S	1.2 E-6	1.0 E-6	S	6.5 E-6	5.5 E-6
Tetrachloroethene		--	--		--	--
Trichloroethene		--	--		--	--
Chemical	P9S1-AH12			P9S1-AH13		
	Method	Commercial Indoor Air	Outdoor Air	Method	Commercial Indoor Air	Outdoor Air
Carbon tetrachloride	S	5.0 E-6	4.2 E-6	S	3.0 E-6	2.5 E-6
Chloroform	S	3.6 E-6	3.0 E-6	S	1.6 E-6	1.3 E-6
Tetrachloroethene		--	--		--	--
Trichloroethene		--	--		--	--
Chemical	P9S1-AH14			P9S1-JD01		
	Method	Commercial Indoor Air	Outdoor Air	Method	Commercial Indoor Air	Outdoor Air
Carbon tetrachloride		--	--	S	1.1 E-6	8.9 E-7
Chloroform	S	1.3 E-6	1.1 E-6	S	9.0 E-7	7.5 E-7
Tetrachloroethene		--	--		--	--
Trichloroethene		--	--		--	--
Chemical	P9S1-JD03A			P9S1-JD03B		
	Method	Commercial Indoor Air	Outdoor Air	Method	Commercial Indoor Air	Outdoor Air
Carbon tetrachloride	S	1.5 E-6	1.2 E-6		--	--
Chloroform		--	--	S	5.8 E-7	4.9 E-7
Tetrachloroethene		--	--		--	--
Trichloroethene		--	--		--	--

Notes:

All units in mg/m³.

Method represents the surface flux measurement used in the risk calculations for that particular chemical/location: S = SIM; F = Full Scan.

See Appendix H for all indoor and outdoor air concentration calculations from surface flux measurement data. See Table 6-7 for outdoor air exposure point concentrations for non-volatile COPCs in soil. Exposure point concentrations for surface flux data are based on a sample by sample basis.

Averaging of the data was not conducted. Therefore only those chemicals detected in a particular sample were included in the risk estimates.

A "--" is presented for those chemical not detected and not included in the risk estimates for each sample location. The exposure point concentration is the maximum of the full scan or SIM analysis results (when both had detected values, otherwise the detected value from one or the other is used).

Thus, summary statistics are not presented in this table (see Table 3-8 for the surface flux data summary).

TABLE 6-5
PARTICULATE EMISSION FACTOR (PEF) FOR NON-CONSTRUCTION SCENARIO
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Parameter	Abbrev.	Units	Value
Wind Erosion and Construction Activities			
Fraction of vegetative cover ⁽¹⁾	V	--	0.5
Mean annual wind speed ⁽²⁾	U _m	m/s	4.10
Equivalent threshold value of wind speed ⁽¹⁾	U _t	m/s	11.32
Function dependent on U/U _t ⁽¹⁾	F(x)	--	0.19
Air Dispersion Factor for Area Source⁽⁴⁾	Q/C_{wind}	g/m²-sec per kg/m³	39.48
Constant A ⁽¹⁾	A	--	13.31
Constant B ⁽¹⁾	B	--	19.84
Constant C ⁽¹⁾	C	--	230.17
Areal Extent of site surface contamination ⁽³⁾	A _{surf}	acres	55.7
Onsite Residential PEF⁽⁵⁾	PEF_{Onsite Resident}	m³/kg	8.57E+08
Total outdoor ambient air dust concentration⁽⁶⁾	D_{Onsite Resident}	kg/m³	1.17E-09

(1) Assumed value for the site based upon USEPA (2002b). Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.

Office of Solid Waste and Emergency Response, Washington, DC. OSWER 9355.4-24. December.

(2) Derived by averaging data from the Las Vegas Airport and Nellis AFB stations.

(3) Site area.

(4) From USEPA 2002b - $Q/C_{sa} = A \times \exp[(\ln(A_{surf}) - B)^2/C]$.

$$\{ [2.6 \times (s/12)^{0.8} \times (W/3)^{0.4} / (M/0.2)^{0.3}] \times [(365-p)/365] \times 281.9 \times \sum VKT_{road} \}.$$

(5) From USEPA 2002b - $PEF_{Onsite Resident} = Q/C_{wind} * (3600 / (0.036 * (1-V) * ((U_m/U_t)^3) * F(x)))$

(6) $D_{Onsite Resident} = 1/PEF_{Onsite Resident}$

TABLE 6-6
PARTICULATE EMISSION FACTOR (PEF) FOR CONSTRUCTION SCENARIO
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 1 of 3)

Parameter	Abbrev.	Units	Value
Wind Erosion and Construction Activities			
Fugitive dust from wind erosion⁽¹⁾	M_{wind}	g	2.3E+05
Fraction of vegetative cover ⁽²⁾	V	--	0.00
Mean annual wind speed ⁽³⁾	U_m	m/s	4.10
Equivalent threshold value of wind speed ⁽²⁾	U_t	m/s	11.32
Function dependent on U/U_t ⁽²⁾	F(x)	--	0.194
Areal Extent of site surface contamination ⁽⁴⁾	A_{surf}	m ²	79,321
Exposure duration ⁽⁵⁾	ED	year	1
Fugitive dust from excavation soil dumping⁽⁶⁾	M_{excav}	g	1.0E+04
In situ wet soil bulk density ⁽⁷⁾	ρ_{soil}	Mg/m ³	1.76
Gravimetric Soil Moisture Content % ⁽⁸⁾	M	%	7.8
Areal extent of site excavation ⁽⁹⁾	A_{excav}	m ²	15864
Average depth of site excavation ⁽²⁾	d_{excav}	m	1.00
Number of times soil is dumped ⁽²⁾	N_A	--	2.00
Fugitive dust from dozing⁽¹⁰⁾	M_{doz}	g	6.3E+03
Soil silt content % ⁽⁷⁾	s	%	11.5
Gravimetric Soil Moisture Content % ⁽⁸⁾	M	%	7.8
Average dozing speed ⁽²⁾	S_{doz}	km/hr	11.40
Number of times area is dozed	N_{doze}	--	3.00
Length of dozer blade	B_d	m	2.44
Sum dozing kilometers traveled ⁽¹¹⁾	VKT_{doz}	km	97.53
Fugitive dust from grading⁽¹²⁾	M_{grade}	g	4.3E+04
Average grading speed ⁽²⁾	S_{grade}	km/hr	11.40
Number of times area is graded	N_{grade}	--	3.00
Length of grading blade	B_g	m	2.44
Sum grading kilometers traveled ⁽¹²⁾	VKT_{grade}	km	97.53

TABLE 6-6
PARTICULATE EMISSION FACTOR (PEF) FOR CONSTRUCTION SCENARIO
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 3)

Parameter	Abbrev.	Units	Value
Fugitive dust from tilling⁽¹³⁾	M_{till}	g	1.5E+04
Soil silt content % ⁽⁷⁾	s	%	11.5
Areal extent of site tilling ⁽⁹⁾	A_{till}	acre	3.92
Number of times soil is tilled ⁽²⁾	N_A	--	2.00
Total Time Averaged PM₁₀ Emission⁽¹⁴⁾	J'_T	g/m ² -sec	1.22E-07
Duration of construction ⁽²⁾	T	sec	3.15E+07
Subchronic Dispersion Factor for Area Source⁽¹⁵⁾	Q/C_{sa}	g/m ² -sec per kg/m ³	7.57
Constant A ⁽²⁾	A	--	2.45
Constant B ⁽²⁾	B	--	17.57
Constant C ⁽²⁾	C	--	189.04
Areal Extent of site surface contamination ⁽⁴⁾	A_{surf}	acres	19.6
Dispersion correction factor⁽¹⁶⁾	F_D	--	0.186
Duration of construction (time period during which construction activities occur)	t_c	hr	8760
Subchronic PEF for Construction Activities⁽¹⁷⁾	PEF_{sc}	m ³ /kg	3.34E+08
Unpaved Road Traffic			
Length of road segment ⁽¹⁸⁾	L_R	m	281.64
Width of road segment ⁽²⁾	W_R	m	6.10
Surface area of contaminated road segment ⁽¹⁹⁾	A_R	m ²	1716.88
Road surface silt content % ⁽²⁰⁾	s	%	11.5
Mean vehicle weight ⁽²⁾	W	tons	8.00
Percent moisture in dry road surface ⁽²⁰⁾	M	%	7.3
Number of days/year with at least 0.01 inches of precipitation ⁽³⁾	p	days	27.00
Number of vehicles for duration of construction	N_V	vehicles	30.00
Length of road traveled per day	L_D	m/day	281.64
Sum of fleet vehicle kilometers traveled during the exposure duration ⁽²¹⁾	VKT_{road}	km	1098.40

TABLE 6-6
PARTICULATE EMISSION FACTOR (PEF) FOR CONSTRUCTION SCENARIO
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 3 of 3)

Parameter	Abbrev.	Units	Value
Subchronic Dispersion Factor for road segment⁽²²⁾	Q/C_{sr}	g/m^2 -sec per kg/m^3	14.39
Constant A ⁽²⁾	A		12.94
Constant B ⁽²⁾	B		5.74
Constant C ⁽²⁾	C		71.77
Subchronic PEF for Unpaved Road Traffic⁽²³⁾	PEF_{sc_road}	m^3/kg	1.16E+07
Total construction related PEF⁽²⁴⁾	PEF_{sc_total}	m^3/kg	1.12E+07
Total outdoor ambient air dust concentration⁽²⁵⁾	$D_{construct}$	kg/m^3	8.95E-08

(1) From USEPA. (2002b). Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response, Washington, DC. OSWER 9355.4-24. December. - $M_{wind} = 0.036 \times (1-V) \times (U_m/U_t)^5 \times F(x) \times A_{surf} \times ED \times 8760hr/yr$.

(2) Assumed value for the site based upon USEPA (2002b).

(3) Derived by averaging data from the Las Vegas Airport and Nellis AFB stations.

(4) Site area.

(5) Construction worker ED

(6) From USEPA 2002b - $M_{excav} = 0.35 \times 0.0016 \times [(U_m/2.2)^{1.3}/(M/2)^{1.4}] \times \rho_{soil} \times A_{excav} \times d_{excav} \times N_A \times 10^3 g/kg$.

(7) This value can change based on site specific characteristics

(8) Based on the average of percent moisture across the site.

(9) Assumed value of one fifth of the site based upon USEPA (2002b).

(10) From USEPA 2002b - $M_{doz} = 0.75 \times [(0.45 \times s^{1.5})/(M)^{1.4}] \times \sum VKT_{doz}/S_{doz} \times 10^3 g/kg$.

(11) From USEPA 2002b - $VKT_{doz} = [(A_{surf}^{0.5}/2.44m) \times A_{surf}^{0.5} \times 3]/1,000 m/km$.

(12) From USEPA 2002b - $M_{grade} = 0.60 \times (0.0056 \times S^{2.0}) \times \sum VKT_{grade} \times 10^3 g/kg$.

(13) From USEPA 2002b - $M_{till} = 1.1 \times s^{0.6} \times A_{till} \times 4,047m^2/acre \times 10^{-4}ha/m^2 \times 10^3 g/kg \times N_A$.

(14) From USEPA 2002b - $J_T = (M_{wind} + M_{excav} + M_{doz} + M_{grade} + M_{till})/(A_{surf} \times T)$.

(15) From USEPA 2002b - $Q/C_{sa} = A \times \exp[(\ln(A_{surf}) - B)^2/C]$.

(16) From USEPA 2002b - $F_D = 0.1852 + (5.3537/t_c) + (-9.6318/t_c^2)$, $t_c = T/(3,600sec/hour)$.

(17) From USEPA 2002b - $PEF_{sc} = Q/C_{sa} \times (1/F_D) \times (1/J_T)$.

(18) Assumed value of the square root of the site area, based upon USEPA (2002b).

(19) From USEPA 2002b - $A_R = L_R \times W_R \times 0.092903 m^2/ft^2$

(20) Average of surface soil percent moisture results.

(21) From USEPA 2002b - $VKT_{road} = 30 vehicles \times L_R \times [(52 wks/yr)/2] \times (5 days/week) / (1000 m/km)$.

(22) From USEPA 2002b - $Q/C_{sr} = A \times \exp[(\ln(A_{surf}) - B)^2/C]$.

(23) From USEPA 2002b - $PEF_{sc_road} = Q/C_{sr} \times (1/F_D) \times T \times A_R / \{ [2.6 \times (s/12)^{0.8} \times (W/3)^{0.4}/(M/0.2)^{0.3}] \times [(365-p)/365] \times 281.9 \times \sum VKT_{road} \}$.

(24) $PEF_{sc_total} = \{ 1/[(1/PEF_{sc}) + (1/PEF_{sc_road})] \}$.

(25) $D_{construct} = 1/PEF_{sc_total}$.

TABLE 6-7
OUTDOOR AIR EXPOSURE POINT CONCENTRATIONS FROM SOIL
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 1 of 1)

Chemical	Soil Conc. (mg/kg)	Construction Worker Outdoor Air		Non-Construction Worker Outdoor Air	
		PEF/VF ⁽¹⁾ (kg/m ³)	Air Conc. ⁽²⁾ (mg/m ³)	PEF/VF ⁽³⁾ (kg/m ³)	Air Conc. ⁽²⁾ (mg/m ³)
Aldehydes					
Acetaldehyde	5.4	8.9 E-8	4.8 E-7	1.2 E-9	6.3 E-9
Inorganics					
Aluminum	12,000	8.9 E-8	1.1 E-3	1.2 E-9	1.4 E-5
Arsenic	4.8	8.9 E-8	4.3 E-7	1.2 E-9	5.6 E-9

Notes:

- (1) Construction worker PEF from Table 6-6.
- (2) Soil concentration × PEF.
- (3) Non-construction PEF from Table 6-5.

TABLE 6-8
WORKERS EXPOSURE FACTORS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Parameter	Abbrev.	Value	Units	Reference
Dermal absorption fraction	ABS	---	chemical-specific--	see text
Maintenance worker dermal adherence facto	AF _{mw}	0.2	mg/cm ²	Closure Plan
Commercial worker dermal adherence facto	AF _{cmw}	NA	mg/cm ²	Closure Plan
Construction worker dermal adherence facto	AF _{cw}	0.3	mg/cm ²	Closure Plan
Averaging time, carcinogeni	AT _c	70	years	Closure Plan
Averaging time, carcinogenic (inhalation)	AT _c	613200	hours	Closure Plan
Averaging time, non-carcinogenic, maintenance/commercial work	AT _{nc}	25	years	Closure Plan
Averaging time, non-carcinogenic, maintenance/commercial worker (inhalatio	AT _{nc}	219000	hours	Closure Plan
Averaging time, non-carcinogenic, construction work	AT _{nc,c}	1	years	Closure Plan
Averaging time, non-carcinogenic, construction worker (inhalatio	AT _{nc,c}	8760	hours	Closure Plan
Adult body weigh	BW _a	70	kg	Closure Plan
Maintenance worker exposure frequenc	EF _{mw}	225	days/year	Closure Plan
Commercial worker exposure frequenc	EF _{cmw}	250	days/year	Closure Plan
Construction worker exposure frequenc	EF _{cmw}	250	days/year	Closure Plan
Exposure duration, maintenance/commercial worker	ED	25	years	Closure Plan
Exposure duration, maintenance/commercial worker (inhalation)	ED	219000	hours	Closure Plan
Exposure duration, construction worker	ED	1	years	Closure Plan
Exposure duration, construction worker (inhalation)	ED	8760	hours	Closure Plan
Maintenance worker exposed surface are	SA _{mw}	3,300	cm ² /day	Closure Plan
Construction worker exposed surface are	SA _{mw}	3,300	cm ² /day	Closure Plan
Commercial worker exposed surface are	SA _{cmw}	NA	cm ² /day	Closure Plan
Maintenance worker soil ingestion rat	IR _{s,mw}	100	mg/day	Closure Plan
Commercial worker soil ingestion rat	IR _{s,cmw}	50	mg/day	Closure Plan
Construction worker soil ingestion rat	IR _{s,cmw}	330	mg/day	Closure Plan
Commercial worker exposure time, indoor	ET _{cmw,i}	8	based on 8 hr/d	Closure Plan
Commercial worker exposure time, outdoor	ET _{cmw,o}	0	indoor worker	Closure Plan
Maintenance worker exposure time, indoor	ET _{mw,i}	0	outdoor worker	Closure Plan
Maintenance worker exposure time, outdoor	ET _{mw,o}	8	based on 8 hr/d	Closure Plan
Soil ingestion, non-cancer, commercial worker	--	4.89 E-7	day ⁻¹	Calculated
Soil ingestion, cancer, commercial worker	--	1.75 E-7	day ⁻¹	Calculated
Soil ingestion, non-cancer, maintenance worker	--	8.81 E-7	day ⁻¹	Calculated
Soil ingestion, cancer, maintenance worker	--	3.15 E-7	day ⁻¹	Calculated
Soil dermal contact, non-cancer, maintenance worker	--	5.81 E-6	day ⁻¹	Calculated
Soil dermal contact, cancer, maintenance worker	--	2.08 E-6	day ⁻¹	Calculated
Inhalation, fugitive-dust, outdoor, non-cancer, maintenance worker	--	2.05 E-1	unitless	Calculated
Inhalation, fugitive-dust, outdoor, cancer, maintenance worker	--	7.34 E-2	unitless	Calculated
Soil ingestion, noncancer, construction worker	--	3.23 E-6	day ⁻¹	Calculated
Soil ingestion, cancer, construction worker	--	4.61 E-8	day ⁻¹	Calculated
Soil dermal contact, noncancer, construction worker	--	9.69 E-6	day ⁻¹	Calculated
Soil dermal contact, cancer, construction worker	--	1.38 E-7	day ⁻¹	Calculated
Inhalation, soil-dust, outdoor, noncancer, construction worker	--	2.28 E-1	unitless	Calculated
Inhalation, soil-dust, outdoor, cancer, construction worker	--	3.26 E-3	unitless	Calculated

Note: Exposure parameters for maintenance workers and commerical workers are based on outdoor and indoor commercial/industrial worker exposure factors, respectively, from USEPA, 2002b.

TABLE 6-9
TOXICITY CRITERIA FOR SURFACE FLUX
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 1 of 1)

Compound	Cancer IUR		Non-Cancer RfC	
	1/($\mu\text{g}/\text{m}^3$)		(mg/m^3)	
Carbon tetrachloride	6.0 E-6	I	1.0 E-1	I
Chloroform	2.3 E-5	I	9.8 E-2	A
Tetrachloroethene	2.6 E-7	I	4.0 E-2	I
Trichloroethene	4.1 E-6	I	2.0 E-3	I

Key:

A = ATSDR

CA = Cal/EPA (from NDEP 2013)

I = IRIS (USEPA 2015)

S = NDEP Surrogate (from NDEP 2013)

TABLE 6-10
NON-CANCER TOXICITY CRITERIA FOR SOIL
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 1 of 1)

Chemical	Inhalation - Chronic		Inhalation - Subchronic		Oral ⁽¹⁾ - Chronic		Oral ⁽¹⁾ - Subchronic		Oral BIO	Dermal ABS ⁽²⁾
	Value (mg/m ³)	Reference	Value (mg/m ³)	Reference	Value (mg/kg/day)	Reference	Value (mg/kg/day)	Reference		
Inorganics										
Aluminum	5.0 E-3	PPRTV	5.0 E-3	Chronic	1.0 E+0	PPRTV	1.0 E+0	Chronic	1.0	NA
Arsenic	1.5 E-5	CalEPA	1.5 E-5	Chronic	3.0 E-4	USEPA 2015	3.0 E-4	Chronic	0.3	NA
Organic Compounds										
Acetaldehyde	9.0 E-3	USEPA 2015	9.0 E-3	Chronic	NA				1.0	NA

Notes

Values obtained from NDEP (2013).

NA = Not applicable. Data is either not applicable for this chemical or not available.

BIO = bioavailability.

ABS = dermal absorption efficiency.

PPRTV = USEPA Provisional Peer Reviewed Toxicity Values.

(1) No COPCs required adjustment of the oral toxicity criteria for the dermal soil exposure pathway (USEPA 2004e).

(2) Dermal absorption factors obtained from USEPA 2004e.

TABLE 6-11
CANCER TOXICITY CRITERIA FOR SOIL
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 1 of 1)

Chemical	Inhalation		Oral ⁽¹⁾		Oral BIO	Dermal ABS ⁽²⁾
	Value (µg/m ³) ⁻¹	Reference	Value (mg/kg-day) ⁻¹	Reference		
<u>Inorganics</u>						
Aluminum	NA		NA		1.0	NA
Arsenic	4.3 E-3	USEPA 2015	1.5 E+0	USEPA 2015	0.3	NA
<u>Organic Compounds</u>						
Acetaldehyde	2.2 E-6	USEPA 2015	NA		1.0	NA

Notes

Values obtained from NDEP (2013).

NA = Not applicable. Data is either not applicable for this chemical (*i.e.*, not carcinogenic) or not available.

BIO = bioavailability - NOTE: The basis for the arsenic oral bioavailability is presented in Closure Plan.

ABS = dermal absorption efficiency.

(1) No COPCs required oral toxicity criteria adjustment for the dermal soil exposure pathway (USEPA 2004e).

(2) Dermal absorption factors obtained from USEPA 2004e.

TABLE 6-12
CHEMICAL RISK SUMMARY FOR CONSTRUCTION WORKER RECEPTORS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Receptor	HI	ILCR
<u>Future On-Site Construction Worker</u>		
Soil, Dermal and Dust	0.1	1 E-7
Volatile Inhalation (from Flux) ⁽¹⁾	0.00002	4 E-10
Combined	0.1	1 E-7

Chemical	Soil Concentration (mg/kg)	Oral HQ	Dermal HQ	Outdoor Inhal HQ	Total HI	Oral ILCR	Dermal ILCR	Outdoor Inhal ILCR	Total ILCR
<i>Inorganics</i>									
Aluminum	12000	3.9 E-2	NA	4.9 E-2	8.8 E-2	NA	NA	NA	NA
Arsenic	4.8	1.5 E-2	NA	6.5 E-3	2.2 E-2	1 E-7	NA	6 E-9	1 E-7
<i>Aldehydes</i>									
Acetaldehyde	5.4	NA	NA	1.2 E-5	1.2 E-5	NA	NA	3 E-12	3 E-12
Total		0.05	NA	0.06	0.1	1 E-7	NA	6 E-9	1 E-7

HQ = hazard quotient

HI - hazard index

ILCR = incremental lifetime cancer risk

(1) Note that risk estimates for surface flux data were done on a sample-by-sample basis, therefore, risks are presented as a range. See Appendix H for sample-specific risk estimates.

TABLE 6-13
CHEMICAL RISK SUMMARY FOR COMMERCIAL (INDOOR) WORKER RECEPTORS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 1 of 1)

Receptor	HI	ILCR
<u>Future On-Site Commercial Worker</u>		
Soil and Dust	0.009	4 E-7
Volatile Inhalation (from Flux) ⁽¹⁾	0.00002	1 E-8
Combined	0.009	4 E-7

Chemical	Soil Concentration (mg/kg)	Oral HQ	Indoor Dust Inhal HQ	Total HI	Oral ILCR	Indoor Dust Inhal ILCR	Total ILCR
<i>Inorganics</i>							
Aluminum	12000	5.9 E-3	2.6 E-4	6.1 E-3	NA	NA	NA
Arsenic	4.8	2.3 E-3	3.4 E-5	2.4 E-3	4 E-7	8 E-10	4 E-7
<i>Aldehydes</i>							
Acetaldehyde	5.4	NA	6.4 E-8	6.4 E-8	NA	5 E-13	5 E-13
Total		0.008	0.0003	0.009	4 E-7	8 E-10	4 E-7

HQ = hazard quotient

HI - hazard index

ILCR = incremental lifetime cancer risk

(1) Note that risk estimates for surface flux data were done on a sample-by-sample basis, therefore, risks are presented as a range. See Appendix H for sample-specific risk estimates.

TABLE 6-14
CHEMICAL RISK SUMMARY FOR MAINTENANCE (OUTDOOR) WORKER RECEPTORS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Receptor	HI	ILCR
<u>Future On-Site Maintenance Worker</u>		
Soil, Dermal, and Dust	0.02	7 E-7
Volatile Inhalation (from Flux) ⁽¹⁾	0.00001	9 E-9
Combined	0.02	7 E-7

Chemical	Soil Conc. (mg/kg)	Oral HQ	Dermal HQ	Outdoor Inhal HQ	Total HI	Oral ILCR	Dermal ILCR	Outdoor Inhal ILCR	Total ILCR
<i>Metals</i>									
Aluminum	12000	1.1 E-2	NA	5.8 E-4	1.1 E-2	NA	NA	NA	NA
Arsenic	4.8	4.2 E-3	NA	7.7 E-5	4.3 E-3	7 E-7	NA	2 E-9	7 E-7
<i>Aldehydes</i>									
Acetaldehyde	5.4	NA	NA	1.4 E-7	1.4 E-7	NA	NA	1 E-12	1 E-12
Total		0.01	NA	0.0007	0.02	7 E-7	NA	2 E-9	7 E-7

HQ = hazard quotient

HI - hazard index

ILCR = incremental lifetime cancer risk

(1) Note that risk estimates for surface flux data were done on a sample-by-sample basis, therefore, risks are presented as a range. See Appendix H for sample-specific risk estimates.

TABLE 6-15
ASBESTOS RISK SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 1 of 1)

Asbestos Risk Calculations		$Risk = (C_{soil} * URF * (ET_{out} + (ET_{in} * ATT_{in})) * EF * ED) / (PEF * AT)$							
ESTIMATED RISK	Units	CHRYSTILE				AMPHIBOLE			
		Construction	Outdoor Worker	Indoor Worker	Onsite Resident	Construction	Outdoor Worker	Indoor Worker	Onsite Resident
Estimated Risk (Total Structures)	Unitless	1 E-8	4 E-9	2 E-9	NA	0 E+0	0 E+0	0 E+0	NA
95% UCL (Total Structures)	Unitless	3 E-8	9 E-9	4 E-9	NA	1 E-6	4 E-7	2 E-7	NA
ESTIMATED AIR CONCENTRATIONS									
Estimated Airborne Concentration, C_{air} (best estimate) ^A	f/m ³	6.68E+01	8.71E-01	8.71E-01	8.71E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Estimated Airborne Concentration (upper bound) ^B	f/m ³	1.73E+02	2.25E+00	2.25E+00	2.25E+00	6.67E+01	8.70E-01	8.70E-01	8.70E-01

^A Estimated Airborne Concentration = Estimated C_{soil} * 1/PEF

^B Estimated Airborne Concentration = 95% UCL (upper bound) * 1/PEF

TABLE 6-16
RADIONUCLIDE RISK SUMMARY
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR THE PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Radionuclide	Soil Concentration⁽¹⁾ (pCi/g)	Indoor Worker BCL⁽²⁾	Indoor Worker ILCR⁽³⁾	Outdoor Worker BCL⁽²⁾	Outdoor Worker ILCR⁽³⁾
<i>Site</i>					
Radium-226	0.84	0.051	2 E-5	0.023	4 E-5
Radium-228	1.9	0.091	2 E-5	0.041	5 E-5
Thorium-228	2.3	0.056	4 E-5	0.025	9 E-5
Thorium-230	1.5	15	1 E-7	8.3	2 E-7
Thorium-232	2	13	2 E-7	7.4	3 E-7
Uranium-233/234	1	20	5 E-8	11	9 E-8
Uranium-235/236	0.34	0.78	4 E-7	0.35	1 E-6
Uranium-238	1.2	3.1	4 E-7	1.4	9 E-7
Total			8 E-5		2 E-4
<i>Background</i>					
Radium-226	1.2	0.051	2 E-5	0.023	5 E-5
Radium-228	2	0.091	2 E-5	0.041	5 E-5
Thorium-228	1.9	0.056	3 E-5	0.025	8 E-5
Thorium-230	1.4	15	9 E-8	8.3	2 E-7
Thorium-232	1.8	13	1 E-7	7.4	2 E-7
Uranium-233/234	1.3	20	7 E-8	11	1 E-7
Uranium-235/236	0.077	0.78	1 E-7	0.35	2 E-7
Uranium-238	1.2	3.1	4 E-7	1.4	9 E-7
Total			8 E-5		2 E-4

(1) See Appendix H and Table 6-1 for 95% UCL concentration calculations.

(2) BCL = Basic Comparison Levels (BCLs) from NDEP 2013.

(3) ILCR = Soil Concentration / BCL / 10^{-6} .

TABLE 7-1
UNCERTAINTY ANALYSIS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 1 of 3)

Source of Uncertainty	May Underestimate Risk	May Overestimate Risk	May Under or Overestimate Risk
Environmental Sampling and Analysis			
Sampling and laboratory analyses may have been inadequate to fully characterize the concentrations at the site.			Moderate
Systematic or random errors in the chemical analyses may yield erroneous data.			Low
The risk estimates are based on the COPCs only. Other chemicals were not quantified.	Moderate		
Some non-detect analytes had SQLs that exceeded risk-based comparison levels.	Low		
Exposure Assumptions			
Fate and transport modeling did not take into account biodegradation or other degradation processes.		Moderate	
Modeling did not take into account interactions that may occur among the different chemicals which may influence their migration.		Moderate	
Only primary receptors of concern were evaluated. Other populations (e.g., visitors, off-site residents) were not assessed.	Low		
Only primary exposure pathways were evaluated. Other pathways were not assessed.	Low		
Worker receptors were evaluated; however, the planned development of the Site may include retail. Potential worker exposures are considered more conservative, and therefore, protective and representative of any potential visitor receptors.		Moderate	
Some of the exposure point concentrations used in the exposure assessment were based on modeled, rather than measured, levels in various media (e.g., air).			Moderate

TABLE 7-1
UNCERTAINTY ANALYSIS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 2 of 3)

Source of Uncertainty	May Underestimate Risk	May Overestimate Risk	May Under or Overestimate Risk
Reasonable maximum exposure values were combined to arrive at the ADD and LADD estimates. There is a low probability that all of the various upper bound assumptions used in the exposure assessment would occur in conjunction with the 95 percent UCL chemical concentration.		Moderate	
Exposure point concentrations and the amount of media intake were assumed to be constant over time.		Low	
Toxicological Data			
Sub-chronic RfDs are appropriate to characterize non-cancer effects for short-term exposures (i.e., construction workers). However, sub-chronic RfDs were not available and therefore, chronic RfDs were used.		Moderate	
RfDs are derived and extrapolated from laboratory animal studies that expose animals to relatively high intakes. Errors are inherent in the extrapolation of data from animals to humans, from high to low doses, and from one exposure route to another.			Moderate
RfDs used to estimate non-carcinogenic risk are derived from NOAELs which are based on the sensitive endpoints in the sensitive species. As a result, extrapolation of toxicity data from animals to humans is uncertain. There may be differences in metabolism, uptake, or distribution of chemicals in the body between animals and humans. To account for this, NOAELs are divided by uncertainty factors spanning several orders of magnitude to establish the RfD. The combination of these two conservative assumptions may establish RfDs which greatly overprotect human health.		Moderate	

TABLE 7-1
UNCERTAINTY ANALYSIS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 3 of 3)

Source of Uncertainty	May Underestimate Risk	May Overestimate Risk	May Under or Overestimate Risk
CSFs used for the animal carcinogens are the 95% UCL derived from the linearized multistage model using animal chronic bioassay data, which tends to greatly overestimate carcinogenic risk in humans. The linearized multistage model ignores many known factors that have been documented to protect humans against the carcinogenic actions of chemicals, such as DNA repair and immunosurveillance.		High	
RfDs, CSFs and defensible carcinogenicity data were not available for some COPCs, which were therefore not quantitatively evaluated.	Low		
Aggregation of Exposure Units			
Aggregating the exposure areas or extrapolating from Site analytical results to estimated concentrations for individual 1/8-acre exposure areas.	Low		

TABLE 9-1
DATA QUALITY ASSESSMENT
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 2)

Table 9-1a: Sample Size Results for Acetaldehyde with BCL = 69.9 mg/kg

Number of samples = 22		s = 2.6		
Threshold = 69.9 mg/kg		$\alpha = 5\%$	$\alpha = 10\%$	$\alpha = 15\%$
MDD = 10% (6.99 mg/kg)	$\beta = 15\%$	3	2	1
	$\beta = 20\%$	3	2	1
	$\beta = 25\%$	2	2	1
MDD = 20% (13.98 mg/kg)	$\beta = 15\%$	2	1	1
	$\beta = 20\%$	2	1	1
	$\beta = 25\%$	2	1	1
MDD = 30% (20.97 mg/kg)	$\beta = 15\%$	2	1	1
	$\beta = 20\%$	2	1	1
	$\beta = 25\%$	2	1	1

Table 9-1b: Sample Size Results for Aluminum with BCL = 100000 mg/kg

Number of samples = 21		s = 1300		
Threshold = 100000 mg/kg		$\alpha = 5\%$	$\alpha = 10\%$	$\alpha = 15\%$
MDD = 10% (10000 mg/kg)	$\beta = 15\%$	2	1	1
	$\beta = 20\%$	2	1	1
	$\beta = 25\%$	2	1	1
MDD = 20% (20000 mg/kg)	$\beta = 15\%$	2	1	1
	$\beta = 20\%$	2	1	1
	$\beta = 25\%$	2	1	1
MDD = 30% (30000 mg/kg)	$\beta = 15\%$	2	1	1
	$\beta = 20\%$	2	1	1
	$\beta = 25\%$	2	1	1

Table 9-1c: Sample Size Results for Arsenic with Background = 7.2 mg/kg

Number of samples = 21		s = 0.98		
Threshold = 7.2 mg/kg		$\alpha = 5\%$	$\alpha = 10\%$	$\alpha = 15\%$
MDD = 10% (0.72 mg/kg)	$\beta = 15\%$	17	13	10
	$\beta = 20\%$	15	11	8
	$\beta = 25\%$	13	9	7
MDD = 20% (1.44 mg/kg)	$\beta = 15\%$	5	4	3
	$\beta = 20\%$	5	3	3
	$\beta = 25\%$	4	3	2
MDD = 30% (2.16 mg/kg)	$\beta = 15\%$	3	2	2
	$\beta = 20\%$	3	2	1
	$\beta = 25\%$	3	2	1

TABLE 9-1
DATA QUALITY ASSESSMENT
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 2)

Table 9-1d: Sample Size Results for Thorium-228 with BCL @ 2×10^{-4} = 5 pCi/g

Number of samples = 22		s = 0.57		
Threshold = 5 pCi/g		$\alpha = 5\%$	$\alpha = 10\%$	$\alpha = 15\%$
MDD = 10% (0.5 pCi/g)	$\beta = 15\%$	12	9	7
	$\beta = 20\%$	11	8	6
	$\beta = 25\%$	10	7	5
MDD = 20% (1 pCi/g)	$\beta = 15\%$	4	3	2
	$\beta = 20\%$	4	3	2
	$\beta = 25\%$	4	2	2
MDD = 30% (1.5 pCi/g)	$\beta = 15\%$	3	2	1
	$\beta = 20\%$	3	2	1
	$\beta = 25\%$	2	2	1

Table 9-1e: Sample Size Results for TCDD TEQ with BCL = 1000 ppt

Number of samples = 11		s = 97		
Threshold = 1000 ppt		$\alpha = 5\%$	$\alpha = 10\%$	$\alpha = 15\%$
MDD = 10% (100 ppt)	$\beta = 15\%$	9	7	5
	$\beta = 20\%$	8	6	4
	$\beta = 25\%$	7	5	4
MDD = 20% (200 ppt)	$\beta = 15\%$	4	2	2
	$\beta = 20\%$	3	2	2
	$\beta = 25\%$	3	2	1
MDD = 30% (300 ppt)	$\beta = 15\%$	2	2	1
	$\beta = 20\%$	2	2	1
	$\beta = 25\%$	2	1	1

α = alpha

β = beta

s = standard deviation of sample data

APPENDIX A

NDEP COMMENTS AND BRC'S RESPONSE TO COMMENTS AND REDLINE/STRIKEOUT TEXT

APPENDIX A

NDEP Comments Dated September 2, 2015 on the Human Health Risk Assessment and Closure Report for the Parcel 9 South Sub-Area, BMI Common Areas (Eastside), Clark County, Nevada

1. Section 1.1, page 1-5, last paragraph of Section 1.1. Please identify in the report the appendix or attachment where the TEQ calculations described are documented. These calculations could not be located.

Response: This information (on the CD in Appendix B, in the electronic datafile) will be provided in Section 1.1 of the report.

2. Section 4.4, page 4-5, last bullet-paragraph. Please provide some reference or explanation supporting the statement that dichloromethyl ether is unrelated to site operations.

Response: This sentence has been removed.

3. Section 4.5, page 4-6. This section states, "The heptachlor results for eight samples, P9S1-AG15-0, P9S1-AG15-0-DUP, P9S1-AG15- 10, P9S1-JD01-0, P9S1-JD01-10, P9S1-JD02-0, P9S1-JD02-10, and P9S1-JD03-10, were rejected due calibration violations." Sample P9S1-JD03-10 should be corrected to P9S1-JD03-0, according to Table B-5.

Response: This sentence has been corrected.

4. Section 4.5.5, page 4-14, and Table E-13. Section 4.5.5, Table 4-6, does not agree with Table E-13. For example, Table 4-6 lists P9S1-AH14-0 with a recovery of 49% and limits of 53-120% (e.g., 2,4-DDD), while Table E-13 lists the limits as 36-150%. According to Table E-13, the results should not be qualified, as they are within limits. One of the tables has the wrong limits and needs to be revised. This appears to be a systemic issue for both tables. Please ensure all data in both tables and text agree and that data are appropriately qualified.

Response: The limits in Table E-13 were incorrect and have been corrected.

5. Section 5.3, page 5-6, second paragraph of Section 5.3. This paragraph refers only to dioxins/furans in relation to the TCDD TEQ and improperly omits reference to PCB congeners as contributors to the TCDD TEQ. Please revise the text to discuss all contributors to the TCDD TEQ. See also the Essential Corrections comment for Table 5-5.

Response: This correction has been made to the report.

6. Section 6.1.3 Outdoor Air, last paragraph, first and last sentences, p. 6-10 Upon review of the tables referenced, the Exposure Point Concentrations From Surface Flux (Table 6-4) and

the risk estimates for VOCs/volatile SVOCs for surface flux at each location were calculated only for carbon tetrachloride and chloroform. It appears the same screening method was applied to limit the COPCs. This approach appears to contradict the first sentence in the last paragraph on page 6-10. Please review and revise as necessary.

Response: *This is the same approach and rationale, discussed with NDEP prior to its implementation, which has been used for all sub-area reports since for used for the Galleria North of ROW sub-area report in 2013. The technical basis has been provided and amply explained to NDEP which concurred during the preparation of that report.*

The following has been added to the identified sentence: "...and selected as a COPC as described in Section 6.1.2."

7. Table 6-2, Footnote (2), last sentence. The last sentence of this footnote should be revised to state, "Total protocol structure counts are presented for informational purposes only."

Response: *This footnote text has been corrected.*

8. Section 7.2, page 7-5, last paragraph of Section 7.2. The text refers to risk calculations for 4 VOCs, but a review of Appendix H risk calculations indicates that risk calculations across all flux chamber samples was limited to chloroform and carbon tetrachloride. This discrepancy is presumably related to the miss-match between the groundwater screening which identified 4 COPCs and detected VOCs in the flux chamber measurements. Please revise the text of this paragraph to identify the two VOCs for which risks were calculated.

The assessment of uncertainty related to the elimination of all but two VOCs in the flux chamber dataset from the risk assessment is limited to the statement that "...the cumulative risks associated with the inhalation of VOCs for all exposure scenarios are underestimated in the HHRA; however, this underestimation is considered low." Please provide risk calculations that include all detected analytes for all flux chamber samples, and reference these results as the basis for an assessment of the potential low bias in the VOC risk assessment.

Response: *BRC disagrees with providing risk calculations for all detected analytes, which goes against the approach agreed upon by the NDEP. While calculated risks may be underestimated, it is our opinion that this underestimation is low, as identified in the text, as is. However, the text has been revised to note that only two of the four identified as COPCs were detected.*

9. Appendix B, Table B-1. Table B-1 includes the data qualifiers for asbestos data, but these are excluded in the asbestos tab of the BRC Parcel 9 South Sub-Area HHRA-Closure Report_Data.xlsx file. The data qualifiers should follow the asbestos data through the data summaries and also be uploaded to the NDEP database.

Response: *These qualifiers have been added to the asbestos data tab within the data file.*

10. Appendix E. Tables E-11 to E-14 need titles in the worksheet.

Response: *Tables in Appendix E have titles on them. Note that these tables are provided electronically only on the CD included in Appendix B.*

11. Figures 1 and 2. Figures 1 and 2 depict the Beta ditch location from the TIMET property discharging on to Parcel 9 South to be in different locations. It is suggested that Figure 1 be revised to match Figure 2 as the latter appears to have it placed correctly.

Response: *Figure 1 has been revised as suggested.*

12. Figure 2. The Red used to outline the parcel of interest includes some of the Triangle sub-area to the Northeast. This figure needs to be revised so that only parcel 9 is delineated with the red line.

Response: *This figure has been fixed.*

13. Figures 3 and 4. These figures would benefit from a cross section location map embedded within the figure(s). Additionally, referencing the figures in the text would assist the reader in understanding the purpose for the figures.

Response: *This location inset has been added to these figures. Also, these figures are referenced in Section 2.2.2, third paragraph.*

14. Figure 9. There is a typo in the legend for Surface Flux Samples (yellow diamond). It presently reads "Sheet 1\$ Events".

Response: *This figure has been fixed.*

~~REDLINE/STRIKEOUT TEXT~~

EXECUTIVE SUMMARY

Basic Remediation Company LLC (BRC) has prepared this Human Health Risk Assessment (HHRA) and Closure Report for Parcel 9 South (Site) of the Basic Management, Inc. (BMI) Common Areas (Eastside) in Clark County, Nevada. The Site is located immediately adjacent to and west of Boulder Highway from the remainder of the Eastside properties, which have been addressed in separate documents. The purpose of this report is to support a request for a No Further Action Determination (NFAD) by the Nevada Division of Environmental Protection (NDEP) for the Site.

The HHRA evaluates the potential for adverse human health impacts that may occur as a result of potential exposures to residual concentrations of chemicals in soil, groundwater, and air following remediation of the Site. If the residual risks do not pose an unacceptable risk to human health and the environment, then an NFAD will be requested from the NDEP. Upon issuance of an NFAD by the NDEP, redevelopment of the Site is expected to proceed in a manner consistent with the Environmental Covenant (Instrument 201102030002818 Clark County Records Office) that is attached to the property. This report also describes the various remediation actions that were performed and presents the subsequent confirmation data collected between 2010 and 2012 at the Site.

BACKGROUND

Initial confirmation sampling investigations were conducted at the Site in 2010 in accordance with BRC's Sampling and Analysis Plan for the Staging Sub-Area and Parcel 9 South (SAP, approved by the NDEP on May 10, 2010). The SAP addressed sampling procedures such that remaining contaminants and their potential impacts to future Site uses (as discussed in Section 1.1 of the *BRC Closure Plan* for the BMI Common Areas [BRC, Environmental Resources Management (ERM), and Daniel B. Stephens & Associates, Inc. (DBS&A) 2007¹]) can be determined. The Site investigations involved collection of soil matrix and surface flux samples from throughout the Site. The sampling plan performed for this purpose, as described in Section 4 of the SAP (BRC 2010a), was consistent with the approach presented in Section 2 of the *Statistical Methodology Report* (NewFields 2006). The *Statistical Methodology Report* describes the statistical methods that are used to confirm the final soils closure at Parcel 9 South

¹ The *BRC Closure Plan* was finalized and approved by NDEP in 2007. Subsequent to this date, revisions were made to Section 9 of the *BRC Closure Plan* (Risk Assessment Methodology–Human Health). The latest revision to Section 9 is March 2010. No other sections of the *BRC Closure Plan* have been revised since 2007.

as well as each of the Eastside sub-areas of the BMI Common Areas. Two subsequent rounds of soil remediation and confirmation sampling were performed. The final number of samples collected was determined to be adequate for the completion of a statistically robust dataset upon which to perform an HHRA.

CONCEPTUAL SITE MODEL

The conceptual site model for the Site considers current and potential future land-use conditions. Currently, the Site is undeveloped. Current receptors that may be exposed to Site chemicals of potential concern (COPCs) include on-site trespassers and off-site residents. Future receptors identified as “on-site receptors” are defined as receptors located within the current Site boundaries (Figure 1), while future “off-site receptors” are those located outside the current Site boundaries. A redevelopment plan has not been generated for the Site; the expected land use is industrial/commercial. For the evaluation in this Closure Report, the focus is for retail/commercial land use and the HHRA assumes future receptors will include indoor commercial workers, outdoor maintenance workers, and construction workers.

Due to the requirement for use of default reasonable maximum exposure parameters for future receptors, exposures to future receptors are greater than current exposures. Accordingly, only future receptors were assessed in the HHRA. Potential exposures to off-site residents were qualitatively evaluated. The HHRA conforms to the methodology included in Section 9 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010).

The entire Site will be enhanced by restoration and redevelopment once remediation is complete. Therefore, there is no exposure to ecological receptors, because the Site will be prepared for retail/commercial land use.

DATA REVIEW AND USABILITY EVALUATION

A data review and usability evaluation was performed to identify appropriate data for use in the HHRA. The results of the data usability evaluation indicate that the data collected between 2010 and 2012 are adequate in terms of quality for use in a risk assessment.

HUMAN HEALTH RISK ASSESSMENT

An HHRA was conducted to determine if chemical concentrations in Site soils are either: (1) representative of background conditions; or (2) do not pose an unacceptable risk to human health and the environment under current and potential future use conditions. The HHRA followed the procedures outlined in U.S. Environmental Protection Agency (USEPA) and the

NDEP guidance documents. As noted above, the HHRA also conforms to the methodology presented in Section 9 of the NDEP-approved *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010) and includes all COPCs for the Site. Results of the HHRA are summarized below.

**TABLE ES-1: SUMMARY OF HUMAN HEALTH
RISK ASSESSMENT CALCULATIONS**

	Construction Worker	Commercial (Indoor) Worker	Maintenance (Outdoor) Worker
Site Chemical Non-Cancer HI ¹	0.1	0.009	0.02
Site Chemical Cancer Risk ²	1×10^{-7}	4×10^{-7}	7×10^{-7}
Site Radionuclide Cancer Risk ^{2,3}	--	8×10^{-5}	2×10^{-4}
Background Radionuclide Risk ^{2,3}	--	8×10^{-5}	2×10^{-4}
Asbestos Risk ^{3,4}	0 to 1×10^{-6}	0 to 2×10^{-7}	0 to 4×10^{-7}

1 – HI = hazard index; the value presented is the total cumulative non-cancer HI.

2 – Cancer risk is the maximum theoretical upper-bound incremental lifetime cancer risk (ILCR).

3 – Consistent with the NDEP-approved BRC Closure Plan (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010), chemical, radionuclide, and asbestos risks are calculated separately.

4 – Asbestos risk refers to the sum of cancer risks for mesothelioma and lung cancer. Asbestos risks represent the cumulative chrysotile and cumulative amphibole asbestos risks for chrysotile and amphibole fibers, respectively. Risks shown are the higher of the risks for chrysotile or amphibole fibers. Asbestos risks are not included in Site Cancer Risk (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010).

Air exposures to volatile organic compounds are evaluated on a sample-by-sample basis, per NDEP requirements, using the surface flux data measurements. Because of this, the minimum and maximum surface flux risks and HI estimates are summed with the soil risk and HI estimates to provide a range of cumulative risks and HIs. The risk estimates shown above incorporate the maximum surface flux risks. Primary risk contributors are discussed in the main body of the report.

EVALUATION OF UNCERTAINTIES

Risk estimates are values that have uncertainties associated with them. These uncertainties, which arise at every step of a risk assessment, are evaluated in the report to provide an indication of the uncertainty associated with a risk estimate. Uncertainties from different sources are compounded in the HHRA. Because the uncertainties are compounded and because the exposure assumptions and toxicity criteria used are considered conservative, the risk estimates calculated in this HHRA are likely to overestimate rather than underestimate potential risks. A detailed discussion of these uncertainties is provided in the Uncertainty Analysis (Section 7) of the report.

POTENTIAL IMPACTS TO GROUNDWATER

As noted in a letter dated September 17, 2012, from Greg Lovato, NDEP, to Mark Paris, BRC, HHRA reports for the project no longer evaluate the potential leaching impacts to groundwater for any Eastside sub-area. This issue will be addressed in the Eastside groundwater remedial alternatives study. As provided for in Section XVII of the Phase III Administrative Order on Consent, No Further Action Determinations issued for the BMI Common Areas are subject to Continuing Work to Address Water Pollution Conditions, Operation and Maintenance, Maintenance of Existing Institutional Controls, and/or Efficacy Review.

SUMMARY

Based on the results of the 2010 to 2012 sampling, the HHRA, and the conclusions presented there from in this report, exposures to residual levels of chemicals in soil at Parcel 9 South should not result in adverse health effects to any of the future receptors evaluated. As a result, an NFAD for Parcel 9 South is warranted, given the following provisos:

1. The NFAD does not pertain to groundwater. BRC retains the responsibility to address any environmental impacts to groundwater beneath the Site, pursuant to the *Settlement Agreement and Administrative Order on Consent: BMI Common Areas, Phase 3* (NDEP 2006). As such, additional investigation may be necessary on the Site as it relates to BRC's responsibilities for groundwater. BRC must be granted access to the Site for activities such as well or soil boring installations or other investigative or remedial efforts.
2. The soils beneath 10 feet below ground surface of the Recorded Environmental Covenant (Instrument 201102030002818 Clark County Records Office) redevelopment grading plan for the Site have not been evaluated to date. Accordingly, the NFAD does not pertain to soil below the top 10 feet of the final grading plan for the Site. The property owner should note that these soils should not be disturbed without additional investigation or evaluation. BRC understands that this provision will be reflected in an Environmental Covenant for the Site.
3. The property owner should ensure that activities at the Site do not exacerbate existing, sub-surface, environmental conditions. Any grading plan that is prepared for redevelopment of the Site will incorporate an Environmental Covenant for the Site to control subsurface excavation.
4. Site use is otherwise suitable for purposes as retail/commercial land use.

1.0 INTRODUCTION

Basic Remediation Company LLC (BRC) has prepared this Human Health Risk Assessment (HHRA) and Closure Report for Parcel 9 South (Site; Figure 1) of the Basic Management, Inc. (BMI) Common Areas (Eastside) in Clark County, Nevada. The purpose of this report is to support a request for a No Further Action Determination (NFAD) by the Nevada Division of Environmental Protection (NDEP) for the Site. As presented in Section XVII.1.a. of the *Settlement Agreement and Administrative Order on Consent: BMI Common Areas, Phase 3* (AOC3; NDEP 2006), the NDEP acknowledges that discrete Eastside areas may be issued an NFAD as remedial actions are completed for selected environmental media. Any such NFAD request shall identify the remedial actions and other work completed at the property in question, the results of such remedial actions and other work, the proposed land use(s), and the reasons supporting the eligibility of the property for an NFAD. This report provides this information for the Site.

BRC recognizes that the following conditions will be included in a Recorded Environmental Covenant (Instrument 201102030002818 Clark County Records Office) as a condition to receiving an NFAD from the NDEP:

1. The NFAD does not pertain to groundwater. BRC retains the responsibility to address any environmental impacts to groundwater beneath the Site, pursuant to the AOC3. As such, additional investigation may be necessary on the Site as it relates to BRC's responsibilities for groundwater. BRC must be granted access to the Site for activities such as well or soil boring installations or other investigative or remedial efforts.
2. The soils beneath 10 feet below ground surface (bgs) for the Site have not been evaluated to date. Accordingly, the NFAD does not pertain to soil below the top 10 feet of the Site. The property owner should note that these soils should not be disturbed without additional investigation or evaluation.
3. The property owner should ensure that activities at the Site do not exacerbate existing, sub-surface, environmental conditions. A grading plan will be developed for redevelopment of the Site, and incorporated as an Environmental Covenant for the Site to control subsurface excavation.
4. Site use is otherwise suitable for purposes as retail/commercial land use.

Consistent with Section VI of the NDEP's *Record of Decision, Remediation of Soils and Sediments in the Upper and Lower Ponds at the BMI Complex* (ROD; NDEP 2001), cleanup of the Site proceeded under Alternative 4B (soils transferred from the Site to a dedicated Corrective Action Management Unit [CAMU] within the BMI Complex),² as identified and described in Section 9 of the Remedial Alternatives Study (RAS) for the Eastside. The *Remedial Alternatives Study for Soils and Sediments in the Upper and Lower Ponds at the BMI Complex* (Environmental Resources Management [ERM] 2000) was submitted to the NDEP in March 2000. The RAS is documented via issuance of the ROD, dated November 2, 2001, by the NDEP.

This report is consistent in format with prior closure reports for other Eastside study areas, and incorporates comments received from the NDEP on those reports. Appendix A has been reserved for potential future NDEP comments on this report and BRC's response to these comments. An electronic version of the entire report, as well as original format files (MS Word and MS Excel) of all text, tables, modeling, and risk calculations are included on the report compact disc (CD) in Appendix B.

1.1 PURPOSE OF THE RISK ASSESSMENT

The purpose of the HHRA is to evaluate the potential for adverse human health impacts that may occur as a result of potential exposures to residual concentrations of chemicals in soil, groundwater, and air following remediation, and to assess whether any additional remedial actions are necessary in order to request an NFAD from the NDEP to allow redevelopment of the Site to proceed. The results of the risk assessment provide risk managers an understanding of the potential human health risks associated with background conditions and additional risks associated with past Site activities.³ Pending issuance of an NFAD by the NDEP, redevelopment of the Site is expected to proceed in a manner consistent with the Recorded Environmental Covenant attached to the property.

² Under this alternative, the Site could be developed in accordance with the current development plan and the recorded Environmental Covenant for the Site that assures appropriate management of soils beneath 10 feet bgs (post-graded), should they need to be disturbed in the future.

³ The HHRA presents total Site-related risk. Background risk is the risk to which a population is normally exposed, and does not include risks from Site contamination. Total Site-related risk includes both incremental (Site only) and background risks. Because naturally occurring constituents are typically included in a risk assessment (i.e., metals and radionuclides), the total Site-related risk will have some element of total risk included. However, because risks are only calculated for a subset of metal and radionuclides, a 'total' risk is not calculated. In instances where the total Site-related risk is calculated to exceed a cancer risk of 10^{-5} (typically when radionuclides are included in the risk assessment calculations) or a non-cancer hazard index greater than 1.0, then a background risk, only including those naturally occurring constituents included in the risk assessment, will also be calculated to provide context to the risk assessment results.

As presented in Section 2.5 of the *Sampling and Analysis Plan for the Staging Sub-Area and Parcel 9 South, BMI Common Areas (Eastside) Clark County, Nevada* (BRC 2010a; hereinafter “SAP”; approved by the NDEP on May 10, 2010), no remediation activities were conducted at the Site prior to sampling in accordance with the SAP.

When the sampling conducted in accordance with the SAP was performed, areas within the Site that warranted remediation were identified, as discussed in Section 3.3. These areas have been addressed. The overall goal of the risk assessment presented in this report, therefore, is to confirm that residual chemical concentrations are: (1) either representative of background conditions; or (2) do not pose an unacceptable risk to human health and the environment under current and potential future land use conditions. Findings of the HHRA are intended to support the Site closure process. While, in general, human health protection, BRC’s overall goal is to remediate Site soils such that they are suitable for residential uses, that is not appropriate nor necessary for this Site since its intended use is as retail/commercial land use.

Project-specific risk level and remediation goals consistent with USEPA precedents and guidelines have been established, as summarized below. It should be noted that: (1) all comparisons to risk or chemical-specific goals are made on an exposure area basis consistent with likely exposure assumptions; and (2) these comparisons are demonstrated through the use of spatial statistical analysis to apply to each one-eighth-acre exposure area.

Human health risks are represented by estimated theoretical upper-bound cancer risks and non-cancer hazards derived in accordance with standard USEPA and NDEP methods. If the carcinogenic risks or non-cancer hazards exceed USEPA acceptable levels or NDEP risk goals, then remedial action alternatives must be considered. The acceptable risk levels defined by USEPA for the protection of human health, as identified in Section 9.1.1 of the *BRC Closure Plan* (BRC, ERM, and Daniel B. Stephens & Associates, Inc. [DBS&A] 2007; Section 9 revised March 2010), are:

- Post-NFAD chemical and radionuclide concentrations in Site soils are targeted to have an associated residual, cumulative theoretical upper-bound incremental lifetime cancer risk (ILCR) level point of departure of 10^{-6} . This is the target risk goal for the project. For cases where the NDEP identifies this goal to be unfeasible, it is BRC’s understanding that the NDEP will re-evaluate the goal in accordance with USEPA (1991a) guidance. In no case will the residual, cumulative theoretical upper-bound carcinogenic risk levels exceed those allowed per USEPA guidance.

- Post-NFAD chemical concentrations in Site soils are targeted to have an associated cumulative, non-carcinogenic hazard index (HI) of 1.0 or less. If the screening HI is determined to be greater than 1.0, target organ-specific HIs will be calculated for primary and secondary organs. The final risk goal will be to achieve target organ-specific non-carcinogenic HIs of 1.0 or less.
- Where background levels exceed risk level goals or chemical-specific remediation goals, metal concentrations and radionuclide activities in Site soils are targeted to have risks no greater than those associated with background conditions.

In addition to the risk goals discussed above, chemical-specific remediation goals have been established for lead and dioxins/furans. The target goal for lead is 400 milligrams per kilogram (mg/kg) for residential land use, which is a residential soil concentration identified by USEPA (based on the Integrated Exposure Uptake Biokinetic Model [IEUBK] model) as protective of any exposure scenario (USEPA 2004a).

For dioxins/furans and polychlorinated biphenyl (PCB) congeners, the USEPA toxicity equivalency (TEQ) procedure, developed to describe the cumulative toxicity of these compounds, is used. This procedure involves assigning individual toxicity equivalency factors (TEFs) to the 2,3,7,8 substituted dioxin/furan and PCB congeners. TEFs are estimates of the toxicity of dioxin-like compounds relative to the toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), which is assigned a TEF of 1.0. Calculating the TEQ of a mixture involves multiplying the concentration of individual congeners by their respective TEF. One-half the detection limit is used for calculating the TEQ for individual congeners that are non-detect in a particular sample. The sum of the TEQ concentrations for the individual congeners is the TCDD TEQ concentration for the mixture. TEFs from USEPA (2010) are used.⁴ [The calculation of the TCDD TEQs are included in the data file on the report CD in Appendix B.](#) Consistent with the Agency for Toxic Substances and Disease Registry (ATSDR) *Update to the ATSDR Policy Guideline for Dioxins and Dioxin-Like Compounds in Residential Soil* (2008), the target goal for retail/commercial land use is the ATSDR screening value and the NDEP worker Basic Comparison Level (BCL; NDEP 2013) of 1,000 parts per trillion (ppt) TCDD TEQ.

⁴ Consistent with the letter dated November 9, 2010, from Greg Lovato, NDEP, to Mark Paris, BRC. BRC will revise the *BRC Closure Plan* accordingly.

1.2 METHODOLOGY AND REGULATORY GUIDANCE

This risk assessment follows procedures outlined in USEPA *Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual* (RAGS; USEPA 1989), and conforms to Section 9 (Risk Assessment Methodology—Human Health) of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010) which was approved by the NDEP on July 16, 2007. Various NDEP guidance documents are also relied on for the risk assessment (as referenced throughout this report). In addition, the NDEP's BCLs (NDEP 2013) are used for comparison of Site characterization data to provide for an initial screening evaluation, assist in the evaluation of data usability, and aid in determination of extent of contamination. A full list of guidance documents consulted is provided in Section 6 and the References section at the end of this document.

This report also relies upon methodology and information provided in the NDEP-approved *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010). The main text of the *BRC Closure Plan* provides discussions of the following elements relative to the BMI Common Areas project as a whole:

- The project history, including cleanup goals and project objective (Closure Plan Sections 1 and 2);
- The list of Site-related chemicals (SRCs; Closure Plan Section 3);
- The conceptual site model (CSM) addressing potential contaminant sources, the nature and extent of chemical of potential concern (COPC) occurrence, and potential exposure pathways (Closure Plan Section 4; a CSM discussion specific to the Site is provided in Section 5 of this report);
- Data verification and validation procedures (Closure Plan Section 5);
- The procedures used to evaluate the usability and adequacy of data for use in the risk assessment (Closure Plan Sections 6 and 9 [2010 revision]);

- The data quality objectives (DQOs; Closure Plan Section 7⁵);
- The RAS process for the Site (Closure Plan Section 8);
- Risk assessment procedures that will be used for Site closure (Closure Plan Section 9 for human health [2010 revision] and Section 10 for ecological); and
- Data quality assessment (Closure Plan Section 5).

As discussed in this report, the risk assessment for the Site is conducted primarily using the data collected during implementation of the Site-specific SAPs and subsequent confirmation sampling events, which have been designed to produce data representative of the conditions to which current (non-remediation workers) and future users would be exposed.

1.3 REPORT ORGANIZATION

The closure report is composed of 11 sections, as outlined below:

- This section (Section 1) presents the purpose of the risk assessment and the methods used in this assessment.
- Section 2 presents Site background, the environmental setting for the Site, and a summary of previous investigations. Section 2 also presents the CSM for the risk assessment. This includes identification of potentially exposed populations, and the potential pathways of human exposure.
- Section 3 presents the confirmation data collected between 2010 and 2014, as well as discussions on the various remedial actions conducted at the Site.
- Section 4 presents data evaluation procedures, including statistical analysis of background concentrations, and data usability and quality.
- Section 5 presents the selection of COPCs recommended for further assessment, including comparisons of Site metals and radionuclides to background conditions.

⁵ As noted in the *BRC Closure Plan*, per discussions with the NDEP, the DQO process is addressed, on an Eastside sub-area by sub-area basis (for soils), in the respective sub-area SAPs developed for each sub-area relating to the soils cleanup. Therefore, the DQO process for the Site is presented in the SAP and is not repeated here. This DQO process was incorporated in the data usability/data adequacy evaluation for the Site data used in the risk assessment.

- Section 6 presents the HHRA. This includes relevant statistical analyses, determination of representative exposure point concentrations, applicable fate and transport modeling, exposure assessment, toxicity assessment, and risk characterization.
- In Section 7, the uncertainties associated with the risk assessment are discussed.
- A summary of the risk assessment results is provided in Section 8.
- The data quality assessment for the risk assessment is presented in Section 9.
- A summary of the HHRA and Closure Report is provided in Section 10.
- A list of references is provided in Section 11.

Smaller tables with supporting information are inserted in the text at the place of reference. The text is followed by the figures, larger tables, and appendices.

2.0 SITE DESCRIPTION

This section presents a description of the Site, including Site background and history, the environmental setting, and a summary of previous investigations. The area known as the “BMI Common Areas,” of which Parcel 9 South is a part, is delineated in Appendix A of the AOC3. The subject Site is near the BMI Industrial Complex, in Clark County, Nevada, approximately 13 miles southeast of Las Vegas, within the City of Henderson (CoH) corporate limits, northeast of the City Hall (Figure 1). Parcel 9 South is approximately 8.7 acres in size⁶, and is located to the west and across Boulder Highway from the remainder of the Eastside property. The Site was previously defined in Figure 1-2 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010) as including a small parcel north of Warm Springs Road. As subsequently modified in the Staging sub-area and Parcel 9 South SAP (BRC 2010a), the property north of Warm Springs Road was removed from Parcel 9 South; that property was granted an NFAD in September 27, 1999.

The Site is an irregularly shaped area immediately south of the Warm Springs Road right-of-way and west of Boulder Highway. The Joker’s Wild Casino is located north of the Site, beyond Warm Springs Road and Boulder Highway; vacant land and a parking lot are present to the northwest. The Site is bounded to the southwest by the Titanium Metals Corporation [TIMET] industrial facility. A strip of landscaped vacant land and Boulder Highway bound the Site to the east.

The Site is undeveloped, with the exception of several utility poles along the southwestern and eastern boundaries. The Site also contains or contained features associated with historical effluent discharge within Eastside. Specifically, portions of the Western, Alpha, and Beta ditches traverse or formerly traversed the Site (Figures 1 and 2). These ditches were unlined, open air drainage ditches that carried effluent from the former BMI Complex to unlined effluent ponds on the other side of Boulder Highway, within Eastside. Use of these ditches was discontinued in 1976.

2.1 SITE HISTORY

Approximately 400 of the more than 2,200 acres comprising the BMI Common Areas contained a network of ditches, canals, flumes, and unlined ponds that were used for the disposal of

⁶ The northern portion of Parcel 9 was granted an NFAD on September 27, 1999.

aqueous waste from the original magnesium plant and, later, other industrial plants and the adjacent municipality. Effluent wastes discharged to the ponds of the BMI Common Areas from the war-time Basic Magnesium operations can be characterized as salts from the production process (chloride salts of a variety of metals and radionuclides), organic solids, and inorganic solids and dissolved components of various types. Chlorinated organic chemicals were included in the effluent. Notable processes that contributed to the waste stream from the plants that succeeded Basic Magnesium included effluents from the manufacture of the following types of products: chlorine and sodium hydroxide (caustic soda); a variety of chlorate and perchlorate compounds, and halogenated boron compounds; manganese dioxide; titanium and related compounds; and a variety of pesticides. Among these wastes were salts, organic and inorganic chemicals, and metals. A more detailed description of these processes and their effluents is found in Sections 2.2 and 2.3 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010).

2.2 ENVIRONMENTAL SETTING

The BMI Common Areas and Complex are located in Clark County, Nevada, and are situated approximately 2 miles west of the River Mountains and 1 mile north of the McCullough Range. 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 BMI Common Areas and Complex, the surface topography slopes north toward the Las Vegas Wash. The River Mountains and McCullough Range consist of volcanic rocks: dacite in the River Mountains and andesite in the McCullough Range (Umhoefer et al. 2010).

The Site (Figure 2) comprises 8.7 acres of undeveloped land with little surface relief that is gently sloping to the northeast. The Site is currently undeveloped, except for the previously noted ditch segment. The native soils are compacted, poorly sorted, non-plastic, light brown to red silty sand with varying amounts of gravel.

2.2.1 Site Location, Climate and Physical Attributes

The Site is in the northeastern quarter of Section 5, Township 22 South, Range 63 East Mount Diablo Base and Meridian. The Site is in the Las Vegas Valley, a broad alluvial valley that occupies a structural basin in the Basin and Range Physiographic Province. The valley is about 1,550 square miles in size, and the structural and topographical axis is aligned approximately northwest to southeast. The eastern edge of the valley is about 5 miles west of Lake Mead, a major multipurpose artificial reservoir on the Colorado River. The Las Vegas Valley is

surrounded mostly by mountains, ranging from 2,000 to 10,000 feet higher than the valley floor. The valley floor ranges in elevation from about 3,000 feet above mean sea level (msl), in the west at the mountain front, to 1,500 feet above msl, in the east at the Wash (Clark County GIS Management Office 2003). The surrounding mountain ranges are:

- Sheep Range to the north;
- Frenchman and Sunrise Mountains to the northeast;
- River Range to the east;
- McCullough Range to the south; and
- Spring Mountains and Sierra Nevada mountain range of California to the west.

The Site is within the CoH corporate limits, northeast of the City Hall, and approximately 13 miles southeast of the city of Las Vegas (Figure 1). At its closest point, the Site is approximately 2.5 miles south of the Las Vegas Wash.

The Site is situated in a natural desert area, where evaporation/evapotranspiration rates are high, due to high temperatures, high winds, and low humidity. Precipitation in this area averages approximately 0.4 inch per month or 4.8 inches per year (Western Regional Climate Center 2008). As discussed in the *Sources/Sinks and Input Parameters for Groundwater Flow Model Revised Technical Memorandum* (DBS&A 2009), in arid settings, recharge from precipitation is typically a small percentage of annual precipitation. Based on values from Scanlon et al. (2006), recharge as a percentage of annual precipitation for the Site area was estimated to be between 0.1 and 5 percent. Recharge is thus estimated to be between 0.0048 and 0.24 inch per year.

According to the Southern Nevada Water Authority's document entitled *Extent and Potential Use of the Shallow Aquifer and Wash Flow in Las Vegas Valley, Nevada* (1996), annual potential evapotranspiration exceeds 86 inches. Pan evaporation data measured from 1985 through 1988 were as high as 17 inches per month; the months with the highest evaporation (May through September) coincide with those months with the highest intensity of rainfall (Law Engineering 1993). However, evaporation and evapotranspiration are functions of vegetation type and density and other Site-specific conditions (especially anthropogenic conditions). Therefore, Site-specific evaporation/evapotranspiration may vary from these regional conditions. These climatic parameters may be appreciably influenced by future redevelopment (e.g., vegetation removal, pavement extent, and construction).

Wind flow patterns are fairly consistent from one month to another, but vary slightly between measurement stations (McCarran International Airport and a station within the BMI Complex adjacent to the employee parking lot at the TIMET plant entrance). For the McCarran station, the prevailing wind direction is from the southwest. The TIMET station also showed a predominant wind direction from the southwest, with southeasterly components. Wind velocity at both locations tends to be the highest in the spring and early summer months (April through July).

2.2.2 Geology/Hydrology

As is common throughout the Las Vegas Valley, Site soils are primarily sand and gravel, with occasional cobbles. This is consistent with the depositional environment of an alluvial fan. The Site is located on alluvial fan sediments, with a surface that slopes to the north-northeast at a gradient of approximately 0.02 foot per foot towards the Las Vegas Wash. Regional drainage is generally to the east.

The uppermost strata beneath the Site consist primarily of alluvial sands and gravels derived from the volcanic source rocks in the McCullough Range, located southwest of the Site. These uppermost alluvial sediments were deposited within the last 2 million years and are of Quaternary Age, and are thus mapped and referred to as the Quaternary alluvium (Qal; Carlsen et al. 1991). The Qal is typically on the order of 50 feet thick at the Site with variations due, in part, to the non-uniform contact between the Qal and the underlying Tertiary Muddy Creek Formation (TMCf).

The TMCf underlies the Qal. The Muddy Creek formation, of which the TMCf is the uppermost part, is a lacustrine deposition from the Tertiary Age, and it underlies much of the Las Vegas Valley. It is more than 2,000 feet thick in places. The lithology of the TMCf underlying the Site is typically fine-grained (sandy silt and clayey silt), although layers with increased sand content are sporadically encountered. These TMCf materials have typically low permeability, with hydraulic conductivities on the order of 10^{-6} to 10^{-8} centimeters per second (Weston 1993). The TMCf in the vicinity of the Site was encountered to the maximum explored depth of 430 feet bgs. Lithologic cross sections are shown on Figures 3 and 4 (note that lithologic cross sections are based on those presented for the nearby Triangle Commercial sub-area).

Two distinct, laterally continuous water-bearing zones are present within the upper 400 feet of the Site subsurface: (1) an upper, unconfined water-bearing zone primarily within the Qal referred to herein as the alluvial aquifer (Aa); and (2) a deep, confined water-bearing zone that occurs in a sandier depth interval within the silts of the deeper TMCf. Both of these water-

bearing zones contain high concentrations of total dissolved solids. Between these two distinct water-bearing zones, a series of saturated sand stringers was sporadically and unpredictably encountered during drilling.

The Aa is an unconfined, shallower, water-bearing zone that occurs across the Site. For the most part, water in the Aa occurs in the Qal. The water surface in the Aa generally follows topography, with the water surface sloping towards the Las Vegas Wash. The depth from the surface to first groundwater at the Site is approximately 32 to 39 feet bgs (Figure 2). Wells completed in the Aa are not highly productive, with sustainable flows typically less than 5 gallons per minute.

2.2.3 Surface Water

Surface water flow occurs for brief periods of time during periodic precipitation events. The Las Vegas Wash collects storm water, shallow groundwater, urban runoff, and treated municipal wastewater. It is the receiving water body for all major Las Vegas area discharges. In dry weather, flow in the Wash comprises mainly treated effluent from the Clark County Water Reclamation District City of North Las Vegas, City of Las Vegas Water Pollution Control Facility, and the CoH Water Reclamation Facility (WRF). The CoH contributes smaller amounts. Aggregate flow is in excess of 160 million gallons per day (Las Vegas Wash Coordination Committee 2000). Discharge from these sources is sufficient to maintain surface flows in the Wash throughout the year. In winter, low-intensity rains fall over broad areas; in the spring and fall, thunderstorms provide short periods of high-intensity rainfall. The latter creates high run-off conditions. Run-off is also affected by human development, which tends to (1) create conduits for surface water flow and (2) decrease infiltration into native soils by covering them with man-made structures or materials (e.g., pavement).

Under current conditions, it is unlikely that ephemeral surface waters generated within the Site will migrate via overland transport to the Las Vegas Wash from the Site due to (1) the distance to the Wash (greater than 2 miles); (2) the intervening presence of the existing berms associated with the former effluent ponds, the CoH WRF, the CoH Northern RIB Ponds, and Weston Hills and Tuscany residential developments between the Site and the Wash. However, the presence of the drainage ditches suggests the current potential for rainfall to be carried from those portions of the Site to the Wash. After redevelopment, when the ditches have been removed, there will be an even lower likelihood that ephemeral surface waters generated within the Site will migrate via overland transport to the Las Vegas Wash from the Site because of the proposed design of the

future storm water facilities and the regional requirement that nuisance flows not be discharged directly into the Las Vegas Wash unless they do so under existing conditions. (Flows from future development do not meet this criterion.)

Groundwater seeps currently exist at various locations north of the BMI Common Areas near the Las Vegas Wash. No seeps currently exist within the Site. An evaluation of historical aerial photos taken between 1964 and 1970 indicates apparent historical seeps within Eastside and at nearby off-site locations in association with past effluent infiltration at the Eastside ponds and with infiltration of municipal wastewater at the southern RIBs. Evidence of seeps was not observed within the Site in these aerial photographs.

2.3 SUMMARY OF HISTORICAL INVESTIGATIONS

Historical field investigations have not been conducted at the Site to characterize the nature and extent of chemical occurrence in Site soils and groundwater.

The data collected as part of the SAP (as discussed in Section 3) are considered representative of current Site conditions⁷ and are relied upon for risk assessment purposes as described in this report.

2.4 HISTORICAL REMEDIAL ACTIVITIES

Remediation activities were not conducted at the Site prior to sampling in accordance with the SAP.

2.5 CONCEPTUAL SITE MODEL

The CSM is a tool used in risk assessment to describe relationships between chemicals and potentially exposed human receptor populations, thereby delineating the relationships between the suspected sources of chemicals identified at the Site, the mechanisms by which the chemicals might be released and transported in the environment, and the means by which the receptors could come in contact with the chemicals. The CSM provides a basis for defining DQOs, guiding Site characterization, and developing exposure scenarios. The Site history; land uses; climate; physical attributes, including geology and hydrogeology; and various field investigations are described in Sections 2.1 through 2.4 of this HHRA. The history and environmental conditions

⁷ This determination is also based on the data usability evaluation summarized in Section 4.2.

of the BMI Common Areas are described in Sections 2 and 4 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010), and in the Sitewide CSM (in preparation).

The HHRA evaluates current and potential future land-use conditions. The Site is currently undeveloped with the exception of several utility poles. The potential on- and off-site receptors are currently trespassers and off-site residents. Exposures to current receptors are being managed through Site access control. A redevelopment plan has not been generated for the Site; the expected land use is industrial/commercial. Therefore, for the evaluation in this Closure Report, the HHRA assumes future receptors will include indoor commercial workers, outdoor maintenance workers, and construction workers.

The entire Site will be enhanced by restoration and redevelopment once remediation is complete. Therefore, exposures to ecological receptors will be mitigated or removed. Future receptors identified as “on-site receptors” are defined as receptors located within current Site boundaries (Figure 1), while future “off-site receptors” are those located outside current Site boundaries. Many potential human receptors are possible at the Site in the period during and after redevelopment. The potentially exposed populations and their potential routes of exposure are discussed in Section 2.5.3.

To construct retail/commercial buildings, roads, parking, landscaping and associated features, the land will be cut and/or filled and nurtured with imported top soils⁸ as needed.

The CSM includes the planned redevelopment of the Site. All potential transfer pathways are included in the CSM. The human health aspects of the CSM for the Site are presented on Figure 5.

Numerous release mechanisms influence chemical behavior in environmental media. Under both current and future land use conditions at the Site, the principal release mechanisms involved are:

- Vertical migration in the vadose zone;
- Storm/surface water runoff into surface water and sediments;

⁸ Imported soil data are not included in risk assessment calculations because imported soils are not expected to be used. However, the chemical data for fill material from a given site within the Eastside property may be useful for evaluating sub-areas to receive fill from that site. Any soil that is imported to a sub-area will be from a sub-area that has received an NFAD.

- Fugitive dust generation and transport; and
- Vapor emission and transport.

Although these release mechanisms are identified here, no quantitative modeling is presented in this section. Instead, those primary release mechanisms identified for particular receptors are presented in this section, and are quantitatively evaluated in Section 6.

2.5.1 Impacted Environmental Media

Environmental media at the Site consist of five categories: surface soil, subsurface soil, groundwater, indoor air, and ambient outdoor air. Samples relative to Site baseline conditions have been collected at the Site for soil. Generally, impacted soil is the source of chemical exposures for other media at the Site.

Because the background water quality of groundwater beneath the Site and in the surrounding area is generally poor (viz., high total dissolved solids concentration) and because BRC has placed Environmental Covenants in the form of a deed restriction to prevent future users from utilizing groundwater beneath the Site, the use of private water wells by businesses for drinking water, irrigation water, or other non-potable uses (e.g., washing cars, filling swimming pools) will not occur in the post-redevelopment phase. Furthermore, there is no anticipated groundwater uses associated with the proposed retail/commercial land use. Therefore, exposure pathways relating to this type of use are incomplete, as defined by USEPA (1989).

Although direct exposures to groundwater will not occur; indirect exposures are possible. The primary indirect exposure pathway from groundwater is the infiltration of VOCs from soil and groundwater to indoor air. In addition, residual levels of chemicals in soil may leach and impact groundwater quality beneath the Site.

2.5.2 Inter-Media Transfers

Exposure to Site chemicals may be direct, as in the case of impacted surface soil, or indirect following inter-media transfers. Impacted soil is the initial source for inter-media transfers at the Site, which can be primary or secondary. For example, upward migration of VOCs from impacted subsurface soil into ambient air thereby reaching a point of human inhalation represents a secondary inter-media transfer.

These inter-media transfers represent the potential migration pathways that may transport one or more chemicals to an area away from the Site where a human receptor could be exposed. Discussions of each of the identified potential transfer pathways are presented below. Figure 5 presents a conceptualized diagram of the inter-media transfers and fate and transport modeling for the Site.

Five initial transfer pathways for which chemicals can migrate from impacted soil to other media have been identified. The first of these pathways is volatilization from soil and upward migration from soil into ambient air. Ambient air can be both indoor and outdoor air. The pathway of volatilization from both soil and groundwater and upward migration into ambient air was evaluated using the surface flux measurements collected. The secondary transfer pathway is downward migration of chemicals from soil to groundwater. The third transfer pathway is migration of chemicals in surface soil via surface runoff to sediments or surface water bodies. However, as discussed in Section 2.2.3, because of the distance to the Wash (greater than 2 miles) and the intervening presence of the existing berms associated with the former effluent ponds, and the CoH WRF, it is unlikely that surface waters (which are ephemeral) will drain to the Las Vegas Wash from the Site. Therefore, the surface water pathway was not evaluated in this risk assessment. The fourth transfer pathway is on-site fugitive dust generation. Finally, chemicals in soil can be transferred to plants grown on the Site via uptake through the roots. However, the plant uptake pathway is only evaluated for residential receptors, and therefore is not included for the Site.

2.5.3 Potential Human Exposure Scenarios

The following subsections summarize land use and the human exposure scenarios that are assessed herein.

2.5.3.1 Current and Future Land Use

Current receptors that may use the Site include trespassers and off-site residents. Current exposures to native soils at the Site are minimal, but exposures to future receptors will be much greater. For example, future receptors evaluated in the HHRA include on-site workers who are assumed to be exposed to soil at the Site for 250 days per year for 25 years, which is much greater than any current exposure scenario. In addition, as discussed above, exposures to current receptors are limited through Site access control. Therefore, a current land use scenario is not quantitatively evaluated in this risk assessment.

USEPA risk assessment guidance (1989) states that potential future land use should be considered in addition to current land use when evaluating the potential for human exposure at a site. As indicated above, the Site will be used for retail/commercial land use, including parking and landscaping. The entire Eastside property will be redeveloped in several phases. Throughout the redevelopment process, the sub-areas of the Site will be redeveloped sequentially. Future receptors identified as “on-site receptors” are defined as receptors located within the current Site boundaries (Figure 1), while future “off-site receptors” are those located outside the current Site boundaries. “On-site receptors” are those future receptors that will be located within the Site under evaluation. “Off-site receptors” are those future receptors that will be located outside the Site under evaluation that may have complete exposure pathways associated with sources within the Site. As noted above, remediation of the Site is to on-site indoor/outdoor/construction worker standards. Consequently, risks to off-site receptors are addressed qualitatively in this risk assessment.

2.5.3.2 Identification of Potentially Exposed Populations and Pathways

Many potential human receptors are possible at the Site in the period during and after redevelopment. The potentially exposed populations and their potential routes of exposure are presented on Figure 5 and summarized below. For a complete exposure pathway to exist, each of the following elements must be present (USEPA 1989):

- A source and mechanism for chemical release;
- An environmental transport medium (i.e., air, water, soil);
- A point of potential human contact with the medium; and
- A route of exposure (e.g., inhalation, ingestion, dermal contact).

As presented in Section 9 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010), the following are the primary exposure pathways for each of the potential receptors following remediation and redevelopment at the Site.

- Indoor commercial workers
 - Incidental soil ingestion*
 - External exposure from soil[†]
 - Indoor inhalation of VOCs from soil and groundwater

- Outdoor maintenance workers
 - Incidental soil ingestion*
 - External exposure from soil[†]
 - Dermal contact with soil
 - Outdoor inhalation of dust*[‡]
 - Outdoor inhalation of VOCs from soil and groundwater
- Construction workers
 - Incidental soil ingestion*
 - External exposure from soil[†]
 - Dermal contact with soil
 - Outdoor inhalation of dust*[‡]
 - Outdoor inhalation of VOCs from soil and groundwater

*Includes radionuclide exposures

[†]Only radionuclide exposures

[‡]Includes asbestos exposures

Although trespassers/recreational users and downwind off-site residents are another potential receptor identified in the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010), exposures for these receptors are less than those evaluated above. As noted in Sections 9.1.1 and 9.7.1 of the *Closure Plan*, potential exposures for trespassers/recreational users will only be evaluated in areas of the BMI Common Areas that are designated as recreational end use (specifically the Western Hook-Open Space sub-area shown on Figure 1). Also, as noted in Section 9.5.4 of the *Closure Plan*, off-site dust levels based on USEPA's model are much lower than those generated for on-site, construction-related activities. Therefore, risks evaluated for an on-site construction worker, as performed in this HHRA, are considered protective of off-site residents.

3.0 CONFIRMATION DATA PROCESS AND SUMMARY

Based on the historical data for the Site, no remediation was proposed prior to implementing the sampling prescribed in the SAP. Decisions for excavation during SAP implementation were based on the initial data (discussed below) in accordance with the Risk Assessment Methodology provided in the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010). The following is the initial scope of work for investigating the Site and meeting the SAP objectives. Much of the discussion below regarding confirmation soil sampling is taken from the *Statistical Methodology Report* (NewFields 2006).

3.1 INITIAL CONFIRMATION SOIL SAMPLING

As per Section 2 of the *Statistical Methodology Report*, the initial confirmation sampling at the Site was conducted on the basis of combined random and biased (judgmental) sampling, as follows:

- **Stratified Random Locations:** For this purpose, the Site was covered by a 3-acre cell grid network. Within each 3-acre cell, a sampling location was randomly selected. Sampling locations were randomly selected within both full and partial grid cells if they were greater than 50 percent of the total grid cell area (based on the project-wide grid cell network and the Site boundaries; those partial grid cells that contain less than 50 percent of their area within the Site were included in the adjacent sub-area SAPs). The main objective of this stratified random sampling was to provide uniform coverage of each Site within the Eastside property.
- **Biased Locations:** Additional sampling locations were selected within or near small-scale contamination points of interests, including but not limited to former conveyance ditches. For this purpose, the randomly selected location within a corresponding 3-acre cell was adjusted in some cases to cover a nearby point of interest. In the event that currently unknown impacted areas were identified during remediation, the presence of these areas were drawn to the NDEP's attention, the need for additional biased sampling points to address those areas was evaluated, and the sampling program modified as needed.

Biased sampling was conducted along the length of the ditch, at approximately 200-foot linear spacing (three locations within the Site). Figure 6 and accompanying Table 3-1 (see Tables section) show the sampling locations within the Site.

The following discusses the multi-depth soil samples that were collected and analyzed for the SRC list at each selected location. As noted previously, a grading plan has not yet been developed for the Site. Therefore, samples were collected at existing surface (0 foot bgs) and 10 feet bgs at each sample location. The analytical sample results were then divided into surface and subsurface (10-foot depth) layers. A schematic example of these rules is shown on Figure 7 (note that this schematic applies to samples collected as part of the Eastside property as a whole, are not entirely applicable to the Site. The sample-specific collection depths are presented in Table 3-1 (Tables section).

As noted above, soil samples were generally collected over a 2- to 3-foot depth interval. This was because of volume of soil required for completion of all analyses. The 10 feet bgs samples were collected in 2- to 3-foot intervals centered on 10 feet (or centered on the deeper sampling depth as indicated in Table 3-1). Confirmation samples, which usually have a shortened analyte list, were collected over a smaller sampling interval. Contamination by the historical manufacturing processes upgradient is usually found predominantly in surface soils. The objective of remedial actions at the Site was to remove surface soils that were impacted by surface releases of off-site chemicals. Therefore, higher concentrations are expected—and have been generally observed—in surface samples. However, to adequately characterize the vertical extent of possible contamination, one or more deeper samples were also collected at each sampling location, as described above.

As discussed in Section 6.1.1, these samples were classified into two different exposure depths: surface and all (surface and subsurface) depths. These different soil exposure depth classifications are considered to represent all possible exposure potential for all receptors, and thus a reasonable worst-case scenario has been assessed.

Initial sampling for the Site was conducted in June 2010. All soil samples were tagged in the database with numeric designations of their corresponding assigned soil layer grouping based on the rules presented above. During these initial sampling events (Table 3-1), 22 soil samples were collected from 10 locations (including field duplicates.).⁹ This included seven “random”¹⁰ and

⁹ Note that in Table 3-4, which summarizes the analyses performed on Site samples, the number of samples reported in that table for a given analysis does not always equal 22. This is due to (1) inclusion in the final dataset of supplemental samples collected to assess the extent of chemical impacts in certain areas; (2) certain analytes were not included in the subsurface samples, as noted in the following section; some samples were remediated for particular analytes, and confirmation samples collected, and (3) rejected data are not included in the statistical summary in Table 3-4.

¹⁰ As noted before, in some cases, random sampling locations were shifted slightly to address points of interest.

three “biased” sample locations. At these locations, BRC initially collected 12 surface samples (one at each location, and duplicates at two locations in accordance with the duplicate frequency specified in the *BRC Quality Assurance Project Plan* (QAPP; BRC and ERM 2009a) and 10 subsurface soil samples. All sampling results are presented electronically on the report CD in Appendix B, and in Tables B-1 through B-11.

3.2 CHEMICALS SELECTED FOR ANALYSIS

The analyte list for soil samples collected during the initial 2010 investigation comprised the BRC project SRC list, and was consistent with the analytical program presented in Section 3 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010)¹¹ and Table 3-2 (Tables section), with the following exceptions for this Site:

- Asbestos and dioxins/furans were only analyzed for in surface soil samples.¹²
- USEPA Method 8141A for organophosphorus pesticides was not conducted. There have been only 47 detections of these compounds in over 10,000 soil sample records (<0.5 percent) from throughout the Eastside. The few detections are well below the NDEP BCLs.
- USEPA Method 8151A for chlorinated herbicides was not conducted. There have been no detections of these compounds in over 1,400 soil sample records from throughout the Eastside. Detection limits are below the NDEP BCLs.
- HPLC Method for organic acids was not conducted. There have been only three detections of these compounds in 567 soil sample records (<0.5 percent) from throughout the Eastside. Moreover, the NDEP has not established BCLs for these compounds.
- USEPA Method 8015B for non-halogenated organics (e.g., methanol and glycols) was not conducted. There have been only five detections of these compounds in 420 soil sample records (1 percent) from throughout the Eastside. The few detections have been well below the NDEP BCLs.

¹¹ Specific analytes and analyte-specific reporting limits for each analysis are listed in Table 4 of the QAPP.

¹² Note that all samples collected at the Site were discrete samples, with the exception of asbestos samples, which were composite samples collected as per the NDEP-approved Standard Operating Procedure [SOP]-12 as provided in the *Field Sampling and Standard Operating Procedures* [FSSOP; BRC, ERM and MWH 2009]).

- USEPA Method 8015 for total petroleum hydrocarbons (TPH) was not conducted. There have been only three detections of these compounds in over 299 soil sample records (1 percent) from throughout the Eastside. The few detections have been below 100 mg/kg, which is the typical low-end aesthetic threshold used for these compounds. There are no indications of possible TPH source areas (e.g., abandoned vehicles, dumping of oils/hydraulic fluids) at the Site. While TPH was not analyzed for, its components were via other methods. In addition, TPH cannot be included in a risk assessment while its components can.
- Consistent with the current project analyte list, the following radionuclides were analyzed for: radium-226, radium-228, thorium-228, thorium-230, thorium-232, uranium-233/234, uranium-235/236, and uranium-238.

The soil analyte list consisted of 272 of the 418 compounds (including water-only parameters) on the project SRC list. The analytical and preparatory methods (Table 3-2) used in accordance with the SAP adhered to the most recent version of the BRC QAPP (BRC and ERM 2009a; see Section B4, Table 4 of that document). As noted in Section 3.6, the analyte list for surface flux samples was composed of the list specified in the NDEP-approved Standard Operating Procedure (SOP)-16, as provided in the *Field Sampling and Standard Operating Procedures* (FSSOP; BRC, ERM and MWH 2009). Surface flux samples were analyzed for VOCs by USEPA Method TO-15 full scan, plus selective ion mode (SIM) analyses for a subset of the analytes.

3.3 INTERMEDIATE SAMPLING AND CLEANUP

All initial data were reviewed and a determination made, in consultation with the NDEP, as to whether localized soil removals were warranted. BRC conducted two rounds of remediation at the Site as follows:

- The first round of remediation occurred in the summer of 2012, and consisted of excavating shallow soils at sample locations 1) P9S1-AH11 within the northern portion of the Site, and 2) P9S1-JD02/P9S1-AG15 in the vicinity of the ditch. These excavations were triggered by asbestos (P9S1-AH11), metals (P9S1-AG15), PCBs (P9S1-AH11 and P9S1-JD02), and dioxin/furan (P9S1-AH11 and P9S1-JD02) exceedances.
- The second round of excavation occurred in the winter of 2012, and involved expansion of the initial P9S1-AH11 excavation area. This excavation was triggered by PCBs and dioxin/furan exceedances.

Remediation involved excavation and removal of impacted soils to the CAMU. The extent of the excavations is depicted on Figure 8.

The non-ditch remediation areas (P9S1-AG15 and P9S1-AH11) were developed based on a Thiessen map overlaid across the Site. Thiessen maps are constructed from a series of polygons formed around each sampling location. Thiessen polygons are created so that every location within a polygon is closer to the sampling location in that polygon than any other sampling location. These polygons do not take into account the respective concentrations at each location. These polygons were used as the basis for the areal extent of remediation for these locations.

For the ditch location (P9S1-JD02), the remediation area was centered about the initial sampling location that triggered remediation. The extent of excavation at this area was a 50-foot-wide segment of the ditch, extended such that the limits of excavation reached half the distance to the adjacent ditch samples to the north and south. Given the proximity to P9S1-AG15, these two excavation areas were merged into a single excavation.

Following remediation, confirmation surface soil samples were collected at each of the original sample locations associated with the remediation area polygons and ditch segments described above.¹³ All sampling locations are shown on Figure 9. The analyte list was composed of those analytes (metals, asbestos or dioxins/furans/PCBs) that triggered the remediation at each sampling location.

3.4 FINAL CONFIRMATION DATASET

Post-scrape analyses associated with follow-up rounds of remediation focused on the constituents triggering that additional remediation and, therefore, did not include the full suite analyses of the original analytical program. Analytical results from the original SAP dataset were retained for all constituents except those that were re-analyzed after additional scraping. The final confirmation dataset included the following sampling results:

- SAP sampling data, retaining the results that were not superseded by subsequent sampling;
- Supplemental data collected subsequent to the initial SAP sampling; and

¹³ The naming convention for confirmation samples uses the same sample identification as the initial (pre-remediation) sample, with an updated numerical prefix. For example, confirmation samples associated with P9S1-AH11 are named P9S6-AH11 (after the first round of confirmation sampling) and P9S7-AH11 (after the second round of confirmation sampling).

- Additional samples collected for confirmation after completion of remediation activities.

The soil dataset was subjected to a series of statistical analyses to determine representative exposure concentrations for the sub-area, as described in Sections 4 and 5 of the NDEP-approved *Statistical Methodology Report* (NewFields 2006). Consistent with the project *Statistical Methodology Report*, kriging or geostatistical analysis was not performed on the data because each measurement was assumed to be equally representative for that chemical at any point in each sub-area of the Eastside property. Hence, calculation of the 95 percent upper confidence limit (UCL) by exposure area directly from the data is considered reasonable.

As discussed in Section 4, all data have been validated. Results of all confirmation sampling and analysis are presented in Appendix B, and electronically on the report CD in Appendix B, as is the dataset used in the HHRA for the Site. All confirmation sampling locations for the Site are shown on Figure 9. Table 3-3 (Tables section) provides a matrix of which analytical suite was analyzed for in each of the samples collected from the Site. Geotechnical and Environmental Services (GES) conducted all fieldwork at the Site. The GES field reports, including boring logs, for each investigation are provided electronically in Appendix C (included on the report CD in Appendix B).

3.5 FINAL CONFIRMATION DATA SUMMARY

Using the compound-specific information presented in Table 2 of the QAPP (BRC and ERM 2009a), the comparison levels for each chemical included in the investigation were compiled for comparison to Site data. Specific soil comparison levels used for this effort were as follows:

- NDEP BCLs for worker soil (NDEP 2013; lower of either indoor or outdoor worker BCLs were used);
- NDEP BCLs for protection of groundwater (LBCL), assuming dilution attenuation factors (DAF) of 1 and 20 (NDEP 2013); and
- The maximum background concentration (for metals and radionuclides only), derived from the shallow Qal McCullough background soil dataset presented in Section 5.¹⁴

¹⁴ This value, for the shallow Qal McCullough background dataset, is used for comparison only; as discussed in Section 5.1, background comparisons were performed for the Site dataset using statistical tests.

A DAF of 1 is used when little or no dilution or attenuation of soil leachate concentrations is expected, and a DAF of 20 may be used when significant attenuation of the leachate is expected due to Site-specific conditions. For the Site, the LBCLs based on a DAF of 1 were used for discussion purposes. Data for the Site, including the number of instances in which chemical concentrations exceed each of the comparison levels, are listed in Table 3-4 (Tables section),¹⁵ and summarized. It is important to note that these comparisons are used to provide for an initial screening evaluation, assist in the evaluation of data usability, and determine the extent of contamination. They are not used for decision-making purposes or as an indication of the risks associated with the Site.

Aluminum

Aluminum was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). All of the detections were lower than the 100,000 mg/kg BCL, but were higher than the 75 mg/kg LBCL_{DAF1}. None of the samples exceeded the 15,300 mg/kg maximum shallow Qal McCullough background level.

Arsenic

Arsenic was detected in 15 of the 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). All of the detections were higher than the 1.77 mg/kg BCL and the 1 mg/kg LBCL_{DAF1}. Of these 15 exceedances, only one was higher than the maximum shallow Qal McCullough background level (7.2 mg/kg), P9S1-AH11 from 10 feet bgs (7.3 mg/kg). The reporting limits for the six non-detect samples were above the comparison levels, but below the background level; thus exceedances of background would have been detectable, if any.

Barium

Barium was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). All of the detections were lower than the 100,000 mg/kg BCL, but were higher than the 82 mg/kg LBCL_{DAF1}. However, none of the detections were higher than the maximum shallow Qal McCullough background level (445 mg/kg).

¹⁵ Pre-scape data for the target constituents are not included in Table 3-4. That is, these have been replaced by post-scape data; however, pre-scape data for the non-target constituents are included in Table 3-4. Because of this, the total number of analyses does not always coincide with the total number of analyses reported in the tables in Appendix B, which include all data, regardless of status.

Boron

Boron was detected in one of the 21 soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). All of the detections were lower than the 100,000 mg/kg BCL, with one sample higher than the 23.4 mg/kg LBCL_{DAFI}. The one sample above the LBCL_{DAFI} also exceeded the 11.6 mg/kg maximum shallow Qal McCullough background level, surface sample P9S1-AG13 (24.6 J mg/kg). The reporting limits for the non-detect samples were lower the comparison levels; thus exceedances would have been detectable, if any.

Cobalt

Cobalt was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). None of the detections were higher than the 337 mg/kg BCL, but all detections were higher than the 0.495 mg/kg LBCL_{DAFI}. None of the detections exceeded the 16.3 mg/kg mg/kg maximum shallow Qal McCullough background level.

Copper

Copper was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). None of the detections were higher than the 42,200 mg/kg BCL; however, one of the detections was higher than the 45.8 mg/kg LBCL_{DAFI} (a surface sample collected at P9S1-JD02; 78.7 J+ mg/kg). That exceedance was also higher than the 25.9 mg/kg maximum shallow Qal McCullough background level.

Iron

Iron was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). None of the detections were higher than the 100,000 mg/kg BCL, but all detections were higher than the 7.56 mg/kg LBCL_{DAFI}. Of these, 10 detections were higher than the 19,700 mg/kg maximum shallow Qal McCullough background level, as listed in Table 3-5.

TABLE 3-5: IRON LBCL_{DAFI} EXCEEDANCES GREATER THAN BACKGROUND

Sample ID	Depth (ft bgs)	Reported Value (mg/kg)	Sample ID	Depth (ft bgs)	Reported Value (mg/kg)
P9S1-JD01	10	23700 J	P9S1-JD02	0	22100 J
P9S1-AH14	0	23100 J	P9S1-JD03	10	21600 J
P9S1-AG13	10	22700 J	P9S1-AH12	0	21000 J
P9S1-AG14	10	22200 J	P9S1-AH14	10	20100 J
P9S1-AG13	0	22100 J	P9S1-JD01	0	20000 J

Lithium

Lithium was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). None of the detections were higher than the 2,270 mg/kg BCL; however, one of the detections was higher than the 21.9 mg/kg LBCL_{DAF1} and the 26.5 mg/kg maximum shallow Qal McCullough background level. This one exceedance occurred at the surface sample from location P9S1-JD03 (31 mg/kg).

Magnesium

Magnesium was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). None of the detections were higher than the 100,000 mg/kg BCL, but all detections were higher than the 973 mg/kg LBCL_{DAF1}. However, all but one of the magnesium detections were lower than the 17,500 mg/kg maximum shallow Qal McCullough background level. The one exceedance was associated with surface soil sample collected from P9S1-AG13 (17,800 J mg/kg).

Manganese

Manganese was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). Of these detections, none were higher than the 24,900 mg/kg BCL; however, all detections were higher than the 1.3 mg/kg LBCL_{DAF1}. Of these, two detections were higher than the 863 mg/kg maximum shallow Qal McCullough background level: surface samples P9S1-AG13 and P9S1-AG14 with concentrations of 1,540 J mg/kg and 882 J mg/kg, respectively.

Nickel

Nickel was detected in all 21 of the soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). Of these detections, none were higher than the 21,800 mg/kg BCL; however, all detections were higher than the 7.0 mg/kg LBCL_{DAF1}. None of these detections were higher than the 30 mg/kg maximum shallow Qal McCullough background level.

Selenium

Selenium was detected in 10 of the 21 soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). None of the detections were higher than the 5,680 mg/kg BCL, but all of the detections were higher than the 0.3 mg/kg LBCL_{DAF1}. These 10 detections

were also higher than the 0.6 mg/kg maximum shallow Qal McCullough background level, as listed in Table 3-6.

**TABLE 3-6: SELENIUM LBCL_{DAF1} EXCEEDANCES GREATER THAN
BACKGROUND**

Sample ID	Depth (ft bgs)	Reported Value (mg/kg)	Sample ID	Depth (ft bgs)	Reported Value (mg/kg)
P9S6-AG15	0	2.4 J	P9S1-AH13	10	1.6 J+
P9S1-AG13	10	2.3 J+	P9S1-AG13	0	1.4 J+
P9S1-AH12	0	2 J+	P9S1-AH11	0	1.4 J+
P9S1-AH11	10	1.8 J+	P9S1-AH12	10	1.3 J+
P9S1-AH13	0	1.8 J+	P9S1-AH11	0	1.2 J+

The analytical reporting limits for the non-detections were higher than the LBCL_{DAF1} and background.

Thallium

Thallium was detected in two of the 21 soil samples in which it was analyzed for (11 surface and 10 subsurface samples; Table B-4). Of these detections, none were higher than the 74.9 mg/kg BCL. Both detections were higher than the 0.4 mg/kg LBCL_{DAF1}. Neither of these two detections were higher than the 1.8 mg/kg maximum shallow Qal McCullough background level. The analytical reporting limits for the non-detections were generally lower than the LBCL_{DAF1} and background, and exceedances would have been detectable, if any.

Other Inorganics

As seen in Table 3-4 (Tables section) and Tables B-3 and B-4 in Appendix B, several inorganic constituents in addition to those listed above were routinely detected in soil samples. None of these additional inorganic constituents were detected at concentrations in excess of the BCL. The following three compounds were detected in excess of their established LBCL_{DAF1}:

- Chlorate detections exceeded the 1.13 mg/kg LBCL_{DAF1} in nine samples;
- Nitrate detections exceeded the 7.0 mg/kg LBCL_{DAF1} in six samples; and
- Perchlorate detections exceeded the 0.0185 mg/kg LBCL_{DAF1} in all of the samples in which it was detected (20 samples).

The analytical reporting limits for these additional inorganic constituents were all lower than their established BCL and LBCL_{DAFI} values.

Organochlorine Pesticides

Organochlorine pesticides were analyzed for in 22 soil samples (12 surface and 10 subsurface samples; Table B-5). The following constituents were detected in at least one sample.

- 2,4-DDE
- 4,4-DDE
- 4,4-DDT
- Aldrin
- beta-BHC

Of these five organochlorine pesticides, none exceeded its BCL and only beta-BHC exceeded its LBCL_{DAFI}. Three beta-BHC detections that exceeded the 0.00596 mg/kg LBCL_{DAFI}, as listed below.

- P9S1-AH13, 0 ft bgs, 0.023 J+ mg/kg
- P9S1-AH11, 10 ft bgs, 0.0082 J+ mg/kg
- P9S1-AH11, 0 ft bgs, 0.011 J mg/kg

Aside from dieldrin, the analytical reporting limits for organochlorine pesticides were lower than the comparison levels.

Volatile Organic Compounds

VOCs were analyzed for in 22 soil samples (12 surface and 10 subsurface samples; Table B-10). As seen in Table 3-4 and Table B-10, 1,2-dichlorobenzene, 1,4-dichlorobenzene, acetone, carbon disulfide, and dichloromethane were detected in at least one sample.

Acetone was detected the most frequently in seven of the 22 (~32 percent) samples in which it was analyzed. None of the detections were above the BCL. With the exception of dichloromethane, the VOC detections were also lower than the LBCL_{DAFI}. The two detections of dichloromethane were higher than the 0.001 LBCL_{DAFI}, and were associated with surface samples P9S1-JD03 (0.063 mg/kg) and P9S1-AG15 (0.03 J mg/kg).

It should be noted that the analytical reporting limits for dichloromethane were higher than the LBCL_{DAFI}. For the other VOCs, the standard reporting limits were lower than the BCL and LBCL_{DAFI}.

Semi-Volatile Organic Compounds

SVOCs were analyzed for in 22 soil samples (12 surface and 10 subsurface samples; Table B-9). As seen in Table 3-4 and Table B-9, all of the SVOCs were non-detect. The standard reporting limits were lower than the BCL, except for dichloromethyl ether, which routinely had analytical reporting limits higher than the BCL.

For several other SVOC non-detections, the analytical reporting limits are higher than the $LBCL_{DAFI}$, and it is unknown whether these constituents are present in those samples at concentrations in excess of the $LBCL_{DAFI}$. The constituents with reporting limits routinely higher than the $LBCL_{DAFI}$ are as follows:

- 2,2'-Dichlorobenzil
- 2,4,6-Trichlorophenol
- 2,4-Dichlorophenol
- 2,4-Dinitrophenol
- 2,4-Dinitrotoluene
- 2,6,-Dinitrotoluene
- 3,3-Dichlorobenzidine
- bis(2-Chloroethyl)ether
- Hexachloroethane
- Isophorone
- Nitrobenzene
- N-nitrosodi-n-propylamine
- p-Chloroaniline
- Pentachlorophenol

Dioxins and Furans

For dioxins/furans, as discussed in Section 1.1, the USEPA TEQ procedure, developed to describe the cumulative toxicity of these compounds, is used. Dioxins and furans were analyzed for in 11 surface soil samples¹⁶ (Table B-2). All of the individual dioxins and furans congeners analyzed were reported as detections in at least one sample. None of the samples analyzed had calculated TCDD TEQ concentrations in excess of the NDEP worker BCL of 1,000 ppt. $LBCL_{DAFI}$ values have not been established for dioxin/furans, thus the potential for impacts to groundwater quality due to their presence could not be assessed by comparisons to the $LBCL_{DAFI}$.

¹⁶ This tally includes field duplicates and confirmation samples.

Polychlorinated Biphenyls

PCBs were analyzed for in 11 surface soil samples¹⁷ (individual PCB congeners) (Table B-7). All of the PCB congeners were detected in at least one sample. BCL values have not been established for individual congeners. PCB congeners are included in the calculation of the TCDD TEQ, and are evaluated in this manner, not on an individual congener basis. LBCL_{DAFI} values have not been established for individual PCB congeners.

Polynuclear Aromatic Hydrocarbons

PAHs were analyzed for in 22 soil samples (12 surface and 10 subsurface samples; Table B-6). PAHs were non-detect in all 22 of the samples. The PAH detections did not exceed either the BCL or the LBCL_{DAFI} where established. The standard PAH analytical reporting limits were lower than the BCL and the LBCL_{DAFI}, thus concentrations in excess of these comparison levels, if present, would have been reported.

Aldehydes

Aldehydes were analyzed for in 22 soil samples (12 surface and 10 subsurface samples; Table B-9). Acetaldehyde was detected in all 22 samples, and formaldehyde was detected in all but one of the 22 samples. None of the detections exceeded the BCL. LBCL_{DAFI} values have not been established for these compounds.

Radionuclides

Radionuclides were detected in all 22 of the soil samples analyzed (12 surface, 10 subsurface samples; Table B-8). Exceedances of comparison levels for radionuclides are shown in Table 3-4 for the eight radionuclides currently included in the project analyte list (radium-226, radium-228, thorium-228, thorium-230, thorium-232, uranium-233/234, uranium-235/236, and uranium-238). Of those activities greater than comparison levels, the majority are lower than the maximum shallow Qal McCullough background activity, as shown in Table 3-4. As seen in that table, all radionuclides except uranium-233/234 and uranium-235/236 were reported at activities higher than their respective BCL and LBCL_{DAFI}. Thorium-228, thorium-232, and uranium-235/236 were detected above background. Radionuclide exceedances are summarized below.

¹⁷ This tally includes field duplicates and confirmation samples.

Radium-226 activities in 21 of the 22 samples were higher than the 0.023 pCi/g BCL and the 0.016 pCi/g LBCL_{DAFI}. None of the detections were higher than the 2.36 pCi/g maximum soil background activity.

Radium-228 activities in 18 of the 21 samples were higher than the 0.041 pCi/g BCL and the 0.016 pCi/g LBCL_{DAFI}. None of the detections were higher than the 2.92 pCi/g maximum soil background activity.

Thorium-232 activities in all 22 samples were higher than the 0.025 pCi/g BCL and the 0.0023 pCi/g LBCL_{DAFI}. Of these, the following six detections were higher than the 2.28 pCi/g maximum soil background activity:

- P9S1-AH11, 0 ft bgs, 3.08 J pCi/g
- P9S1-AH14, 0 ft bgs, 2.46 pCi/g
- P9S1-AG15, 0 ft bgs, 2.93 J pCi/g
- P9S1-AH12, 10 ft bgs, 2.38 J pCi/g
- P9S1-JD01, 10 ft bgs, 2.76 pCi/g
- P9S1-AG13, 0 ft bgs, 2.34 J pCi/g

Thorium-230 activities in 20 of the 22 samples were higher than the 0.00084 pCi/g LBCL_{DAFI}. None of the samples were above the 8.3 pCi/g BCL or the 3.01 pCi/g maximum soil background activity.

Thorium-232 activities in all 22 samples were higher than the 0.0029 pCi/g LBCL_{DAFI}. None of the samples were above the 7.4 pCi/g BCL. Only one of the detections exceeded the 2.23 pCi/g maximum soil background activity, surface sample from location P9S1-JD01, which had a detected concentration of 2.75 pCi/g.

Uranium-238 activities for four of the 22 samples for which it was analyzed were above the 1.4 pCi/g BCL. No LBCL_{DAFI} has been established for this compound. All of the detections above the BCL were lower than the 2.37 pCi/g maximum soil background activity.

As presented in NDEP guidance (NDEP 2009a), as part of the process used to evaluate radionuclide data for the BMI Common Areas, BRC assessed whether radionuclides are in secular equilibrium. As discussed in Section 5.1, secular equilibrium is an indication of background conditions. The data indicate that not all radionuclides are in secular equilibrium at the Site. Specifically, the mean radioactivities for the thorium-232 decay chain (i.e., thorium-232, radium-228, and thorium-232) are comparable (1.7, 1.6, and 1.9 pCi/g, respectively). However, the mean values for the uranium-238 decay chain (uranium-238, uranium-233/234,

thorium-230, and radium-226) are not comparable, ranging from 0.75 to 1.3 pCi/g. All of the mean values are lower than their respective maximum background activity levels. A quantitative evaluation of secular equilibrium is presented in Section 5.1.

Summary of Soil Exceedances

As summarized above and in the associated data tables (Table 3-4 and Appendix B), some BCL and LBCL_{DAFI} exceedances are currently observed in Site soils. The following constituents were reported at concentrations higher than the worker BCL and the maximum shallow Qal McCullough background level (where applicable):

- Arsenic (one sample)
- Thorium-228 (six samples)

The following constituents were reported at concentrations higher than the LBCL_{DAFI} and the maximum shallow Qal McCullough background level (where applicable):

- Arsenic (one sample)
- Boron (one sample)
- Copper (one sample)
- Iron (10 samples)
- Manganese (two samples)
- Nitrate (six samples)
- Selenium (10 samples)
- Thorium-232 (one sample)
- beta-BHC (three samples)
- Chlorate (nine samples)
- Dichloromethane (two samples)
- Lithium (one sample)
- Magnesium (one sample)
- Perchlorate (20 samples)
- Thorium-228 (six samples)

Elevated chemical concentrations (e.g., asbestos, arsenic, selenium, magnesium, manganese, sodium, TCDD TEQ, thorium-228, beta-BHC), have been detected in the four western-most sample locations (P9S1-AH12, P9S1-AH-13, P9S1-AG13, and in particular the surface sample at P9S1-AH11, which had the highest levels of asbestos, TCDD TEQ, and thorium-228). All of these detections except one arsenic detection (7.3 mg/kg) at 10 feet bgs and the thorium-228 detections were below their respective worker BCLs and/or maximum background level. Therefore, because of this, and given the nature of the exposures for non-residential receptors (that is, exposures will not be exclusive to one particular area), separate exposure areas were not evaluated in the HHRA; that is, the Site was evaluated as a single exposure area, consistent with the project *Statistical Methodology Report* (NewFields 2006), and as discussed further in Section 6.1.1.

The limited number of BCL and LBCL_{DAFI} exceedances indicates that there is a low likelihood of adverse impacts to human health and the environment due to residual chemical concentrations in Site soils. Consistent with the methodology in the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010), an HHRA was conducted to further evaluate this possibility, as discussed in subsequent sections of this report.

3.6 SURFACE FLUX SAMPLING

Concurrent with the confirmation soil sampling, BRC implemented surface flux sampling across the Site. This sampling conformed to the most recent NDEP-approved version of SOP-16 (BRC, ERM, and MWH 2009). The sampling procedure for the effort included the USEPA surface emission isolation flux chamber (flux chamber) sampling to support an air pathway analysis for the Site.

Noted that BRC submitted a technical memorandum to the NDEP (BRC 2010b), in which the results of radon testing performed in groundwater and indoor air samples were presented. Based on the findings of this memorandum, the NDEP concluded that HHRAs for Eastside property sub-areas do not need to evaluate the pathway of radon migration from groundwater to indoor air for sub-areas with a separation distance of at least 15 feet between any current or future building structure base and the high water table (letter dated November 9, 2010, from Greg Lovato, NDEP, to Mark Paris, BRC). Based on this conclusion and given the depth to groundwater at the Site is at least 32 feet bgs, the intrusion of radon into indoor air is not evaluated in the HHRA.

The flux chamber sample collection rationale was based on the project goal of obtaining a representative dataset of air emissions per sub-area. Flux chamber samples were collected from seven locations (Figure 9): five random sampling locations and two biased locations (and one duplicate P9S1-JD03 A/B). This density of sample collection is considered adequate for sub-area characterization given the biased nature of the sample locations, the size of the sub-area, and the number of sample locations suggested by the USEPA (1986) in the flux chamber User's Guide for assessing zones of homogeneous site properties.

The analyte list for surface flux samples is composed of the list provided in the most recent NDEP-approved version of SOP-16 (BRC, ERM, and MWH 2009). This analyte list is provided in Table 3-7 (Tables section), and consists of the USEPA Method TO-15 full scan, plus SIM analyses for a subset of the analytes. The analytical results are summarized in Table B-11

(Appendix B), and the principal investigator Report of Findings (which includes descriptions of sampling procedures) is provided in Appendix D (included on the report CD in Appendix B).¹⁸ It should be noted that, in addition to VOC data for the Site, the flux chamber report also contains data for the Staging sub-area outside the Site boundaries. Data collected from outside the Site boundaries are not included in this HHRA. A data summary for the flux chamber sample results is provided in Table 3-8 (Tables section).

As seen in Tables 3-8 and B-11, 15 of the 67 organic constituents included in the TO-15 scan were detected in at least one surface flux sample. The most commonly detected constituents were as follows:

- Chloroform was detected in seven of eight samples;
- Acetone was detected in seven of seven samples;
- Methyl-ethyl ketone (2-butanone) was detected in six of seven samples; and
- Chloromethane were detected in six of seven samples.

The highest reported concentrations were as follows:

- Acetone: 2.29 micrograms per square meter per minute [$\mu\text{g}/\text{m}^2, \text{min}^{-1}$] at P9S1-AH13;
- Ethanol: 0.873 J- $\mu\text{g}/\text{m}^2, \text{min}^{-1}$ at P9S1-AH13;
- Methyl ethyl ketone (2-butanone): 0.345 $\mu\text{g}/\text{m}^2, \text{min}^{-1}$ at P9S1-AH13; and
- Dichloromethane: 0.236 $\mu\text{g}/\text{m}^2, \text{min}^{-1}$ at P9S1-AH-11.

As discussed in Section 4, all data have been validated. The HHRA surface flux dataset for the Site is included on the report CD in Appendix B. Surface flux sample locations are shown on Figure 9.

¹⁸ Note that this report was prepared prior to data validation; therefore, data qualifiers may differ from those in the remainder of this report.

3.7 LEACHATE DATA

No samples collected within the Site during the confirmation sampling events included synthetic precipitation leaching procedure (SPLP) analysis. Findings from SPLP samples within the adjacent Eastside property are applicable to the Site as well. The potential leaching impacts to groundwater will be addressed in the Eastside groundwater remedial alternatives study.

4.0 DATA EVALUATION

This section describes the procedures used to evaluate the acceptability of data for use in the risk assessment. Overall quality of sample results is a function of proper sample management. Management of samples began at the time of collection and continued throughout the analytical process. SOPs were followed to ensure that samples were collected and managed properly and consistently and to optimize the likelihood that the resultant data are valid and representative.

The primary objective of the data review and usability evaluation was to identify appropriate data for use in the HHRA. The analytical data were reviewed for applicability and usability following procedures in USEPA's *Guidance for Data Usability in Risk Assessment (Part A)* (1992a) and *Risk Assessment Guidance for Superfund: Volume I* (1989), and the NDEP's *Supplemental Guidance for Assessing Data Usability for Environmental Investigations at the BMI Complex and Common Areas* (2008a). A quality assurance/quality control (QA/QC) review of the analytical results was conducted during the sampling events. According to the USEPA Data Usability Guidance, there are six principal evaluation criteria by which data are judged for usability in risk assessment. The six criteria are:

- Reports to risk assessor (availability of information associated with Site data);
- Documentation;
- Data sources;
- Analytical methods and detection limits;
- Data review; and
- Data quality indicators (DQIs), including precision, accuracy, representativeness, comparability, and completeness (PARCC).

A summary of these six criteria for determining data usability is provided below. In addition to the six principal evaluation criteria, the NDEP's Data Usability Guidance includes a step for data usability analysis, which is discussed after these six USEPA evaluation criteria. Data usability evaluation tables are provided electronically in Appendix E (included on the report CD in Appendix B).

4.1 CRITERION I – REPORTS TO RISK ASSESSOR (AVAILABILITY OF INFORMATION ASSOCIATED WITH SITE DATA)

The usability analysis of the site characterization data requires the availability of sufficient data for review. The required information is available from documentation associated with the Site data and data collection efforts. Data have been validated as described in the following Data Validation Summary Report (DVSRs), which are provided electronically in Appendix F:

- *Data Validation Summary Report, Staging Sub-Area Soil Investigation – May-June 2010 (Dataset 66)* (BRC and ERM 2010a), approved by the NDEP on January 9, 2012;
- *Data Validation Summary Report, Eastside North Surface Flux Investigations (Remaining Sub-Areas) – July through August 2010 (Dataset 71)* (BRC and ERM 2011), approved by the NDEP on July 25, 2011; and
- *Eastside Confirmation/Supplemental Sampling Events – July 2012 Through February 2014 (Dataset 72f)* (BRC and ERM 2014) approved by the NDEP on January 15, 2015.

The information sources and the availability of such information for the data usability process are as follows:

- A Site description provided in this report and the NDEP-approved SAP identify 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 9.
- Sampling design and procedures were provided in the NDEP-approved SAP.
- Analytical methods and sample quantitation limits (SQLs) are provided in the dataset file included on the report CD in Appendix B.
- A complete dataset is provided in the dataset file included on the report CD in Appendix B.
- 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 DVSRs (BRC and ERM 2010a, 2011, 2014).

- QC results are provided by the laboratory, including blanks, replicates, and spikes. The laboratory QC results are included as part of the DVSRs (BRC and ERM 2010a, 2011, 2014).
- Data flags used by the laboratory were defined adequately.
- Electronic files containing the raw data made available by the laboratory are included as part of the DVSRs (BRC and ERM 2010a, 2011, 2014).

4.2 CRITERION II – DOCUMENTATION REVIEW

The objective of the documentation review is to confirm that the analytical results provided are associated with a specific sampling location and collection procedure, using available documentation. For the purposes of this data usability analysis, 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 DVSRs (BRC and ERM 2010a, 2011, 2014). Based on the documentation review, all samples analyzed by the laboratory were correlated to the correct geographic location at the Site, as shown on Figure 9. The samples were collected in accordance with the SAP (BRC 2010a), and the SOPs developed for the BMI Common Areas as provided in the FSSOP (BRC, ERM, and MWH 2009). Field procedures included documentation of sample times, dates, and locations; other sample-specific information such as sample depth was also recorded. Information from field forms generated during sample collection activities was imported into the project database.

The analytical data were reported in a format that provides adequate information for evaluation, including appropriate QC measures and acceptance criteria. Each laboratory report describes the analytical method used; provides results on a sample-by-sample basis, along with sample-specific SQLs; and provides the results of appropriate QC samples such as laboratory control spike samples, sample surrogates and internal standards, and matrix spike samples. All laboratory reports, except for asbestos, were prepared as provided by the documentation required by USEPA's Contract Laboratory Program (USEPA 2003a, 2004b,c) which includes chain-of-custody records; calibration data; QC results for blanks, duplicates, and spike samples from the field and laboratory; and all supporting raw data generated during sample analysis were also included. Reported analytical results were imported into the project database.

Measurement of asbestos was conducted consistent with the NDEP's *Technical Guidance for the Calculation of Asbestos-Related Risk in Soils* (2011a). The recommended method for providing asbestos data that are useful for risk assessment purposes was performed by EMSL Analytical,

Inc., in Westmont, New Jersey. Although this laboratory is not currently certified in Nevada, it does have State of California and U.S. accreditation for asbestos analysis. Because many of the QC procedures associated with other analyses do not apply to asbestos analysis (e.g., laboratory blanks, duplicates and spikes), data validation of the asbestos laboratory reports involved a somewhat lesser level of effort than for other analyses (consistent with the NDEP's 2012 *Guidance on Data Validation for Asbestos Data in Soils*).

4.3 CRITERION III – DATA SOURCES

The review of data sources is performed to determine whether the analytical techniques used in the site characterization process (i.e., SAP sampling) are appropriate for risk assessment purposes. The data collection activities specified in the SAP were developed to characterize a broad spectrum of chemicals potentially present on the Site, including asbestos, aldehydes, general chemistry and ions, VOCs, SVOCs, metals, dioxins/furans, PAHs, organochlorine pesticides, radionuclides, and PCBs (SRCs and analyses performed under SAP implementation are listed in Table 3-2, and Table 3-7 for surface flux samples).¹⁹ Because of the soil removals that have occurred on the Site, data collected prior to SAP implementation had significant gaps and inconsistencies in analytical methodology, and as discussed in Section 2, those historical data are not evaluated further in the data usability process, or the HHRA. Only post-remediation data collected under the SAP (and subsequent confirmation sampling events) are being used in the HHRA, and these were subjected to the formal data usability evaluation described in this section. Figure 9 demonstrates that samples collected in accordance with the SAP are situated across the entire Site; analyses associated with these samples are summarized in Tables 3-2 (soil) and 3-7 (surface flux).

The State of Nevada is in the process of certifying the laboratories used to generate the analytical data. As such, standards of practice in these laboratories follow the quality program developed by the Nevada Revised Statutes and are within the guidelines of the analytical methodologies established by the USEPA. Based on the review of the available information, the data sources for chemical and physical parameter measurements are adequate for use in a risk assessment.

¹⁹ Although radon samples were collected and analyzed for the Site, radon has been evaluated through a separate process and is not considered further in the data usability process (Section 3.6).

4.4 CRITERION IV – ANALYTICAL METHODS AND DETECTION LIMITS

In addition to the appropriateness of the analytical techniques evaluated as part of Criterion III, it is necessary to evaluate if the detection limits are low enough to allow adequate characterization of risks. At a minimum, this data usability criterion can be met through the determination that routine USEPA and U.S. Department of Energy (DOE) reference analytical methods were used in analyzing samples collected from the Site. The USEPA and DOE methods that were used in conducting the laboratory analysis of soil and surface flux samples are identified in the dataset file included on the report CD in Appendix B. Each of the identified methods is considered the most appropriate method for the respective constituent class and each was approved by the NDEP as part of the SAP (BRC 2010a). As recommended by NDEP's guidance on *Detection Limits and Data Reporting* (NDEP 2008b), the laboratory-reported SQL was used in evaluating detection limits.

Laboratory practical quantitation limits (PQLs) were based on those outlined in the reference method, the SAP (BRC 2010a), and the project QAPP. In accordance with respective laboratory SOPs, the analytical processes included performing instrument calibration, laboratory method blanks, and other verification standards used to ensure QC during the analyses of collected samples.

The range of SQLs achieved in field samples was compared to NDEP BCLs (NDEP 2013). As seen in the summary of the Site dataset provided in Tables 3-4 (soil) and 3-8 (surface flux), of the standard analytes, only five constituents had SQLs that exceeded their respective worker soil BCLs. The SQLs exceedances of NDEP BCLs are discussed below.

- The radium-226 in one of 22 samples and radium-228 in four of 22 samples had minimum detectable activities (MDA) higher than the BCL; the uranium-235/236 MDA in six of 22 sample analyses were higher than the BCL.
- Arsenic SQLs exceeding the PQL were identified in all six non-detect results. All six non-detects were due to blank contamination where the non-detect value was raised to the PQL.
- The only organic analytes with a SQL higher than the BCL was dichloromethyl ether in all 22 samples analyzed. Dichloromethyl ether was not detected in any sample. The dichloromethyl ether SQL is greater than 100 times the BCL and a reduction in the SQL is not likely to be achieved by the laboratory. ~~Dichloromethyl ether is unrelated to the operational history of the site. Therefore, the analytical SQLs are considered adequate for~~

~~risk assessment purposes.~~ This chemical is further discussed in the Uncertainty Analysis section (Section 7.1).

As discussed in the 2008 *Supplemental Shallow Soil Background Report* (BRC and ERM 2009b), there are differences in SQLs among datasets that may affect data comparability for datasets comprised primarily of non-detect values. For these datasets, left-censored data can result in difficulties in differentiating whether datasets are actually different or merely an artifact of detection limits.

4.5 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 and surface flux sample data were subject to data validation. DVSRs were prepared as separate deliverables (BRC and ERM 2010a, 2011, 2014; Appendix F). The analytical data were validated according to the internal procedures using the principles of USEPA National Functional Guidelines (USEPA 1999, 2004d, 2005a, 2008) and were designed to ensure completeness and adequacy of the dataset. Additionally, the DVSRs were issued utilizing the NDEP's two *Supplemental Guidance on Data Validation* documents (NDEP 2009b,c). Any analytical errors and/or limitations in the data have been addressed and an explanation for data qualification is provided in the respective data tables. The results of ERM's data review for these issues are presented in the DVSRs and are summarized below.

A limited number of results for certain analytes/samples (eight data points, all non-detections) were rejected as unusable for the following reasons:

- The heptachlor results for eight samples, P9S1-AG15-0, P9S1-AG15-0-DUP, P9S1-AG15-10, P9S1-JD01-0, P9S1-JD01-10, P9S1-JD02-0, P9S1-JD02-10, and P9S1-JD03-100, were rejected due calibration violations.

Data qualifications are discussed in the subsections that follow.

4.5.1 Holding Time Exceedances / Sample Condition Qualifications

Holding time refers to the period of time between sample collection and the preparation and/or analysis of the sample. The accuracy of analytical results may depend upon analysis within specified holding times and sample temperature. In general, a longer holding time is assumed to result in a less accurate measurement due to the potential for loss or degradation of the analyte over time. Sample temperature is of greatest concern for VOCs that may volatilize from the

sample at higher temperatures. As described in the DVSRs (BRC and ERM 2010a, 2011, 2014), sample results were reviewed for compliance with the method-prescribed preparation and analysis holding times.

USEPA guidance for validation allows professional judgment to be used in evaluating qualification due to holding time exceedances. Sample results that were generated after the required holding time, but less than two times after the holding time, were qualified as estimated (J- or UJ flagged). If the samples were prepared after two times the holding time was exceeded, non-detect results were qualified as rejected (R) and detections were qualified as estimated (J-). Qualifications to 21 samples (dataset 66) were made on the basis of exceeded holding times (see Table 2-2 of DVSR 66 [BRC and ERM 2010a], Appendix F), as follows:

- Chromium (VI) results for 20 soil samples were qualified as estimated (J-/UJ) due to holding time exceedances. The lengths of time between sample preparation and analysis for these batches varied between 5 and 6 days (1 to 2 days beyond the method-prescribed 4-day period). The samples qualified are listed in Table 4-1.

**TABLE 4-1: CHROMIUM (VI) SAMPLES QUALIFIED
DUE TO HOLDING TIME EXCEEDANCES**

Sample ID	Lab ID	Sample ID	Lab ID
P9S1-AG13-0	F0F100463001	P9S1-AG13-10	F0F100463002
P9S1-AH11-0	F0F100463007	P9S1-AH11-0-DUP	F0F100463008
P9S1-AH11-10	F0F100463009	P9S1-AH12-0	F0F100463005
P9S1-AH12-10	F0F100463006	P9S1-AH13-0	F0F100463003
P9S1-AH13-10	F0F100463004	P9S1-AG14-0	F0F090529010
P9S1-AG14-10	F0F090529011	P9S1-AG15-10	F0F090529003
P9S1-AH14-0	F0F090529012	P9S1-AH14-10	F0F090529013
P9S1-JD01-0	F0F090529004	P9S1-JD01-10	F0F090529005
P9S1-JD02-0	F0F090529006	P9S1-JD02-10	F0F090529007
P9S1-JD03-0	F0F090529008	P9S1-JD03-10	F0F090529009

- The Aldrin result for one soil sample, P9S1-AH14-0, was qualified as estimated (J-) due to holding time exceedances. The length of time between sample collection and extraction for this sample was 22 days (8 days beyond the method-prescribed 28-day period).

As noted in the DVSRs (BRC and ERM 2010a, 2011, 2014), all samples were received at the laboratory within the required temperatures range of $4^{\circ} \pm 2^{\circ}$ Celsius. No sample results were qualified based on sample temperatures.

4.5.2 Blank Contamination

Blanks are artificial samples designed to evaluate the nature and extent of contamination of environmental samples that may be introduced by field or laboratory procedures. Field and laboratory blanks, consisting of contaminant-free water, were prepared and analyzed as part of standard QA/QC procedures to monitor for potential contamination of field equipment, laboratory process reagents, and sample containers. As presented in the DVSRs (BRC and ERM 2010a, 2011, 2014), 172 results were qualified as undetected (U) or estimated (J or J+) due to laboratory or field blank contamination, as discussed below. Of these, the majority, 162 results, were qualified as undetected (U). Detections of constituents qualified as non-detections due to comparable detections in laboratory or field blanks are known as “censored” data, and are presented in Tables 2-5 and 2-6 of DVSR 66, Tables 2-3 and 2-4 of DVSR 71, and Tables 2-4 and 2-5 of DVSR 72f (Appendix F). In these cases, non-detections are represented in the database as “< [the PQL]” in the case of inorganics detected below the PQL, or as “<[result value]” for all others.²⁰

These censored data are summarized in Appendix E, Table E-14 (included on the report CD in Appendix B) by compound class. As seen in that table, analytes were initially reported as detections in samples, but were later qualified as non-detections based on the presence of comparable concentrations of that analyte in blank samples. As seen in Appendix E, compounds most often censored for soil results included the following:

- Ammonia (as N) (12 samples)
- Cadmium (19 samples)
- Molybdenum (12 samples)
- Tin (16 samples)
- Orthophosphate (11 samples)
- Mercury (18 samples)
- Selenium (11 samples)
- Dichloromethane (11 samples)

In addition, dibromochloropropane (eight of eight results) was censored in all flux samples.

Table 4-2 presents the metals most likely to be affected by this issue.

²⁰ Although NDEP has issued recent guidance regarding qualifying data due to blank contamination (NDEP 2011c); BRC has addressed this issue in the *Technical Memorandum – BRC Comments on NDEP Blank Contamination Guidance* (BRC 2011) and, consistent with this Technical Memorandum, no changes were made to the Site dataset.

**TABLE 4-2: METALS MOST FREQUENTLY CENSORED
DURING BLANK SAMPLE EVALUATION**

Metal	Number of Detects	Number of Samples	Number of Censored Results	Max Non-Detect (mg/kg)	NDEP Worker BCL (mg/kg)
Cadmium	3	21	19	0.29	1,110
Mercury	1	21	18	0.0389	341
Molybdenum	4	21	12	2.9	5,680
Selenium	10	21	11	2.9	5,680
Tin	5	21	16	1.2	100,000

What this table demonstrates is that while the number of censored results is numerous for some metals compared to the number of detections, the censored values are still much lower than soil BCLs.

4.5.3 Sample/Duplicate Differences Outside Permissible Range or Greater than Permissible Values

During the data validation process, sample/duplicate results are evaluated to determine whether differences in those results suggest potential issues with data quality. Specifically, the analyst evaluates the following:

- Matrix spike/matrix spike duplicate (MS/MSD) relative percent difference (RPD), to determine if the RPDs are outside acceptance limits;
- Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) RPD, to determine if the RPDs are outside acceptance limits;
- Sample/field duplicate results to determine if differences are greater than the permissible value; and
- Sample/laboratory duplicate results to determine if differences are greater than the permissible value.

4.5.3.1 Qualifications Due to Matrix Spike/Matrix Spike Duplicate Recoveries Outside Acceptance Criteria

As discussed in the DVSRs (BRC and ERM 2010a, 2011, 2014), 232 inorganic sample results and no organic sample results were qualified as estimated (either UJ for non-detections or J for detections; “+” or “ – “ added to denote potential high or low bias, respectively) based on MS/MSD recoveries. No results were rejected due to MS/MSD recoveries. The qualifications applied on the basis of MS/MSD recoveries were as follows:

- The Total Kjeldahl Nitrogen result for one soil sample (P9S1-JD03-0) was qualified as estimated due to recoveries below than the acceptance criteria of 75 to 125 percent.
- Metals results for soil samples in various laboratory data packages were qualified due to recoveries outside the acceptance criteria of 75 to 125 percent, as summarized in Table 4-3.

TABLE 4-3: METALS SAMPLES QUALIFIED DUE TO RECOVERIES OUTSIDE ACCEPTANCE CRITERIA

Lab Data Package	Antimony	Arsenic	Barium	Beryllium	Chromium	Cobalt	Copper	Nickel	Potassium	Selenium	Silver	Sodium	Strontium	Tungsten	Vanadium	Zinc
160-336-1	-	+	+		+	+	+	+	+		-	+	+	-	+	+
F0F090529	-	+	+	+	+	+	+		+	+		+	+	-	+	+
F0F100463	-		+						+	+		+	+	-		

+ = Recovery greater than the acceptance limits

- = Recovery less than the acceptance limits

Blank entry signifies that the recovery was within the acceptance limits

Appendix E, Table E-11 (included on the report CD in Appendix B) lists the samples and associated analytes exhibiting MS/MSD percent recoveries below the laboratory control limits. In cases in which the recoveries were higher than the acceptance criteria, the results have the potential of being similarly biased high, and using these data in the HHRA could result in risks being calculated that are higher than would be associated with actual Site conditions. Of more concern for the HHRA is underestimation of risk, which could be associated with the use of data that are biased low.

As indicated in that table, reported detections and non-detects for soil data were flagged as estimated (“J-” or “UJ,” respectively) due to low MS/MSD recoveries (*i.e.*, from 30 to 74 percent for metals).²¹ Non-detects associated with “very low” MS/MSD recoveries (*i.e.*, less than 30 percent for metals), are generally rejected as unusable. No results were rejected due to MS/MSD recoveries. The data flagged as estimated based on low MS/MSD recoveries were subjected to further review in terms of data usability for the Site, as discussed in Section 4.6.2.3.

²¹ If additional validation criteria (aside from the MS/MSD recoveries) did not suggest a low bias for a given result, the sample result was flagged with “J” (no bias inferred).

4.5.3.2 Qualifications Due to Laboratory Control Sample/Laboratory Control Sample Duplicate Recoveries Outside Acceptance Criteria

Inorganic constituent results for 11 soil samples were qualified as estimated (J+) for selenium (P9S1-AG14-0, P9S1-AG14-10, P9S1-AG15-10, P9S1-AH14-0, P9S1-AH14-10, P9S1-JD01-0, P9S1-JD01-10, P9S1-JD02-0, P9S1-JD02-10, P9S1-JD03-0, and P9S1-JD03-10). These results were further qualified as non-detect due to field blank contamination. No organics were qualified and no data were rejected due to LCS recoveries.

As noted above, recoveries below the lower laboratory limits are of the most concern in terms of data usability. No results were flagged as estimated due to low LCS/LCSD percent recoveries, therefore, no further review is necessary.

4.5.3.3 Qualifications Due to Sample/Field Duplicate Differences Outside Acceptance Criteria

The following two soil field duplicates were collected during the sampling activities:

- P9S1-AG15-0-DUP
- P9S1-AH11-0-DUP

No surface flux field duplicates were associated with this dataset.

If field duplicate results are less than five times the PQL, results are qualified if the absolute difference between the two results is greater than the PQL. If results are greater than five times the PQL, results are compared to a precision goal of ≤ 50 percent RPD. Field duplicate differences in excess of acceptance limits were noted in both field duplicate pairs of soil samples. The differences are presented in Appendix E, Table E-12 (included on the report CD in Appendix B). All associated data were flagged as estimated (J/UJ). No data were rejected on the basis of sample/field duplicate differences.

4.5.3.4 Qualifications Due to Sample/Laboratory Duplicate Differences Outside Acceptance Criteria

Of the samples representing post-remediation conditions (i.e., not including those data points associated with samples from soil intervals subsequently removed from the Site), results for the one soil sample (one data point) identified in Table 4-4 had a sample/laboratory duplicate difference greater than the permissible value (i.e., for radionuclides, absolute difference greater than 1 pCi/g).

**TABLE 4-4: RESULTS QUALIFIED DUE TO SAMPLE/LABORATORY
DUPLICATE DIFFERENCES OUTSIDE ACCEPTANCE CRITERIA**

Field Sample ID	Lab Sample ID	Analyte	Result	Unit	RPD or Difference
P9S1-AH11-0-DUP	254446008	Thorium-228	1.32 J	pCi/g	Difference=1.01

The above data flagged as estimated based on sample/laboratory duplicate differences were subjected to further review in terms of data usability for the Site, as discussed in Section 4.6.2.3.

4.5.4 Internal Standards Outside Acceptance Criteria

Internal standards are prepared for certain organic gas chromatograph/mass spectrometry (GC/MS) and inductively coupled plasma/mass spectrometry analyses 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. The evaluation of internal standards involved comparing the instrument response and retention time from the target compounds in the sample with the response and retention time of specific internal standards added to the sample extract prior to analysis. No data were rejected due to internal standard recoveries.

As presented in the DVSRs (BRC and ERM 2010a, 2011, 2014), the following results were qualified as estimated (J/UJ) due to internal standard exceedances:

- Dioxins/furans results for five soil samples were qualified as estimated (J/UJ) due to low or high internal standard recoveries if the percent recovery was below 40 percent or above 135 percent. Qualified samples are presented in Table 4-5.

**TABLE 4-5: DIOXIN/FURAN SOIL SAMPLE RESULTS QUALIFIED DUE
TO INTERNAL STANDARDS OUTSIDE ACCEPTANCE CRITERIA**

Laboratory Data Package #	Sample ID	
F0F090468	P9S1-JD01-0 P9S1-JD03-0	P9S1-AG14-0
F0F100459	P9S1-AG13-0	P9S1-AH13-0

4.5.5 Surrogate Percent Recoveries Outside Laboratory Control Limit

As discussed in the DVSRs (BRC and ERM 2010a, 2011, 2014), surrogate spikes were added to each of the samples submitted for organic analysis to monitor potential interferences from the matrix. Results associated with unacceptable surrogate recoveries were qualified as estimated

(J+, J- or UJ). Generally, when surrogate recoveries are less than 10 percent, associated non-detect results are qualified as rejected (R) because false negatives are a possibility. No sample results were rejected due to surrogate recoveries. The soil samples listed in Table 4-6 were qualified due to surrogate recovery exceedances.

TABLE 4-6: RESULTS QUALIFIED DUE TO SURROGATE RECOVERIES OUTSIDE LABORATORY CONTROL LIMIT

Sample ID	Lab ID	Analysis	Recovery	Acceptable Range
P9S1-AH11-0	F0F100463007	Organochlorine Pesticides	263%	36-150
P9S1-AH11-10	NTF1083-09	Aldehydes	26%	39-134
P9S1-AH11-10	F0F100463009	Organochlorine Pesticides	254%	36-150
P9S1-AH13-0	F0F100463003	Organochlorine Pesticides	284%	36-150
P9S1-AH14-0	F0F090529012	Organochlorine Pesticides	49%	53-120
P9S1-JD01-10	F0F090529005	Organochlorine Pesticides	46%	53-120
P9S1-JD02-0	F0F090529006	Organochlorine pesticides	41%	53-120
P9S1-JD02-10	F0F090529007	Organochlorine pesticides	248%	36-150
P9S1-JD02-10	F0F090529007	Organochlorine pesticides	43%	53-120
P9S1-JD03-0	F0F090529008	Organochlorine Pesticides	52%	53-120

Several surrogate recoveries outside the acceptance criteria were below the lower laboratory control limit. Further review of low surrogate recoveries is necessary in terms of data usability for the Site, as discussed in Section 4.6.2.3.

4.5.6 Calibrations Outside Laboratory Control Limits

Requirements for instrument calibration ensure that the instrument is capable of producing acceptable quantitative data. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run. Continuing calibration checks document satisfactory maintenance and adjustment of the instrument on a day-to-day basis. As presented in the DVSRs (BRC and ERM 2010a, 2011, 2014), certain data were qualified due to initial or continuing calibration issues. Of specific concern, are analytes with a final qualifier indicating a low bias due to calibration. In the following tables, the percentage of analyte recovered is based on the percent difference of the actual amount and recovered amount reported from the continuing calibration. As the percentage decreases, the potential for false negatives increases.

Table 4-7 summarizes the SVOC results that were qualified during the evaluation of the continuing calibrations.

TABLE 4-7: SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUND RESULTS QUALIFIED DUE TO CALIBRATIONS OUTSIDE LABORATORY CONTROL LIMIT

Analyte	# of Samples Qualified	Percent of Qualified Non-Detect	Percentage of Analyte Recovered as Indicated by Outlier
2,4-Dinitrophenol	22	100%	73-74.9%
Benzyl alcohol	13	100%	73%
Carbazole	9	100%	74.2%
Hexachlorocyclopentadiene	13	100%	56%
Phthalic Acid	9	100%	74%

Note: The control limits are 75-125% (%D \leq 25%). Detected and non-detected results associated with calibration recoveries below the lower control limit were qualified as estimated (J-/UJ).

Table 4-8 summarizes the organochlorine pesticide results that were qualified due to continuing calibrations.

TABLE 4-8: SUMMARY OF ORGANOCHLORINE PESTICIDE RESULTS QUALIFIED DUE TO CALIBRATIONS OUTSIDE LABORATORY CONTROL LIMIT

Analyte	# of Samples Qualified	Percent of Qualified Non-detect	Percentage of Analyte Recovered as Indicated by Outlier
Heptachlor	5	100%	29%

Note: The control limits are 85-115% (%D \leq 15%). Detected and non-detected results associated with calibration recoveries below the lower control limit were qualified as estimated (J-/UJ). Detected results associated with calibration recoveries above the upper control limit were qualified as estimated (J+).

Low instrument response was noted for 2-nitropropane, acetonitrile, and ethanol as indicated by the relative response factor (Table 4-9).

TABLE 4-9: SUMMARY OF VOLATILE ORGANIC COMPOUND RESULTS QUALIFIED DUE TO LOW INSTRUMENT RESPONSE

Analyte	# of Samples Qualified	Percent of Qualified Non-detect	Range of RRFs
2-Nitropropane	9	100%	0.04687
Acetonitrile	22	100%	0.00985-0.02464
Ethanol	22	100%	0.00124-0.00366

Note: The control limit for RRFs, or relative response factors, is \geq 0.05.

Table 4-10 summarizes the VOC (TO-15) results that were qualified in surface flux samples due to continuing calibrations.

**TABLE 4-10: SUMMARY OF VOLATILE ORGANIC COMPOUND (TO-15)
SURFACE FLUX SAMPLE RESULTS QUALIFIED DUE TO CALIBRATIONS
OUTSIDE LABORATORY CONTROL LIMIT**

Analyte	# of Samples Qualified	Percent of Qualified Non-detect	Percentage of Analyte Recovered as Indicated by Outlier
1,2,4-Trichlorobenzene	7	100%	53-69.7%
1,2-Dichlorobenzene	6	100%	60-64%
1,3-Dichlorobenzene	1	100%	60%
2-Hexanone	5	100%	69.8%
Acetonitrile	7	100%	63-68%
Ethanol	7	86%	56-67%
Naphthalene	7	100%	53-62%

Note: The control limits are 70-130% (%D ≤ 30%). Detected and non-detected results associated with calibration recoveries below the lower control limit were qualified as estimated (J-/UJ).

Table 4-11 summarizes the VOC (TO-15 SIM) results that were qualified in surface flux samples due to continuing calibrations.

**TABLE 4-11: SUMMARY OF VOLATILE ORGANIC COMPOUND (TO-15 SIM)
SURFACE FLUX SAMPLE RESULTS QUALIFIED DUE TO CALIBRATIONS
OUTSIDE LABORATORY CONTROL LIMIT**

Analyte	# of Samples Qualified	Percent of Qualified Non-detect	Percentage of Analyte Recovered as Indicated by Outlier
1,1,2,2-Tetrachloroethane	6	100%	63%
Dibromochloropropane	6	100%	54-65%
Hexachlorobutadiene	5	100%	64%

Note: The control limits are 70-130% (%D ≤ 30%). Detected and non-detected results associated with calibration recoveries below the lower control limit were qualified as estimated (J-/UJ). Detected results associated with calibration recoveries above the upper control limit were qualified as estimated (J+).

4.5.7 Tentatively Identified Compounds

For the GC/MS methods, a list and estimated concentrations for tentatively identified compounds (TICs) was provided by the laboratory if detected. Most of the reported TICs were identified as “unknown” or “unknown aldol condensate.” Others were as follows:

- 1,1,2,2-Tetrachloroethane
- Chloriodomethane
- Eicosane

In addition to the above, an unknown aldol condensate was also reported by the laboratory as being present in 22 samples; as previously noted, the reported concentrations were flagged “U”

due to blank contamination. Eicosane is indicative of column breakdown and is not likely site related. 1,1,2,2-Tetrachloroethane has already been characterized in VOC samples. Chloriodomethane was identified in four samples and does not have any toxicity criteria established.

4.5.8 Data Review Summary

For 941 of the 6,211 analytical results in the final HHRA dataset, quality criteria were not met and various data qualifiers were added to indicate limitations and/or bias in the data. The definitions for the data qualifiers, or data validation flags, used during validation are those defined in SOP-40 (BRC, ERM and MWH 2009) and the project QAPP (BRC and ERM 2009a). Sample results are rejected based on findings of significant deficiencies in the ability to properly collect or analyze the sample and meet QC criteria. Only rejected data are considered unusable for decision-making purposes, and rejected analytical results are not used in the HHRA.

As noted above, eight sample results were rejected in the Site dataset and excluded from the HHRA for the reasons previously noted. Other data points were excluded from the risk assessment not due to data quality issues, but for one of the following reasons: (1) the sample was reanalyzed by the laboratory, or (2) the sample location was removed during a remedial action.

4.6 CRITERION VI – DATA QUALITY INDICATORS

DQIs are used to verify that sampling and analytical systems used in support of project activities are in control and the quality of the data generated for this project is appropriate for making decisions affecting future activities. The DQIs address the field and analytical data quality aspects as they affect uncertainties in the data collected for site characterization and risk assessment. The DQIs include PARCC. The project QAPP provides the definitions and specific criteria for assessing DQIs using field and laboratory QC samples and is the basis for determining the overall quality of the dataset. Data validation activities included the evaluation of PARCC parameters, and all data not meeting the established PARCC criteria were qualified during the validation process using the guidelines presented in the National Functional Guidelines for Laboratory Data Review for Organics, Inorganics, and Dioxin/Furans (USEPA 1999, 2004d, 2005a, 2008).

4.6.1 Evaluation of Data Precision

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. Replicate measurements can be made on the same sample or on two samples from the same source. Precision is generally assessed using a subset of the measurements made. The precision of the data was evaluated using several laboratory QA/QC procedures. Based on BRC's review of the results of these procedures, the overall level of precision for the Site data and the background data (BRC and ERM 2009b) does not limit the usability of a particular analyte, sample, method, or dataset as a whole.

4.6.2 Evaluation of Data Accuracy

Accuracy measures the level of bias that an analytical method or measurement exhibits. 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:

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

Detailed discussions of specific exceedances to precision and accuracy (with tables) are provided in the DVSRs (BRC and ERM 2010a, 2011, 2014) and data qualified as a result of this evaluation are presented with qualifiers in the data usability tables in Appendix E (included on the report CD in Appendix B). As presented in Section 4.5, eight sample results were rejected in the Site dataset and excluded from the HHRA. The remaining results were considered sufficiently accurate for risk assessment purposes, as discussed below.

4.6.2.1 Holding Time Exceedances/Sample Condition

There is a potential for analyte loss if the holding time for a sample is exceeded. As discussed in Section 4.5.1, holding times were exceeded in 20 soil samples for chromium (VI) analysis (95 percent of the samples analyzed for that constituent) and one aldrin samples (less than 5 percent of the aldrin samples). All of the samples were qualified as estimated. Holding time violations affect the majority of chromium (VI) samples. However, reported results were also significantly less than their respective BCLs. Sixty percent of the qualified chromium (VI) results were detected. Chromium (VI) is further discussed in the uncertainty section.

As presented in the DVSRs (BRC and ERM 2010a, 2011, 2014), all Site samples with temperature requirements were received at the laboratory within the required range of $4^{\circ}\pm 2^{\circ}$ Celsius. No sample results were qualified based on sample temperatures or due to lack of proper preservation.

4.6.2.2 Calibration Violations Indicating a Low Bias

The instrument calibration checks that resulted in a low bias are summarized in the tables presented in Section 4.5.6. One organochlorine pesticide, heptachlor, had recoveries below 50 percent in five of 14 samples. Heptachlor was not detected in any sample. The maximum SQL was compared to the soil BCL for heptachlor. It is unlikely, even with a potential for a false negative, that the bias could affect the result to such a degree that the analyte is present at the Site in excess of the BCL.

4.6.2.3 Matrix Spike/Matrix Spike Duplicate or Laboratory Control Sample/Laboratory Control Sample Duplicate Recoveries below Acceptance Criteria

During the data usability review, results associated with MS/MSD and/or LCS/LCSD recoveries that were only slightly lower than the lower acceptance limit (i.e., 50 to 75 percent recoveries for inorganics) were accepted as usable without further evaluation. Samples with lower percent recoveries (i.e., recoveries lower than 50 percent for inorganics and one-half the lower limit or 30 percent, whichever is greater, for organics) were reviewed more closely to assess if it was appropriate to use them in the HHRA. In this HHRA, no results were below 50 percent for inorganics and no organics were qualified due to MS/MSD outliers.

Given the limited number of samples for the inorganics involved, these data points are not likely to have a significant effect on risk assessment. No LCS/LCSD recoveries were lower than the lower laboratory control limit.

4.6.2.4 Surrogate Percent Recoveries below Laboratory Control Limit

Surrogate recoveries were below the laboratory control limit in one of 22 aldehyde samples and five of the 22 organochlorine samples and all results were qualified as estimated (J-/UJ). Given that low surrogate recoveries affected less than 10 percent of the aldehyde samples, it is unlikely to bias the dataset for aldehydes. For the organochlorines, the maximum SQLs were compared to the soil BCLs. It is unlikely, even with a potential for a false negative, that the bias could affect the result to such a degree that the analyte is present at the Site in excess of the BCL.

4.6.2.5 Blank Contamination

As noted in Section 4.5.2, certain detections were flagged during the data review as being non-detections or estimated with a high bias due to laboratory or field blank contamination. If the associated constituent qualified as being a non-detection was, in fact, present in the samples related to the affected blank sample, revising its status to non-detect could result in risk underestimation. In the dataset for the Site, 162 results were censored due to blank contamination. Affected soil analytes are listed in Table 4-12.

**TABLE 4-12: SUMMARY OF SOIL ANALYTES CENSORED
 DURING BLANK SAMPLE EVALUATION**

Analyte	# of Censored Results	Analyte	# of Censored Results
Ammonia (as N)	12	Arsenic	6
Orthophosphate as P	11	Mercury	18
Cadmium	19	Selenium	11
Molybdenum	12	Thallium	1
Tin	16	Tungsten	6
PCB 118	1	Thorium-230	2
1,2,4-Trichlorobenzene	1	1,2,4-Trimethylbenzene	9
Acetone	5	Chlorobenzene	1
Dichloromethane	11		

In addition, there were several TICs qualified due to blank contamination. See discussion of TICs in Section 4.5.7. Affected surface flux analytes are listed in Table 4-13.

**TABLE 4-13: SUMMARY OF SURFACE FLUX ANALYTES CENSORED
DURING BLANK SAMPLE EVALUATION**

Analyte	# of Censored Results	Analyte	# of Censored Results
Benzene	6	Carbon tetrachloride	3
Dibromochloropropane	8	Hexachlorobutadiene	3

The constituents for which this potential concern has the most bearing in risk assessment are those in soil samples for which the detections are close to or exceed either (1) background conditions, or (2) relevant human health comparison levels (e.g., NDEP BCLs). As determined during that evaluation, qualification of detections as non-detections based on blank contamination are not likely to have an appreciable effect on the risk estimates, as discussed below.

Censored results that are less than the maximum background concentration and $1/10^{\text{th}}$ the soil BCL have a negligible impact on risk assessment findings. If a portion of the result reflects an actual Site concentration, then the uncertainty related to the censored result is low. However, data censored at values at or above background or greater than $1/10^{\text{th}}$ the soil BCLs, may pose a potential underestimation of human health risks. Therefore, censored results at values in excess of $1/10^{\text{th}}$ the soil BCL (or the maximum background concentration, if higher) were evaluated further. None of the soil data censored due to blank contamination were in excess of $1/10^{\text{th}}$ the soil BCL (and background).

Surface flux data are not comparable with BCLs. Dibromochloropropane is associated with eight censored data points and benzene is associated with six censored data points; the remaining censored analytes were associated with three or fewer surface flux samples.

4.6.2.6 Data Usability Summary

As discussed above, because the qualifications with the potential for low bias were small in number, the data usability evaluation determined it was unlikely that they could lead to significant risk underestimation. Furthermore, the small amount of rejected data points does not represent a significant data gap in terms of risk assessment.

4.6.3 Evaluation of Data Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of the population at a sampling point or an environmental condition (USEPA 2002a). There is no standard method or formula for evaluating representativeness, which is a qualitative term.

Representativeness is achieved through selection of sampling locations that are appropriate relative to the objective of the specific sampling task, and by collection of an adequate number of samples from the relevant types of locations. The sampling locations at the Site were based on both systematic sampling with random point placement within each grid cell, as well as focused samples collected from specific areas to further investigate potential areas of concern.

The samples were analyzed for a broad spectrum of chemical classes across the Site. Samples were delivered to the laboratory in coolers packed with ice to minimize the loss of analytes. In a few instances, such as samples being analyzed slightly beyond the holding time, the representativeness of the associated data is in question; however, there were few instances of this, as noted in Section 4.5.1. As previously noted, no sample results were qualified based on sample temperatures or preservation. Sample-specific results are discussed in the DVSRs. A discussion of representativeness for the background dataset is provided in each of the background investigation reports.

4.6.4 Evaluation of Data Completeness

Completeness is commonly expressed as a percentage of measurements that are valid and usable relative to the total number of measurements made. 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. Some of the data were eliminated due to data usability concerns. The percent completeness for the Site is 99.9 percent and includes the surface flux chamber data. The percent completeness for the soil only dataset is 99.9 percent. The percent completeness for the background dataset used in the HHRA is 98.8 percent.

4.6.5 Evaluation of Data Comparability

Comparability is a qualitative characteristic expressing the confidence with which one dataset can be compared with another. The desire for comparability is the basis for specifying the analytical methods; these methods are generally consistent with those used in previous investigations of the Site. The comparability goal is achieved through using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units. The ranges of detected sample results from the current investigation are generally comparable to recent results at the Eastside, as well as to the Site background datasets (Section 5).

One exception may be uranium-235/236, which has reported activities that are slightly elevated compared to background and other reported isotopes of uranium. The laboratory that performed the Site radionuclide analysis has indicated that the activities for uranium-235/236 hover around the noise level of the instrument and secular equilibrium is generally still achieved. Therefore, activities at the noise level of the instrument may vary between the instruments used.

There are differences in SQLs among datasets that may affect data comparability for datasets comprised primarily of non-detect values. Examples of the differences in SQLs at the Site and in background soil for several analytes with low detection frequency are provided in Table 4-14.

**TABLE 4-14: LOW DETECTION ANALYTES EXHIBITING SQL DIFFERENCES
BETWEEN BACKGROUND AND SITE SAMPLES**

Analyte	Background Min SQL	Background Max SQL	Site Min SQL	Site Max SQL²²
Antimony	0.3298	0.3298	0.83	0.96
Boron	3.2	3.2	17	19.5
Selenium	0.1579	0.1579	2.6	2.9
Thallium	0.5428	0.5428	0.31	1.1
Tungsten	0.0175	0.0175	0.43	2.9

All results in units of mg/kg.

Cumulative probability plots and side-by-side boxplots for the background and Site datasets are included in Appendix G. For these datasets, left-censored data can result in difficulties in differentiating whether datasets are actually different or merely an artifact of detection limits. Note that for constituents with SQLs that meet project limit requirements, comparisons between Site and background may be less important, as these left-censored data are likely to indicate conditions that pose an “acceptable” risk and further evaluation is not necessary.

4.7 DATA ANALYSIS

Data validation and usability evaluations tend to look at the data on a result-by-result basis. The data analysis step is intended to take a step back and look at the dataset as a whole. The intent of this is to identify any anomalies or unusual data trends that may indicate any potential laboratory issues. This is performed by reviewing summary statistics, cumulative probability plots and side-by-side boxplots, or other visual aids. The soil dataset used for the HHRA is summarized in tabular format in Table 3-4. While it is not feasible to present all the detected analytes in a

²² The SQLs reported here may differ from the detection limits reported elsewhere (e.g., background comparisons). Detection limits may be raised due to blank contamination.

graphical format, cumulative probability plots and side-by-side boxplots are provided in Appendix G for the analytes included in the background comparisons (that is, metals and radionuclides). No anomalies in the dataset were identified.

As discussed in Section 4.5, the data validation process resulted in numerous sample results being qualified as estimated, with only the above-listed results being rejected. Sample results qualified as estimated are likely to be quantitatively biased to some degree; estimated analytical results are used in the HHRA. Data qualified as anomalous, as defined in the DVSRs, refers to data that were qualified (“U”) due to blank contamination, and are used in the HHRA. These data usability decisions follow the guidelines provided in the *Guidance for Data Usability in Risk Assessment (Part A)* (USEPA 1992a).

For the HHRA, all soil data associated with post-remediation conditions that were not rejected during data validation, replaced by reanalysis results, or removed during a soil remedial action were included. Some data were qualified as estimated due to recoveries being outside the acceptance criteria. In cases where the recoveries were higher than the acceptance criteria, the results have the potential of being similarly biased high, and using these data in the risk assessment could result in risks being calculated that are higher than would be associated with actual Site conditions. Of more concern for the HHRA is underestimation of risk, which could be associated with the use of data that are biased low. Results associated with the following QA/QC issues could lead to results that are biased low, and were subjected to further scrutiny during the data usability evaluation:

- Results associated with holding time exceedances;
- Detections qualified during the data review as being non-detections due to laboratory or field blank contamination;
- Results associated with calibration violations indicating a low bias;
- Results associated with MS/MSD or LCS/LCSD recoveries below acceptance criteria; and/or
- Results associated with surrogate percent recoveries below laboratory control limits.

Such data, which are listed above in Section 4.5, were evaluated during the data usability process to determine whether it was appropriate to use them in the risk assessment. The data usability evaluation determined that the estimated results listed in Section 4.5 were appropriate for use in the risk assessment and that the rejected data did not constitute significant data gaps and/or were not otherwise likely to lead to an underestimation of risk, as discussed in Section 4.6.2.

5.0 SELECTION OF CHEMICALS OF POTENTIAL CONCERN

The broad suite of analytes sampled for was the initial list of potential COPCs at the Site. However, to ensure that a risk assessment focuses on those substances that contribute the greatest to the overall risk (USEPA 1989), the following procedures were used to eliminate analytes as COPCs for quantitative evaluation in the risk assessment:²³

- Identification of chemicals with detected levels similar to background concentrations (where applicable) (Section 5.1);
- Chemicals that are considered essential nutrients (Section 5.2); and
- Chemicals with maximum concentrations below risk-based comparison levels (i.e., below one-tenth of the worker soil BCLs) (Section 5.3).

Following USEPA guidance (1989), compounds reliably associated with Site activities based on historical information were not eliminated from the risk assessment, even if the results of the procedures given in this section indicate that such elimination is possible. The procedures for evaluating COPCs relative to background conditions and further selection of COPCs based on the other procedures are presented below.

5.1 EVALUATION OF CONCENTRATIONS/ACTIVITIES RELATIVE TO BACKGROUND CONDITIONS

Some chemicals at the Site, particularly metals and radionuclides, are known to be naturally occurring constituents of soils and groundwater. A risk assessment should consider the contribution of background concentrations to overall Site risks, as differentiated from those concentrations associated with historical Site operations or regional anthropogenic conditions. Therefore, it is necessary to establish Site-specific background conditions to support the risk assessment.

²³ Note that these procedures for selection of COPCs deviate somewhat from those presented in the *BRC Closure Plan*, but are consistent with discussions between BRC and NDEP and their consultants in a December 9, 2010, meeting. BRC will use these procedures for all subsequent risk assessments. BRC intends to revise the *BRC Closure Plan* accordingly to make it consistent with these procedures.

As indicated in the *Background Soil Compilation Report* (BRC and ERM 2010b), the Site is in an area of McCullough lithology (see Figure 10, Qh₁ label).²⁴ Therefore, comparison of Site-related soil concentrations to background levels was conducted using the shallow Qal McCullough background dataset presented in the *Background Soil Compilation Report* (BRC and ERM 2010b). The background dataset used is included in the dataset file on the enclosed report CD in Appendix B.

Background comparisons were performed using the Quantile test, Slippage test, the *t*-test, and the Wilcoxon Rank Sum (WRS) test with Gehan modification. The Guided Interactive Statistical Decision Tools (GiSdT[®]) library (Neptune and Company 2009) run from within the R statistical computer software program was used to perform all background comparison statistics. A weight-of-evidence approach is utilized to interpret the results of these analyses. If the detection frequency in both Site and background datasets is greater than 40 percent, then the following rationale is used for evaluation: (1) where one or two results fail one or more of the statistical tests, the remaining testing and statistical information (boxplots, summary statistics) are reviewed to support decision-making regarding whether or not the chemical should be considered consistent with background (as described by the rationale in the table below); and (2) where three or more statistical tests fail, the constituent is considered inconsistent with background. If the detection frequency is less than 40 percent in either the background or Site datasets, then the constituent is evaluated based on boxplots and summary statistics.

For samples with primary and field duplicate results, the Site sample and field duplicate²⁵ are treated as independent samples and both are included in all subsequent data analyses, regardless of whether one or both are non-detect. This is considered appropriate because field duplicate samples represent a discrete and unique measurement of soil chemical conditions proximal to the primary sample (unlike split samples). The field duplicates were compared to the primary sample during the course of data validation. The variances were not out of the line with the variance in results across the Site. Therefore, as distinct soil chemical measurements, they are treated as unique samples in the analyses.

²⁴ As noted in a letter dated September 17, 2012, from Greg Lovato, NDEP, to Mark Paris, BRC, the 2003 soil background dataset collected by Environ for the City of Henderson is not used for background soil comparison purposes.

²⁵ Field duplicates are shown in Appendix B and indicated with the “FD” qualifier under the column entitled “Sample Type.”

The shallow Qal McCullough background dataset was compared to the Site HHRA dataset as a whole. The results of the background comparison evaluation are presented in Table 5-1 (Tables section), and summarized in Table 5-2 below.

**TABLE 5-2: SUMMARY OF STATISTICAL
 BACKGROUND COMPARISON EVALUATION**

Chemical	Greater than Background?	Basis
Aluminum	YES	Multiple tests
Antimony	YES	Multiple tests
Arsenic	YES	WRS test
Barium	YES	Multiple tests
Beryllium	YES	Multiple tests
Boron	YES	Multiple tests
Cadmium	YES	Multiple tests
Calcium	NO	Multiple tests
Chromium	YES	Multiple tests
Chromium (VI)	YES	Quantile test
Cobalt	YES	Multiple tests
Copper	YES	Multiple tests
Iron	YES	Multiple tests
Lead	YES	Multiple tests
Lithium	YES	Multiple tests
Magnesium	YES	Multiple tests
Manganese	YES	Multiple tests
Mercury	YES	WRS test
Molybdenum	YES	Multiple tests
Nickel	YES	Multiple tests
Potassium	YES	Multiple tests
Selenium	YES	Multiple tests
Silver	NO	Multiple tests
Sodium	YES	Multiple tests

**TABLE 5-2: SUMMARY OF STATISTICAL
 BACKGROUND COMPARISON EVALUATION**

Chemical	Greater than Background?	Basis
Strontium	YES	WRS test
Thallium	NO	Multiple tests
Tin	YES	Multiple tests
Titanium	YES	Multiple tests
Tungsten	YES	Multiple tests
Uranium	YES	Multiple tests
Vanadium	YES	Multiple tests
Zinc	YES	Multiple tests
Radium-226	NO	Multiple tests
Radium-228	NO	Multiple tests
Thorium-228	YES	Slippage test
Thorium-230	NO	Multiple tests
Thorium-232	NO	Multiple tests
Uranium-233/234	NO	Multiple tests
Uranium-235/236	NO	all results near noise level of instrument
Uranium-238	NO	Multiple tests

Cumulative probability plots and side-by-side boxplots²⁶ were also prepared and are included in Appendix G. These plots give a visual indication of the similarities and differences between the Site and background datasets. The results of this comparison indicate that a number of metals are statistically significant (greater than) with respect to background levels. Due to the large number of sample data in both the Site and background datasets, even small differences between the two are identified as statistically significant. For example, although there were small differences in median concentrations, cobalt, magnesium, and uranium were found to be statistically greater than background, as shown in Table 5-3.

²⁶ Site and background boxplots were segregated by depth (and all data). This is different than how the data were segregated in the development of exposure point concentrations as presented in Section 6.1.

**TABLE 5-3: EXAMPLE DIFFERENCES IN SITE AND BACKGROUND
MEDIAN CONCENTRATIONS FOR CHEMICALS STATISTICALLY
GREATER THAN BACKGROUND**

Metal	Site Median	Background Median	Difference¹
Cobalt	11	9.0	2.0 mg/kg
Uranium	1.1	0.97	0.13 mg/kg
Thorium-228	1.7	1.8	-0.1 pCi/g
1 These differences in median concentrations were small relative to both background median concentrations and worker soil BCLs.			

It should be noted that statistically significant differences may not represent scientifically and technically relevant differences.

Secular Equilibrium for Radionuclides. For radionuclides, secular equilibrium exists when the quantity of a radioactive isotope remains constant because its production rate (due to the decay of a parent isotope) is equal to its decay rate. In theory, if secular equilibrium exists, the parent isotope activity should be equivalent to the activity of all daughter radionuclides. Pure secular equilibrium is not expected in environmental samples because of the effect of natural chemical and physical processes. However, approximate secular equilibrium is expected under background conditions (NDEP 2009d). Only the thorium-232 chain was determined to be in approximate secular equilibrium following equivalence testing outlined in the NDEP's *Guidance for Evaluating Secular Equilibrium at the BMI Complex and Common Areas February* (NDEP 2009d). The results of the equivalence testing for secular equilibrium are provided in Table 5-4.

TABLE 5-4: EQUIVALENCE TEST FOR SECULAR EQUILIBRIUM

Chain	Equivalence Test		Secular Equilibrium?	Mean Proportion			
	Delta	p-value		Ra-226	Th-230	U-233/234	U-238
U-238	0.1	0.5	No	0.1867	0.3333	0.2192	0.2607
				Ra-228	Th-228	Th-232	
Th-232	0.1	0.0228	Yes	0.2954	0.3655	0.3391	

Therefore, since thorium-228 failed background tests and radionuclides are not in secular equilibrium, all radionuclides are conservatively considered to be COPCs, and are therefore evaluated in the HHRA.

5.2 ESSENTIAL NUTRIENTS

An essential nutrient is a chemical required for normal body functioning that either cannot be synthesized by the body at all, or cannot be synthesized in amounts adequate for good health, and thus must be obtained from a dietary source. USEPA (1989) states that “Chemicals that are (1) essential human nutrients, (2) present at low concentrations (i.e., only slightly elevated above naturally occurring levels), and (3) toxic only at very high doses (i.e., much higher than those that could be associated with contact at the Site) need not be considered further in the quantitative risk assessment. Examples of such chemicals are calcium, iron, magnesium, potassium, and sodium.” As discussed with and approved by the NDEP²⁷ and consistent with guidance and standard practices, no further quantitative evaluations are required for these essential nutrients.

5.3 COMPARISON TO WORKER SOILS BCLs

Soil BCLs for workers are chemical-specific, risk-based concentrations in soils that are protective of a commercial land use scenario (NDEP 2013). As discussed with and approved by the NDEP (see footnote 23), if the maximum detected concentration for a constituent is less than one-tenth of the worker soil BCL, then no further quantitative evaluation is required for that constituent. For those constituents with 100 percent non-detect values, if the maximum non-detect concentration²⁸ for a constituent is less than one-tenth of the worker soil BCL, no further evaluation will be conducted. If the maximum non-detect concentration is greater than one-tenth of the worker soil BCL, no further quantitative evaluation will be conducted; however, a discussion is provided in the Uncertainty Analysis (Section 7) for these constituents.

Consistent with the Closure Plan, if the TCDD TEQ concentrations do not exceed the NDEP worker BCL of 1,000 ppt for any sample within the Site,²⁹ dioxins/furans and PCB congeners are not retained as COPCs. Therefore, because this criterion is met for the Site, dioxins/furans and PCB congeners are not considered COPCs, and are not evaluated further in the HHRA. Lead was also not evaluated further in the HHRA since all concentrations were below its target goal of 400 mg/kg for residential land use.

²⁷ Meeting with NDEP on December 9, 2010.

²⁸ The non-detect value is equal to the SQL.

²⁹ See Section 2.5 for a discussion on future land use for the Parcel 9 South Sub-Area.

The results of comparisons to one-tenth of the worker soil BCL are presented in Table 5-5 (Tables section). One organic compound, four metals, and one radionuclide were found to exceed their respective one-tenth of the worker soil BCL (asbestos does not have a BCL, but does have relevant and available toxicity criteria).

5.4 SUMMARY OF SELECTION OF COPCS

The procedures for COPC selection were discussed above. Results of the selection of COPCs, including the rationale for excluding chemicals as COPCs are presented in Table 5-6 (Tables section). The resulting COPCs for soil are summarized below.

- Asbestos
- Aluminum
- Arsenic
- Acetaldehyde
- Radionuclides

These procedures apply to soil results. Ambient air exposures for VOCs are evaluated on a sample-by-sample basis, per NDEP requirements, using the surface flux data measurements. See Section 6.1.2 regarding selection of COPCs for the surface flux data. Therefore, the maximum surface flux risk estimates are summed with the soil risk estimates to provide an upper-bound risk for each receptor.

6.0 HUMAN HEALTH RISK ASSESSMENT

This section presents the HHRA of all COPCs identified in Section 5 for all receptors of concern via all complete pathways. The methods used in the risk assessment follow standard USEPA guidance. Specifically, the methods used in the risk assessment followed basic procedures outlined in the USEPA's *Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual* (USEPA 1989). Other guidance documents consulted include:

- *Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual. Supplemental Guidance: Standard Default Exposure Factors* (USEPA 1991b).
- *Guidelines for Exposure Assessment* (USEPA 1992b).
- *Soil Screening Guidance: Technical Background Document* (USEPA 1996).
- *Exposure Factors Handbook, Volumes I-III* (USEPA 1997).
- *Soil Screening Guidance for Radionuclides* (USEPA 2000).
- *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA 2002b).
- *Technical Support Document for a Protocol to Assess Asbestos-Related Risk. Final Draft* (USEPA 2003b).
- *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)* (USEPA 2004e).
- *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment)* (USEPA 2009).

Various NDEP guidance documents are also relied on for the HHRA. These include:

- *Supplemental Guidance for Assessing Data Usability for Environmental Investigations at the BMI Complex and Common Areas in Henderson, Nevada* (NDEP 2008a).
- *Guidance for Evaluating Radionuclide Data for the BMI Plant Sites and Common Areas Projects* (NDEP 2009a).

- *Technical Guidance for the Calculation of Asbestos-Related Risk in Soils for the Basic Management Incorporated (BMI) Complex and Common Areas* (NDEP 2011a) and *Workbook for the Calculation of Asbestos-Related Risk in Soils* (NDEP 2011b).
- *Supplemental Guidance on Data Validation* (NDEP 2009b,c).
- *Guidance for Evaluating Secular Equilibrium at the BMI Complex and Common Areas* (NDEP 2009d).

The risk assessment is a deterministic risk assessment, meaning that single values based on conservative assumptions are used for all modeling, exposure parameters, and toxicity criteria. These conservative estimates compound each other so that the calculated risks likely exceed the true risks at the Site.

The method used in the risk assessment consists of several steps. The first step is the calculation of exposure point concentrations representative of the particular area, for each medium of concern. This step includes fate and transport modeling to predict concentrations that may be present when direct measurements are not available. The second step is the exposure assessment for the various receptors present in the particular areas. The next step is to define the toxicity values for each COPC. The final step is risk characterization where theoretical upper-bound cancer risks and non-cancer HIs are calculated.

6.1 DETERMINATION OF EXPOSURE POINT CONCENTRATIONS

A representative exposure concentration is a COPC-specific and media-specific concentration value. In risk assessment, these exposure concentrations are values incorporated into the exposure assessment equations from which potential baseline human exposures are calculated. As described below, the methods, rationale, and assumptions employed in deriving these concentration values follow USEPA guidance and reflect Site-specific conditions.

Chemical, physical, and biological processes may affect the fate and transport of chemicals in water, soil, and air. Chemical processes include solubilization, hydrolysis, oxidation-reduction, and photolysis. Physical processes include advection and hydrodynamic dispersion; volatilization; dispersion; and sorption/desorption to soil, sediment, and other solid surfaces. Biological processes include biodegradation, bioaccumulation, and bioconcentration. All of these processes are dependent upon the physical and chemical properties of the chemicals; the physical and chemical properties of the soil and water; and other environmental factors such as

temperature, humidity, and the conditions of water recharge and movement. The net effect of these environmental factors is a time-dependent reduction of chemical concentrations in water, soil, and air. The determination of exposure point concentrations for media other than soil take into account chemical-specific physical parameters and inter-media transfers as discussed below. All modeling input parameters, calculations, and results are presented in Appendix H (included on the report CD in Appendix B).

6.1.1 Soil

Due to the uncertainty associated with determining the true average concentration at a site, where direct measurements of the site average are infeasible and unavailable, the USEPA recommends using the lower of the maximum detected concentration or the 95 percent UCL as the concentration of a chemical to which an individual could be exposed over time (USEPA 1992b). For the 95 percent UCL concentration approach, the 95 percent UCL was computed to represent the area-wide exposure point concentrations. The 95 percent UCL is a statistic that quantifies the uncertainty associated with the sample mean. If randomly drawn subsets of Site data are collected and the UCL is computed for each subset, the UCL equals or exceeds the true mean roughly 95 percent of the time. The purpose for using the 95 percent UCL is to derive a conservative, upper-bound estimate of the mean concentration, which takes into account the different concentrations to which a person may be exposed at the Site. That is, an individual will be exposed to a range of concentrations that exist at an exposure area, from non-detect to the maximum concentration, over an entire exposure period.

A 95 percent UCL was calculated using the `summary.stats()` function in the GiSdT[®] package (Neptune and Company 2009) in R (R Core Team 2012). Section 5.1 outlines the treatment of sample locations with field duplicates prior to the 95 percent UCL statistical calculations described in this section. For these calculations, chemical non-detect results are assigned a value of one-half the SQL. The formulas for calculating the 95 percent UCL COPC concentration (as the representative exposure concentration) are presented in USEPA (1992c, 2002c) and GiSdT[®] (Neptune and Company 2009). Three UCL methods are employed in the GiSdT[®] library. They include the Student's t UCL, the bootstrap percentile UCL, and the bootstrap BCa UCL. The maximum UCL of these three methods was used as the exposure point concentration, unless the maximum UCL of the three methods was greater than the maximum detected concentration. In these cases, the maximum detected concentration was selected as the exposure point concentration.

The representativeness of the 95 percent UCLs for the exposure area, that is, a Sitewide mean concentration is valid for all receptors at the Site, is further supported by the intensity plot figures included in Appendix I. Figures for each of the COPCs are included in Appendix I (in addition to figures developed for all metals). A figure is also presented for TCDD TEQ. Although not a COPC for the Site, TCDD TEQ is a primary chemical of interest for the project. Based on the results of the background comparison tests, a review of the probability plots, boxplots, and distribution and intensity plot figures, data across the Site are assumed to be uncorrelated, that is, there is no discernable spatial correlation.³⁰ Thus, the assumption is made for statistical testing purposes that the data are not spatially correlated.³¹ This results in lower p-values and hence a greater number of statistical differences than would be the case if spatial correlation were accounted for. Ignoring correlation therefore causes conservatism, and the need to further evaluate spatial correlation is not warranted. Therefore consistent with the project *Statistical Methodology Report* (NewFields 2006), each measurement is assumed to be equally representative for that chemical at any point in the Site and calculation of the 95 percent UCL is appropriate. The data were also reviewed for the presence of hot spots, and as discussed in Section 3.5, no potential hot spots were identified at the Site; therefore, separate exposure areas were not evaluated in the HHRA.

Representative exposure concentrations for soil are based on the potential exposure depth for each of the receptors. For all receptors, two different exposure depths are considered, based on the sample depth rules schematic presented in Section 3: all data (surface and subsurface), and data classified as surface soil. These different soil exposure classifications are considered to represent all possible exposure potential for all receptors, based on the future grade and use of Site soils. Ninety-five percent UCLs are calculated for each exposure depth scenarios. To be conservative, the higher of these values was used in the risk estimates for each COPC. The 95 percent UCL for each COPC is presented in Table 6-1 (Tables section). For indirect exposures, this concentration was used in fate and transport modeling.

³⁰ Although the *Statistical Methodology Report* states that confirmation measurements of each chemical in a given soil layer will be used to compute variograms, as noted in the text above, this was not conducted for the Site, which is a deviation from the *BRC Closure Plan* methodology.

³¹ Some variability of the data is expected; if there was perfect homogeneity then only one sample would be needed to represent the Site. This natural variability is demonstrated by the background datasets for the project. As shown on the probability and boxplots in Appendix G, the data generally follow a normal distribution, and their variability are similar to the background data.

The exposure point concentrations for asbestos (USEPA 2003b, NDEP 2011a) were based on the pooled analytical sensitivity of the dataset. The asbestos data and analytical sensitivities are presented in Table 6-2 (Tables section). Therefore, asbestos exposure point concentrations are determined differently than those for the other COPCs. The pooled analytical sensitivity is calculated as follows:

$$\text{Pooled Analytical Sensitivity} = 1 / \left[\sum_i (1 / \text{analytical sensitivity for trial } i) \right]$$

Two estimates of the asbestos concentration were evaluated, best estimate and upper bound, as defined in the draft methodology (USEPA 2003b). The best estimate concentration is similar to a central tendency estimate, while the upper bound concentration is comparable to a reasonable maximum exposure estimate. The pooled analytical sensitivity is multiplied by the number of chrysotile or amphibole structures to estimate concentration:

$$\text{Estimated Bulk Concentration (10}^6 \text{ s/gPM10)} = \text{Long fiber count} \times \text{Pooled analytical sensitivity}$$

For the best estimate, the number of fibers measured across all samples is incorporated into the calculation above. The upper bound of the asbestos concentration was also evaluated. It is calculated as the 95 percent UCL of the Poisson distribution mean, where the Poisson mean was estimated as the total number of structures detected across all samples. In Microsoft Excel, the following equation may be employed to calculate this value:

$$\text{95 percent UCL of Poisson Distribution Mean} = \text{CHIINV}(1 - \text{upper confidence percentile}, 2 \times (\text{Long fiber count} + 1)) / 2$$

This value is then multiplied by the pooled analytical sensitivity to estimate the upper bound concentration. The intent of the risk assessment methodology is to predict the risk associated with airborne asbestos. In order to quantify the airborne asbestos concentration, the estimated dust levels or particulate emission factors (PEFs) were used:

$$\text{Estimated Airborne Concentration (s/cm}^3\text{)} = \text{Estimated bulk concentration (10}^6 \text{ s/gPM10)} \times \text{Estimated dust level (ug/cm}^3\text{)}$$

Further explanation of the asbestos risk calculations and estimates are provided in the NDEP's *Technical Guidance for the Calculation of Asbestos-Related Risk in Soils* (2011a) and *Workbook for the Calculation of Asbestos-Related Risk in Soils* (2011b).

6.1.2 Indoor Air

USEPA's 2002 Vapor Intrusion Guidance

BRC has reviewed USEPA's 2002 Vapor Intrusion Guidance (2002d), and believes that the approach used for the Site conforms to this guidance. The guidance recommends, and BRC has followed, a tiered approach to address vapor intrusion for each of the Eastside sub-areas, including the Parcel 9 South Sub-Area. First, in each of the sub-area SAPs, including that for the Site, BRC has identified each of the chemicals (VOCs and volatile SVOCs) to be evaluated further in each sub-area (that is, a Tier 1 assessment).

Second, BRC explicitly compared the existing groundwater data for wells that are located within (or adjacent to) that sub-area with the USEPA 2002 Tier 2 comparison values (provided in lookup tables in the guidance document). Thus, this Tier 2 assessment was done in the NDEP-approved SAPs for each of the sub-areas. The Tier 2 comparison table for the Site is provided in Appendix J (Table J-1; note that groundwater concentrations have been updated with the most recent groundwater monitoring event for VOCs in August 2012). As shown in this table, with the exception of chloroform (see discussion below), carbon tetrachloride, and tetrachloroethene, all VOCs and volatile SVOCs pass a Tier 2 assessment.

Third, BRC has conducted a site-specific human health risk assessment for vapor intrusion using surface flux data on a sample-by-sample basis, per NDEP recommendations (that is, a Tier 3 assessment; see below). As noted in USEPA's 2002 guidance for a Tier 3 site-specific assessment: "If buildings are not available or not appropriate for sampling, for example in cases where future potential impacts need to be evaluated, other more direct measures of potential impacts, such as emission flux chambers or soil gas surveys, may need to be conducted in areas underlain by subsurface contamination." Thus flux measurements are allowed under USEPA's guidance.

Fourth, BRC has also evaluated the various factors pertaining to vapor intrusion, including depth to groundwater, the nature of the soil column from ground surface to groundwater (see Table 6-3 below), and, water quality (*i.e.*, the constituents likely to be present in groundwater and which might pose any vapor intrusion concerns). BRC has performed a more detailed site-specific evaluation of vapor intrusion potential at a comparison study area within the Eastside property. Based on site-specific conditions, including depth to groundwater, VOC concentrations in groundwater (which are generally similar near the Site - for example, chloroform concentration in groundwater of 5.4 to 1,100 µg/L in the vicinity of the Site versus 180 to 1,200 µg/L at the comparison study area), and expected similar soil physical property, the comparison study area

presents a similar potential for vapor intrusion than the Site (and as shown below, in all cases ILCRs and non-cancer HIs are at or below acceptable levels). See the table below for various parameters.

**TABLE 6-3: SOIL PROPERTIES RESULTS FOR SITE
AND COMPARISON STUDY AREA**

Parameter	Comparison Study Area	Parcel 9 South Sub-Area	Units
Particle Density ¹	2.7	2.7	g/cm ³
Gravimetric Soil Moisture ¹	4.46	7.6	percent
Porosity ¹	33.8	35.8	percent
Permeability ¹	0.0019	0.0060	cm/sec
Bulk Density ¹	1.8	1.8	g/cm ³
Organic Carbon Content ¹	1.1	2.8	percent
USCS Soil Types	SM/GM/GW/ML	SM/GM/GW/ML	--
Depth to Groundwater	49 to 60	32 to 47	ft bgs
Chloroform in Groundwater	180 to 1,200	5.4 to 1,100	µg/L

¹Values presented from the nearby Triangle Commercial sub-area, and are averages for each area. For example, the range of permeabilities in the vicinity of the Site are 0.00066 to 0.0096 centimeters per second (cm/sec), while those for the comparison study area are 0.00029 to 0.0065 cm/sec.

g/cm³ = grams per cubic centimeter

USCS = Unified Soil Classification System

BRC has performed a detailed evaluation of vapor intrusion risk assessments for chloroform at the comparison study area location, showing that risks were acceptable (residential indoor ILCRs ranged from 1×10^{-8} to 9×10^{-7} , and non-cancer HIs were well below 1.0).³² The comparison study area risk estimate calculations are provided electronically in Appendix J (included on the report CD in Appendix B). Input parameters and results for the indoor air calculations for the comparison study area location are also provided in Appendix J (Tables J-2 through J-6).

Finally, BRC is aware of USEPA's recent *Review of the Draft 2002 Subsurface Vapor Intrusion Guidance*. Issues and recommendations identified in this document, as well as the USEPA Office of Inspector General's *Evaluation Report—Lack of Final Guidance on Vapor Intrusion Impedes Efforts to Address Indoor Air Risks* (December 14, 2009), focus primarily on Tier 1 and Tier 2 assessments, and ultimately will not affect how indoor air exposures have been evaluated for the Site.

³² For comparison, chloroform residential indoor ILCRs for the Site were 1×10^{-8} to 3×10^{-6} and non-cancer HIs were well below 1.0; and vapor intrusion ILCRs for the Mohawk sub-area were 4×10^{-8} to 9×10^{-7} and non-cancer HIs were well below 1.0.

Site-Specific Tier 3 Assessment

Concentrations of volatile constituents (VOCs and certain SVOCs) in soil and groundwater that may infiltrate buildings to be constructed at the Site through cracks in the foundations are estimated using USEPA surface emission isolation flux chamber (flux chamber) measurements collected at the Site in accordance with USEPA (1986) guidance and the Flux Chamber SOP-16 (BRC, ERM, and MWH 2009). The flux chamber is used to measure the emission rates from surfaces emitting gas species. Use of the flux chamber reduces the need for modeling surface flux rates, which potentially reduces the uncertainty in the air representative exposure concentrations and the risk characterization. Because the flux chamber measurements were conducted outdoors on open soil, an “infiltration factor” is applied to the outdoor surface flux data to generate data supporting the inhalation of indoor air exposure pathway. The infiltration factor is based on the factors found in the American Society for Testing and Materials (ASTM) *Standard Guide for Risk-Based Corrective Action* (2000). The indoor air concentrations are determined from the surface flux measurements using the following mixing equation:

$$C_a = \frac{J \times \eta}{L \times ER}$$

where:

- C_a = indoor air concentration (milligram per cubic meter [mg/m^3])
- J = measured flux of chemical (milligram per square meter per minute [$\text{mg}/\text{m}^2\text{-min}$])
- η = foundation crack fraction (unitless)
- L = enclosed space volume/infiltration area ratio (meter [m])
- ER = enclosed space air exchange rate (1/min)

Default parameter values from ASTM (2000) for commercial buildings were used (as presented in Section 9 of the NDEP-approved *BRC Closure Plan* [BRC, ERM, and DBS&A 2007; Section 9 revised March 2010]). These default parameters are presented in the electronic indoor air calculation files in Appendix J (included on the report CD in Appendix B). As noted in Section 5.4, indoor air exposures are evaluated on a sample by sample basis, per NDEP requirements, using the surface flux data measurements.

Those VOCs and volatile SVOCs that did not pass the Tier 2 assessment (see above) are evaluated at each individual surface flux location. However, to be consistent with the selection of COPCs for soil; one-tenth of the groundwater Tier 2 comparison values were used. Based on

this, carbon tetrachloride, chloroform, tetrachloroethene, and trichloroethene were evaluated further in the vapor intrusion Tier 3 assessment.

Indoor air concentrations based on the surface flux data measurements are shown in the electronic indoor air calculation files in Appendix H (included on the report CD in Appendix B) and are summarized in Table 6-4 (Tables section). In all cases the maximum of the two flux chamber measurements (TO-15 full scan and TO-15 SIM) is used.

6.1.3 Outdoor Air

Long-term exposure to COPCs bound to dust particles is evaluated using the USEPA's PEF approach (USEPA 2002b). The PEF relates concentrations of a chemical in soil to the concentration of dust particles in the air. The Q/C (Site-Specific Dispersion Factor) values in this equation are for Las Vegas, Nevada (Appendix D of USEPA 2002b). The equation used is:

$$PEF = Q/C_{wind} \times \frac{3,600 \text{ sec/hr}}{0.036 \times (1 - V) \times (U_m / U_t)^3 \times F(x)}$$

where:

- PEF = Particulate emission factor (cubic meter per kilogram [m^3/kg])
Q/C_{wind} = Inverse of the ratio of the geometric mean air concentration to the emission flux at the center of a square source ($\text{g}/\text{m}^2\text{-s}$ per kg/m^3)
V = Fraction of vegetative cover (unitless)
U_m = Mean annual windspeed (m/s)
U_t = Equivalent threshold value of windspeed at 7m (m/s)
F(x) = Function dependent on U_m/U_t derived using USEPA (1985) (unitless)

and

$$Q/C_{wind} = A \times \exp\left(\frac{(\ln A_{site} - B)^2}{C}\right)$$

where

- A_{site} = Source Area (acre)
A, B, C = Air Dispersion Constants for LV (unitless)

The dust model and parameters utilized to generate the PEF are presented in Table 6-5 (Tables section).

The USEPA guidance for dust generated by construction activities (USEPA 2002b) was used for assessing short-term construction worker exposures:

$$PEF = \frac{I}{\left(\left(\frac{I}{PEF_{sc}} \right) + \left(\frac{I}{PEF_{sc_road}} \right) \right)}$$

where:

PEF_{sc} = Subchronic particulate emission factor for construction activities (m^3/kg)

PEF_{sc_road} = Subchronic particulate emission factor for unpaved road traffic (m^3/kg)

Input soil concentrations for the model are the exposure point concentrations as described above. The construction dust model and all relevant equations and parameters utilized to generate the construction worker PEF from this guidance are provided in Table 6-6 (Tables section). Site-specific surface soil moisture data were collected in December-January and May-July. The average of the surface soil data is 7.6 percent. This is considered an adequate representation of the annual average; therefore, this value is used for the percent moisture in dry road surface parameter instead of the NDEP model default value.

In addition, for receptors with indoor exposures (i.e., indoor commercial workers), a dilution factor is applied to obtain an indoor air concentration of dust particles, based on USEPA (2000).

The flux chamber measurements as described in Section 6.1.2 above are used for exposures to VOCs and volatile SVOCs in outdoor air if the chemical was present in the TO-15 analyte list and selected as a COPC as described in Section 6.1.2. If the VOC or volatile SVOC was measured in soil, but not on the TO-15 analyte list, then the exposure point concentration was estimated using USEPA's volatilization factor. Outdoor surface flux data are divided by the dispersion factor for volatiles (Q/C_{vol} for Las Vegas; from USEPA 2002b) for use in the outdoor air exposure pathway. The same dispersion factor is used for all scenarios. The dispersion factor for the construction worker is not adjusted to account for soil intrusion activities. Outdoor air concentrations based on soil data for all receptors are shown in Table 6-7 (Tables section). Outdoor air concentrations based on the surface flux data measurements are shown in the electronic indoor air calculation files in Appendix H (included on the report CD in Appendix B) and are summarized in Table 6-4.

6.2 EXPOSURE ASSESSMENT

In a risk assessment, the possible exposures of populations are examined to determine if the chemicals at a site could pose a threat to the health of identified receptors. The risks associated with exposure to chemicals depend not only on the concentration of the chemicals in the media, but also on the duration and frequency of exposure to those media. For example, the risks associated with exposure to chemicals for 1 hour a day are less than those associated with exposure to the same chemicals at the same concentrations for 2 hours a day. Potential health impacts from chemicals in a medium can occur via one or more exposure pathways. The exposure assessment step of a risk assessment combines information regarding impacted media at a site with assumptions about the people who could come into contact with these media. The result is an estimation of a person's potential rate of contact with impacted media from the Site. The intake rates are evaluated in the risk characterization step to estimate the risks they could pose.

In this section, assumptions regarding people's activities, such as the frequency with which a person could come into contact with impacted media, are discussed. Finally, the daily doses at the points of potential human contact were estimated using these assumptions, the models described in Section 6.1, and the chemical concentrations reported for soil and surface flux samples collected from the Site.

6.2.1 Exposure Parameters

In this section, the assumptions regarding the extent of exposure are presented for each of the exposure pathways for each medium of concern at the Site. Table 6-8 (Tables section) presents each of the exposure parameters used in the risk assessment for each receptor and each pathway. Many of the assumptions regarding the extent of exposure are default factors developed by USEPA's Superfund program. Default values were modified to reflect Site-specific conditions, where possible. The exposure parameters used in the risk assessment were those defined in Tables 9-2 through 9-5 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010).

6.2.2 Quantification of Exposure

In this section, the concentrations of COPCs at the points of potential human exposure are combined with assumptions about the behavior of the populations potentially at risk to estimate the dose of COPCs that may be taken in by the exposed individuals. Later, in the risk

characterization step of the assessment, the doses are combined with toxicity parameters for COPCs to estimate whether the calculated intake levels pose a threat to human health.

The method used to estimate the average daily dose (ADD) for non-carcinogens COPCs via each of the complete exposure pathways is based on USEPA (1989, 1992b) guidance. For carcinogens, lifetime ADD (LADD) estimates are based on chronic lifetime exposure, extrapolated over the estimated average lifetime (assumed to be 70 years). This establishes consistency with cancer slope factors (CSFs), which are based on chronic lifetime exposures. For non-carcinogens, ADD estimates are averaged over the estimated exposure period. ADDs and LADDs were calculated for each exposure scenario using the following generic equation:

$$Dose = \frac{C \times IR \times ED \times EF}{BW \times AT \times 365 \text{ d/yr}}$$

where:

- Dose = ADD for non-carcinogens and LADD for carcinogens (in mg/kg-day)
- C = chemical concentration in the contact medium (e.g., mg/kg soil)
- IR = intake rate (e.g., mg/day soil ingestion and dermal contact [requires a conversion factor of 10^{-6} kilograms per milligram [kg/mg]]);
- ED = exposure duration (years of exposure)
- EF = exposure frequency (number of days per year)
- BW = average body weight over the exposure period (kilograms)
- BIO = relative bioavailability (unitless)
- AF = absorption fraction (percent)
- AT = averaging time; same as the ED for non-carcinogens and 70 years (average lifetime) for carcinogens

Risk estimates for inhalation exposures follow USEPA's *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment)* (USEPA 2009). That is, the concentration of a chemical in air is used as the exposure metric (e.g., mg/m³), rather than inhalation intake of a chemical in air based on inhalation rate and body weight (e.g., mg/kg-day). The generic equation for calculating inhalation exposures is:

$$EC = \frac{C_{air} \times ET \times ED \times EF}{AT}$$

where:

- EC = exposure concentration (in mg/m^3)
- C_{air} = chemical concentration in air (in mg/m^3)
- ET = exposure time (hours per day)
- ED = exposure duration (years of exposure)
- EF = exposure frequency (number of days per year)
- AT = averaging time; same as the ED for non-carcinogens and 613,200 hours (i.e., 70 years; average lifetime) for carcinogens

Pathway-specific equations for calculating ADDs and LADDs are provided in Table 9-6 of the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010). For conservatism, the relative oral bioavailability (BIO) of all COPCs was assumed to be 100 percent, except for arsenic. Consistent with the *BRC Closure Plan* (BRC, ERM, and DBS&A 2007; Section 9 revised March 2010), an arsenic oral bioavailability of 30 percent is used.

Chemical-specific dermal absorption values from USEPA guidance (USEPA 2004e [Part E RAGS]) were used in the risk assessment. USEPA does not recommend absorption factors for VOCs based on the rationale that VOCs from the soil are volatilized on skin and exposure is accounted for via inhalation routes. In addition, RAGS Part E (USEPA 2004e) states “For inorganics, the speciation of the compound is critical to the dermal absorption and there are too little data to extrapolate a reasonable default value.” Therefore, dermal absorption factors are also not used for inorganics. The NDEP and its consultants have concurred with this decision.

Exposure levels of potentially carcinogenic and non-carcinogenic chemicals are calculated separately because different exposure assumptions apply (i.e., ADD for non-carcinogens and LADD for carcinogens). Exposure levels are estimated for each relevant exposure pathway (i.e., soil, air, and water), and for each exposure route (i.e., oral, inhalation, and dermal). Daily doses for the same route of exposure are summed. The total dose of each chemical is the sum of doses across all applicable exposure routes.

6.2.3 Asbestos

Although final USEPA guidance is unavailable at this time, USEPA recommends that site-specific risk assessments be performed for asbestos (USEPA 2004f). Risks associated with asbestos in soil are evaluated using the NDEP’s *Technical Guidance for the Calculation of*

Asbestos-Related Risk in Soils (2011a) and *Workbook for the Calculation of Asbestos-Related Risk in Soils* (2011b), and the draft methodology proposed by USEPA (2003b). This methodology is an update of the method described in *Methodology for Conducting Risk Assessments at Asbestos Superfund Sites-Part 1: Protocol* and *Part 2: Technical Background Document* (Berman and Crump 1999a,b). Because the risk assessment methodology for asbestos is unlike that for other COPCs, asbestos risks are evaluated separately from other chemical risks.

The intent of the risk assessment methodology is to predict the amount of airborne asbestos, which causes an unacceptable risk to a human receptor. Asbestos concentrations are measured in soil, and are then used to predict airborne asbestos concentrations using a dust emissions model. Asbestos data are collected from the top 2 inches of soil. While asbestos might exist below the top 2 inches of soil due to soil turnover, the concentrations in the surface soil are likely to be greater than concentrations beneath the surface, and exposure to the top 2 inches of soil is the most likely point of contact for asbestos. Therefore, the “shallow” surface soils asbestos concentration estimate is used to represent the potential exposure to asbestos.

To interpret measurements of asbestos in soils, it is necessary to establish the relationship between the asbestos concentrations observed in soils and concentrations that will occur in air when such soil is disturbed by natural or anthropogenic forces. This is because asbestos is a hazard when inhaled (see, for example, Berman and Crump 2001; USEPA 2003b). Indeed, the Modified Elutriator Method (Berman and Kolk 2000), which was the method employed to perform the analyses presented in this report, was designed specifically to facilitate prediction of airborne asbestos exposures based on bulk measurements (see, for example, Berman and Chatfield 1990).

Briefly, the Modified Elutriator Method incorporates a procedure for isolating and concentrating asbestos structures as part of the respirable dust fraction of a sample, and analytical measurements are reported as the number of asbestos structures per mass of respirable dust in the sample. This turns out to be precisely the dimensions required to combine such measurements with published dust emission and dispersion models to convert them to asbestos emission and dispersion models. These models can be combined with measurements from the Modified Elutriator Method to predict airborne exposures and assess the attendant risks.

6.2.4 Radionuclides

For radionuclides, the risk assessment approach consists of a comparison of 95 percent UCL soil concentrations to both NDEP indoor and outdoor worker BCLs. Radionuclides have a cancer

endpoint only. Therefore, when utilizing BCLs, carcinogenic risks are evaluated based on the following:

$$\text{Cancer Risk} = \frac{95\% \text{ UCL Soil Concentration}}{\text{Outdoor (or Indoor) Worker BCL}} \times 10^{-6}$$

In this fashion the BCL converts a measured concentration to incremental risk of an individual developing cancer from exposure to radionuclides. See Section 7.3.7 for a further discussion on the use of this simplified approach for radionuclides.

6.3 TOXICITY ASSESSMENT

This section describes the toxicity of the COPCs at the Site. Numerical toxicity values were developed for use in the calculation of the hazard quotients (HQs; for non-carcinogens) and risks (for carcinogens).

6.3.1 Toxicity Values

Toxicity values, when available, are published by the USEPA in the on-line Integrated Risk Information System [IRIS]; (USEPA 2015). CSFs (in units of milligrams per kilogram per day [mg/kg-d]⁻¹) are chemical-specific and experimentally derived potency values that are used to calculate the risk of cancer resulting from exposure to potentially carcinogenic chemicals. Inhalation unit risks (IURs) represent the upper-bound excess lifetime cancer risk from continuous exposure to a chemical at a concentration of 1 microgram per cubic meter (µg/m³). A higher value implies a more potent carcinogenic potential. Reference dosages (RfDs) are experimentally derived “no-effect” levels used to quantify the extent of toxic effects other than cancer due to exposure to chemicals (in units of mg/kg-d). Similarly, a reference concentration (RfC) is the derived “no-effect” concentration for a lifetime of continuous inhalation exposure (in units of mg/m³). With RfDs or RfCs, a lower value implies a more potent toxicant. These criteria are generally developed by USEPA risk assessment work groups and listed in the USEPA risk assessment guidance documents and databases. Available toxicity values for all Site COPCs used in the risk assessment were obtained using the following hierarchy for selecting toxicity criteria (based on USEPA 2003c):

1. IRIS;
2. USEPA’s Provisional Peer Reviewed Toxicity Values (PPRTVs);

3. National Center for Environmental Assessment (or other current USEPA sources);
4. Health Effects Assessment Summary Tables (HEAST);
5. USEPA Criteria Documents (e.g., drinking water criteria documents, drinking water Health Advisory summaries, ambient water quality criteria documents, and air quality criteria documents);
6. ATSDR toxicological profiles;
7. USEPA's Environmental Criteria and Assessment Office; and
8. Peer-reviewed scientific literature.

In addition, toxicity criteria and toxicological surrogates recommended by the NDEP are used in the risk assessment. Toxicity criteria are consistent with those used in the development of the NDEP's BCLs (NDEP 2013), unless newer values are available from USEPA. Toxicity criteria have not been developed by BRC for elements or compounds that do not have criteria published in the above sources.

Although USEPA has developed toxicity criteria for the oral and inhalation routes of exposure, it has not developed toxicity criteria for the dermal route of exposure. USEPA has proposed a method for extrapolating oral toxicity criteria to the dermal route in the *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)* (USEPA 2004e). USEPA states that the adjustment of the oral toxicity factor for dermal exposures is necessary only when the oral-gastrointestinal absorption efficiency of the chemical of interest is less than 50 percent (due to the variability inherent in absorption studies). For COPCs to which dermal exposure might occur at the Site, the oral-gastrointestinal absorption efficiencies are greater than 50 percent. Therefore, it was not necessary to use the USEPA-indicated adjustment of the oral toxicity criteria to generate dermal criteria.

6.3.2 Non-Carcinogenic Health Effects

For non-carcinogenic health effects, USEPA assumes that a dose threshold exists, below which adverse effects are not expected to occur. A chronic RfD or RfC of a chemical is an estimate of a lifetime daily dose to humans that is likely to be without appreciable deleterious non-carcinogenic health effects. To derive an RfD or RfC, a series of professional judgments is made

to assess the quality and relevance of the human or animal data and to identify the critical study and the most critical toxic effect. Data typically used in developing the RfD or RfC are the highest no-observable-adverse-effect-levels (NOAELs) for the critical studies and effects of the non-carcinogen. For each factor representing a specific area of uncertainty inherent in the extrapolation from the available data, an uncertainty factor is applied. Uncertainty factors generally consist of multiples of 10, although values less than 10 are sometimes used.

Four major types of uncertainty factors are typically applied to NOAELs in the derivation of RfDs or RfCs. Uncertainty factors of 10 are used to (1) account for the variability between humans, (2) extrapolate from animals to humans, (3) account for a NOAEL based on a subchronic study instead of a chronic study, and (4) extrapolate from a lowest-observed-adverse-effect-level (LOAEL) to a NOAEL, if necessary. In addition, a modifying factor can be used to account for adequacy of the database. Typically, the modifying factor is set equal to one.

To obtain the RfD or RfC, all uncertainty factors associated with the NOAEL are multiplied together, and the NOAEL is divided by the total uncertainty factor. Therefore, each uncertainty factor adds a degree of conservatism (usually one order of magnitude) to the RfD or RfC. An understanding of the uncertainties associated with RfDs or RfCs is important in evaluating the significance of the HIs calculated in the risk characterization portion of the risk assessment. When available, sub-chronic RfDs or RfCs were used to evaluate construction worker exposures. The COPCs in this assessment with USEPA-established oral/dermal and inhalation RfDs or RfCs are presented in Tables 6-9 and 6-10 (Tables section), for surface flux and soil COPCs, respectively.

6.3.3 Carcinogenic Health Effects

USEPA develops CSFs and IURs from chronic animal studies or, where possible, epidemiological data. Because animal studies use much higher doses over shorter periods of time than the exposures generally expected for humans, the data from these studies are adjusted, typically using a linearized multi-stage (LMS) mathematical model. To ensure protectiveness, CSFs/IURs are typically derived from the 95th percentile UCL of the slope, and thus the actual risks are unlikely to be higher than those predicted using the CSF/IUR, and may be considerably lower. The COPCs in this assessment with USEPA-established oral/dermal and inhalation CSFs/IURs are presented in Tables 6-9 and 6-11 (Tables section), for surface flux and soil COPCs, respectively.

6.3.4 Asbestos

Asbestos toxicity criteria were obtained from Table 8-1 of Berman and Crump's (2001) document and Tables 8-2 and 8-3 in the USEPA (2003b) guidance. The toxicity criteria vary based on fiber type, endpoint (lung cancer, mesothelioma, or combined) and percent of fibers longer than 10 micrometers (μm) and less than 0.4 μm in width. For this risk assessment the toxicity criteria were based on a combined endpoint of lung cancer and mesothelioma averaged over the smokers and non-smokers of the population, with the assumption that 50 percent of fibers are greater than 10 μm in length (Berman and Crump 2001). The resulting unit risk factors (structures/cubic centimeter) are presented in Appendix H (included on the report CD in Appendix B). A complete discussion on issues associated with risk estimates for asbestos is presented in the NDEP's *Technical Guidance for the Calculation of Asbestos-Related Risk in Soils* (2011a).

6.4 RISK CHARACTERIZATION

In the last step of a risk assessment, the estimated rate at which a receptor intakes a chemical is compared with information about the toxicity of that COPC to estimate the potential risks posed by exposure to the COPC. This step is known as risk characterization. The methods used for assessing cancer risks and non-cancer adverse health effects are discussed below.

6.4.1 Methods for Assessing Cancer Risks

In the risk characterization, carcinogenic risk is estimated separately as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to chemicals and asbestos. Carcinogenic risks for chemicals were evaluated by multiplying the estimated average exposure rate (i.e., LADD calculated in the exposure assessment) by the chemical's CSF or IUR. The CSF converts estimated daily doses averaged over a lifetime to incremental risk of an individual developing cancer. Because cancer risks are averaged over a person's lifetime, longer-term exposure to a carcinogen results in higher risks than shorter-term exposure to the same carcinogen, if all other exposure assumptions are constant. Theoretical risks associated with low levels of exposure in humans are assumed to be directly related to an observed cancer incidence in animals associated with high levels of exposure while the IUR converts estimated exposure concentrations averaged over a lifetime to incremental risk of an individual developing cancer. According to USEPA (1989), this approach is appropriate for theoretical upper-bound ILCRs of less than 1×10^{-2} . The following equations were used to calculate COPC-specific risks and total risks:

$$Risk = EC \times IUR \text{ or } LADD \times CSF$$

where:

LADD = lifetime average daily dose (mg/kg-d)
EC = exposure concentration (mg/m³)
IUR = inhalation unit risk (mg/m³)⁻¹
CSF = cancer slope factor (mg/kg-d)⁻¹

and:

$$Total\ Carcinogenic\ Risk = \Sigma Individual\ Risk$$

It is assumed that cancer risks for different chemicals and from multiple exposure routes are additive, which introduces a protective bias in the result of the cancer risk assessment. A similar approach is used for radionuclides:

$$Total\ Radionuclide\ Risk = \Sigma Individual\ Radionuclide\ Risk$$

Carcinogenic risk estimates were compared to the USEPA acceptable, incremental risk range of 1 in 10,000 (10⁻⁴) and 1 in 1 million (10⁻⁶) and the NDEP's acceptable, incremental level of 10⁻⁶. If the estimated incremental risk falls within or below this risk range, the chemical is considered unlikely to pose an unacceptable carcinogenic risk to individuals under the given exposure conditions. A risk level of 1 × 10⁻⁵ (1 E-5) represents an incremental probability of one in 100,000 that an individual could develop cancer from exposure to the potential carcinogen under a defined set of exposure assumptions.

6.4.2 Methods for Assessing Non-Cancer Health Effects

Non-cancer adverse health effects are estimated by comparing the estimated average exposure rate (i.e., ADDs estimated in the exposure assessment) with an exposure level at which no adverse health effects are expected to occur for a long period of exposure (e.g., the RfDs or RfCs). ADDs (or exposure concentrations [ECs]) and RfDs (or RfCs) are compared by dividing the ADD by the RfD (or EC by the RfC) to obtain the ADD:RfD (EC:RfC) ratio, as follows:

$$HQ = \frac{EC}{RfC} \text{ or } \frac{ADD}{RfD}$$

where:

HQ	=	hazard quotient
ADD	=	average daily dose (mg/kg-d)
EC	=	exposure concentration (mg/m ³)
RfD	=	reference dose (mg/kg-d)
RfC	=	reference concentration (mg/m ³)

The ADD-to-RfD (EC-to-RfC) ratio is known as an HQ. If a person's average exposure is less than the RfD or RfC (i.e., if the HQ is less than 1), the chemical is considered unlikely to pose a significant non-carcinogenic health hazard to individuals under the given exposure conditions. Unlike carcinogenic risk estimates, an HQ is not expressed as a probability. Therefore, while both cancer and non-cancer risk characterizations indicate a relative potential for adverse effects to occur from exposure to a chemical, a non-cancer adverse health effect estimate is not directly comparable with a cancer risk estimate.

If more than one pathway is evaluated, the HQs for each pathway are summed to determine whether exposure to a combination of pathways poses a health concern. This sum of the HQs is known as an HI.

$$\text{Hazard Index} = \sum \text{Hazard Quotients}$$

Any HI less than or equal to 1.0 indicates the exposure is unlikely to be associated with a potential health concern. If the HI is greater than 1.0, then the HQs are summed by the specific target organs affected by a particular chemical or chemicals. This is also summed across pathways and chemicals. Target organs are identified primarily by the source of the toxicity criteria (e.g., IRIS). Since a chemical may affect more than one organ, in addition to the source of the toxicity criteria Oak Ridge National Laboratory's (ORNL) Risk Assessment Information System's toxicity profiles were also searched for target organ information (ORNL 2013).

6.4.3 Methods for Assessing Asbestos Risks

For assessing asbestos risks, Table 8-2 (Based on Optimum Risk Coefficients) of USEPA (2003b) was used. Table 8-2 presents best estimate risks optimized based upon separation of fiber type, size and endpoint (mesothelioma/lung cancer), thereby reducing apparent variation between the studies utilized. The values in Table 8-2 are used because they are the authors' "best" estimates of potency based upon all the available data (whereas the "conservative values"

presented in Table 8-3 present only the most conservative, and best “behaved” data). As described in USEPA (2003b), because the asbestos risks to male and female smokers/non-smokers are different, population averaged risks are evaluated based on Eqn. 8-1 of USEPA (2003b):

$$URF = 0.5 \times ((0.786 \times (NSM + NSF)) + ((0.214 \times (SM + SF)) \times CF)$$

where:

- URF = Population Averaged Unit Risk Factor (risk per fibers/cubic centimeter [cm^3])
- NSM = risk for male non-smokers
- NSF = risk for male non-smokers
- SM = risk for male smokers
- SF = risk for female smokers
- CF = factor to convert risk from risk per 100,000 to risk per 1,000,000

This equation considers male smokers, male non-smokers, female smokers, and female non-smokers. In addition, because both chrysotile and amphibole have been detected at the BMI Common Areas, both amphibole and chrysotile fibers are evaluated in the risk assessments, regardless of if either was detected within an exposure area (as calculated using the 95 percent UCL of the mean of the assumed underlying Poisson distribution).

The basic equation for assessing inhalation cancer risk for asbestos is analogous to that recommended by USEPA for other inhalation carcinogens. As shown in Equation 11 of *Risk Assessment Guidance for Superfund, Part F* (USEPA 2009) inhalation cancer risk is the product of an IUR factor and an exposure concentration. The exposure concentration is a function of the asbestos air concentration, the length of time an individual is exposed, and the averaging time for which carcinogenic effects are evaluated for the unit risk factor. This calculation of asbestos related risk (ARR) is also consistent with application of Berman and Crump (2003) to risk calculations described in Berman (2003a,b; 2005). The risk equation used in performing an asbestos inhalation risk assessment is:

$$ARR = \frac{C_{air} \times URF \times ET \times EF \times ED}{AT}$$

where:

- C_{air} = air concentration of asbestos (f/cm^3) (fibers per centimeter cubed)
- ET = exposure time (hours/day)

EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
AT	=	averaging time (hours)
URF	=	unit risk factor (risk per f/cm ³)

Asbestos risk estimates are compared to the USEPA acceptable, incremental risk range for carcinogens of 1 in 10,000 (10^{-4}) and 1 in 1 million (10^{-6}) and the NDEP's acceptable, incremental level of 10^{-6} , although the risk estimates represent the probability of death from mesothelioma or lung cancer rather than the probability of contracting cancer. If the estimated asbestos risk falls within or below this risk range, asbestos is considered unlikely to pose an unacceptable risk to individuals under the given exposure conditions. A risk level of 1×10^{-5} (1 E-5) represents a probability of one in 100,000 that an individual could die from contracting mesothelioma or lung cancer from exposure to asbestos under a defined set of exposure assumptions.

6.4.4 Risk Assessment Results

The calculation of theoretical upper-bound ILCRs and non-cancer health effects are presented by receptor in Tables 6-12 through 6-14 (Tables section) and are discussed in Section 8. These tables present the theoretical upper-bound ILCRs and non-cancer health effects calculations for construction worker, commercial (indoor) worker, and maintenance (outdoor) worker receptors. The risk of death from lung cancer or mesothelioma as a consequence of exposure to asbestos on a Site-wide basis is presented in Table 6-15 (Tables section). The calculation of theoretical upper-bound ILCRs for radionuclides for both the Site and background are presented in Table 6-16. All calculation spreadsheets are provided in Appendix H (included on the report CD in Appendix B).

7.0 UNCERTAINTY ANALYSIS

Risk estimates are values that have uncertainties associated with them. These uncertainties, which arise at every step of a risk assessment, are evaluated to provide an indication of the uncertainty associated with a risk estimate. Risk assessments are not intended to estimate the true risk to a receptor associated with exposure to chemicals in the environment. In fact, estimating the true risk is impossible because of the variability in the exposed or potentially exposed populations. There are always gaps in knowledge because a true exposure for every individual human being cannot be measured. Therefore, risk assessment is a means of estimating the probability that an adverse health effect (e.g., cancer, impaired reproduction) will occur in a receptor to assist in decision-making regarding the protection of human health. The use of conservative values for a majority of the assumptions in risk assessments helps guard against the underestimation of risks.

Risk estimates are calculated by combining Site data, assumptions about individual receptor's exposures to impacted media, and toxicity data. The uncertainties in this HHRA can be grouped into four main categories that correspond to these steps:

- Uncertainties in environmental sampling and analysis;
- Uncertainties in fate and transport modeling;
- Uncertainties in assumptions concerning exposure scenarios; and
- Uncertainties in toxicity data and dose-response extrapolations.

General uncertainties associated with the HHRA for the Site are summarized in Table 7-1. In this table, "Low," "Moderate," and "High" are qualitative indicators as to whether the source of uncertainty will likely have a small, medium, or large effect on the risk calculations, respectively. In general, the scenarios and parameters evaluated and used in this HHRA are considered conservative based on how the Site will be developed. This is a large source of potential conservative bias in this HHRA. Additional discussion on the uncertainties associated with the HHRA is provided below.

7.1 ENVIRONMENTAL SAMPLING

The HHRA for the Site was based on the sampling results obtained from investigations conducted in 2010 through 2012. Errors in sampling results can arise from the field sampling, laboratory analyses, and data analyses.

The environmental sampling at the Site is one source of uncertainty in the evaluation. However, the number of sampling locations and events is large, widespread and spatially distributed, with consistent analytical results (i.e., no hot spots), and sampling was performed using approved procedures; therefore, the sampling and analytical data are sufficient to characterize the impacts and the associated potential risks.

Because of the surface soil removal undertaken for certain chemicals, the new surface layer of the Site could have different chemical concentrations than those measured prior to soil removal. Because only the trigger constituents were reanalyzed for in the post-scrape samples, the original measured surface soil data at the Site for all other chemicals was retained for further evaluation. However, it is reasonable to assume that the concentrations are now lower for some chemicals (e.g., metals, if due to contamination), because of the removal of some soil.

The laboratory data are another potential source of uncertainty. Maximum SQLs for dichloromethyl ether exceeded one-tenth its worker soil BCL. This chemical was not evaluated quantitatively in the HHRA as it was not detected in any Site samples. This may result in an underestimation of risk.

The types of analyses were chosen based on historical knowledge of the Site and BMI Common Areas. The data validation and data usability evaluations provided documentation that the HHRA database is adequate to support HHRA conclusions (Section 4 and Appendix E). Based on the data validation and data usability, the risk estimates are likely to be overestimated rather than underestimated.

Holding times were exceeded in 20 soil samples for chromium (VI) analysis (95 percent of the samples analyzed for that constituent). Chromium (VI) was not selected as a COPC because reported results were significantly less than its worker BCL (less than 100 times the BCL). Sixty percent of the qualified hexavalent chromium results were detected. The significant numbers of biased low data have the potential to underestimate the chromium (VI) results. However, qualifications of chromium (VI) data due to holding time exceedances are not likely to result in underestimation of the total Site risk.

NDEP has issued recent guidance regarding qualifying data due to blank contamination (NDEP 2011c). As noted in the guidance, NDEP requires that data validated before June 2011 and impacted by blank contamination be discussed in any report that uses such data. In so doing, a semi-quantitative comparison of the potential differences between approaches taken previously and the requirements specified in the guidance will be described and explained. The discussion below provides this semi-quantitative comparison for data impacted by blank contamination for the Site.

The initial data for the Site were collected and validated prior to June 2011; therefore, data were qualified using existing USEPA and NDEP guidance. The issue of blank contamination is not one that affects the typical primary risk drivers for the project, including those for the Site. The primary risk drivers for the Site are aluminum and arsenic; only one of which, arsenic, had blank contamination issues. There were six arsenic results, out of 21 for the Site, affected by blank contamination, with initial reported values (3.7 to 4.9 mg/kg) slightly less than the qualified values used in the HHRA (5.3 to 5.5 mg/kg). Therefore, the impact of these samples on the background comparison statistics for arsenic is unlikely to be significant. The following other metals had samples qualified non-detect due to blank contamination: cadmium (20 samples), mercury (18 samples), molybdenum (12 samples), selenium (11 samples), silver (one sample), thallium (two samples), tin (17 samples), tungsten (seven samples), and zinc (five samples). Given the number of samples qualified due to blank contamination for several of these, this may have an impact on the background comparison statistics. However, in all cases, the maximum detected concentrations for these metals are less than one-tenth their respective BCLs (and their maximum non-detect concentrations are also less than one-tenth their BCLs). Therefore, this issue has no material effect on the selection of COPCs and the results of the HHRA for the Site.

Uncertainties are also introduced into the risk assessment by assumptions that are made regarding the grading plan. As described in Section 3.1, a grading plan has not yet been developed for the Site. Because of this, the data were subdivided by depth intervals as described in Section 3.1, and the maximum of the UCLs for the two subsets of data was used as the exposure point concentration. There is some uncertainty in the choice of subsetting on the concentrations of interest, and there is a potential small overestimation of risk by choosing the maximum of the two UCLs as the exposure point concentration. The effects are likely to be small given the data, since there is not much variation in the different UCLs.

7.2 ESTIMATES OF EXPOSURE

The selection of exposure pathways is a process, often based on best professional judgment, which attempts to identify the most probable potentially harmful exposure scenarios. In a risk assessment, it is possible that risks are not calculated for all of the exposure pathways that may occur, possibly causing some underestimation of risk.

7.2.1 Aggregation of Exposure Areas

Although land use is not residential, default residential exposure areas are one-eighth-acre in size. However, sampling has not been performed at the frequency of guaranteeing at least one sample per every one-eighth-acre exposure area. Instead, sampling has been performed at the scale of approximately once every three acres. This is considered sufficient if the concentration distribution for COPCs appears similar across the Site. To the extent that this assumption is not valid the risk assessment might underestimate risks. However, considering the sampling protocols employed and the physical remediation activities performed, the risk estimates are considered both reasonable from this perspective and unlikely to have resulted in an underestimation of risk at the Site.

7.2.2 Types of Exposures Examined

In an evaluation, risks are sometimes not calculated for all of the exposure pathways that may occur, possibly causing some underestimation of risk. However, in this case, all principal potential exposure pathways were evaluated. In this assessment, risks were estimated for future worker receptors. Risks for the most likely routes of exposure to these receptors were estimated. For example, risks to workers were estimated for soil ingestion, skin contact with soil, and inhalation of outdoor air (including dust generation). Although it is possible that other exposure routes could exist (e.g., downwind off-site residents), these exposures are expected to be lower than the risks associated with the pathways considered.

7.2.3 Intake Assumptions Used

The risks calculated depend largely on the assumptions used to calculate the rate of COPC intake. For this assessment, standard default values developed by USEPA are used for reasonable maximum exposures frequency and exposure duration for all receptors. These estimates are conservative values, and the possibility that they underestimate the risk is low. The uncertainties associated with particular parameters used in this risk assessment are described below.

The amount of COPCs the human body absorbs may be different from the amount of a COPC contacted, and the percentage absorbed may vary from one person to another. In this HHRA, with the exception of arsenic, absorption of ingested and inhaled COPCs is conservatively assumed to be 100 percent.

Current USEPA guidance (USEPA 2004e) states that “There are no default dermal absorption values presented for volatile organic compounds nor inorganic classes of compounds. The rationale for this is that in the considered soil exposure scenarios, volatile organic compounds would tend to be volatilized from the soil on skin and should be accounted for via inhalation routes in the combined exposure pathway analysis. For inorganics, the speciation of the compound is critical to the dermal absorption and there are too little data to extrapolate a reasonable default value.” While USEPA guidance does not specifically state that this pathway should be dismissed, consistent with the approach utilized in current USEPA guidance, the risk estimates in this HHRA do not include a dermal absorption value for VOCs or inorganics (unless a specific value has been identified). Thus, the risks presented in this assessment could be underestimated as a result.

The construction activity dust emissions did not take into account dust control measures that would reduce the amount of dust generated to below those levels used in the HHRA. The Clark County Department of Air Quality and Environmental Management has dust control permitting requirements, and an inhalable particulate matter action level of $50 \mu\text{g}/\text{m}^3$. The construction activity dust emissions predicted and used in the HHRA exceeded this level. Therefore, dust suppression activities would need to be implemented, thus reducing dust levels and exposures.

The dispersion factor for the construction worker is not adjusted to account for soil intrusion activities. Because these activities may cause increased air concentrations than that evaluated, risks to VOCs in soil may be underestimated for this receptor. However, VOCs are primarily associated with groundwater, this potential underestimation is considered low.

Using a process similar to the selection of COPCs for soil, only those VOCs and volatile SVOCs that did not pass the Tier 2 assessment in Section 6.1.2 were evaluated at each individual surface flux location. Based on this, only four of the 67 chemicals analyzed for in surface flux samples were included in the cumulative risks associated with the inhalation of VOCs: (note that only two of these four chemicals were detected in surface flux data). Therefore, the cumulative risks associated with the inhalation of VOCs for all exposure scenarios are underestimated in the HHRA; however, this underestimation is considered low.

7.3 TOXICITY ASSESSMENT

The availability and quality of toxicological data is another source of uncertainty in the risk assessment. Uncertainties associated with animal and human studies may have influenced the toxicity criteria. Carcinogenic criteria are classified according to the amount of evidence available that suggests human carcinogenicity. In the establishment of the non-carcinogenic criteria, conservative safety factors, known as uncertainty and modifying factors, are used.

7.3.1 COPCs Lacking Toxicological Data

Toxicity criteria have not been established for some of the chemicals detected at the Site. These chemicals were not quantitatively evaluated in the HHRA. For example, potassium is an analyte for which no USEPA toxicity criteria have been established. The health effects and levels of concern for potassium in soil are not known. While not including potassium may have resulted in a low degree of underestimation of quantitative Site risk estimates, the available toxicological information suggests that this underestimation will not likely affect the decisions made relative to Site risks.

Because of the inconclusive nature of TICs as potentially SRCs, non-cancer surrogate toxicity criteria were not applied. Non-cancer surrogate toxicity criteria were not applied to the inorganic chemicals because of the complexity of ion and metal toxicity. A quantitative estimation of risk was not conducted for these COPCs. Thus, the risks presented in this assessment could be underestimated as a result.

7.3.2 Uncertainties in Animal and Human Studies

Extrapolation of toxicological data from animal tests is one of the largest sources of uncertainty in a risk assessment. There may be important, but unidentified, differences in uptake, metabolism, and distribution of chemicals in the body between the test species and humans. For the most part, these uncertainties are addressed through use of conservative assumptions in establishing values for RfDs, RfCs, CSFs, and IURs, which results in the likelihood that the risk is overstated.

Typically, test animals are administered high doses (e.g., maximum tolerated dose) of a chemical in a standard diet or in air. Humans are generally exposed to much lower doses in the environment, which may affect the toxicity of the chemical. In these studies, test animals, often laboratory rodents, are exposed daily to the chemical agent for various periods of time up to their

2-year lifetimes. Humans have an average 70-year lifetime and may be exposed either intermittently or regularly for an exposure period ranging from weeks to a full lifetime. Because of these differences, it is not surprising that extrapolation error is a large source of uncertainty in a risk assessment.

7.3.3 Non-Carcinogenic Toxicity Criteria

In the establishment of the non-carcinogenic criteria, conservative safety factors, known as uncertainty factors, are used. Most of the chronic non-carcinogenic toxicity criteria that were located in the IRIS database have uncertainty factors of 1,000. This means that the dose corresponding to a toxicological effect level (e.g., LOAEL) is divided by 1,000 to deem a safe, or “reference,” dose. The purpose of the uncertainty factor is to account for the extrapolation of toxicity data from animals to humans and to ensure the protection of sensitive individuals.

7.3.4 Sub-Chronic Non-Carcinogenic Toxicity Criteria

Construction worker exposures are evaluated for an exposure duration of 1 year, which is more representative of a sub-chronic exposure rather than a chronic exposure. As such, where available, sub-chronic RfDs were used to characterize non-cancer effects for the construction worker. However, for many COPCs, a sub-chronic RfD was not available and the chronic RfD was used. This likely presented an overestimation of non-cancer health risks to the construction worker.

7.3.5 Carcinogenic Toxicity Criteria

Uncertainty due to extrapolation of toxicological data for potential carcinogens tested in animals to human response is commonly the case for potentially carcinogenic chemicals. USEPA frequently uses the LMS model, or other non-threshold low-dose extrapolation models, to extrapolate the toxicological data to estimate human response. These low-dose extrapolation models assume that there is no threshold for carcinogenic substances; that is, exposure to even one molecule, fiber, or picocurie of a carcinogen is sufficient to cause cancer. This is a highly conservative assumption, because the body has several mechanisms to protect against cancer.

The use of the LMS model to extrapolate is a well-recognized source of significant uncertainty in the development of carcinogenic toxicity criteria and, subsequently, theoretical carcinogenic risk estimates. At high levels of exposure, there may indeed be a risk of cancer regardless of whether or not the effect occurs via a threshold mechanism. An animal bioassay cannot determine what

happens at low levels of exposure, however, which are generally typical of human exposure levels.

At low levels of exposure, the probability of cancer cannot be measured but must be extrapolated from higher dosages. To do this, test animals are typically exposed to carcinogens at levels that are orders of magnitude greater than those likely to be encountered by humans in the environment. It would be difficult, if not impossible, to perform animal experiments with a large enough number of animals to directly estimate the level of risk at the low exposure levels typically encountered by humans. Thus, to estimate the risk to humans exposed at low levels, dose-response data derived from animals given high dosages are extrapolated downward using mathematical models such as the LMS model, which assumes that there is no threshold of response. The dose-response curve generated by the model is known as the maximum likelihood estimate. The slope of the 95 percent lower confidence interval (i.e., upper-bound limit) curve, which is a function of the variability in the input animal data, is taken as the CSF. CSFs are then used directly in cancer risk assessment.

The U.S. federal government, including USEPA itself, has acknowledged the limitations of the high-to-low dose extrapolation models, particularly the LMS model (USEPA 1991c). In fact, this aspect of cancer risk assessment has been criticized by many scientists (including regulatory scientists) in recent years. USEPA has recently released revised cancer risk assessment guidelines (USEPA 2005b).

Even for genotoxic (i.e., non-threshold) substances, there are two major sources of bias embedded in the LMS model: (1) its inherent conservatism at low doses and (2) the routine use of the linearized form in which the 95 percent upper confidence interval is used instead of the unbiased maximum likelihood estimate. The inherent conservatism at low doses is due in part to the fact that the LMS model ignores all of the numerous biological factors that argue against a linear dose-response relationship for genotoxic effects (e.g., DNA repair, immunosurveillance, toxicokinetic factors).

Several other factors inherent in the LMS model result in overestimated carcinogenic potency: (1) any exaggerations in the extrapolation that can be produced by some high dose responses (if they occur) are generally neglected; (2) UCLs on the actual response observed in the animal study are used rather than the actual response, resulting in upper-bound low dose extrapolations, which can greatly overestimate risk; and (3) non-genotoxic chemicals (i.e., threshold carcinogens) are modeled in the same manner as highly genotoxic chemicals.

7.3.6 Uncertainties with the Asbestos Risk Assessment

For the risk assessment, asbestos concentrations were presented two ways, as a best estimate and upper bound based upon the UCL of the mean of the Poisson distribution. Asbestos risk estimates are highly dependent on the number of samples to increase or decrease the pooled analytical sensitivity. That is, a larger number of non-detect samples with similar individual analytical sensitivity results in a lower pooled analytical sensitivity and subsequently a lower estimated ARR, whereas a smaller number of non-detect samples results in a higher ARR. Uncertainty is, thus, reduced as more samples are collected.

7.3.7 Uncertainties with the Radionuclide Risk Assessment

For radionuclides, a simple comparison to NDEP indoor and outdoor worker BCLs was conducted. This differs from the approach used for other COPCs; however, it is considered a conservative approach for the Site. There are BCLs established for indoor and outdoor workers, but not construction workers. However, carcinogenic risks to construction workers for other COPCs (besides asbestos) is lower than for the other receptors, generally due to their shorter exposure duration. The same would also be the case for radionuclides. Therefore, not including the construction worker receptor for radionuclides will not impact the decisions made relative to Site risks. Another factor to consider is that radionuclide risks are estimated for both the Site and background conditions. Therefore, ultimately, regardless of how the risks are estimated for radionuclides, differences between the Site and background will remain constant, as the exposure concentrations remain the same. Thus, again, the simple comparison approach used for radionuclides will not impact the decisions made relative to Site risks.

7.4 CUMULATIVE EFFECT OF UNCERTAINTIES

Uncertainties from different sources are compounded in the HHRA. For example, if a person's daily intake rate for a chemical is compared to an RfD to determine potential health risks, the uncertainties in the concentration measurements, exposure assumptions, and toxicities are all expressed in the result. Because the exposure assumptions and toxicity criteria are considered conservative, the risk estimates calculated in this HHRA are likely to overestimate rather than underestimate potential risks.

8.0 SUMMARY OF RESULTS

This HHRA has evaluated potential risks to human health associated with chemicals and asbestos detected in soil at the Parcel 9 South Sub-Area located within the BMI Common Areas in Clark County, Nevada. All calculation spreadsheets for this HHRA are presented in Appendix H (on the report CD in Appendix B), including calculations of chemical theoretical upper-bound ILCRs and non-cancer health effects and asbestos risk calculations.

The risk estimates are based on reasonable maximum exposure scenarios, which results in estimates of the potential reasonable maximum, or high-end, risks associated with the Site. The calculated chemical theoretical upper-bound ILCRs and HIs are presented in Table 6-12 through 6-14 for construction worker, commercial (indoor) worker, and maintenance (outdoor) worker receptors, respectively. Asbestos estimated risk of death from lung cancer or mesothelioma on a Sitewide basis is presented in Table 6-15. The calculation of theoretical upper-bound ILCRs for radionuclides for both the Site and background are presented in Table 6-16.

8.1 CONSTRUCTION WORKERS

For chemical exposures, the total cumulative non-cancer HI for construction worker receptors at the Site is 0.1 (including the surface flux air risk estimates) (Table 6-12), with metals soil exposures via the oral ingestion pathway being the primary contributors. The HI does not exceed the target HI of 1.0. As a result, BRC did not evaluate target organ or background non-cancer HI values.

The maximum theoretical upper-bound ILCR for construction worker receptors at the Site is 1×10^{-7} (including the surface flux air risk estimates see Table 6-12) with arsenic soil exposures via the oral ingestion pathway the primary contributor. The theoretical upper-bound ILCRs are all below the low end of the risk goal of 1×10^{-6} .

The estimated risks for death from lung cancer or mesothelioma for asbestos exposures to construction workers were at or below 1×10^{-6} . For construction workers receptors, the best estimate and upper bound concentrations for chrysotile fibers are 1×10^{-8} and 3×10^{-8} ; and 0 and 1×10^{-6} for amphibole fibers (Table 6-15). These estimated risks are at or below the low end of the risk goal of 1×10^{-6} .

8.2 COMMERCIAL (INDOOR) WORKERS

For chemical exposures, the total cumulative non-cancer HI for commercial (indoor) worker receptors at the Site is 0.009 (including the surface flux air risk estimates) (Table 6-13), with

metals soil exposures via the oral ingestion pathway being the primary contributors. The HI does not exceed the target HI of 1.0. As a result, BRC did not evaluate background non-cancer HI values.

The maximum theoretical upper-bound ILCR for commercial (indoor) worker receptors at the Site is 4×10^{-7} (including the surface flux air risk estimates see Table 6-13) with the soil theoretical upper-bound ILCRs for arsenic via the oral ingestion and dermal contact pathways the primary contributor. The theoretical upper-bound ILCRs are all below the low end of the risk goal of 1×10^{-6} .

The estimated risks for death from lung cancer or mesothelioma for asbestos exposures to commercial (indoor) workers were below 1×10^{-6} . For commercial (indoor) worker receptors, the best estimate and upper bound concentrations for chrysotile fibers are 2×10^{-9} and 4×10^{-9} ; and 0 and 2×10^{-7} for amphibole fibers (Table 6-15). These estimated risks are below the low end of the risk goal of 1×10^{-6} .

The maximum theoretical upper-bound ILCR for commercial (indoor) worker receptors exposure to radionuclides at the Site is 8×10^{-5} (Table 6-16). Although the theoretical upper-bound ILCR is greater than the low end of the risk goal of 1×10^{-6} , it is the same as the background ILCR for radionuclides of 8×10^{-5} (Table 6-16).

8.3 MAINTENANCE (OUTDOOR) WORKERS

For chemical exposures, the total cumulative non-cancer HI for maintenance (outdoor) worker receptors at the Site is 0.02 (including the surface flux air risk estimates) (Table 6-14), with metals soil exposures via the oral ingestion pathway being the primary contributors. The HI does not exceed the target HI of 1.0. As a result, BRC did not evaluate background non-cancer HI values.

The maximum theoretical upper-bound ILCR for maintenance (outdoor) worker receptors at the Site is 7×10^{-7} (including the surface flux air risk estimates see Table 6-14) with the soil theoretical upper-bound ILCRs for arsenic via the oral ingestion and dermal contact pathways the primary contributor. The theoretical upper-bound ILCRs are below the low end of the risk goal of 1×10^{-6} .

The estimated risks for death from lung cancer or mesothelioma for asbestos exposures to maintenance (outdoor) workers were below 1×10^{-6} . For maintenance (outdoor) worker receptors, the best estimate and upper bound concentrations for chrysotile fibers are 4×10^{-9} and

9×10^{-9} ; and 0 and 4×10^{-7} for amphibole fibers (Table 6-15). These estimated risks are below the low end of the risk goal of 1×10^{-6} .

The maximum theoretical upper-bound ILCR for maintenance (outdoor) worker receptors exposure to radionuclides at the Site is 2×10^{-4} (Table 6-16). Although the theoretical upper-bound ILCR is greater than the low end of the risk goal of 1×10^{-6} , it is the same as the background ILCR for radionuclides of 2×10^{-4} (Table 6-16).

9.0 DATA QUALITY ASSESSMENT

Sample size calculations were conducted for the four selected COPCs for the Site (with thorium-228 representative of radionuclides),³³ as well as TCDD TEQ. TCDD TEQ was included because it is a chemical of primary concern for the overall project.

The formula used here for calculation of sample size is based on a non-parametric test (the Wilcoxon signed rank test), and on simulation studies performed by Pacific Northwest National Laboratories (2009) that formed the basis for an approximate formula that is based on the normal distribution. Essentially, the formula is the one that would be used if a normal-based test were being performed, but an adjustment is made (multiply by 1.16) to account for the intent to perform a non-parametric test. The formula is as follows:

$$n = 1.16 \left[\frac{s^2}{\Delta^2} (z_{1-\alpha} + z_{1-\beta(\mu)})^2 + 0.5 z_{1-\alpha}^2 \right]$$

where:

- n = number of samples
- s = estimated standard deviation of concentrations/fibers
- Δ = width of the gray region (the difference between the threshold value stated in the null hypothesis and the point at which β is specified)
- α = significance level or Type I error tolerance
- $\beta(\mu)$ = Type II error tolerance; and
- z = quantile from the standard normal distribution

For each chemical, inputs for the calculations include an estimate of the variance from the measured data, a desired significance level, and desired power of the test that must be specified at a concentration of interest (which determines the tolerable difference from the threshold value). For arsenic, the Site mean concentration exceeds its BCL based on the target cancer risk level of 10^{-6} . It is not appropriate to apply this calculation where the threshold value is less than the mean concentration. Therefore, an adjustment of the threshold value was used based the maximum background concentration. The same is true for thorium-228. In this case, an

³³ Note that benzo(a)pyrene was selected as a COPC based on exceeding the one-tenth BCL criteria. Other carcinogenic PAHs were also selected as COPCs because of benzo(a)pyrene. Therefore, sample size calculations were only performed for benzo(a)pyrene, as representative of PAHs.

adjustment of the threshold value was used based on the background cancer risk level of 2×10^{-4} . The calculations provided here cover a range of Type I and Type II error tolerances, and the point at which the Type II error is specified. Results are presented in Table 9-1. In this table, various combinations of input values are used, including values of α of 5, 10, and 15 percent; values of β of 15, 20, and 25 percent; and a gray region of width 10, 20, and 30 percent of the threshold level. It is clear from Table 9-1 that the number of samples collected is adequate for the Site. That is, calculated adequate sample numbers are generally less than those actually collected at the Site for use in the HHRA.

Note also that there are 12 samples collected for asbestos analysis. Amphibole was not detected in any of these samples; however, because of the number of samples collected, the ARR is at or less than 1×10^{-6} . Consequently, sufficient samples have been collected to address ARRs.

10.0 SUMMARY

BRC has prepared this HHRA and Closure Report for the Site. The purpose of this report is to request an NFAD by the NDEP. The NDEP acknowledges that discrete portions of the Eastside may be issued an NFAD as remedial actions are completed for selected environmental media (NDEP 2006). The portion of the Eastside for which the NFAD is being requested based on this HHRA and Closure Report is shown in red on Figure 1. The legal description of the Site is provided in Appendix K.

The HHRA evaluated the potential for adverse human health impacts that may occur as a result of potential exposures to residual concentrations of chemicals in soil, groundwater, and air following remediation, and assessed whether any additional remedial actions are necessary in order to obtain an NFAD from the NDEP to allow redevelopment of the Site to proceed. The results of the risk assessment provide risk managers with an understanding of the potential human health risks associated with background conditions and additional risks associated with past Site activities.

For human health protection, and given the proposed land use for the Site, BRC's goal is to remediate the Site soils such that they are suitable for retail/commercial land use. Human health risks are represented by estimated theoretical upper-bound cancer risks and non-cancer hazards derived in accordance with standard USEPA and NDEP methods. If the carcinogenic risks or non-cancer hazards exceed USEPA acceptable levels or NDEP risk goals, then remedial action alternatives must be considered. Findings of the HHRA are intended to support the Site closure process. The major findings of this report are the following:

- Data collected for use in the HHRA are adequate and usable for their intended purpose;
- All relevant and reasonable exposure scenarios and pathway have been evaluated; and
- Construction worker, commercial (indoor) worker, and maintenance (outdoor) worker cancer and non-cancer risk estimates are within or below the risk goals for the project.

Therefore, based on the results of the HHRA, and the conclusions in this report, exposures to residual levels of chemicals in soil at the Parcel 9 South Sub-Area do not result in adverse health effects to all future receptors. Therefore, BRC concludes that an NFAD for the Parcel 9 South Sub-Area is warranted and requests that the NDEP issue the NFAD (see Appendix K for the legal description of the Site).

11.0 REFERENCES

- Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Update to the ATSDR Policy Guideline for Dioxins and Dioxin-Like Compounds in Residential Soil. U.S. Department of Health and Human Services, Public Health Service. November.
- American Society for Testing and Materials (ASTM). 2000. Standard Guide for Risk-Based Corrective Action. E2081-00.
- Basic Remediation Company (BRC). 2010a. Sampling and Analysis Plan for the Staging Sub-Area and Parcel 9 South, BMI Common Areas (Eastside), Clark County, Nevada. April.
- BRC. 2010b. Technical Memorandum – Correlation of Radon Activities in Indoor Air and Shallow Zone Groundwater, BMI Common Areas (Eastside) Site, Clark County, Nevada. August 30.
- BRC. 2011. BRC Comments on NDEP Blank Contamination Guidance. Technical Memorandum. Draft. August 15.
- BRC and Environmental Resources Management (ERM). 2009a. BRC Quality Assurance Project Plan. BMI Common Areas, Clark County, Nevada. May.
- BRC and ERM. 2009b. 2008 Supplemental Shallow Soil Background Report. BMI Common Areas (Eastside), Clark County, Nevada. September.
- BRC and ERM. 2010a. Data Validation Summary Report, Staging Sub-Area Soil Investigation – May-June 2010 (Dataset 66). BMI Common Areas (Eastside), Clark County, Nevada. October.
- BRC and ERM. 2010b. Background Soil Compilation Report. BMI Complex and Common Areas, Clark County, Nevada. April.
- BRC and ERM. 2011. Data Validation Summary Report, Eastside North Surface Flux Investigations (Remaining Sub-Areas) – July through August 2010 (Dataset 71). BMI Common Areas (Eastside), Clark County, Nevada. July.
- BRC and ERM. 2014. Eastside Confirmation/Supplemental Sampling Events – July 2012 Through February 2014 (Dataset 72f). BMI Common Areas (Eastside), Clark County, Nevada. June.

- BRC, ERM, and Daniel B. Stephens & Associates, Inc. (DBS&A). 2007. BRC Closure Plan, BMI Common Areas, Clark County, Nevada. May. [Section 9 revised March 2010]
- BRC, ERM, and MWH. 2009. BRC Field Sampling and Standard Operating Procedures, BMI Common Areas, Clark County, Nevada. December.
- Berman D.W. 2003a. Analysis and Interpretation of Measurements for the Determination of Asbestos in Core Samples Collected at the Southdown Quarry in Sparta, New Jersey, November 12.
- Berman D.W. 2003b. Evaluation of Asbestos Measurements and Assessment of Risks Attendant to Excavation and Use of Soils Within the Proposed Borrow Area of the BRC Corrective Action Management Unit, Henderson, NV, November 25.
- Berman D.W. 2005. Draft Preliminary Evaluation of the Implications of Airborne Asbestos Exposure Concentrations Observed During Simulation of a Selected Set of Common, Outdoor Residential Activities Conducted at the North Ridge Estates Site, Klamath Falls, Oregon, February 18.
- Berman, D.W., and E.J. Chatfield. 1990. Interim Superfund Method for the Determination of Asbestos in Ambient Air. Part 2: Technical Background Document, Office of Solid Waste and Remedial Response, U.S. EPA, Washington, D.C., EPA/540/2-90/005b, May.
- Berman, D.W., and K. Crump. 1999a. Methodology for Conducting Risk Assessments at Asbestos Superfund Sites—Part 1: Protocol. Interim Version. Prepared for USEPA Region 9, February 15.
- Berman, D.W., and K. Crump. 1999b. Methodology for Conducting Risk Assessments at Asbestos Superfund Sites—Part 2: Technical Background Document. Interim Version. Prepared for USEPA Region 9, February 15.
- Berman, D.W., and K.S. Crump. 2001. Technical Support Document for a Protocol to Assess Asbestos-Related Risk. Prepared for Mark Raney, Volpe Center, U.S. Department of Transportation, 55 Broadway, Kendall Square, Cambridge, MA 02142. Under EPA Review.
- Berman D.W., and K.S. Crump. 2003. Final draft: Technical support document for a protocol to assess asbestos-related risk. Prepared for Mark Follensbee, Syracuse Research Corporation,

Syracuse, NY, and the Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, DC. USEPA #9345.4-06. Limited revision draft.

Berman, D.W., and A. Kolk. 2000. Modified Elutriator Method for the Determination of Asbestos in Soils and Bulk Material. May (Revision 1).

Carlsen, C.L., R.C. Lunnis, and D.E. Prudie. 1991. Changes in water levels and water quality in shallow groundwater, Pittman-Henderson Area, Clark County, Nevada, Resulting from diversion of industrial cooling water from ditch to pipeline in 1985. U.S. Geological Survey Water-Resources Investigation Report 89-4093. Carson City, Nevada.

Clark County GIS Management Office. 2003. 5 Foot Contours for the Las Vegas Valley, Mesquite and Laughlin. Fall 2003 Flight of Clark County.

Daniel B. Stephens & Associates, Inc. (DBS&A). 2009. Revised Technical Memorandum: Sources/Sinks and Input Parameters for Groundwater Flow Model, BMI Common Areas, Eastside Area.

Environmental Remediation Management (ERM). 2000. Remedial Alternatives Study for Soils and Sediments in the Upper and Lower Ponds at the BMI Complex. Henderson, Nevada. March 1.

Las Vegas Wash Coordination Committee. 2000. The Las Vegas Wash Comprehensive Adaptive Management Plan. <http://www.lvwash.org/resources/docs/lvwcamp.html>.

Law Engineering Inc. 1993. Final Report of Phase I Environmental Condition Assessment, Titanium Metals Corporation (TIMET) - Henderson, Nevada.

Neptune and Company. 2009. Guided Interactive Statistical Decision Tools (GiSdT). www.gisdt.org.

Nevada Division of Environmental Protection (NDEP). 2001. Record of Decision, Remediation of Soils and Sediments in the Upper and Lower Ponds at the BMI Complex. Henderson, Nevada. November 2.

NDEP. 2006. Settlement Agreement and Administrative Order on Consent: BMI Common Areas, Phase 3 (AOC3).

- NDEP. 2008a. 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. October 22.
- NDEP. 2008b. Detection Limits and Data Reporting. Bureau of Corrective Actions, Special Projects Branch. December 3.
- NDEP. 2009a. Guidance for Evaluating Radionuclide Data for the BMI Plant Sites and Common Areas Projects. February 6.
- NDEP. 2009b. Supplemental Guidance on Data Validation. March 19.
- NDEP. 2009c. Supplemental Guidance on Data Validation. April 13.
- NDEP. 2009d. Guidance for Evaluating Secular Equilibrium at the BMI Complex and Common Areas. BMI Plant Sites and Common Areas Projects, Henderson, Nevada. February 6.
- NDEP. 2011a. Technical Guidance for the Calculation of Asbestos-Related Risk in Soils for the Basic Management Incorporated (BMI) Complex and Common Areas. February.
- NDEP. 2011b. Workbook for the Calculation of Asbestos-Related Risk in Soils for the Basic Management Incorporated (BMI) Complex and Common Areas.
- NDEP. 2011c. July 2011 Guidance on Qualifying Data due to Blank Contamination. BMI Plant Sites and Common Areas Projects, Henderson, Nevada.
- NDEP. 2012. Guidance on Data Validation for Asbestos Data in Soils. BMI Plant Sites and Common Areas Projects, Henderson, Nevada. July.
- NDEP. 2013. User's Guide and Background Technical Document for Nevada Division of Environmental Protection (NDEP) Basic Comparison Levels (BCLs) for Human Health for the BMI Complex and Common Areas. August.
- NewFields Companies, LLC (NewFields). 2006. Statistical Methodology Report, BMI Common Areas (Eastside), Henderson, Nevada. August.
- Oak Ridge National Laboratory (ORNL). 2013. Risk Assessment Information System (RAIS) Toxicity Profiles. http://rais.ornl.gov/tools/tox_profiles.html

Pacific Northwest National Laboratory. 2009. Visual Sample Plan. <http://vsp.pnl.gov>.

Scanlon, B.R., K.E. Keese, A.L. Flint, L.E. Flint, C.B. Gaye, W.M. Edmunds, and I. Simmers. 2006. Global synthesis of groundwater recharge in semiarid and arid regions. *Hydrological Processes Hydrol. Process.* 20(15):3335–3370.

Southern Nevada Water Authority. 1996. Extent and Potential Use of the Shallow Aquifer and Wash Flow in Las Vegas Valley, Nevada.

Umhoefer, P.J., L.S. Beard, and M.A. Lamb. eds. 2010. Miocene Tectonics of the Lake Mead Region, Central Basin and Range. Geological Society of America. Special Paper 463.

U.S. Environmental Protection Agency (USEPA). 1985. Rapid Assessment of Exposure to Particulate Emissions From Surface Contamination Sites. EPA/600/8-85/002. Office of Health and Environmental Assessment. Washington, DC.

USEPA. 1986. Measurement of Gaseous Emission Rates From Land Surfaces Using an Emission Isolation Flux Chamber, Users Guide. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada, EPA Contract No. 68-02-3889, Radian Corporation, February.

USEPA. 1989. Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response, Washington, DC. USEPA/540/1-89/002. December.

USEPA. 1991a. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions. Memorandum from D.R. Clay, Assistant Administrator, USEPA. OSWER Directive 9355.0-30, April.

USEPA. 1991b. Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual. Supplemental Guidance ‘Standard Default Exposure Factors’. Office of Emergency and Remedial Response, Washington, DC. OSWER Directive 9285.3-03. March.

USEPA. 1991c. Current Regulatory Issues in Risk Assessment and Risk Management. Executive Office of the President. Government Printing Office, Washington, DC. S/N 041 001 00354 1.

USEPA. 1992a. Guidance for Data Usability in Risk Assessment. Part A. Office of Emergency and Remedial Response, Washington DC. Publication 9285.7-09A. PB92-963356. April.

- USEPA. 1992b. Guidelines for Exposure Assessment. Federal Register, 57(104):22888-22938. May 29.
- USEPA. 1992c. Supplemental Guidance to RAGS: Calculating the Concentration Term. Office of Emergency and Remedial Response, Washington, DC. Publication 9285.7-08I. May.
- USEPA. 1996. Soil Screening Guidance: Technical Background Document. Office of Emergency and Remedial Response, Washington, DC. USEPA/540/R-96/018. April.
- USEPA. 1997. Exposure Factors Handbook. Office of Research and Development, Washington DC. USEPA/600/P-95/002Fa-c. August.
- USEPA. 1999. National Functional Guidelines for Organic Data Review. EPA 540/R-99-008. OSWER 9240.1-05A-P. October.
- USEPA. 2000. Soil Screening Guidance for Radionuclides. Office of Radiation and Indoor Air, Washington, DC. USEPA/540-R-00-007 and USEPA/540-R-00-006.
- USEPA. 2002a. Guidance for Quality Assurance Project Plans. EPA QA/G-5. Office of Environmental Information, Washington, DC. December.
- USEPA. 2002b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response, Washington, DC. OSWER 9355.4-24. December.
- USEPA. 2002c. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. Office of Emergency and Remedial Response, Washington, DC. OSWER 9285.6-10. December.
- USEPA. 2002d. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance) EPA 530-f-02-052. November.
- USEPA. 2003a. Contract Laboratory Program Statement of Work for Organic Analysis: Multi-media, Multi-concentration. OLM04.3. Office of Emergency and Remedial Response. March.
- USEPA. 2003b. Technical Support Document for a Protocol to Assess Asbestos-Related Risk. Final Draft. Office of Solid Waste and Emergency Response, Washington, DC.

- USEPA. 2003c. Memorandum on Human Health Toxicity Values in Superfund Risk Assessments, from Michael B. Cook, Director, Office of Superfund Remediation and Technology Innovation to Superfund Remediation Policy Managers, Regions 1 - 10, dated December 5. OSWER Directive 9285.7-53.
- USEPA. 2004a. Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Solid Waste and Emergency Response.
- USEPA. 2004b. Contract Laboratory Program Statement of Work for Organic Analysis: Multimedia, Multi-concentration. SOM01.0. Office of Emergency and Remedial Response. October.
- USEPA. 2004c. Contract Laboratory Program Statement of Work for Inorganic Analysis: Multimedia, Multi-concentration. ILM05.3. Office of Emergency and Remedial Response. March.
- USEPA. 2004d. National Functional Guidelines for Inorganic Data Review. EPA 540-R-04-004. OSWER 9240.1-45. October.
- USEPA. 2004e. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. Office of Emergency and Remedial Response, Washington, DC. EPA/540/R/99/005. July.
- USEPA. 2004f. Memorandum on Clarifying Cleanup Goals and Identification of New Assessment Tools for Evaluating Asbestos at Superfund Cleanups, from Michael B. Cook, Director, Office of Superfund Remediation and Technology Innovation to Superfund Remediation Policy Managers, Regions 1-10, August. OSWER Directive 9345.4-05.
- USEPA. 2005a. National Functional Guidelines for Chlorinated Dioxin/Furan Data Review. EPA 540-R-05-001. OSWER 9240.1-51. September.
- USEPA. 2005b. Guidelines for Carcinogen Risk Assessment. Risk Assessment Forum, Washington, DC. March.
- USEPA. 2008. National Functional Guidelines for Superfund Organic Methods Data Review. EPA 540-R-08-01. OSWER 9240.1-48. June.

- USEPA. 2009. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). EPA-540-R-070-002. <http://www.epa.gov/oswer/riskassessment/ragsf/>.
- USEPA. 2010. Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds. Risk Assessment Forum, Washington, DC. EPA/600/R-10/005.
- USEPA. 2015. Integrated Risk Information System. USEPA on-line database: <http://www.epa.gov/iris/index.html>.
- Western Regional Climate Center. 2008. Monthly average precipitation for Las Vegas. Desert Research Institute. <<http://www.wrcc.dri.edu/summary/Climsmnv.html>>.
- Weston. 1993. Site Conceptual Model, Stauffer/Pioneer/Montrose Site, Henderson, Nevada, September.

APPENDIX B

PARCEL 9 SOUTH SUB-AREA INVESTIGATION DATA TABLES

(Note that all report files, including the database,
are on the report CD included in this appendix)

LIST OF TABLES (APPENDIX B)

Table B-1	Asbestos Results and Analytical Sensitivities
Table B-2	Soil Dioxins/Furans Data
Table B-3	Soil General Chemistry/Ions Data
Table B-4	Soil Metals Data
Table B-5	Soil Organochlorine Pesticides Data
Table B-6	Soil Polynuclear Aromatic Hydrocarbons (PAHs) Data
Table B-7	Soil Polychlorinated Biphenyls (PCBs) Data
Table B-8	Soil Radionuclides Data
Table B-9	Soil Aldehydes and Semi-Volatile Organic Compounds (SVOCs) Data
Table B-10	Soil Volatile Organic Compounds (VOCs) Data
Table B-11	Surface Flux Data

TABLE B-1
ASBESTOS RESULTS AND ANALYTICAL SENSITIVITIES
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Analytical Sensitivity (10 ⁶ s/gPM ₁₀)	Concentration Protocol Structures ⁽¹⁾		Number of Protocol Structures ⁽²⁾					
					Chrysotile (10 ⁶ s/gPM ₁₀)	Amphibole (10 ⁶ s/gPM ₁₀)	Chrysotile			Amphibole		
							Total	Long	Qualifier	Total	Long	Qualifier
P9S1-AG13	0	NORM	06/11/10	3.000	< 8.970 E+6	< 8.970 E+6	0	0		0	0	
P9S1-AG14	0	NORM	06/11/10	2.990	< 8.930 E+6	< 8.930 E+6	0	0		0	0	
P9S1-AH14	0	NORM	06/11/10	2.980	< 8.920 E+6	< 8.920 E+6	0	0		0	0	
P9S1-AG15	0	NORM	06/11/10	2.970	< 8.880 E+6	< 8.880 E+6	0	0		0	0	
P9S1-JD02	0	NORM	06/11/10	2.970	< 8.890 E+6	< 8.890 E+6	0	0		0	0	
P9S1-JD03	0	NORM	06/11/10	2.990	< 8.930 E+6	< 8.930 E+6	0	0		0	0	
P9S1-JD01	0	NORM	06/11/10	3.000	< 8.960 E+6	< 8.960 E+6	0	0		0	0	J
P9S1-JD01	0	FD	06/11/10	2.970	< 8.870 E+6	< 8.870 E+6	0	0		2	0	J
P9S1-AH11	0	NORM	06/11/10	3.000	< 8.960 E+6	< 8.960 E+6	0	0		2	1	
P9S1-AH11	0	FD	06/11/10	2.990	< 8.930 E+6	< 8.930 E+6	0	0		4	0	
P9S1-AH12	0	NORM	06/11/10	2.970	< 8.890 E+6	< 8.890 E+6	0	0		9	0	
P9S1-AH13	0	NORM	06/11/10	2.980	< 8.900 E+6	< 8.900 E+6	0	0		1	0	
P9S6-AH11	0	NORM	07/20/12	3.000	< 8.960 E+6	< 8.960 E+6	0	0	J	2	0	J
P9S6-AH11	0	FD	07/20/12	2.990	< 8.960 E+6	< 8.930 E+6	3	3	J	0	0	J

⁽¹⁾Fiber dimensions are presented in the respective analytical reports for each sample.

⁽²⁾Protocol structures include structures >5 µm in length and < 0.4 µm in width. Only long structures (>10µm in length) present a potential risk and are used for estimating asbestos risks.

Long protocol structure concentrations are presented for informational purposes only.

= Data not included in risk assessment. Sample location excavated and data replaced with post-excavation data.

TABLE B-2
SOIL DIOXINS/FURANS DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 2)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Dioxins/Furans								
				1,2,3,4,6,7,8-HpCDF	1,2,3,4,6,7,8-HpCDD	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDF	1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8,9-HxCDD
P9S1-AG13	0	NORM	6/9/2010	< 0.69 U	< 0.18 U	< 0.3 U	< 0.4 U	< 0.063 U	< 0.23 U	< 0.079 U	< 0.083 U	< 0.053 U
P9S1-AG14	0	NORM	6/8/2010	< 0.47 U	< 0.3 U	< 0.27 U	< 0.28 U	< 0.092 U	< 0.19 U	< 0.07 U	< 0.088 U	< 0.089 U
P9S1-AG15	0	NORM	6/8/2010	48 J	53 J	16 J	28 J	< 0.88 U	11 J	3.4 J	< 1.3 U	< 2 U
P9S1-AG15	0	FD	6/8/2010	150 J	150 J	62 J	78 J	3.2 J	34 J	8.7	4.4 J	5.8
P9S1-AH11	0	NORM	6/9/2010	610 J	49 J	260 J	190 J	9.5 J	200 J	18 J	32 J	9.6 J
P9S1-AH11	0	FD	6/9/2010	1600 J	130 J	730 J	470 J	23 J	450 J	43 J	83 J	21 J
P9S1-AH12	0	NORM	6/9/2010	< 1.9 U	< 0.21 U	< 0.76 U	< 1.5 U	< 0.087 U	< 0.84 U	< 0.1 U	< 0.34 U	< 0.096 U
P9S1-AH13	0	NORM	6/9/2010	70	5.5	33	21	< 1.1 U	21	< 1.8 U	2.9 J	< 1.2 U
P9S1-AH14	0	NORM	6/8/2010	70	7.7	30	34	< 1.1 U	19	< 2.1 U	2.9 J	< 2 U
P9S1-JD01	0	NORM	6/8/2010	< 1 UJ	< 0.4 UJ	< 0.4 UJ	< 0.44 U	< 0.089 U	< 0.19 U	< 0.076 U	< 0.11 U	< 0.075 U
P9S1-JD02	0	NORM	6/8/2010	860	84	410	500	17	260	28	31	25
P9S1-JD03	0	NORM	6/8/2010	97	58	37	45	< 1.5 U	21	3.8 J	3 J	< 2.1 U
P9S6-AH11	0	NORM	7/20/2012	2000 J	180	870	840	32	580	64	94	59
P9S6-JD02	0	NORM	7/20/2012	24	5.3	8.2	8.6	0.32 J	5.5	0.68 J	0.68 J	0.54 J
P9S7-AH11	0	NORM	12/20/2012	1300	120	590	780	24	460	49	71	46

All units in pg/g.

-- = no sample data.

= Data not included in risk assessment. Sample location either excavated and data replaced with post-excavation data or sample location/depth below 10 feet bgs.

TABLE B-2
SOIL DIOXINS/FURANS DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 2)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Dioxins/Furans								
				1,2,3,7,8-PeCDF	1,2,3,7,8-PeCDD	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDF	2,3,7,8-TCDD	OCDD	OCDF	TCDD TEQ
P9S1-AG13	0	NORM	6/9/2010	< 0.17 U	< 0.089 U	< 0.17 U	< 0.096 U	< 0.37 U	< 0.053 U	< 1.1 UJ	< 2.5 UJ	0.18
P9S1-AG14	0	NORM	6/8/2010	< 0.13 U	< 0.062 U	< 0.076 U	< 0.078 U	< 0.23 U	< 0.047 U	< 1.7 UJ	< 2.5 UJ	0.14
P9S1-AG15	0	NORM	6/8/2010	10 J	< 1.1 U	< 2.4 U	6.5 J	13 J	< 0.38 U	630 J	560 J	12
P9S1-AG15	0	FD	6/8/2010	31 J	3.1 J	8.6	20 J	31 J	1 J	1900 J	1600 J	43
P9S1-AH11	0	NORM	6/9/2010	170 J	13 J	43 J	97 J	98 J	4.3 J	52 J	1600 J	120
P9S1-AH11	0	FD	6/9/2010	340 J	29 J	86 J	200 J	180 J	8.9 J	140 J	4800 J	280
P9S1-AH12	0	NORM	6/9/2010	< 0.58 U	< 0.14 U	< 0.16 U	< 0.18 U	0.75 J	< 0.046 U	< 0.26 U	< 4.6 U	0.38
P9S1-AH13	0	NORM	6/9/2010	15	< 1.2 U	4.6 J	8	6.5	< 0.34 U	6.3 J	190 J	11
P9S1-AH14	0	NORM	6/8/2010	16	< 1.4 U	4.3 J	8.6	11	< 0.39 U	22	300	13
P9S1-JD01	0	NORM	6/8/2010	< 0.15 U	< 0.062 U	< 0.097 U	< 0.11 U	< 0.37 U	< 0.054 U	< 3.9 UJ	13 J	0.17
P9S1-JD02	0	NORM	6/8/2010	160	16	44	76	39	2.1	130	7300 J	160
P9S1-JD03	0	NORM	6/8/2010	18	< 1.9 U	4.3 J	10	15	0.6 J	730 J	920 J	21
P9S6-AH11	0	NORM	7/20/2012	500	41	150	280	250	11	180	4900 J	400
P9S6-JD02	0	NORM	7/20/2012	4.2 J	< 0.38 U	1.3 J	2.2 J	3	0.12 J	46	250	4.6
P9S7-AH11	0	NORM	12/20/2012	430	33	110	240	200	11	96	3000	330

All units in pg/g.

-- = no sample data.

= Data not included in risk assessment. Sample location either excavated and data replaced with post-excavation data or sample location/depth below 10 feet bgs.

TABLE B-3
SOIL GENERAL CHEMISTRY/IONS DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	General Chemistry/Ions												
				Ammonia	Bromide	Chlorate	Chloride	Cyanide (Total)	Fluoride	Nitrate (as N)	Nitrite (as N)	Orthophosphate as P	Perchlorate	Sulfate	Sulfide	Total Kjeldahl Nitrogen (TKN)
P9S1-AG13	0	NORM	6/9/2010	< 0.52 U	1.3 J	1.3 J	560	< 0.12 U	0.67 J	31.9	< 0.034 U	< 5.2 U	4.68	120	< 0.86 U	61.8
P9S1-AG13	10	NORM	6/9/2010	< 0.53 U	< 0.27 U	1.3 J	62	< 0.12 U	1.1	1.5	< 0.035 U	< 0.58 U	0.381	56.7	< 0.88 U	64.7
P9S1-AG14	0	NORM	6/8/2010	< 0.56 U	< 0.28 U	1.2 J	50.1	< 0.13 U	0.19 J	0.61	< 0.037 U	< 5.6 U	6.59	60	< 0.93 U	40.7
P9S1-AG14	10	NORM	6/8/2010	< 0.11 U	< 0.29 U	< 0.42 U	8.6	< 0.13 U	2.4	0.45	< 0.039 U	< 0.64 U	0.0578	25.6	< 0.97 U	76.3
P9S1-AG15	0	NORM	6/8/2010	< 0.56 U	< 0.28 U	< 0.4 U	10.1	< 0.13 U	0.43 J	0.32 J	< 0.037 U	< 5.6 U	0.227 J	8.8	< 0.93 U	41.8
P9S1-AG15	0	FD	6/8/2010	< 0.52 U	< 0.26 U	< 0.37 U	14.9	< 0.12 U	0.72 J	11.7 J	< 0.034 U	< 0.57 U	0.0368 J	7.8	< 0.87 U	37.9
P9S1-AG15	10	NORM	6/8/2010	< 0.098 U	< 0.27 U	< 0.38 U	8	< 0.12 U	1.3	0.87	< 0.035 U	< 0.58 U	0.0795	15.8	< 0.89 U	34.4
P9S1-AH11	0	NORM	6/9/2010	< 0.099 U	< 0.27 U	0.8 J	71.9	< 0.12 U	1.9	3.9	< 0.035 U	< 5.3 U	0.326 J	200	< 0.89 U	88.6
P9S1-AH11	0	FD	6/9/2010	< 0.54 U	< 0.27 U	0.63 J	54.8	< 0.12 U	1.2	2.5	< 0.036 U	< 5.4 U	1.19 J	229	< 0.89 U	72.9
P9S1-AH11	10	NORM	6/9/2010	< 0.55 U	< 0.27 U	70.1	970	< 0.12 U	4.1	10.9	< 0.036 U	< 0.6 U	2.89	365	< 0.91 U	59.6
P9S1-AH12	0	NORM	6/9/2010	< 0.53 U	2.4 J	7.2	890	< 0.12 U	1.1	11.4	< 0.035 U	< 5.3 U	3.35	1780	< 0.89 U	52.7
P9S1-AH12	10	NORM	6/9/2010	< 0.55 U	< 0.27 U	2.9 J	210	< 0.12 U	0.88 J	5.9	< 0.036 U	< 5.5 U	0.603	153	< 0.91 U	60.1
P9S1-AH13	0	NORM	6/9/2010	< 0.53 U	0.29 J	1.7 J	304	< 0.12 U	0.51 J	20	< 0.035 U	< 5.3 U	8.45	672	< 0.87 U	83.8
P9S1-AH13	10	NORM	6/9/2010	< 0.099 U	< 0.27 U	1.6 J	88.2	< 0.12 U	0.96 J	0.91	< 0.035 U	< 0.58 U	0.17	117	< 0.89 U	51
P9S1-AH14	0	NORM	6/8/2010	< 0.53 U	< 0.27 U	< 0.38 U	8.8	< 0.12 U	2.3	1.6	< 0.035 U	< 0.58 U	< 0.0106 U	185	< 0.89 U	58.9
P9S1-AH14	10	NORM	6/8/2010	< 0.099 U	1.1 J	4.5 J	400	< 0.12 U	1 J	2.4	< 0.035 U	< 5.4 U	2.73	20.8	< 0.89 U	50.6
P9S1-JD01	0	NORM	6/8/2010	< 0.53 U	< 0.26 U	< 0.38 U	53.2	< 0.12 U	0.65 J	10.5	< 0.035 U	< 0.57 U	0.0484	66.7	< 0.88 U	51.3
P9S1-JD01	10	NORM	6/8/2010	< 0.099 U	< 0.27 U	< 0.39 U	13.3	< 0.12 U	1.1	1.3	< 0.036 U	< 0.59 U	< 0.0106 U	26.4	< 0.9 U	45
P9S1-JD02	0	NORM	6/8/2010	2	< 0.27 U	< 0.39 U	27.5	< 0.12 U	1.1	2.4	< 0.035 U	8.3	0.175	71.1	< 0.89 U	39.9
P9S1-JD02	10	NORM	6/8/2010	< 0.098 U	< 0.27 U	< 0.38 U	36.6	< 0.12 U	1.1	0.46	< 0.035 U	< 5.3 U	0.478	853	< 0.89 U	80.1
P9S1-JD03	0	NORM	6/8/2010	< 0.099 U	< 0.27 U	< 0.39 U	33.5	< 0.12 U	1.1	3.6	< 0.036 U	< 0.59 U	0.586	145	< 0.89 U	86.2 J-
P9S1-JD03	10	NORM	6/8/2010	< 0.11 U	< 0.29 U	< 0.42 U	4.9	< 0.13 U	0.93 J	0.49	< 0.038 U	< 5.8 U	0.586	13.1	< 0.97 U	54.1

All units in mg/kg.

-- = no sample data.

TABLE B-4
SOIL METALS DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 4)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Metals							
				Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium
P9S1-AG13	0	NORM	6/9/2010	12800 J	< 0.85 UJ	7	284 J	0.83	24.6 J	0.34	30400 J
P9S1-AG13	10	NORM	6/9/2010	10900 J	< 0.87 UJ	< 5.3 U	186 J	0.86	< 17.7 U	< 0.27 U	16300 J
P9S1-AG14	0	NORM	6/8/2010	9590 J	< 0.92 UJ	4.3 J+	210 J	0.64 J+	< 18.7 U	< 0.28 U	24400 J
P9S1-AG14	10	NORM	6/8/2010	13700 J	< 0.96 UJ	5.2 J+	316 J	0.94 J+	< 19.5 U	< 0.29 U	38300 J
P9S1-AG15	0	NORM	6/8/2010	25100 J	< 0.92 UJ	10.2 J	407 J	1.4 J+	31.1 J	0.83 J	48400 J
P9S1-AG15	0	FD	6/8/2010	13400 J	< 0.85 UJ	4.3 J	200 J	0.87 J+	< 17.4 U	< 0.26 UJ	14500 J
P9S1-AG15	10	NORM	6/8/2010	10800 J	< 0.87 UJ	3.9 J+	199 J	0.66 J+	< 17.8 U	< 0.27 U	29100 J
P9S1-AH11	0	NORM	6/9/2010	9610 J	< 0.88 UJ	< 5.3 U	173 J	0.65	< 17.9 U	< 0.27 U	29100 J
P9S1-AH11	0	FD	6/9/2010	11400 J	< 0.88 UJ	< 5.4 U	203 J	0.81	< 18 U	< 0.27 U	17100 J
P9S1-AH11	10	NORM	6/9/2010	10800 J	< 0.9 UJ	7.3	377 J	0.7	< 18.3 U	< 0.27 U	34700 J
P9S1-AH12	0	NORM	6/9/2010	10200 J	< 0.88 UJ	< 5.3 U	164 J	0.67	< 17.9 U	< 0.27 U	14700 J
P9S1-AH12	10	NORM	6/9/2010	12400 J	< 0.9 UJ	< 5.5 U	265 J	0.84	< 18.3 U	< 0.27 U	34000 J
P9S1-AH13	0	NORM	6/9/2010	10700 J	< 0.86 UJ	< 5.3 U	165 J	0.76	< 17.6 U	< 0.26 U	22700 J
P9S1-AH13	10	NORM	6/9/2010	11600 J	< 0.88 UJ	5.6	229 J	0.76	< 17.8 U	< 0.27 U	33800 J
P9S1-AH14	0	NORM	6/8/2010	14100 J	< 0.88 UJ	4.3 J+	335 J	0.83 J+	< 17.9 U	< 0.27 U	25300 J
P9S1-AH14	10	NORM	6/8/2010	11900 J	< 0.88 UJ	5.2 J+	280 J	0.79 J+	< 17.9 U	< 0.27 U	35600 J
P9S1-JD01	0	NORM	6/8/2010	11000 J	< 0.86 UJ	3.9 J+	221 J	0.75 J+	< 17.6 U	< 0.26 U	30200 J
P9S1-JD01	10	NORM	6/8/2010	13300 J	< 0.88 UJ	5.2 J+	240 J	0.92 J+	< 18 U	< 0.27 U	22700 J
P9S1-JD02	0	NORM	6/8/2010	12300 J	< 0.88 UJ	3.6 J+	174 J	0.73 J+	< 17.9 U	< 0.27 U	11800 J
P9S1-JD02	10	NORM	6/8/2010	11000 J	< 0.87 UJ	4.4 J+	172 J	0.74 J+	< 17.8 U	< 0.27 U	28000 J
P9S1-JD03	0	NORM	6/8/2010	11400 J	< 0.88 UJ	4.9 J+	171 J	0.72 J+	< 18 U	< 0.27 U	46500 J
P9S1-JD03	10	NORM	6/8/2010	12800 J	< 0.96 UJ	5.9 J+	224 J	0.85 J+	< 19.5 U	< 0.29 U	23100 J
P9S6-AG15	0	NORM	7/20/2012	10000	< 0.83 UJ	3.5 J+	200 J+	0.71	< 17 U	0.19 J	21000

All units in mg/kg.

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TABLE B-4
SOIL METALS DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 4)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Metals							
				Chromium	Chromium (VI)	Cobalt	Copper	Iron	Lead	Lithium	Magnesium
P9S1-AG13	0	NORM	6/9/2010	25.2	0.21 J-	15	31.2	22100 J	45.9	15.6	17800 J
P9S1-AG13	10	NORM	6/9/2010	21.7	0.27 J-	12.7	24.7	22700 J	10.6	14	12600 J
P9S1-AG14	0	NORM	6/8/2010	16.3 J+	< 0.11 UJ	11.5 J+	22.7 J+	16900 J	21.8	12.3	12600 J
P9S1-AG14	10	NORM	6/8/2010	15.3 J+	< 0.12 UJ	11.7 J+	24.2 J+	22200 J	11.2	19.9	12400 J
P9S1-AG15	0	NORM	6/8/2010	79.8 J	0.27 J-	31.9 J	84.7 J	33300 J	72 J	31.4 J	31000 J
P9S1-AG15	0	FD	6/8/2010	17.5 J	0.15 J-	13 J	27.2 J	24700 J	12.4 J	15.7 J	11800 J
P9S1-AG15	10	NORM	6/8/2010	15.5 J+	< 0.11 UJ	9.9 J+	19.2 J+	18000 J	9.8	14.3	9430 J
P9S1-AH11	0	NORM	6/9/2010	14.5	0.32 J-	9	18.5	17300 J	9	15.1	10100 J
P9S1-AH11	0	FD	6/9/2010	16.5	0.27 J-	9.9	21.6	19700 J	10.2	18.7	11900 J
P9S1-AH11	10	NORM	6/9/2010	11.5	0.17 J-	11.2	25.6	18500 J	10.1	18.4	11200 J
P9S1-AH12	0	NORM	6/9/2010	16.1	0.12 J-	11.8	21.5	21000 J	9.7	14.9	9640 J
P9S1-AH12	10	NORM	6/9/2010	16.7	< 0.11 UJ	10.2	22	19000 J	9.8	21.1	12700 J
P9S1-AH13	0	NORM	6/9/2010	14.4	0.22 J-	10.7	17.3	17200 J	8.7	12.8	11600 J
P9S1-AH13	10	NORM	6/9/2010	15.2	0.12 J-	10.3	25.9	19600 J	9.5	19	12000 J
P9S1-AH14	0	NORM	6/8/2010	17.9 J+	< 0.11 UJ	13 J+	22.9 J+	23100 J	11.6	15	10900 J
P9S1-AH14	10	NORM	6/8/2010	16.1 J+	< 0.11 UJ	10.6 J+	22.3 J+	20100 J	10.3	19.3	11900 J
P9S1-JD01	0	NORM	6/8/2010	28.3 J+	0.41 J-	10.9 J+	24 J+	20000 J	11.2	15.8	11800 J
P9S1-JD01	10	NORM	6/8/2010	26.7 J+	0.15 J-	13 J+	45.5 J+	23700 J	13	17.4	12600 J
P9S1-JD02	0	NORM	6/8/2010	19 J+	0.58 J-	13.3 J+	78.7 J+	22100 J	14.3	13.6	13500 J
P9S1-JD02	10	NORM	6/8/2010	14.5 J+	< 0.11 UJ	10.4 J+	24.2 J+	19100 J	8.6	17.1	10900 J
P9S1-JD03	0	NORM	6/8/2010	15.8 J+	< 0.11 UJ	11.4 J+	23.9 J+	18800 J	9.7	31	13200 J
P9S1-JD03	10	NORM	6/8/2010	17.5 J+	0.17 J-	12 J+	28.2 J+	21600 J	9.8	19.2	12800 J
P9S6-AG15	0	NORM	7/20/2012	13 J+	< 0.1 U	9.4 J+	22 J+	18000	19	11	10000

All units in mg/kg.

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TABLE B-4
SOIL METALS DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 3 of 4)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Metals							
				Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
P9S1-AG13	0	NORM	6/9/2010	1540 J	< 0.0345 U	2.8	25.4	3510 J	1.4 J+	0.15 J	749 J+
P9S1-AG13	10	NORM	6/9/2010	582 J	< 0.0064 U	0.51 J	24.1	3020 J	2.3 J+	< 0.042 U	475 J+
P9S1-AG14	0	NORM	6/8/2010	882 J	< 0.0374 U	3.3	22.1	2490 J	< 2.8 UJ	< 0.045 U	1130 J+
P9S1-AG14	10	NORM	6/8/2010	541 J	< 0.0389 U	< 2.9 U	21.8	2500 J	< 2.9 UJ	< 0.047 U	1050 J+
P9S1-AG15	0	NORM	6/8/2010	3150 J	< 0.0375 U	10.5 J	49.2 J	5370 J	< 2.8 UJ	0.3 J	632 J
P9S1-AG15	0	FD	6/8/2010	664 J	< 0.0347 U	< 2.6 UJ	24 J	2950 J	< 2.6 UJ	0.044 J	370 J
P9S1-AG15	10	NORM	6/8/2010	481 J	< 0.0355 U	< 2.7 U	17.6	2330 J	< 2.7 UJ	0.051 J	477 J+
P9S1-AH11	0	NORM	6/9/2010	445 J	< 0.0356 U	< 2.7 U	16.2	2510 J	1.2 J+	< 0.043 U	1090 J
P9S1-AH11	0	FD	6/9/2010	442 J	< 0.0359 U	< 2.7 U	20.2	3040 J	1.4 J+	< 0.043 U	1840 J
P9S1-AH11	10	NORM	6/9/2010	494 J	< 0.0366 U	< 2.7 U	19.1	2370 J	1.8 J+	< 0.044 U	3040 J+
P9S1-AH12	0	NORM	6/9/2010	525 J	< 0.0356 U	< 0.41 U	22.1	2230 J	2 J+	< 0.043 U	974 J+
P9S1-AH12	10	NORM	6/9/2010	470 J	< 0.0366 U	< 2.7 U	20.1	2370 J	1.3 J+	< 0.044 U	811 J+
P9S1-AH13	0	NORM	6/9/2010	481 J	< 0.0351 U	< 2.6 U	22.3	2130 J	1.8 J+	< 0.042 U	1010 J+
P9S1-AH13	10	NORM	6/9/2010	432 J	< 0.0356 U	< 0.41 U	20.2	2030 J	1.6 J+	< 0.043 U	760 J+
P9S1-AH14	0	NORM	6/8/2010	655 J	< 0.0357 U	< 0.41 U	22	3120 J	< 2.7 UJ	0.044 J	936 J+
P9S1-AH14	10	NORM	6/8/2010	503 J	< 0.0357 U	< 0.41 U	20.1	2240 J	< 2.7 UJ	< 0.043 U	936 J+
P9S1-JD01	0	NORM	6/8/2010	332 J	< 0.0352 U	< 2.6 U	21.1	2420 J	< 2.6 UJ	0.05 J	454 J+
P9S1-JD01	10	NORM	6/8/2010	470 J	< 0.036 U	< 2.7 U	23.4	2830 J	< 2.7 UJ	0.065 J	517 J+
P9S1-JD02	0	NORM	6/8/2010	793 J	< 0.0358 U	< 2.7 U	21.3	2230 J	< 2.7 UJ	0.067 J	661 J+
P9S1-JD02	10	NORM	6/8/2010	559 J	< 0.0355 U	< 0.41 U	19.6	2190 J	< 2.7 UJ	< 0.043 U	559 J+
P9S1-JD03	0	NORM	6/8/2010	648 J	< 0.0359 U	< 2.7 U	25.1	2000 J	< 2.7 UJ	0.049 J	381 J+
P9S1-JD03	10	NORM	6/8/2010	621 J	< 0.007 U	< 2.9 U	22.7	2570 J	< 2.9 UJ	< 0.047 U	644 J+
P9S6-AG15	0	NORM	7/20/2012	620	0.025 J	0.89 J	16 J+	2200 J+	2.4 J	0.076 J	430 J+

All units in mg/kg.

-- = no sample data.

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TABLE B-4
SOIL METALS DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 4 of 4)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Metals							
				Strontium	Thallium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc
P9S1-AG13	0	NORM	6/9/2010	230 J	1.5	1.7 J+	1140 J	4.7 J-	1.1	63.6	97.2
P9S1-AG13	10	NORM	6/9/2010	168 J	< 1.1 U	< 1.1 U	1310 J	< 2.7 UJ	0.99	66.6	58.3
P9S1-AG14	0	NORM	6/8/2010	216 J	< 0.33 U	1.1	948 J	< 2.8 UJ	1.1	50 J+	52.1 J+
P9S1-AG14	10	NORM	6/8/2010	446 J	< 0.34 U	< 1.2 U	1150 J	< 0.48 UJ	1.4	57.1 J+	52.2 J+
P9S1-AG15	0	NORM	6/8/2010	305 J	1.4	5.7 J	1900 J	10.8 J	4.2 J	124 J	177 J
P9S1-AG15	0	FD	6/8/2010	200 J	< 1 U	< 1 UJ	1340 J	< 2.6 UJ	1 J	66.9 J	58.8 J
P9S1-AG15	10	NORM	6/8/2010	249 J	< 0.31 U	< 1.1 U	952 J	< 0.44 UJ	1	48.9 J+	44.2 J+
P9S1-AH11	0	NORM	6/9/2010	198 J	< 0.31 U	< 1.1 U	880 J	< 0.44 UJ	0.83	45	38.8 J+
P9S1-AH11	0	FD	6/9/2010	202 J	< 0.31 U	< 1.1 U	1040 J	< 0.44 UJ	1.3	54.6	45.9 J+
P9S1-AH11	10	NORM	6/9/2010	296 J	< 0.32 U	< 1.1 U	914 J	< 0.45 UJ	1.7	55.3	46.9 J+
P9S1-AH12	0	NORM	6/9/2010	173 J	< 0.31 U	< 1.1 U	1060 J	< 0.44 UJ	0.97	59.1	51.5
P9S1-AH12	10	NORM	6/9/2010	361 J	< 0.32 U	< 1.1 U	957 J	< 2.7 UJ	1.2	54.8	45.8 J+
P9S1-AH13	0	NORM	6/9/2010	175 J	< 0.31 U	< 1.1 U	998 J	< 0.43 UJ	1	45.3	46.6 J+
P9S1-AH13	10	NORM	6/9/2010	306 J	< 0.31 U	< 1.1 U	1070 J	< 0.44 UJ	1.8	55.5	48.4
P9S1-AH14	0	NORM	6/8/2010	431 J	< 0.31 U	< 1.1 U	1090 J	< 0.44 UJ	0.9	57.6 J+	57.9 J+
P9S1-AH14	10	NORM	6/8/2010	390 J	< 0.31 U	< 1.1 U	988 J	< 0.44 UJ	1.5	56.6 J+	45.5 J+
P9S1-JD01	0	NORM	6/8/2010	245 J	< 0.31 U	< 1.1 U	999 J	< 0.43 UJ	0.98	66.8 J+	48.3 J+
P9S1-JD01	10	NORM	6/8/2010	254 J	< 0.31 U	2.2	1390 J	< 2.7 UJ	1.3	79.3 J+	62.4 J+
P9S1-JD02	0	NORM	6/8/2010	207 J	< 0.31 U	1.3	1100 J	< 2.7 UJ	1.1	67 J+	89.3 J+
P9S1-JD02	10	NORM	6/8/2010	243 J	< 0.31 U	< 1.1 U	898 J	< 0.44 UJ	1.2	56.1 J+	44.6 J+
P9S1-JD03	0	NORM	6/8/2010	229 J	< 0.31 U	< 1.1 U	824 J	< 0.44 UJ	1.1	56 J+	62.6 J+
P9S1-JD03	10	NORM	6/8/2010	292 J	< 0.34 U	< 1.2 U	1000 J	< 2.9 UJ	1.3	57.6 J+	50.6 J+
P9S6-AG15	0	NORM	7/20/2012	200 J+	0.68 J	0.78 J	730	2.5 J	0.95	42 J+	46 J+

All units in mg/kg.

-- = no sample data.

= Data not included in risk assessment. Sample location either excavated and data replaced with post-excavation data or sample location/depth below 10 feet bgs.

TABLE B-5
SOIL ORGANOCHLORINE PESTICIDES DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 3)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Organochlorine Pesticides							
				2,4-DDD	2,4-DDE	4,4-DDD	4,4-DDE	4,4-DDT	Aldrin	alpha-BHC	alpha-Chlordane
P9S1-AG13	0	NORM	6/9/2010	< 0.00023 U	< 0.00032 U	< 0.000085 U	< 0.0004 U	< 0.00065 U	< 0.00032 U	< 0.00014 U	< 0.00059 U
P9S1-AG13	10	NORM	6/9/2010	< 0.00024 U	< 0.00033 U	< 0.000087 U	< 0.00041 U	< 0.00067 U	< 0.00032 U	< 0.00014 U	< 0.0006 U
P9S1-AG14	0	NORM	6/8/2010	< 0.00025 U	< 0.00035 U	< 0.000092 U	< 0.00044 U	< 0.0007 U	< 0.00034 U	< 0.00015 U	< 0.00064 U
P9S1-AG14	10	NORM	6/8/2010	< 0.00026 U	< 0.00037 U	< 0.000096 U	< 0.00046 U	< 0.00073 U	< 0.00036 U	< 0.00016 U	< 0.00066 U
P9S1-AG15	0	NORM	6/8/2010	< 0.00025 U	< 0.00035 U	< 0.000092 U	0.0022	0.0022	< 0.00034 U	< 0.00015 U	< 0.00064 U
P9S1-AG15	0	FD	6/8/2010	< 0.00023 U	< 0.00033 U	< 0.000085 U	< 0.00041 U	< 0.00065 U	< 0.00032 U	< 0.00014 U	< 0.00059 U
P9S1-AG15	10	NORM	6/8/2010	< 0.00024 U	< 0.00033 U	< 0.000087 U	< 0.00042 U	< 0.00067 U	< 0.00033 U	< 0.00014 U	< 0.0006 U
P9S1-AH11	0	NORM	6/9/2010	< 0.00024 U	0.018 J	< 0.000088 U	0.018 J	0.018 J	< 0.00033 U	< 0.00014 U	< 0.00061 U
P9S1-AH11	0	FD	6/9/2010	< 0.00024 U	< 0.00034 UJ	< 0.000088 U	< 0.00042 UJ	< 0.00068 UJ	< 0.00033 U	< 0.00014 U	< 0.00061 U
P9S1-AH11	10	NORM	6/9/2010	< 0.00024 U	0.0048 J+	< 0.00009 U	0.0067 J+	0.0034 J+	< 0.00034 U	< 0.00015 U	< 0.00062 U
P9S1-AH12	0	NORM	6/9/2010	< 0.00024 U	< 0.00034 U	< 0.000088 U	< 0.00042 U	< 0.00067 U	< 0.00033 U	< 0.00014 U	< 0.00061 U
P9S1-AH12	10	NORM	6/9/2010	< 0.00024 U	< 0.00034 U	< 0.00009 U	< 0.00043 U	< 0.00069 U	< 0.00034 U	< 0.00015 U	< 0.00062 U
P9S1-AH13	0	NORM	6/9/2010	< 0.00023 U	0.0057 J+	< 0.000086 U	0.012 J+	0.0043 J+	< 0.00032 U	< 0.00014 U	< 0.0006 U
P9S1-AH13	10	NORM	6/9/2010	< 0.00024 U	< 0.00034 U	< 0.000088 U	< 0.00042 U	< 0.00067 U	< 0.00033 U	< 0.00014 U	< 0.00061 U
P9S1-AH14	0	NORM	6/8/2010	< 0.00024 UJ	< 0.00034 UJ	< 0.000088 UJ	< 0.00042 UJ	< 0.00067 UJ	0.002 J-	< 0.00014 UJ	< 0.00061 UJ
P9S1-AH14	10	NORM	6/8/2010	< 0.00024 U	< 0.00034 U	< 0.000088 U	< 0.00042 U	< 0.00067 U	< 0.00033 U	< 0.00014 U	< 0.00061 U
P9S1-JD01	0	NORM	6/8/2010	< 0.00024 U	< 0.00033 U	< 0.000086 U	< 0.00041 U	< 0.00066 U	< 0.00032 U	< 0.00014 U	< 0.0006 U
P9S1-JD01	10	NORM	6/8/2010	< 0.00024 UJ	< 0.00034 UJ	< 0.000088 UJ	< 0.00042 UJ	< 0.00068 UJ	< 0.00033 UJ	< 0.00014 UJ	< 0.00061 UJ
P9S1-JD02	0	NORM	6/8/2010	< 0.00024 UJ	< 0.00034 UJ	< 0.000088 UJ	< 0.00042 UJ	< 0.00067 UJ	< 0.00033 UJ	< 0.00014 UJ	< 0.00061 UJ
P9S1-JD02	10	NORM	6/8/2010	< 0.00024 UJ	< 0.00033 UJ	< 0.000087 UJ	< 0.00042 UJ	< 0.00067 UJ	< 0.00033 UJ	< 0.00014 UJ	< 0.0006 UJ
P9S1-JD03	0	NORM	6/8/2010	< 0.00024 UJ	< 0.00034 UJ	< 0.000088 UJ	< 0.00042 UJ	< 0.00068 UJ	< 0.00033 UJ	< 0.00014 UJ	< 0.00061 UJ
P9S1-JD03	10	NORM	6/8/2010	< 0.00026 U	< 0.00037 U	< 0.000096 U	< 0.00045 U	< 0.00073 U	< 0.00036 U	< 0.00015 U	< 0.00066 U

All units in mg/kg.

-- = no sample data.

TABLE B-5
SOIL ORGANOCHLORINE PESTICIDES DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 3)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Organochlorine Pesticides							
				beta-BHC	Chlordane	delta-BHC	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin
P9S1-AG13	0	NORM	6/9/2010	0.0022	< 0.0039 U	< 0.00025 U	< 0.00022 U	< 0.00059 U	< 0.00024 U	< 0.00026 U	< 0.00014 U
P9S1-AG13	10	NORM	6/9/2010	< 0.00032 U	< 0.004 U	< 0.00026 U	< 0.00023 U	< 0.0006 U	< 0.00025 U	< 0.00026 U	< 0.00014 U
P9S1-AG14	0	NORM	6/8/2010	< 0.00034 U	< 0.0042 U	< 0.00027 U	< 0.00024 U	< 0.00064 U	< 0.00026 U	< 0.00028 U	< 0.00015 U
P9S1-AG14	10	NORM	6/8/2010	< 0.00035 U	< 0.0044 U	< 0.00028 U	< 0.00025 U	< 0.00067 U	< 0.00027 U	< 0.00029 U	< 0.00016 U
P9S1-AG15	0	NORM	6/8/2010	< 0.00034 U	< 0.0042 U	< 0.00027 U	< 0.00024 U	< 0.00064 U	< 0.00026 U	< 0.00028 U	< 0.00015 U
P9S1-AG15	0	FD	6/8/2010	< 0.00031 U	< 0.0039 U	< 0.00025 U	< 0.00022 U	< 0.00059 U	< 0.00024 U	< 0.00026 U	< 0.00014 U
P9S1-AG15	10	NORM	6/8/2010	< 0.00032 U	< 0.004 U	< 0.00026 U	< 0.00023 U	< 0.00061 U	< 0.00025 U	< 0.00027 U	< 0.00015 U
P9S1-AH11	0	NORM	6/9/2010	0.011 J	< 0.004 U	< 0.00026 U	< 0.00023 U	< 0.00061 U	< 0.00025 U	< 0.00027 U	< 0.00015 U
P9S1-AH11	0	FD	6/9/2010	< 0.00032 UJ	< 0.004 U	< 0.00026 U	< 0.00023 U	< 0.00061 U	< 0.00025 U	< 0.00027 U	< 0.00015 U
P9S1-AH11	10	NORM	6/9/2010	0.0082 J+	< 0.0041 U	< 0.00027 U	< 0.00024 U	< 0.00063 U	< 0.00026 U	< 0.00027 U	< 0.00015 U
P9S1-AH12	0	NORM	6/9/2010	< 0.00032 U	< 0.004 U	< 0.00026 U	< 0.00023 U	< 0.00061 U	< 0.00025 U	< 0.00027 U	< 0.00015 U
P9S1-AH12	10	NORM	6/9/2010	< 0.00033 U	< 0.0041 U	< 0.00027 U	< 0.00024 U	< 0.00063 U	< 0.00026 U	< 0.00027 U	< 0.00015 U
P9S1-AH13	0	NORM	6/9/2010	0.023 J+	< 0.0039 U	< 0.00026 U	< 0.00023 U	< 0.0006 U	< 0.00025 U	< 0.00026 U	< 0.00014 U
P9S1-AH13	10	NORM	6/9/2010	< 0.00032 U	< 0.004 U	< 0.00026 U	< 0.00023 U	< 0.00061 U	< 0.00025 U	< 0.00027 U	< 0.00015 U
P9S1-AH14	0	NORM	6/8/2010	< 0.00032 UJ	< 0.004 UJ	< 0.00026 UJ	< 0.00023 UJ	< 0.00061 UJ	< 0.00025 UJ	< 0.00027 UJ	< 0.00015 UJ
P9S1-AH14	10	NORM	6/8/2010	< 0.00032 U	< 0.004 U	< 0.00026 U	< 0.00023 U	< 0.00061 U	< 0.00025 U	< 0.00027 U	< 0.00015 U
P9S1-JD01	0	NORM	6/8/2010	< 0.00032 U	< 0.0039 U	< 0.00026 U	< 0.00023 U	< 0.0006 U	< 0.00025 U	< 0.00026 U	< 0.00014 U
P9S1-JD01	10	NORM	6/8/2010	< 0.00032 UJ	< 0.004 UJ	< 0.00026 UJ	< 0.00023 UJ	< 0.00061 UJ	< 0.00025 UJ	< 0.00027 UJ	< 0.00015 UJ
P9S1-JD02	0	NORM	6/8/2010	< 0.00032 UJ	< 0.004 UJ	< 0.00026 UJ	< 0.00023 UJ	< 0.00061 UJ	< 0.00025 UJ	< 0.00027 UJ	< 0.00015 UJ
P9S1-JD02	10	NORM	6/8/2010	< 0.00032 UJ	< 0.004 UJ	< 0.00026 UJ	< 0.00023 UJ	< 0.00061 UJ	< 0.00025 UJ	< 0.00027 UJ	< 0.00015 UJ
P9S1-JD03	0	NORM	6/8/2010	< 0.00032 UJ	< 0.004 UJ	< 0.00026 UJ	< 0.00023 UJ	< 0.00061 UJ	< 0.00025 UJ	< 0.00027 UJ	< 0.00015 UJ
P9S1-JD03	10	NORM	6/8/2010	< 0.00035 U	< 0.0043 U	< 0.00028 U	< 0.00025 U	< 0.00066 U	< 0.00027 U	< 0.00029 U	< 0.00016 U

All units in mg/kg.

-- = no sample data.

TABLE B-5
SOIL ORGANOCHLORINE PESTICIDES DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 3 of 3)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Organochlorine Pesticides							
				Endrin aldehyde	Endrin ketone	gamma-BHC (Lindane)	gamma-Chlordane	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene
P9S1-AG13	0	NORM	6/9/2010	< 0.0004 U	< 0.00031 U	< 0.00017 U	< 0.00016 U	< 0.000098 UJ	< 0.00044 U	< 0.00074 U	< 0.016 U
P9S1-AG13	10	NORM	6/9/2010	< 0.00041 U	< 0.00031 U	< 0.00018 U	< 0.00017 U	< 0.0001 UJ	< 0.00045 U	< 0.00076 U	< 0.016 U
P9S1-AG14	0	NORM	6/8/2010	< 0.00044 U	< 0.00033 U	< 0.00019 U	< 0.00018 U	< 0.00011 UJ	< 0.00048 U	< 0.00081 U	< 0.017 U
P9S1-AG14	10	NORM	6/8/2010	< 0.00045 U	< 0.00035 U	< 0.0002 U	< 0.00018 U	< 0.00011 UJ	< 0.0005 U	< 0.00084 U	< 0.018 U
P9S1-AG15	0	NORM	6/8/2010	< 0.00044 U	< 0.00033 U	< 0.00019 U	< 0.00018 U	R	< 0.00048 U	< 0.00081 U	< 0.017 U
P9S1-AG15	0	FD	6/8/2010	< 0.00041 U	< 0.00031 U	< 0.00018 U	< 0.00016 U	R	< 0.00045 U	< 0.00075 U	< 0.016 U
P9S1-AG15	10	NORM	6/8/2010	< 0.00041 U	< 0.00032 U	< 0.00018 U	< 0.00017 U	R	< 0.00046 U	< 0.00077 U	< 0.016 U
P9S1-AH11	0	NORM	6/9/2010	< 0.00042 U	< 0.00032 U	< 0.00018 U	< 0.00017 U	< 0.0001 UJ	< 0.00046 U	< 0.00077 U	< 0.016 U
P9S1-AH11	0	FD	6/9/2010	< 0.00042 U	< 0.00032 U	< 0.00018 U	< 0.00017 U	< 0.0001 UJ	< 0.00046 U	< 0.00078 U	< 0.016 U
P9S1-AH11	10	NORM	6/9/2010	< 0.00043 U	< 0.00033 U	< 0.00018 U	< 0.00017 U	< 0.0001 UJ	< 0.00047 U	< 0.00079 U	< 0.017 U
P9S1-AH12	0	NORM	6/9/2010	< 0.00042 U	< 0.00032 U	< 0.00018 U	< 0.00017 U	< 0.0001 UJ	< 0.00046 U	< 0.00077 U	< 0.016 U
P9S1-AH12	10	NORM	6/9/2010	< 0.00043 U	< 0.00033 U	< 0.00018 U	< 0.00017 U	< 0.0001 UJ	< 0.00047 U	< 0.00079 U	< 0.017 U
P9S1-AH13	0	NORM	6/9/2010	< 0.00041 U	< 0.00031 U	< 0.00018 U	< 0.00017 U	< 0.0001 UJ	< 0.00045 U	< 0.00076 U	< 0.016 U
P9S1-AH13	10	NORM	6/9/2010	< 0.00042 U	< 0.00032 U	< 0.00018 U	< 0.00017 U	< 0.0001 UJ	< 0.00046 U	< 0.00077 U	< 0.016 U
P9S1-AH14	0	NORM	6/8/2010	< 0.00042 UJ	< 0.00032 UJ	< 0.00018 UJ	< 0.00017 UJ	< 0.0001 UJ	< 0.00046 UJ	< 0.00077 UJ	< 0.016 UJ
P9S1-AH14	10	NORM	6/8/2010	< 0.00042 U	< 0.00032 U	< 0.00018 U	< 0.00017 U	< 0.0001 UJ	< 0.00046 U	< 0.00077 U	< 0.016 U
P9S1-JD01	0	NORM	6/8/2010	< 0.00041 U	< 0.00031 U	< 0.00018 U	< 0.00017 U	R	< 0.00045 U	< 0.00076 U	< 0.016 U
P9S1-JD01	10	NORM	6/8/2010	< 0.00042 UJ	< 0.00032 UJ	< 0.00018 UJ	< 0.00017 UJ	R	< 0.00046 UJ	< 0.00078 UJ	< 0.016 UJ
P9S1-JD02	0	NORM	6/8/2010	< 0.00042 UJ	< 0.00032 UJ	< 0.00018 UJ	< 0.00017 UJ	R	< 0.00046 UJ	< 0.00077 UJ	< 0.016 UJ
P9S1-JD02	10	NORM	6/8/2010	< 0.00041 UJ	< 0.00032 UJ	< 0.00018 UJ	< 0.00017 UJ	R	< 0.00046 UJ	< 0.00077 UJ	< 0.016 UJ
P9S1-JD03	0	NORM	6/8/2010	< 0.00042 UJ	< 0.00032 UJ	< 0.00018 UJ	< 0.00017 UJ	R	< 0.00046 UJ	< 0.00077 UJ	< 0.016 UJ
P9S1-JD03	10	NORM	6/8/2010	< 0.00045 U	< 0.00035 U	< 0.0002 U	< 0.00018 U	< 0.00011 UJ	< 0.0005 U	< 0.00084 U	< 0.018 U

All units in mg/kg.

-- = no sample data.

TABLE B-6
SOIL POLYNUCLEAR AROMATIC HYDROCARBONS (PAHs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Polynuclear Aromatic Hydrocarbons (PAHs)												
				Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene
P9S1-AG13	0	NORM	6/9/2010	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U
P9S1-AG13	10	NORM	6/9/2010	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U
P9S1-AG14	0	NORM	6/8/2010	< 0.00172 U	< 0.00172 U	< 0.00172 U	< 0.00172 U	< 0.00172 U	< 0.00172 U	< 0.00172 U	< 0.00172 U	< 0.00172 U	< 0.00172 U	< 0.00172 U	< 0.00172 U	< 0.00172 U
P9S1-AG14	10	NORM	6/8/2010	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U
P9S1-AG15	0	NORM	6/8/2010	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U
P9S1-AG15	0	FD	6/8/2010	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U
P9S1-AG15	10	NORM	6/8/2010	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U
P9S1-AH11	0	NORM	6/9/2010	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U
P9S1-AH11	0	FD	6/9/2010	< 0.00183 U	< 0.00183 U	< 0.00183 U	< 0.00183 U	< 0.00183 U	< 0.00183 U	< 0.00183 U	< 0.00183 U	< 0.00183 U	< 0.00183 U	< 0.00183 U	< 0.00183 U	< 0.00183 U
P9S1-AH11	10	NORM	6/9/2010	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U
P9S1-AH12	0	NORM	6/9/2010	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U
P9S1-AH12	10	NORM	6/9/2010	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U	< 0.0018 U
P9S1-AH13	0	NORM	6/9/2010	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U	< 0.00175 U
P9S1-AH13	10	NORM	6/9/2010	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U	< 0.00182 U
P9S1-AH14	0	NORM	6/8/2010	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U
P9S1-AH14	10	NORM	6/8/2010	< 0.00181 U	< 0.00181 U	< 0.00181 U	< 0.00181 U	< 0.00181 U	< 0.00181 U	< 0.00181 U	< 0.00181 U	< 0.00181 U	< 0.00181 U	< 0.00181 U	< 0.00181 U	< 0.00181 U
P9S1-JD01	0	NORM	6/8/2010	< 0.00174 U	< 0.00174 U	< 0.00174 U	< 0.00174 U	< 0.00174 U	< 0.00174 U	< 0.00174 U	< 0.00174 U	< 0.00174 U	< 0.00174 U	< 0.00174 U	< 0.00174 U	< 0.00174 U
P9S1-JD01	10	NORM	6/8/2010	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U	< 0.00176 U
P9S1-JD02	0	NORM	6/8/2010	< 0.00177 U	< 0.00177 U	< 0.00177 U	< 0.00177 U	< 0.00177 U	< 0.00177 U	< 0.00177 U	< 0.00177 U	< 0.00177 U	< 0.00177 U	< 0.00177 U	< 0.00177 U	< 0.00177 U
P9S1-JD02	10	NORM	6/8/2010	< 0.00178 U	< 0.00178 U	< 0.00178 U	< 0.00178 U	< 0.00178 U	< 0.00178 U	< 0.00178 U	< 0.00178 U	< 0.00178 U	< 0.00178 U	< 0.00178 U	< 0.00178 U	< 0.00178 U
P9S1-JD03	0	NORM	6/8/2010	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U
P9S1-JD03	10	NORM	6/8/2010	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U	< 0.00179 U

All units in mg/kg.

-- = no sample data.

TABLE B-7
SOIL POLYCHLORINATED BIPHENYLS (PCBs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Polychlorinated Biphenyls (PCBs)													
				PCB 105	PCB 114	PCB 118	PCB 123	PCB 126	PCB 156	PCB 156/157	PCB 157	PCB 167	PCB 169	PCB 189	PCB 209	PCB 77	PCB 81
P9S1-AG13	0	NORM	6/9/2010	8.2	< 0.18 U	20	< 0.19 U	< 0.17 U	2.2	--	< 0.11 U	< 0.14 U	< 0.11 U	< 0.098 U	22	< 2.2 U	< 0.12 U
P9S1-AG14	0	NORM	6/8/2010	2.8	< 0.17 U	< 6.4 U	< 0.18 U	< 0.19 U	< 0.13 U	--	< 0.13 U	< 0.15 U	< 0.14 U	< 0.16 U	< 0.096 U	< 0.15 U	< 0.14 U
P9S1-AG15	0	NORM	6/8/2010	290 J	6.3 J	600 J	< 0.24 U	12 J	120 J	--	28 J	29 J	< 0.28 UJ	11 J	3600 J	< 0.18 U	< 0.17 U
P9S1-AG15	0	FD	6/8/2010	1900 J	63 J	3600 J	< 0.44 U	99 J	810 J	--	190 J	290 J	8.9 J	88 J	15000 J	< 0.37 U	< 0.35 U
P9S1-AH11	0	NORM	6/9/2010	260 J	55	530 J	< 0.48 U	26 J	140 J	--	35 J	78 J	8.5 J	74 J	17000 J	< 0.37 U	< 0.36 U
P9S1-AH11	0	FD	6/9/2010	730 J	41	1500 J	< 1.1 U	65 J	370 J	--	91 J	190 J	15 J	130 J	25000 J	< 0.33 U	< 0.32 U
P9S1-AH12	0	NORM	6/9/2010	2.2	< 0.12 U	6.6	< 0.12 U	< 0.13 U	< 0.11 U	--	< 0.1 U	< 0.13 U	< 0.12 U	< 0.14 U	43	< 0.15 U	< 0.14 U
P9S1-AH13	0	NORM	6/9/2010	7.1	< 0.29 U	15	< 0.32 U	< 0.25 U	5.4	--	< 0.2 U	4.9	< 0.2 U	4.6	1100 J	< 0.15 U	< 0.15 U
P9S1-AH14	0	NORM	6/8/2010	64	5.8	140	< 0.28 U	4.7	28	--	6.6	10	< 0.33 U	5.5	2200 J	< 0.23 U	< 0.21 U
P9S1-JD01	0	NORM	6/8/2010	18	< 0.13 U	39	< 0.14 U	< 0.15 U	8.8	--	2.9	3.3	< 0.18 U	< 0.14 U	260	< 0.1 U	< 0.097 U
P9S1-JD02	0	NORM	6/8/2010	1500	12	3000 J	< 0.25 U	32	930	--	220	270	4.3	120	21000 J	< 0.36 U	< 0.34 U
P9S1-JD03	0	NORM	6/8/2010	1700	36	3900 J	< 0.41 U	43	780	--	190	280	2.7	60	6500 J	< 0.31 U	< 0.28 U
P9S6-AH11	0	NORM	7/20/2012	440	56	750	28	60	270	--	270	140	25	130	25000 J	78	26
P9S6-JD02	0	NORM	7/20/2012	820	10	1700 J	26	8.1	480	--	480	150	< 0.36 U	23	2100 J	35	< 0.27 U
P9S7-AH11	0	NORM	12/20/2012	270	46	490	92	40	--	170	--	110	14	110	19000 J	58	24

All units in pg/g.

-- = no sample data.

= Data not included in risk assessment. Sample location either excavated and data replaced with post-excavation data or sample location/depth below 10 feet bgs.

TABLE B-8
SOIL RADIONUCLIDES DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Radionuclides							
				Radium-226	Radium-228	Thorium-228	Thorium-230	Thorium-232	Uranium-233/234	Uranium-235/236	Uranium-238
P9S1-AG13	0	NORM	6/9/2010	0.81	2.27	2.34 J	1 U	1.39	0.826	0.219	1.24
P9S1-AG13	10	NORM	6/9/2010	0.584	2.13	1.98 J	1.51	1.78	1.46	0.278 U	1.58
P9S1-AG14	0	NORM	6/8/2010	0.962	1.83	1.92	1.34	1.86	0.855	0.323 U	1.05
P9S1-AG14	10	NORM	6/8/2010	0.815	1.76	2.27	1.25	1.75	0.773	0.302 U	0.814
P9S1-AG15	0	NORM	6/8/2010	0.611	0.954 UJ	0.982 J	1.24	1.41	0.809	0.292 U	0.901
P9S1-AG15	0	FD	6/8/2010	0.43 U	2.13 J	2.93 J	0.897	1.95	1.13	0.368 U	0.854
P9S1-AG15	10	NORM	6/8/2010	0.857	1.1	1.6	1.55	1.64	0.654	0.361 U	0.792
P9S1-AH11	0	NORM	6/9/2010	0.629	0.968 U	3.08 J	1.4	1.76	0.785	0.262	0.885
P9S1-AH11	0	FD	6/9/2010	0.675	1.06	1.32 J	1.28	1.5	0.996	0.23 U	0.929
P9S1-AH11	10	NORM	6/9/2010	0.696	1.93	1.14 J	1.03	1.89	1.36	0.515 U	1.6
P9S1-AH12	0	NORM	6/9/2010	0.374	1.47	1.44 J	1.36	1.93	0.239	0.284 U	0.9
P9S1-AH12	10	NORM	6/9/2010	0.634	1.36	2.38 J	1.41	1.6	1.26	0.222 U	0.823
P9S1-AH13	0	NORM	6/9/2010	0.623	1.26	1.74 J	1 U	1.63	0.61	0.257 U	0.901
P9S1-AH13	10	NORM	6/9/2010	1.04	0.958 U	2.18 J	1.44	2.05	1.09	0.454 U	1.15
P9S1-AH14	0	NORM	6/8/2010	0.815	1.68	2.46	0.672	2.02	0.99	0.248 U	1.34
P9S1-AH14	10	NORM	6/8/2010	0.429	0.939 U	1.63	1.08	1.6	0.902	0.44 U	1.56
P9S1-JD01	0	NORM	6/8/2010	0.871	2.35	1.55	1.88	2.75	0.799	0.182 U	1
P9S1-JD01	10	NORM	6/8/2010	1.06	2.19	2.76	1.55	2.17	0.777	0.223 U	0.707
P9S1-JD02	0	NORM	6/8/2010	0.547	2.11	1.75	1.58	1.54	0.431 U	0.399 U	0.511
P9S1-JD02	10	NORM	6/8/2010	1.19	1.61	1.35	1.22	1.49	1.2	0.298 U	1.16
P9S1-JD03	0	NORM	6/8/2010	0.835	1.18	1.69	1.07	1.61	0.754	0.276 U	0.949
P9S1-JD03	10	NORM	6/8/2010	1.08	0.988	1.65	2.51	1.07	0.868	0.346 U	1.46

All units in pCi/g.

-- = no sample data.

TABLE B-9
SOIL ALDEHYDES AND SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Aldehydes		Semi-Volatile Organic Compounds (SVOCs)							
				Acetaldehyde	Formaldehyde	1,2,4,5-Tetrachloro- benzene	1,2-Diphenylhydrazine	1,4-Dioxane	2,2'-Dichlorobenzil	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol
P9S1-AG13	0	NORM	6/9/2010	3.33	0.694 J	< 0.0702 U	< 0.0702 U	< 0.0702 U	< 0.116 U	< 0.0702 U	< 0.0702 U	< 0.0702 U	< 0.0702 U
P9S1-AG13	10	NORM	6/9/2010	1.42	0.329 J	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.0715 U
P9S1-AG14	0	NORM	6/8/2010	3.96	0.764 J	< 0.0689 U	< 0.0689 U	< 0.0689 U	< 0.114 U	< 0.0689 U	< 0.0689 U	< 0.0689 U	< 0.0689 U
P9S1-AG14	10	NORM	6/8/2010	0.868 J	0.416 J	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.0705 U
P9S1-AG15	0	NORM	6/8/2010	6.78 J	1.42	< 0.0701 U	< 0.0701 U	< 0.0701 U	< 0.116 U	< 0.0701 U	< 0.0701 U	< 0.0701 U	< 0.0701 U
P9S1-AG15	0	FD	6/8/2010	1.06 J	0.39 J	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.0705 U
P9S1-AG15	10	NORM	6/8/2010	0.753 J	0.26 J	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.0714 U
P9S1-AH11	0	NORM	6/9/2010	2.17	0.418 J	< 0.0719 U	< 0.0719 U	< 0.0719 U	< 0.119 U	< 0.0719 U	< 0.0719 U	< 0.0719 U	< 0.0719 U
P9S1-AH11	0	FD	6/9/2010	1.03 J	0.317 J	< 0.0733 U	< 0.0733 U	< 0.0733 U	< 0.121 U	< 0.0733 U	< 0.0733 U	< 0.0733 U	< 0.0733 U
P9S1-AH11	10	NORM	6/9/2010	0.512 J	< 0.22 UJ	< 0.0729 U	< 0.0729 U	< 0.0729 U	< 0.12 U	< 0.0729 U	< 0.0729 U	< 0.0729 U	< 0.0729 U
P9S1-AH12	0	NORM	6/9/2010	1.01 J	0.354 J	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.0714 U
P9S1-AH12	10	NORM	6/9/2010	1.34	0.292 J	< 0.0721 U	< 0.0721 U	< 0.0721 U	< 0.119 U	< 0.0721 U	< 0.0721 U	< 0.0721 U	< 0.0721 U
P9S1-AH13	0	NORM	6/9/2010	1.7	0.497 J	< 0.0698 U	< 0.0698 U	< 0.0698 U	< 0.115 U	< 0.0698 U	< 0.0698 U	< 0.0698 U	< 0.0698 U
P9S1-AH13	10	NORM	6/9/2010	0.791 J	0.328 J	< 0.0727 U	< 0.0727 U	< 0.0727 U	< 0.12 U	< 0.0727 U	< 0.0727 U	< 0.0727 U	< 0.0727 U
P9S1-AH14	0	NORM	6/8/2010	2.69	0.413 J	< 0.0703 U	< 0.0703 U	< 0.0703 U	< 0.116 U	< 0.0703 U	< 0.0703 U	< 0.0703 U	< 0.0703 U
P9S1-AH14	10	NORM	6/8/2010	0.952 J	0.358 J	< 0.0722 U	< 0.0722 U	< 0.0722 U	< 0.119 U	< 0.0722 U	< 0.0722 U	< 0.0722 U	< 0.0722 U
P9S1-JD01	0	NORM	6/8/2010	1.89	0.504 J	< 0.0696 U	< 0.0696 U	< 0.0696 U	< 0.115 U	< 0.0696 U	< 0.0696 U	< 0.0696 U	< 0.0696 U
P9S1-JD01	10	NORM	6/8/2010	2.36	0.393 J	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.0705 U
P9S1-JD02	0	NORM	6/8/2010	12.3	1.31	< 0.071 U	< 0.071 U	< 0.071 U	< 0.117 U	< 0.071 U	< 0.071 U	< 0.071 U	< 0.071 U
P9S1-JD02	10	NORM	6/8/2010	3.92	0.729 J	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.0714 U
P9S1-JD03	0	NORM	6/8/2010	2.47	0.584 J	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.0715 U
P9S1-JD03	10	NORM	6/8/2010	1.89	0.462 J	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.0715 U

All units in mg/kg.

-- = no sample data.

TABLE B-9
SOIL ALDEHYDES AND SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Semi-Volatile Organic Compounds (SVOCs)									
				2,4-Dinitrophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chloronaphthalene	2-Chlorophenol	2-Methylnaphthalene	2-Nitroaniline	2-Nitrophenol	3,3-Dichlorobenzidine	3-Nitroaniline
P9S1-AG13	0	NORM	6/9/2010	< 0.133 UJ	< 0.0351 U	< 0.0351 U	< 0.0123 U	< 0.0702 U	< 0.00702 U	< 0.0702 U	< 0.0351 U	< 0.105 U	< 0.0702 U
P9S1-AG13	10	NORM	6/9/2010	< 0.136 UJ	< 0.0357 U	< 0.0357 U	< 0.0125 U	< 0.0715 U	< 0.00715 U	< 0.0715 U	< 0.0357 U	< 0.107 U	< 0.0715 U
P9S1-AG14	0	NORM	6/8/2010	< 0.131 UJ	< 0.0345 U	< 0.0345 U	< 0.0121 U	< 0.0689 U	< 0.00689 U	< 0.0689 U	< 0.0345 U	< 0.103 U	< 0.0689 U
P9S1-AG14	10	NORM	6/8/2010	< 0.134 UJ	< 0.0352 U	< 0.0352 U	< 0.0123 U	< 0.0705 U	< 0.00705 U	< 0.0705 U	< 0.0352 U	< 0.106 U	< 0.0705 U
P9S1-AG15	0	NORM	6/8/2010	< 0.133 UJ	< 0.035 U	< 0.035 U	< 0.0123 U	< 0.0701 U	< 0.00701 U	< 0.0701 U	< 0.035 U	< 0.105 U	< 0.0701 U
P9S1-AG15	0	FD	6/8/2010	< 0.134 UJ	< 0.0352 U	< 0.0352 U	< 0.0123 U	< 0.0705 U	< 0.00705 U	< 0.0705 U	< 0.0352 U	< 0.106 U	< 0.0705 U
P9S1-AG15	10	NORM	6/8/2010	< 0.136 UJ	< 0.0357 U	< 0.0357 U	< 0.0125 U	< 0.0714 U	< 0.00714 U	< 0.0714 U	< 0.0357 U	< 0.107 U	< 0.0714 U
P9S1-AH11	0	NORM	6/9/2010	< 0.137 UJ	< 0.036 U	< 0.036 U	< 0.0126 U	< 0.0719 U	< 0.00719 U	< 0.0719 U	< 0.036 U	< 0.108 U	< 0.0719 U
P9S1-AH11	0	FD	6/9/2010	< 0.139 UJ	< 0.0366 U	< 0.0366 U	< 0.0128 U	< 0.0733 U	< 0.00733 U	< 0.0733 U	< 0.0366 U	< 0.11 U	< 0.0733 U
P9S1-AH11	10	NORM	6/9/2010	< 0.139 UJ	< 0.0365 U	< 0.0365 U	< 0.0128 U	< 0.0729 U	< 0.00729 U	< 0.0729 U	< 0.0365 U	< 0.109 U	< 0.0729 U
P9S1-AH12	0	NORM	6/9/2010	< 0.136 UJ	< 0.0357 U	< 0.0357 U	< 0.0125 U	< 0.0714 U	< 0.00714 U	< 0.0714 U	< 0.0357 U	< 0.107 U	< 0.0714 U
P9S1-AH12	10	NORM	6/9/2010	< 0.137 UJ	< 0.0361 U	< 0.0361 U	< 0.0126 U	< 0.0721 U	< 0.00721 U	< 0.0721 U	< 0.0361 U	< 0.108 U	< 0.0721 U
P9S1-AH13	0	NORM	6/9/2010	< 0.133 UJ	< 0.0349 U	< 0.0349 U	< 0.0122 U	< 0.0698 U	< 0.00698 U	< 0.0698 U	< 0.0349 U	< 0.105 U	< 0.0698 U
P9S1-AH13	10	NORM	6/9/2010	< 0.138 UJ	< 0.0363 U	< 0.0363 U	< 0.0127 U	< 0.0727 U	< 0.00727 U	< 0.0727 U	< 0.0363 U	< 0.109 U	< 0.0727 U
P9S1-AH14	0	NORM	6/8/2010	< 0.134 UJ	< 0.0352 U	< 0.0352 U	< 0.0123 U	< 0.0703 U	< 0.00703 U	< 0.0703 U	< 0.0352 U	< 0.105 U	< 0.0703 U
P9S1-AH14	10	NORM	6/8/2010	< 0.137 UJ	< 0.0361 U	< 0.0361 U	< 0.0126 U	< 0.0722 U	< 0.00722 U	< 0.0722 U	< 0.0361 U	< 0.108 U	< 0.0722 U
P9S1-JD01	0	NORM	6/8/2010	< 0.132 UJ	< 0.0348 U	< 0.0348 U	< 0.0122 U	< 0.0696 U	< 0.00696 U	< 0.0696 U	< 0.0348 U	< 0.104 U	< 0.0696 U
P9S1-JD01	10	NORM	6/8/2010	< 0.134 UJ	< 0.0353 U	< 0.0353 U	< 0.0123 U	< 0.0705 U	< 0.00705 U	< 0.0705 U	< 0.0353 U	< 0.106 U	< 0.0705 U
P9S1-JD02	0	NORM	6/8/2010	< 0.135 UJ	< 0.0355 U	< 0.0355 U	< 0.0124 U	< 0.071 U	< 0.0071 U	< 0.071 U	< 0.0355 U	< 0.106 U	< 0.071 U
P9S1-JD02	10	NORM	6/8/2010	< 0.136 UJ	< 0.0357 U	< 0.0357 U	< 0.0125 U	< 0.0714 U	< 0.00714 U	< 0.0714 U	< 0.0357 U	< 0.107 U	< 0.0714 U
P9S1-JD03	0	NORM	6/8/2010	< 0.136 UJ	< 0.0357 U	< 0.0357 U	< 0.0125 U	< 0.0715 U	< 0.00715 U	< 0.0715 U	< 0.0357 U	< 0.107 U	< 0.0715 U
P9S1-JD03	10	NORM	6/8/2010	< 0.136 UJ	< 0.0358 U	< 0.0358 U	< 0.0125 U	< 0.0715 U	< 0.00715 U	< 0.0715 U	< 0.0358 U	< 0.107 U	< 0.0715 U

All units in mg/kg.

-- = no sample data.

TABLE B-9
SOIL ALDEHYDES AND SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 3 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Semi-Volatile Organic Compounds (SVOCs)									
				4-Bromophenyl phenyl ether	4-Chloro-3-methylphenol	4-Chlorophenyl phenyl ether	4-Chlorothioanisole	4-Nitroaniline	4-Nitrophenol	Acetophenone	Aniline	Benzenethiol	Benzoic acid
P9S1-AG13	0	NORM	6/9/2010	< 0.0351 U	< 0.0351 U	< 0.0351 U	< 0.116 U	< 0.0702 U	< 0.0702 U	< 0.0351 U	< 0.123 U	< 0.116 U	< 0.175 U
P9S1-AG13	10	NORM	6/9/2010	< 0.0357 U	< 0.0357 U	< 0.0357 U	< 0.118 U	< 0.0715 U	< 0.0715 U	< 0.0357 U	< 0.125 U	< 0.118 U	< 0.179 U
P9S1-AG14	0	NORM	6/8/2010	< 0.0345 U	< 0.0345 U	< 0.0345 U	< 0.114 U	< 0.0689 U	< 0.0689 U	< 0.0345 U	< 0.121 U	< 0.114 U	< 0.172 U
P9S1-AG14	10	NORM	6/8/2010	< 0.0352 U	< 0.0352 U	< 0.0352 U	< 0.116 U	< 0.0705 U	< 0.0705 U	< 0.0352 U	< 0.123 U	< 0.116 U	< 0.176 U
P9S1-AG15	0	NORM	6/8/2010	< 0.035 U	< 0.035 U	< 0.035 U	< 0.116 U	< 0.0701 U	< 0.0701 U	< 0.035 U	< 0.123 U	< 0.116 U	< 0.175 U
P9S1-AG15	0	FD	6/8/2010	< 0.0352 U	< 0.0352 U	< 0.0352 U	< 0.116 U	< 0.0705 U	< 0.0705 U	< 0.0352 U	< 0.123 U	< 0.116 U	< 0.176 U
P9S1-AG15	10	NORM	6/8/2010	< 0.0357 U	< 0.0357 U	< 0.0357 U	< 0.118 U	< 0.0714 U	< 0.0714 U	< 0.0357 U	< 0.125 U	< 0.118 U	< 0.179 U
P9S1-AH11	0	NORM	6/9/2010	< 0.036 U	< 0.036 U	< 0.036 U	< 0.119 U	< 0.0719 U	< 0.0719 U	< 0.036 U	< 0.126 U	< 0.119 U	< 0.18 U
P9S1-AH11	0	FD	6/9/2010	< 0.0366 U	< 0.0366 U	< 0.0366 U	< 0.121 U	< 0.0733 U	< 0.0733 U	< 0.0366 U	< 0.128 U	< 0.121 U	< 0.183 U
P9S1-AH11	10	NORM	6/9/2010	< 0.0365 U	< 0.0365 U	< 0.0365 U	< 0.12 U	< 0.0729 U	< 0.0729 U	< 0.0365 U	< 0.128 U	< 0.12 U	< 0.182 U
P9S1-AH12	0	NORM	6/9/2010	< 0.0357 U	< 0.0357 U	< 0.0357 U	< 0.118 U	< 0.0714 U	< 0.0714 U	< 0.0357 U	< 0.125 U	< 0.118 U	< 0.179 U
P9S1-AH12	10	NORM	6/9/2010	< 0.0361 U	< 0.0361 U	< 0.0361 U	< 0.119 U	< 0.0721 U	< 0.0721 U	< 0.0361 U	< 0.126 U	< 0.119 U	< 0.18 U
P9S1-AH13	0	NORM	6/9/2010	< 0.0349 U	< 0.0349 U	< 0.0349 U	< 0.115 U	< 0.0698 U	< 0.0698 U	< 0.0349 U	< 0.122 U	< 0.115 U	< 0.175 U
P9S1-AH13	10	NORM	6/9/2010	< 0.0363 U	< 0.0363 U	< 0.0363 U	< 0.12 U	< 0.0727 U	< 0.0727 U	< 0.0363 U	< 0.127 U	< 0.12 U	< 0.182 U
P9S1-AH14	0	NORM	6/8/2010	< 0.0352 U	< 0.0352 U	< 0.0352 U	< 0.116 U	< 0.0703 U	< 0.0703 U	< 0.0352 U	< 0.123 U	< 0.116 U	< 0.176 U
P9S1-AH14	10	NORM	6/8/2010	< 0.0361 U	< 0.0361 U	< 0.0361 U	< 0.119 U	< 0.0722 U	< 0.0722 U	< 0.0361 U	< 0.126 U	< 0.119 U	< 0.181 U
P9S1-JD01	0	NORM	6/8/2010	< 0.0348 U	< 0.0348 U	< 0.0348 U	< 0.115 U	< 0.0696 U	< 0.0696 U	< 0.0348 U	< 0.122 U	< 0.115 U	< 0.174 U
P9S1-JD01	10	NORM	6/8/2010	< 0.0353 U	< 0.0353 U	< 0.0353 U	< 0.116 U	< 0.0705 U	< 0.0705 U	< 0.0353 U	< 0.123 U	< 0.116 U	< 0.176 U
P9S1-JD02	0	NORM	6/8/2010	< 0.0355 U	< 0.0355 U	< 0.0355 U	< 0.117 U	< 0.071 U	< 0.071 U	< 0.0355 U	< 0.124 U	< 0.117 U	< 0.177 U
P9S1-JD02	10	NORM	6/8/2010	< 0.0357 U	< 0.0357 U	< 0.0357 U	< 0.118 U	< 0.0714 U	< 0.0714 U	< 0.0357 U	< 0.125 U	< 0.118 U	< 0.178 U
P9S1-JD03	0	NORM	6/8/2010	< 0.0357 U	< 0.0357 U	< 0.0357 U	< 0.118 U	< 0.0715 U	< 0.0715 U	< 0.0357 U	< 0.125 U	< 0.118 U	< 0.179 U
P9S1-JD03	10	NORM	6/8/2010	< 0.0358 U	< 0.0358 U	< 0.0358 U	< 0.118 U	< 0.0715 U	< 0.0715 U	< 0.0358 U	< 0.125 U	< 0.118 U	< 0.179 U

All units in mg/kg.

-- = no sample data.

TABLE B-9
SOIL ALDEHYDES AND SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 4 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Semi-Volatile Organic Compounds (SVOCs)									
				Benzyl alcohol	bis(2-Chloroethoxy) methane	bis(2-Chloroethyl) ether	bis(2-Chloroisopropyl) ether	bis(2-Ethylhexyl) phthalate	bis(p-Chlorophenyl) sulfone	bis(p-Chlorophenyl) disulfide	Butylbenzyl phthalate	Carbazole	Dibenzofuran
P9S1-AG13	0	NORM	6/9/2010	< 0.105 U	< 0.0702 U	< 0.0702 U	< 0.0702 U	< 0.0702 U	< 0.116 U	< 0.116 U	< 0.0702 U	< 0.0105 UJ	< 0.0702 U
P9S1-AG13	10	NORM	6/9/2010	< 0.107 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.118 U	< 0.0715 U	< 0.0107 UJ	< 0.0715 U
P9S1-AG14	0	NORM	6/8/2010	< 0.103 UJ	< 0.0689 U	< 0.0689 U	< 0.0689 U	< 0.0689 U	< 0.114 U	< 0.114 U	< 0.0689 U	< 0.0103 U	< 0.0689 U
P9S1-AG14	10	NORM	6/8/2010	< 0.106 UJ	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.116 U	< 0.0705 U	< 0.0106 U	< 0.0705 U
P9S1-AG15	0	NORM	6/8/2010	< 0.105 UJ	< 0.0701 U	< 0.0701 U	< 0.0701 U	< 0.0701 U	< 0.116 U	< 0.116 U	< 0.0701 U	< 0.0105 U	< 0.0701 U
P9S1-AG15	0	FD	6/8/2010	< 0.106 UJ	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.116 U	< 0.0705 U	< 0.0106 U	< 0.0705 U
P9S1-AG15	10	NORM	6/8/2010	< 0.107 UJ	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.118 U	< 0.0714 U	< 0.0107 U	< 0.0714 U
P9S1-AH11	0	NORM	6/9/2010	< 0.108 U	< 0.0719 U	< 0.0719 U	< 0.0719 U	< 0.0719 U	< 0.119 U	< 0.119 U	< 0.0719 U	< 0.0108 UJ	< 0.0719 U
P9S1-AH11	0	FD	6/9/2010	< 0.11 U	< 0.0733 U	< 0.0733 U	< 0.0733 U	< 0.0733 U	< 0.121 U	< 0.121 U	< 0.0733 U	< 0.011 UJ	< 0.0733 U
P9S1-AH11	10	NORM	6/9/2010	< 0.109 U	< 0.0729 U	< 0.0729 U	< 0.0729 U	< 0.0729 U	< 0.12 U	< 0.12 U	< 0.0729 U	< 0.0109 UJ	< 0.0729 U
P9S1-AH12	0	NORM	6/9/2010	< 0.107 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.118 U	< 0.0714 U	< 0.0107 UJ	< 0.0714 U
P9S1-AH12	10	NORM	6/9/2010	< 0.108 U	< 0.0721 U	< 0.0721 U	< 0.0721 U	< 0.0721 U	< 0.119 U	< 0.119 U	< 0.0721 U	< 0.0108 UJ	< 0.0721 U
P9S1-AH13	0	NORM	6/9/2010	< 0.105 U	< 0.0698 U	< 0.0698 U	< 0.0698 U	< 0.0698 U	< 0.115 U	< 0.115 U	< 0.0698 U	< 0.0105 UJ	< 0.0698 U
P9S1-AH13	10	NORM	6/9/2010	< 0.109 U	< 0.0727 U	< 0.0727 U	< 0.0727 U	< 0.0727 U	< 0.12 U	< 0.12 U	< 0.0727 U	< 0.0109 UJ	< 0.0727 U
P9S1-AH14	0	NORM	6/8/2010	< 0.105 UJ	< 0.0703 U	< 0.0703 U	< 0.0703 U	< 0.0703 U	< 0.116 U	< 0.116 U	< 0.0703 U	< 0.0105 U	< 0.0703 U
P9S1-AH14	10	NORM	6/8/2010	< 0.108 UJ	< 0.0722 U	< 0.0722 U	< 0.0722 U	< 0.0722 U	< 0.119 U	< 0.119 U	< 0.0722 U	< 0.0108 U	< 0.0722 U
P9S1-JD01	0	NORM	6/8/2010	< 0.104 UJ	< 0.0696 U	< 0.0696 U	< 0.0696 U	< 0.0696 U	< 0.115 U	< 0.115 U	< 0.0696 U	< 0.0104 U	< 0.0696 U
P9S1-JD01	10	NORM	6/8/2010	< 0.106 UJ	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.116 U	< 0.0705 U	< 0.0106 U	< 0.0705 U
P9S1-JD02	0	NORM	6/8/2010	< 0.106 UJ	< 0.071 U	< 0.071 U	< 0.071 U	< 0.071 U	< 0.117 U	< 0.117 U	< 0.071 U	< 0.0106 U	< 0.071 U
P9S1-JD02	10	NORM	6/8/2010	< 0.107 UJ	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.118 U	< 0.0714 U	< 0.0107 U	< 0.0714 U
P9S1-JD03	0	NORM	6/8/2010	< 0.107 UJ	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.118 U	< 0.0715 U	< 0.0107 U	< 0.0715 U
P9S1-JD03	10	NORM	6/8/2010	< 0.107 UJ	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.118 U	< 0.0715 U	< 0.0107 U	< 0.0715 U

All units in mg/kg.

-- = no sample data.

TABLE B-9
SOIL ALDEHYDES AND SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 5 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Semi-Volatile Organic Compounds (SVOCs)									
				Dichloromethyl ether	Diethyl phthalate	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate	Diphenyl disulfide	Diphenyl sulfide	Diphenyl sulfone	Diphenylamine	Fluoranthene
P9S1-AG13	0	NORM	6/9/2010	< 0.116 U	< 0.0702 U	< 0.0702 U	< 0.0351 U	< 0.0702 U	< 0.116 U	< 0.116 U	< 0.116 U	< 0.0702 U	< 0.0105 U
P9S1-AG13	10	NORM	6/9/2010	< 0.118 U	< 0.0715 U	< 0.0715 U	< 0.0357 U	< 0.0715 U	< 0.118 U	< 0.118 U	< 0.118 U	< 0.0715 U	< 0.0107 U
P9S1-AG14	0	NORM	6/8/2010	< 0.114 U	< 0.0689 U	< 0.0689 U	< 0.0345 U	< 0.0689 U	< 0.114 U	< 0.114 U	< 0.114 U	< 0.0689 U	< 0.0103 U
P9S1-AG14	10	NORM	6/8/2010	< 0.116 U	< 0.0705 U	< 0.0705 U	< 0.0352 U	< 0.0705 U	< 0.116 U	< 0.116 U	< 0.116 U	< 0.0705 U	< 0.0106 U
P9S1-AG15	0	NORM	6/8/2010	< 0.116 U	< 0.0701 U	< 0.0701 U	< 0.035 U	< 0.0701 U	< 0.116 U	< 0.116 U	< 0.116 U	< 0.0701 U	< 0.0105 U
P9S1-AG15	0	FD	6/8/2010	< 0.116 U	< 0.0705 U	< 0.0705 U	< 0.0352 U	< 0.0705 U	< 0.116 U	< 0.116 U	< 0.116 U	< 0.0705 U	< 0.0106 U
P9S1-AG15	10	NORM	6/8/2010	< 0.118 U	< 0.0714 U	< 0.0714 U	< 0.0357 U	< 0.0714 U	< 0.118 U	< 0.118 U	< 0.118 U	< 0.0714 U	< 0.0107 U
P9S1-AH11	0	NORM	6/9/2010	< 0.119 U	< 0.0719 U	< 0.0719 U	< 0.036 U	< 0.0719 U	< 0.119 U	< 0.119 U	< 0.119 U	< 0.0719 U	< 0.0108 U
P9S1-AH11	0	FD	6/9/2010	< 0.121 U	< 0.0733 U	< 0.0733 U	< 0.0366 U	< 0.0733 U	< 0.121 U	< 0.121 U	< 0.121 U	< 0.0733 U	< 0.011 U
P9S1-AH11	10	NORM	6/9/2010	< 0.12 U	< 0.0729 U	< 0.0729 U	< 0.0365 U	< 0.0729 U	< 0.12 U	< 0.12 U	< 0.12 U	< 0.0729 U	< 0.0109 U
P9S1-AH12	0	NORM	6/9/2010	< 0.118 U	< 0.0714 U	< 0.0714 U	< 0.0357 U	< 0.0714 U	< 0.118 U	< 0.118 U	< 0.118 U	< 0.0714 U	< 0.0107 U
P9S1-AH12	10	NORM	6/9/2010	< 0.119 U	< 0.0721 U	< 0.0721 U	< 0.0361 U	< 0.0721 U	< 0.119 U	< 0.119 U	< 0.119 U	< 0.0721 U	< 0.0108 U
P9S1-AH13	0	NORM	6/9/2010	< 0.115 U	< 0.0698 U	< 0.0698 U	< 0.0349 U	< 0.0698 U	< 0.115 U	< 0.115 U	< 0.115 U	< 0.0698 U	< 0.0105 U
P9S1-AH13	10	NORM	6/9/2010	< 0.12 U	< 0.0727 U	< 0.0727 U	< 0.0363 U	< 0.0727 U	< 0.12 U	< 0.12 U	< 0.12 U	< 0.0727 U	< 0.0109 U
P9S1-AH14	0	NORM	6/8/2010	< 0.116 U	< 0.0703 U	< 0.0703 U	< 0.0352 U	< 0.0703 U	< 0.116 U	< 0.116 U	< 0.116 U	< 0.0703 U	< 0.0105 U
P9S1-AH14	10	NORM	6/8/2010	< 0.119 U	< 0.0722 U	< 0.0722 U	< 0.0361 U	< 0.0722 U	< 0.119 U	< 0.119 U	< 0.119 U	< 0.0722 U	< 0.0108 U
P9S1-JD01	0	NORM	6/8/2010	< 0.115 U	< 0.0696 U	< 0.0696 U	< 0.0348 U	< 0.0696 U	< 0.115 U	< 0.115 U	< 0.115 U	< 0.0696 U	< 0.0104 U
P9S1-JD01	10	NORM	6/8/2010	< 0.116 U	< 0.0705 U	< 0.0705 U	< 0.0353 U	< 0.0705 U	< 0.116 U	< 0.116 U	< 0.116 U	< 0.0705 U	< 0.0106 U
P9S1-JD02	0	NORM	6/8/2010	< 0.117 U	< 0.071 U	< 0.071 U	< 0.0355 U	< 0.071 U	< 0.117 U	< 0.117 U	< 0.117 U	< 0.071 U	< 0.0106 U
P9S1-JD02	10	NORM	6/8/2010	< 0.118 U	< 0.0714 U	< 0.0714 U	< 0.0357 U	< 0.0714 U	< 0.118 U	< 0.118 U	< 0.118 U	< 0.0714 U	< 0.0107 U
P9S1-JD03	0	NORM	6/8/2010	< 0.118 U	< 0.0715 U	< 0.0715 U	< 0.0357 U	< 0.0715 U	< 0.118 U	< 0.118 U	< 0.118 U	< 0.0715 U	< 0.0107 U
P9S1-JD03	10	NORM	6/8/2010	< 0.118 U	< 0.0715 U	< 0.0715 U	< 0.0358 U	< 0.0715 U	< 0.118 U	< 0.118 U	< 0.118 U	< 0.0715 U	< 0.0107 U

All units in mg/kg.

-- = no sample data.

TABLE B-9
SOIL ALDEHYDES AND SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 6 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Semi-Volatile Organic Compounds (SVOCs)									
				Fluorene	Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Hydroxymethyl phthalimide	Isophorone	m,p-Cresols	Naphthalene	Nitrobenzene
P9S1-AG13	0	NORM	6/9/2010	< 0.0105 U	< 0.0702 U	< 0.0702 U	< 0.0702 U	< 0.0702 U	< 0.116 U	< 0.0702 U	< 0.14 U	< 0.0105 U	< 0.0702 U
P9S1-AG13	10	NORM	6/9/2010	< 0.0107 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.0715 U	< 0.143 U	< 0.0107 U	< 0.0715 U
P9S1-AG14	0	NORM	6/8/2010	< 0.0103 U	< 0.0689 U	< 0.0689 U	< 0.0689 U	< 0.0689 U	< 0.114 U	< 0.0689 U	< 0.138 U	< 0.0103 U	< 0.0689 U
P9S1-AG14	10	NORM	6/8/2010	< 0.0106 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.0705 U	< 0.141 U	< 0.0106 U	< 0.0705 U
P9S1-AG15	0	NORM	6/8/2010	< 0.0105 U	< 0.0701 U	< 0.0701 U	< 0.0701 U	< 0.0701 U	< 0.116 U	< 0.0701 U	< 0.14 U	< 0.0105 U	< 0.0701 U
P9S1-AG15	0	FD	6/8/2010	< 0.0106 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.0705 U	< 0.141 U	< 0.0106 U	< 0.0705 U
P9S1-AG15	10	NORM	6/8/2010	< 0.0107 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.0714 U	< 0.143 U	< 0.0107 U	< 0.0714 U
P9S1-AH11	0	NORM	6/9/2010	< 0.0108 U	< 0.0719 U	< 0.0719 U	< 0.0719 U	< 0.0719 U	< 0.119 U	< 0.0719 U	< 0.144 U	< 0.0108 U	< 0.0719 U
P9S1-AH11	0	FD	6/9/2010	< 0.011 U	< 0.0733 U	< 0.0733 U	< 0.0733 U	< 0.0733 U	< 0.121 U	< 0.0733 U	< 0.147 U	< 0.011 U	< 0.0733 U
P9S1-AH11	10	NORM	6/9/2010	< 0.0109 U	< 0.0729 U	< 0.0729 U	< 0.0729 U	< 0.0729 U	< 0.12 U	< 0.0729 U	< 0.146 U	< 0.0109 U	< 0.0729 U
P9S1-AH12	0	NORM	6/9/2010	< 0.0107 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.0714 U	< 0.143 U	< 0.0107 U	< 0.0714 U
P9S1-AH12	10	NORM	6/9/2010	< 0.0108 U	< 0.0721 U	< 0.0721 U	< 0.0721 U	< 0.0721 U	< 0.119 U	< 0.0721 U	< 0.144 U	< 0.0108 U	< 0.0721 U
P9S1-AH13	0	NORM	6/9/2010	< 0.0105 U	< 0.0698 U	< 0.0698 U	< 0.0698 U	< 0.0698 U	< 0.115 U	< 0.0698 U	< 0.14 U	< 0.0105 U	< 0.0698 U
P9S1-AH13	10	NORM	6/9/2010	< 0.0109 U	< 0.0727 U	< 0.0727 U	< 0.0727 U	< 0.0727 U	< 0.12 U	< 0.0727 U	< 0.145 U	< 0.0109 U	< 0.0727 U
P9S1-AH14	0	NORM	6/8/2010	< 0.0105 U	< 0.0703 U	< 0.0703 U	< 0.0703 U	< 0.0703 U	< 0.116 U	< 0.0703 U	< 0.141 U	< 0.0105 U	< 0.0703 U
P9S1-AH14	10	NORM	6/8/2010	< 0.0108 U	< 0.0722 U	< 0.0722 U	< 0.0722 U	< 0.0722 U	< 0.119 U	< 0.0722 U	< 0.144 U	< 0.0108 U	< 0.0722 U
P9S1-JD01	0	NORM	6/8/2010	< 0.0104 U	< 0.0696 U	< 0.0696 U	< 0.0696 U	< 0.0696 U	< 0.115 U	< 0.0696 U	< 0.139 U	< 0.0104 U	< 0.0696 U
P9S1-JD01	10	NORM	6/8/2010	< 0.0106 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.0705 U	< 0.141 U	< 0.0106 U	< 0.0705 U
P9S1-JD02	0	NORM	6/8/2010	< 0.0106 U	< 0.071 U	< 0.071 U	< 0.071 U	< 0.071 U	< 0.117 U	< 0.071 U	< 0.142 U	< 0.0106 U	< 0.071 U
P9S1-JD02	10	NORM	6/8/2010	< 0.0107 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.0714 U	< 0.143 U	< 0.0107 U	< 0.0714 U
P9S1-JD03	0	NORM	6/8/2010	< 0.0107 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.0715 U	< 0.143 U	< 0.0107 U	< 0.0715 U
P9S1-JD03	10	NORM	6/8/2010	< 0.0107 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.0715 U	< 0.143 U	< 0.0107 U	< 0.0715 U

All units in mg/kg.

-- = no sample data.

TABLE B-9
SOIL ALDEHYDES AND SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 7 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Semi-Volatile Organic Compounds (SVOCs)									
				N-nitrosodi-n-propyl- amine	o-Cresol	Octachlorostyrene	p-Chloroaniline	p-Chlorobenzenethiol	Pentachlorobenzene	Pentachlorophenol	Phenol	Phthalic acid	Pyridine
P9S1-AG13	0	NORM	6/9/2010	< 0.0702 U	< 0.0702 U	< 0.116 U	< 0.0702 U	< 0.116 U	< 0.0702 U	< 0.0702 U	< 0.0702 U	< 0.116 UJ	< 0.0702 U
P9S1-AG13	10	NORM	6/9/2010	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.0715 U	< 0.118 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.118 UJ	< 0.0715 U
P9S1-AG14	0	NORM	6/8/2010	< 0.0689 U	< 0.0689 U	< 0.114 U	< 0.0689 U	< 0.114 U	< 0.0689 U	< 0.0689 U	< 0.0689 U	< 0.114 U	< 0.0689 U
P9S1-AG14	10	NORM	6/8/2010	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.0705 U	< 0.116 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.0705 U
P9S1-AG15	0	NORM	6/8/2010	< 0.0701 U	< 0.0701 U	< 0.116 U	< 0.0701 U	< 0.116 U	< 0.0701 U	< 0.0701 U	< 0.0701 U	< 0.116 U	< 0.0701 U
P9S1-AG15	0	FD	6/8/2010	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.0705 U	< 0.116 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.0705 U
P9S1-AG15	10	NORM	6/8/2010	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.0714 U	< 0.118 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.0714 U
P9S1-AH11	0	NORM	6/9/2010	< 0.0719 U	< 0.0719 U	< 0.119 U	< 0.0719 U	< 0.119 U	< 0.0719 U	< 0.0719 U	< 0.0719 U	< 0.119 UJ	< 0.0719 U
P9S1-AH11	0	FD	6/9/2010	< 0.0733 U	< 0.0733 U	< 0.121 U	< 0.0733 U	< 0.121 U	< 0.0733 U	< 0.0733 U	< 0.0733 U	< 0.121 UJ	< 0.0733 U
P9S1-AH11	10	NORM	6/9/2010	< 0.0729 U	< 0.0729 U	< 0.12 U	< 0.0729 U	< 0.12 U	< 0.0729 U	< 0.0729 U	< 0.0729 U	< 0.12 UJ	< 0.0729 U
P9S1-AH12	0	NORM	6/9/2010	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.0714 U	< 0.118 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.118 UJ	< 0.0714 U
P9S1-AH12	10	NORM	6/9/2010	< 0.0721 U	< 0.0721 U	< 0.119 U	< 0.0721 U	< 0.119 U	< 0.0721 U	< 0.0721 U	< 0.0721 U	< 0.119 UJ	< 0.0721 U
P9S1-AH13	0	NORM	6/9/2010	< 0.0698 U	< 0.0698 U	< 0.115 U	< 0.0698 U	< 0.115 U	< 0.0698 U	< 0.0698 U	< 0.0698 U	< 0.115 UJ	< 0.0698 U
P9S1-AH13	10	NORM	6/9/2010	< 0.0727 U	< 0.0727 U	< 0.12 U	< 0.0727 U	< 0.12 U	< 0.0727 U	< 0.0727 U	< 0.0727 U	< 0.12 UJ	< 0.0727 U
P9S1-AH14	0	NORM	6/8/2010	< 0.0703 U	< 0.0703 U	< 0.116 U	< 0.0703 U	< 0.116 U	< 0.0703 U	< 0.0703 U	< 0.0703 U	< 0.116 U	< 0.0703 U
P9S1-AH14	10	NORM	6/8/2010	< 0.0722 U	< 0.0722 U	< 0.119 U	< 0.0722 U	< 0.119 U	< 0.0722 U	< 0.0722 U	< 0.0722 U	< 0.119 U	< 0.0722 U
P9S1-JD01	0	NORM	6/8/2010	< 0.0696 U	< 0.0696 U	< 0.115 U	< 0.0696 U	< 0.115 U	< 0.0696 U	< 0.0696 U	< 0.0696 U	< 0.115 U	< 0.0696 U
P9S1-JD01	10	NORM	6/8/2010	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.0705 U	< 0.116 U	< 0.0705 U	< 0.0705 U	< 0.0705 U	< 0.116 U	< 0.0705 U
P9S1-JD02	0	NORM	6/8/2010	< 0.071 U	< 0.071 U	< 0.117 U	< 0.071 U	< 0.117 U	< 0.071 U	< 0.071 U	< 0.071 U	< 0.117 U	< 0.071 U
P9S1-JD02	10	NORM	6/8/2010	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.0714 U	< 0.118 U	< 0.0714 U	< 0.0714 U	< 0.0714 U	< 0.118 U	< 0.0714 U
P9S1-JD03	0	NORM	6/8/2010	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.0715 U	< 0.118 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.0715 U
P9S1-JD03	10	NORM	6/8/2010	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.0715 U	< 0.118 U	< 0.0715 U	< 0.0715 U	< 0.0715 U	< 0.118 U	< 0.0715 U

All units in mg/kg.

-- = no sample data.

TABLE B-10
SOIL VOLATILE ORGANIC COMPOUNDS (VOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Volatile Organic Compounds (VOCs)											
				I,1,1,2-Tetrachloroethane	I,1,1-Trichloroethane	I,1,2,2-Tetrachloroethane	I,1,2-Trichloroethane	I,1-Dichloroethane	I,1-Dichloroethene	I,1-Dichloropropene	I,2,3-Trichlorobenzene	I,2,3-Trichloropropane	I,2,4-Trichlorobenzene	I,2,4-Trimethylbenzene	I,2-Dichlorobenzene
P9S1-AG13	0	NORM	6/9/2010	< 0.00039 U	< 0.00024 U	< 0.00046 U	< 0.00037 U	< 0.00038 U	< 0.00024 U	< 0.00023 U	< 0.00047 U	< 0.0005 U	< 0.00032 U	< 0.00084 U	< 0.00037 U
P9S1-AG13	10	NORM	6/9/2010	< 0.0004 U	< 0.00025 U	< 0.00047 U	< 0.00038 U	< 0.00039 U	< 0.00025 U	< 0.00023 U	< 0.00048 U	< 0.00051 U	< 0.00032 U	< 0.00081 U	< 0.00038 U
P9S1-AG14	0	NORM	6/8/2010	< 0.00042 U	< 0.00026 U	< 0.00049 U	< 0.0004 U	< 0.00041 U	< 0.00026 U	< 0.00025 U	< 0.0005 U	< 0.00054 U	< 0.00034 U	< 0.00044 U	< 0.0004 U
P9S1-AG14	10	NORM	6/8/2010	< 0.00044 U	< 0.00027 U	< 0.00051 U	< 0.00042 U	< 0.00043 U	< 0.00027 U	< 0.00026 U	< 0.00053 U	< 0.00056 U	< 0.00036 U	< 0.00046 U	< 0.00042 U
P9S1-AG15	0	NORM	6/8/2010	< 0.00043 U	< 0.00026 U	< 0.0005 U	< 0.0004 U	< 0.00041 U	< 0.00026 U	< 0.00025 U	< 0.00051 U	< 0.00054 U	< 0.00034 U	< 0.00044 U	< 0.0004 U
P9S1-AG15	0	FD	6/8/2010	< 0.00039 U	< 0.00024 U	< 0.00046 U	< 0.00037 U	< 0.00038 U	< 0.00024 U	< 0.00023 U	< 0.00047 U	< 0.0005 U	< 0.00032 U	< 0.00041 U	< 0.00037 U
P9S1-AG15	10	NORM	6/8/2010	< 0.0004 U	< 0.00025 U	< 0.00047 U	< 0.00038 U	< 0.00039 U	< 0.00025 U	< 0.00023 U	< 0.00048 U	< 0.00051 U	< 0.00033 U	< 0.00042 U	< 0.00038 U
P9S1-AH11	0	NORM	6/9/2010	< 0.0004 U	< 0.00025 U	< 0.00047 U	< 0.00038 U	< 0.00039 U	< 0.00025 U	< 0.00023 U	< 0.00048 U	< 0.00052 U	< 0.00033 U	< 0.00084 U	< 0.00038 U
P9S1-AH11	0	FD	6/9/2010	< 0.00041 U	< 0.00025 U	< 0.00047 U	< 0.00039 U	< 0.0004 U	< 0.00025 U	< 0.00024 U	< 0.00049 U	< 0.00052 U	< 0.00033 U	< 0.0009 U	< 0.00038 U
P9S1-AH11	10	NORM	6/9/2010	< 0.00041 U	< 0.00026 U	< 0.00048 U	< 0.00039 U	< 0.0004 U	< 0.00026 U	< 0.00024 U	< 0.00049 U	< 0.00053 U	< 0.00033 U	< 0.00087 U	< 0.00039 U
P9S1-AH12	0	NORM	6/9/2010	< 0.0004 U	< 0.00025 U	< 0.00047 U	< 0.00038 U	< 0.00039 U	< 0.00025 U	< 0.00023 U	< 0.00048 U	< 0.00052 U	< 0.00044 U	< 0.0012 U	0.00053 J
P9S1-AH12	10	NORM	6/9/2010	< 0.00041 U	< 0.00026 U	< 0.00048 U	< 0.00039 U	< 0.0004 U	< 0.00026 U	< 0.00024 U	< 0.00049 U	< 0.00053 U	< 0.00033 U	< 0.00079 U	< 0.00039 U
P9S1-AH13	0	NORM	6/9/2010	< 0.0004 U	< 0.00025 U	< 0.00046 U	< 0.00038 U	< 0.00039 U	< 0.00025 U	< 0.00023 U	< 0.00047 U	< 0.00051 U	< 0.00032 U	< 0.00085 U	< 0.00038 U
P9S1-AH13	10	NORM	6/9/2010	< 0.0004 U	< 0.00025 U	< 0.00047 U	< 0.00038 U	< 0.00039 U	< 0.00025 U	< 0.00023 U	< 0.00048 U	< 0.00051 U	< 0.00033 U	< 0.00088 U	< 0.00038 U
P9S1-AH14	0	NORM	6/8/2010	< 0.0004 U	< 0.00025 U	< 0.00047 U	< 0.00038 U	< 0.00039 U	< 0.00025 U	< 0.00023 U	< 0.00048 U	< 0.00052 U	< 0.00033 U	< 0.00042 U	< 0.00038 U
P9S1-AH14	10	NORM	6/8/2010	< 0.0004 U	< 0.00025 U	< 0.00047 U	< 0.00038 U	< 0.00039 U	< 0.00025 U	< 0.00023 U	< 0.00048 U	< 0.00052 U	< 0.00033 U	< 0.00042 U	< 0.00038 U
P9S1-JD01	0	NORM	6/8/2010	< 0.0004 U	< 0.00025 U	< 0.00046 U	< 0.00038 U	< 0.00039 U	< 0.00025 U	< 0.00023 U	< 0.00047 U	< 0.00051 U	< 0.00032 U	< 0.00042 U	< 0.00038 U
P9S1-JD01	10	NORM	6/8/2010	< 0.00041 U	< 0.00025 U	< 0.00047 U	< 0.00039 U	< 0.0004 U	< 0.00025 U	< 0.00024 U	< 0.00049 U	< 0.00052 U	< 0.00033 U	< 0.00043 U	< 0.00038 U
P9S1-JD02	0	NORM	6/8/2010	< 0.00041 U	< 0.00025 U	< 0.00047 U	< 0.00039 U	< 0.0004 U	< 0.00025 U	< 0.00024 U	< 0.00048 U	< 0.00052 U	< 0.00033 U	< 0.00042 U	< 0.00038 U
P9S1-JD02	10	NORM	6/8/2010	< 0.0004 U	< 0.00025 U	< 0.00047 U	< 0.00038 U	< 0.00039 U	< 0.00025 U	< 0.00023 U	< 0.00048 U	< 0.00051 U	< 0.00033 U	< 0.00042 U	< 0.00038 U
P9S1-JD03	0	NORM	6/8/2010	< 0.00041 U	< 0.00025 U	< 0.00047 U	< 0.00039 U	< 0.0004 U	< 0.00025 U	< 0.00024 U	< 0.00048 U	< 0.00052 U	< 0.00033 U	< 0.00043 U	< 0.00038 U
P9S1-JD03	10	NORM	6/8/2010	< 0.00044 U	< 0.00027 U	< 0.00051 U	< 0.00042 U	< 0.00043 U	< 0.00027 U	< 0.00026 U	< 0.00052 U	< 0.00056 U	< 0.00036 U	< 0.00046 U	< 0.00041 U

All units in mg/kg.

-- = no sample data.

TABLE B-10
SOIL VOLATILE ORGANIC COMPOUNDS (VOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Volatile Organic Compounds (VOCs)											
				1,2-Dichloroethane	1,2-Dichloroethene	1,2-Dichloropropane	1,3,5-Trichlorobenzene	1,3,5-Trimethylbenzene	1,3-Dichlorobenzene	1,3-Dichloropropane	1,4-Dichlorobenzene	2,2,3-Trimethylbutane	2,2-Dichloropropane	2,2-Dimethylpentane	2,3-Dimethylpentane
P9S1-AG13	0	NORM	6/9/2010	< 0.00033 U	< 0.00064 U	< 0.00038 U	< 0.00052 U	< 0.00026 U	< 0.00045 U	< 0.00043 U	< 0.00032 U	< 0.00054 U	< 0.00032 U	< 0.00054 U	< 0.00045 U
P9S1-AG13	10	NORM	6/9/2010	< 0.00034 U	< 0.00066 U	< 0.00039 U	< 0.00054 U	< 0.00027 U	< 0.00046 U	< 0.00044 U	< 0.00033 U	< 0.00056 U	< 0.00032 U	< 0.00056 U	< 0.00046 U
P9S1-AG14	0	NORM	6/8/2010	< 0.00036 U	< 0.0007 U	< 0.00041 U	< 0.00057 U	< 0.00028 U	< 0.00049 U	< 0.00046 U	< 0.00034 U	< 0.00059 U	< 0.00034 U	< 0.00059 U	< 0.00049 U
P9S1-AG14	10	NORM	6/8/2010	< 0.00038 U	< 0.00073 U	< 0.00043 U	< 0.00059 U	< 0.00029 U	< 0.00051 U	< 0.00048 U	< 0.00036 U	< 0.00061 U	< 0.00036 U	< 0.00061 U	< 0.00051 U
P9S1-AG15	0	NORM	6/8/2010	< 0.00036 U	< 0.0007 U	< 0.00042 U	< 0.00057 U	< 0.00028 U	< 0.00049 U	< 0.00046 U	< 0.00035 U	< 0.00059 U	< 0.00034 U	< 0.00059 U	< 0.00049 U
P9S1-AG15	0	FD	6/8/2010	< 0.00033 U	< 0.00065 U	< 0.00038 U	< 0.00053 U	< 0.00026 U	< 0.00045 U	< 0.00043 U	< 0.00032 U	< 0.00055 U	< 0.00032 U	< 0.00055 U	< 0.00045 U
P9S1-AG15	10	NORM	6/8/2010	< 0.00034 U	< 0.00066 U	< 0.00039 U	< 0.00054 U	< 0.00027 U	< 0.00046 U	< 0.00044 U	< 0.00033 U	< 0.00056 U	< 0.00033 U	< 0.00056 U	< 0.00046 U
P9S1-AH11	0	NORM	6/9/2010	< 0.00034 U	< 0.00067 U	< 0.00039 U	< 0.00054 U	< 0.00027 U	< 0.00047 U	< 0.00044 U	< 0.00033 U	< 0.00056 U	< 0.00033 U	< 0.00056 U	< 0.00046 U
P9S1-AH11	0	FD	6/9/2010	< 0.00035 U	< 0.00067 U	< 0.0004 U	< 0.00055 U	< 0.00027 U	< 0.00047 U	< 0.00044 U	< 0.00033 U	< 0.00057 U	< 0.00033 U	< 0.00057 U	< 0.00047 U
P9S1-AH11	10	NORM	6/9/2010	< 0.00035 U	< 0.00068 U	< 0.0004 U	< 0.00056 U	< 0.00027 U	< 0.00048 U	< 0.00045 U	< 0.00034 U	< 0.00058 U	< 0.00033 U	< 0.00058 U	< 0.00048 U
P9S1-AH12	0	NORM	6/9/2010	< 0.00034 U	< 0.00067 U	< 0.00039 U	< 0.00054 U	< 0.00027 U	< 0.00047 U	< 0.00044 U	0.00073 J	< 0.00056 U	< 0.00033 U	< 0.00056 U	< 0.00046 U
P9S1-AH12	10	NORM	6/9/2010	< 0.00035 U	< 0.00068 U	< 0.0004 U	< 0.00056 U	< 0.00027 U	< 0.00048 U	< 0.00045 U	< 0.00034 U	< 0.00058 U	< 0.00033 U	< 0.00058 U	< 0.00047 U
P9S1-AH13	0	NORM	6/9/2010	< 0.00034 U	< 0.00066 U	< 0.00039 U	< 0.00053 U	< 0.00026 U	< 0.00046 U	< 0.00043 U	< 0.00032 U	< 0.00055 U	< 0.00032 U	< 0.00055 U	< 0.00046 U
P9S1-AH13	10	NORM	6/9/2010	< 0.00034 U	< 0.00066 U	< 0.00039 U	< 0.00054 U	< 0.00027 U	< 0.00047 U	< 0.00044 U	< 0.00033 U	< 0.00056 U	< 0.00033 U	< 0.00056 U	< 0.00046 U
P9S1-AH14	0	NORM	6/8/2010	< 0.00034 U	< 0.00067 U	< 0.00039 U	< 0.00054 U	< 0.00027 U	< 0.00047 U	< 0.00044 U	< 0.00033 U	< 0.00056 U	< 0.00033 U	< 0.00056 U	< 0.00046 U
P9S1-AH14	10	NORM	6/8/2010	< 0.00034 U	< 0.00067 U	< 0.00039 U	< 0.00054 U	< 0.00027 U	< 0.00047 U	< 0.00044 U	< 0.00033 U	< 0.00056 U	< 0.00033 U	< 0.00056 U	< 0.00046 U
P9S1-JD01	0	NORM	6/8/2010	< 0.00034 U	< 0.00066 U	< 0.00039 U	< 0.00053 U	< 0.00026 U	< 0.00046 U	< 0.00043 U	< 0.00032 U	< 0.00055 U	< 0.00032 U	< 0.00055 U	< 0.00046 U
P9S1-JD01	10	NORM	6/8/2010	< 0.00035 U	< 0.00067 U	< 0.0004 U	< 0.00055 U	< 0.00027 U	< 0.00047 U	< 0.00044 U	< 0.00033 U	< 0.00057 U	< 0.00033 U	< 0.00057 U	< 0.00047 U
P9S1-JD02	0	NORM	6/8/2010	< 0.00034 U	< 0.00067 U	< 0.0004 U	< 0.00054 U	< 0.00027 U	< 0.00047 U	< 0.00044 U	< 0.00033 U	< 0.00056 U	< 0.00033 U	< 0.00056 U	< 0.00046 U
P9S1-JD02	10	NORM	6/8/2010	< 0.00034 U	< 0.00066 U	< 0.00039 U	< 0.00054 U	< 0.00027 U	< 0.00046 U	< 0.00044 U	< 0.00033 U	< 0.00056 U	< 0.00033 U	< 0.00056 U	< 0.00046 U
P9S1-JD03	0	NORM	6/8/2010	< 0.00035 U	< 0.00067 U	< 0.0004 U	< 0.00055 U	< 0.00027 U	< 0.00047 U	< 0.00044 U	< 0.00033 U	< 0.00056 U	< 0.00033 U	< 0.00056 U	< 0.00047 U
P9S1-JD03	10	NORM	6/8/2010	< 0.00037 U	< 0.00072 U	< 0.00043 U	< 0.00059 U	< 0.00029 U	< 0.00051 U	< 0.00048 U	< 0.00036 U	< 0.00061 U	< 0.00036 U	< 0.00061 U	< 0.0005 U

All units in mg/kg.

-- = no sample data.

TABLE B-10
SOIL VOLATILE ORGANIC COMPOUNDS (VOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 3 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Volatile Organic Compounds (VOCs)											
				2,4-Dimethylpentane	2-Chlorotoluene	2-Hexanone	2-Methylhexane	2-Nitropropane	3,3-Dimethylpentane	3-Ethylpentane	3-Methylhexane	4-Chlorotoluene	4-Methyl-2-pentanone (MIBK)	Acetone	Acetonitrile
P9S1-AG13	0	NORM	6/9/2010	< 0.0005 U	< 0.00035 U	< 0.00029 U	< 0.00052 U	< 0.00033 UJ	< 0.00049 U	< 0.00046 U	< 0.00048 U	< 0.00026 U	< 0.00032 U	< 0.0067 U	< 0.0036 UJ
P9S1-AG13	10	NORM	6/9/2010	< 0.00051 U	< 0.00036 U	< 0.0003 U	< 0.00053 U	< 0.00034 UJ	< 0.0005 U	< 0.00047 U	< 0.00049 U	< 0.00026 U	< 0.00032 U	< 0.0069 U	< 0.0037 UJ
P9S1-AG14	0	NORM	6/8/2010	< 0.00054 U	< 0.00038 U	< 0.00031 U	< 0.00056 U	< 0.00036 U	< 0.00053 U	< 0.0005 U	< 0.00052 U	< 0.00028 U	< 0.00034 U	0.014 J	< 0.0039 UJ
P9S1-AG14	10	NORM	6/8/2010	< 0.00056 U	< 0.00039 U	< 0.00033 U	< 0.00059 U	< 0.00037 U	< 0.00056 U	< 0.00052 U	< 0.00054 U	< 0.00029 U	< 0.00036 U	< 0.0099 U	< 0.0041 UJ
P9S1-AG15	0	NORM	6/8/2010	< 0.00054 U	< 0.00038 U	< 0.00032 U	< 0.00056 U	< 0.00036 U	< 0.00054 U	< 0.0005 U	< 0.00052 U	< 0.00028 U	< 0.00034 U	0.012 J	< 0.0039 UJ
P9S1-AG15	0	FD	6/8/2010	< 0.0005 U	< 0.00035 U	< 0.00029 U	< 0.00052 U	< 0.00033 U	< 0.0005 U	< 0.00046 U	< 0.00048 U	< 0.00026 U	< 0.00032 U	< 0.0084 U	< 0.0036 UJ
P9S1-AG15	10	NORM	6/8/2010	< 0.00052 U	< 0.00036 U	< 0.0003 U	< 0.00053 U	< 0.00034 U	< 0.00051 U	< 0.00047 U	< 0.0005 U	< 0.00027 U	< 0.00033 U	< 0.01 U	< 0.0037 UJ
P9S1-AH11	0	NORM	6/9/2010	< 0.00052 U	< 0.00036 U	< 0.0003 U	< 0.00054 U	< 0.00034 UJ	< 0.00051 U	< 0.00047 U	< 0.0005 U	< 0.00027 U	< 0.00033 U	< 0.0069 U	< 0.0037 UJ
P9S1-AH11	0	FD	6/9/2010	< 0.00052 U	< 0.00036 U	< 0.0003 U	< 0.00054 U	< 0.00034 UJ	< 0.00051 U	< 0.00048 U	< 0.0005 U	< 0.00027 U	< 0.00033 U	< 0.007 U	< 0.0037 UJ
P9S1-AH11	10	NORM	6/9/2010	< 0.00053 U	< 0.00037 U	< 0.00031 U	< 0.00055 U	< 0.00035 UJ	< 0.00052 U	< 0.00049 U	< 0.00051 U	< 0.00027 U	< 0.00034 U	< 0.0071 U	< 0.0038 UJ
P9S1-AH12	0	NORM	6/9/2010	< 0.00052 U	< 0.00036 U	< 0.0003 U	< 0.00054 U	< 0.00034 UJ	< 0.00051 U	< 0.00047 U	< 0.0005 U	< 0.00027 U	< 0.00033 U	< 0.0069 U	< 0.0037 UJ
P9S1-AH12	10	NORM	6/9/2010	< 0.00053 U	< 0.00037 U	< 0.00031 U	< 0.00055 U	< 0.00035 UJ	< 0.00052 U	< 0.00049 U	< 0.00051 U	< 0.00027 U	< 0.00034 U	< 0.0071 U	< 0.0038 UJ
P9S1-AH13	0	NORM	6/9/2010	< 0.00051 U	< 0.00035 U	< 0.0003 U	< 0.00053 U	< 0.00034 UJ	< 0.0005 U	< 0.00047 U	< 0.00049 U	< 0.00026 U	< 0.00032 U	< 0.0068 U	< 0.0037 UJ
P9S1-AH13	10	NORM	6/9/2010	< 0.00052 U	< 0.00036 U	< 0.0003 U	< 0.00054 U	< 0.00034 UJ	< 0.00051 U	< 0.00047 U	< 0.0005 U	< 0.00027 U	< 0.00033 U	< 0.0069 U	< 0.0037 UJ
P9S1-AH14	0	NORM	6/8/2010	< 0.00052 U	< 0.00036 U	< 0.0003 U	< 0.00054 U	< 0.00034 U	< 0.00051 U	< 0.00047 U	< 0.0005 U	< 0.00027 U	< 0.00033 U	0.011 J	< 0.0037 UJ
P9S1-AH14	10	NORM	6/8/2010	< 0.00052 U	< 0.00036 U	< 0.0003 U	< 0.00054 U	< 0.00034 U	< 0.00051 U	< 0.00048 U	< 0.0005 U	< 0.00027 U	< 0.00033 U	< 0.0093 U	< 0.0037 UJ
P9S1-JD01	0	NORM	6/8/2010	< 0.00051 U	< 0.00035 U	< 0.0003 U	< 0.00053 U	< 0.00034 U	< 0.0005 U	< 0.00047 U	< 0.00049 U	< 0.00026 U	< 0.00032 U	0.015 J	< 0.0037 UJ
P9S1-JD01	10	NORM	6/8/2010	< 0.00052 U	< 0.00036 U	< 0.0003 U	< 0.00054 U	< 0.00034 U	< 0.00051 U	< 0.00048 U	< 0.0005 U	< 0.00027 U	< 0.00033 U	< 0.0097 U	< 0.0037 UJ
P9S1-JD02	0	NORM	6/8/2010	< 0.00052 U	< 0.00036 U	< 0.0003 U	< 0.00054 U	< 0.00034 U	< 0.00051 U	< 0.00048 U	< 0.0005 U	< 0.00027 U	< 0.00033 U	0.011 J	< 0.0037 UJ
P9S1-JD02	10	NORM	6/8/2010	< 0.00052 U	< 0.00036 U	< 0.0003 U	< 0.00053 U	< 0.00034 U	< 0.00051 U	< 0.00047 U	< 0.0005 U	< 0.00027 U	< 0.00033 U	0.012 J	< 0.0037 UJ
P9S1-JD03	0	NORM	6/8/2010	< 0.00052 U	< 0.00036 U	< 0.0003 U	< 0.00054 U	< 0.00034 U	< 0.00051 U	< 0.00048 U	< 0.0005 U	< 0.00027 U	< 0.00033 U	0.037	< 0.0037 UJ
P9S1-JD03	10	NORM	6/8/2010	< 0.00056 U	< 0.00039 U	< 0.00033 U	< 0.00058 U	< 0.00037 U	< 0.00055 U	< 0.00052 U	< 0.00054 U	< 0.00029 U	< 0.00036 U	< 0.0075 U	< 0.004 UJ

All units in mg/kg.

-- = no sample data.

TABLE B-10
SOIL VOLATILE ORGANIC COMPOUNDS (VOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 4 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Volatile Organic Compounds (VOCs)											
				Benzene	Bromobenzene	Bromodichloromethane	Bromoform	Bromomethane	Carbon disulfide	Carbon tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroethane	Chloroform	Chloromethane
P9S1-AG13	0	NORM	6/9/2010	< 0.00034 U	< 0.00039 U	< 0.00033 U	< 0.00043 U	< 0.00041 U	< 0.00028 U	< 0.00031 U	< 0.00031 U	< 0.00045 U	< 0.00032 U	< 0.00037 U	< 0.00028 U
P9S1-AG13	10	NORM	6/9/2010	< 0.00035 U	< 0.0004 U	< 0.00034 U	< 0.00044 U	< 0.00042 U	< 0.00029 U	< 0.00032 U	< 0.00032 U	< 0.00046 U	< 0.00033 U	< 0.00038 U	< 0.00029 U
P9S1-AG14	0	NORM	6/8/2010	< 0.00037 U	< 0.00042 U	< 0.00036 U	< 0.00046 U	< 0.00044 U	< 0.00031 U	< 0.00034 U	< 0.00034 U	< 0.00049 U	< 0.00034 U	< 0.0004 U	< 0.0003 U
P9S1-AG14	10	NORM	6/8/2010	< 0.00038 U	< 0.00044 U	< 0.00037 U	< 0.00048 U	< 0.00046 U	< 0.00032 U	< 0.00035 U	< 0.00035 U	< 0.00051 U	< 0.00036 U	< 0.00041 U	< 0.00032 U
P9S1-AG15	0	NORM	6/8/2010	< 0.00037 U	< 0.00042 U	< 0.00036 U	< 0.00046 U	< 0.00045 U	< 0.00031 U	< 0.00034 U	< 0.00034 U	< 0.00049 U	< 0.00035 U	< 0.0004 U	< 0.0003 U
P9S1-AG15	0	FD	6/8/2010	< 0.00034 U	< 0.00039 U	< 0.00033 U	< 0.00043 U	< 0.00041 U	< 0.00029 U	< 0.00031 U	< 0.00031 U	< 0.00045 U	< 0.00032 U	< 0.00037 U	< 0.00028 U
P9S1-AG15	10	NORM	6/8/2010	< 0.00035 U	< 0.0004 U	< 0.00034 U	< 0.00044 U	< 0.00042 U	< 0.00029 U	< 0.00032 U	< 0.00032 U	< 0.00046 U	< 0.00033 U	< 0.00038 U	< 0.00029 U
P9S1-AH11	0	NORM	6/9/2010	< 0.00035 U	< 0.0004 U	< 0.00034 U	< 0.00044 U	< 0.00042 U	< 0.00029 U	< 0.00032 U	< 0.00032 U	< 0.00046 U	< 0.00033 U	< 0.00038 U	< 0.00029 U
P9S1-AH11	0	FD	6/9/2010	< 0.00035 U	< 0.0004 U	< 0.00034 U	< 0.00044 U	< 0.00043 U	< 0.0003 U	< 0.00033 U	< 0.00032 U	< 0.00047 U	< 0.00033 U	< 0.00038 U	< 0.00029 U
P9S1-AH11	10	NORM	6/9/2010	< 0.00036 U	< 0.00041 U	< 0.00035 U	< 0.00045 U	< 0.00043 U	0.00038 J	< 0.00033 U	< 0.00033 U	< 0.00048 U	< 0.00034 U	< 0.00039 U	< 0.0003 U
P9S1-AH12	0	NORM	6/9/2010	< 0.00035 U	< 0.0004 U	< 0.00034 U	< 0.00044 U	< 0.00042 U	< 0.00029 U	< 0.00032 U	< 0.00032 U	< 0.00046 U	< 0.00033 U	< 0.00038 U	< 0.00029 U
P9S1-AH12	10	NORM	6/9/2010	< 0.00036 U	< 0.00041 U	< 0.00035 U	< 0.00045 U	< 0.00043 U	0.0004 J	< 0.00033 U	< 0.00033 U	< 0.00047 U	< 0.00034 U	< 0.00039 U	< 0.0003 U
P9S1-AH13	0	NORM	6/9/2010	< 0.00034 U	< 0.00039 U	< 0.00034 U	< 0.00043 U	< 0.00042 U	< 0.00029 U	< 0.00032 U	< 0.00032 U	< 0.00046 U	< 0.00032 U	< 0.00037 U	< 0.00029 U
P9S1-AH13	10	NORM	6/9/2010	< 0.00035 U	< 0.0004 U	< 0.00034 U	< 0.00044 U	< 0.00042 U	< 0.00029 U	< 0.00032 U	< 0.00032 U	< 0.00046 U	< 0.00033 U	< 0.00038 U	< 0.00029 U
P9S1-AH14	0	NORM	6/8/2010	< 0.00035 U	< 0.0004 U	< 0.00034 U	< 0.00044 U	< 0.00042 U	< 0.00029 U	< 0.00032 U	< 0.00032 U	< 0.00046 U	< 0.00033 U	< 0.00038 U	< 0.00029 U
P9S1-AH14	10	NORM	6/8/2010	< 0.00035 U	< 0.0004 U	< 0.00034 U	< 0.00044 U	< 0.00042 U	< 0.00029 U	< 0.00032 U	< 0.00032 U	< 0.00046 U	< 0.00033 U	< 0.00038 U	< 0.00029 U
P9S1-JD01	0	NORM	6/8/2010	< 0.00034 U	< 0.00039 U	< 0.00034 U	< 0.00043 U	< 0.00042 U	< 0.00029 U	< 0.00032 U	< 0.00032 U	< 0.00046 U	< 0.00032 U	< 0.00037 U	< 0.00029 U
P9S1-JD01	10	NORM	6/8/2010	< 0.00035 U	< 0.0004 U	< 0.00034 U	< 0.00044 U	< 0.00043 U	< 0.0003 U	< 0.00033 U	< 0.00032 U	< 0.00047 U	< 0.00033 U	< 0.00038 U	< 0.00029 U
P9S1-JD02	0	NORM	6/8/2010	< 0.00035 U	< 0.0004 U	< 0.00034 U	< 0.00044 U	< 0.00043 U	< 0.00029 U	< 0.00032 U	< 0.00032 U	< 0.00046 U	< 0.00033 U	< 0.00038 U	< 0.00029 U
P9S1-JD02	10	NORM	6/8/2010	< 0.00035 U	< 0.0004 U	< 0.00034 U	< 0.00044 U	< 0.00042 U	< 0.00029 U	< 0.00032 U	< 0.00032 U	< 0.00046 U	< 0.00033 U	< 0.00038 U	< 0.00029 U
P9S1-JD03	0	NORM	6/8/2010	< 0.00035 U	< 0.0004 U	< 0.00034 U	< 0.00044 U	< 0.00043 U	< 0.00029 U	< 0.00032 U	< 0.00076 U	< 0.00047 U	< 0.00033 U	< 0.00038 U	< 0.00029 U
P9S1-JD03	10	NORM	6/8/2010	< 0.00038 U	< 0.00043 U	< 0.00037 U	< 0.00048 U	< 0.00046 U	< 0.00032 U	< 0.00035 U	< 0.00035 U	< 0.0005 U	< 0.00036 U	< 0.00041 U	< 0.00032 U

All units in mg/kg.

-- = no sample data.

TABLE B-10
SOIL VOLATILE ORGANIC COMPOUNDS (VOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 5 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Volatile Organic Compounds (VOCs)											
				cis-1,2-Dichloroethene	cis-1,3-Dichloropropene	Cymene (Isopropyl- toluene)	Dibromochloromethane	Dibromochloropropane	Dibromomethane	Dichloromethane (Methylene chloride)	Dimethyldisulfide	Ethanol	Ethylbenzene	Freon-11 (Trichlorofluoromethane)	Freon-113 (1,1,2-Trifluoro 1,2,2-trichloroethane)
P9S1-AG13	0	NORM	6/9/2010	< 0.00034 U	< 0.00024 U	< 0.00027 U	< 0.0003 U	< 0.00061 U	< 0.00035 U	< 0.0024 U	< 0.00049 U	< 0.064 UJ	< 0.0003 U	< 0.00031 U	< 0.00025 U
P9S1-AG13	10	NORM	6/9/2010	< 0.00035 U	< 0.00025 U	< 0.00027 U	< 0.00031 U	< 0.00063 U	< 0.00036 U	< 0.0025 U	< 0.0005 U	< 0.065 UJ	< 0.00031 U	< 0.00032 U	< 0.00026 U
P9S1-AG14	0	NORM	6/8/2010	< 0.00037 U	< 0.00026 U	< 0.00029 U	< 0.00032 U	< 0.00066 U	< 0.00038 U	< 0.015 U	< 0.00053 U	< 0.069 UJ	< 0.00032 U	< 0.00034 U	< 0.00028 U
P9S1-AG14	10	NORM	6/8/2010	< 0.00039 U	< 0.00027 U	< 0.0003 U	< 0.00034 U	< 0.00069 U	< 0.0004 U	< 0.023 U	< 0.00056 U	< 0.072 UJ	< 0.00034 U	< 0.00035 U	< 0.00029 U
P9S1-AG15	0	NORM	6/8/2010	< 0.00037 U	< 0.00026 U	< 0.00029 U	< 0.00033 U	< 0.00067 U	< 0.00039 U	0.03 J	< 0.00054 U	< 0.069 UJ	< 0.00033 U	< 0.00034 U	< 0.00028 U
P9S1-AG15	0	FD	6/8/2010	< 0.00034 U	< 0.00024 U	< 0.00027 U	< 0.0003 U	< 0.00062 U	< 0.00036 U	< 0.013 UJ	< 0.0005 U	< 0.064 UJ	< 0.0003 U	< 0.00032 U	< 0.00026 U
P9S1-AG15	10	NORM	6/8/2010	< 0.00035 U	< 0.00025 U	< 0.00027 U	< 0.00031 U	< 0.00063 U	< 0.00037 U	< 0.02 U	< 0.00051 U	< 0.065 UJ	< 0.00031 U	< 0.00032 U	< 0.00026 U
P9S1-AH11	0	NORM	6/9/2010	< 0.00035 U	< 0.00025 U	< 0.00027 U	< 0.00031 U	< 0.00063 U	< 0.00037 U	< 0.0025 U	< 0.00051 U	< 0.066 UJ	< 0.00031 U	< 0.00032 U	< 0.00026 U
P9S1-AH11	0	FD	6/9/2010	< 0.00036 U	< 0.00025 U	< 0.00028 U	< 0.00031 U	< 0.00064 U	< 0.00037 U	< 0.0025 U	< 0.00051 U	< 0.066 UJ	< 0.00031 U	< 0.00033 U	< 0.00027 U
P9S1-AH11	10	NORM	6/9/2010	< 0.00036 U	< 0.00026 U	< 0.00028 U	< 0.00032 U	< 0.00065 U	< 0.00038 U	< 0.0025 U	< 0.00052 U	< 0.067 UJ	< 0.00032 U	< 0.00033 U	< 0.00027 U
P9S1-AH12	0	NORM	6/9/2010	< 0.00035 U	< 0.00025 U	< 0.00027 U	< 0.00031 U	< 0.00063 U	< 0.00037 U	< 0.0025 U	< 0.00051 U	< 0.066 UJ	< 0.00031 U	< 0.00032 U	< 0.00026 U
P9S1-AH12	10	NORM	6/9/2010	< 0.00036 U	< 0.00026 U	< 0.00028 U	< 0.00032 U	< 0.00065 U	< 0.00038 U	< 0.0025 U	< 0.00052 U	< 0.067 UJ	< 0.00032 U	< 0.00033 U	< 0.00027 U
P9S1-AH13	0	NORM	6/9/2010	< 0.00035 U	< 0.00025 U	< 0.00027 U	< 0.0003 U	< 0.00062 U	< 0.00036 U	< 0.0024 U	< 0.0005 U	< 0.065 UJ	< 0.0003 U	< 0.00032 U	< 0.00026 U
P9S1-AH13	10	NORM	6/9/2010	< 0.00035 U	< 0.00025 U	< 0.00027 U	< 0.00031 U	< 0.00063 U	< 0.00037 U	< 0.0025 U	< 0.00051 U	< 0.066 UJ	< 0.00031 U	< 0.00032 U	< 0.00026 U
P9S1-AH14	0	NORM	6/8/2010	< 0.00035 U	< 0.00025 U	< 0.00027 U	< 0.00031 U	< 0.00063 U	< 0.00037 U	< 0.024 U	< 0.00051 U	< 0.066 UJ	< 0.00031 U	< 0.00032 U	< 0.00026 U
P9S1-AH14	10	NORM	6/8/2010	< 0.00035 U	< 0.00025 U	< 0.00028 U	< 0.00031 U	< 0.00063 U	< 0.00037 U	< 0.022 U	< 0.00051 U	< 0.066 UJ	< 0.00031 U	< 0.00032 U	< 0.00026 U
P9S1-JD01	0	NORM	6/8/2010	< 0.00035 U	< 0.00025 U	< 0.00027 U	< 0.0003 U	< 0.00062 U	< 0.00036 U	< 0.026 U	< 0.0005 U	< 0.065 UJ	< 0.0003 U	< 0.00032 U	< 0.00026 U
P9S1-JD01	10	NORM	6/8/2010	< 0.00036 U	< 0.00025 U	< 0.00028 U	< 0.00031 U	< 0.00064 U	< 0.00037 U	< 0.02 U	< 0.00051 U	< 0.066 UJ	< 0.00031 U	< 0.00033 U	< 0.00027 U
P9S1-JD02	0	NORM	6/8/2010	< 0.00035 U	< 0.00025 U	< 0.00028 U	< 0.00031 U	< 0.00064 U	< 0.00037 U	< 0.025 U	< 0.00051 U	< 0.066 UJ	< 0.00031 U	< 0.00033 U	< 0.00026 U
P9S1-JD02	10	NORM	6/8/2010	< 0.00035 U	< 0.00025 U	< 0.00027 U	< 0.00031 U	< 0.00063 U	< 0.00037 U	< 0.017 U	< 0.00051 U	< 0.065 UJ	< 0.00031 U	< 0.00032 U	< 0.00026 U
P9S1-JD03	0	NORM	6/8/2010	< 0.00036 U	< 0.00025 U	< 0.00028 U	< 0.00031 U	< 0.00064 U	< 0.00037 U	0.063	< 0.00051 U	< 0.066 UJ	< 0.00031 U	< 0.00033 U	< 0.00026 U
P9S1-JD03	10	NORM	6/8/2010	< 0.00038 U	< 0.00027 U	< 0.0003 U	< 0.00034 U	< 0.00069 U	< 0.0004 U	< 0.026 U	< 0.00055 U	< 0.072 UJ	< 0.00034 U	< 0.00035 U	< 0.00029 U

All units in mg/kg.

-- = no sample data.

TABLE B-10
SOIL VOLATILE ORGANIC COMPOUNDS (VOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 6 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Volatile Organic Compounds (VOCs)										
				Freon-12 (Dichloro- difluoromethane)	Heptane	Isopropylbenzene	m,p-Xylene	Methyl ethyl ketone (2-Butanone)	Methyl iodide	MTBE (Methyl tert-butyl ether)	n-Butylbenzene	Nonanal	n-Propylbenzene	o-Xylene
P9S1-AG13	0	NORM	6/9/2010	< 0.00025 U	< 0.00038 U	< 0.00029 U	< 0.00047 U	< 0.00059 U	< 0.0004 U	< 0.00048 U	< 0.0003 U	< 0.00037 U	< 0.00028 U	< 0.00024 U
P9S1-AG13	10	NORM	6/9/2010	< 0.00026 U	< 0.00039 U	< 0.0003 U	< 0.00048 U	< 0.0006 U	< 0.00041 U	< 0.00049 U	< 0.00031 U	< 0.00038 U	< 0.00029 U	< 0.00025 U
P9S1-AG14	0	NORM	6/8/2010	< 0.00028 U	< 0.00042 U	< 0.00032 U	< 0.0005 U	< 0.00064 U	< 0.00043 U	< 0.00052 U	< 0.00033 U	< 0.0004 U	< 0.0003 U	< 0.00026 U
P9S1-AG14	10	NORM	6/8/2010	< 0.00029 U	< 0.00043 U	< 0.00033 U	< 0.00053 U	< 0.00066 U	< 0.00045 U	< 0.00054 U	< 0.00034 U	< 0.00042 U	< 0.00032 U	< 0.00027 U
P9S1-AG15	0	NORM	6/8/2010	< 0.00028 U	< 0.00042 U	< 0.00032 U	< 0.00051 U	< 0.00064 U	< 0.00043 U	< 0.00052 U	< 0.00033 U	< 0.00041 U	< 0.0003 U	< 0.00026 U
P9S1-AG15	0	FD	6/8/2010	< 0.00026 U	< 0.00039 U	< 0.00029 U	< 0.00047 U	< 0.00059 U	< 0.0004 U	< 0.00048 U	< 0.0003 U	< 0.00038 U	< 0.00028 U	< 0.00024 U
P9S1-AG15	10	NORM	6/8/2010	< 0.00026 U	< 0.0004 U	< 0.0003 U	< 0.00048 U	< 0.00061 U	< 0.00041 U	< 0.00049 U	< 0.00031 U	< 0.00038 U	< 0.00029 U	< 0.00025 U
P9S1-AH11	0	NORM	6/9/2010	< 0.00026 U	< 0.0004 U	< 0.0003 U	< 0.00048 U	< 0.00061 U	< 0.00041 U	< 0.00049 U	< 0.00031 U	< 0.00038 U	< 0.00029 U	< 0.00025 U
P9S1-AH11	0	FD	6/9/2010	< 0.00027 U	< 0.0004 U	< 0.0003 U	< 0.00049 U	< 0.00061 U	< 0.00041 U	< 0.0005 U	< 0.00031 U	< 0.00039 U	< 0.00029 U	< 0.00025 U
P9S1-AH11	10	NORM	6/9/2010	< 0.00027 U	< 0.00041 U	< 0.00031 U	< 0.00049 U	< 0.00062 U	< 0.00042 U	< 0.00051 U	< 0.00032 U	< 0.0004 U	< 0.0003 U	< 0.00026 U
P9S1-AH12	0	NORM	6/9/2010	< 0.00026 U	< 0.0004 U	< 0.0003 U	< 0.00048 U	< 0.00061 U	< 0.00041 U	< 0.00049 U	< 0.00031 U	< 0.00038 U	< 0.00029 U	< 0.00025 U
P9S1-AH12	10	NORM	6/9/2010	< 0.00027 U	< 0.00041 U	< 0.00031 U	< 0.00049 U	< 0.00062 U	< 0.00042 U	< 0.00051 U	< 0.00032 U	< 0.00039 U	< 0.0003 U	< 0.00026 U
P9S1-AH13	0	NORM	6/9/2010	< 0.00026 U	< 0.00039 U	< 0.0003 U	< 0.00047 U	< 0.0006 U	< 0.0004 U	< 0.00049 U	< 0.00031 U	< 0.00038 U	< 0.00029 U	< 0.00025 U
P9S1-AH13	10	NORM	6/9/2010	< 0.00026 U	< 0.0004 U	< 0.0003 U	< 0.00048 U	< 0.00061 U	< 0.00041 U	< 0.00049 U	< 0.00031 U	< 0.00038 U	< 0.00029 U	< 0.00025 U
P9S1-AH14	0	NORM	6/8/2010	< 0.00026 U	< 0.0004 U	< 0.0003 U	< 0.00048 U	< 0.00061 U	< 0.00041 U	< 0.00049 U	< 0.00031 U	< 0.00039 U	< 0.00029 U	< 0.00025 U
P9S1-AH14	10	NORM	6/8/2010	< 0.00026 U	< 0.0004 U	< 0.0003 U	< 0.00048 U	< 0.00061 U	< 0.00041 U	< 0.00049 U	< 0.00031 U	< 0.00039 U	< 0.00029 U	< 0.00025 U
P9S1-JD01	0	NORM	6/8/2010	< 0.00026 U	< 0.00039 U	< 0.0003 U	< 0.00047 U	< 0.0006 U	< 0.00041 U	< 0.00049 U	< 0.00031 U	< 0.00038 U	< 0.00029 U	< 0.00025 U
P9S1-JD01	10	NORM	6/8/2010	< 0.00027 U	< 0.0004 U	< 0.0003 U	< 0.00049 U	< 0.00061 U	< 0.00041 U	< 0.0005 U	< 0.00032 U	< 0.00039 U	< 0.00029 U	< 0.00025 U
P9S1-JD02	0	NORM	6/8/2010	< 0.00026 U	< 0.0004 U	< 0.0003 U	< 0.00048 U	< 0.00061 U	< 0.00041 U	< 0.0005 U	< 0.00031 U	< 0.00039 U	< 0.00029 U	< 0.00025 U
P9S1-JD02	10	NORM	6/8/2010	< 0.00026 U	< 0.0004 U	< 0.0003 U	< 0.00048 U	< 0.00061 U	< 0.00041 U	< 0.00049 U	< 0.00031 U	< 0.00038 U	< 0.00029 U	< 0.00025 U
P9S1-JD03	0	NORM	6/8/2010	< 0.00026 U	< 0.0004 U	< 0.0003 U	< 0.00048 U	< 0.00061 U	< 0.00041 U	< 0.0005 U	< 0.00031 U	< 0.00039 U	< 0.00029 U	< 0.00025 U
P9S1-JD03	10	NORM	6/8/2010	< 0.00029 U	< 0.00043 U	< 0.00033 U	< 0.00052 U	< 0.00066 U	< 0.00045 U	< 0.00054 U	< 0.00034 U	< 0.00042 U	< 0.00032 U	< 0.00027 U

All units in mg/kg.

-- = no sample data.

TABLE B-10
SOIL VOLATILE ORGANIC COMPOUNDS (VOCs) DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 7 of 7)

Sample ID	Depth (ft bgs)	Sample Type	Sample Date	Volatile Organic Compounds (VOCs)										
				sec-Butylbenzene	Styrene	tert-Butylbenzene	Tetrachloroethene	Toluene	trans-1,2-Dichloroethene	trans-1,3-Dichloro-propene	Trichloroethene	Vinyl acetate	Vinyl chloride	Xylenes (total)
P9S1-AG13	0	NORM	6/9/2010	< 0.00033 U	< 0.00021 U	< 0.00023 U	< 0.00048 U	< 0.00025 U	< 0.00035 U	< 0.00018 U	< 0.00027 U	< 0.00039 U	< 0.00033 U	< 0.00066 U
P9S1-AG13	10	NORM	6/9/2010	< 0.00034 U	< 0.00022 U	< 0.00024 U	< 0.00049 U	< 0.00025 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.0004 U	< 0.00034 U	< 0.00067 U
P9S1-AG14	0	NORM	6/8/2010	< 0.00036 U	< 0.00023 U	< 0.00025 U	< 0.00052 U	< 0.00027 U	< 0.00038 U	< 0.0002 U	< 0.00029 U	< 0.00042 U	< 0.00036 U	< 0.00071 U
P9S1-AG14	10	NORM	6/8/2010	< 0.00038 U	< 0.00024 U	< 0.00026 U	< 0.00054 U	< 0.00028 U	< 0.00039 U	< 0.00021 U	< 0.00031 U	< 0.00044 U	< 0.00038 U	< 0.00074 U
P9S1-AG15	0	NORM	6/8/2010	< 0.00036 U	< 0.00023 U	< 0.00025 U	< 0.00052 U	< 0.00027 U	< 0.00038 U	< 0.0002 U	< 0.00029 U	< 0.00043 U	< 0.00036 U	< 0.00072 U
P9S1-AG15	0	FD	6/8/2010	< 0.00034 U	< 0.00021 U	< 0.00023 U	< 0.00048 U	< 0.00025 U	< 0.00035 U	< 0.00018 U	< 0.00027 U	< 0.0004 U	< 0.00033 U	< 0.00066 U
P9S1-AG15	10	NORM	6/8/2010	< 0.00034 U	< 0.00022 U	< 0.00024 U	< 0.00049 U	< 0.00025 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.0004 U	< 0.00034 U	< 0.00068 U
P9S1-AH11	0	NORM	6/9/2010	< 0.00034 U	< 0.00022 U	< 0.00024 U	< 0.00049 U	< 0.00026 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.00041 U	< 0.00034 U	< 0.00068 U
P9S1-AH11	0	FD	6/9/2010	< 0.00035 U	< 0.00022 U	< 0.00024 U	< 0.0005 U	< 0.00026 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.00041 U	< 0.00035 U	< 0.00069 U
P9S1-AH11	10	NORM	6/9/2010	< 0.00035 U	< 0.00023 U	< 0.00025 U	< 0.00051 U	< 0.00026 U	< 0.00037 U	< 0.00019 U	< 0.00029 U	< 0.00042 U	< 0.00035 U	< 0.0007 U
P9S1-AH12	0	NORM	6/9/2010	< 0.00034 U	< 0.00022 U	< 0.00024 U	< 0.00049 U	< 0.00026 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.00041 U	< 0.00034 U	< 0.00068 U
P9S1-AH12	10	NORM	6/9/2010	< 0.00035 U	< 0.00023 U	< 0.00025 U	< 0.00051 U	< 0.00026 U	< 0.00037 U	< 0.00019 U	< 0.00029 U	< 0.00042 U	< 0.00035 U	< 0.0007 U
P9S1-AH13	0	NORM	6/9/2010	< 0.00034 U	< 0.00022 U	< 0.00024 U	< 0.00049 U	< 0.00025 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.0004 U	< 0.00034 U	< 0.00067 U
P9S1-AH13	10	NORM	6/9/2010	< 0.00034 U	< 0.00022 U	< 0.00024 U	< 0.00049 U	< 0.00026 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.0004 U	< 0.00034 U	< 0.00068 U
P9S1-AH14	0	NORM	6/8/2010	< 0.00034 U	< 0.00022 U	< 0.00024 U	< 0.00049 U	< 0.00026 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.00041 U	< 0.00034 U	< 0.00068 U
P9S1-AH14	10	NORM	6/8/2010	< 0.00034 U	< 0.00022 U	< 0.00024 U	< 0.00049 U	< 0.00026 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.00041 U	< 0.00034 U	< 0.00068 U
P9S1-JD01	0	NORM	6/8/2010	< 0.00034 U	< 0.00022 U	< 0.00024 U	< 0.00049 U	< 0.00025 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.0004 U	< 0.00034 U	< 0.00067 U
P9S1-JD01	10	NORM	6/8/2010	< 0.00035 U	< 0.00022 U	< 0.00024 U	< 0.0005 U	< 0.00026 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.00041 U	< 0.00035 U	< 0.00069 U
P9S1-JD02	0	NORM	6/8/2010	< 0.00035 U	< 0.00022 U	< 0.00024 U	< 0.00049 U	< 0.00026 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.00041 U	< 0.00034 U	< 0.00068 U
P9S1-JD02	10	NORM	6/8/2010	< 0.00034 U	< 0.00022 U	< 0.00024 U	< 0.00049 U	< 0.00025 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.0004 U	< 0.00034 U	< 0.00068 U
P9S1-JD03	0	NORM	6/8/2010	< 0.00035 U	< 0.00022 U	< 0.00024 U	< 0.0005 U	< 0.00026 U	< 0.00036 U	< 0.00019 U	< 0.00028 U	< 0.00041 U	< 0.00035 U	< 0.00068 U
P9S1-JD03	10	NORM	6/8/2010	< 0.00038 U	< 0.00024 U	< 0.00026 U	< 0.00054 U	< 0.00028 U	< 0.00039 U	< 0.00021 U	< 0.00031 U	< 0.00044 U	< 0.00037 U	< 0.00074 U

All units in mg/kg.

-- = no sample data.

TABLE B-11
SURFACE FLUX DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 8)

Sample ID	Sample Type	Sample Date	Surface Flux								
			1,1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,1-Dichloropropene	1,2,3-Trichloropropane	1,2,4-Trichlorobenzene
P9S1-AG13	NORM	7/27/2010	< 0.0104 U	< 0.0223 U	< 0.00281 UJ	< 0.0223 U	< 0.0165 U	< 0.0162 U	< 0.0112 U	< 0.0108 U	< 0.122 UJ
P9S1-AH11	NORM	7/27/2010	< 0.0108 U	< 0.0231 U	< 0.00288 UJ	< 0.0231 U	< 0.0169 U	< 0.0165 U	< 0.0112 U	< 0.0112 U	< 0.126 UJ
P9S1-AH12	NORM	7/27/2010	< 0.0108 U	< 0.0227 U	< 0.00285 UJ	< 0.0227 U	< 0.0165 U	< 0.0165 U	< 0.0112 U	< 0.0112 U	< 0.125 UJ
P9S1-AH13	NORM	7/27/2010	< 0.0365 U	< 0.0773 U	< 0.00277 UJ	< 0.0773 U	< 0.0569 U	< 0.0558 U	< 0.0381 U	< 0.0381 U	< 0.425 UJ
P9S1-AH14	NORM	7/27/2010	< 0.0104 U	< 0.0219 U	< 0.00277 UJ	< 0.0219 U	< 0.0162 U	< 0.0158 U	< 0.0108 U	< 0.0108 U	< 0.122 UJ
P9S1-JD01	NORM	7/27/2010	< 0.0104 U	< 0.0219 U	< 0.00277 UJ	< 0.0219 U	< 0.0162 U	< 0.0158 U	< 0.0108 U	< 0.0108 U	< 0.122 UJ
P9S1-JD03	NORM	7/27/2010	< 0.0112 U	< 0.0238 U	< 0.003 UJ	< 0.0238 U	< 0.0177 U	< 0.0173 U	< 0.0119 U	< 0.0119 U	< 0.132 UJ

All units in $\mu\text{g}/\text{m}^2, \text{min}^{-1}$.

TABLE B-11
SURFACE FLUX DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 8)

Sample ID	Sample Type	Sample Date	Surface Flux								
			1,2,4-Trimethylbenzene	1,2-Dichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Dichlorobenzene	1,3-Dichloropropane	1,4-Dichlorobenzene	1,4-Dioxane
P9S1-AG13	NORM	7/27/2010	< 0.0804 U	< 0.0962 UJ	< 0.00165 U	< 0.0192 U	< 0.0208 U	< 0.0981 U	< 0.0112 U	< 0.00246 UJ	< 0.0269 U
P9S1-AH11	NORM	7/27/2010	< 0.0823 U	< 0.0988 UJ	0.00419 J	< 0.0196 U	< 0.0215 U	< 0.101 U	< 0.0115 U	< 0.00254 U	< 0.0277 U
P9S1-AH12	NORM	7/27/2010	< 0.0819 U	< 0.0981 UJ	< 0.00169 U	< 0.0196 U	< 0.0212 U	< 0.1 UJ	< 0.0115 U	< 0.0025 U	< 0.0277 U
P9S1-AH13	NORM	7/27/2010	< 0.279 U	< 0.334 U	< 0.00165 U	< 0.0662 U	< 0.0723 U	< 0.341 U	< 0.0388 U	< 0.00242 UJ	< 0.0942 U
P9S1-AH14	NORM	7/27/2010	< 0.0796 U	< 0.0954 UJ	< 0.00165 U	< 0.0188 U	< 0.0208 U	< 0.0973 U	< 0.0112 U	< 0.00242 U	< 0.0269 U
P9S1-JD01	NORM	7/27/2010	< 0.0796 U	< 0.0954 UJ	< 0.00165 U	< 0.0188 U	< 0.0208 U	< 0.0973 U	< 0.0112 U	< 0.00242 UJ	< 0.0269 U
P9S1-JD03	NORM	7/27/2010	< 0.0865 U	< 0.104 UJ	< 0.00181 U	< 0.0204 U	< 0.0223 U	< 0.106 U	< 0.0119 U	< 0.00265 U	< 0.0292 U

All units in $\mu\text{g}/\text{m}^2, \text{min}^{-1}$.

TABLE B-11
SURFACE FLUX DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 3 of 8)

Sample ID	Sample Type	Sample Date	Surface Flux								
			2,2-Dichloropropane	2-Hexanone	4-Methyl-2-pentanone (MIBK)	Acetone	Acetonitrile	Benzene	Bromodichloromethane	Bromoform	Bromomethane
P9S1-AG13	NORM	7/27/2010	< 0.015 U	< 0.0108 UJ	< 0.0115 U	0.499	< 0.0138 UJ	< 0.0227 U	< 0.01 U	< 0.0104 U	< 0.0162 U
P9S1-AH11	NORM	7/27/2010	< 0.0154 U	< 0.0112 UJ	< 0.0119 U	1.02	< 0.0142 UJ	< 0.0281 U	< 0.0104 U	< 0.0104 U	< 0.0165 U
P9S1-AH12	NORM	7/27/2010	< 0.0154 U	< 0.0108 U	< 0.0115 U	1.05	< 0.0138 UJ	< 0.0212 U	< 0.01 U	< 0.0104 U	< 0.0165 U
P9S1-AH13	NORM	7/27/2010	< 0.0527 U	< 0.0373 U	< 0.0396 U	2.29	< 0.0477 UJ	0.0808 J	< 0.0346 U	< 0.0354 U	< 0.0562 U
P9S1-AH14	NORM	7/27/2010	< 0.015 U	< 0.0108 UJ	< 0.0112 U	0.226	< 0.0135 UJ	< 0.015 U	< 0.01 U	< 0.01 U	< 0.0162 U
P9S1-JD01	NORM	7/27/2010	< 0.015 U	< 0.0108 UJ	< 0.0112 U	0.303	< 0.0135 UJ	< 0.0212 U	< 0.01 U	< 0.01 U	< 0.0162 U
P9S1-JD03	NORM	7/27/2010	< 0.0162 U	< 0.0115 UJ	< 0.0123 U	0.286	< 0.0146 UJ	< 0.0181 U	< 0.0108 U	< 0.0112 U	< 0.0173 U

All units in $\mu\text{g}/\text{m}^2, \text{min}^{-1}$.

TABLE B-11
SURFACE FLUX DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 4 of 8)

Sample ID	Sample Type	Sample Date	Surface Flux							
			Carbon disulfide	Carbon tetrachloride	Chlorobenzene	Chlorobromomethane	Chloroethane	Chloroform	Chloromethane	cis-1,2-Dichloroethene
P9S1-AG13	NORM	7/27/2010	0.0142 J	0.00877 J	< 0.0188 U	< 0.0104 U	< 0.0112 U	0.00504 J	0.0627	< 0.0162 U
P9S1-AH11	NORM	7/27/2010	0.035 J	< 0.00438 U	< 0.0192 U	< 0.0108 U	< 0.0112 U	0.0272	0.0254 J	< 0.0169 U
P9S1-AH12	NORM	7/27/2010	< 0.0108 U	0.0208	< 0.0192 U	< 0.0108 U	< 0.0112 U	0.0151	0.0423 J	< 0.0165 U
P9S1-AH13	NORM	7/27/2010	0.0565 J	0.0127 J	< 0.0654 U	< 0.0362 U	< 0.0381 U	0.00673 J	< 0.0292 U	< 0.0569 U
P9S1-AH14	NORM	7/27/2010	< 0.0104 U	< 0.00465 U	< 0.0188 U	< 0.0104 U	< 0.0108 U	0.00527 J	0.0477	< 0.0162 U
P9S1-JD01	NORM	7/27/2010	0.0642	0.00446 J	< 0.0188 U	< 0.0104 U	< 0.0108 U	0.00373 J	0.0958	< 0.0162 U
P9S1-JD03	NORM	7/27/2010	0.156	0.00608 J	< 0.0204 U	< 0.0112 U	< 0.0119 U	0.00242 J	0.0165 J	< 0.0177 U

All units in $\mu\text{g}/\text{m}^2, \text{min}^{-1}$.

TABLE B-11
SURFACE FLUX DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 5 of 8)

Sample ID	Sample Type	Sample Date	Surface Flux							
			cis-1,3-Dichloropropene	Cymene (Isopropyltoluene)	Dibromochloromethane	Dibromochloropropane	Dibromomethane	Dichloromethane (Methylene chloride)	Ethanol	Ethylbenzene
P9S1-AG13	NORM	7/27/2010	< 0.0192 U	< 0.0142 U	< 0.00127 U	< 0.0215 UJ	< 0.01 U	< 0.0146 U	< 0.104 UJ	< 0.0181 U
P9S1-AH11	NORM	7/27/2010	< 0.0196 U	< 0.0146 U	< 0.00131 U	< 0.0151 UJ	< 0.01 U	0.236	< 0.107 UJ	< 0.0185 U
P9S1-AH12	NORM	7/27/2010	< 0.0196 U	< 0.0142 U	< 0.00127 U	< 0.00304 UJ	< 0.01 U	0.0288 J	< 0.106 UJ	< 0.0185 U
P9S1-AH13	NORM	7/27/2010	< 0.0669 U	< 0.0488 U	< 0.00127 U	< 0.021 UJ	< 0.0342 U	< 0.0504 U	0.873 J-	< 0.0627 U
P9S1-AH14	NORM	7/27/2010	< 0.0192 U	< 0.0138 U	0.0015 J	< 0.0137 UJ	< 0.00962 U	< 0.0142 U	< 0.103 UJ	< 0.0181 U
P9S1-JD01	NORM	7/27/2010	< 0.0192 U	< 0.0138 U	< 0.00127 U	< 0.0199 UJ	< 0.00962 U	< 0.0142 U	< 0.103 UJ	< 0.0181 U
P9S1-JD03	NORM	7/27/2010	< 0.0208 U	< 0.015 U	< 0.00135 U	< 0.012 UJ	< 0.0108 U	< 0.0154 U	< 0.112 UJ	< 0.0196 U

All units in $\mu\text{g}/\text{m}^2, \text{min}^{-1}$.

TABLE B-11
SURFACE FLUX DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 6 of 8)

Sample ID	Sample Type	Sample Date	Surface Flux							
			Freon-11 (Trichlorofluoromethane)	Freon-113 (1,1,2-Trifluoro 1,2,2-trichloroethane)	Freon-12 (Dichloro- difluoromethane)	Heptane	Hexachlorobutadiene	Isopropylbenzene	Methyl ethyl ketone (2-Butanone)	Methyl iodide
P9S1-AG13	NORM	7/27/2010	< 0.0235 U	< 0.0312 U	0.0423 J	< 0.00923 U	< 0.00558 UJ	< 0.0138 U	0.135	< 0.00692 U
P9S1-AH11	NORM	7/27/2010	0.0354 J	< 0.0323 U	< 0.0215 U	0.103	< 0.0045 UJ	< 0.0142 U	0.0327 J	< 0.00731 U
P9S1-AH12	NORM	7/27/2010	0.0615 J	< 0.0319 U	0.103 J	< 0.00923 U	< 0.0045 UJ	< 0.0142 U	0.0546 J	< 0.00731 U
P9S1-AH13	NORM	7/27/2010	< 0.0812 U	< 0.109 U	< 0.0723 U	< 0.0319 U	< 0.00638 UJ	< 0.0477 U	0.345	< 0.0242 U
P9S1-AH14	NORM	7/27/2010	< 0.0231 U	< 0.0312 U	< 0.0208 U	< 0.00923 U	< 0.00435 UJ	< 0.0138 U	< 0.0112 U	< 0.00692 U
P9S1-JD01	NORM	7/27/2010	< 0.0231 U	< 0.0312 U	< 0.0208 U	< 0.00923 U	< 0.00515 UJ	< 0.0138 U	0.0319 J	< 0.00692 U
P9S1-JD03	NORM	7/27/2010	< 0.0254 U	< 0.0338 U	< 0.0223 U	< 0.01 U	< 0.00473 UJ	< 0.015 U	0.0512 J	< 0.00769 U

All units in $\mu\text{g}/\text{m}^2, \text{min}^{-1}$.

TABLE B-11
SURFACE FLUX DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 7 of 8)

Sample ID	Sample Type	Sample Date	Surface Flux							
			MTBE (Methyl tert-butyl ether)	Naphthalene	n-Butylbenzene	n-Propylbenzene	o-Xylene	sec-Butylbenzene	Styrene	tert-Butylbenzene
P9S1-AG13	NORM	7/27/2010	< 0.00962 U	< 0.0185 UJ	< 0.0131 U	< 0.0135 U	< 0.0177 U	< 0.0142 U	< 0.0177 U	< 0.0135 U
P9S1-AH11	NORM	7/27/2010	< 0.01 U	< 0.0188 UJ	< 0.0135 U	< 0.0138 U	< 0.0181 U	< 0.0146 U	< 0.0181 U	< 0.0138 U
P9S1-AH12	NORM	7/27/2010	< 0.01 U	< 0.0188 UJ	< 0.0135 U	< 0.0138 U	< 0.0181 U	< 0.0146 U	< 0.0181 U	< 0.0138 U
P9S1-AH13	NORM	7/27/2010	< 0.0338 U	< 0.0642 UJ	< 0.0458 U	< 0.0473 U	< 0.0615 U	< 0.0496 U	< 0.0612 U	< 0.0465 U
P9S1-AH14	NORM	7/27/2010	< 0.00962 U	< 0.0185 UJ	< 0.0131 U	< 0.0135 U	< 0.0177 U	< 0.0142 U	< 0.0173 U	< 0.0135 U
P9S1-JD01	NORM	7/27/2010	< 0.00962 U	< 0.0185 UJ	< 0.0131 U	< 0.0135 U	< 0.0177 U	< 0.0142 U	< 0.0173 U	< 0.0135 U
P9S1-JD03	NORM	7/27/2010	< 0.0104 U	< 0.02 UJ	< 0.0142 U	< 0.0146 U	< 0.0192 U	< 0.0154 U	< 0.0188 U	< 0.0146 U

All units in $\mu\text{g}/\text{m}^2, \text{min}^{-1}$.

TABLE B-11
SURFACE FLUX DATA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 8 of 8)

Sample ID	Sample Type	Sample Date	Surface Flux							
			Tetrachloroethene	Toluene	trans-1,2-Dichloroethene	trans-1,3-Dichloro-propene	Trichloroethene	Vinyl acetate	Vinyl chloride	Xylenes (Total)
P9S1-AG13	NORM	7/27/2010	< 0.0277 U	< 0.0154 U	< 0.0104 U	< 0.0188 U	< 0.0223 U	< 0.0458 UJ	< 0.0108 U	< 0.0358 U
P9S1-AH11	NORM	7/27/2010	< 0.0285 U	0.108	< 0.0108 U	< 0.0192 U	< 0.0227 U	< 0.0469 UJ	< 0.0108 U	< 0.0369 U
P9S1-AH12	NORM	7/27/2010	< 0.0281 U	< 0.0158 U	< 0.0108 U	< 0.0192 U	< 0.0227 U	< 0.0465 UJ	< 0.0108 U	< 0.0365 U
P9S1-AH13	NORM	7/27/2010	< 0.0962 U	< 0.0538 U	< 0.0365 U	< 0.0658 U	< 0.0769 U	< 0.158 UJ	< 0.0369 U	< 0.124 U
P9S1-AH14	NORM	7/27/2010	< 0.0273 U	< 0.0154 U	< 0.0104 U	< 0.0188 U	< 0.0219 U	< 0.0454 UJ	< 0.0104 U	< 0.0354 U
P9S1-JD01	NORM	7/27/2010	< 0.0273 U	0.0669 J	< 0.0104 U	< 0.0188 U	< 0.0219 U	< 0.0454 UJ	< 0.0104 U	< 0.0354 U
P9S1-JD03	NORM	7/27/2010	< 0.03 U	< 0.0165 U	< 0.0115 U	< 0.0204 U	< 0.0238 U	< 0.0492 UJ	< 0.0115 U	< 0.0385 U

All units in $\mu\text{g}/\text{m}^2, \text{min}^{-1}$.

APPENDIX C

GES FIELD REPORTS
(on the report CD in Appendix B)

APPENDIX D

SURFACE FLUX CHAMBER TESTING INVESTIGATOR'S REPORT (on the report CD in Appendix B)

APPENDIX E

DATA USABILITY TABLES (on the report CD in Appendix B)

LIST OF TABLES (APPENDIX E)

Table E-1	Data Usability Evaluation for Semi-Volatile Organic Compounds
Table E-2	Data Usability Evaluation for Dioxins/Furans
Table E-3	Data Usability Evaluation for Aldehydes
Table E-4	Data Usability Evaluation for Radionuclides
Table E-5	Data Usability Evaluation for Polychlorinated Biphenyls
Table E-6	Data Usability Evaluation for Organochlorine Pesticides
Table E-7	Data Usability Evaluation for General Chemistry
Table E-8	Data Usability Evaluation for Volatile Organic Compounds in Soil
Table E-9	Data Usability Evaluation for Metals
Table E-10	Data Usability Evaluation for Volatile Organic Compounds in Surface Flux
Table E-11	Data Usability Evaluation for Low MS and LCS Recoveries
Table E-12	Data Usability Evaluation for Field Duplicate RPD Exceedances
Table E-13	Data Usability Evaluation for Low Surrogate Recoveries
Table E-14	Summary of Data Censored Due to Lab or Field Blank Contamination

APPENDIX F

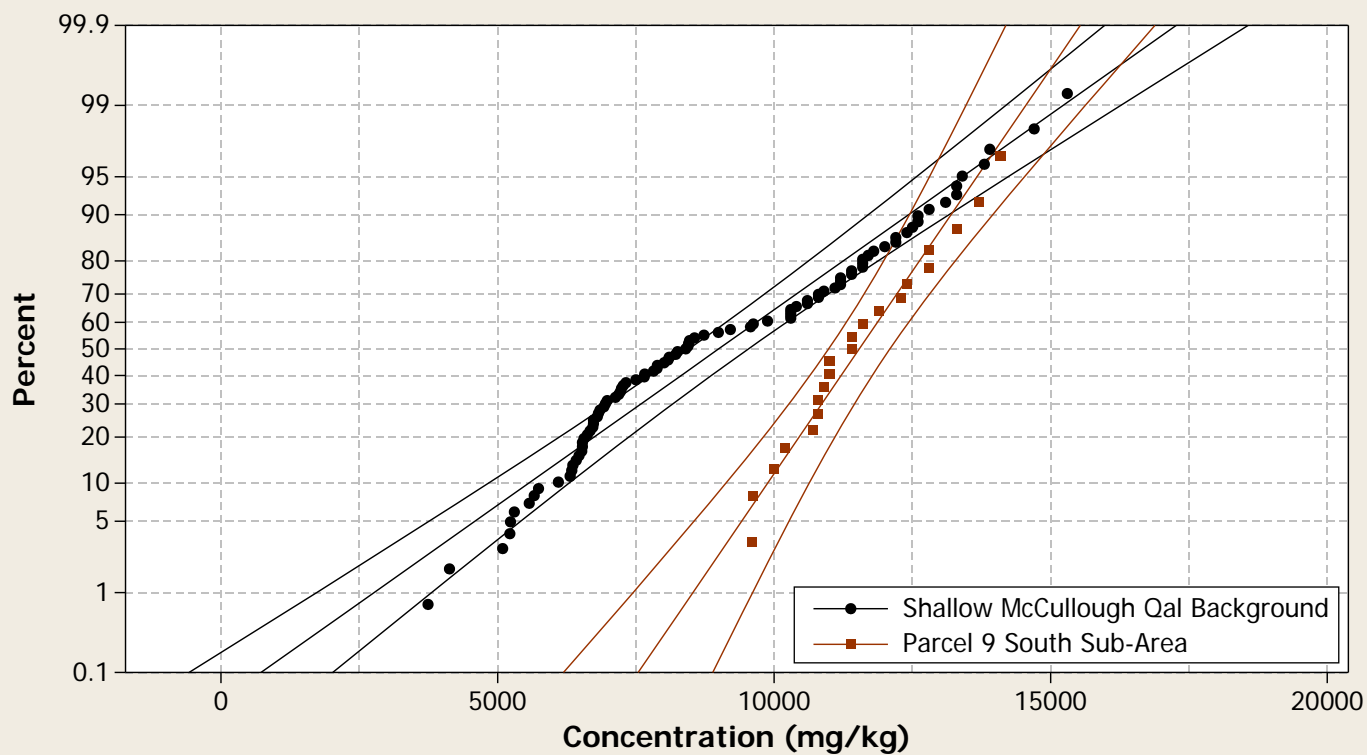
DATA VALIDATION SUMMARY REPORTS

APPENDIX G

CUMULATIVE PROBABILITY PLOTS AND BOXPLOTS FOR METALS AND RADIONUCLIDES

Probability Plot

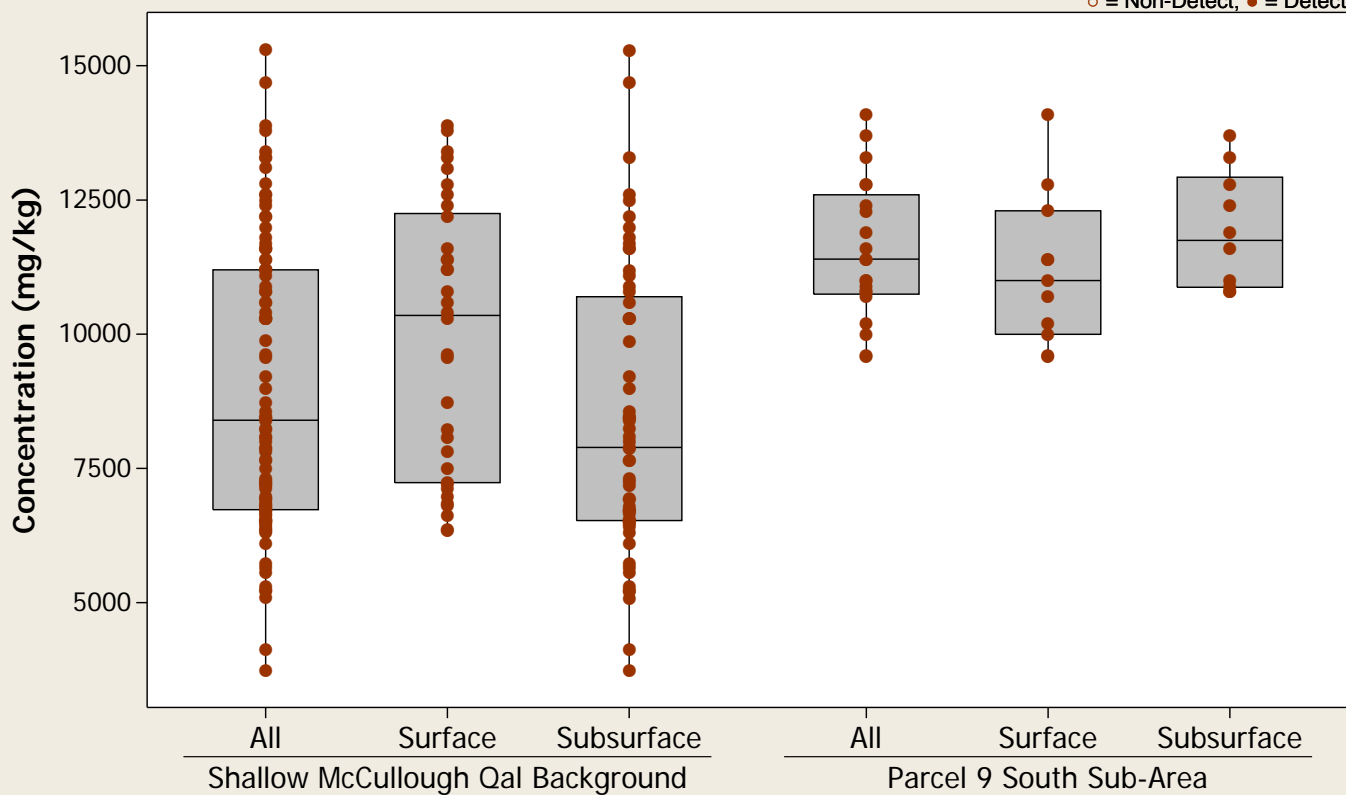
Normal - 95% CI
Analyte = Aluminum



Boxplot

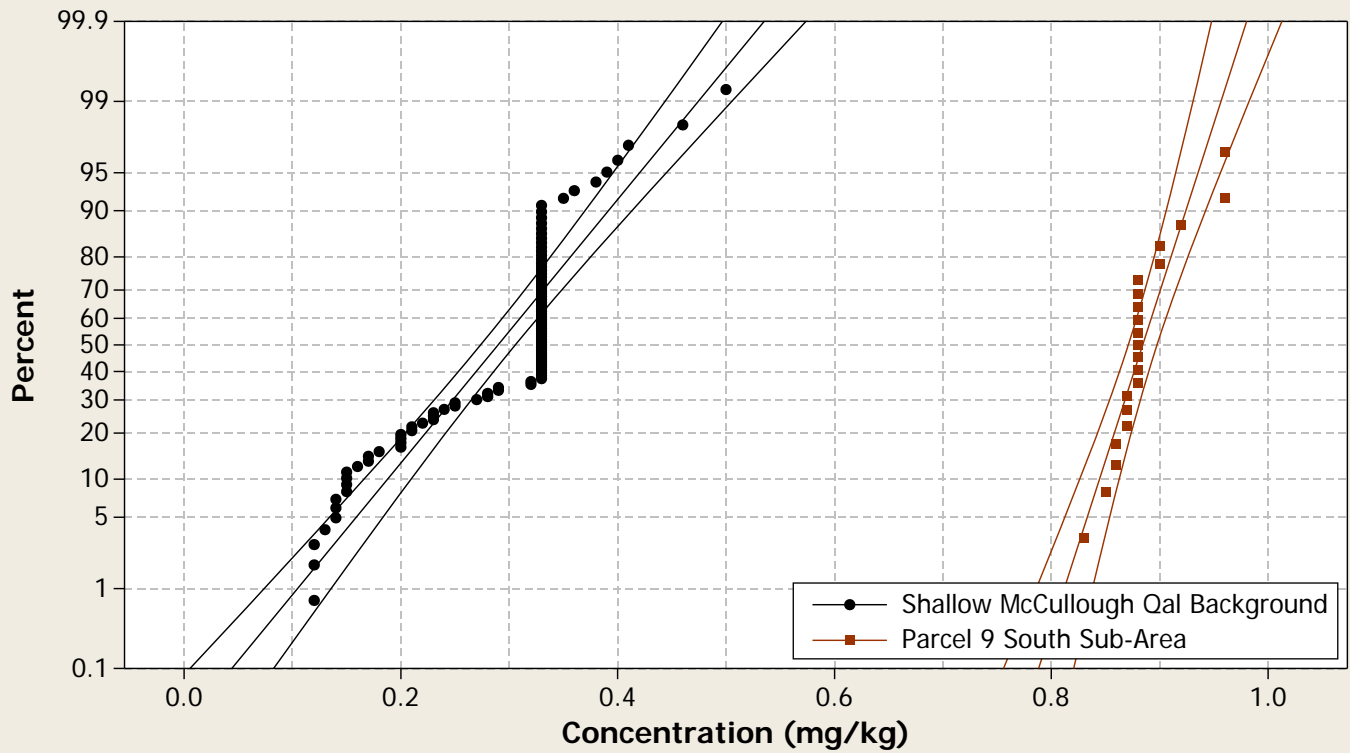
Analyte = Aluminum

○ = Non-Detect; ● = Detect



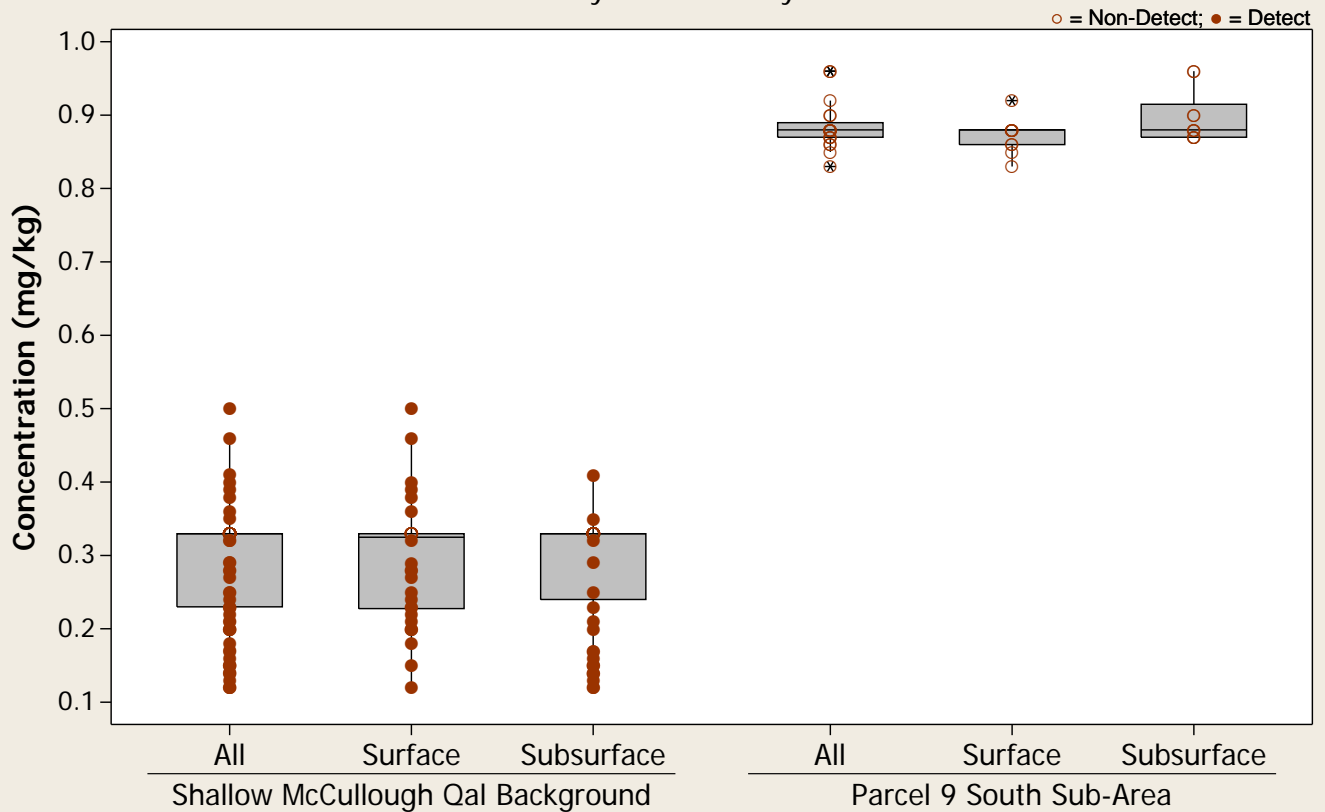
Probability Plot

Normal - 95% CI
Analyte = Antimony



Boxplot

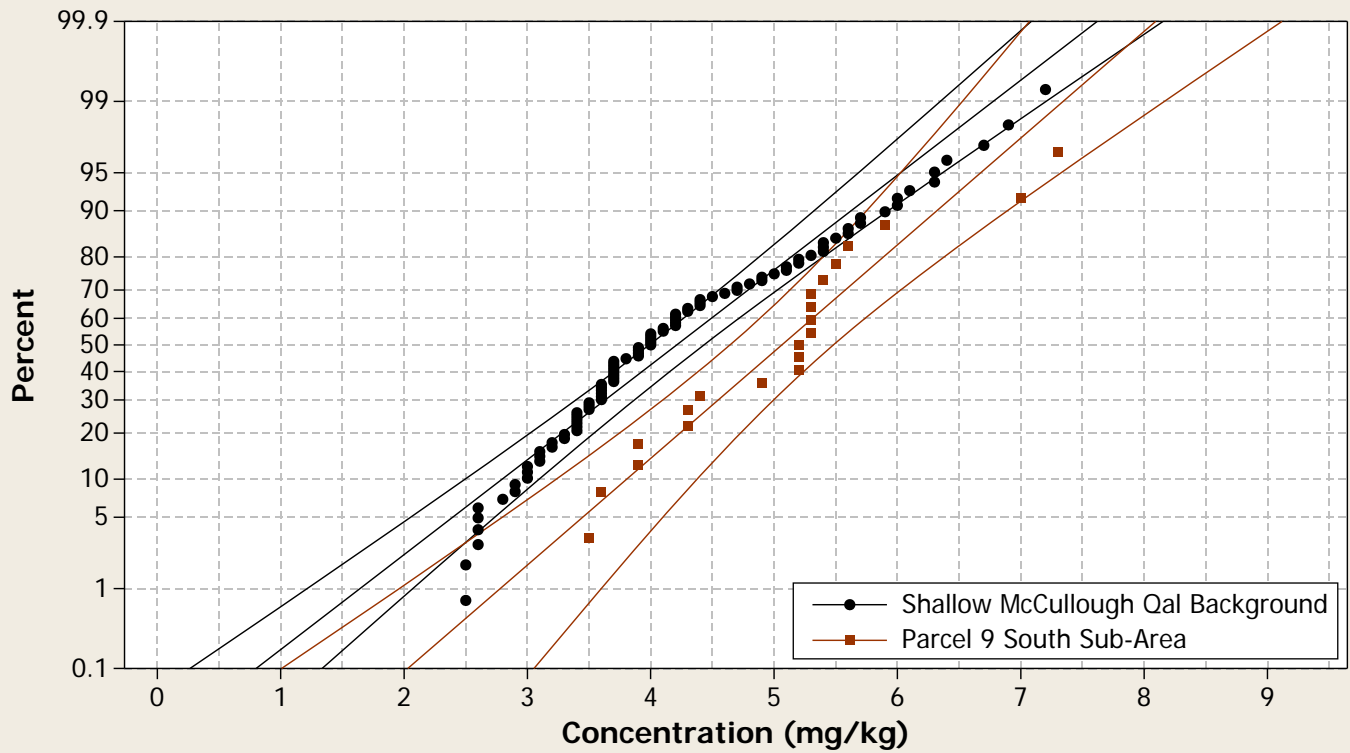
Analyte = Antimony



Probability Plot

Normal - 95% CI

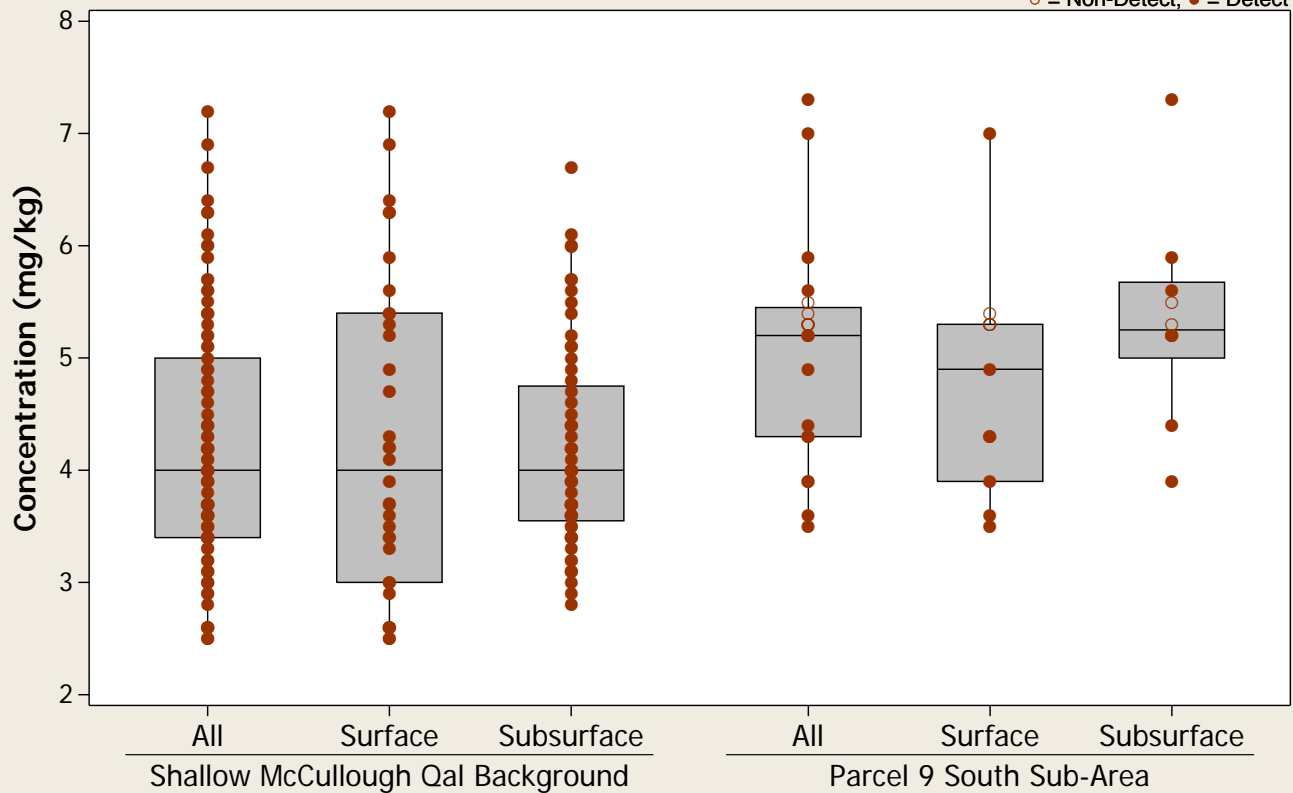
Analyte = Arsenic



Boxplot

Analyte = Arsenic

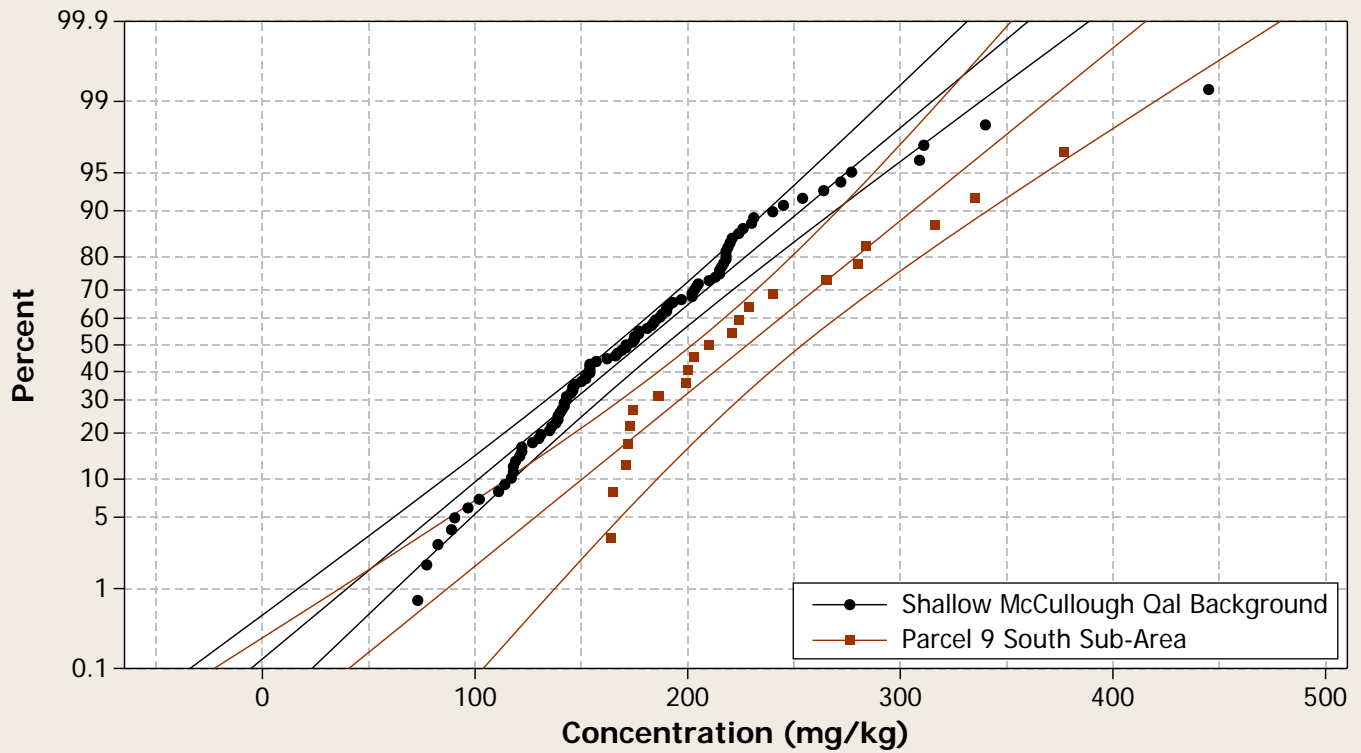
○ = Non-Detect; ● = Detect



Probability Plot

Normal - 95% CI

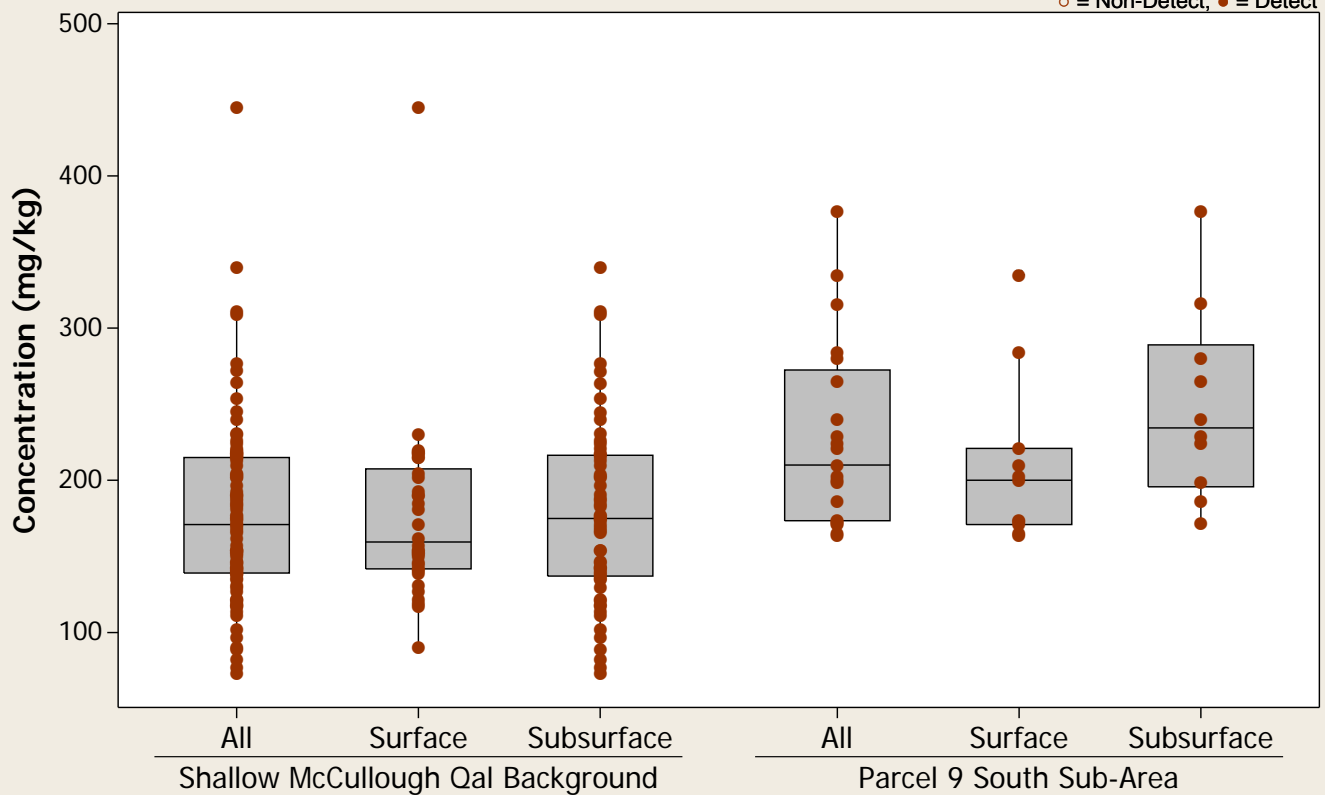
Analyte = Barium



Boxplot

Analyte = Barium

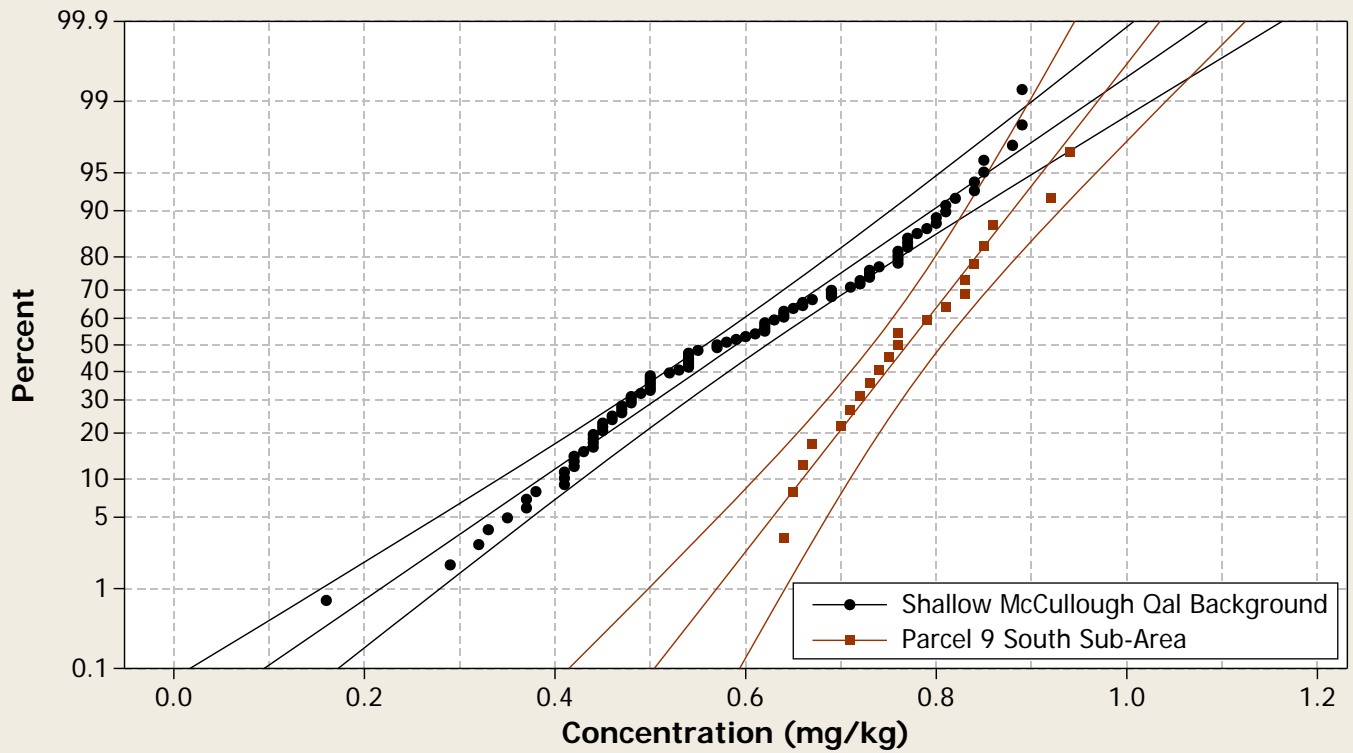
○ = Non-Detect; ● = Detect



Probability Plot

Normal - 95% CI

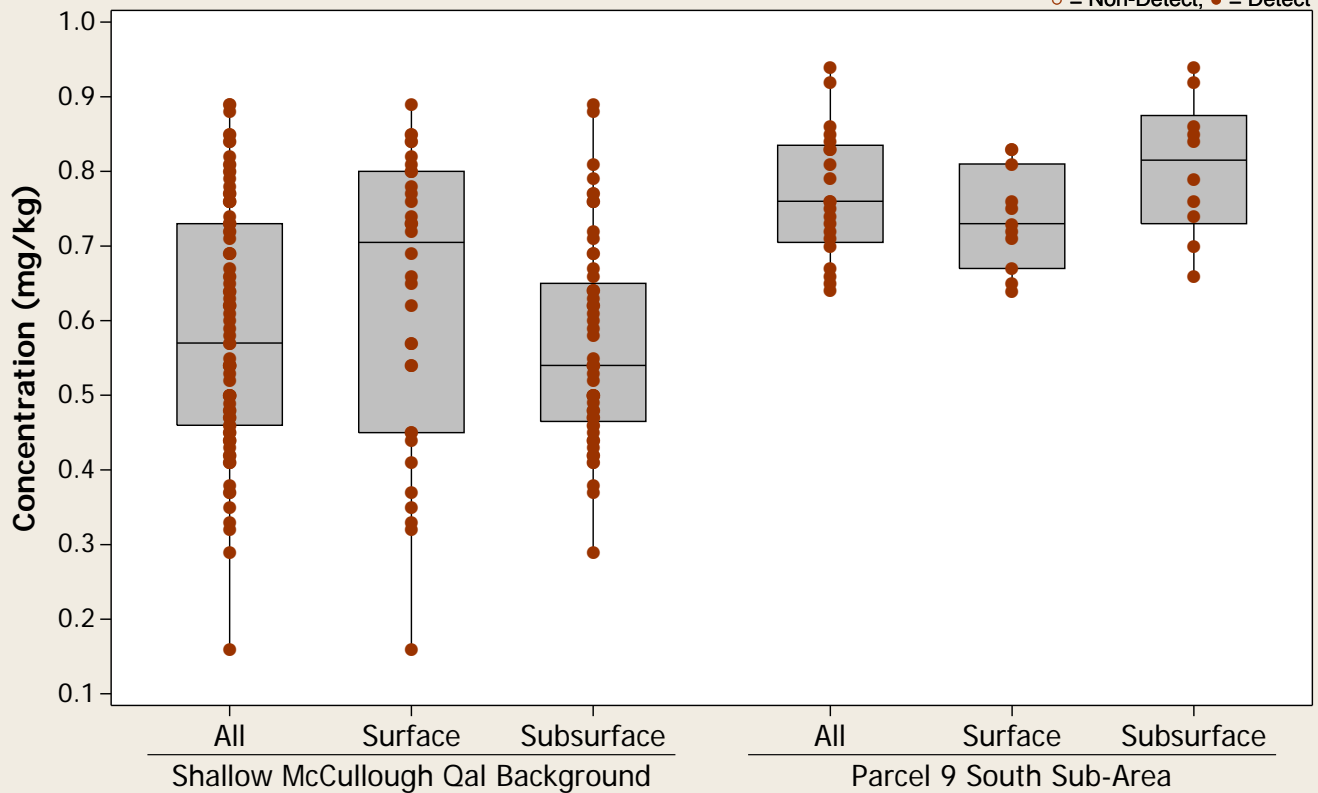
Analyte = Beryllium



Boxplot

Analyte = Beryllium

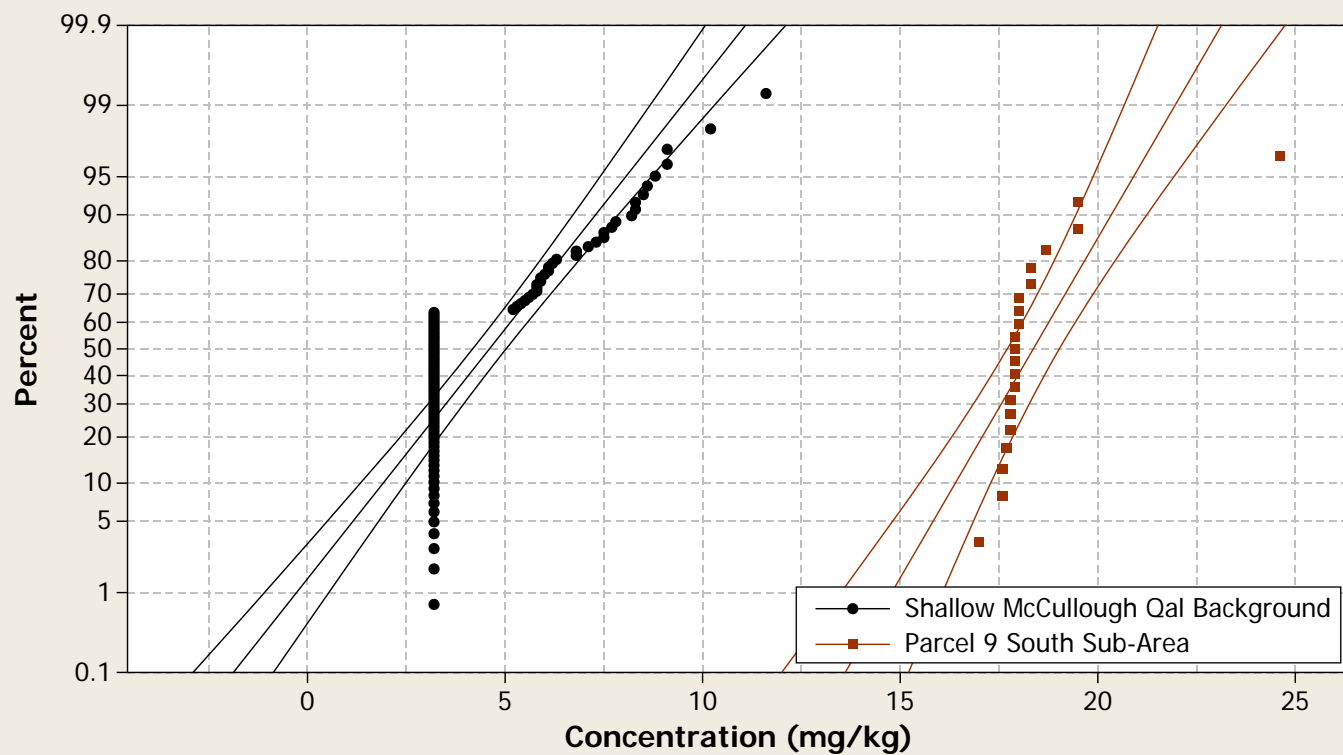
○ = Non-Detect; ● = Detect



Probability Plot

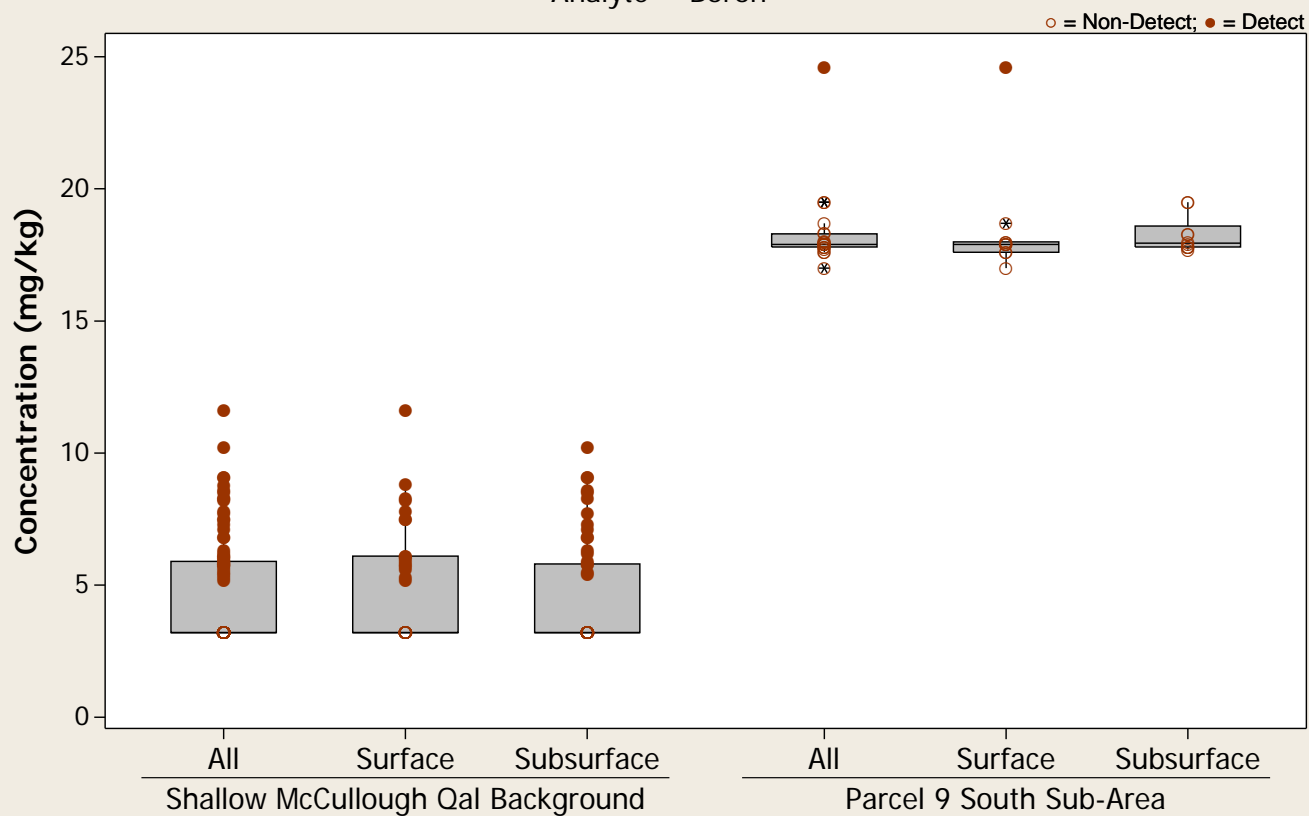
Normal - 95% CI

Analyte = Boron



Boxplot

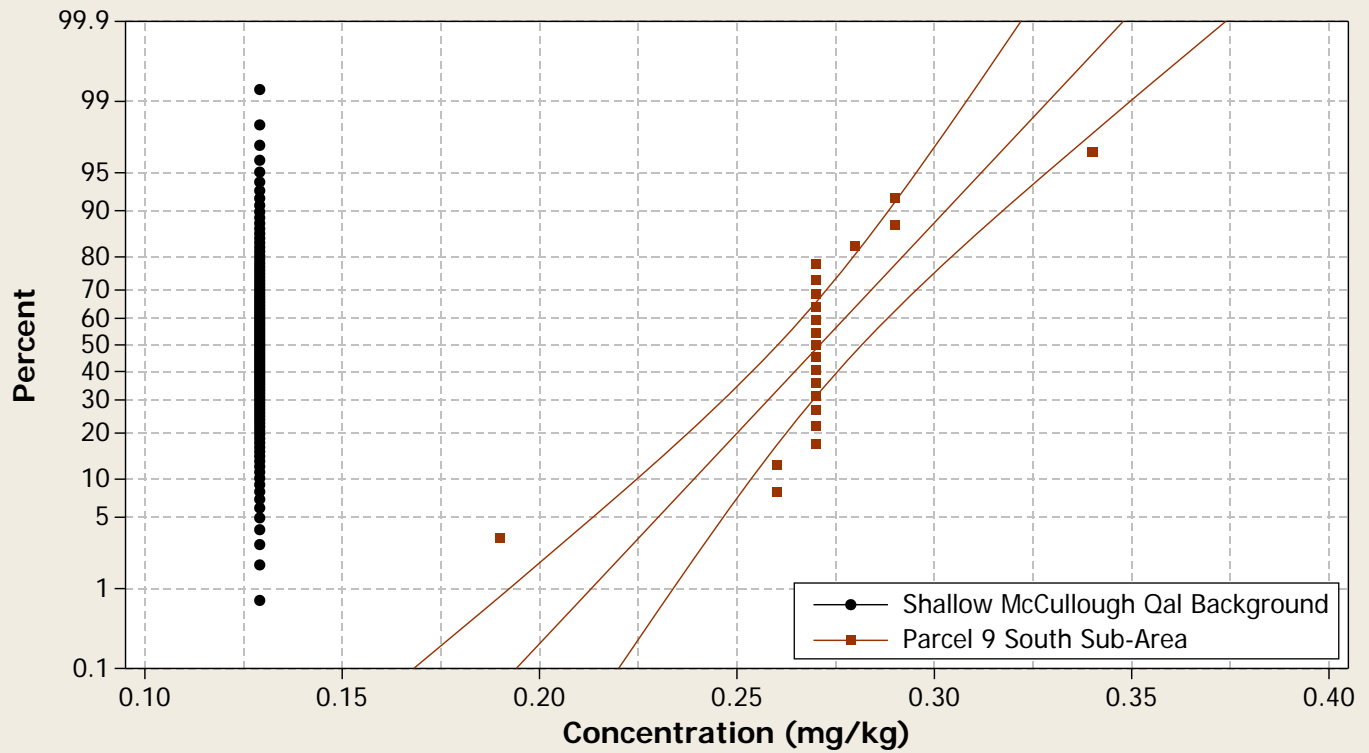
Analyte = Boron



Probability Plot

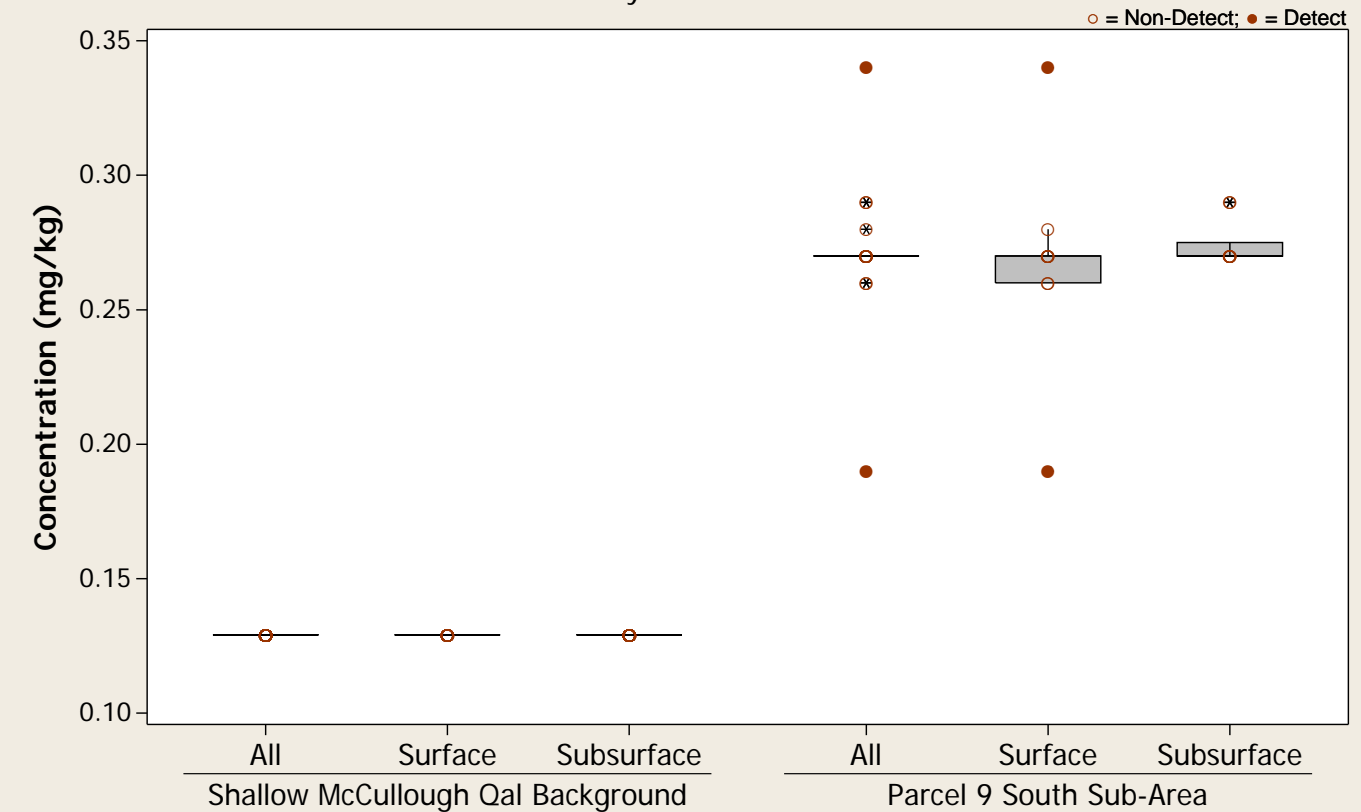
Normal - 95% CI

Analyte = Cadmium



Boxplot

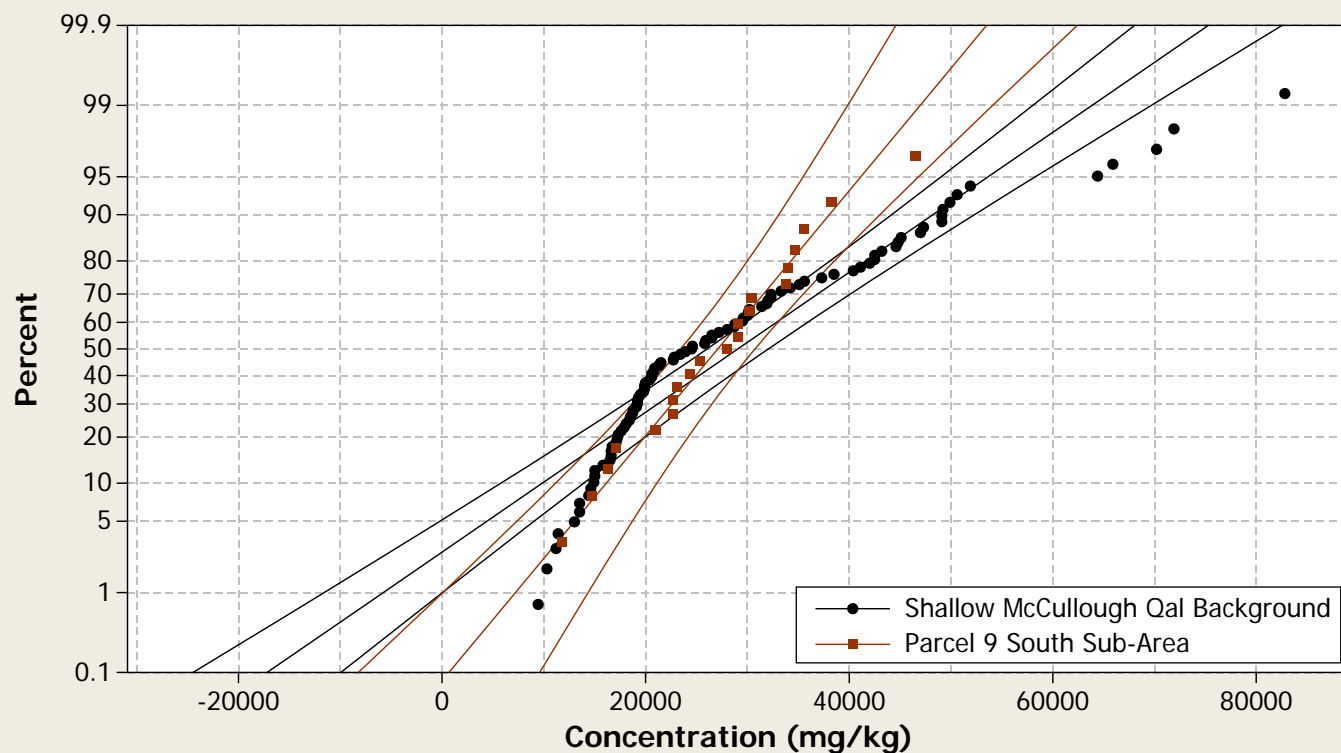
Analyte = Cadmium



Probability Plot

Normal - 95% CI

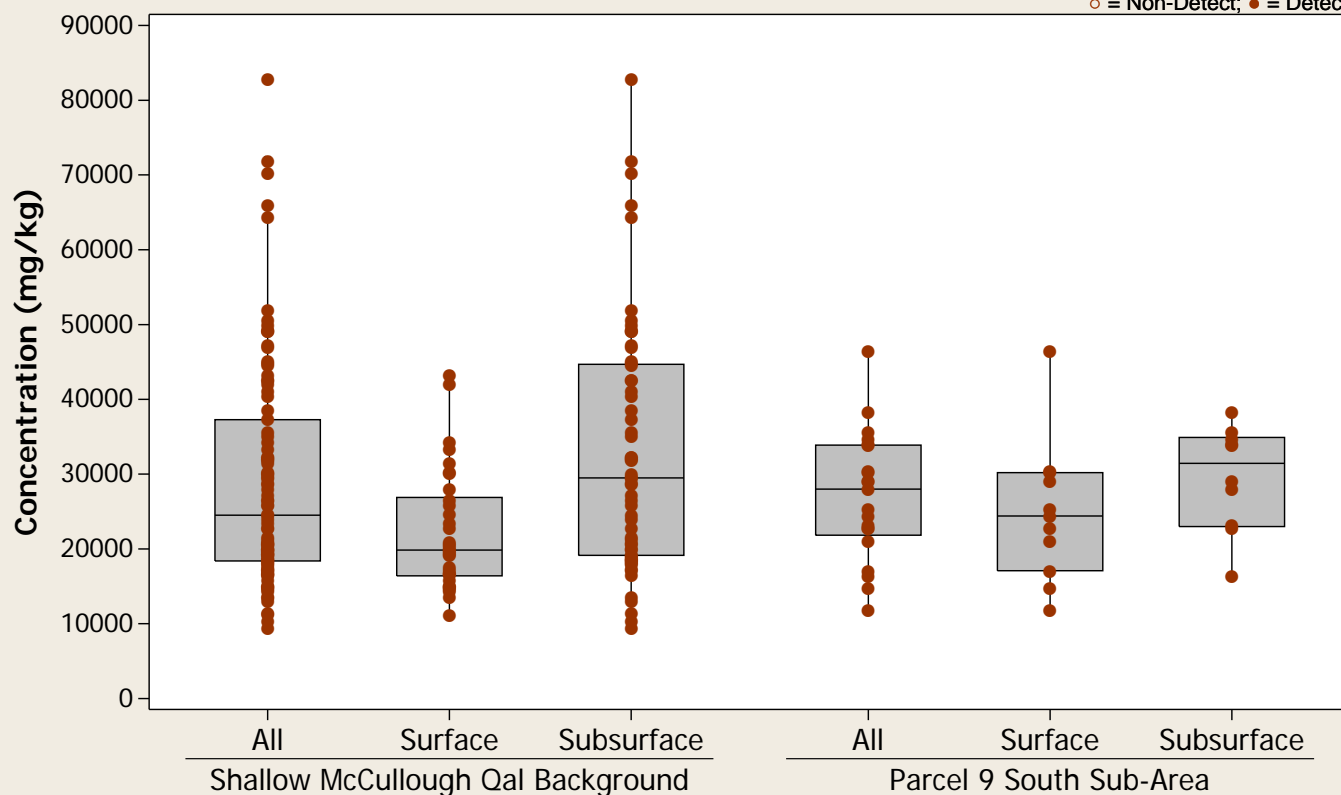
Analyte = Calcium



Boxplot

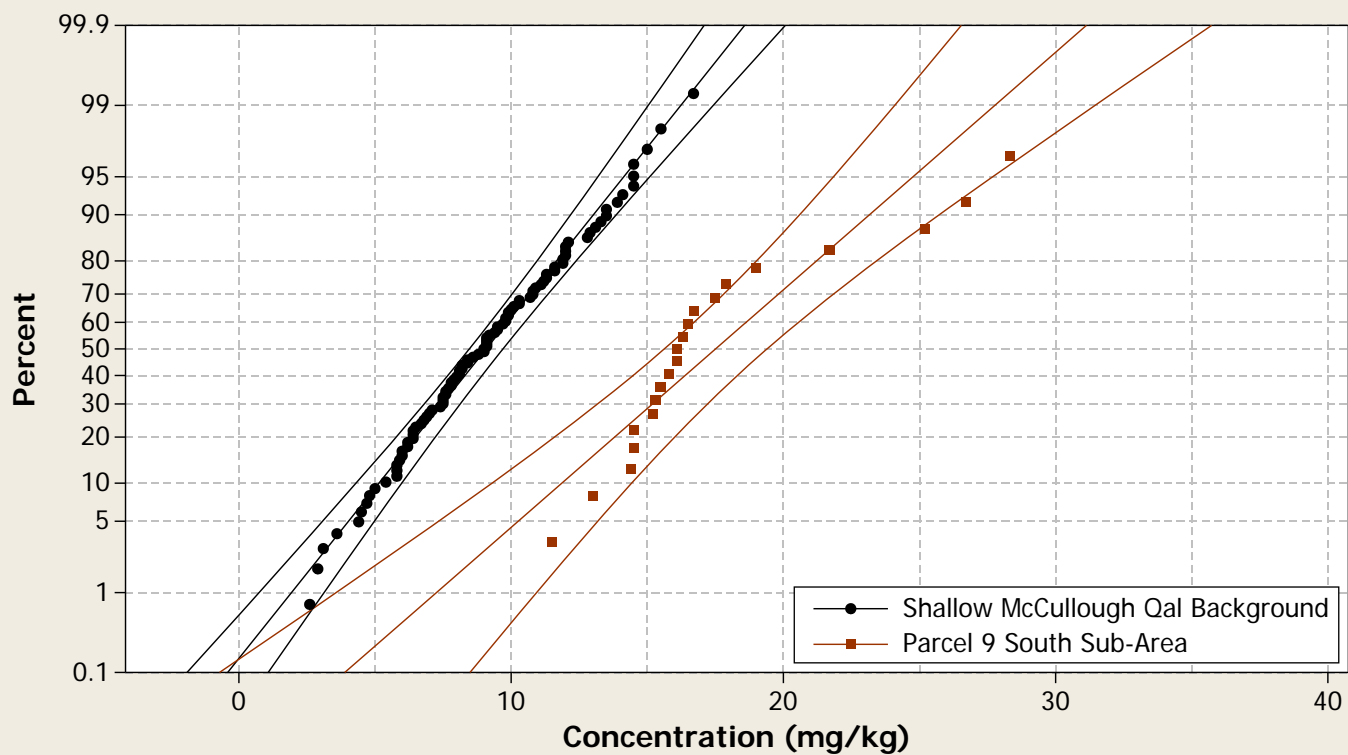
Analyte = Calcium

○ = Non-Detect; ● = Detect



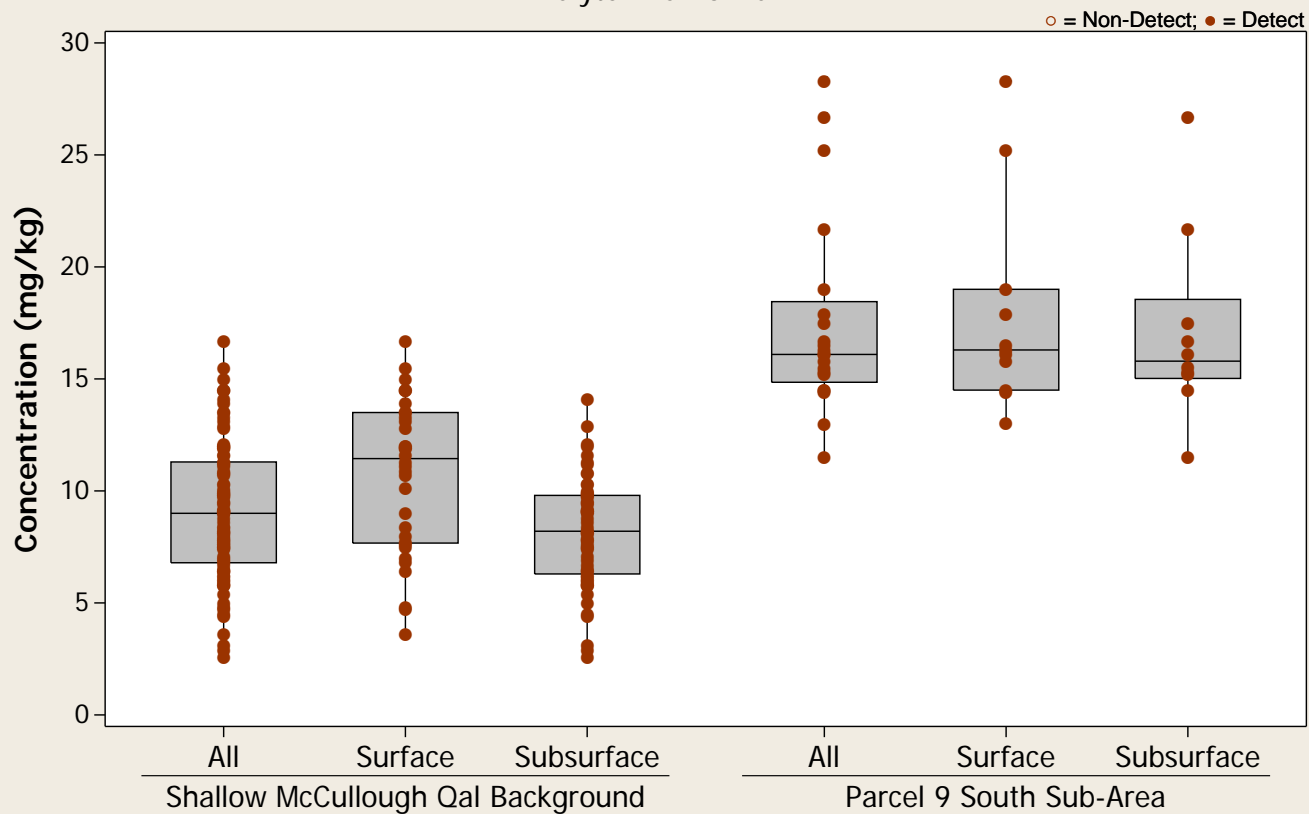
Probability Plot

Normal - 95% CI
Analyte = Chromium

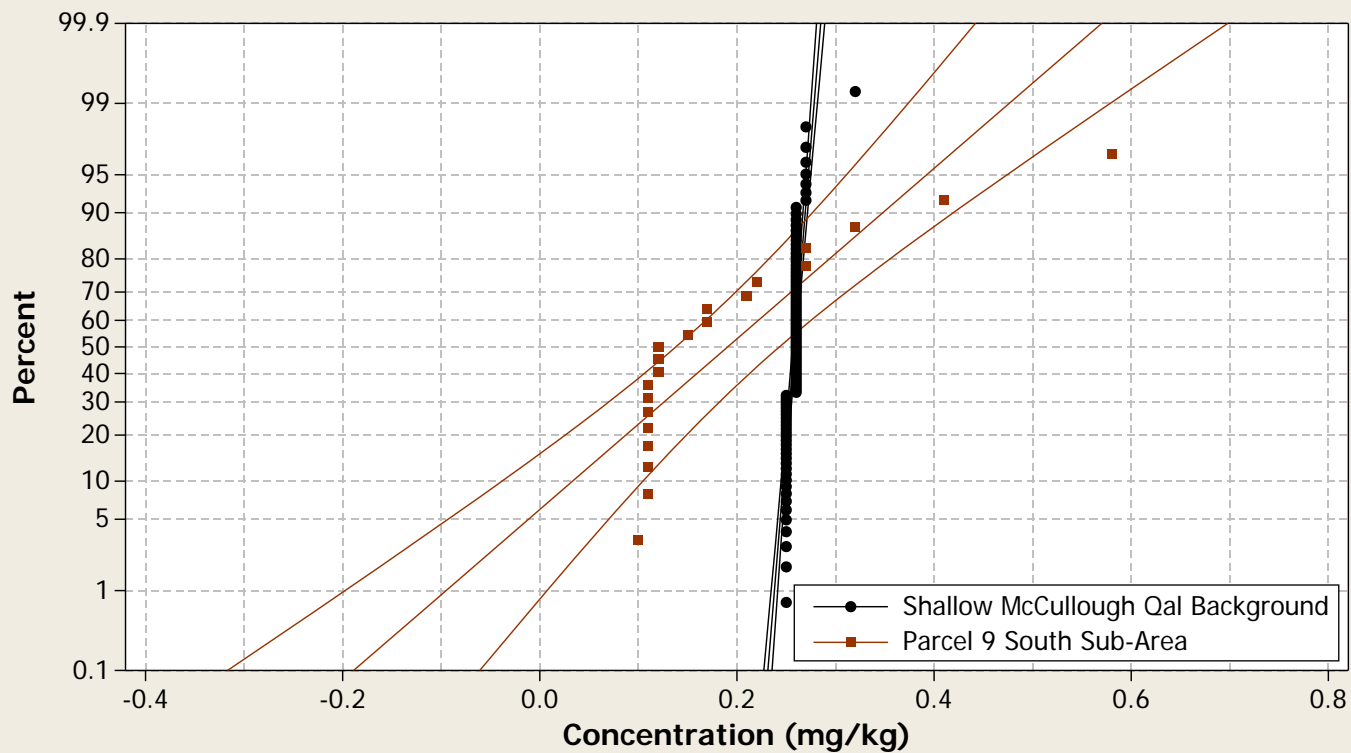


Boxplot

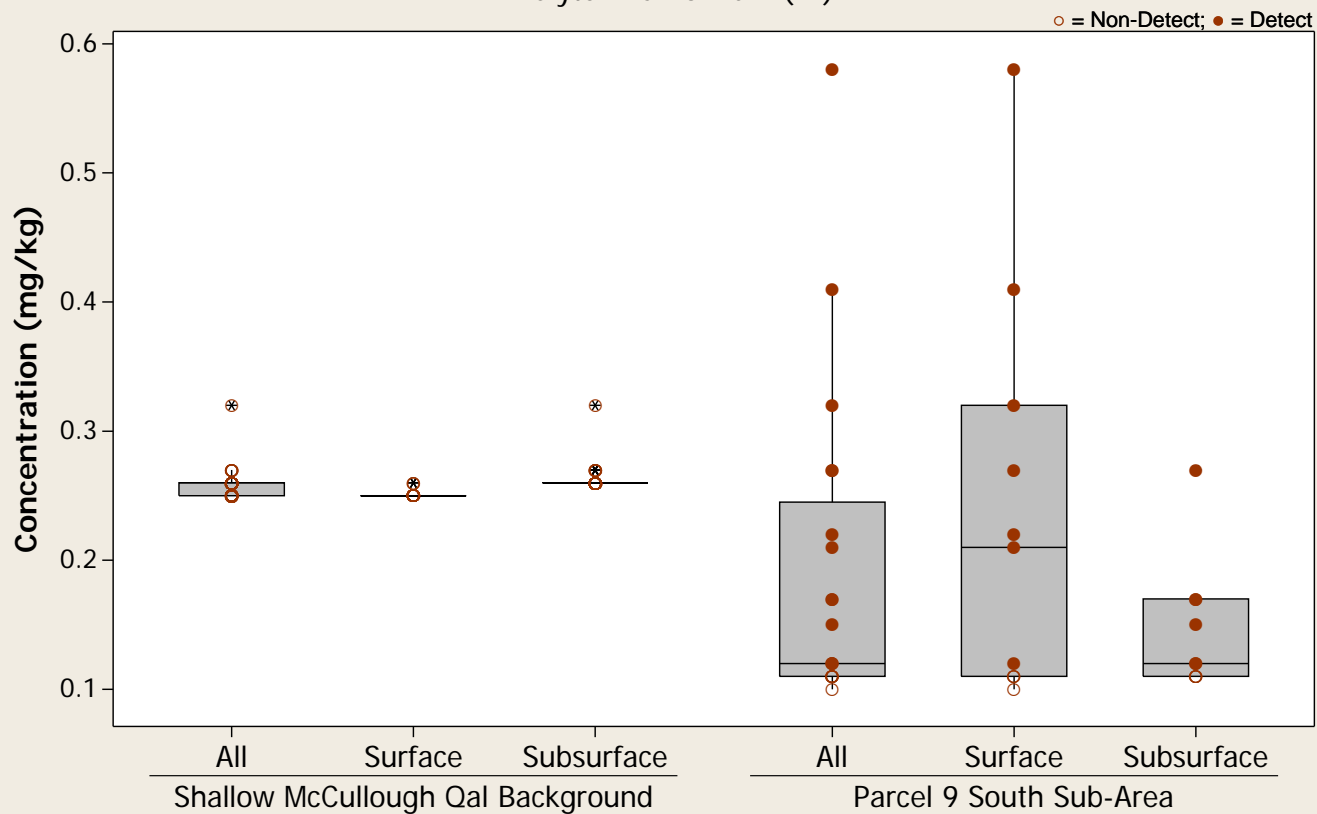
Analyte = Chromium



Probability Plot
 Normal - 95% CI
 Analyte = Chromium (VI)



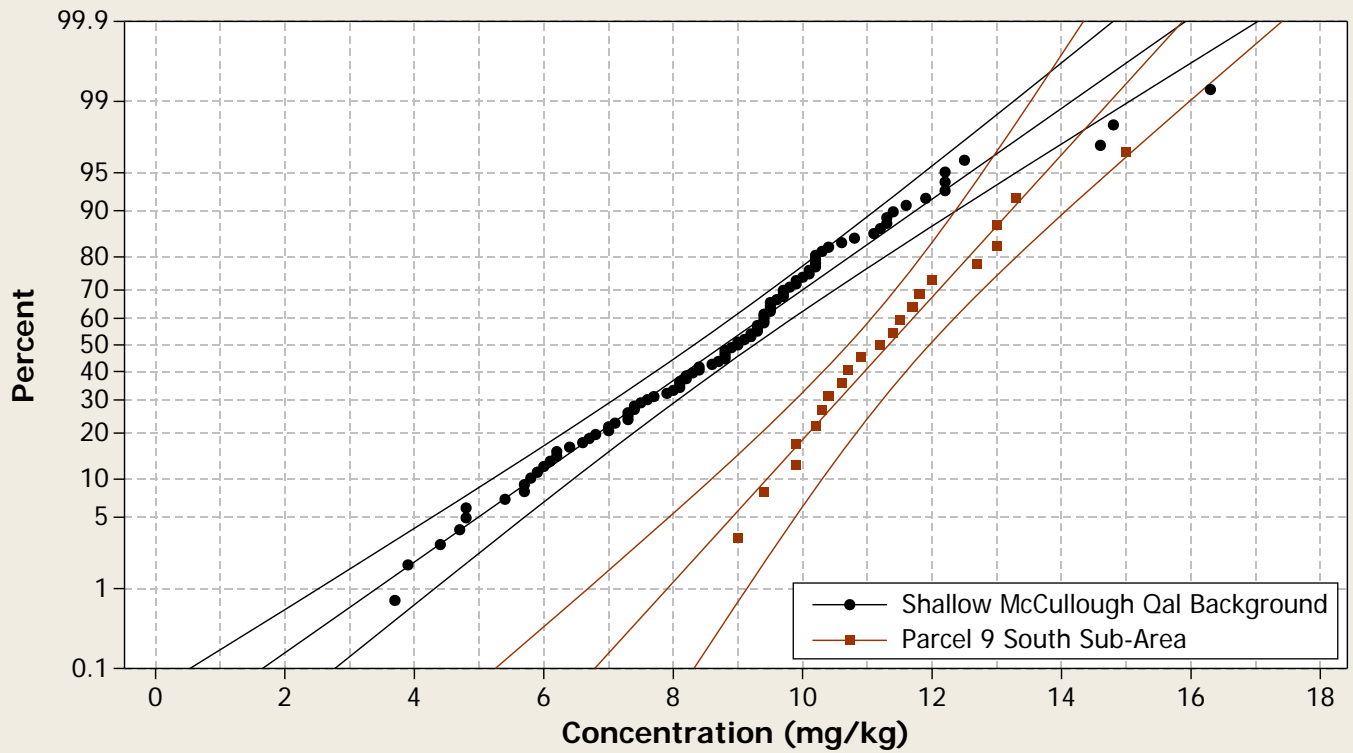
Boxplot
 Analyte = Chromium (VI)



Probability Plot

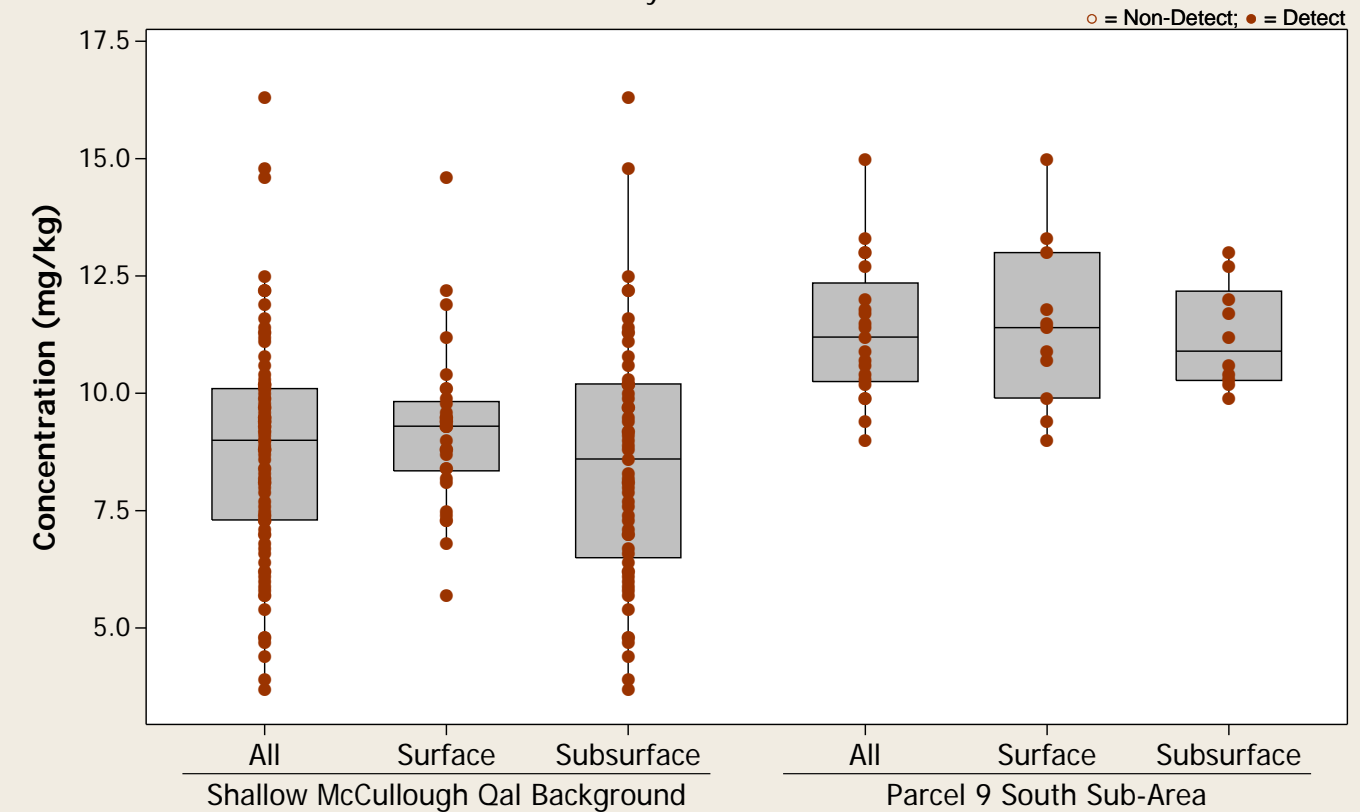
Normal - 95% CI

Analyte = Cobalt



Boxplot

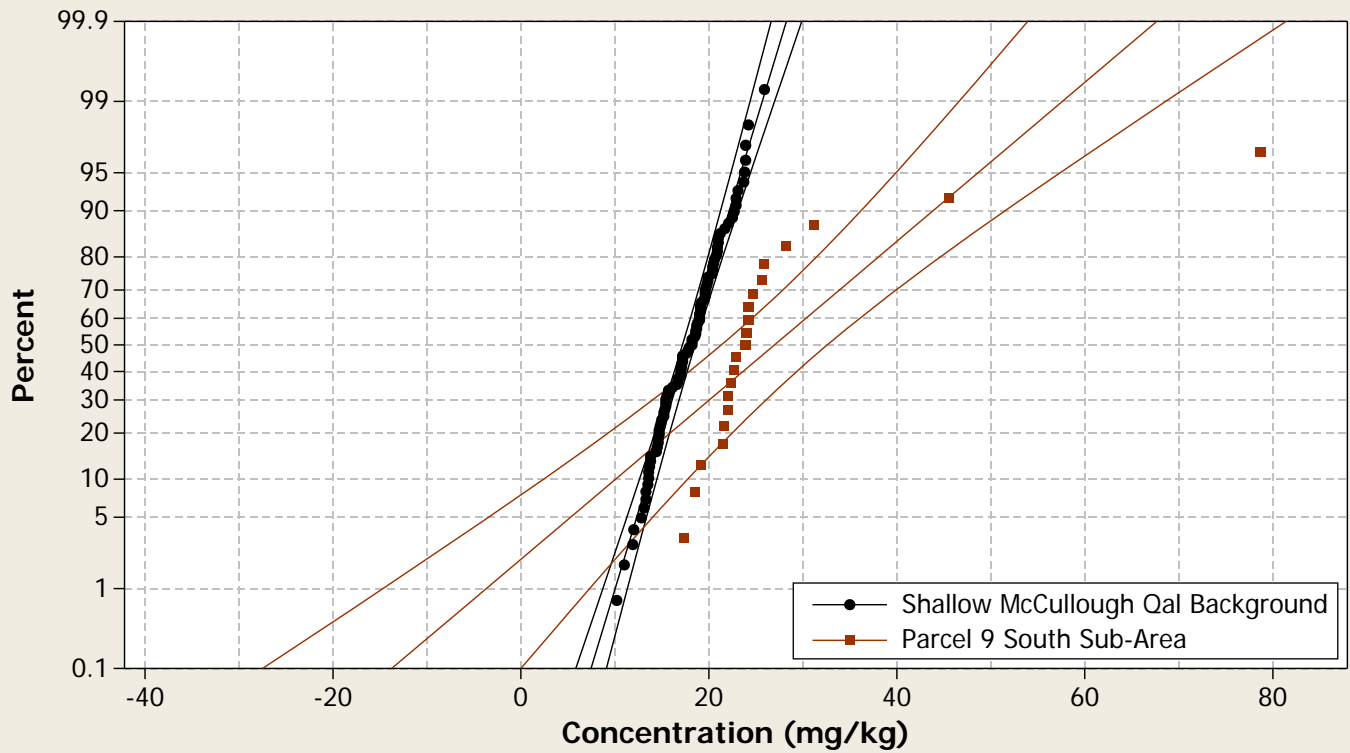
Analyte = Cobalt



Probability Plot

Normal - 95% CI

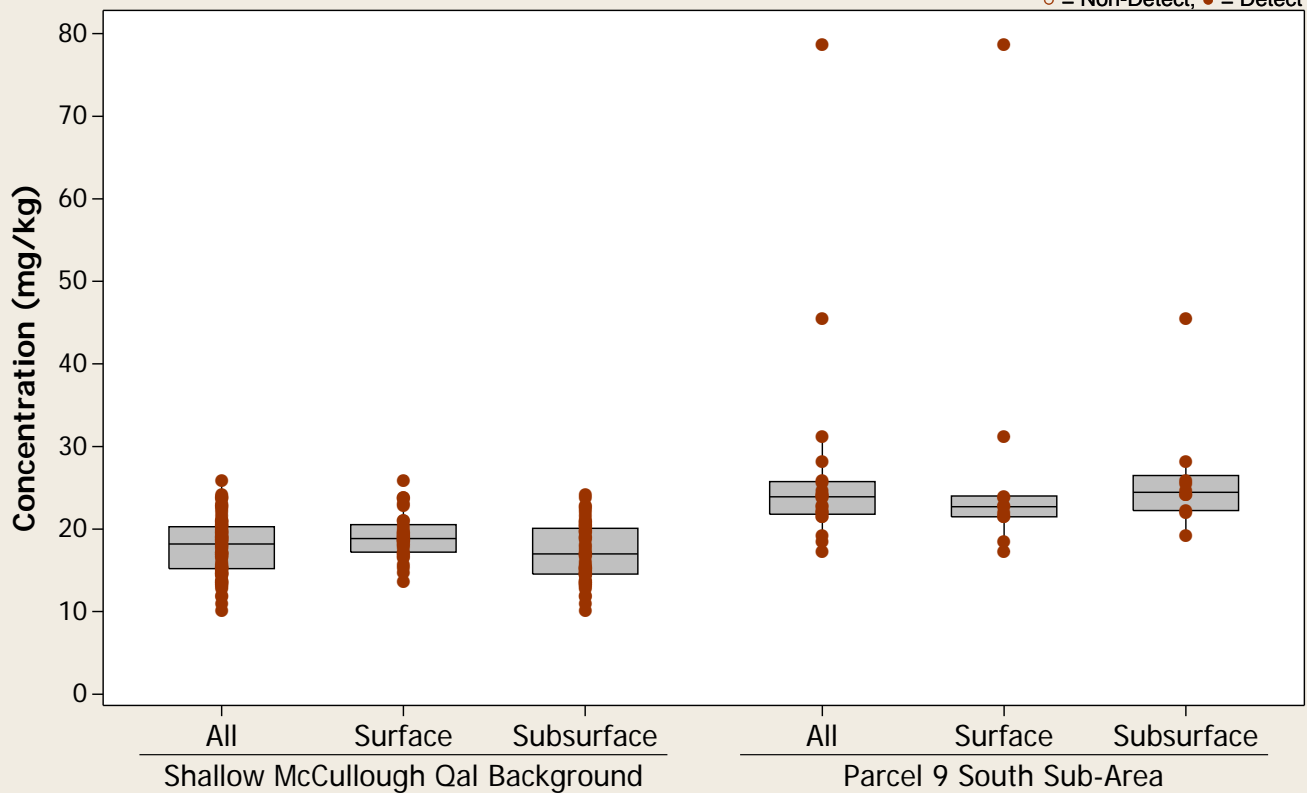
Analyte = Copper



Boxplot

Analyte = Copper

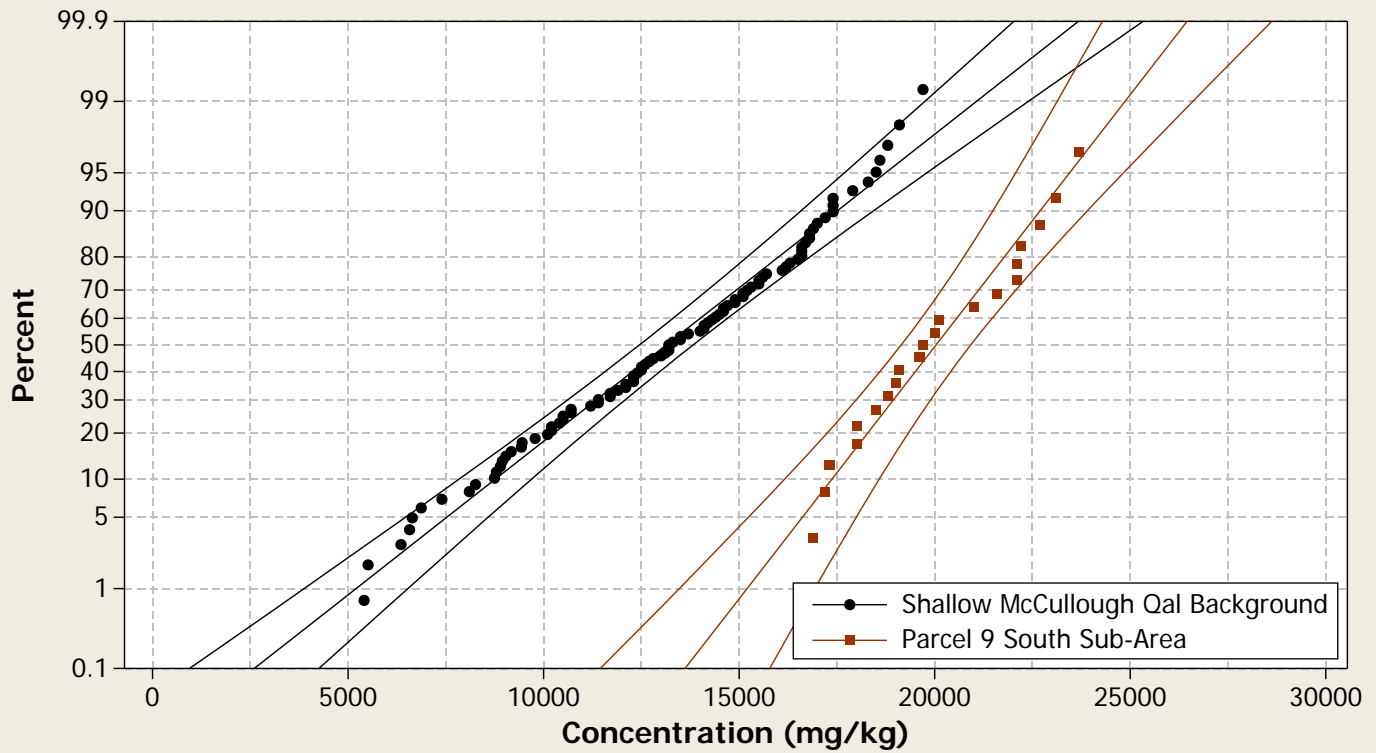
○ = Non-Detect; ● = Detect



Probability Plot

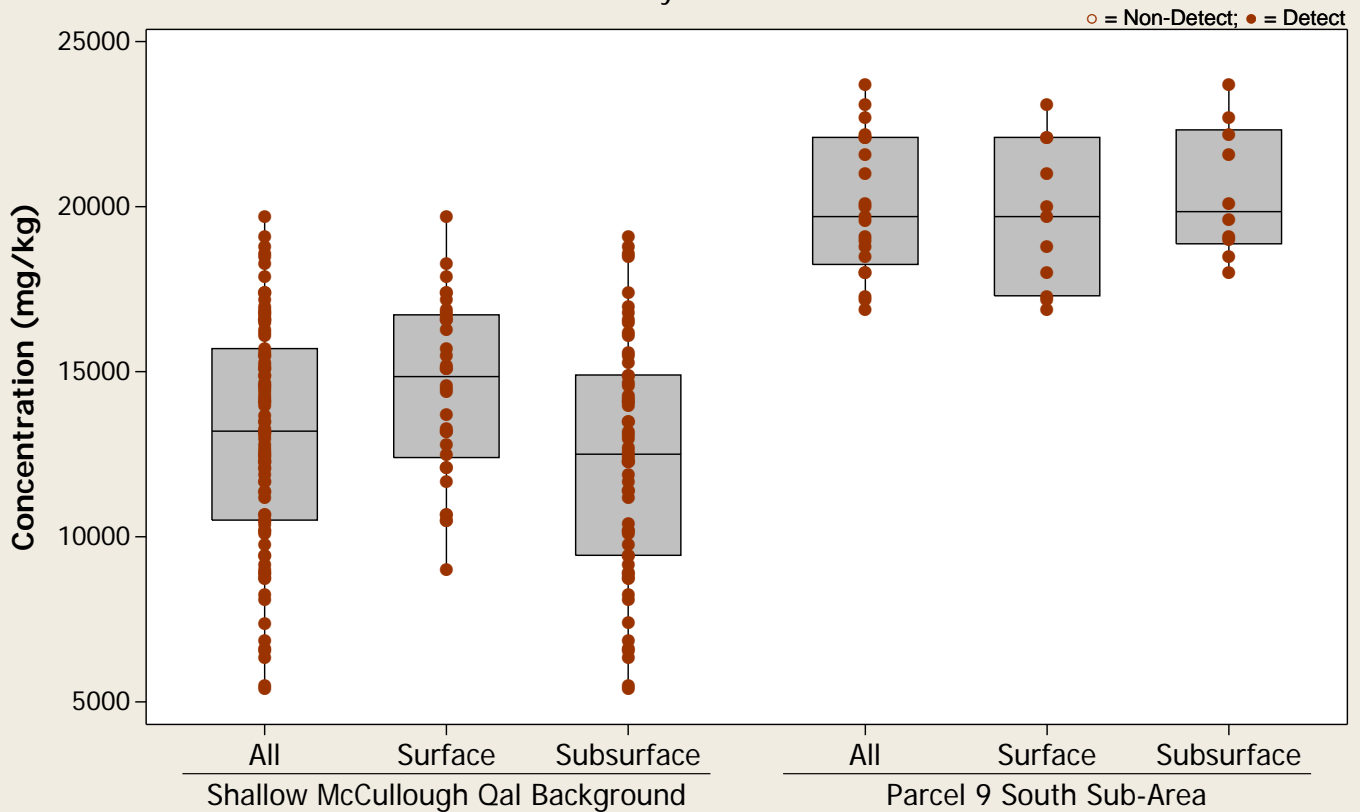
Normal - 95% CI

Analyte = Iron



Boxplot

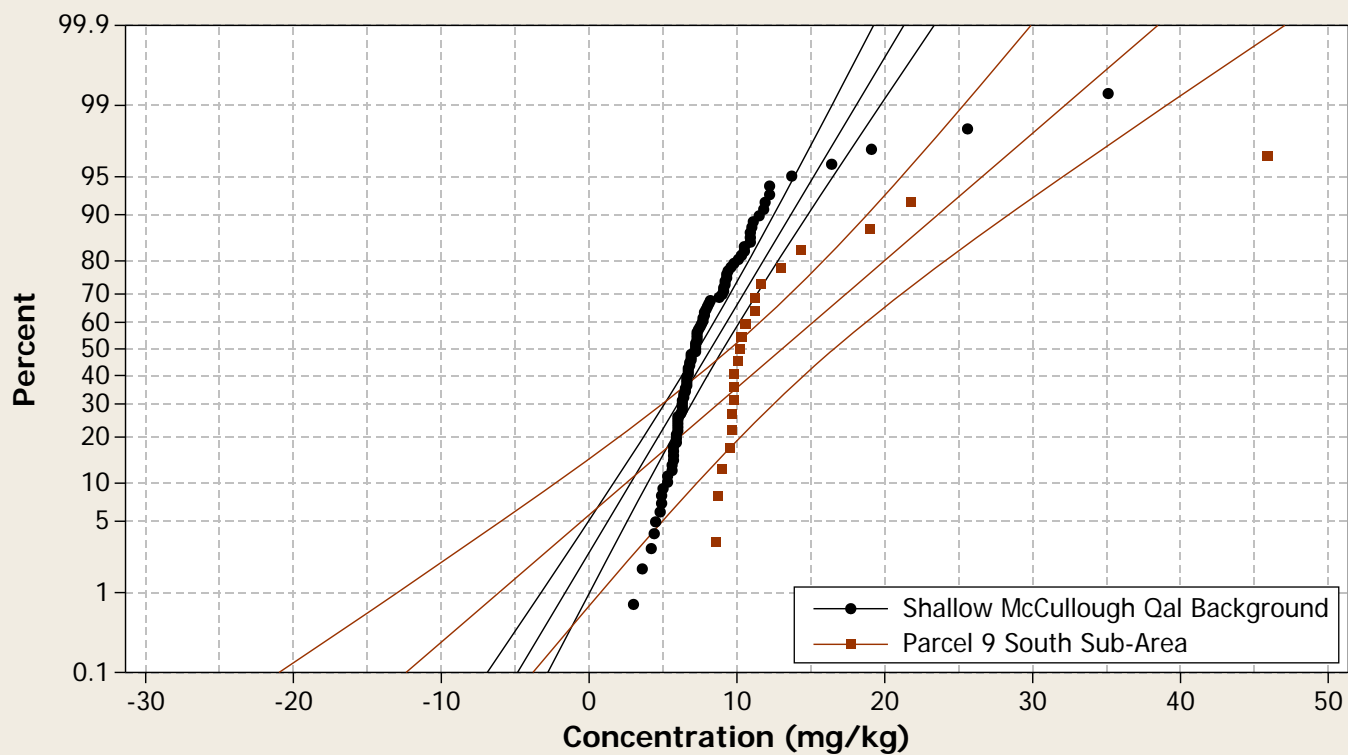
Analyte = Iron



Probability Plot

Normal - 95% CI

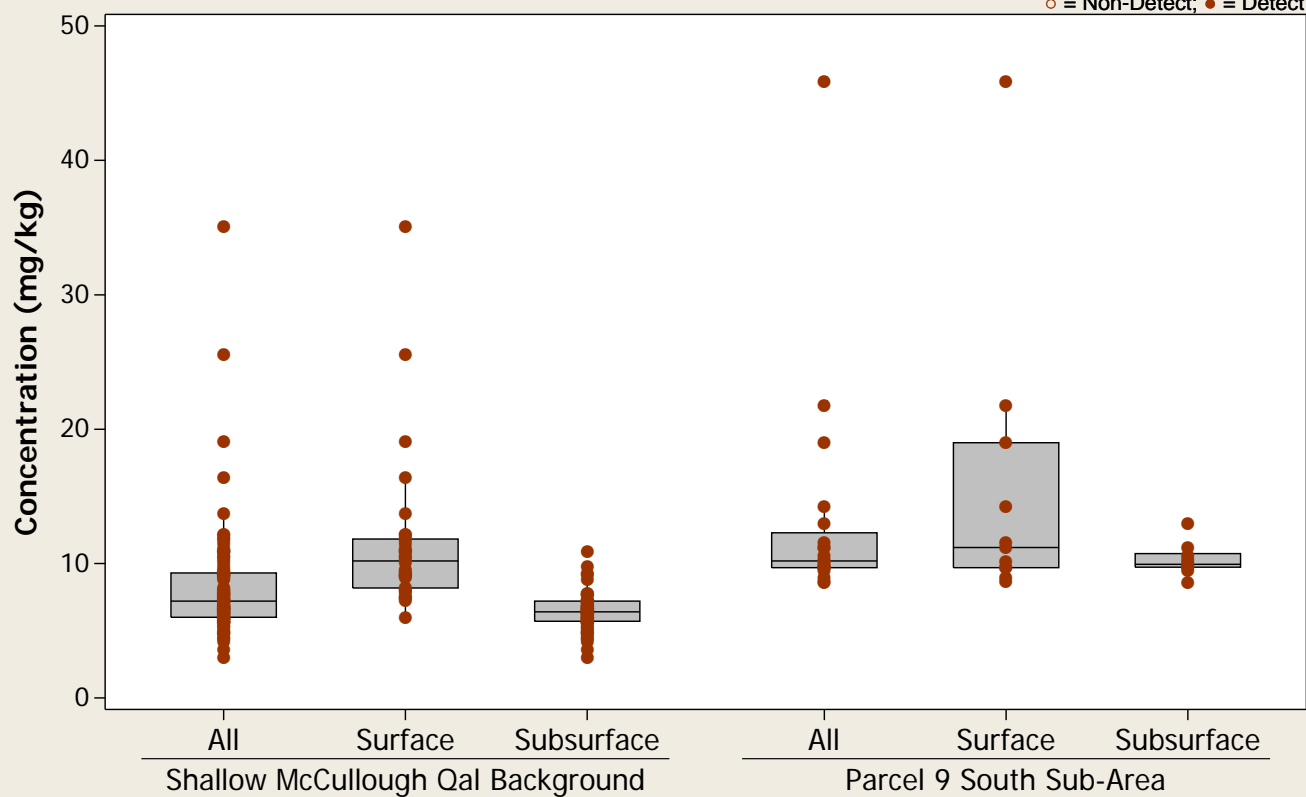
Analyte = Lead



Boxplot

Analyte = Lead

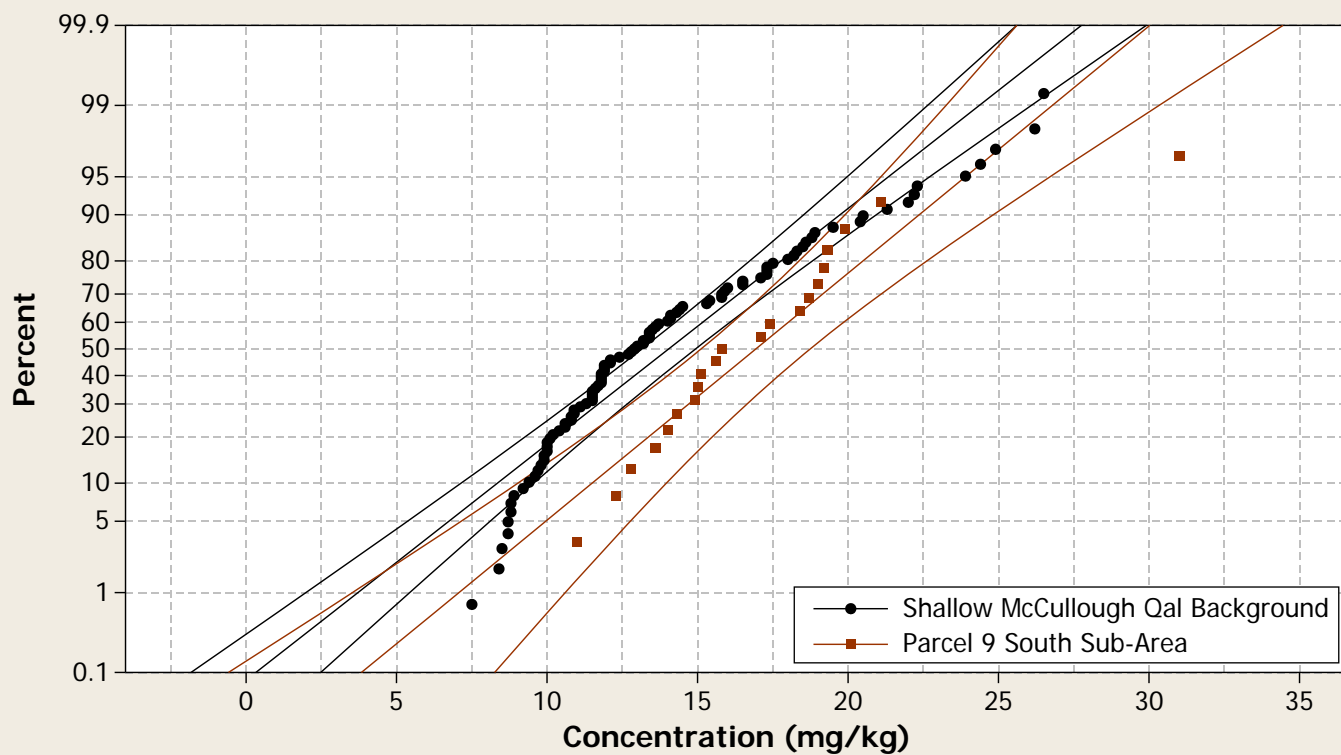
○ = Non-Detect; ● = Detect



Probability Plot

Normal - 95% CI

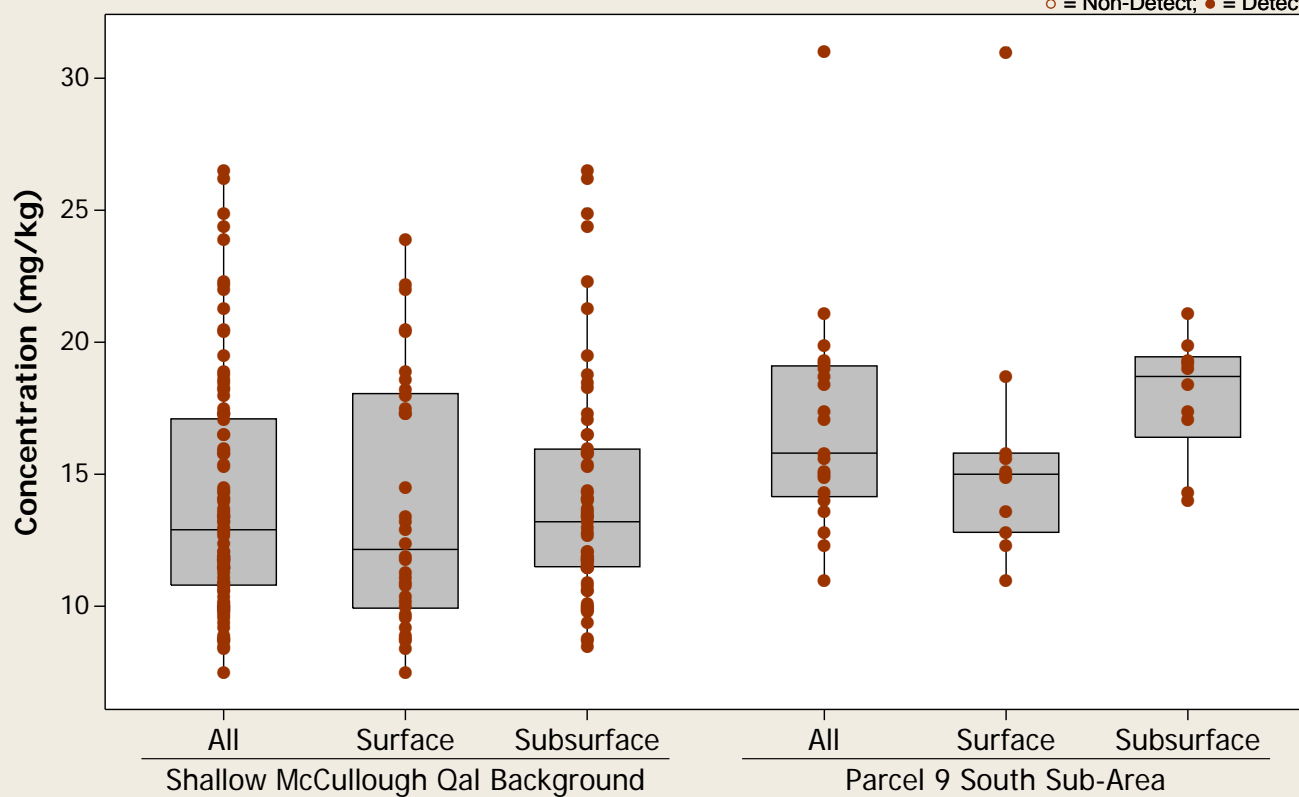
Analyte = Lithium



Boxplot

Analyte = Lithium

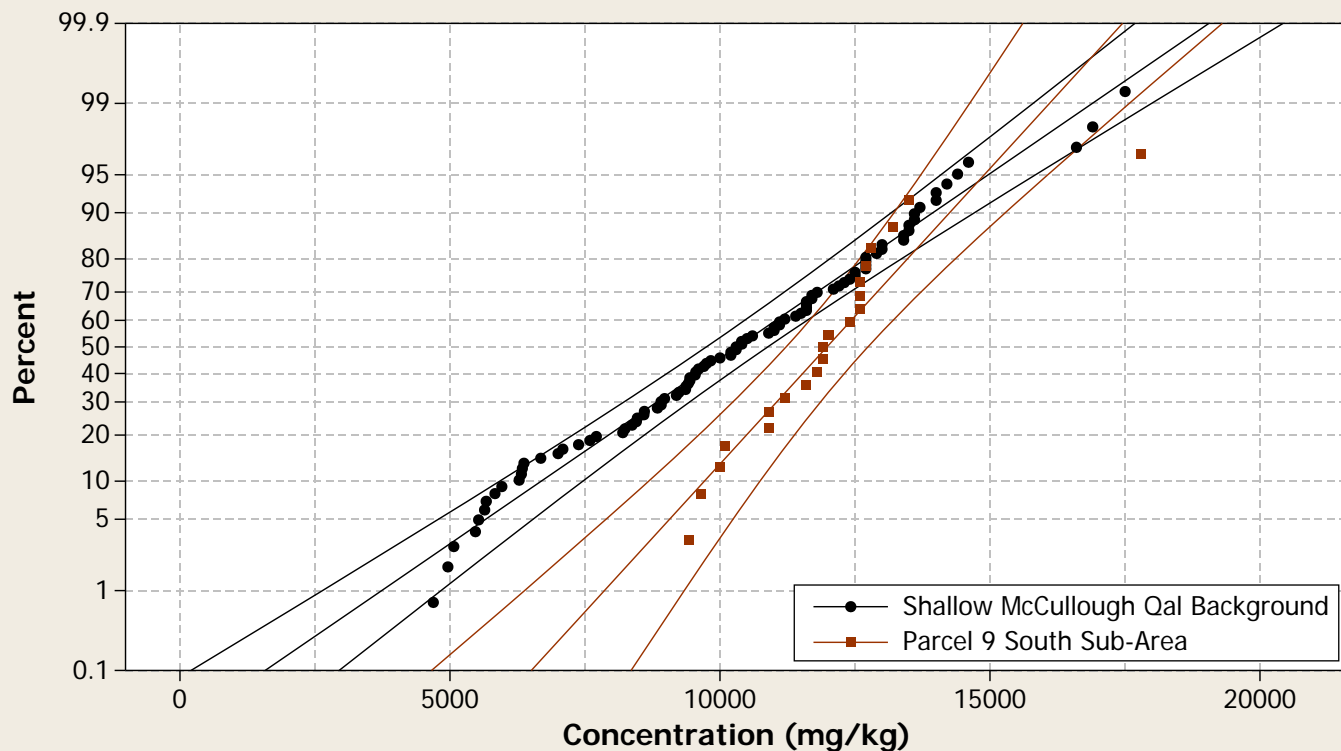
○ = Non-Detect; ● = Detect



Probability Plot

Normal - 95% CI

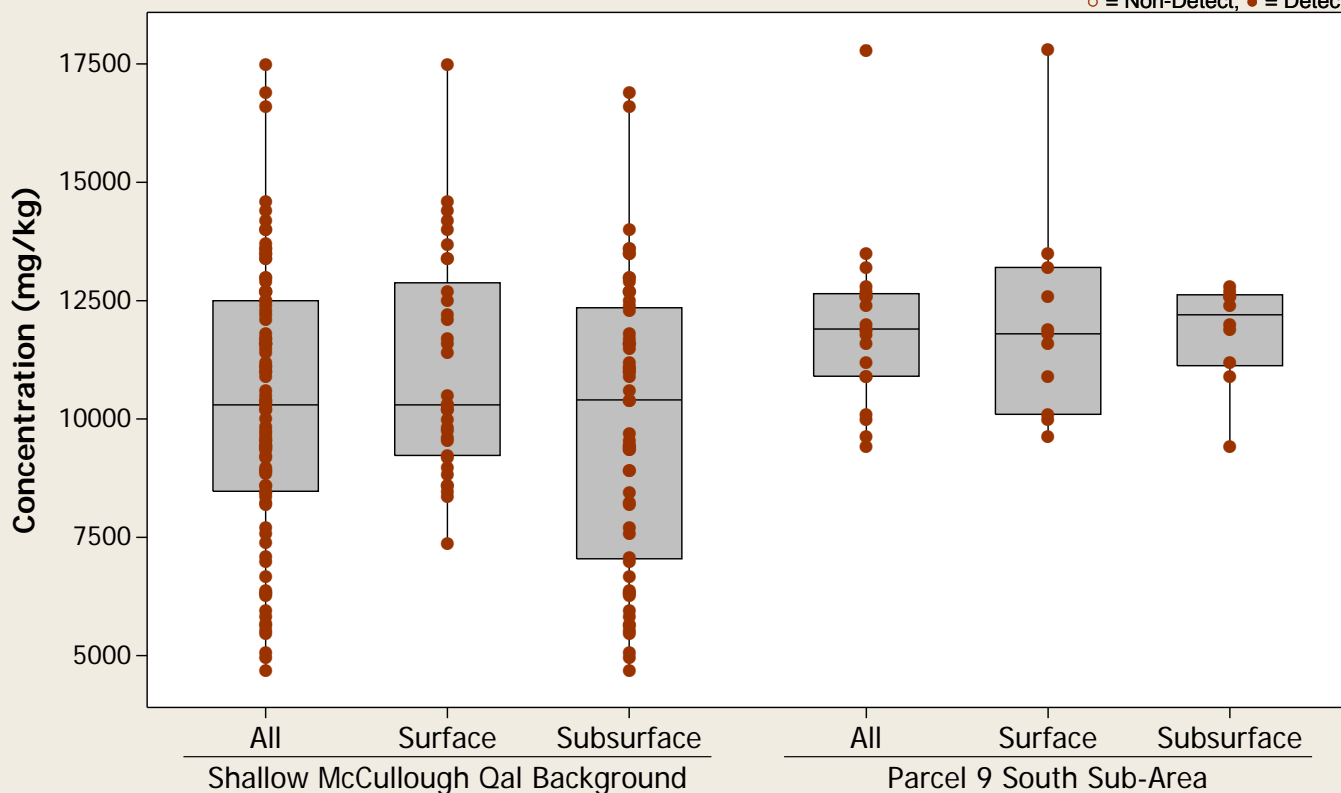
Analyte = Magnesium



Boxplot

Analyte = Magnesium

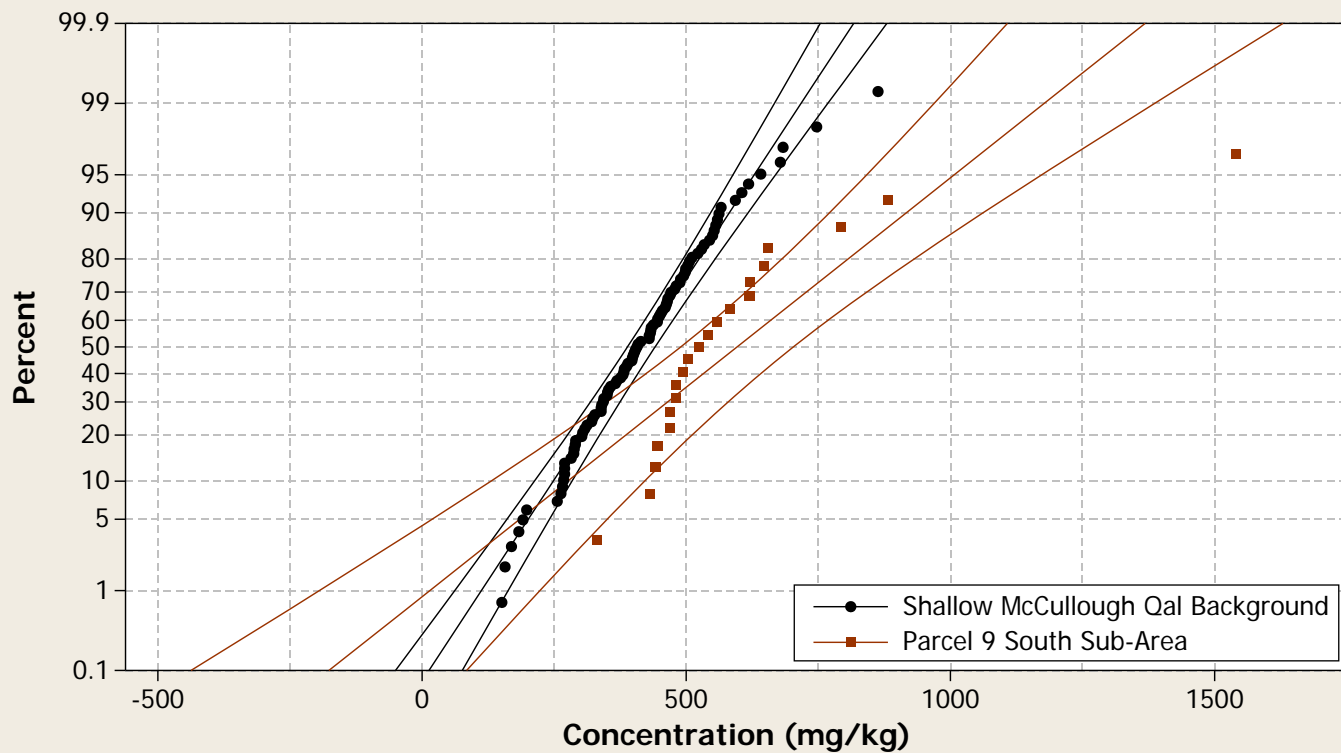
○ = Non-Detect; ● = Detect



Probability Plot

Normal - 95% CI

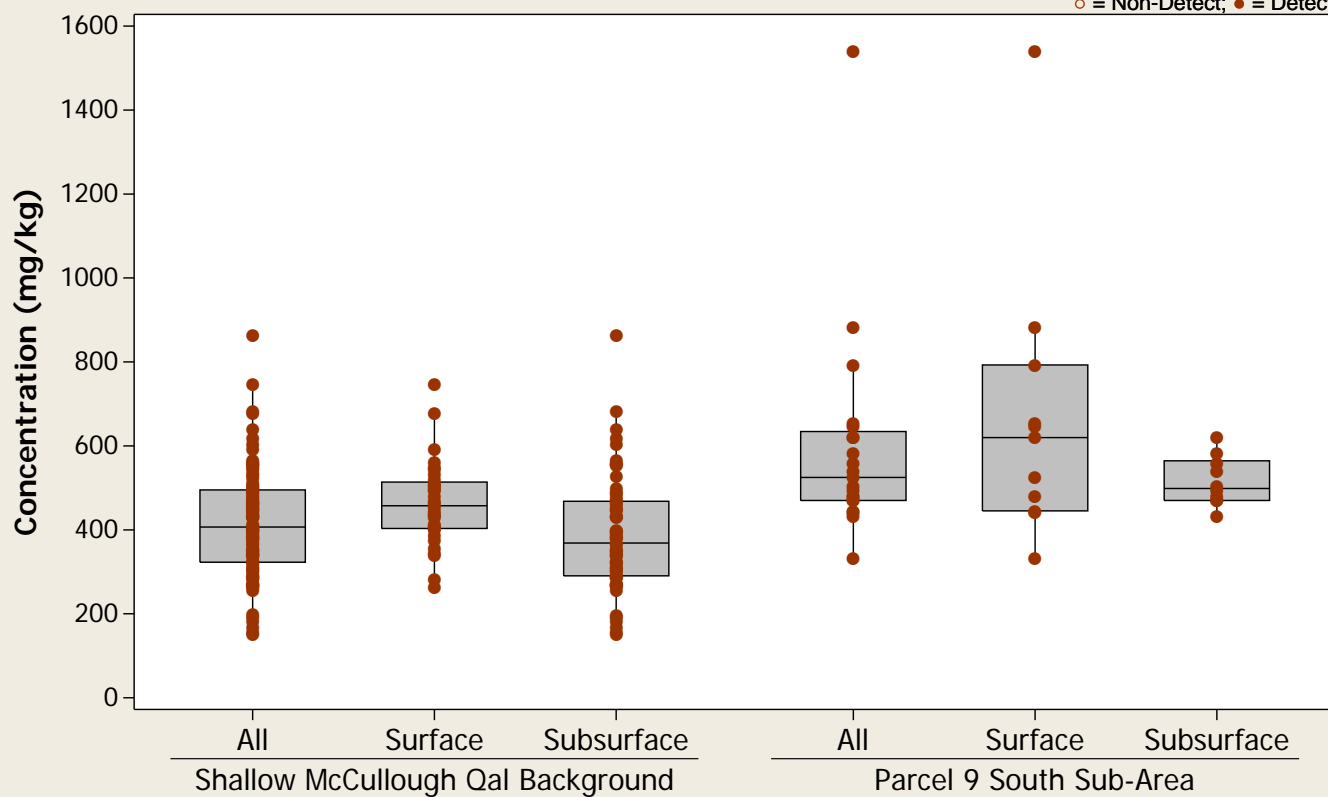
Analyte = Manganese



Boxplot

Analyte = Manganese

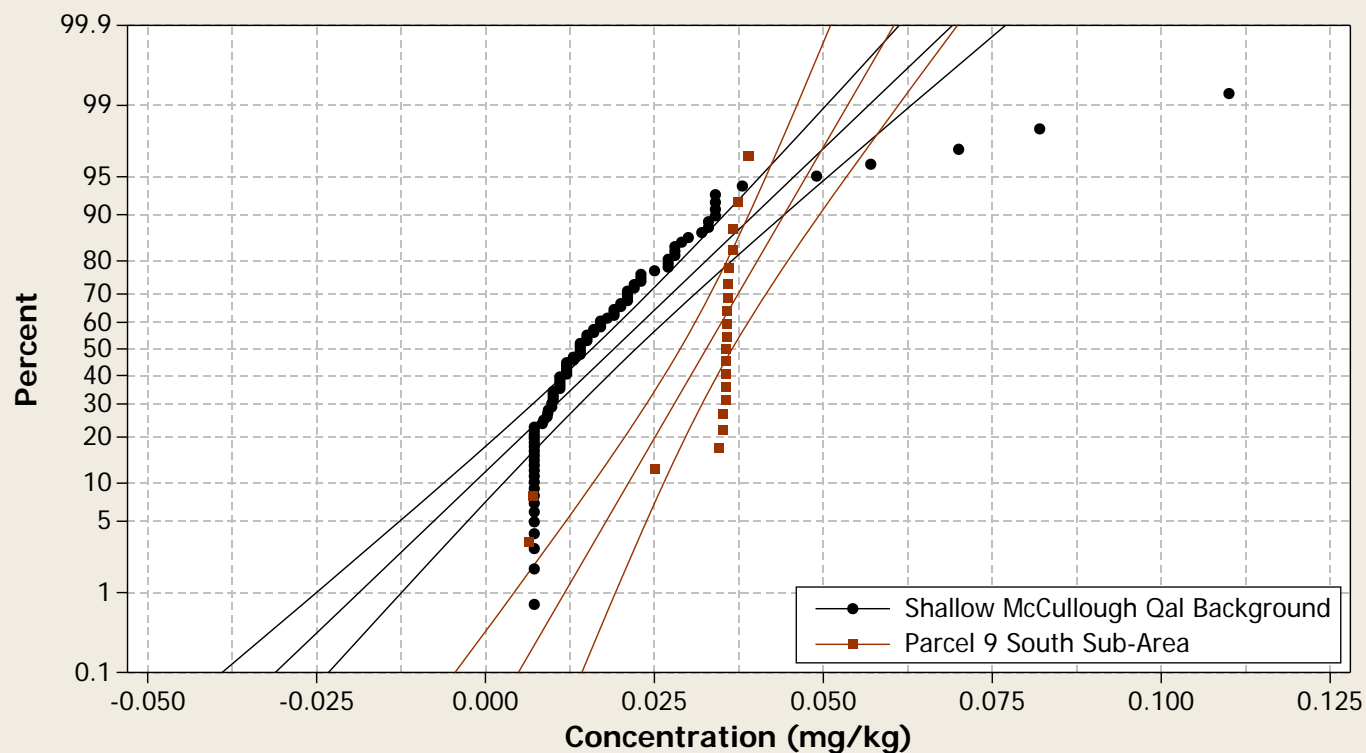
○ = Non-Detect; ● = Detect



Probability Plot

Normal - 95% CI

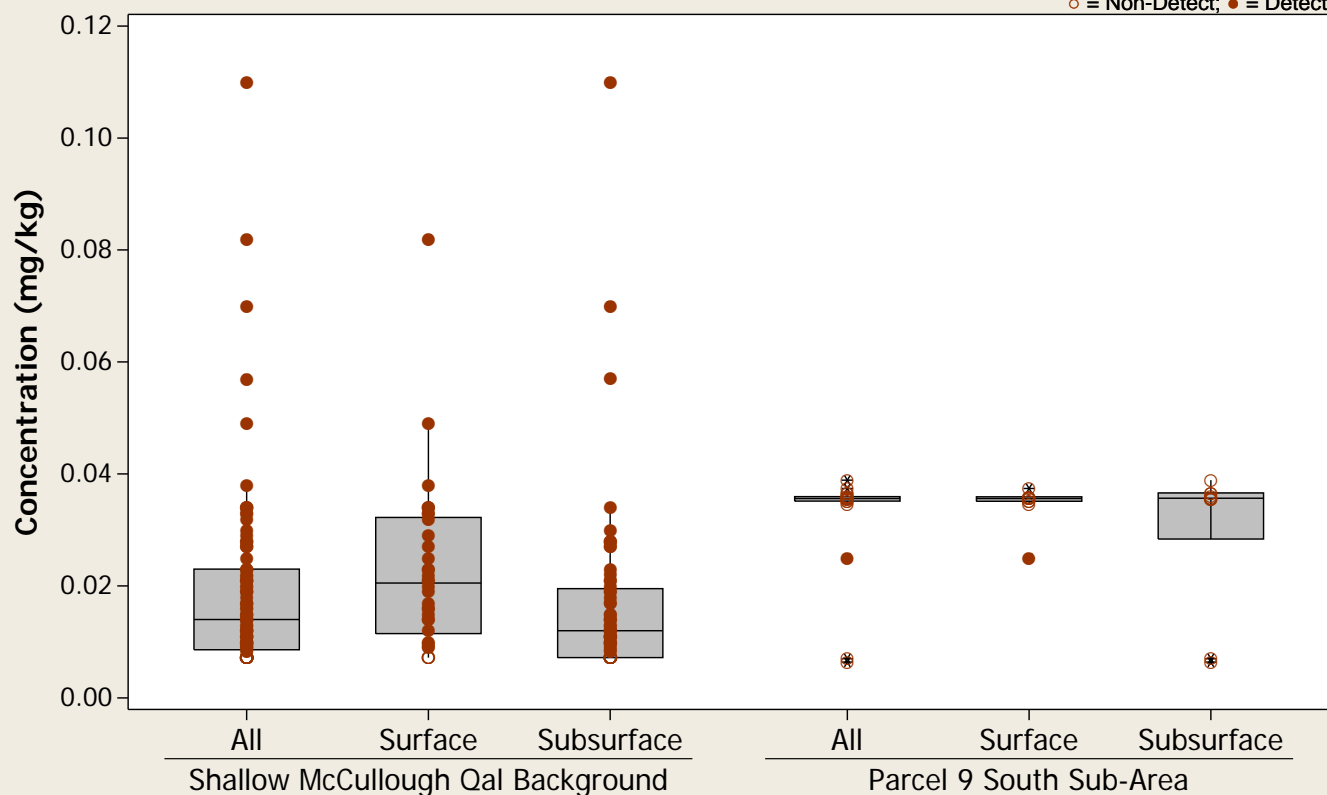
Analyte = Mercury



Boxplot

Analyte = Mercury

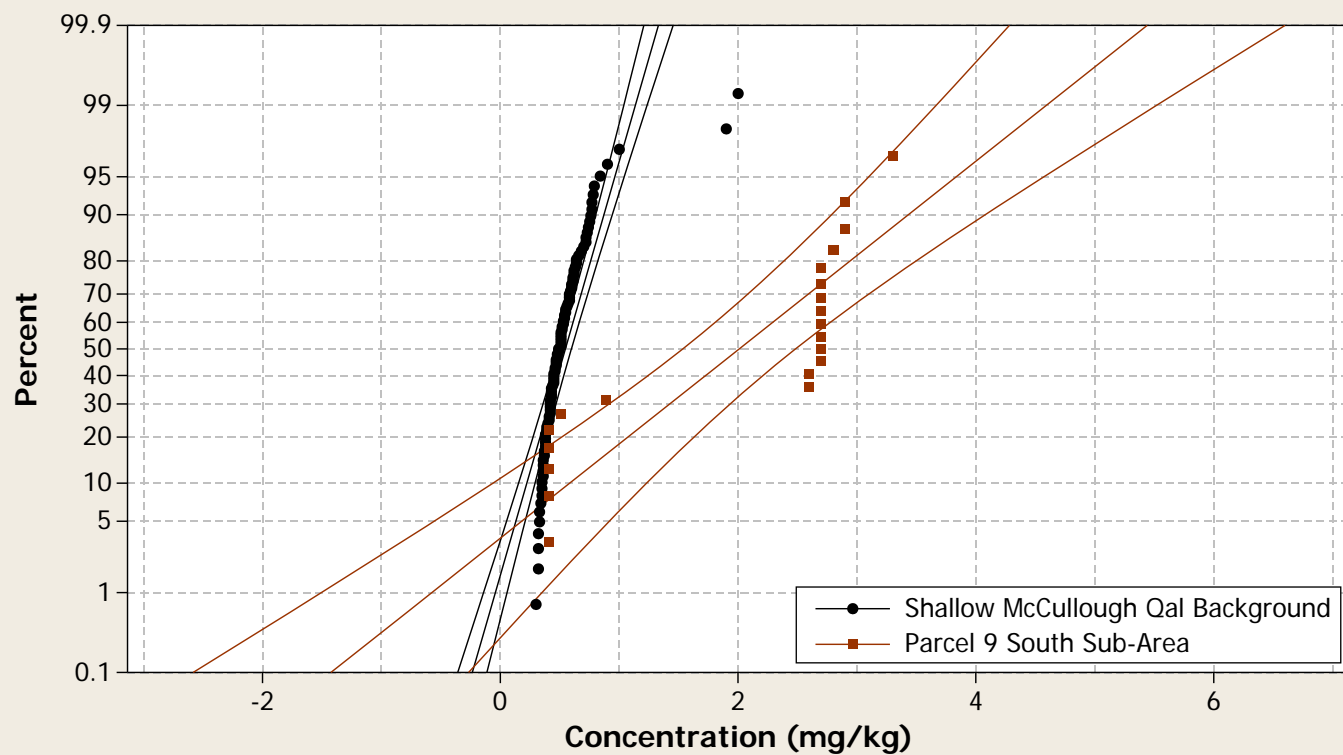
○ = Non-Detect; ● = Detect



Probability Plot

Normal - 95% CI

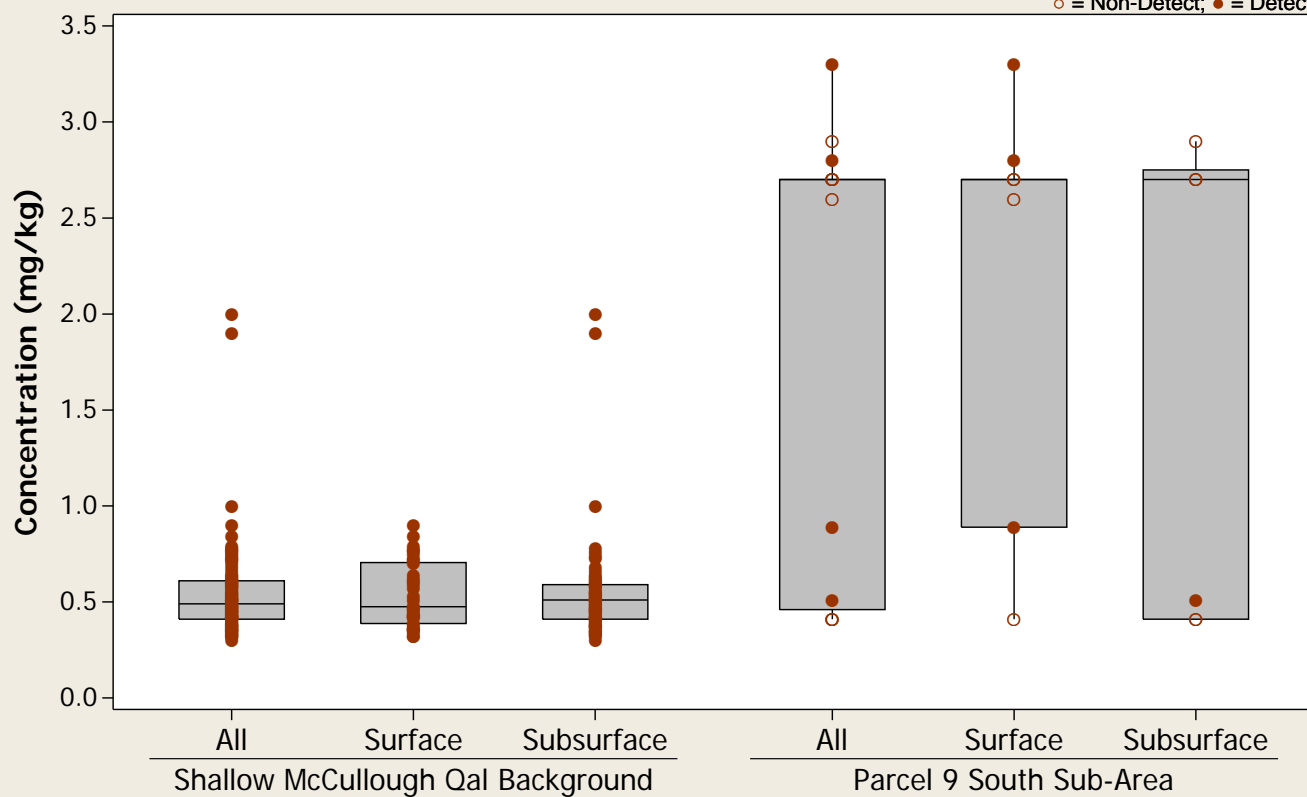
Analyte = Molybdenum



Boxplot

Analyte = Molybdenum

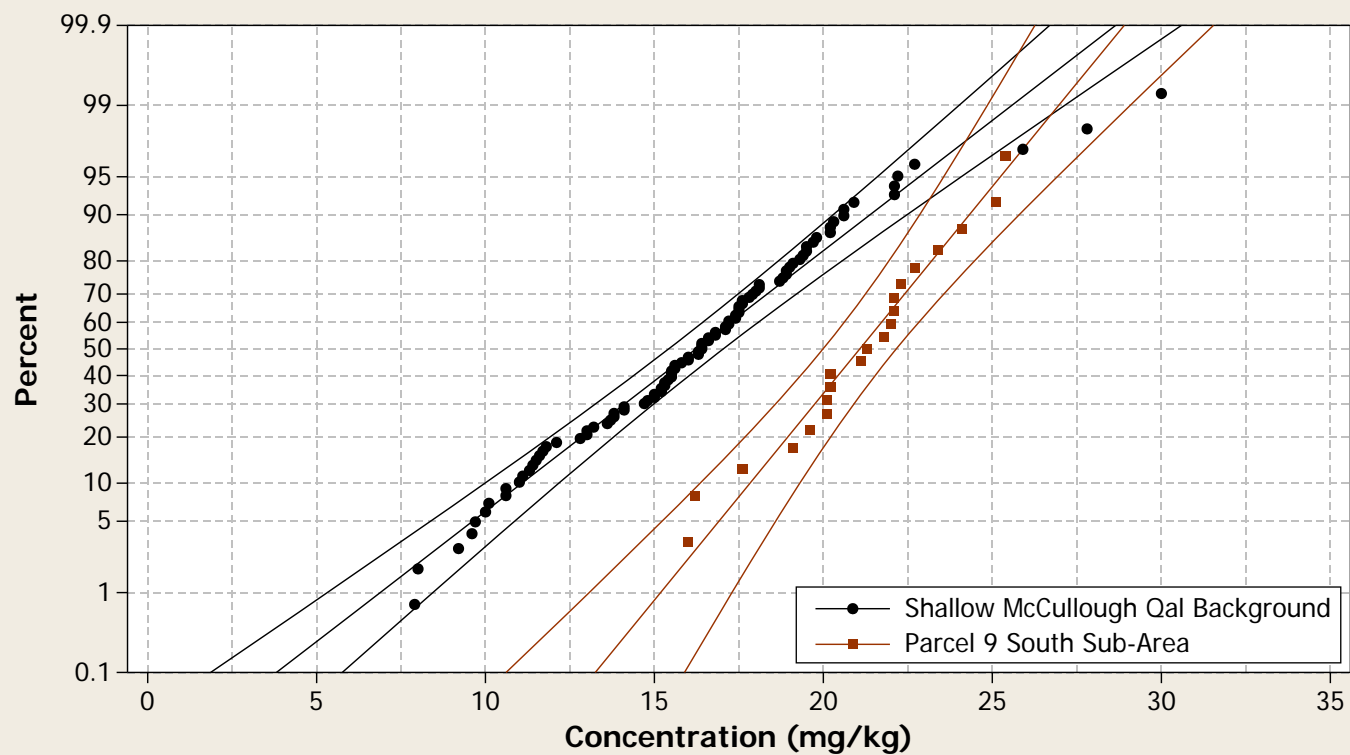
○ = Non-Detect; ● = Detect



Probability Plot

Normal - 95% CI

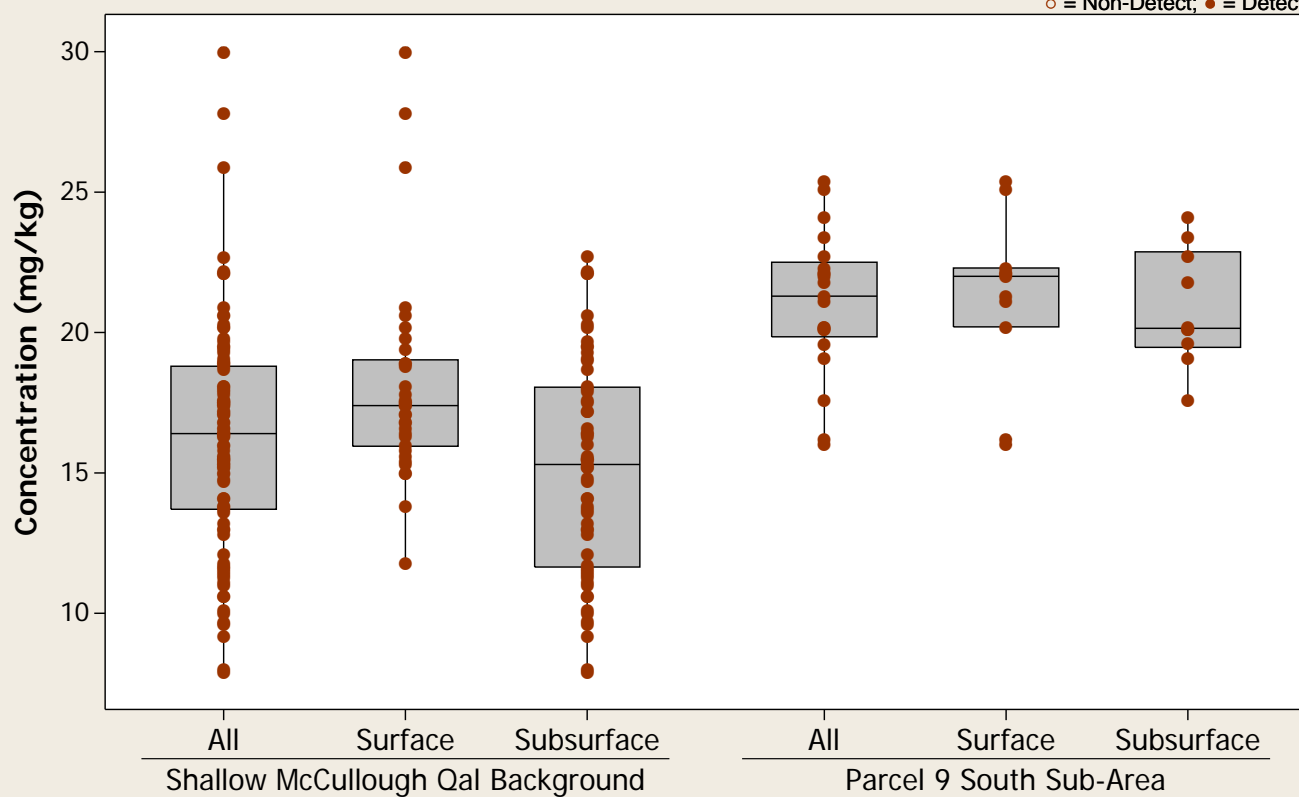
Analyte = Nickel



Boxplot

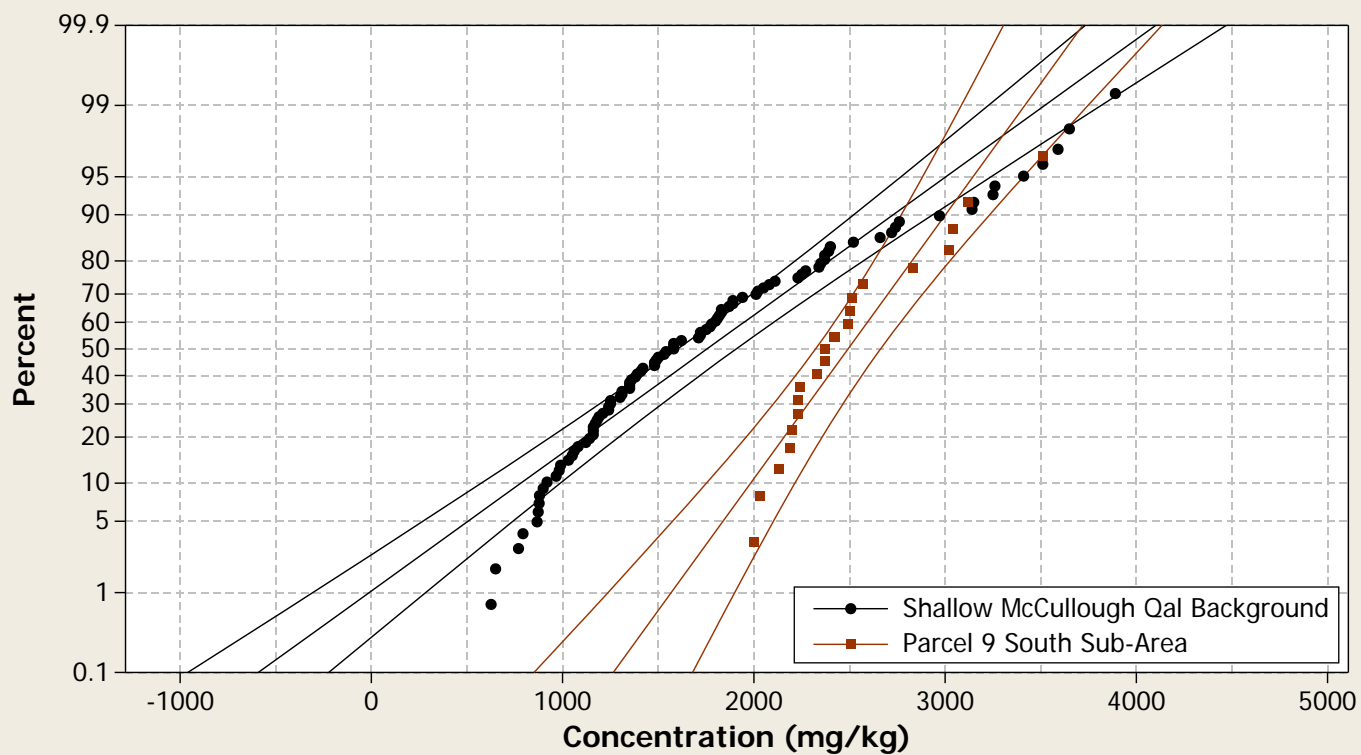
Analyte = Nickel

○ = Non-Detect; ● = Detect



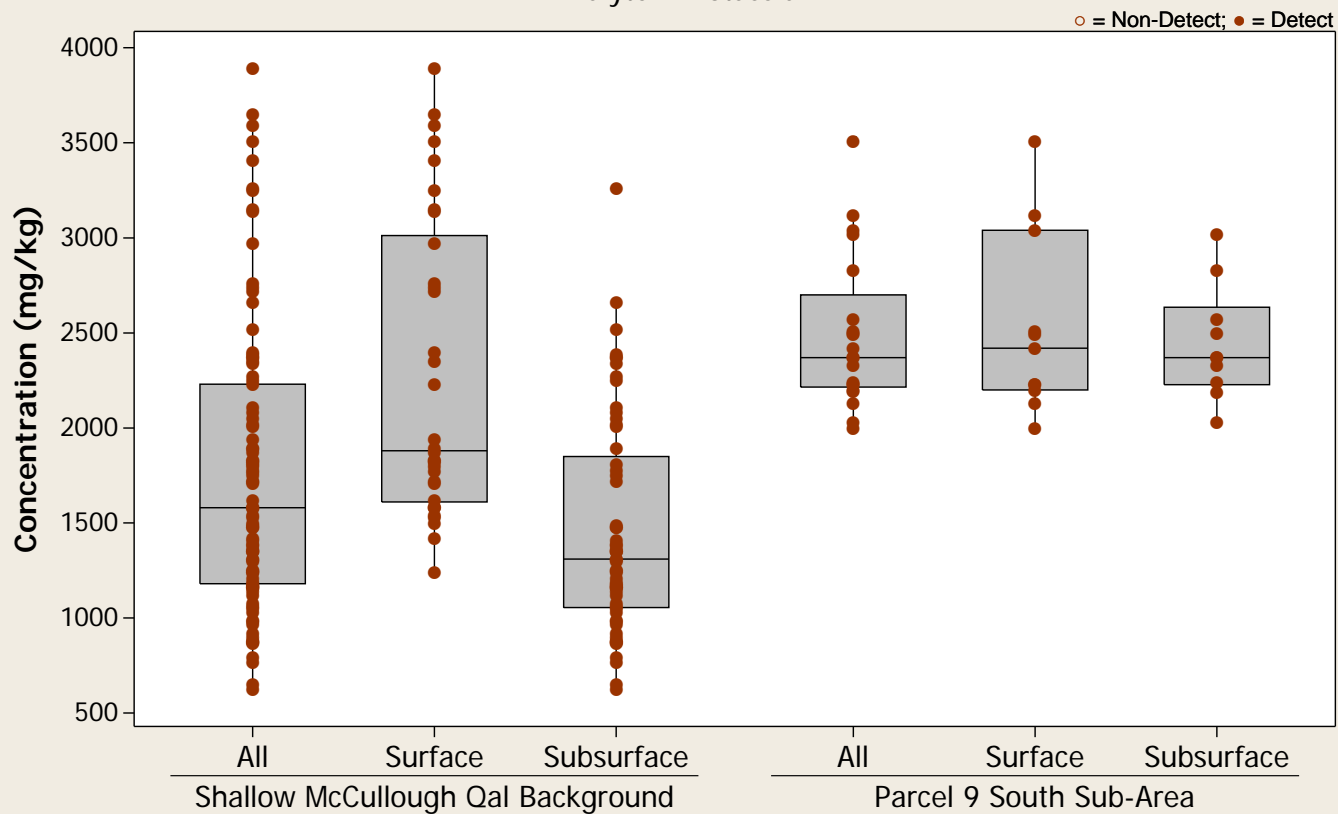
Probability Plot

Normal - 95% CI
Analyte = Potassium



Boxplot

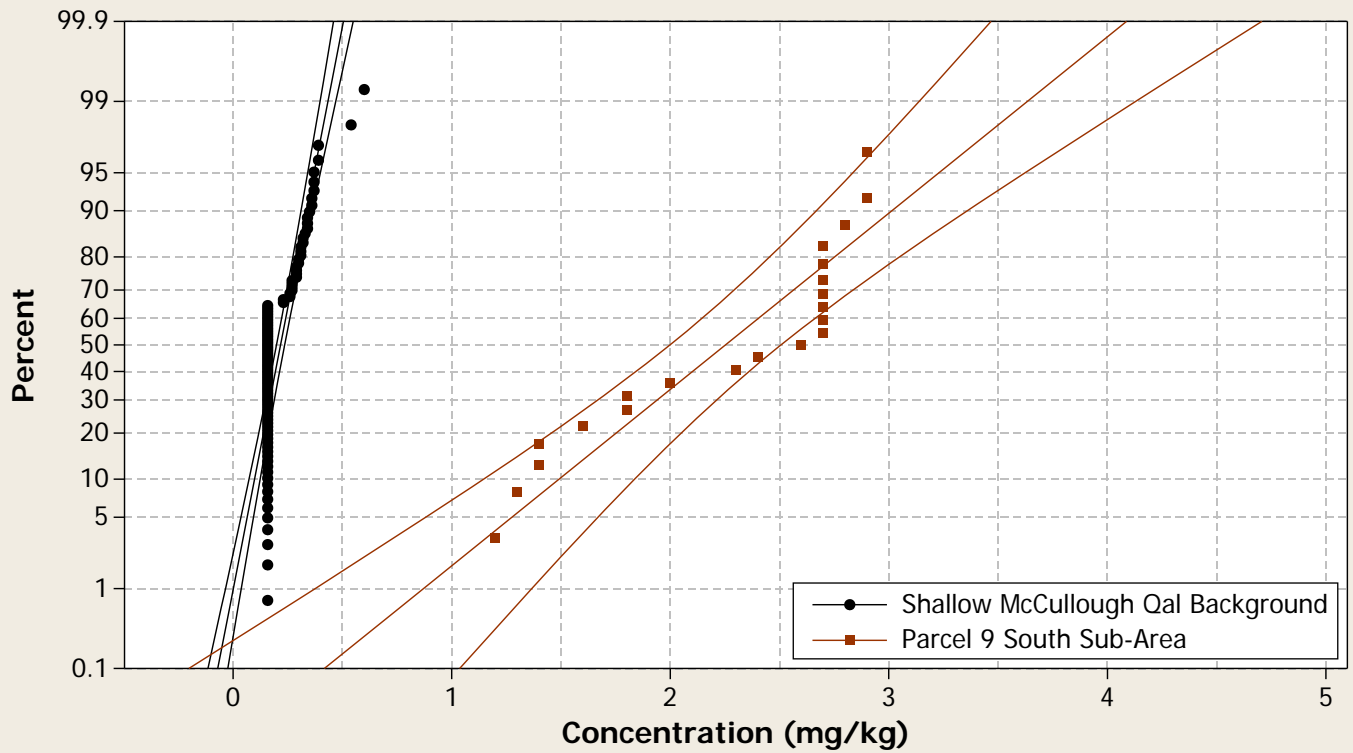
Analyte = Potassium



Probability Plot

Normal - 95% CI

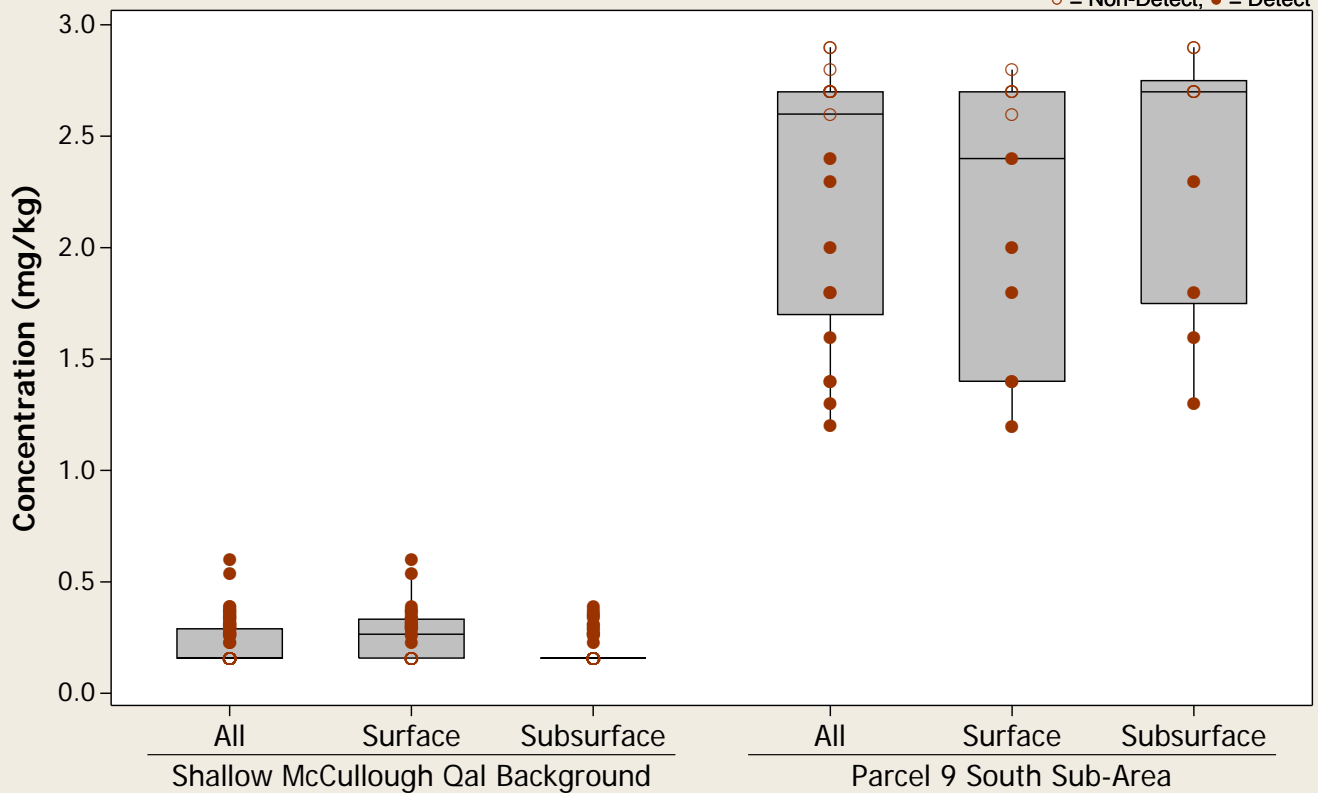
Analyte = Selenium



Boxplot

Analyte = Selenium

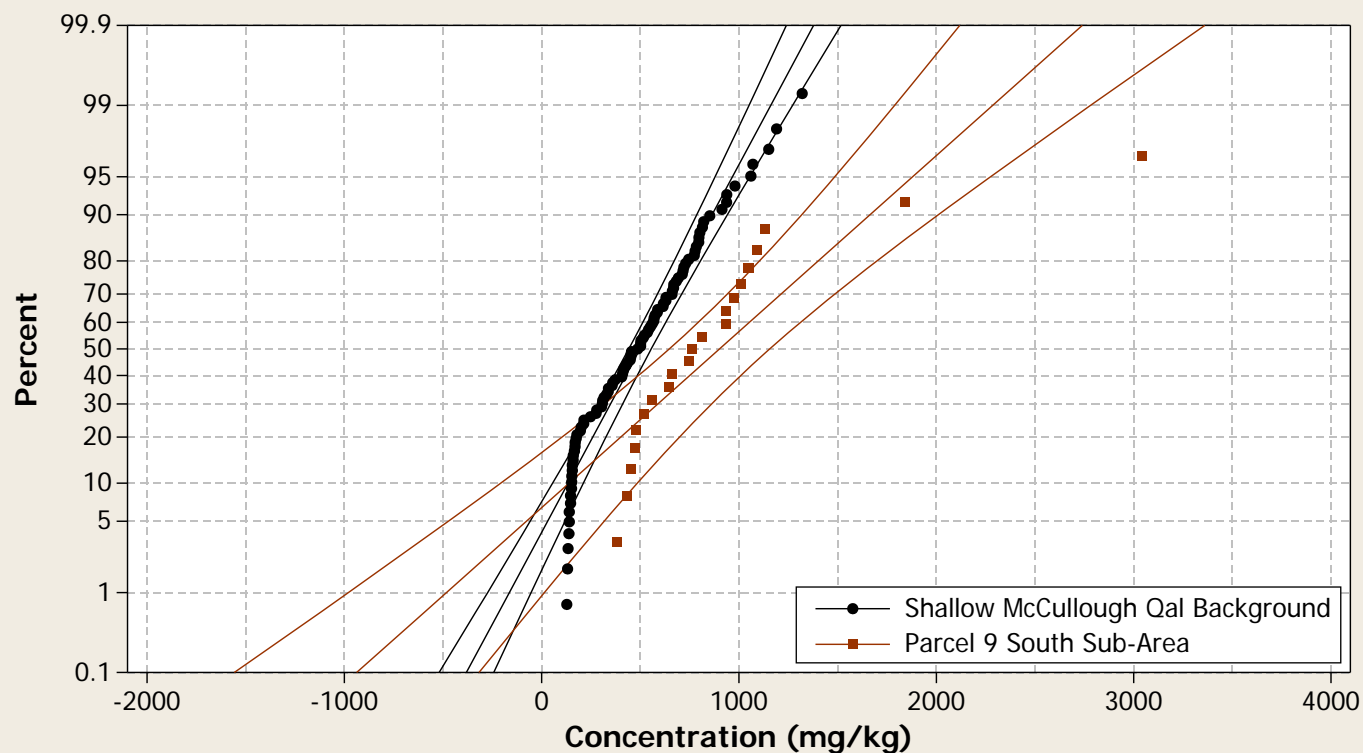
○ = Non-Detect; ● = Detect



Probability Plot

Normal - 95% CI

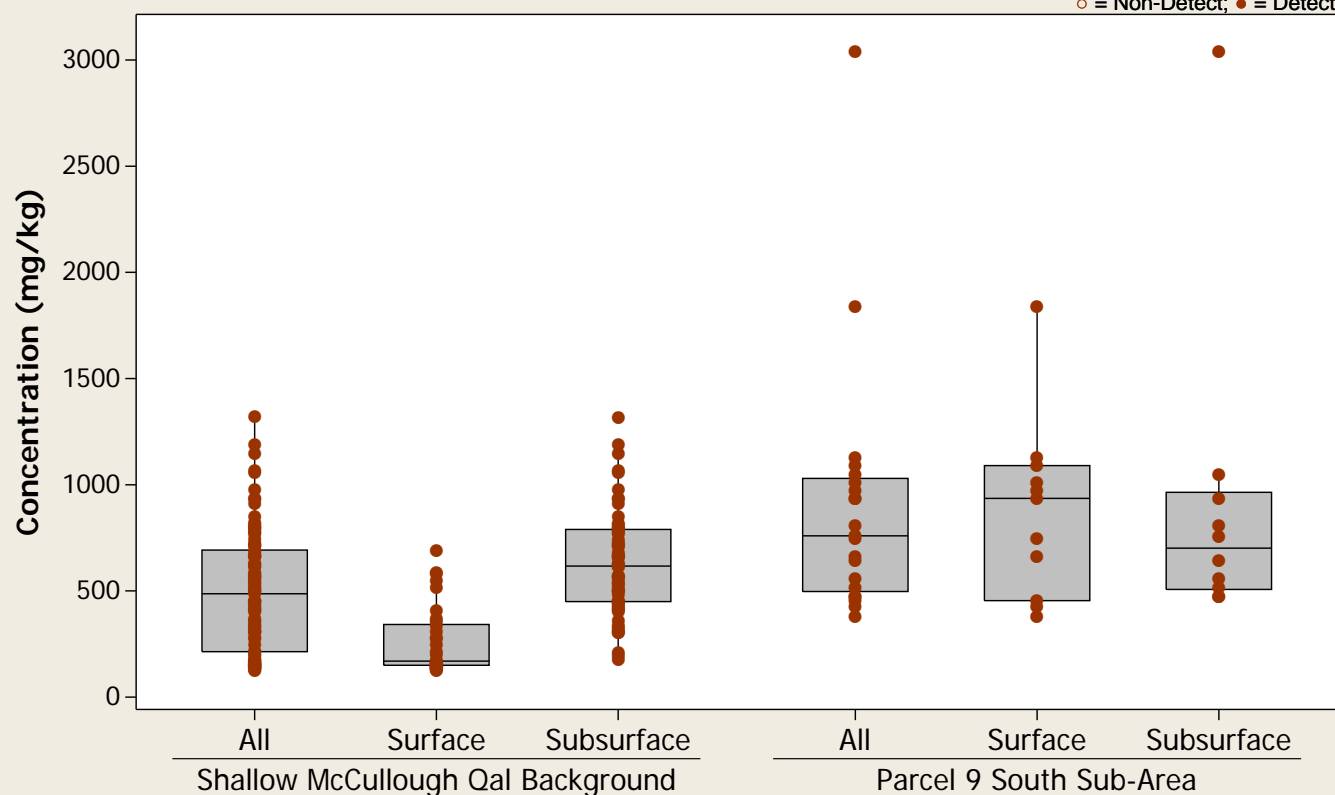
Analyte = Sodium



Boxplot

Analyte = Sodium

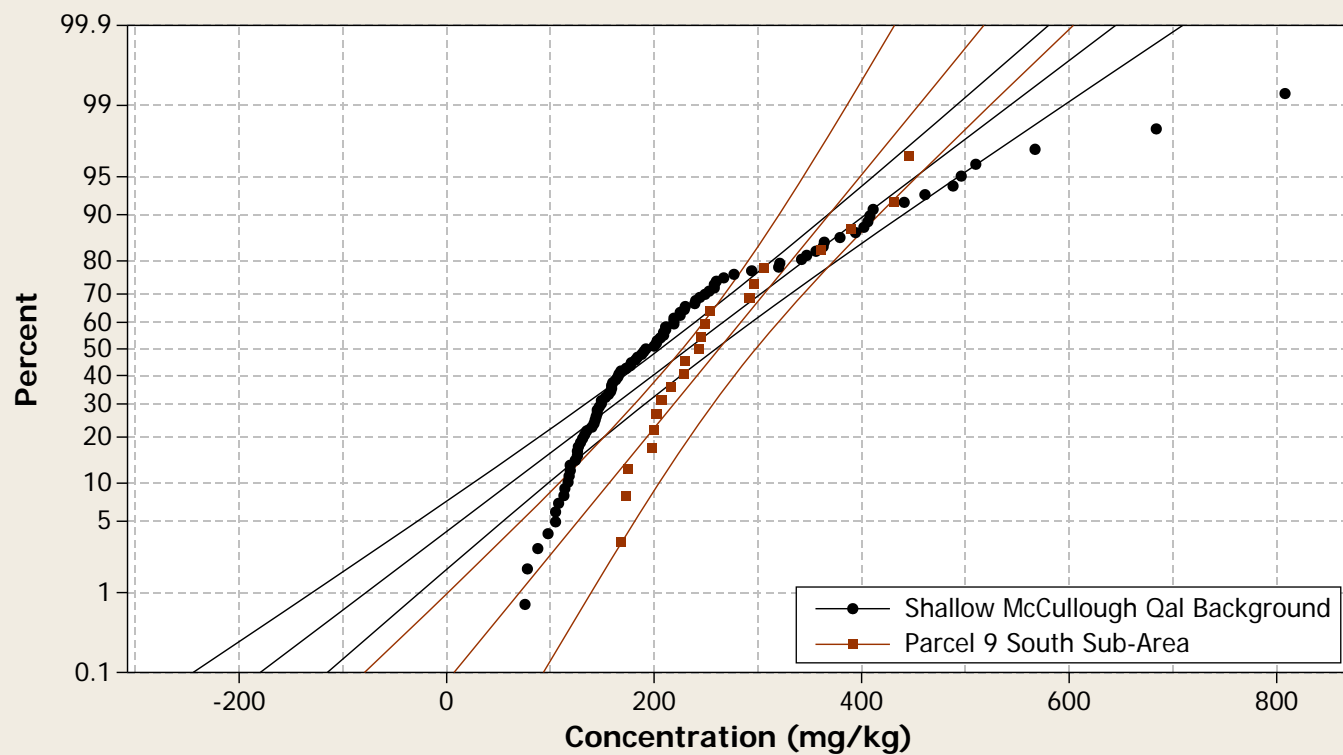
○ = Non-Detect; ● = Detect



Probability Plot

Normal - 95% CI

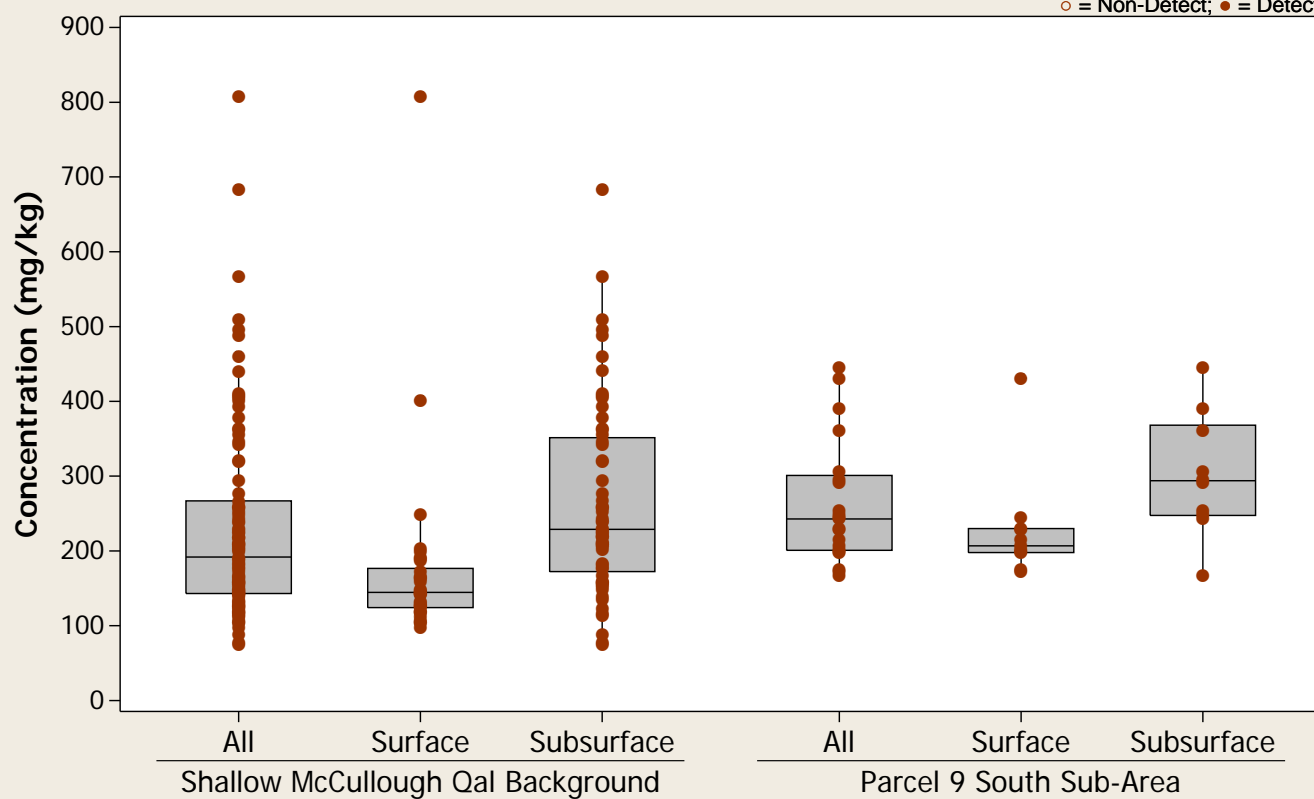
Analyte = Strontium



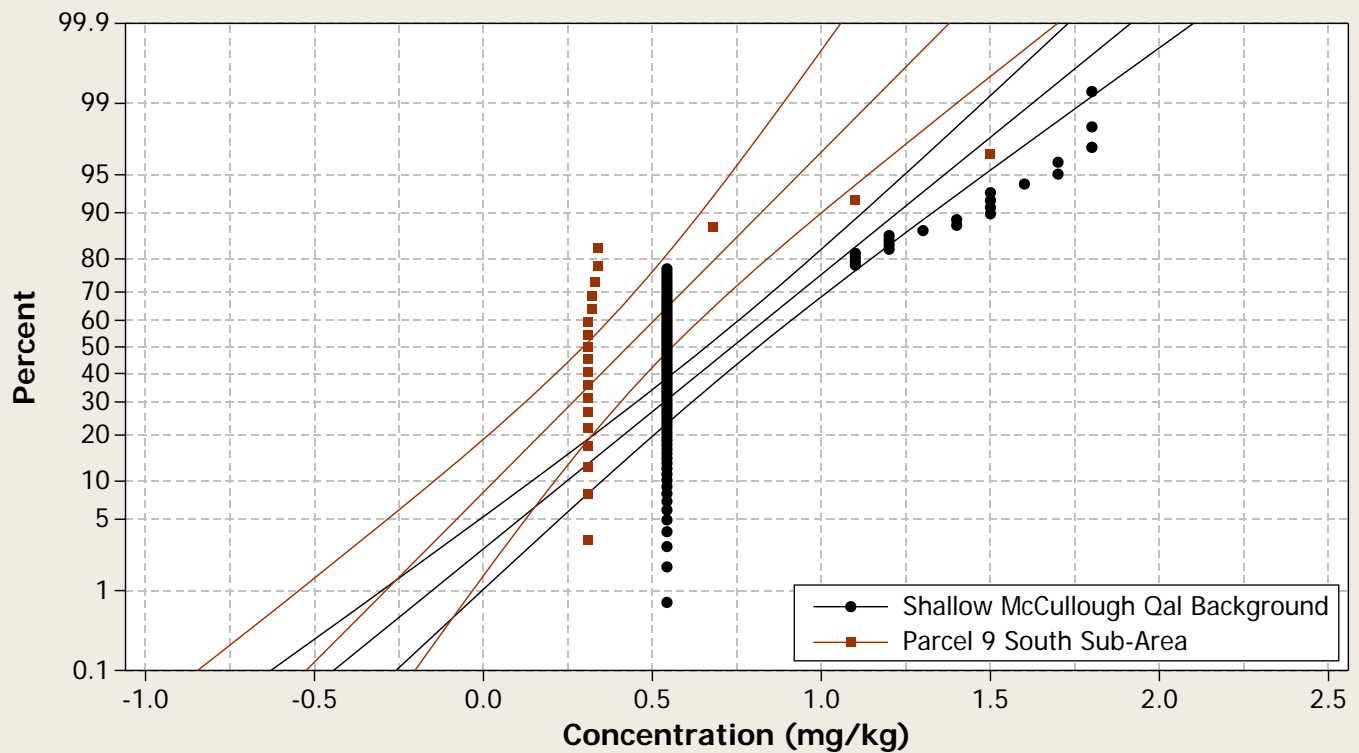
Boxplot

Analyte = Strontium

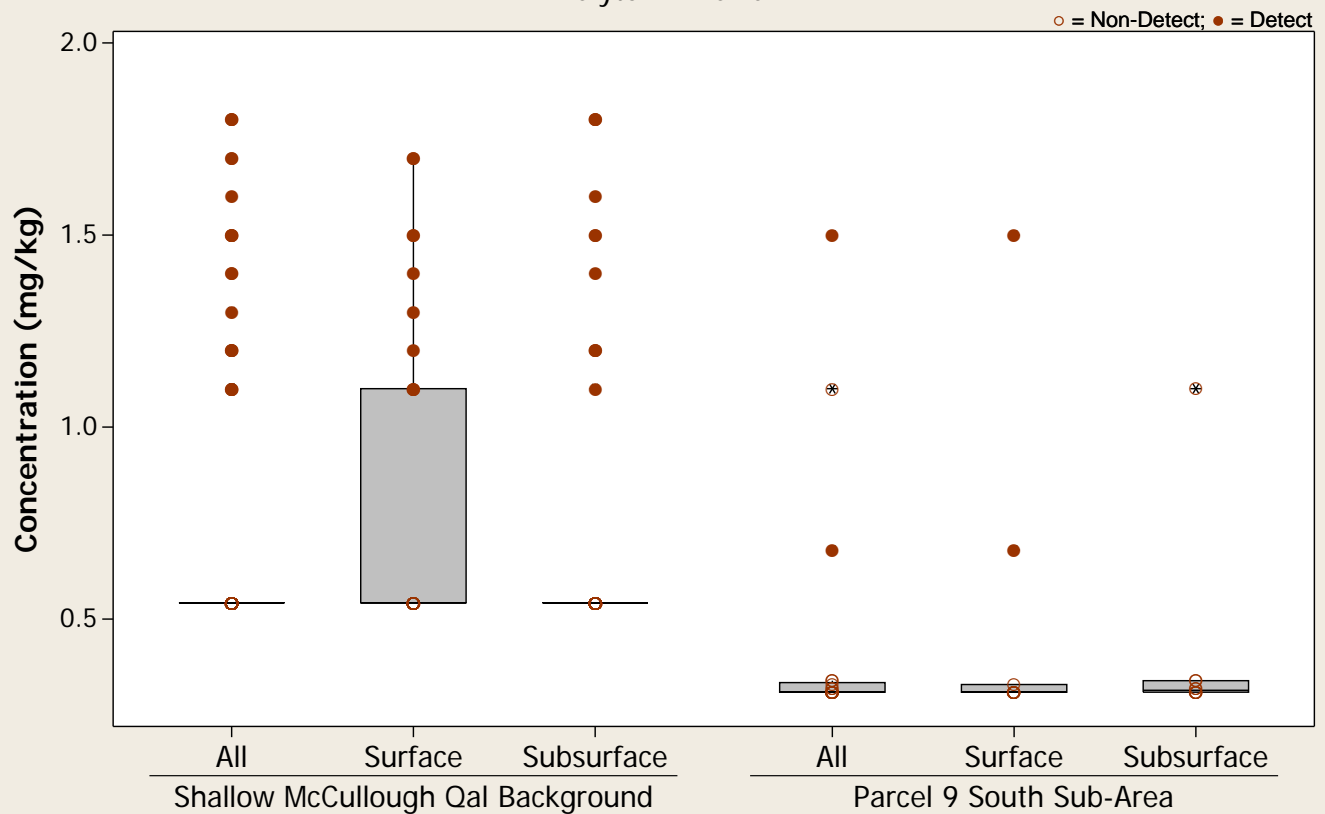
○ = Non-Detect; ● = Detect



Analyte = Thallium



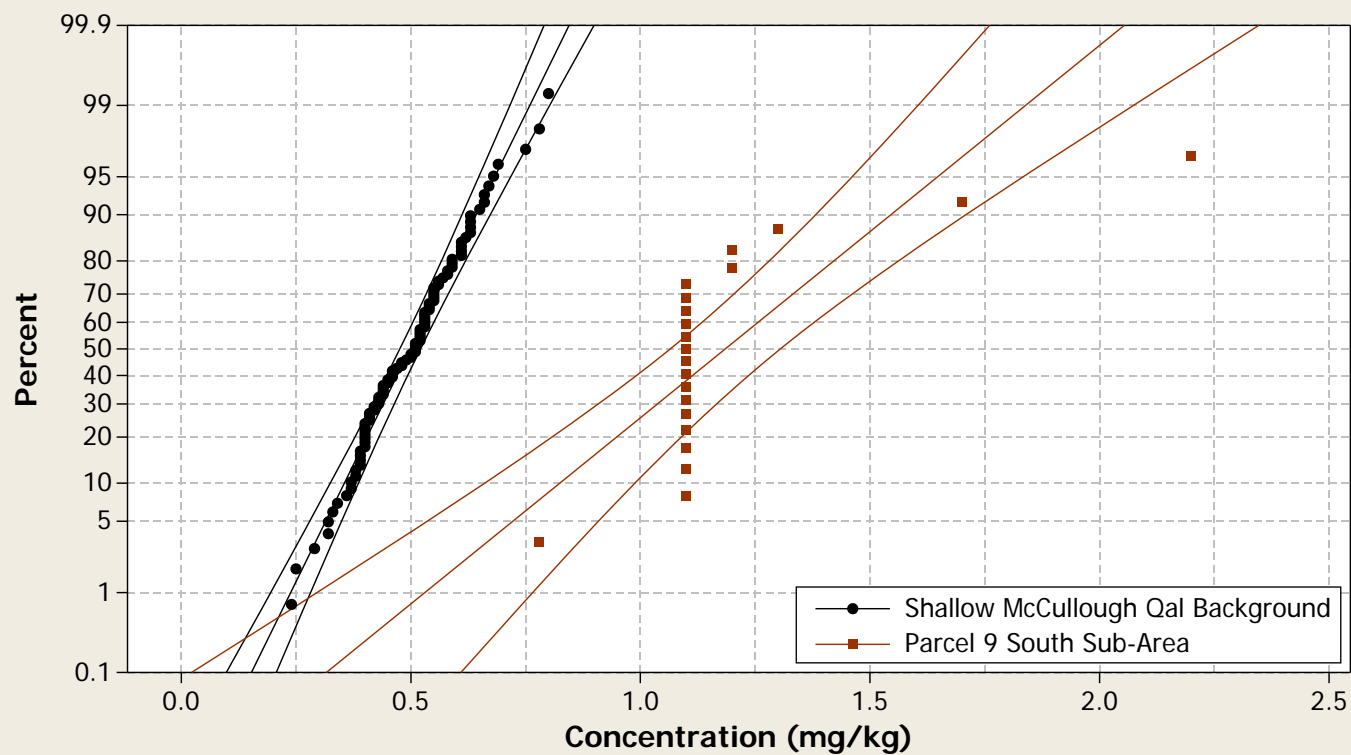
Analyte = Thallium



Probability Plot

Normal - 95% CI

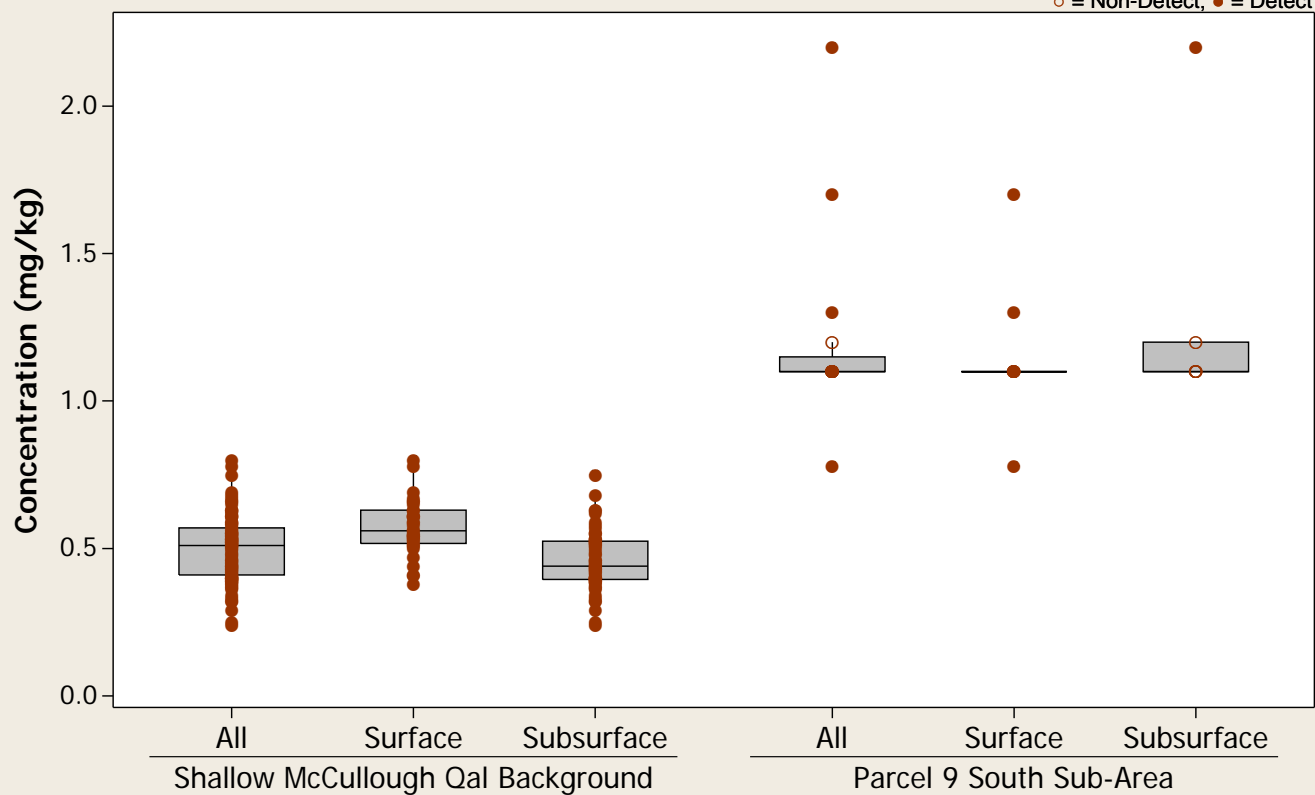
Analyte = Tin



Boxplot

Analyte = Tin

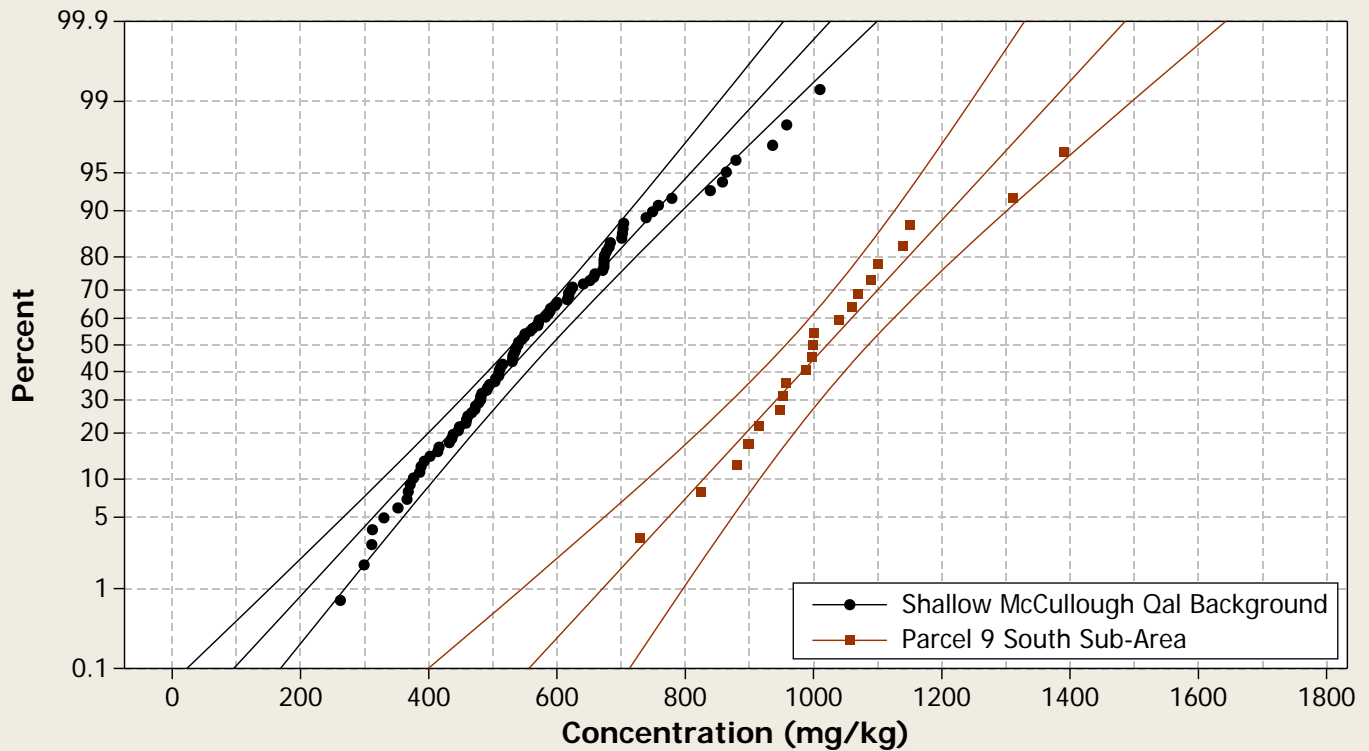
○ = Non-Detect; ● = Detect



Probability Plot

Normal - 95% CI

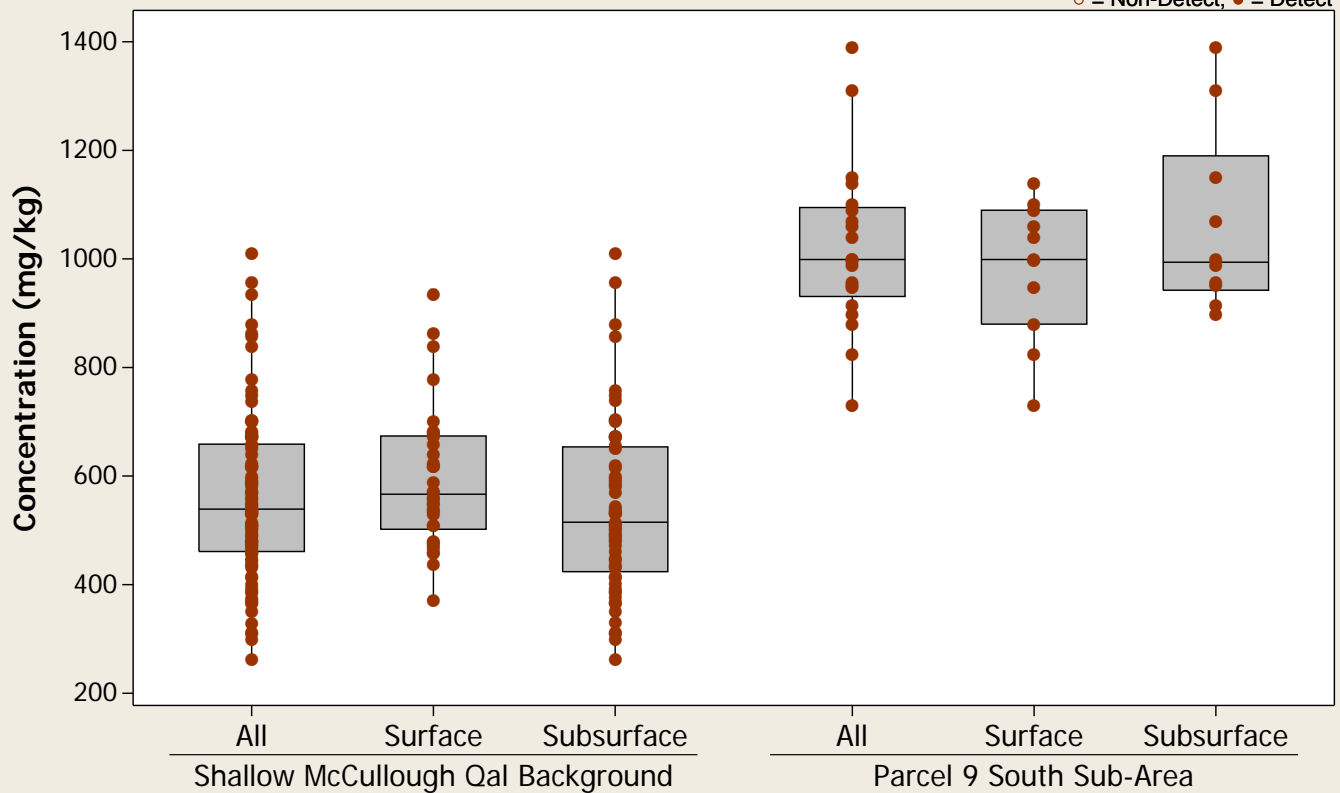
Analyte = Titanium



Boxplot

Analyte = Titanium

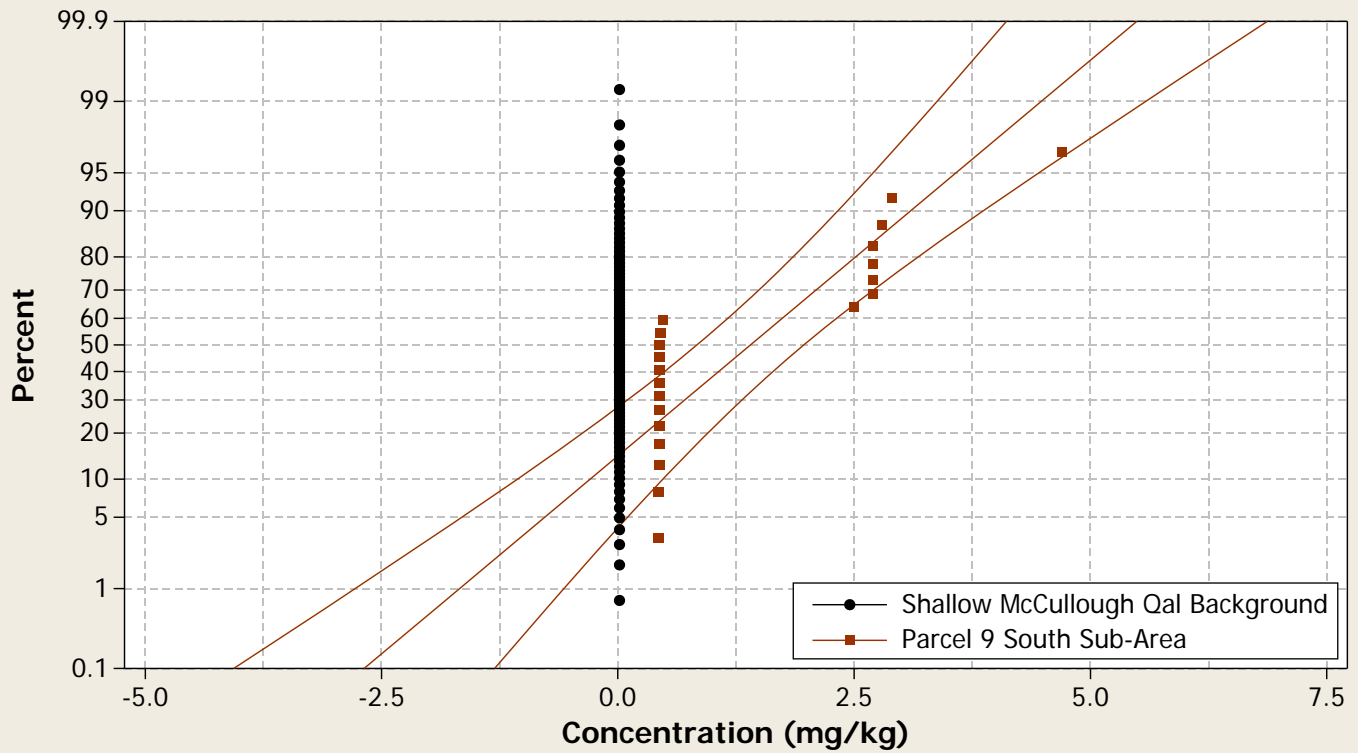
○ = Non-Detect; ● = Detect



Probability Plot

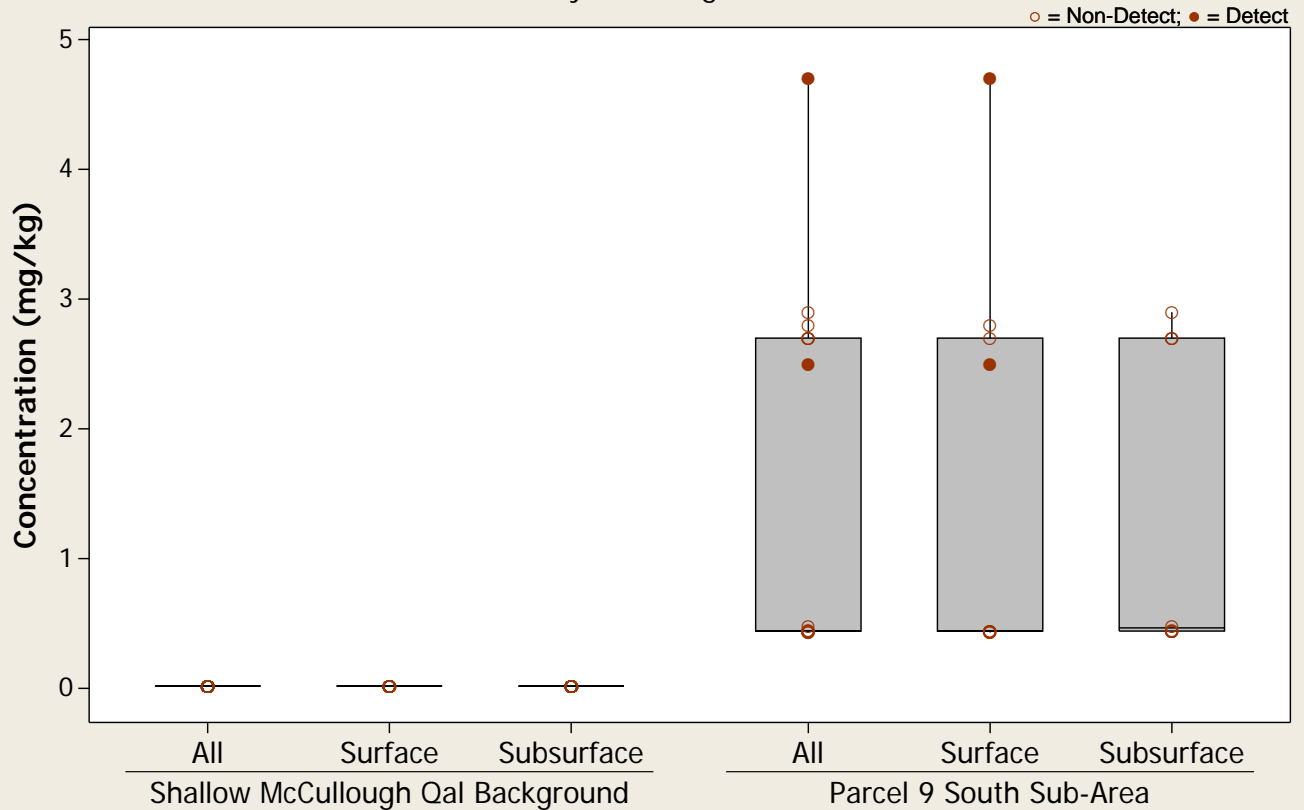
Normal - 95% CI

Analyte = Tungsten



Boxplot

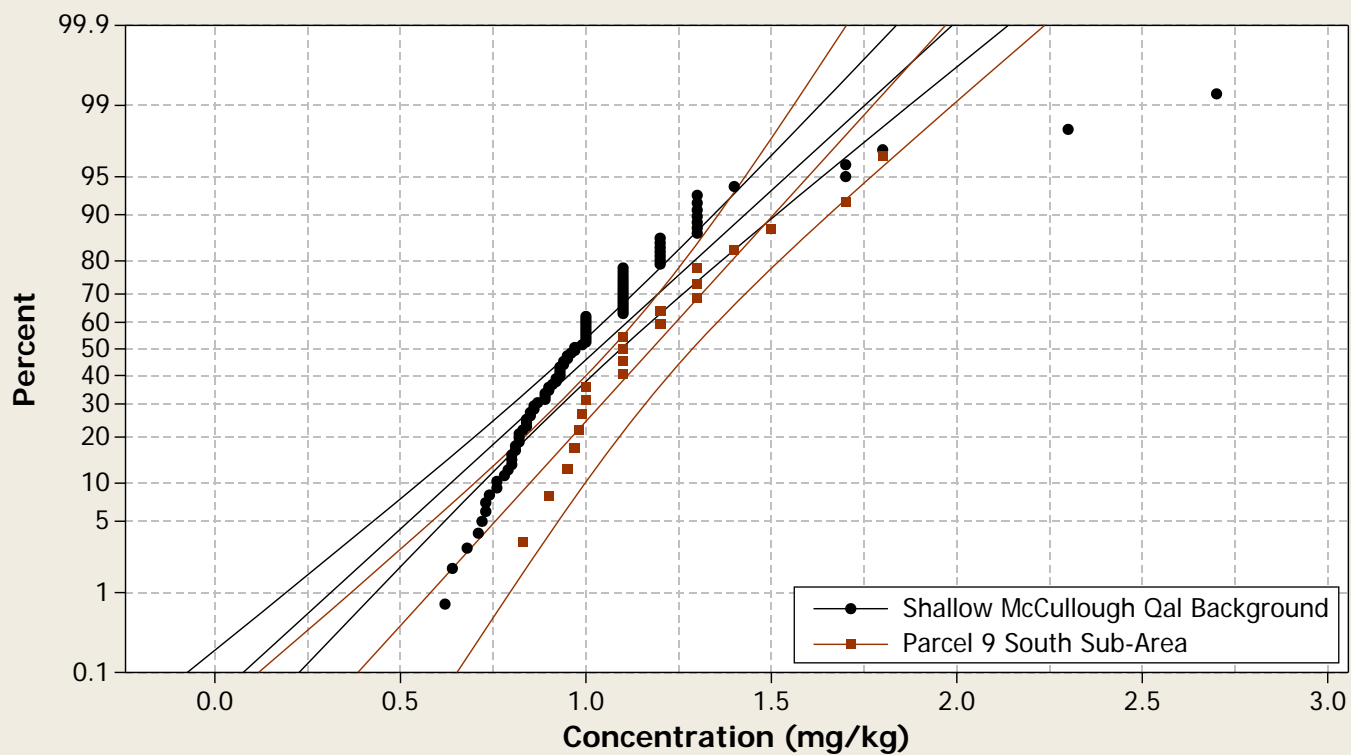
Analyte = Tungsten



Probability Plot

Normal - 95% CI

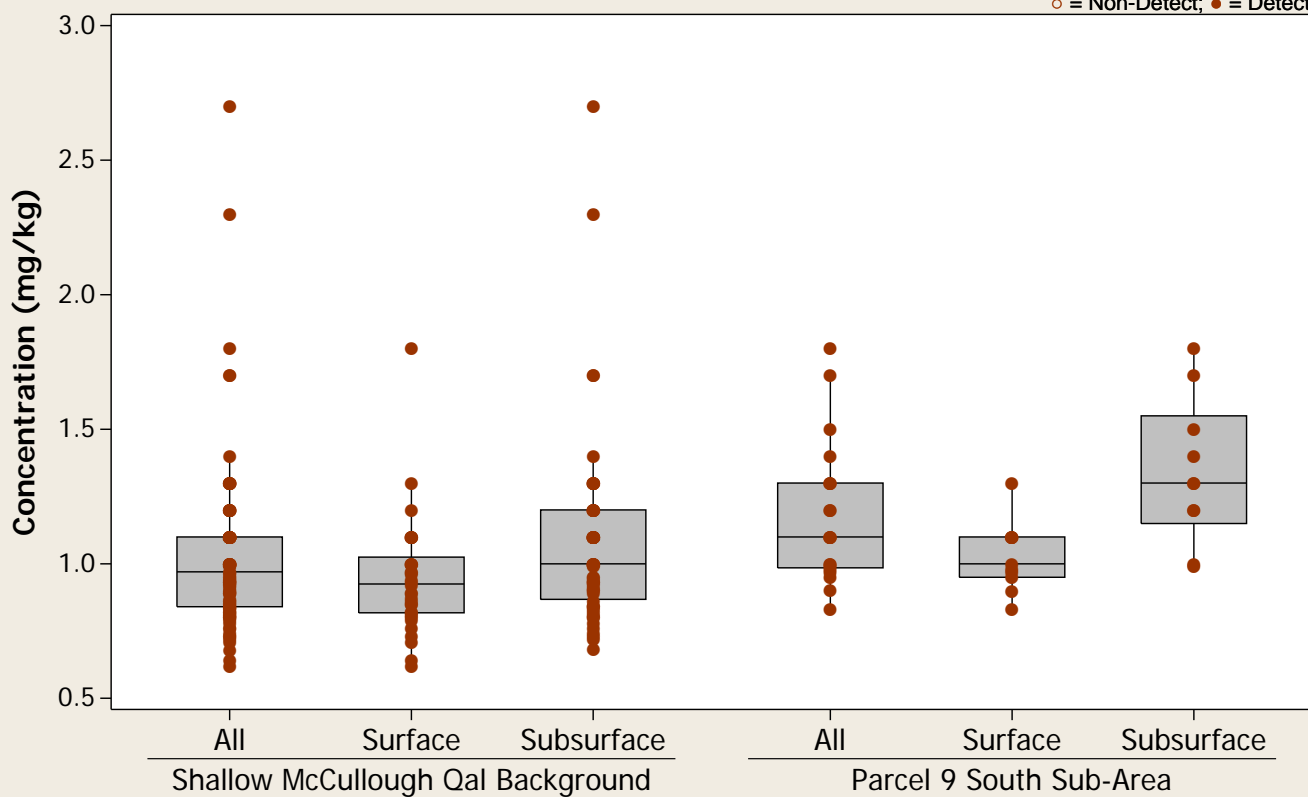
Analyte = Uranium



Boxplot

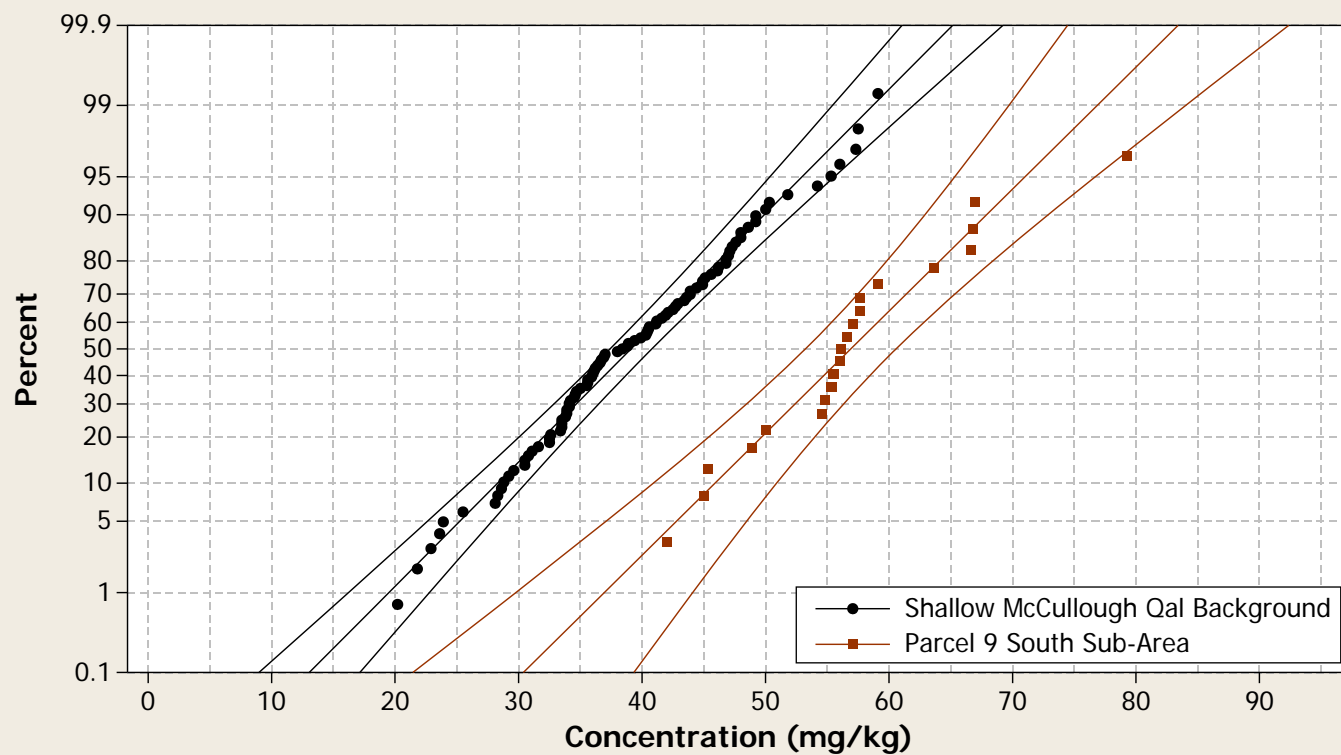
Analyte = Uranium

○ = Non-Detect; ● = Detect



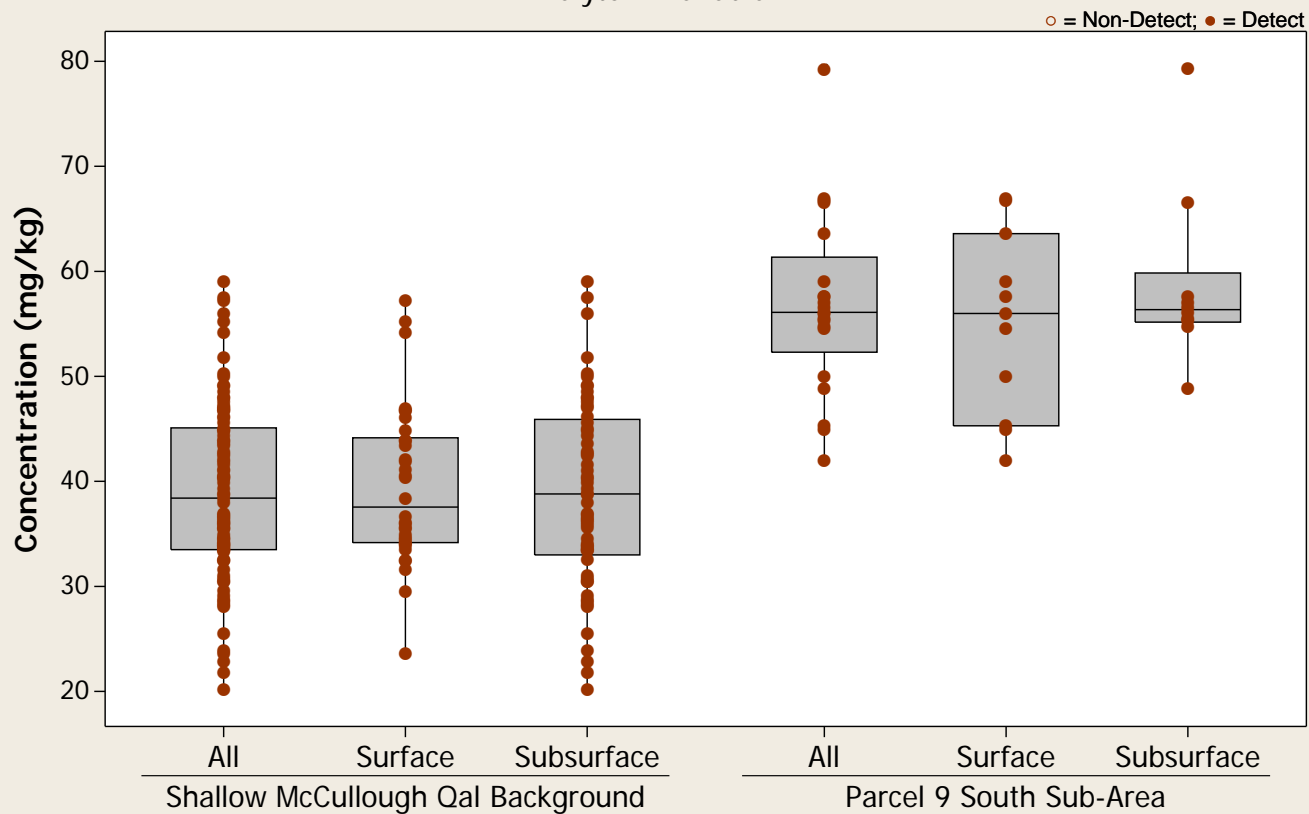
Probability Plot

Normal - 95% CI
Analyte = Vanadium



Boxplot

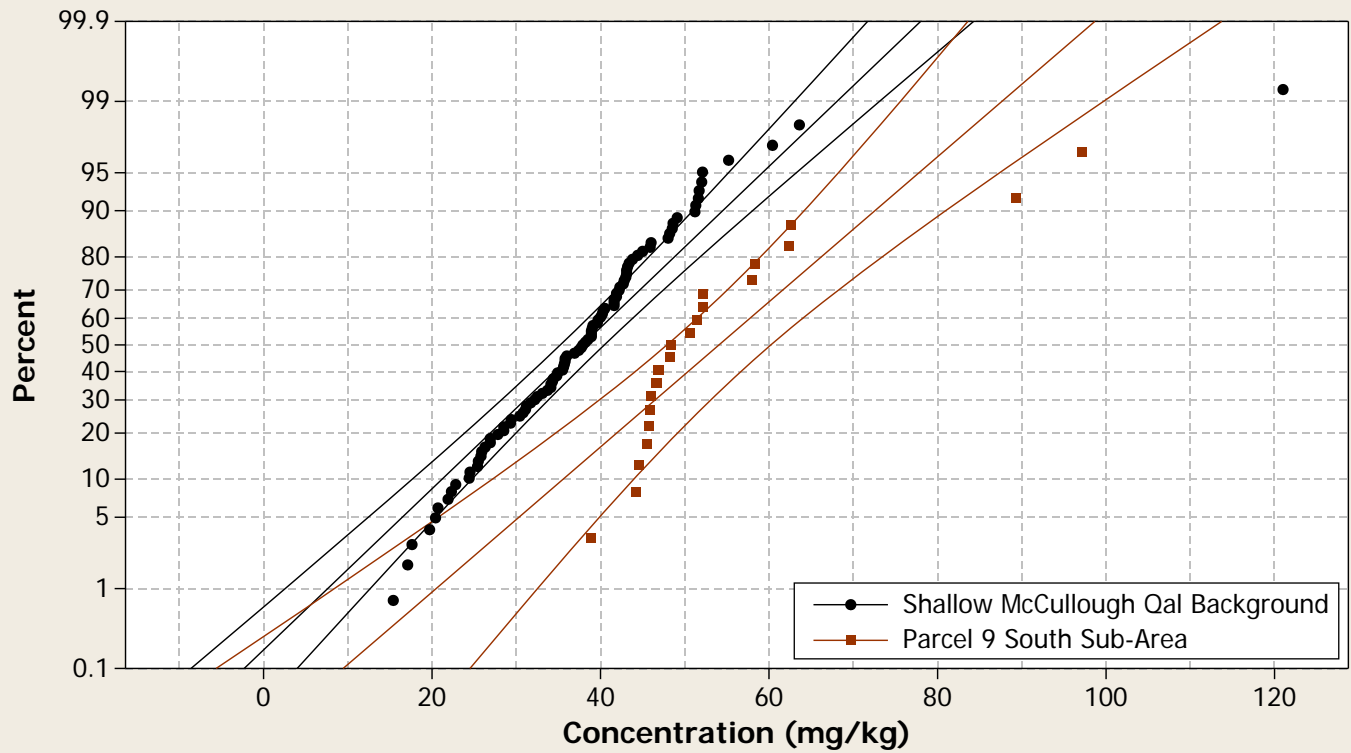
Analyte = Vanadium



Probability Plot

Normal - 95% CI

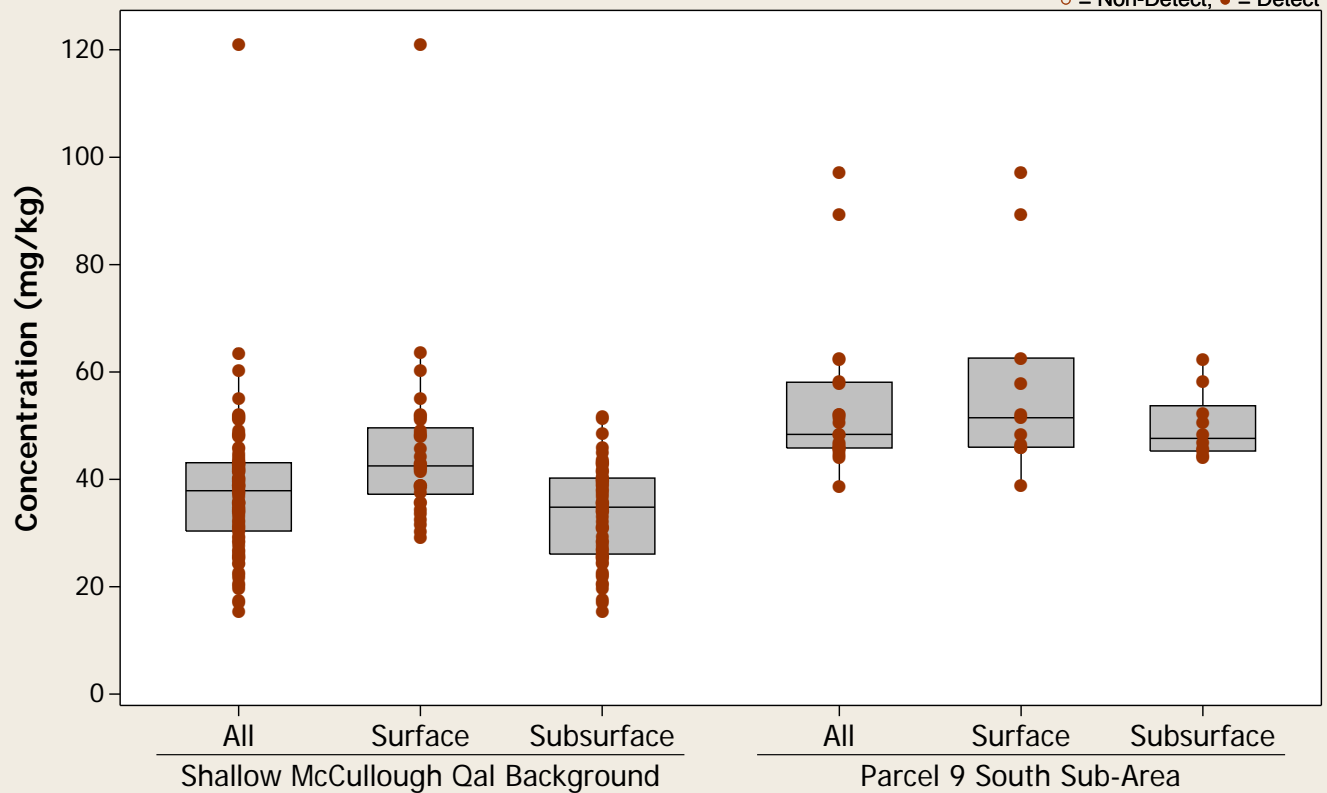
Analyte = Zinc



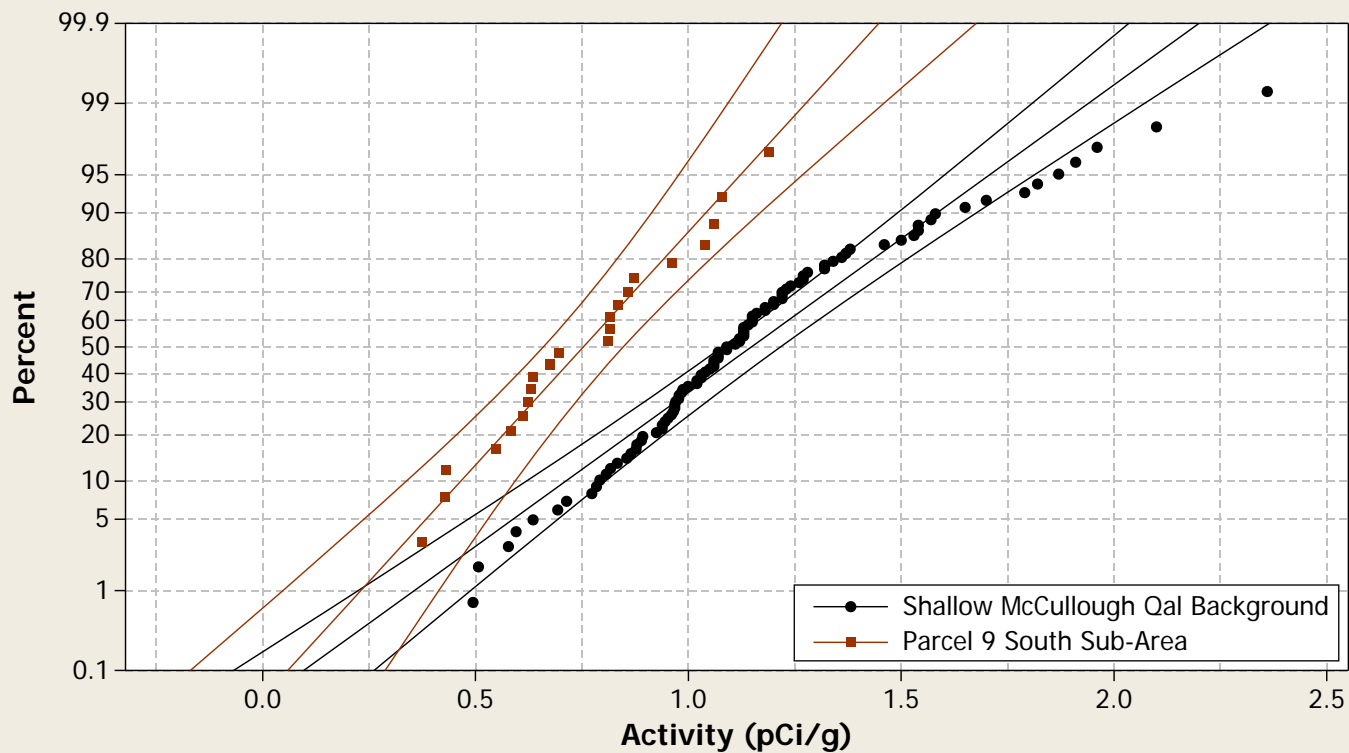
Boxplot

Analyte = Zinc

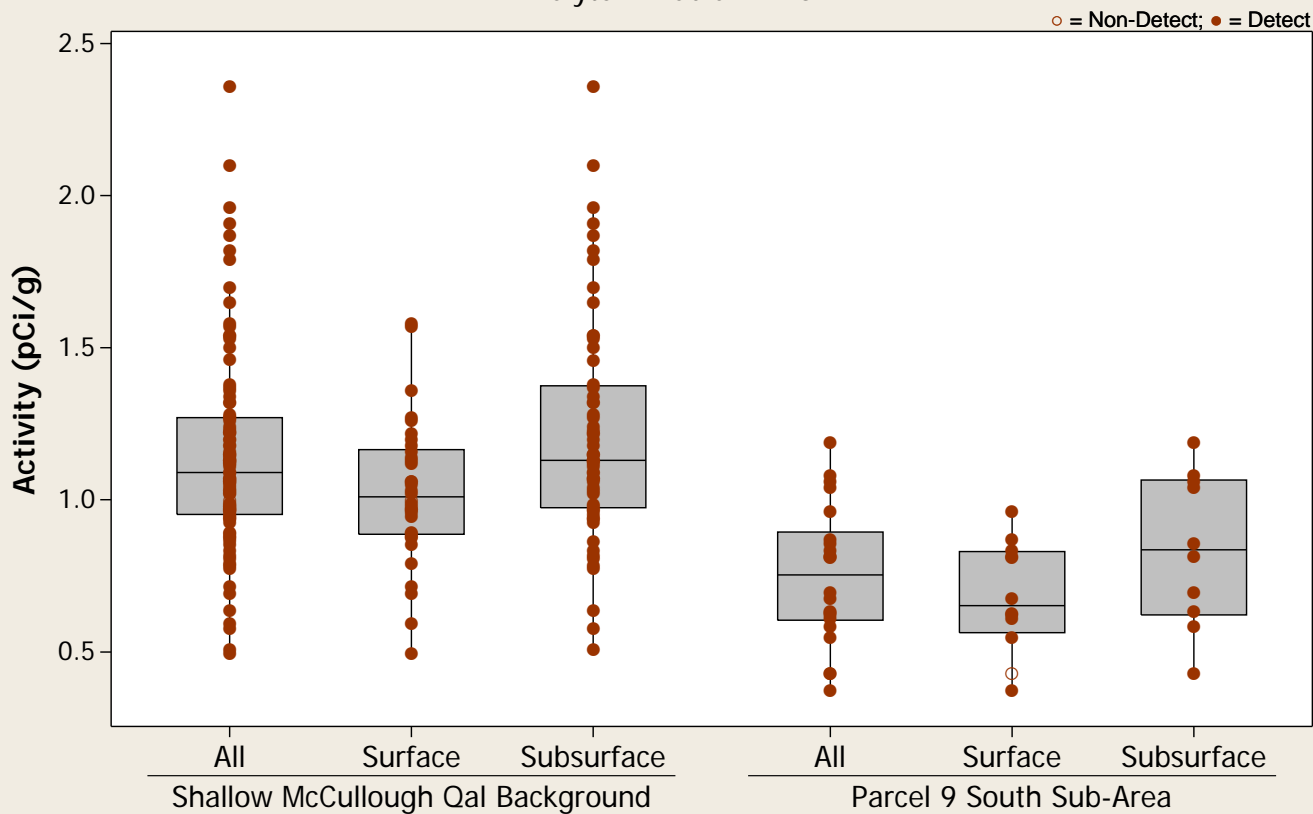
○ = Non-Detect; ● = Detect



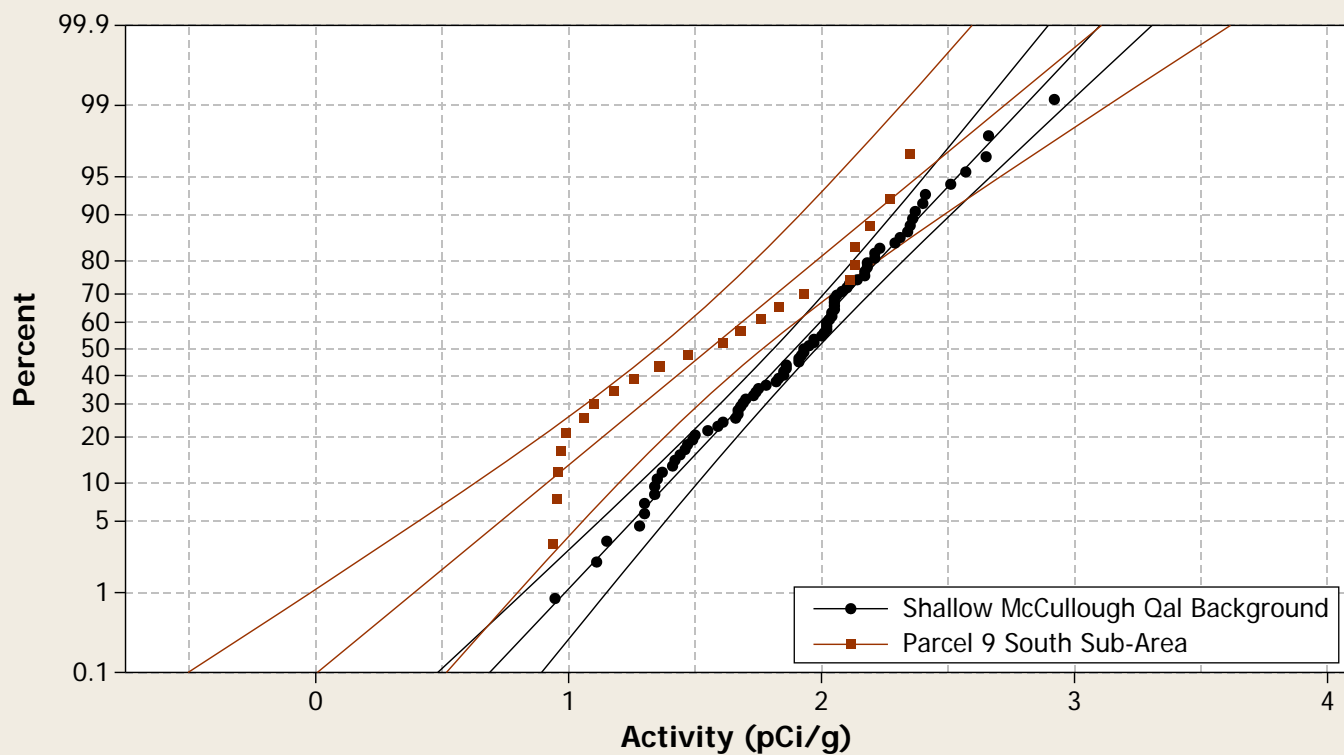
Probability Plot
 Normal - 95% CI
 Analyte = Radium-226



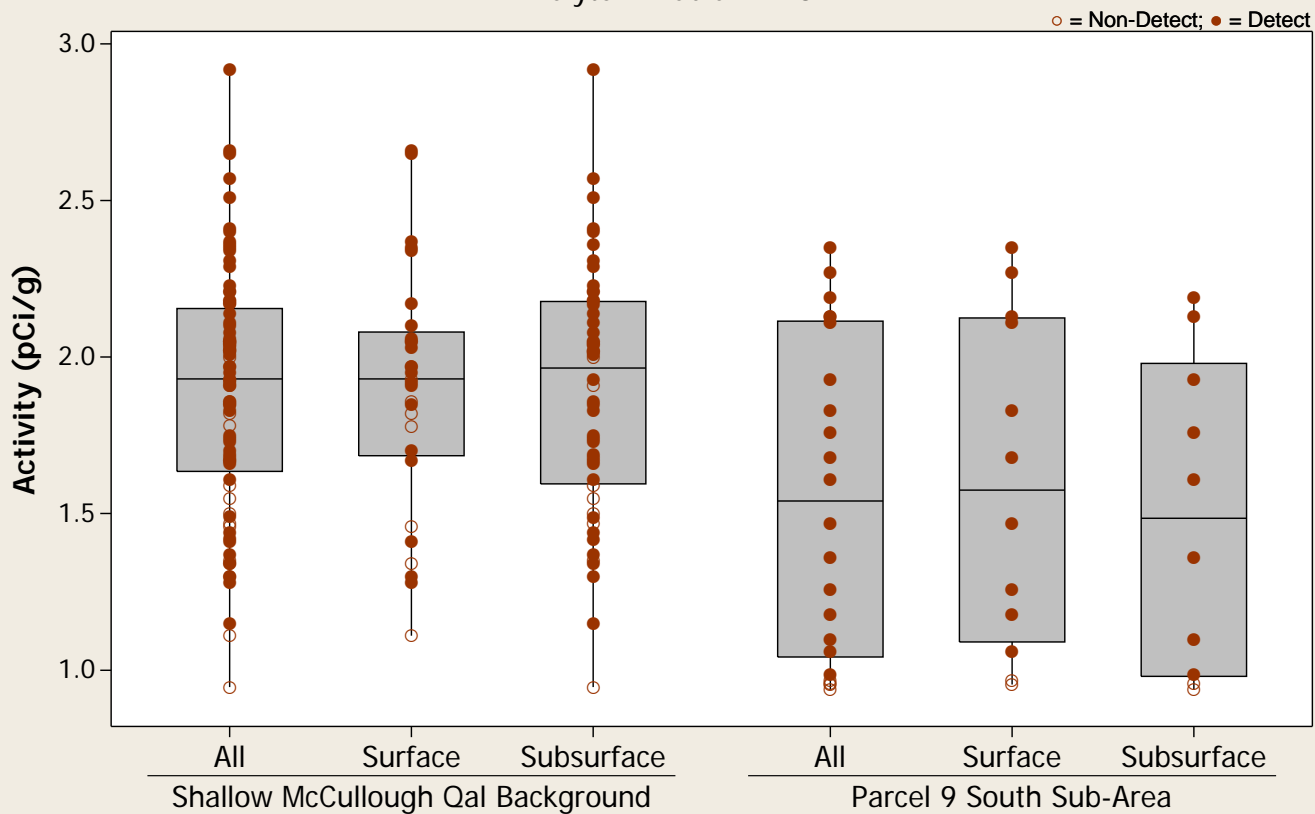
Boxplot
 Analyte = Radium-226



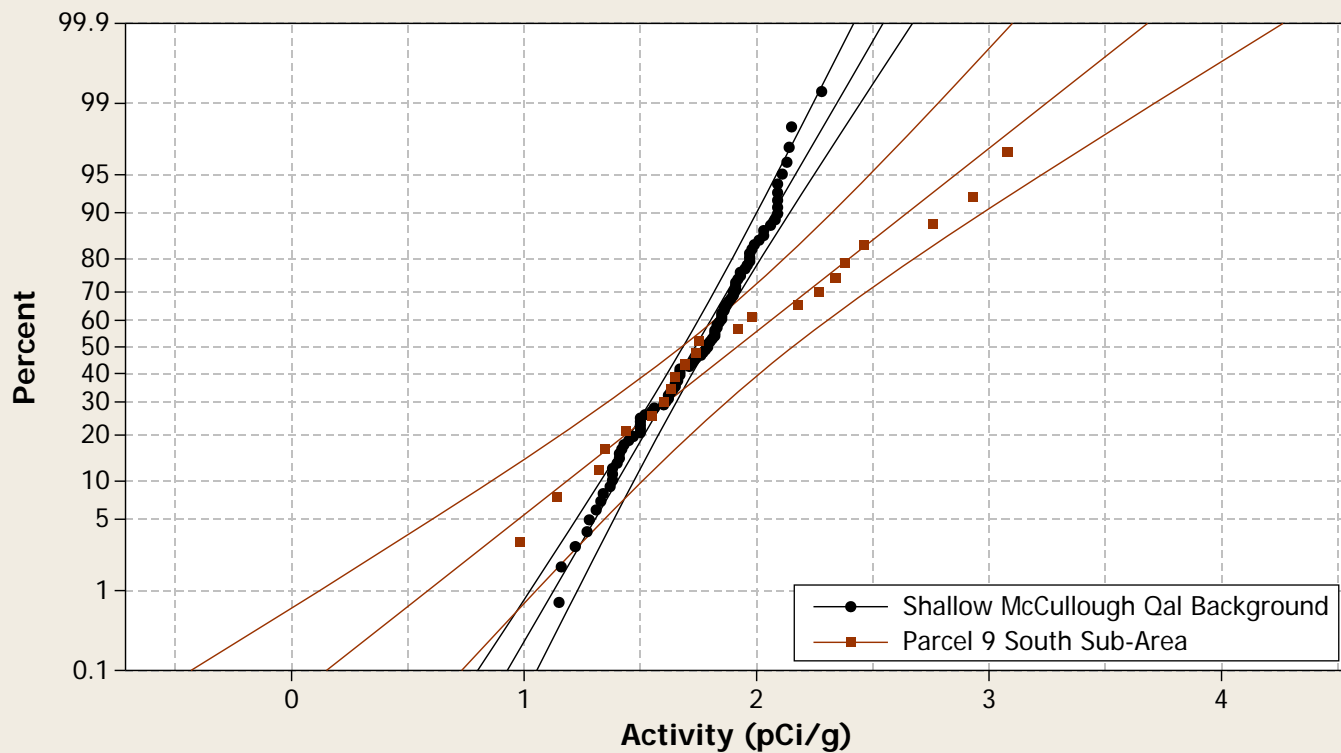
Probability Plot
 Normal - 95% CI
 Analyte = Radium-228



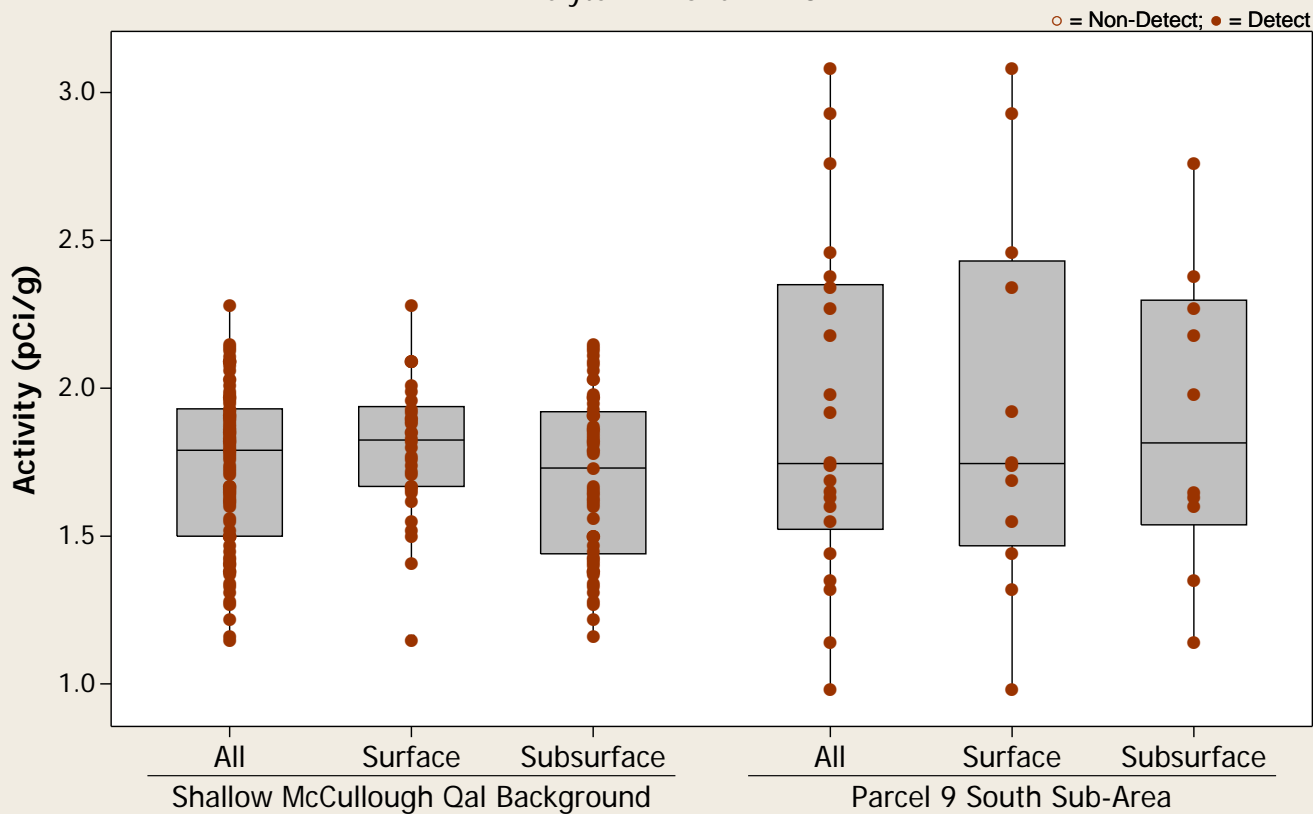
Boxplot
 Analyte = Radium-228



Probability Plot
 Normal - 95% CI
 Analyte = Thorium-228



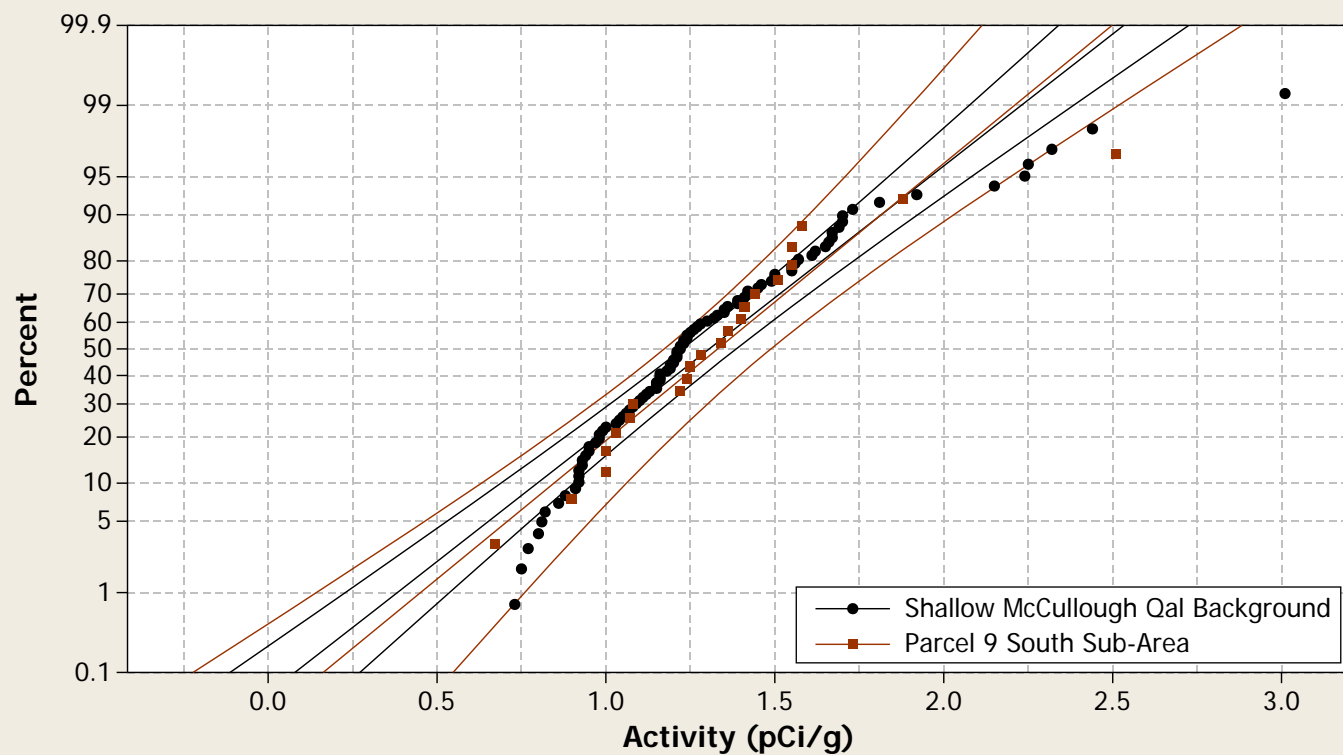
Boxplot
 Analyte = Thorium-228



Probability Plot

Normal - 95% CI

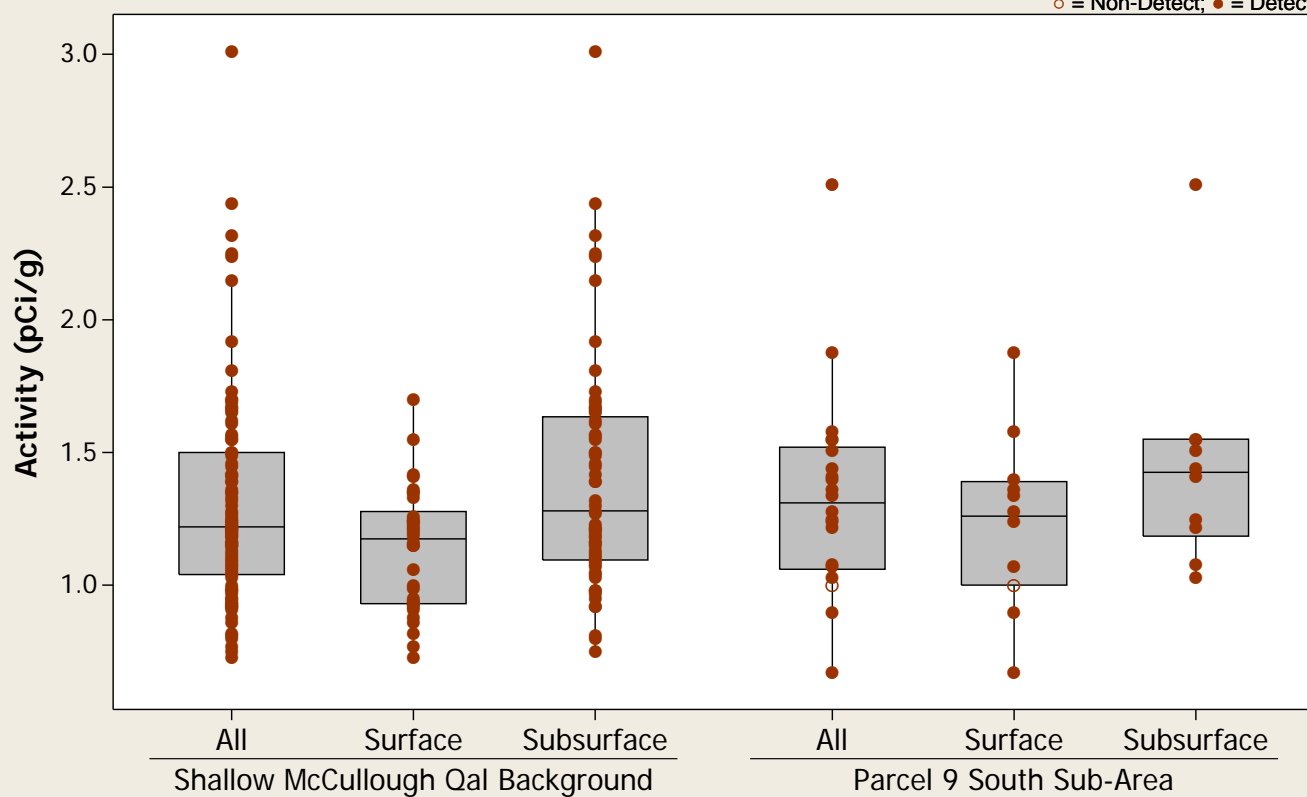
Analyte = Thorium-230



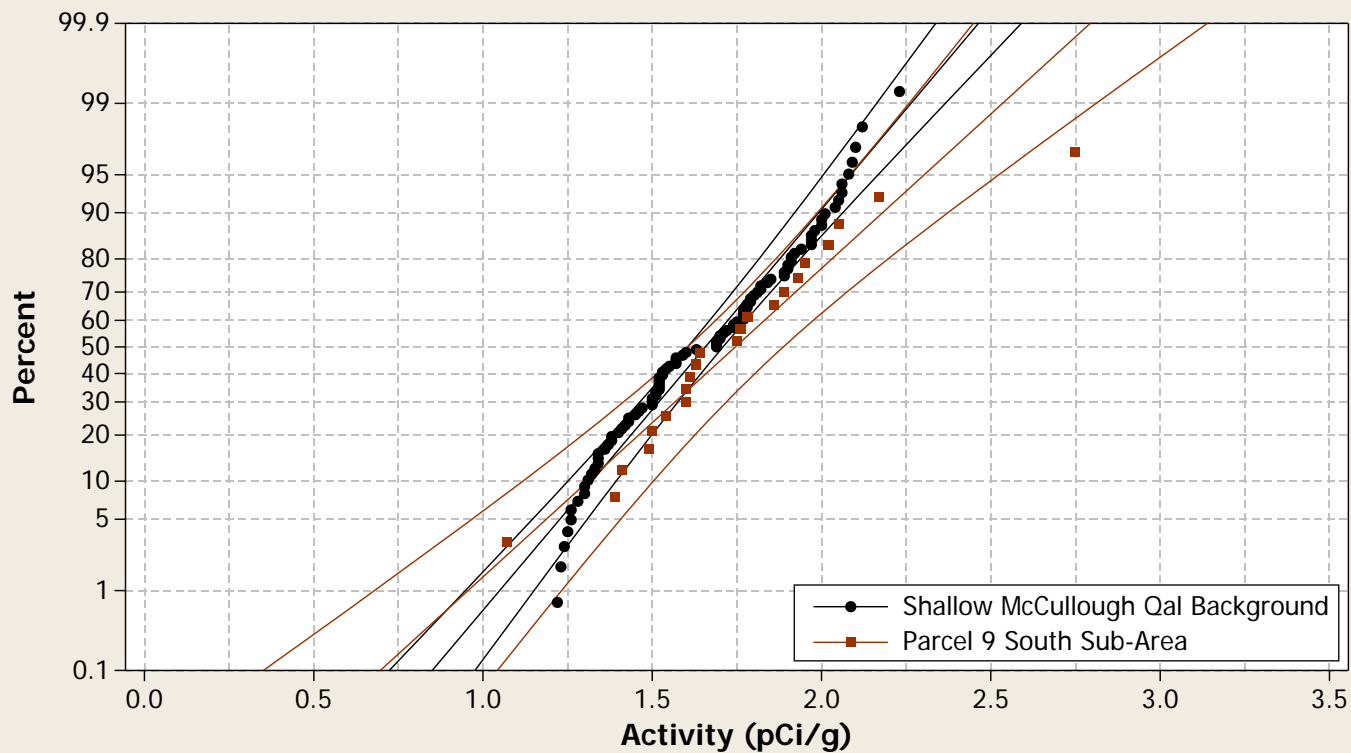
Boxplot

Analyte = Thorium-230

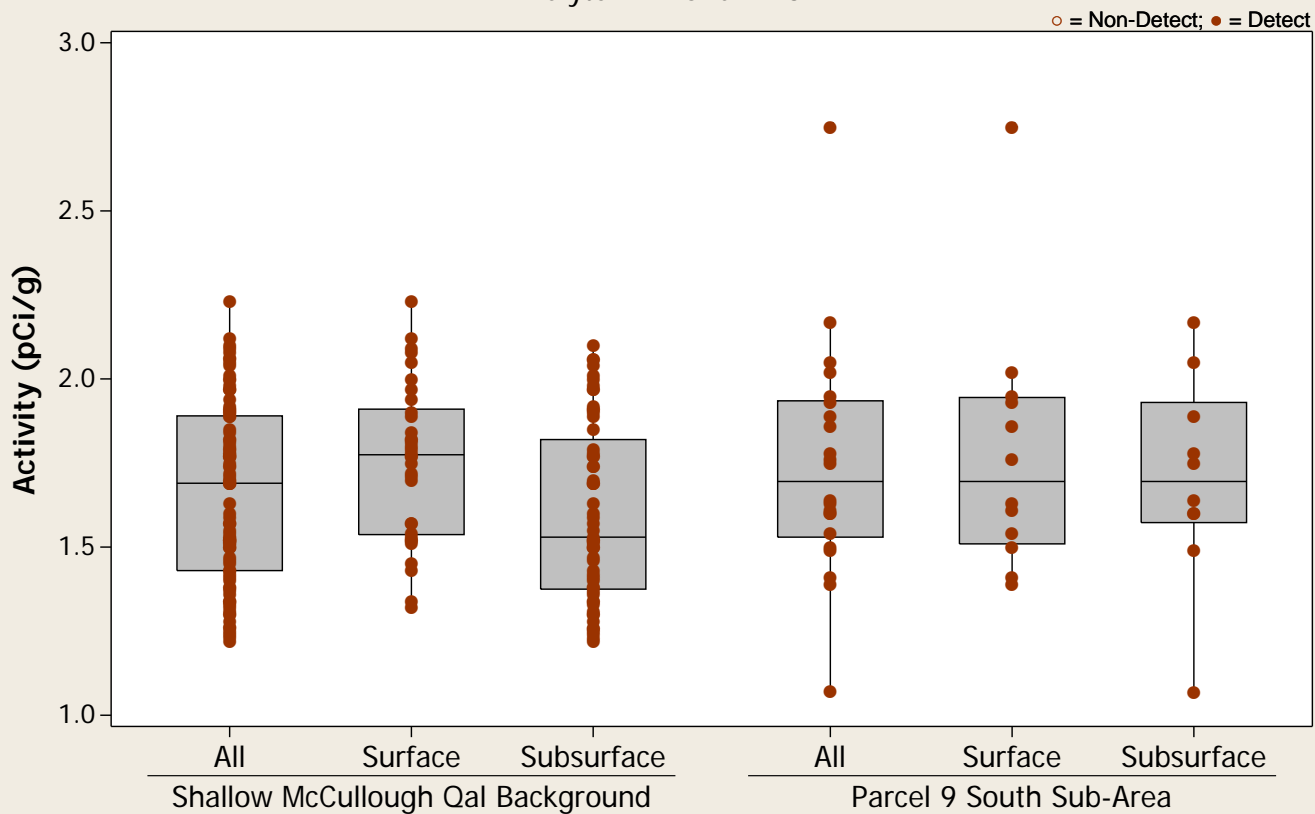
○ = Non-Detect; ● = Detect



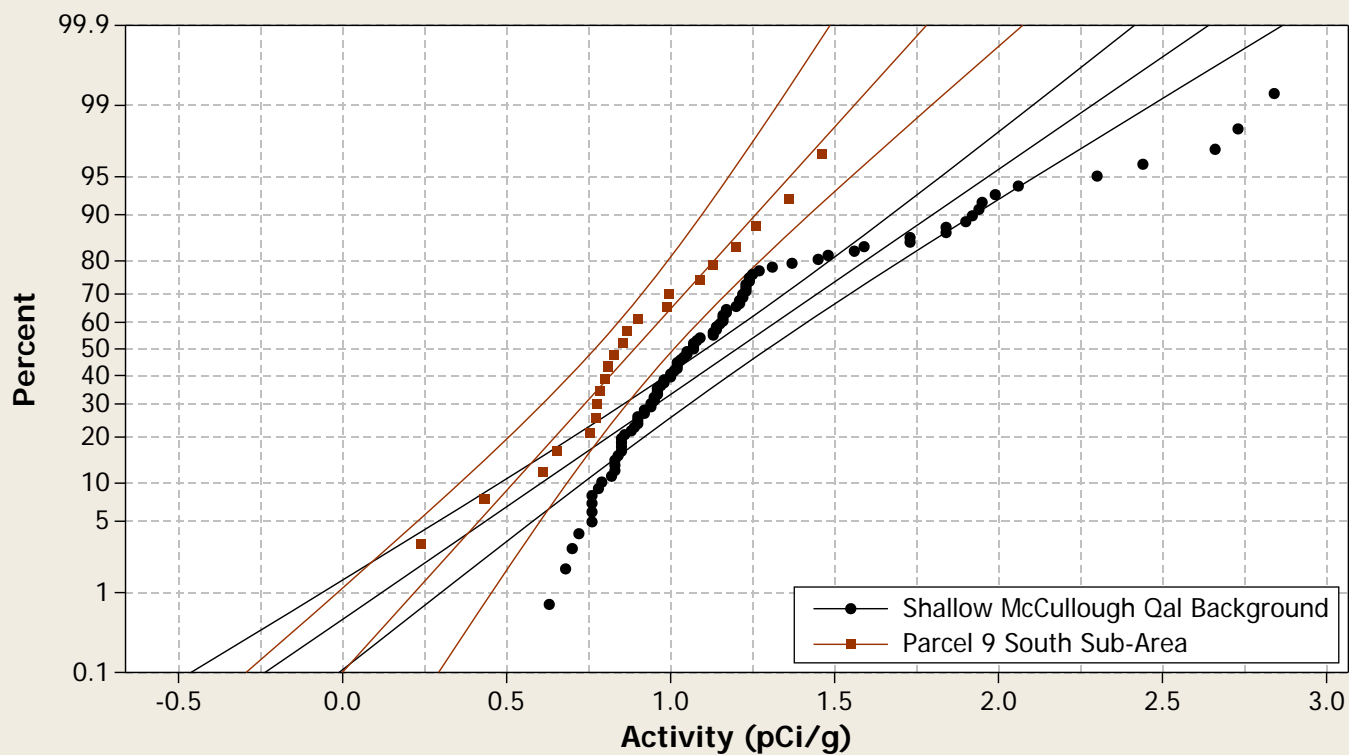
Probability Plot Normal - 95% CI Analyte = Thorium-232



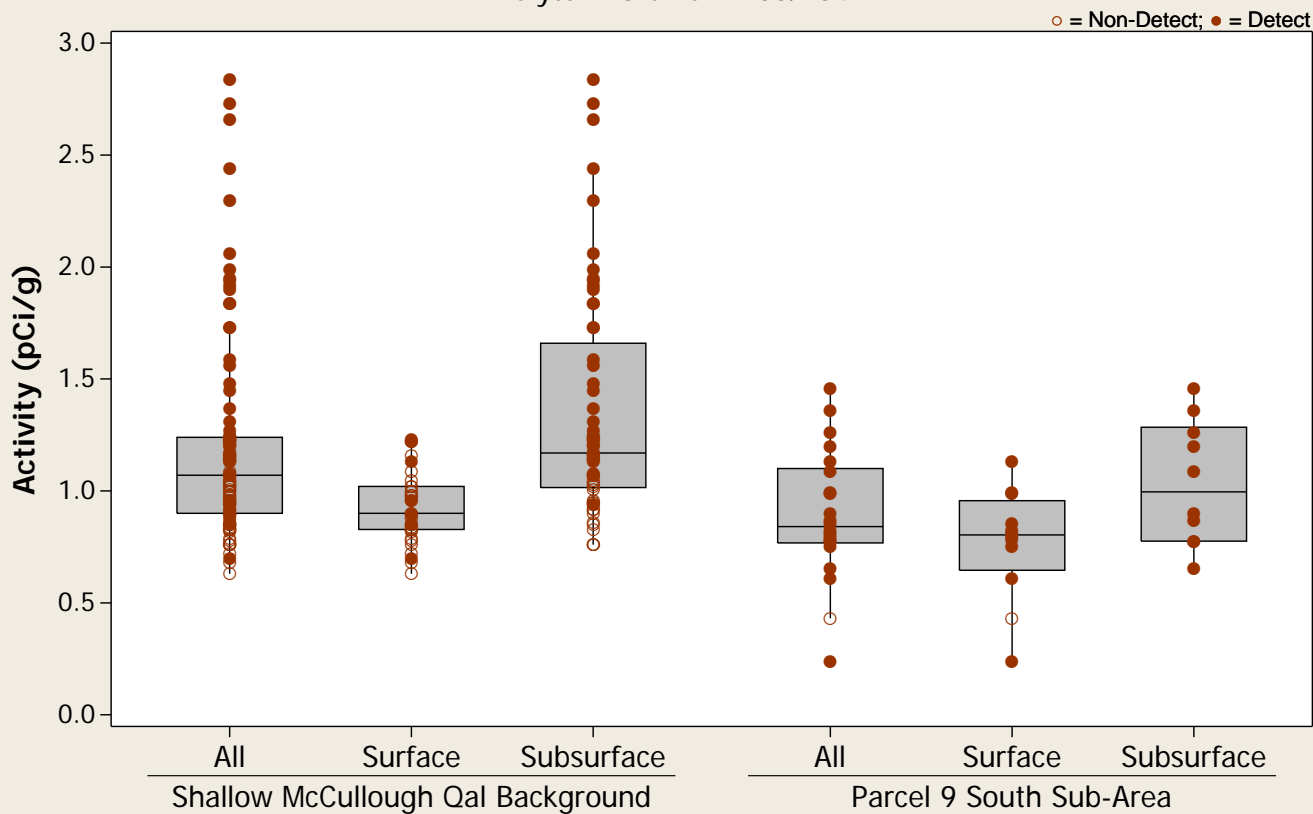
Boxplot Analyte = Thorium-232



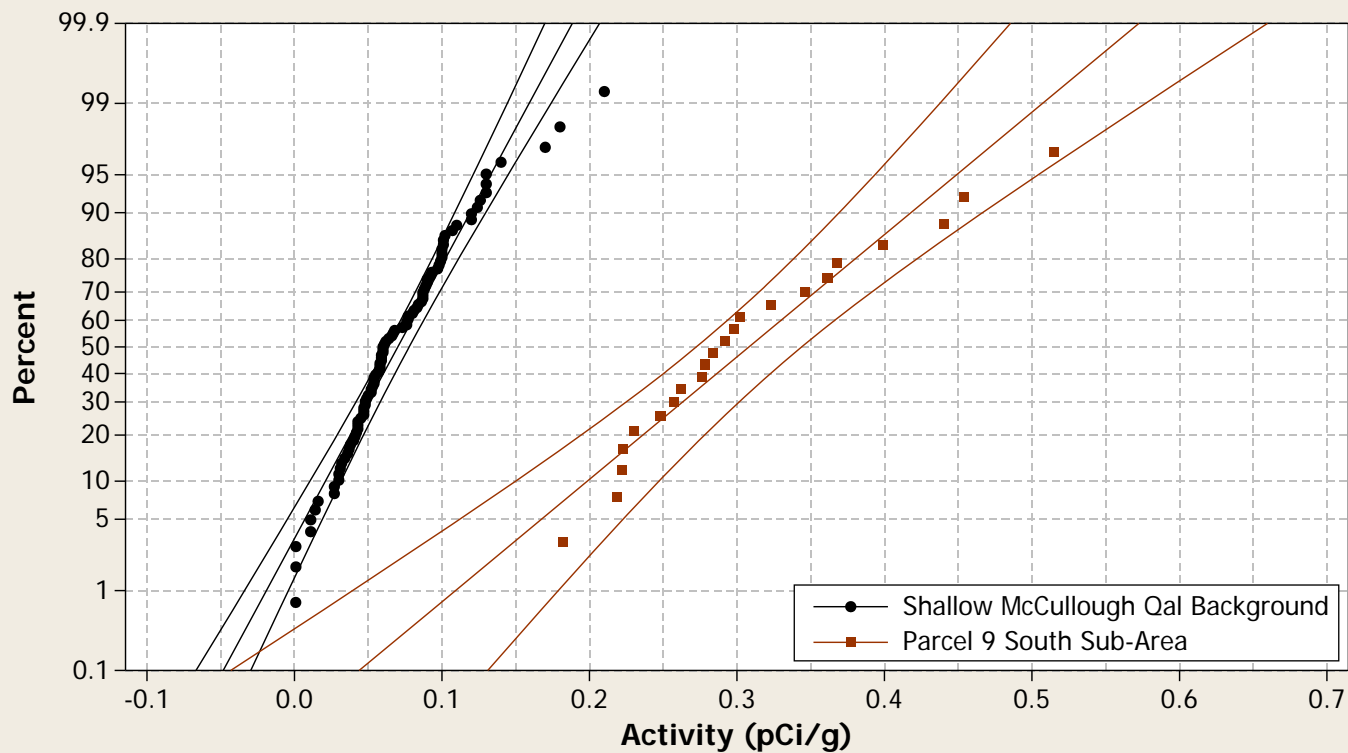
Probability Plot
 Normal - 95% CI
 Analyte = Uranium-233/234



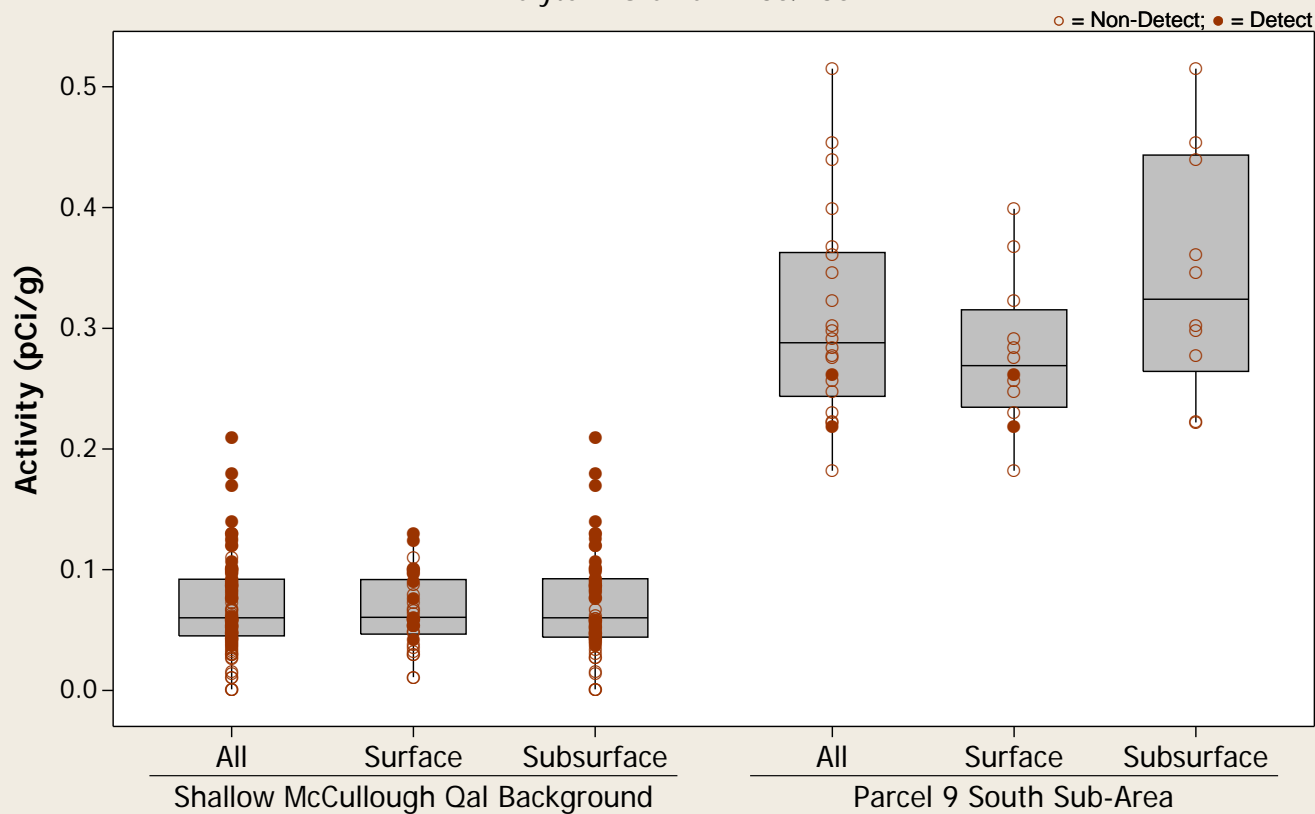
Boxplot
 Analyte = Uranium-233/234



Probability Plot
Normal - 95% CI
Analyte = Uranium-235/236



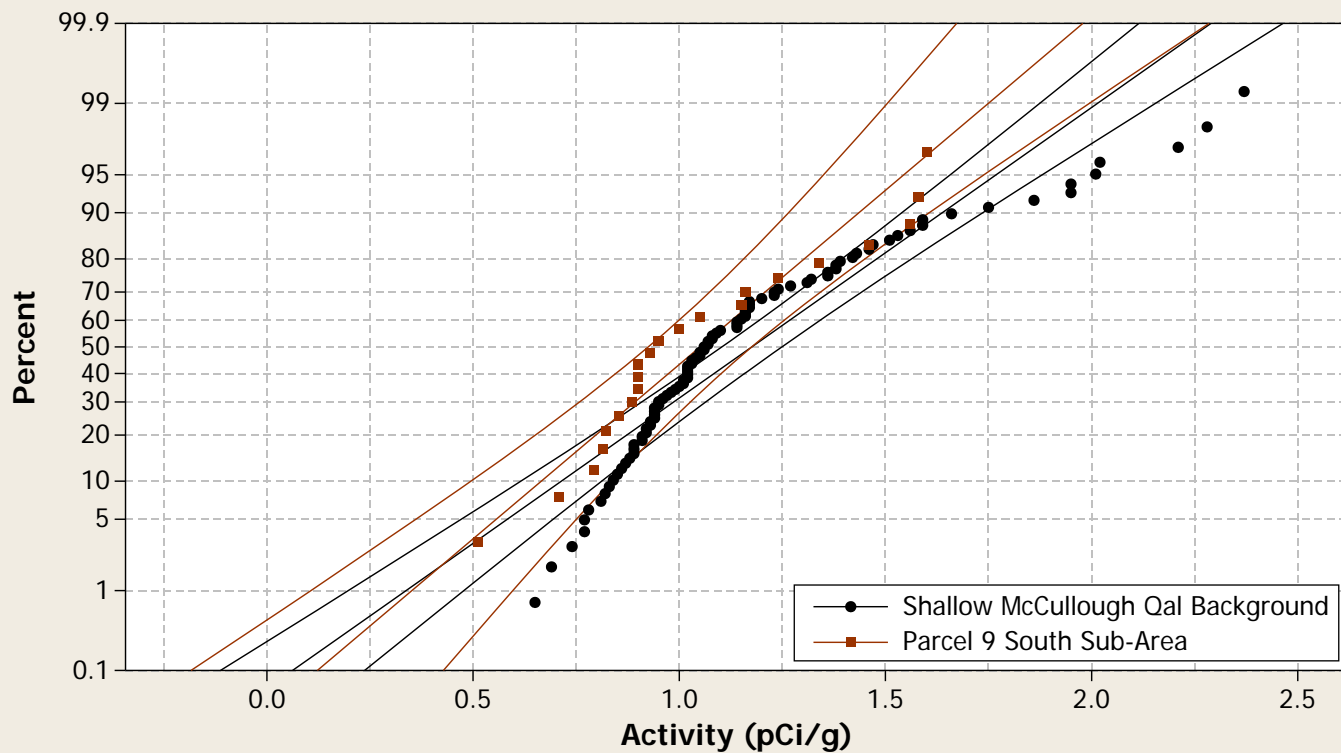
Boxplot
Analyte = Uranium-235/236



Probability Plot

Normal - 95% CI

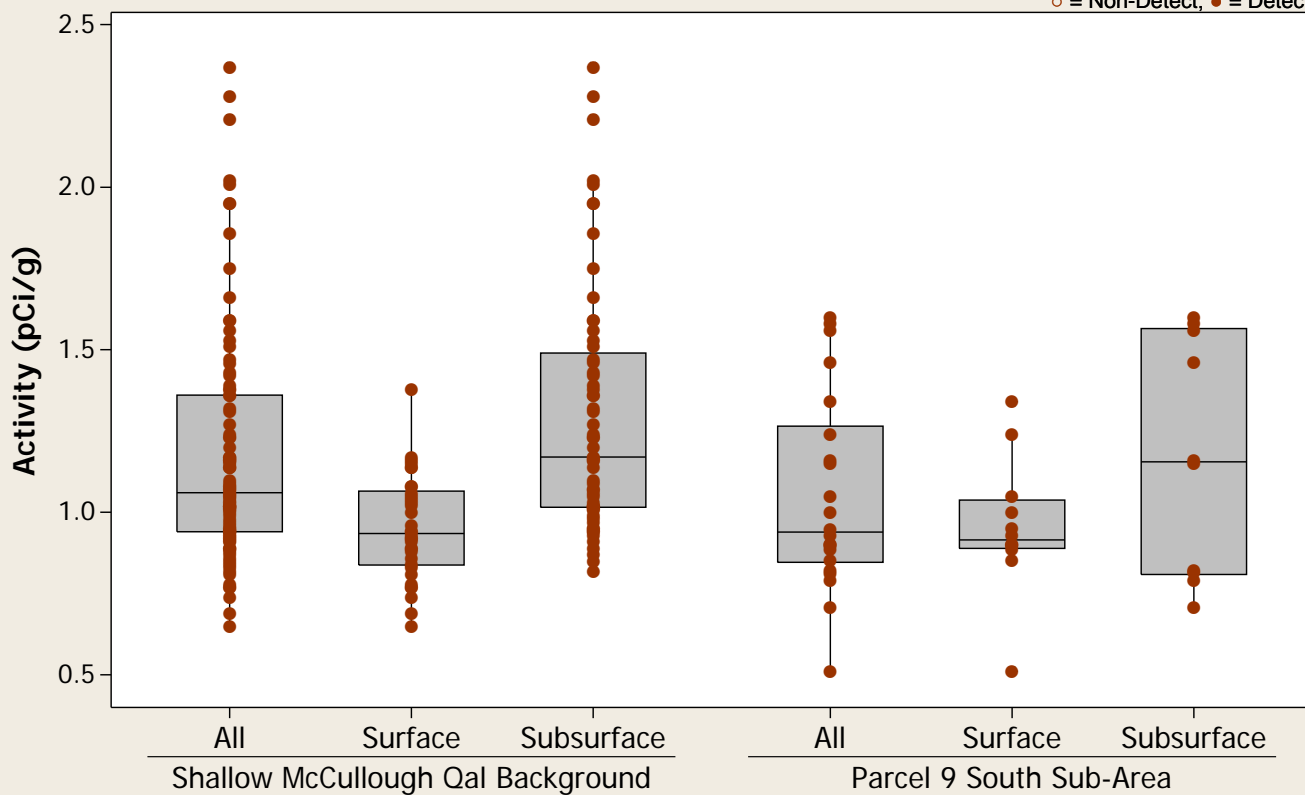
Analyte = Uranium-238



Boxplot

Analyte = Uranium-238

○ = Non-Detect; ● = Detect



APPENDIX H

HUMAN HEALTH RISK ASSESSMENT CALCULATION SPREADSHEETS (on the report CD in Appendix B)

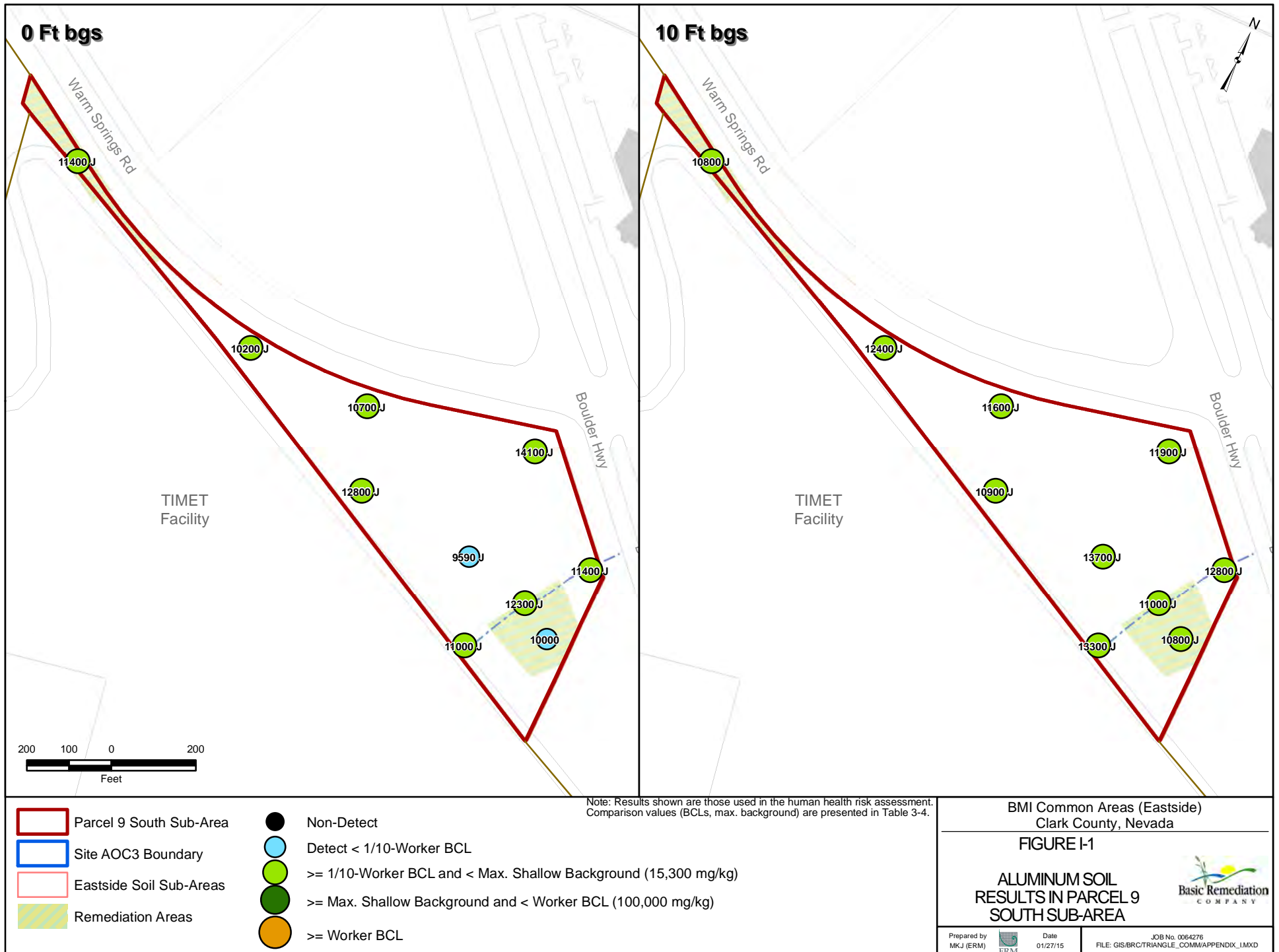
APPENDIX I

METALS AND CHEMICALS OF POTENTIAL CONCERN INTENSITY PLOTS

LIST OF FIGURES (APPENDIX I)

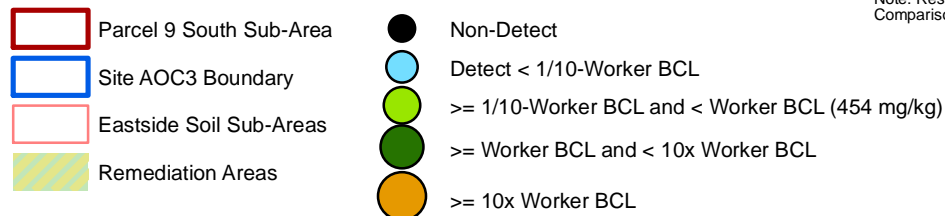
Figure I-1	Aluminum Soil Results in Parcel 9 South Sub-Area
Figure I-2	Antimony Soil Results in Parcel 9 South Sub-Area
Figure I-3	Arsenic Soil Results in Parcel 9 South Sub-Area
Figure I-4	Barium Soil Results in Parcel 9 South Sub-Area
Figure I-5	Beryllium Soil Results in Parcel 9 South Sub-Area
Figure I-6	Boron Soil Results in Parcel 9 South Sub-Area
Figure I-7	Cadmium Soil Results in Parcel 9 South Sub-Area
Figure I-8	Calcium Soil Results in Parcel 9 South Sub-Area
Figure I-9	Chromium Soil Results in Parcel 9 South Sub-Area
Figure I-10	Chromium (VI) Soil Results in Parcel 9 South Sub-Area
Figure I-11	Cobalt Soil Results in Parcel 9 South Sub-Area
Figure I-12	Copper Soil Results in Parcel 9 South Sub-Area
Figure I-13	Iron Soil Results in Parcel 9 South Sub-Area
Figure I-14	Lead Soil Results in Parcel 9 South Sub-Area
Figure I-15	Lithium Soil Results in Parcel 9 South Sub-Area
Figure I-16	Magnesium Soil Results in Parcel 9 South Sub-Area
Figure I-17	Manganese Soil Results in Parcel 9 South Sub-Area
Figure I-18	Mercury Soil Results in Parcel 9 South Sub-Area
Figure I-19	Molybdenum Soil Results in Parcel 9 South Sub-Area
Figure I-20	Nickel Soil Results in Parcel 9 South Sub-Area
Figure I-21	Potassium Soil Results in Parcel 9 South Sub-Area
Figure I-22	Selenium Soil Results in Parcel 9 South Sub-Area
Figure I-23	Silver Soil Results in Parcel 9 South Sub-Area
Figure I-24	Sodium Soil Results in Parcel 9 South Sub-Area
Figure I-25	Strontium Soil Results in Parcel 9 South Sub-Area
Figure I-26	Thallium Soil Results in Parcel 9 South Sub-Area
Figure I-27	Tin Soil Results in Parcel 9 South Sub-Area
Figure I-28	Titanium Soil Results in Parcel 9 South Sub-Area
Figure I-29	Tungsten Soil Results in Parcel 9 South Sub-Area
Figure I-30	Uranium Soil Results in Parcel 9 South Sub-Area

- Figure I-31 Vanadium Soil Results in Parcel 9 South Sub-Area
- Figure I-32 Zinc Soil Results in Parcel 9 South Sub-Area
- Figure I-33 Acetaldehyde Soil Results in Parcel 9 South Sub-Area
- Figure I-34 Thorium-228 Soil Results in Parcel 9 South Sub-Area
- Figure I-35 Asbestos Soil Results in Parcel 9 South Sub-Area
- Figure I-36 TCDD TEQ Soil Results in Parcel 9 South Sub-Area





Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-2

ANTIMONY SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

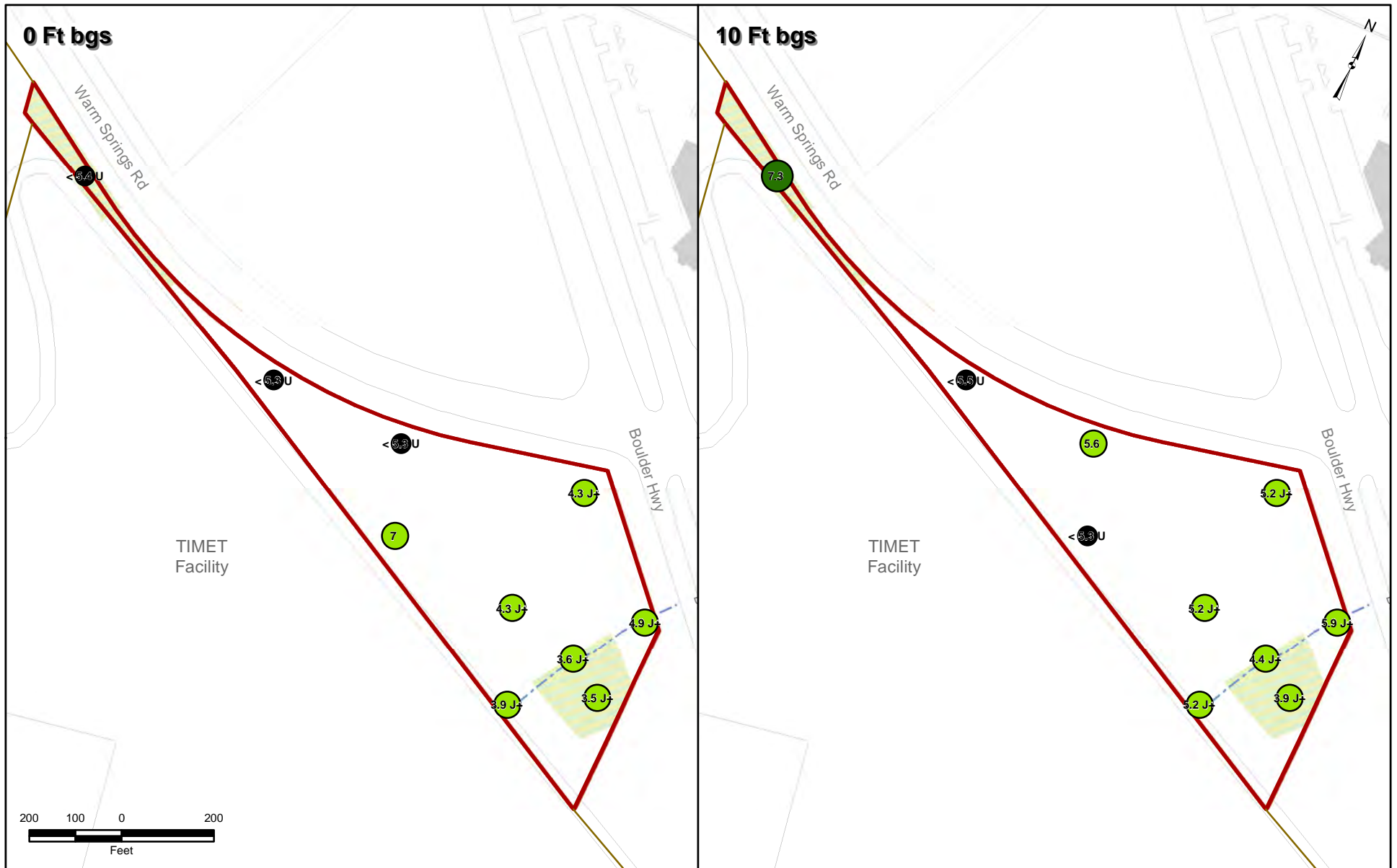


Prepared by
MKJ (ERM)

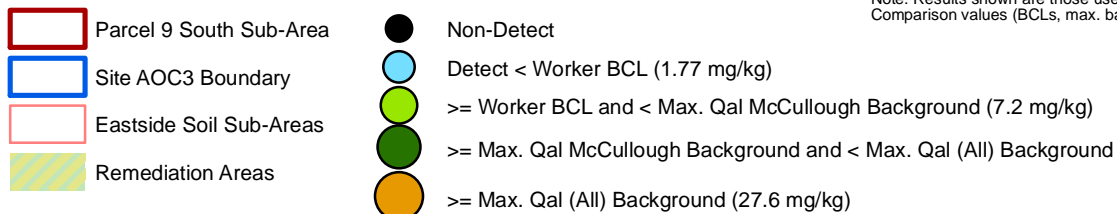


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMMAPPENDIX_LMXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-3

ARSENIC SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

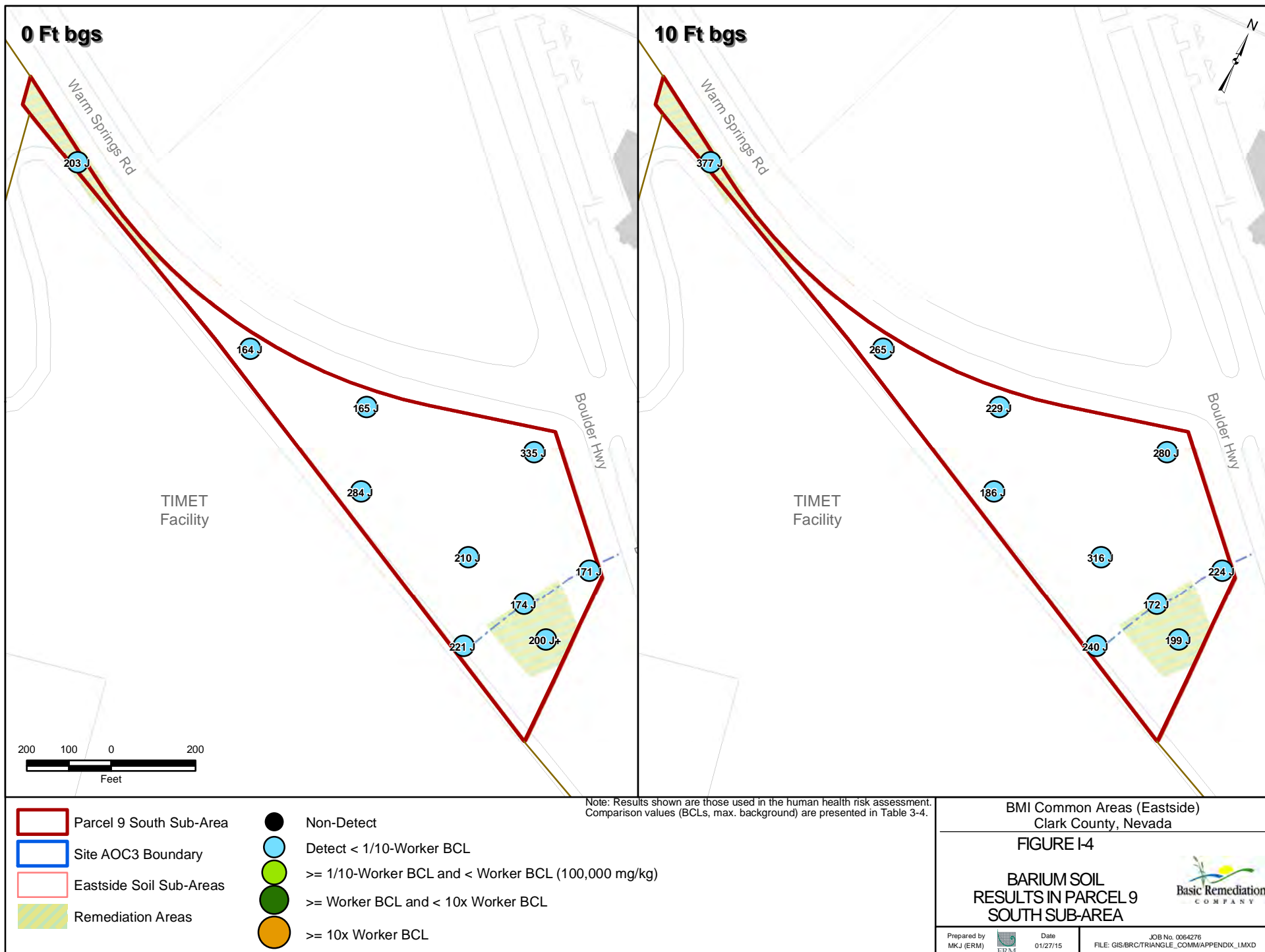


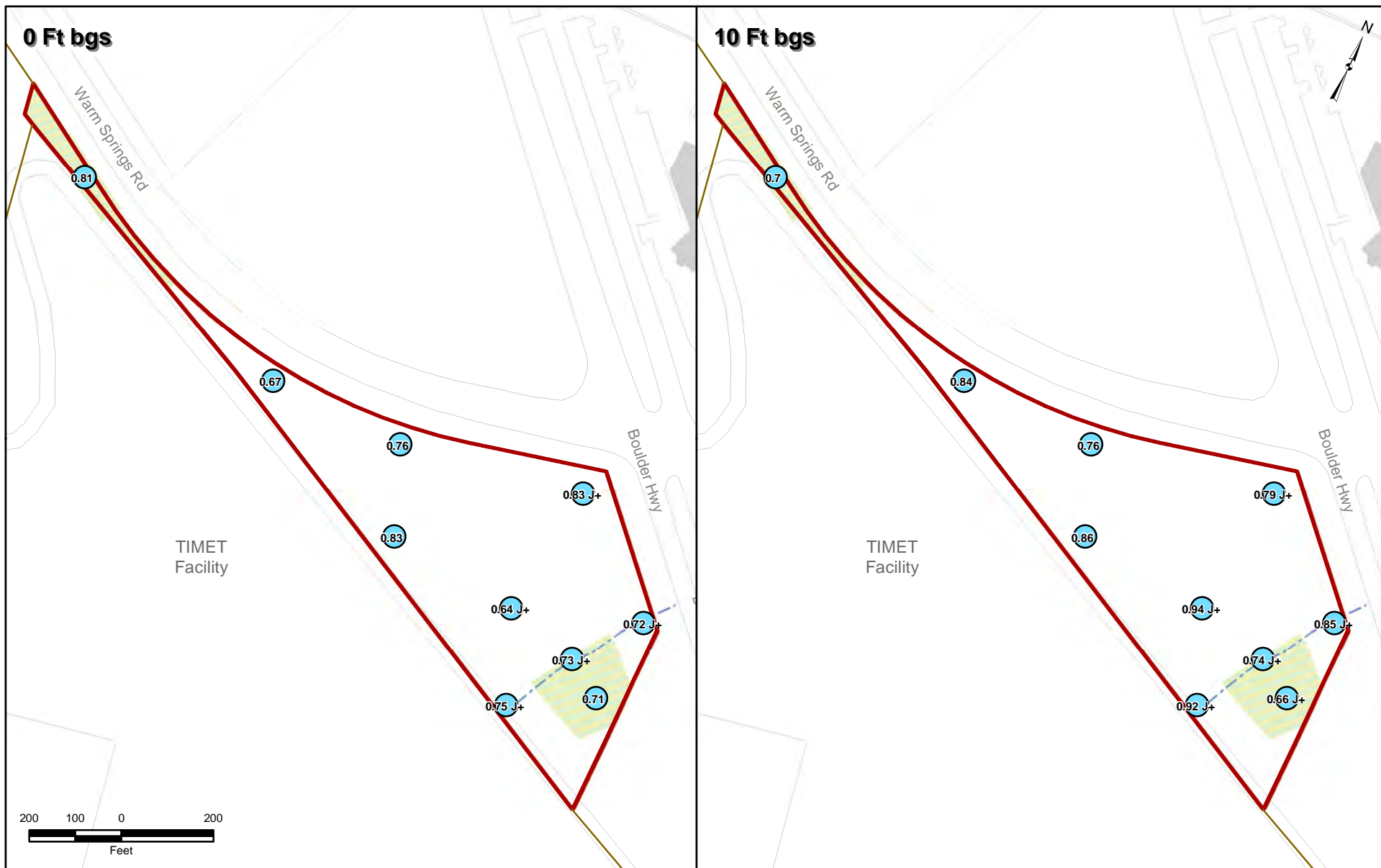
Prepared by
MKJ (ERM)



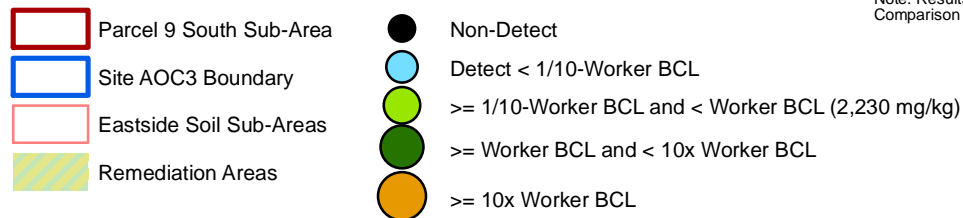
Date
01/27/15

JOB No. 0064276
FILE: GIS/BC/TRIANGLE_COMM/APPENDIX_1.MXD





Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-5

**BERYLLIUM SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA**



Prepared by
MKJ (ERM)

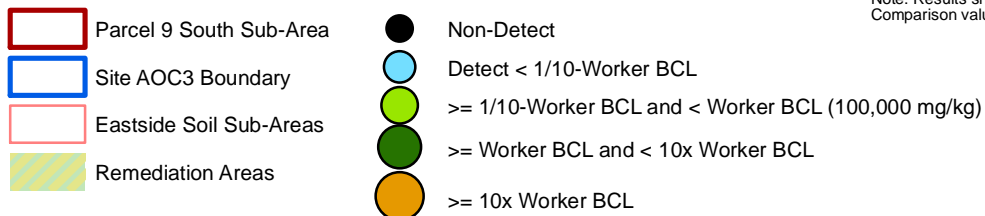


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMM/APPENDIX_LMXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-6

**BORON SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA**



Prepared by
MKJ (ERM)

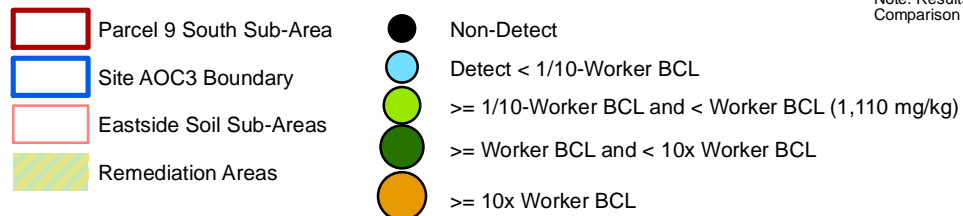


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMMAPPENDIX_LMXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-7

CADMIUM SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA



Prepared by
MKJ (ERM)

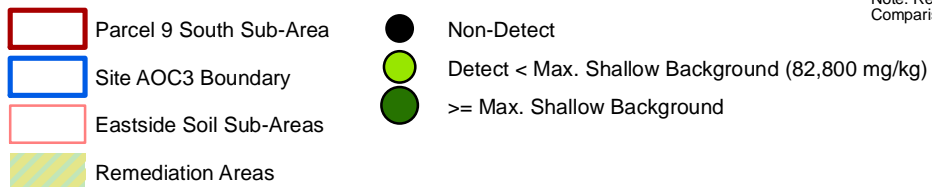


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMMAPPENDIX_LMXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-8

CALCIUM SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

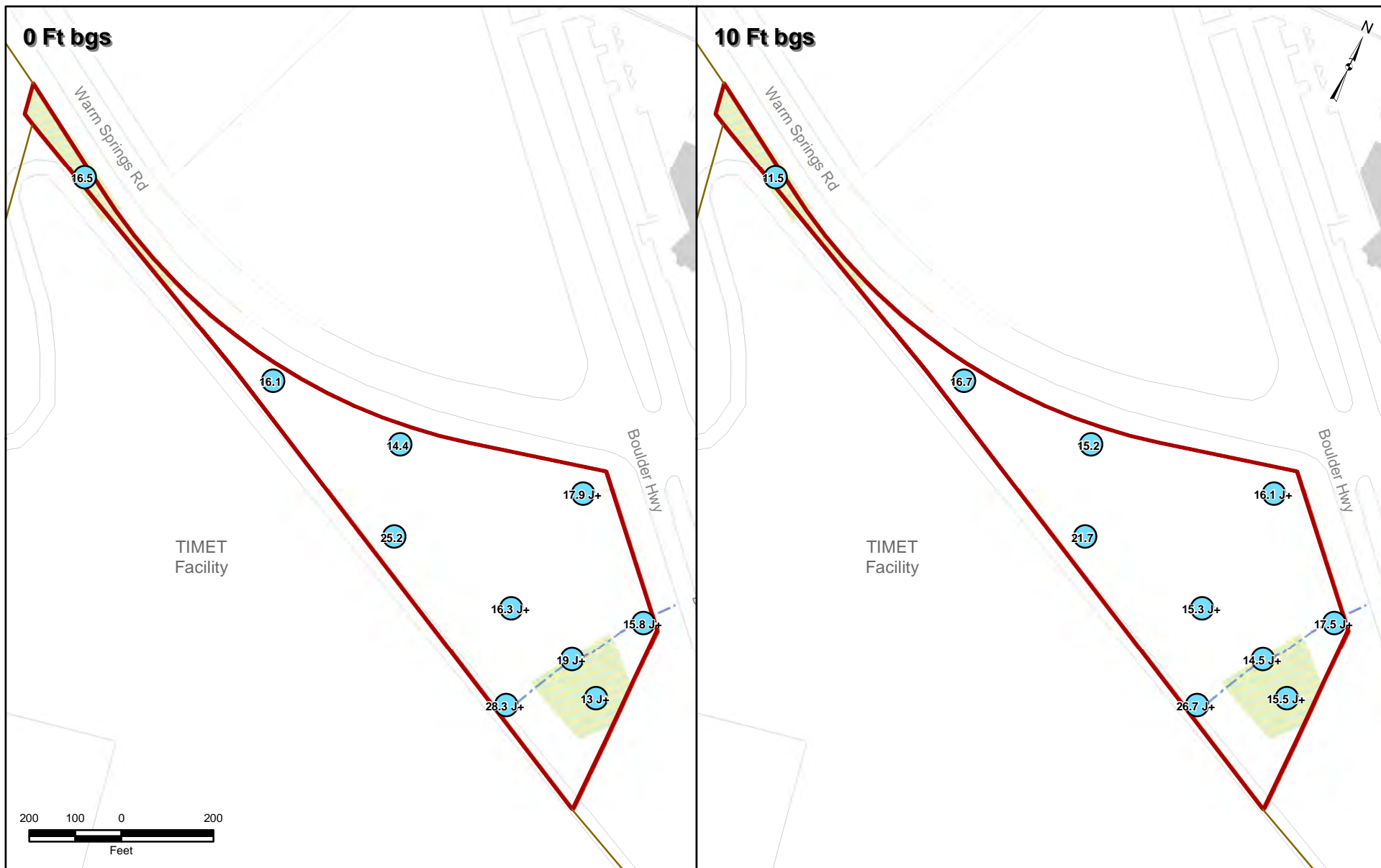


Prepared by
MKJ (ERM)

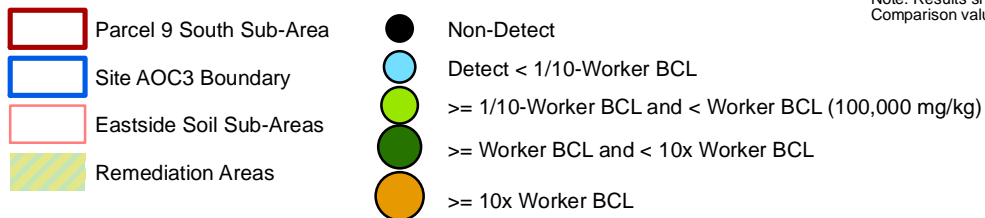


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMM/APPENDIX_1.MXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-9

CHROMIUM SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

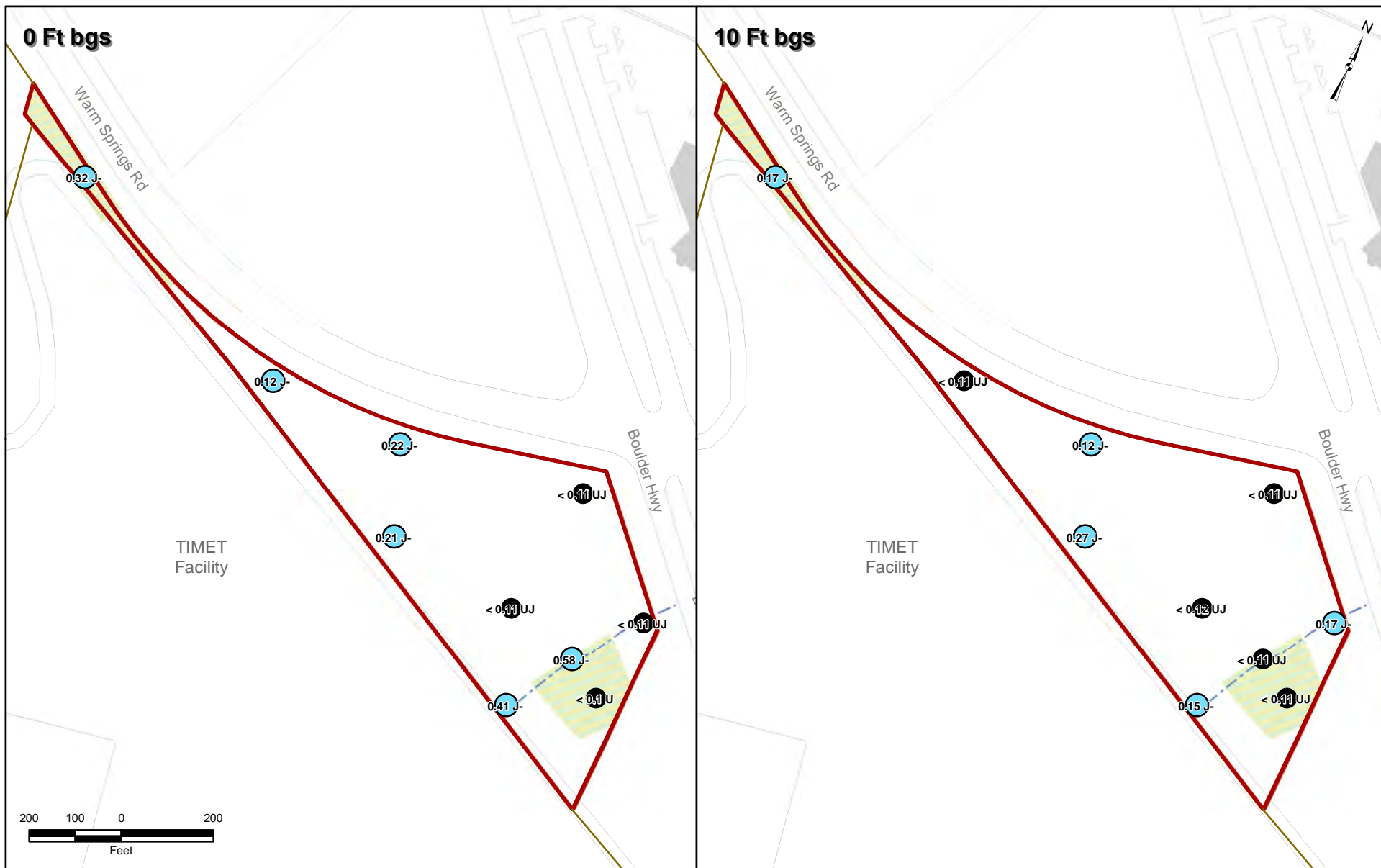


Prepared by
MKJ (ERM)

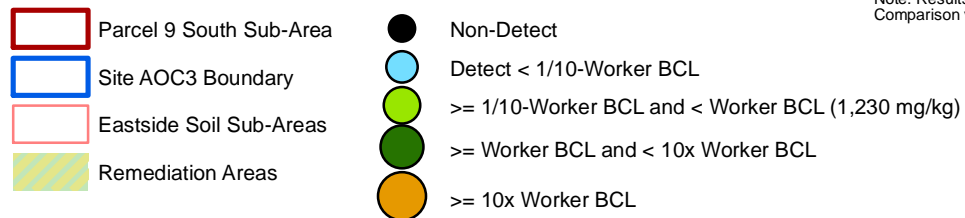


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRC/TRIANGLE_COMM/APPENDIX_LMXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-10

CHROMIUM (VI) SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

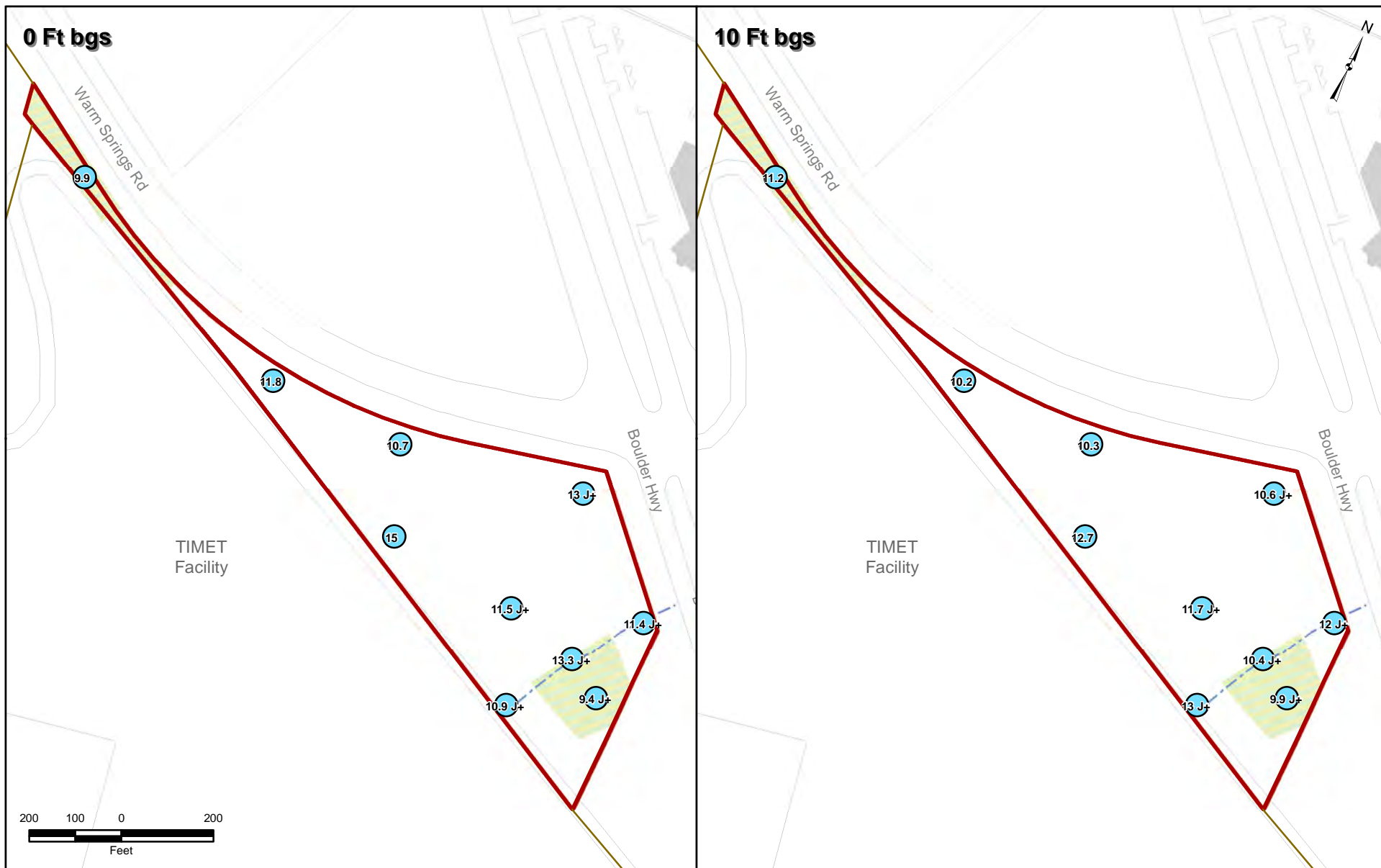


Prepared by
MKJ (ERM)

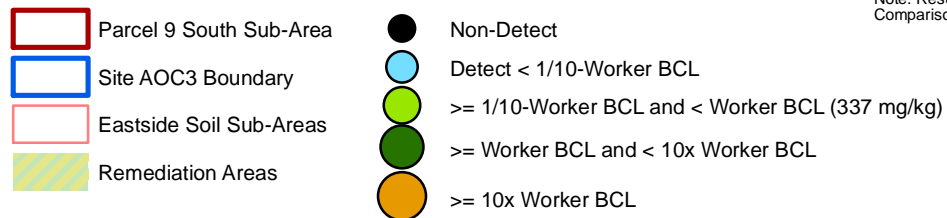


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMM/APPENDIX_LMXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-11

COBALT SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

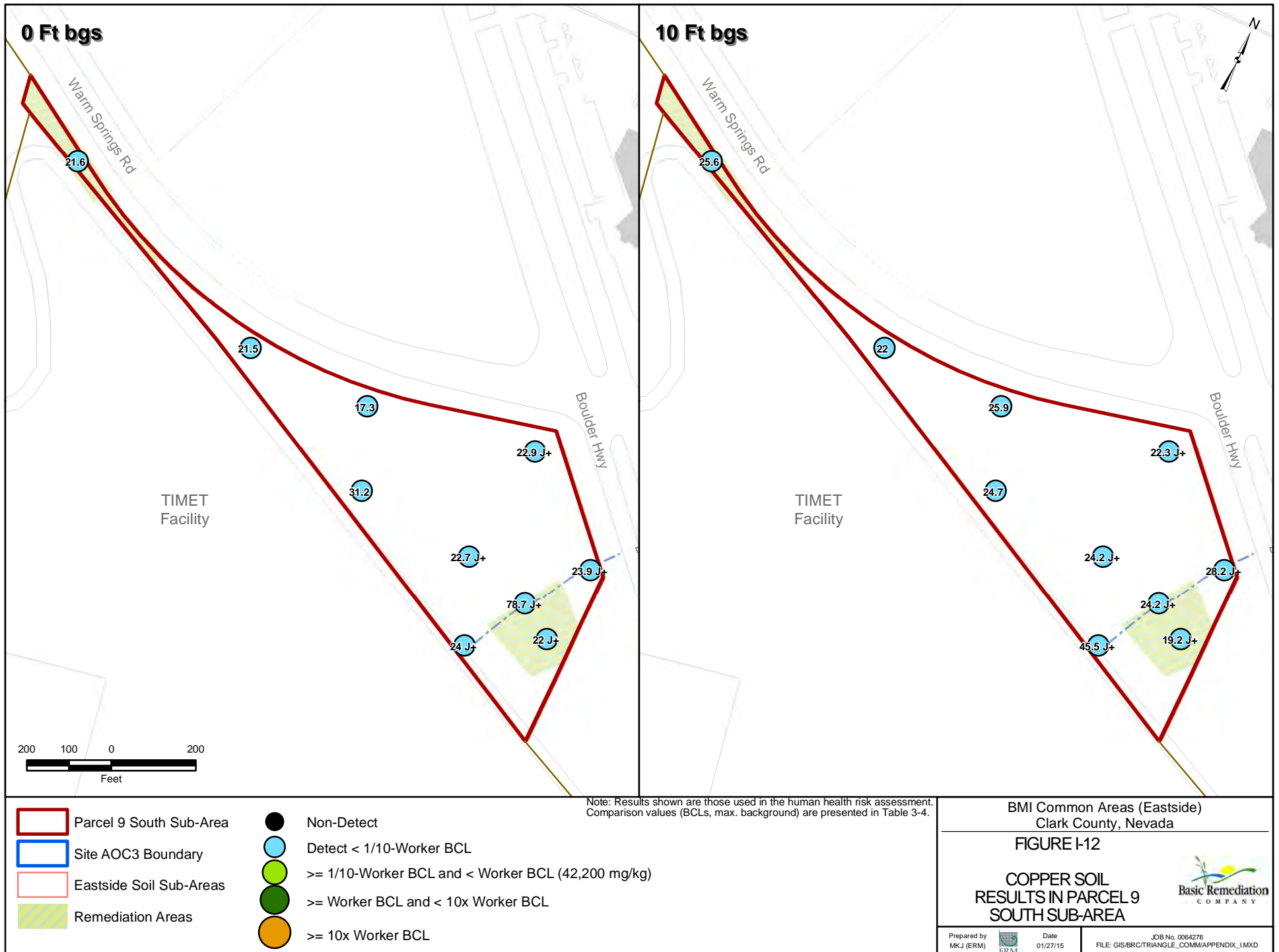


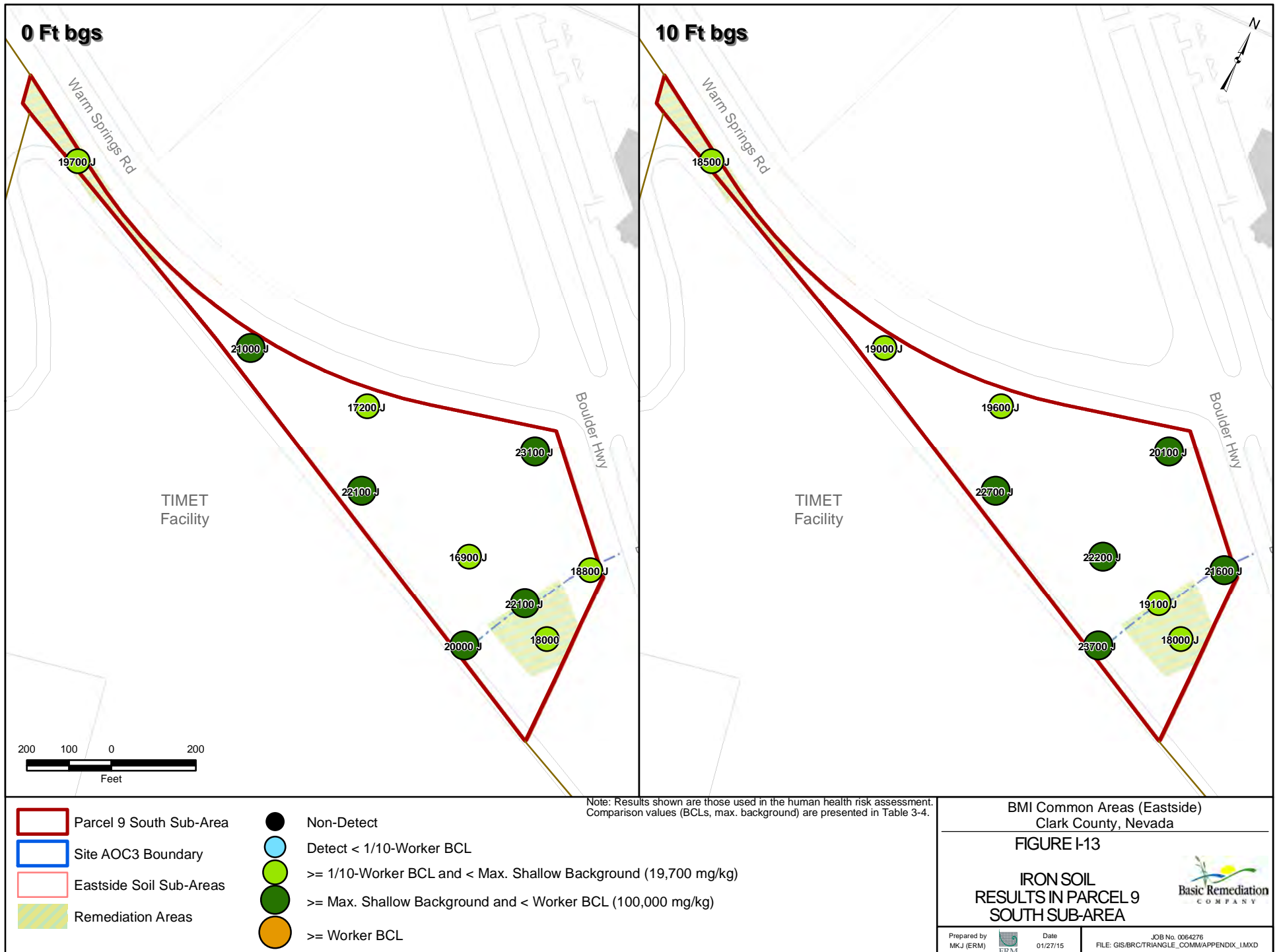
Prepared by
MKJ (ERM)

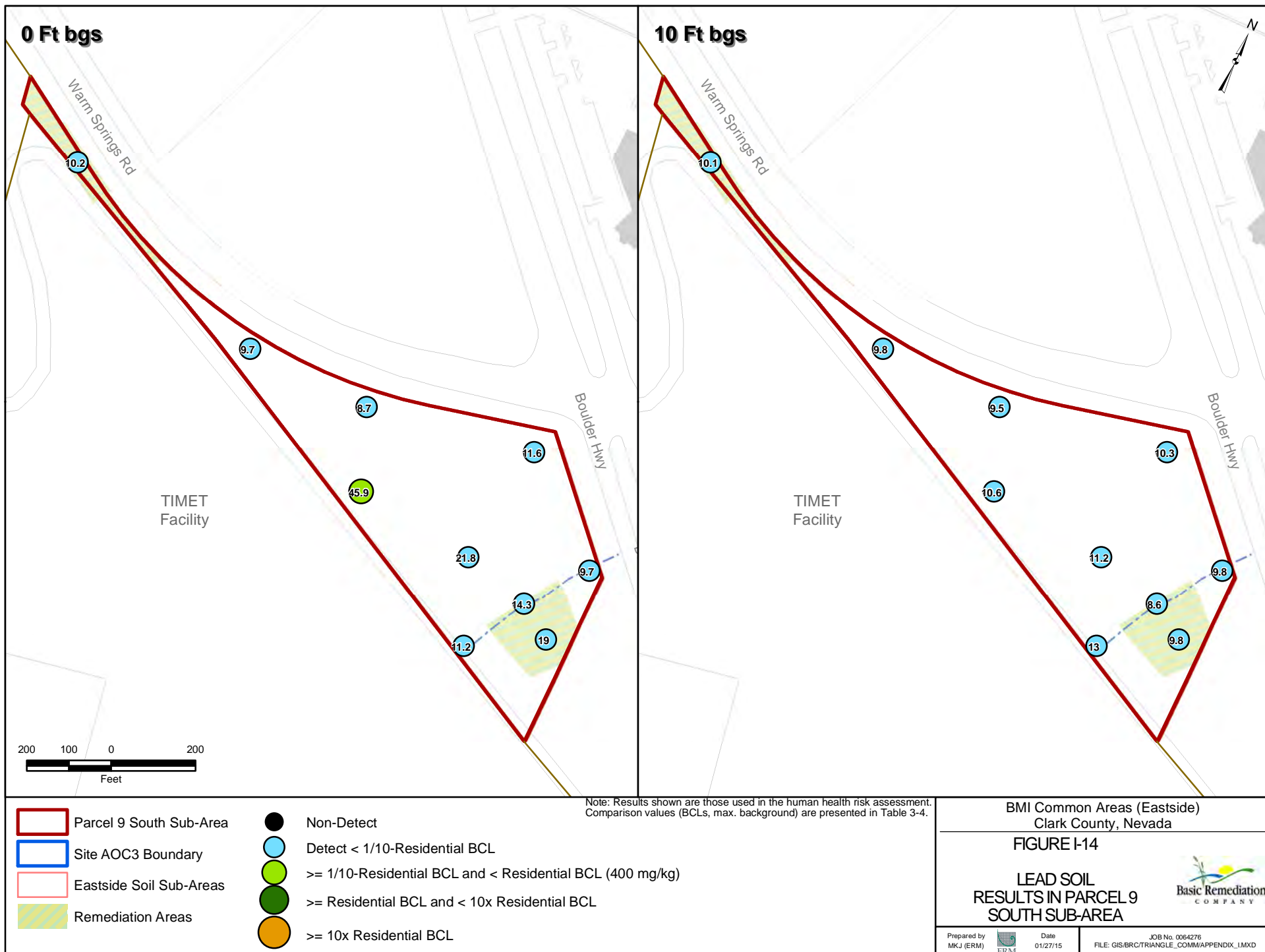


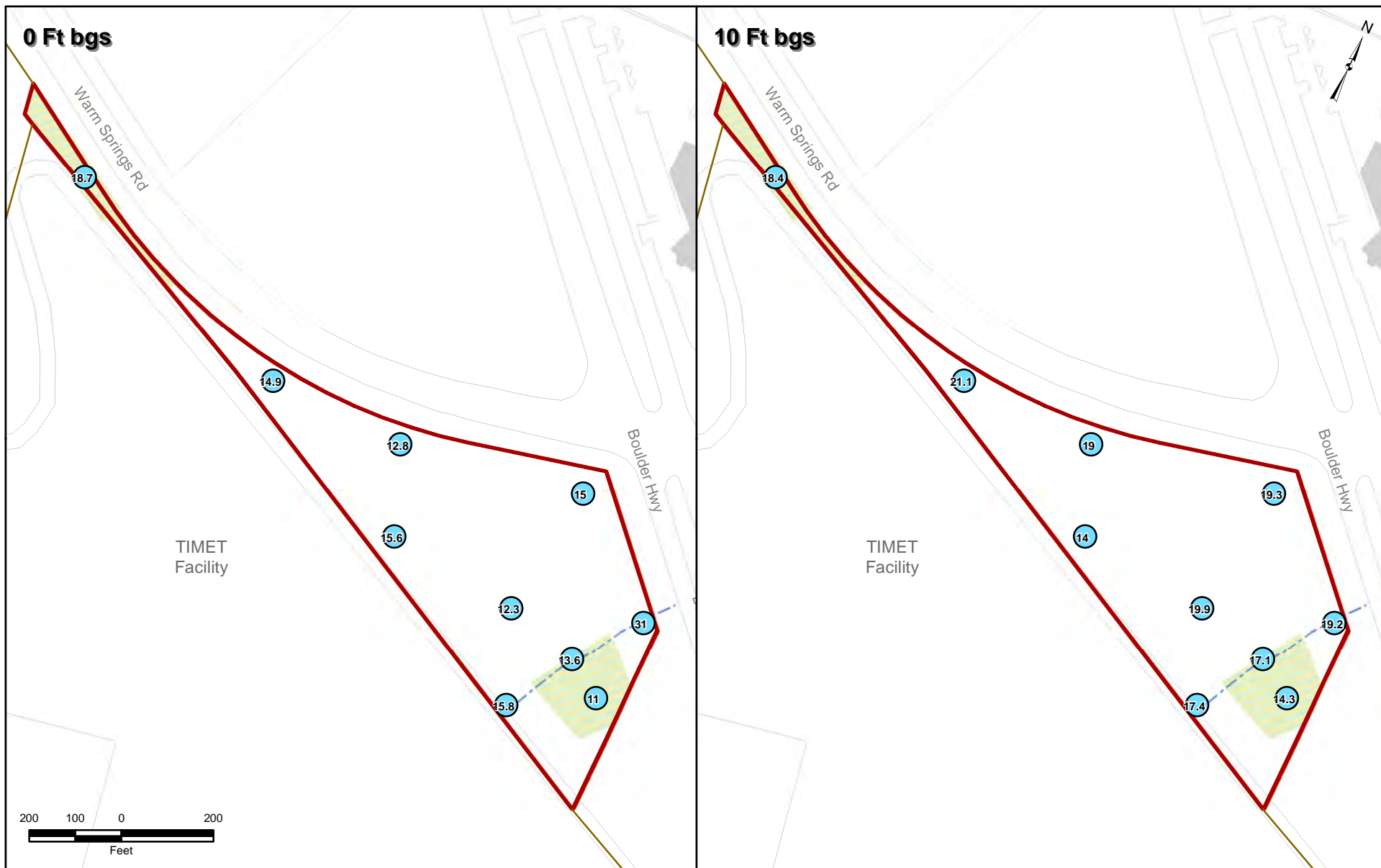
Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMMAPPENDIX_LMXD

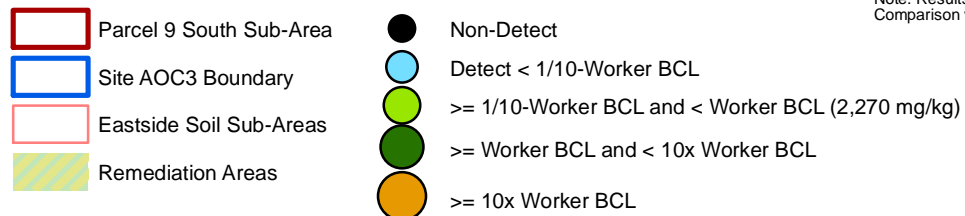








Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-15

LITHIUM SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

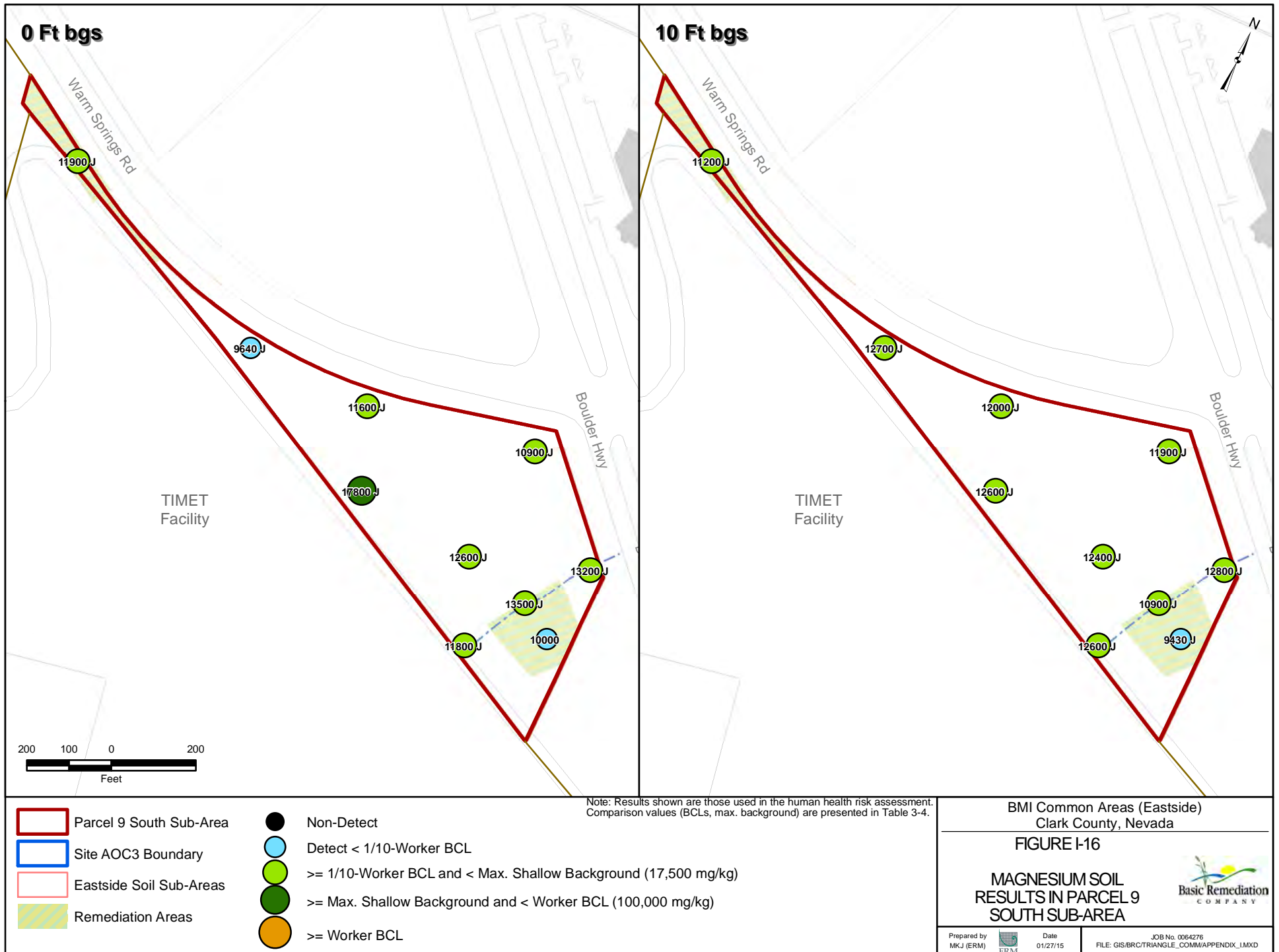


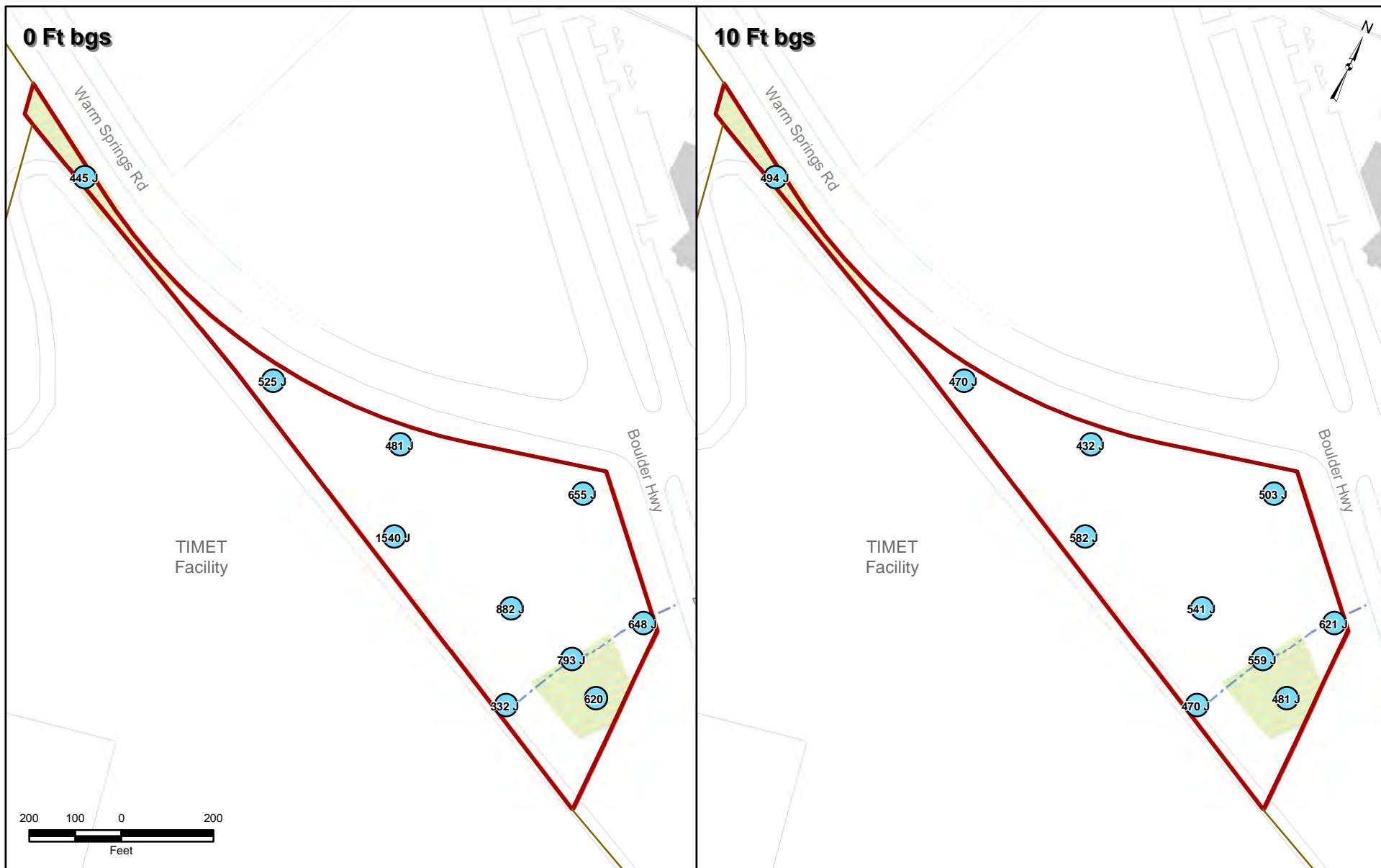
Prepared by
MKJ (ERM)



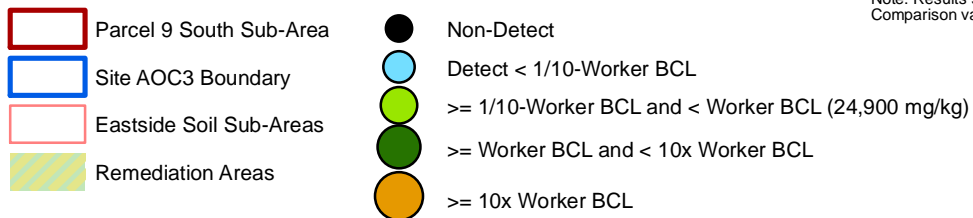
Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMM/APPENDIX_LMXD





Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-17

MANGANESE SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA



Prepared by
MKJ (ERM)



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01/27/15

JOB No. 0064276
FILE: GIS/BRC/TRIANGLE_COMM/APPENDIX_LMXD



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-18

MERCURY SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

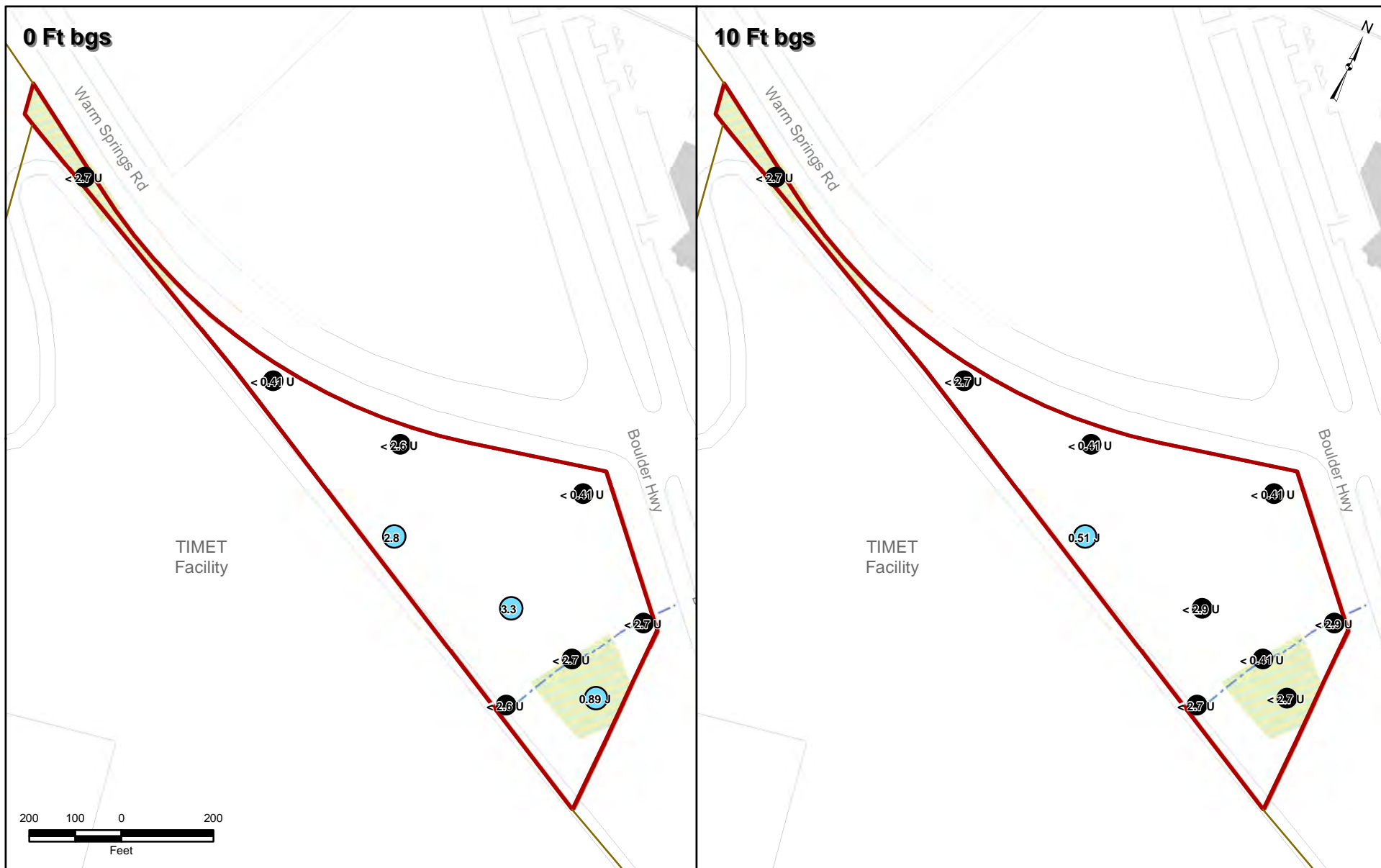


Prepared by
MKJ (ERM)

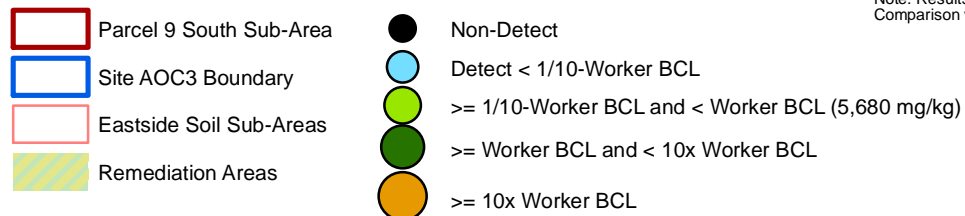


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMMAPPENDIX_LMXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-19

MOLYBDENUM SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

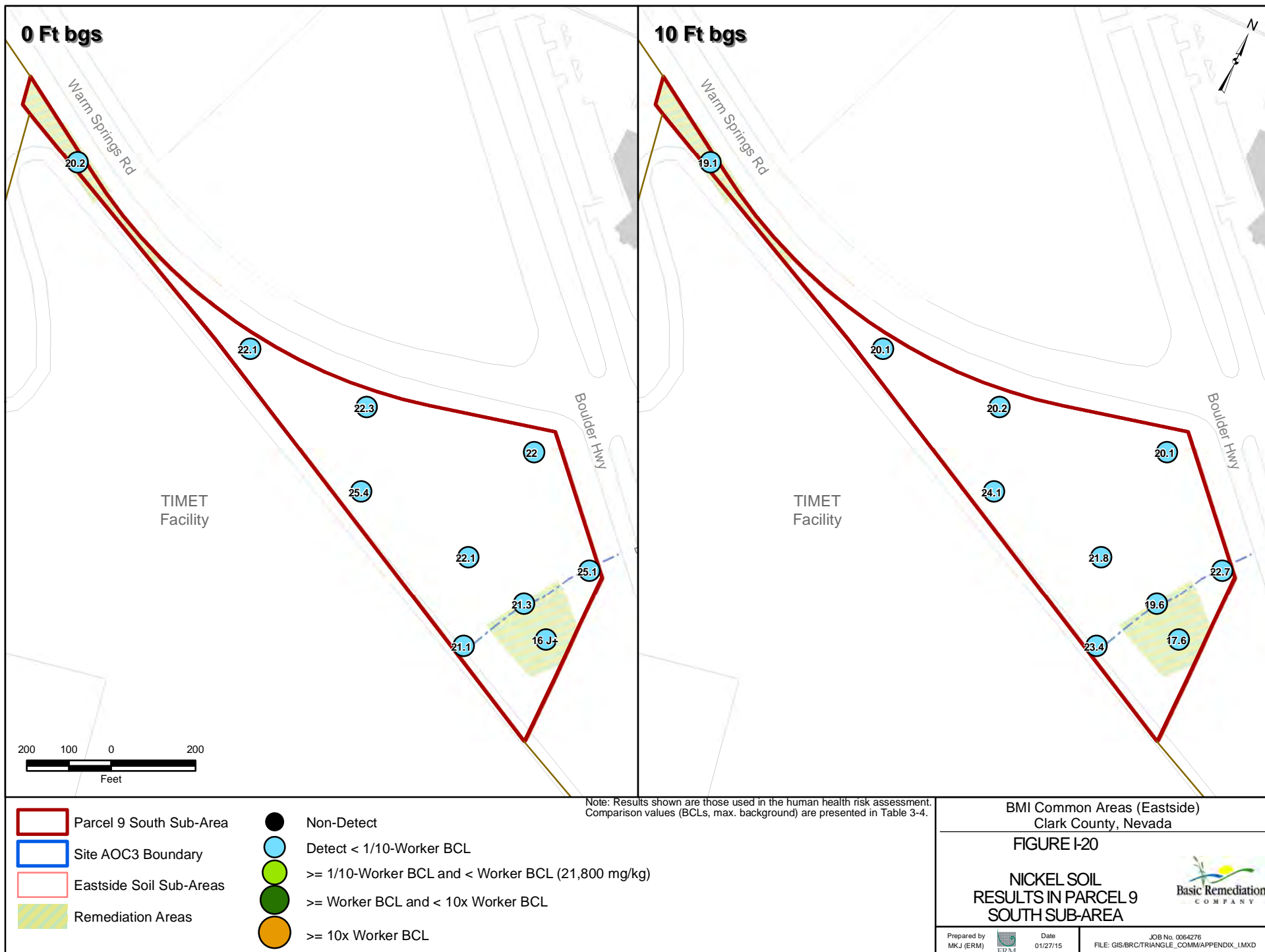


Prepared by
MKJ (ERM)



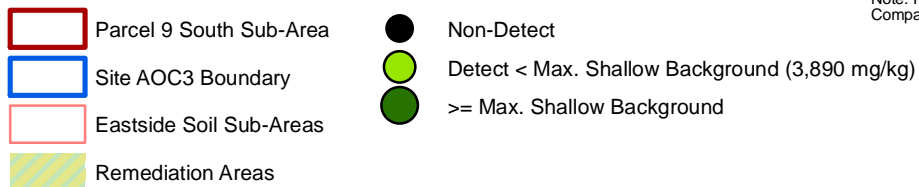
Date
01/27/15

JOB No. 0064276
FILE: GIS/BC/TRIANGLE_COMM/APPENDIX_1.MXD





Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-21

POTASSIUM SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA



Prepared by
MKJ (ERM)

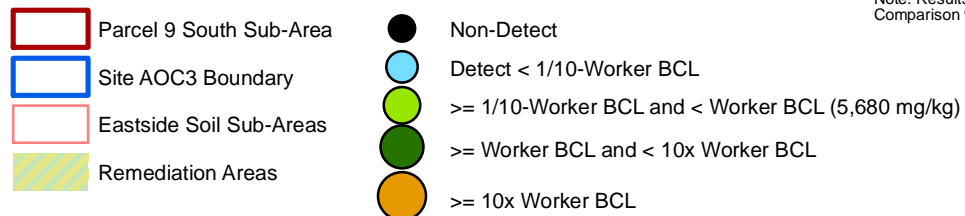


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMMAPPENDIX_1.MXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-22

SELENIUM SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA



Prepared by
MKJ (ERM)



Date
01/27/15

JOB No. 0064276
FILE: GIS/BRC/TRIANGLE_COMM/APPENDIX_LMXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.

- Parcel 9 South Sub-Area
- Site AOC3 Boundary
- Eastside Soil Sub-Areas
- Remediation Areas

- Non-Detect
- Detect < 1/10-Worker BCL
- \geq 1/10-Worker BCL and < Worker BCL (5,680 mg/kg)
- \geq Worker BCL and < 10x Worker BCL
- \geq 10x Worker BCL

BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-23

SILVER SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA



Prepared by
MKJ (ERM)










Date
01/27/15

JOB No. 0064276
FILE: GIS/BC/TRIANGLE_COMM/APPENDIX_1.MXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.

- | | | | |
|---|-------------------------|---|--|
|  | Parcel 9 South Sub-Area |  | Non-Detect |
|  | Site AOC3 Boundary |  | Detect < Max. Shallow Background (1,320 mg/kg) |
|  | Eastside Soil Sub-Areas |  | >= Max. Shallow Background |
|  | Remediation Areas | | |

BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-24

SODIUM SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

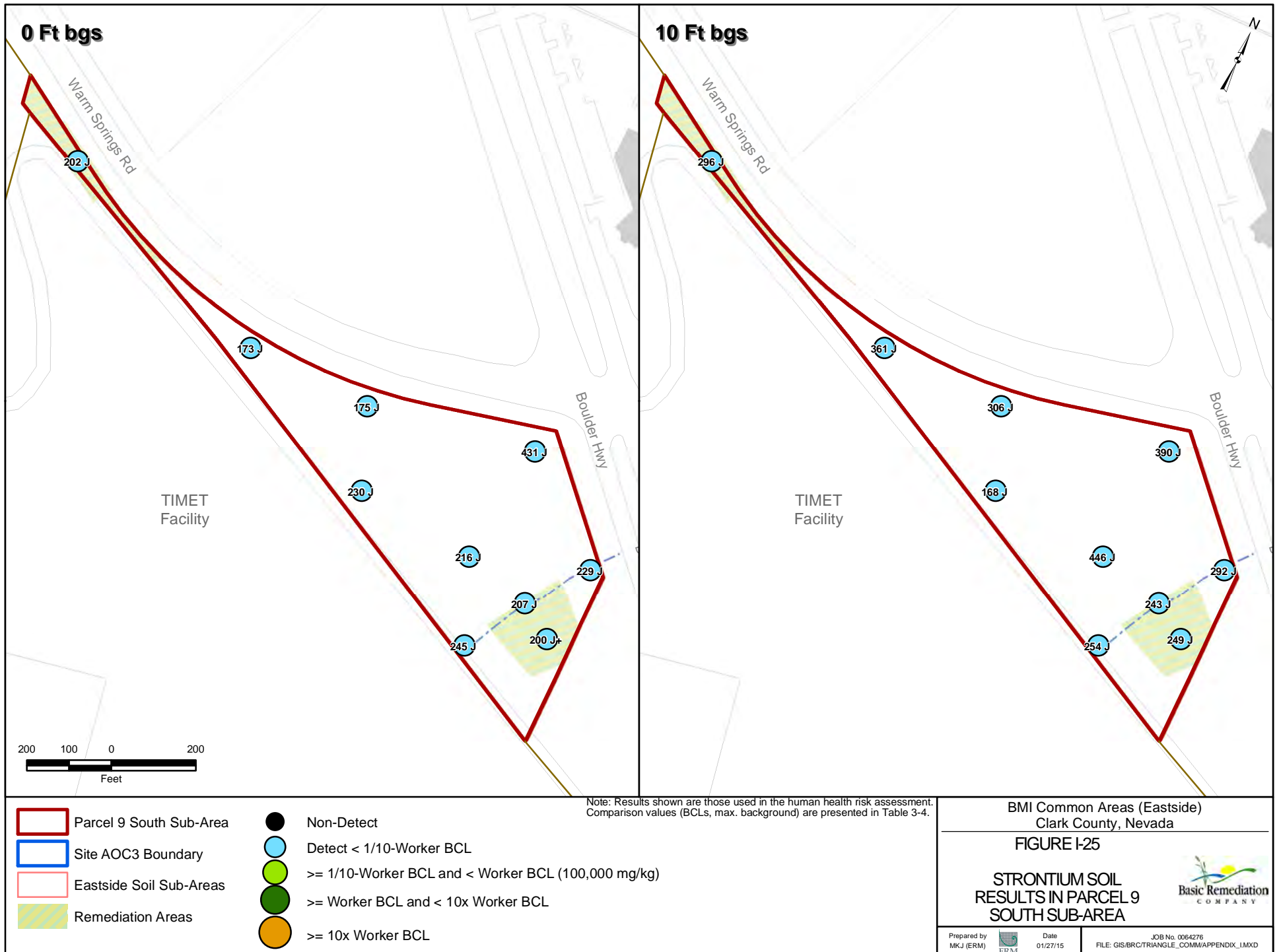


Prepared by
MKJ (ERM)



Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMMAPPENDIX_LMXD





Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.

- Parcel 9 South Sub-Area
- Site AOC3 Boundary
- Eastside Soil Sub-Areas
- Remediation Areas

- Non-Detect
- Detect < 1/10-Worker BCL
- \geq 1/10-Worker BCL and < Worker BCL (74.9 mg/kg)
- \geq Worker BCL and < 10x Worker BCL
- \geq 10x Worker BCL

BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-26

THALLIUM SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA



Prepared by
MKJ (ERM)

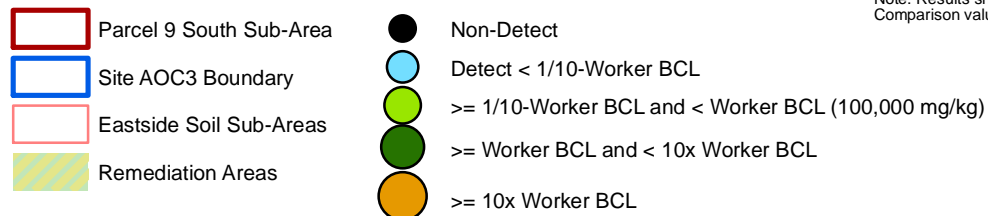


Date
01/27/15

JOB No. 0064276
FILE: GIS/BC/TRIANGLE_COMM/APPENDIX_1.MXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-27

TIN SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

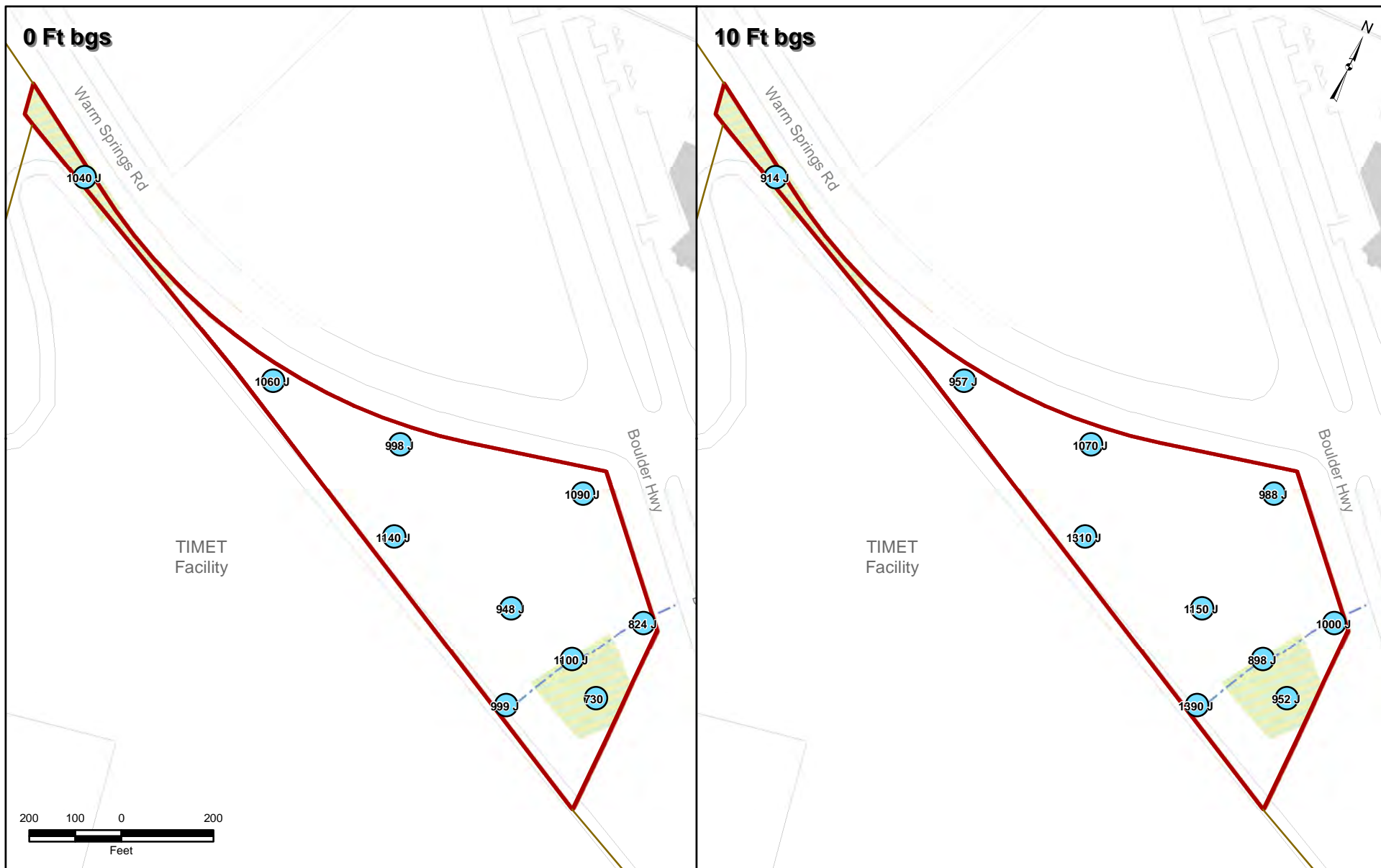


Prepared by
MKJ (ERM)

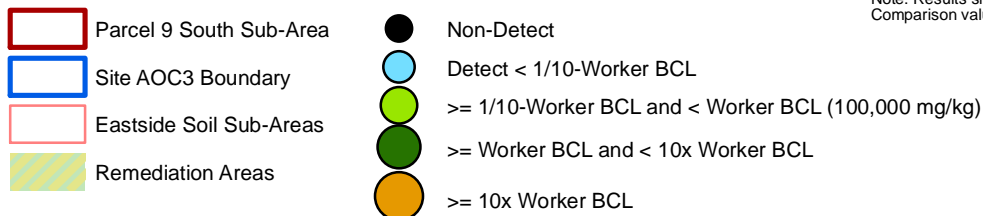


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRC/TRIANGLE_COMM/APPENDIX_LMXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-28

TITANIUM SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

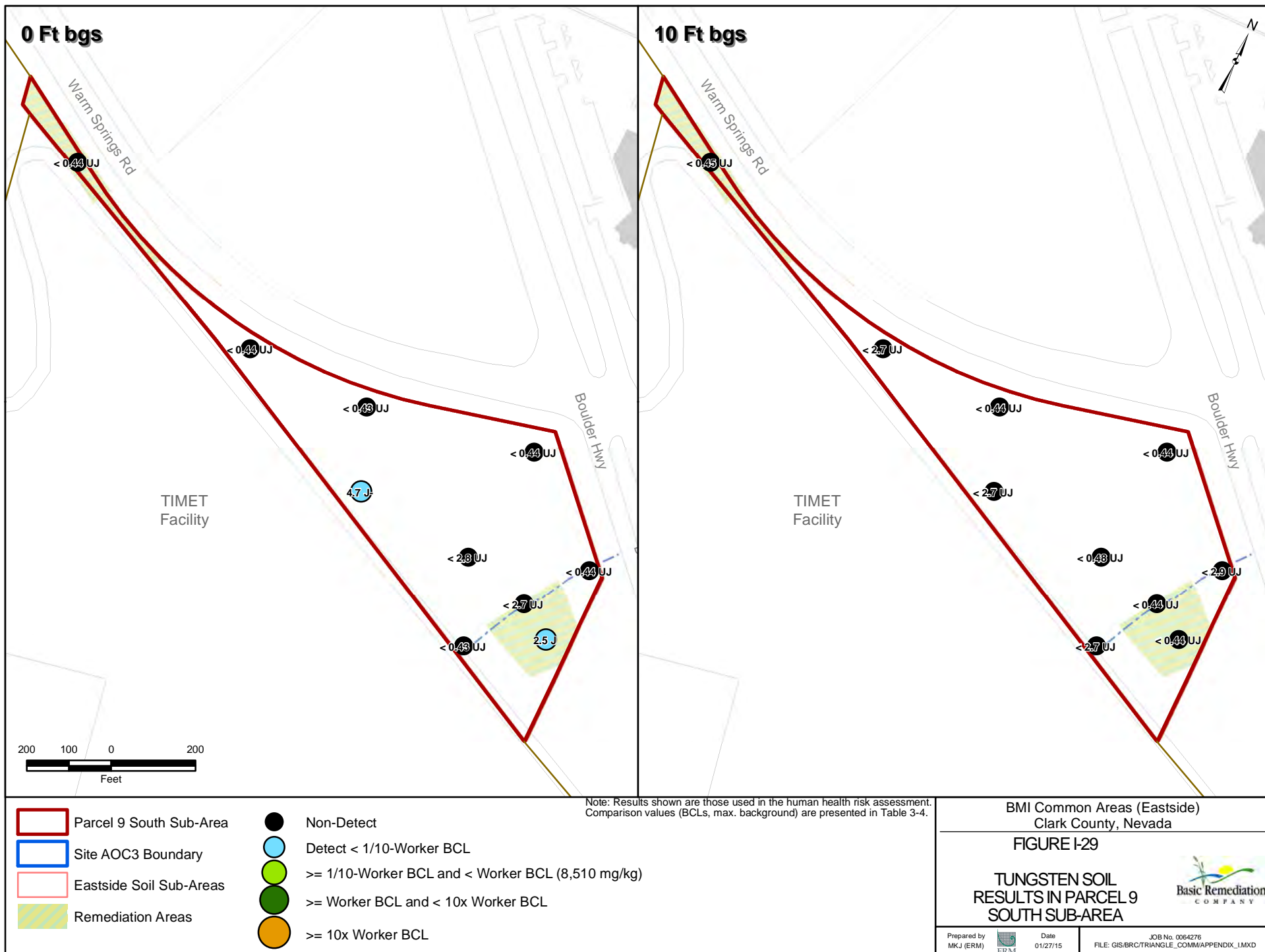


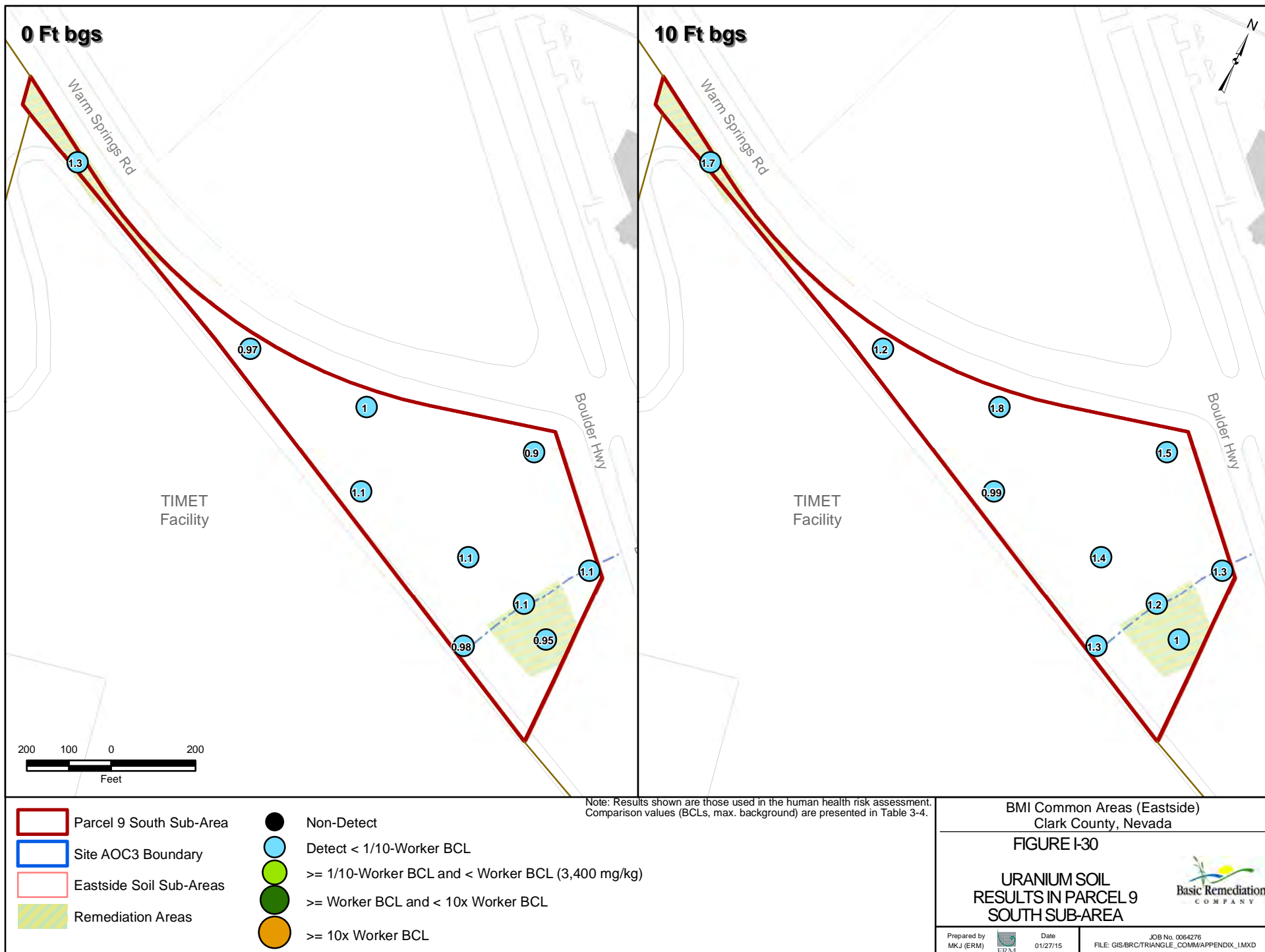
Prepared by
MKJ (ERM)

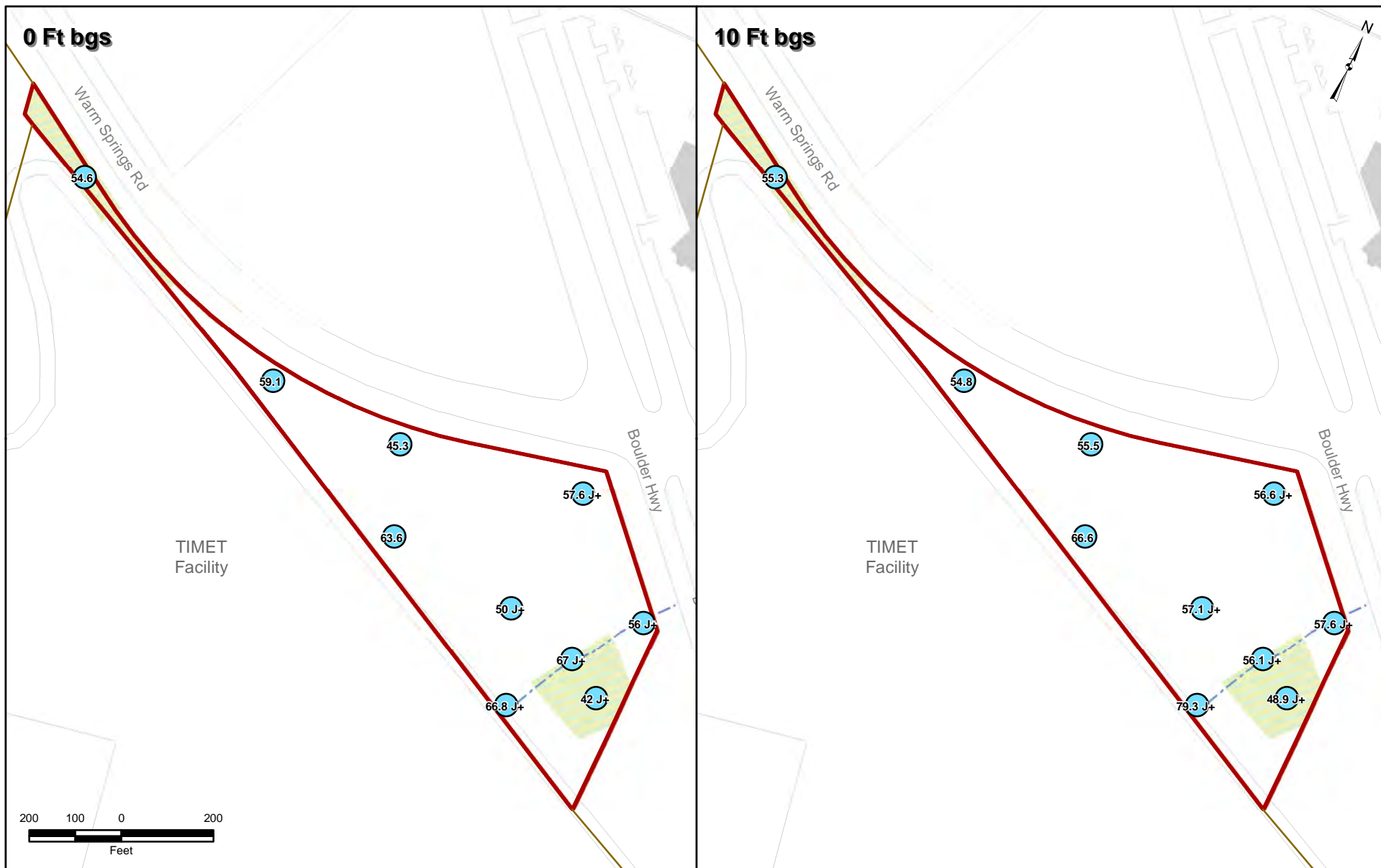


Date
01/27/15

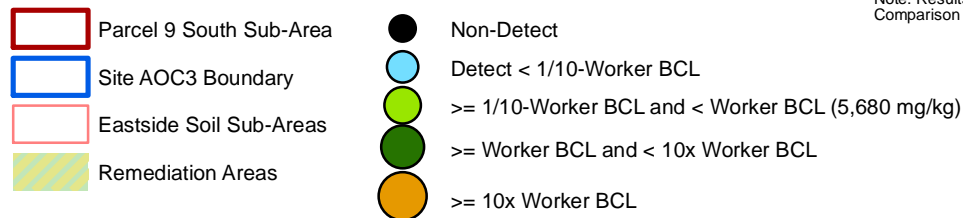
JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMM/APPENDIX_1.MXD







Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-31

VANADIUM SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA



Prepared by
MKJ (ERM)

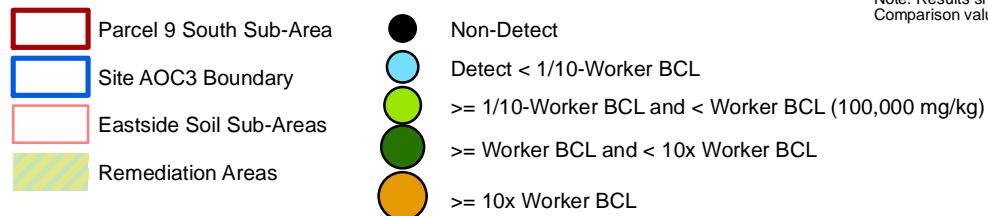


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMM/APPENDIX_LMXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-32

ZINC SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA



Prepared by
MKJ (ERM)

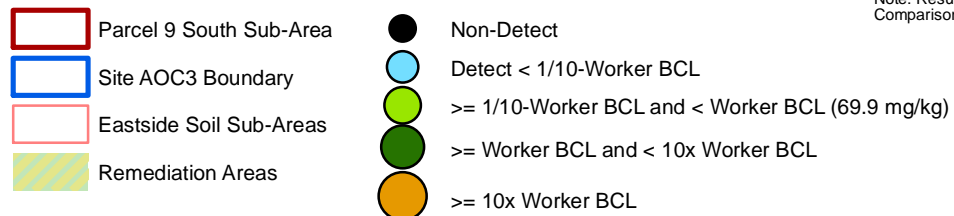


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMM/APPENDIX_LMXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-33

ACETALDEHYDE SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

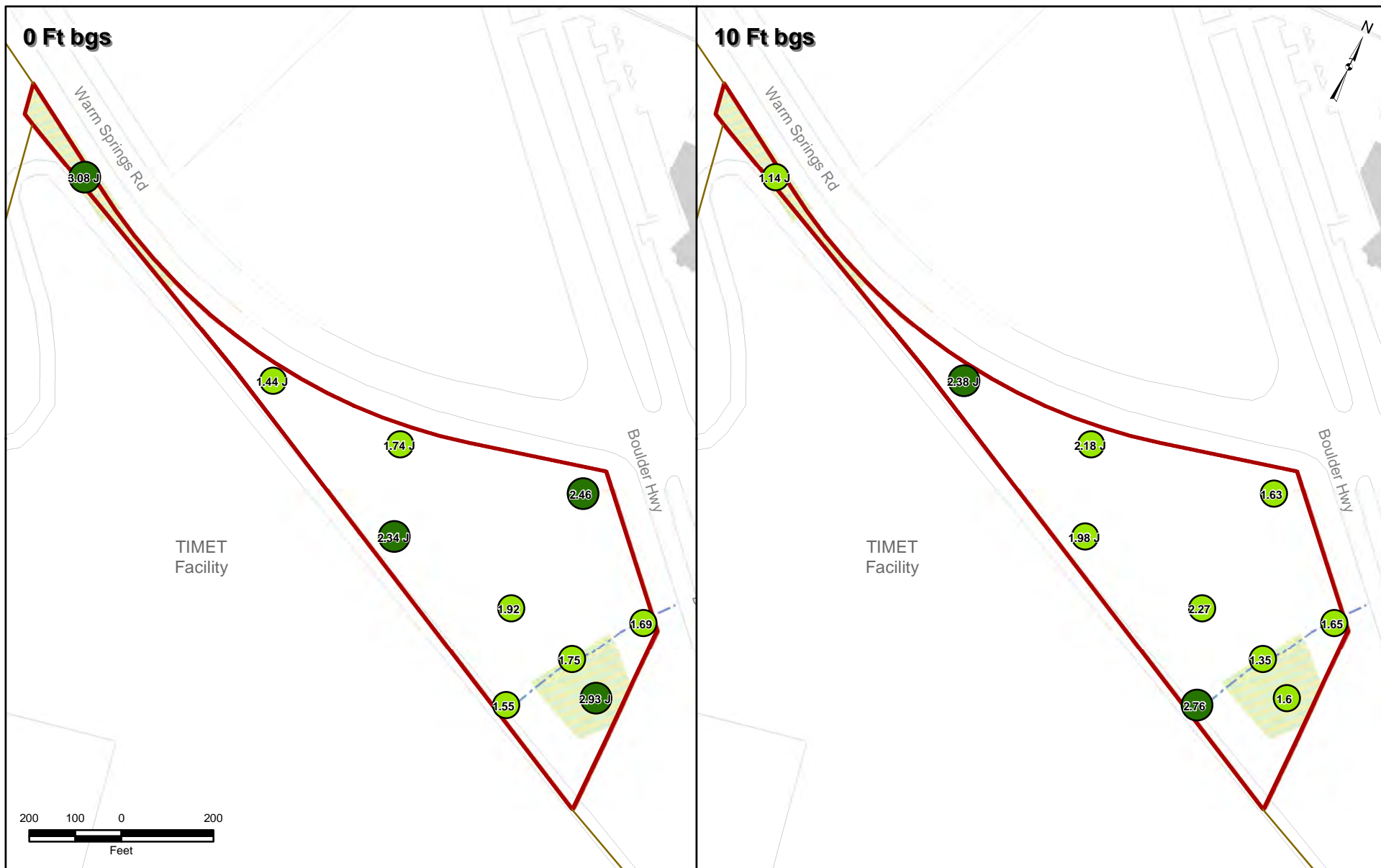


Prepared by
MKJ (ERM)

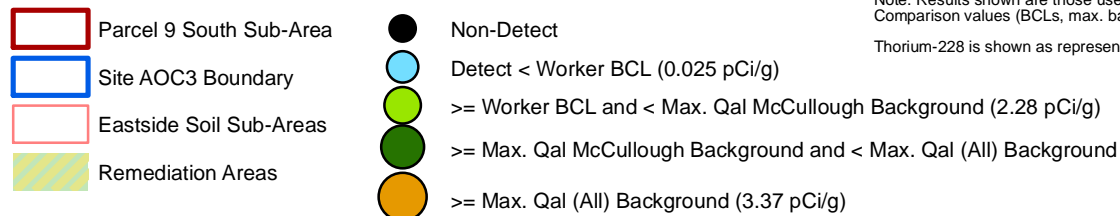


Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMMAPPENDIX_LMXD



Note: Results shown are those used in the human health risk assessment. Comparison values (BCLs, max. background) are presented in Table 3-4. Thorium-228 is shown as representative of the radionuclide COPCs.



BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE I-34

THORIUM-228 SOIL
RESULTS IN PARCEL 9
SOUTH SUB-AREA

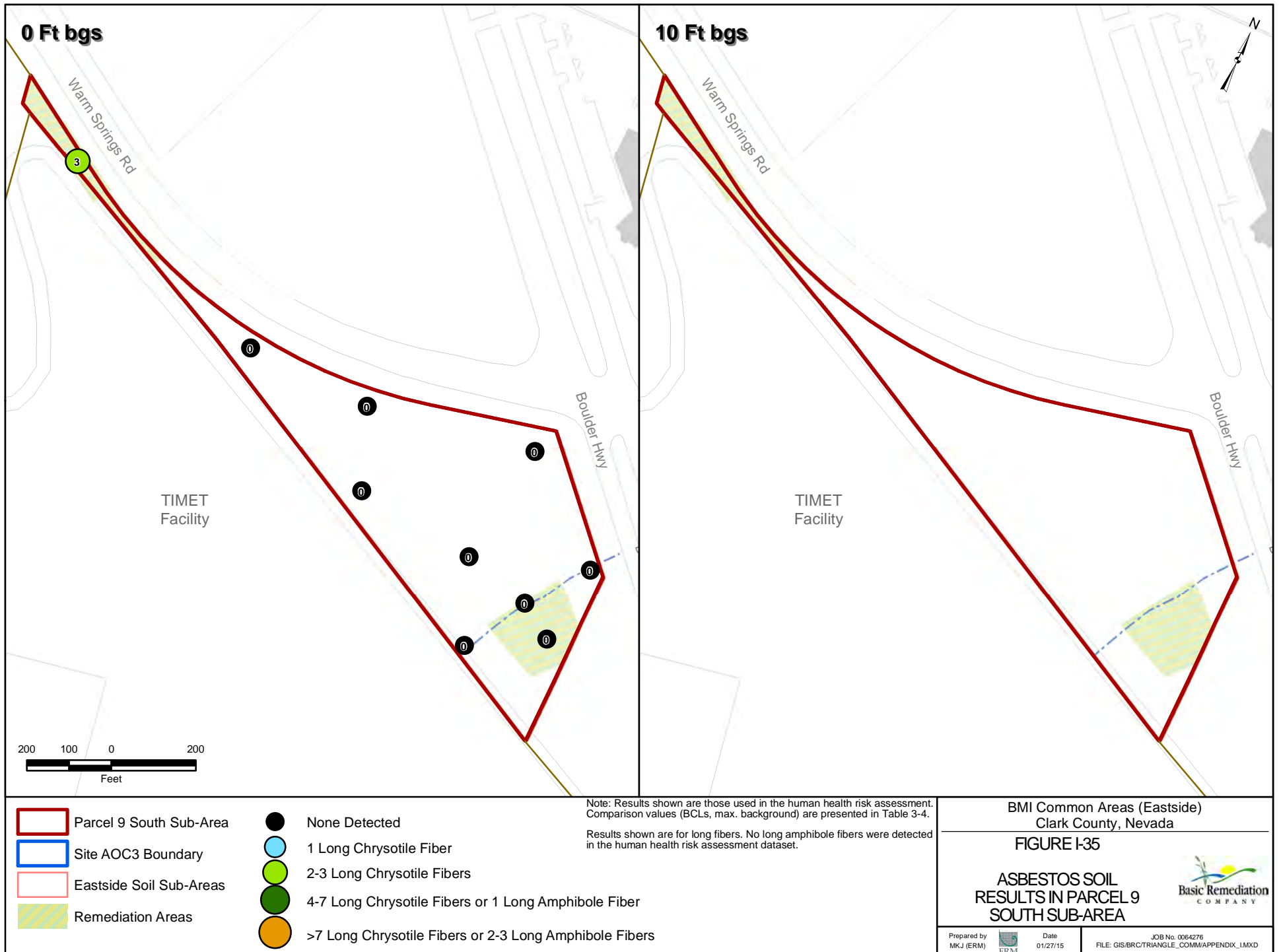


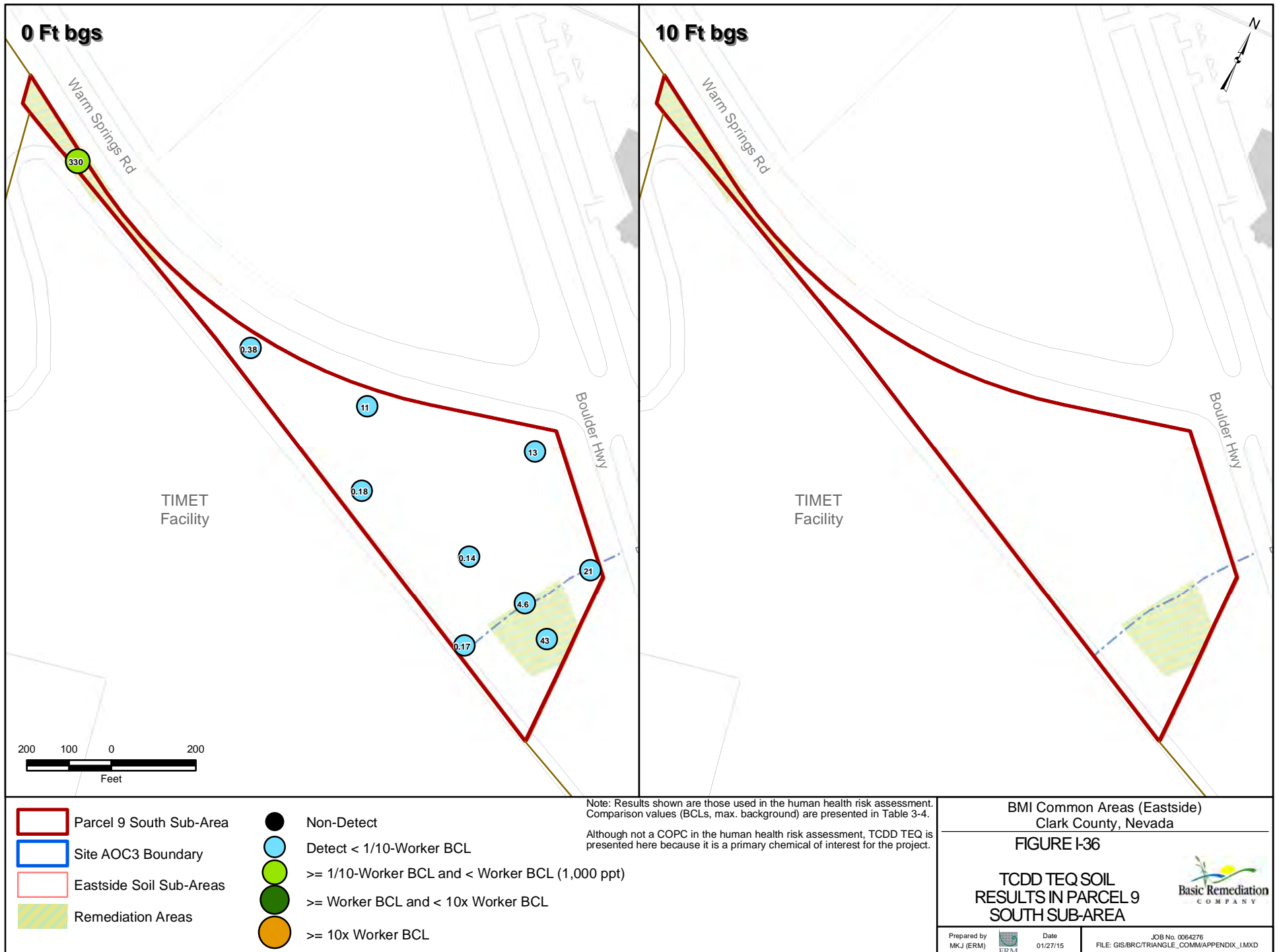
Prepared by
MKJ (ERM)



Date
01/27/15

JOB No. 0064276
FILE: GIS/BRCTRIANGLE_COMMAPPENDIX_1.MXD





APPENDIX J

VAPOR INTRUSION TIER 2 ASSESSMENT AND COMPARISON STUDY AREA RESULTS (model files on the report CD in Appendix B)

LIST OF TABLES (APPENDIX J)

Table J-1	Tier 2 Assessment for the Parcel 9 South Sub-Area
Table J-2	Measured Soil Physical Properties from Comparison Study Area
Table J-3	Comparison Study Area Johnson and Ettinger Model Input Values
Table J-4	Comparison Study Area Surface Flux to Indoor Air Equation Input Values
Table J-5	Measured and Modeled Soil Gas, Surface Flux, and Indoor Air Results for Chloroform
Table J-6	Chloroform Residential Indoor Air Risks from Surface Flux and Soil Gas Measurements

TABLE J-1
TIER 2 ASSESSMENT FOR THE PARCEL 9 SOUTH SUB-AREA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 3)

Chemical	Units	USEPA VI SL ⁽¹⁾	AA-01 Aug 2009 (Dec 2014) ⁽²⁾	TMPZ-107 ⁽³⁾ Apr 2013	TMPZ-110 ⁽³⁾ May 2013
1,1,1,2-Tetrachloroethane	µg/L	3.2	< 0.16 U	--	--
1,1,1-Trichloroethane	µg/L	200	< 0.088 U	< 0.3 U	< 0.3 U
1,1,2,2-Tetrachloroethane	µg/L	2.8	< 0.11 U	--	--
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	1500	< 0.12 U	--	--
1,1,2-Trichloroethane	µg/L	5	< 0.071 U	< 0.3 U	< 0.3 U
1,1-Dichloroethane	µg/L	6.6	0.1 J	< 0.3 U	< 0.3 U
1,1-Dichloroethene	µg/L	190	1.8	0.6 J	1.5
1,1-Dichloropropene	µg/L	--	< 0.068 U	--	--
1,2,3-Trichlorobenzene	µg/L	--	< 0.16 U	--	--
1,2,3-Trichloropropane	µg/L	22	< 0.23 U	--	--
1,2,4-Trichlorobenzene	µg/L	70	< 0.16 U	--	--
1,2,4-Trimethylbenzene	µg/L	29	< 0.062 U	--	--
1,2-Dibromo-3-chloropropane (DBCP)	µg/L	0.2	< 0.2 U	--	--
1,2-Dichlorobenzene	µg/L	600	< 0.11 U	--	--
1,2-Dichloroethane	µg/L	5	< 0.05 U	< 0.3 U	< 0.3 U
1,2-Dichloroethene (total)	µg/L	--	< 0.21 U	--	--
1,2-Dichloropropane	µg/L	5	< 0.054 U	< 0.3 U	< 0.3 U
1,3,5-Trichlorobenzene	µg/L	--	< 0.12 U	--	--
1,3,5-Trimethylbenzene	µg/L	--	< 0.11 U	--	--
1,3-Dichlorobenzene	µg/L	--	< 0.081 U	< 0.3 U	< 0.3 U
1,3-Dichloropropane	µg/L	--	< 0.053 U	--	--
1,4-Dichlorobenzene	µg/L	75	< 0.11 U	--	--
2,2-Dichloropropane	µg/L	--	< 0.1 U	--	--
2-Chlorotoluene	µg/L	--	< 0.11 U	--	--
2-Hexanone	µg/L	8200	< 1.3 U	--	--
2-Nitropropane	µg/L	0.18	< 1.1 U	--	--
4-Chlorotoluene	µg/L	--	< 0.095 U	--	--
4-Methyl-2-pentanone	µg/L	NVT	< 0.32 U	< 3.4 U	< 3.4 U
Acetone	µg/L	NVT	< 0.42 U	< 3 U	< 3 U
Acetonitrile	µg/L	44000	< 4.2 U	--	--
Benzene	µg/L	5	< 0.06 U	< 0.3 U	< 0.3 U
Bromobenzene	µg/L	--	< 0.084 U	--	--
Bromodichloromethane ⁽²⁾	µg/L	80	< 0.090 U	1.4	< 0.3 U
Bromoform ⁽²⁾	µg/L	--	< 0.17 U	0.5 J	< 0.34 U
Bromomethane	µg/L	17	< 0.096 U	< 0.3 U	< 0.3 U
Carbon disulfide	µg/L	1200	< 0.52 U	< 0.3 U	< 0.3 U
Carbon tetrachloride ⁽²⁾	µg/L	5	< 0.13 U	8.6	< 0.3 U
Chlorobenzene	µg/L	410	< 0.06 U	< 0.3 U	< 0.3 U

TABLE J-1
TIER 2 ASSESSMENT FOR THE PARCEL 9 SOUTH SUB-AREA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 2 of 3)

Chemical	Units	USEPA VI SL ⁽¹⁾	AA-01 Aug 2009 (Dec 2014) ⁽²⁾	TMPZ-107 ⁽³⁾ Apr 2013	TMPZ-110 ⁽³⁾ May 2013
Chlorobromomethane	µg/L	700	< 0.12 U	--	--
Chlorodibromomethane ⁽²⁾	µg/L	80	< 0.13 U	0.33 J	< 0.3 U
Chloroethane	µg/L	23000	< 0.085 U	--	--
Chloroform ⁽²⁾	µg/L	80	5.4	1100	8.2
Chloromethane	µg/L	260	< 0.086 U	< 0.3 U	< 0.3 U
cis-1,2-Dichloroethene	µg/L	70	< 0.14 U	< 0.3 U	< 0.3 U
cis-1,3-Dichloropropene	µg/L	4.2	< 0.099 U	--	--
Dibromomethane	µg/L	120	< 0.095 U	--	--
Dichlorodifluoromethane (Freon-12)	µg/L	7.4	< 0.058 UJ	--	--
Dichloromethane	µg/L	39	< 0.1 U	< 0.3 U	< 0.3 U
Dimethyl disulfide	µg/L	--	< 0.27 U	--	--
Ethanol	µg/L	--	< 85 U	--	--
Ethylbenzene	µg/L	700	< 0.11 U	< 0.3 U	< 0.3 U
Heptane	µg/L	--	< 0.12 U	--	--
Iodomethane	µg/L	--	< 0.091 U	--	--
Isopropylbenzene	µg/L	890	< 0.096 U	--	--
m,p-Xylenes	µg/L	360	< 0.19 U	--	--
Methyl ethyl ketone	µg/L	NVT	< 0.83 U	< 3 U	< 3 U
MTBE (Methyl tert-butyl ether)	µg/L	390	< 0.098 U	--	--
Naphthalene	µg/L	4	--	< 0.3 U	< 0.3 U
n-Butylbenzene	µg/L	--	< 0.12 U	--	--
Nonanal	µg/L	--	< 1.2 U	--	--
n-Propylbenzene	µg/L	2400	< 0.093 U	--	--
o-Xylene	µg/L	490	< 0.055 U	--	--
p-Isopropyltoluene	µg/L	--	< 0.11 U	--	--
sec-Butylbenzene	µg/L	--	< 0.085 U	--	--
Styrene	µg/L	9300	< 0.042 U	< 0.3 U	< 0.3 U
tert-Butylbenzene	µg/L	--	< 0.11 U	--	--
Tetrachloroethene ⁽²⁾	µg/L	5	23	2	25
Toluene	µg/L	19000	< 0.07 U	< 0.3 U	< 0.3 U
trans-1,2-Dichloroethene	µg/L	380	< 0.081 U	< 0.3 U	< 0.3 U
trans-1,3-Dichloropropene	µg/L	4.2	< 0.23 U	--	--
Trichloroethene	µg/L	5	0.3 J	< 0.3 U	0.78 J
Trichlorofluoromethane (Freon-11)	µg/L	180	< 0.11 U	< 0.3 U	< 0.3 U
Vinyl acetate	µg/L	9600	< 0.23 U	--	--
Vinyl chloride	µg/L	2	< 0.091 U	< 0.3 U	< 0.3 U
Xylenes (total)	µg/L	490	< 0.22 U	< 2 U	< 2 U

TABLE J-1
TIER 2 ASSESSMENT FOR THE PARCEL 9 SOUTH SUB-AREA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 3 of 3)

Chemical	Units	USEPA VI SL ⁽¹⁾	AA-01 Aug 2009 (Dec 2014) ⁽²⁾	TMPZ-107 ⁽³⁾ Apr 2013	TMPZ-110 ⁽³⁾ May 2013
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⁽¹⁾Groundwater to indoor air vapor intrusion screening level from USEPA's May 2012 Vapor Intrusion Screening Level (VISL) Calculator (Risk = 1×10^{-6}).

⁽²⁾Results for bromodichloromethane, bromoform, carbon tetrachloride, chlorodibromomethane, chloroform, and tetrachloroethene are from December 2014 (no other VOCs included in this sampling event).

⁽³⁾Results for TIMET 2013 Annual Groundwater Monitoring Report.

NVT = Not sufficiently volatile and/or toxic to pose inhalation risk in selected exposure scenario for the indicated medium (from USEPA).

TABLE J-2
MEASURED SOIL PHYSICAL PROPERTIES FROM COMPARISON STUDY AREA
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Parameter	Sample ID	Sample Depth	Result	Units
Dry Bulk Density	STA-4C-0-SO	0	1.61	g/cm ³
	STA-4C-2-SO	2	1.69	g/cm ³
	STA-4C-4-SO	4	1.9	g/cm ³
	STA-4C-6-SO	6	1.76	g/cm ³
	STA-4C-8-SO	8	1.78	g/cm ³
	STA-4C-10-SO	10	1.84	g/cm ³
Percent Moisture	STA-4C-0-SO	0	3.9	percent
	STA-4C-0-SO	0	6.9	percent
	STA-4C-2-SO	2	3.6	percent
	STA-4C-2-SO	2	3.8	percent
	STA-4C-4-SO	4	2.8	percent
	STA-4C-4-SO	4	3.7	percent
	STA-4C-6-SO	6	3	percent
	STA-4C-6-SO	6	4.4	percent
	STA-4C-8-SO	8	4.7	percent
	STA-4C-8-SO	8	5.5	percent
	STA-4C-10-SO	10	4.4	percent
	STA-4C-10-SO	10	6.8	percent
Porosity	STA-4C-0-SO	0	39.9	percent
	STA-4C-2-SO	2	36.3	percent
	STA-4C-4-SO	4	28.8	percent
	STA-4C-6-SO	6	34.6	percent
	STA-4C-8-SO	8	32.9	percent
	STA-4C-10-SO	10	30.4	percent
Particle Density	STA-4C-0-SO	0	2.676	g/cm ³
	STA-4C-2-SO	2	2.658	g/cm ³
	STA-4C-4-SO	4	2.663	g/cm ³
	STA-4C-6-SO	6	2.696	g/cm ³
	STA-4C-8-SO	8	2.659	g/cm ³
	STA-4C-10-SO	10	2.652	g/cm ³

TABLE J-3
COMPARISON STUDY AREA JOHNSON AND ETTINGER MODEL INPUT VALUES
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 1 of 1)

Parameter	Value	Source
Interval 1 (0-5 feet)		
Depth Below grade to bottom of enclosed floor space (cm)	15	Default
Depth to Soil Vapor Sample (ft)	5 or 10	Sample Specific
Average Soil Temperature (C)	16.67	Site-specific
Stratum Thickness (cm)	152.4	Site-specific
Interval 1 Dry Bulk Density (g/cm ³)	1.73	Site-specific Average
Interval 1 Total Porosity (unitless)	0.35	Site-specific Average
Interval 1 Water-Filled Porosity (unitless)	0.070	Site-specific Average
Interval 2 (5-10 feet)		
Stratum Thickness (cm)	152.4	Site-specific
Vadose Zone Dry Bulk Density (g/cm ³)	1.79	Site-specific Average
Vadose Zone Total Porosity (unitless)	0.33	Site-specific Average
Vadose Zone Water-Filled Porosity (unitless)	0.068	Site-specific Average
Building Characteristics		
Enclosed space floor thickness (cm)	10	Default
Soil-building pressure differential (g/cm-s ²)	40	Default
Enclosed space floor length (cm)	1,000	Default
Enclosed space floor width (cm)	1,000	Default
Enclosed space floor area (cm ²)	1.0 E+6	Default
Enclosed space height (cm)	244	Default
Enclosed space volume (cm ³)	2.4 E+8	Default
Floor-wall seam crack width (cm)	0.1	Default
Indoor air exchange rate (1/hr)	0.50	Default (from Cal/EPA)

TABLE J-4
COMPARISON STUDY AREA SURFACE FLUX TO INDOOR AIR EQUATION INPUT VALUES
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Parameter	Abbrev.	Value	Units	Reference
Foundation crack fraction	η	0.01	unitless	ASTM 2000
Enclosed space volume/infiltration area ratio, residential	L_r	200	cm	ASTM 2000
Enclosed space air exchange rate, residential	ER_r	12	1/day	ASTM 2000

TABLE J-5
MEASURED AND MODELED SOIL GAS, SURFACE FLUX, AND INDOOR AIR RESULTS FOR CHLOROFORM
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 1)

Location	Sample	Soil Vapor Sample Depth	Method	Measured Soil Vapor Conc. (ug/m ³)	Modeled Indoor Air Conc. from Soil Vapor (ug/m ³)	Measured Surface Flux (ug/m ² -min)	Crack Fraction (unitless)	Volume:Area Ratio (m)	Air Exchange Rate (l/min)	Indoor Air Conc. from Measured Surface Flux (ug/m ³)
4C	STA-4C-5	5	TO-15	137.3	0.117	<0.013 U	0.01	2	0.00833	ND
4C	STA-4C-5	5	TO-15 SIM	135.91 J	0.058	0.0067	0.01	2	0.00833	0.0040
4C	STA-4C-5B	5	TO-15	<0.26 U	ND	<0.013 U	0.01	2	0.00833	ND
4C	STA-4C-5B	5	TO-15 SIM	<0.026 U	ND	0.0067	0.01	2	0.00833	0.0040
4C	STA-4C-10	10	TO-15	239.03	0.086	<0.013 U	0.01	2	0.00833	ND
4C	STA-4C-10	10	TO-15 SIM	250.45 J	0.090	0.0067	0.01	2	0.00833	0.0040
4CR	STA-4CR-5	5	TO-15	146.62	0.063	<0.013 U	0.01	2	0.00833	ND
4CR	STA-4CR-5	5	TO-15 SIM	43.537 J	0.019	0.0074	0.01	2	0.00833	0.0044
4CR	STA-4C-5-DUP	5	TO-15	153.94	0.066	<0.013 U	0.01	2	0.00833	ND
4CR	STA-4C-5-DUP	5	TO-15 SIM	147.947 J	0.063	0.0080	0.01	2	0.00833	0.0048
4CR	STA-4CR-10	10	TO-15	184.85	0.066	<0.013 U	0.01	2	0.00833	ND
4CR	STA-4CR-10	10	TO-15 SIM	246.687 J	0.088	0.0074	0.01	2	0.00833	0.0044
4CR	STA-4C-10-DUP	10	TO-15	213.93	0.077	<0.013 U	0.01	2	0.00833	ND
4CR	STA-4C-10-DUP	10	TO-15 SIM	225.465 J	0.081	0.0080	0.01	2	0.00833	0.0048
4E	STA-4E-5	5	TO-15	302.65	0.129	0.0154 J	0.01	2	0.00833	0.0092
4E	STA-4E-5	5	TO-15 SIM	49.718 J	0.021	0.0260	0.01	2	0.00833	0.016
4E	STA-4E-10	10	TO-15	402.61	0.144	0.0154 J	0.01	2	0.00833	0.0092
4E	STA-4E-10	10	TO-15 SIM	274.322 J	0.098	0.0260	0.01	2	0.00833	0.016
4N	STA-4N-5	5	TO-15	125.18	0.053	0.0146 J	0.01	2	0.00833	0.0088
4N	STA-4N-5	5	TO-15 SIM	32.201 J	0.014	0.0185 J	0.01	2	0.00833	0.011
4N	STA-4N-10	10	TO-15	278.35	0.100	0.0146 J	0.01	2	0.00833	0.0088
4N	STA-4N-10	10	TO-15 SIM	<0.201 UJ	ND	0.0185 J	0.01	2	0.00833	0.011
4S	STA-4S-5	5	TO-15	103.16	0.044	<0.013 U	0.01	2	0.00833	ND
4S	STA-4S-5	5	TO-15 SIM	110.502 J	0.047	0.0026 J	0.01	2	0.00833	0.0016
4S	STA-4S-10	10	TO-15	225.84	0.081	<0.013 U	0.01	2	0.00833	ND
4S	STA-4S-10	10	TO-15 SIM	197.818 J	0.071	0.0026 J	0.01	2	0.00833	0.0016
4W	STA-4W-5	5	TO-15	111.38	0.048	<0.013 U	0.01	2	0.00833	ND
4W	STA-4W-5	5	TO-15 SIM	145.454 J	0.062	0.0123	0.01	2	0.00833	0.0074
4W	STA-4W-10	10	TO-15	111.77	0.040	<0.013 U	0.01	2	0.00833	ND
4W	STA-4W-10	10	TO-15 SIM	139.903 J	0.050	0.0123	0.01	2	0.00833	0.0074

TABLE J-6
CHLOROFORM RESIDENTIAL INDOOR AIR RISKS FROM SURFACE FLUX AND SOIL GAS MEASUREMENTS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
(Page 1 of 2)

Site	Chloroform Residential Indoor Air Risks			Indoor Air Concentration (ug/m ³)	Sampling Method
	Sample Location	HQ	ILCR		
Side-by-Side Comparison Study	STA-4C-5	0.0008	8 E-7	1.2 E-1	Soil Gas
	STA-4C-5 (SIM)	0.0004	4 E-7	5.8 E-2	Soil Gas
	STA-4C-5B	--	--	ND	Soil Gas
	STA-4C-5B (SIM)	--	--	ND	Soil Gas
	STA-4C-10	0.0006	6 E-7	8.6 E-2	Soil Gas
	STA-4C-10 (SIM)	0.0006	6 E-7	9.0 E-2	Soil Gas
	STA-4CR-5	0.0004	4 E-7	6.3 E-2	Soil Gas
	STA-4CR-5 (SIM)	0.00013	1 E-7	1.9 E-2	Soil Gas
	STA-4C-5-DUP	0.0004	4 E-7	6.6 E-2	Soil Gas
	STA-4C-5-DUP (SIM)	0.0004	4 E-7	6.3 E-2	Soil Gas
	STA-4CR-10	0.0005	4 E-7	6.6 E-2	Soil Gas
	STA-4CR-10 (SIM)	0.0006	6 E-7	8.8 E-2	Soil Gas
	STA-4C-10-DUP	0.0005	5 E-7	7.7 E-2	Soil Gas
	STA-4C-10-DUP (SIM)	0.0005	5 E-7	8.1 E-2	Soil Gas
	STA-4E-5	0.0009	8 E-7	1.3 E-1	Soil Gas
	STA-4E-5 (SIM)	0.00014	1 E-7	2.1 E-2	Soil Gas
	STA-4E-10	0.0010	9 E-7	1.4 E-1	Soil Gas
	STA-4E-10 (SIM)	0.0007	6 E-7	9.8 E-2	Soil Gas
	STA-4N-5	0.0004	4 E-7	5.3 E-2	Soil Gas
	STA-4N-5 (SIM)	0.00009	9 E-8	1.4 E-2	Soil Gas
	STA-4N-10	0.0007	7 E-7	1.0 E-1	Soil Gas
	STA-4N-10 (SIM)	--	--	ND	Soil Gas
	STA-4S-5	0.0003	3 E-7	4.4 E-2	Soil Gas
	STA-4S-5 (SIM)	0.0003	3 E-7	4.7 E-2	Soil Gas
	STA-4S-10	0.0006	5 E-7	8.1 E-2	Soil Gas
	STA-4S-10 (SIM)	0.0005	5 E-7	7.1 E-2	Soil Gas
	STA-4W-5	0.0003	3 E-7	4.8 E-2	Soil Gas
	STA-4W-5 (SIM)	0.0004	4 E-7	6.2 E-2	Soil Gas
	STA-4W-10	0.00027	3 E-7	4.0 E-2	Soil Gas
	STA-4W-10 (SIM)	0.0003	3 E-7	5.0 E-2	Soil Gas

TABLE J-6
CHLOROFORM RESIDENTIAL INDOOR AIR RISKS FROM SURFACE FLUX AND SOIL GAS MEASUREMENTS
HUMAN HEALTH RISK ASSESSMENT AND CLOSURE REPORT FOR PARCEL 9 SOUTH SUB-AREA
BMI COMMON AREAS (EASTSIDE), CLARK COUNTY, NEVADA
 (Page 2 of 2)

Site	Chloroform Residential Indoor Air Risks			Indoor Air Concentration (ug/m ³)	Sampling Method
	Sample Location	HQ	ILCR		
Side-by-Side Comparison Study	STA-4C	0.000027	3 E-8	4.0 E-3	Surface Flux
	STA-4CR	0.000030	3 E-8	4.4 E-3	Surface Flux
	STA-4C-DUP	0.000033	3 E-8	4.8 E-3	Surface Flux
	STA-4E	0.00011	1 E-7	1.6 E-2	Surface Flux
	STA-4N	0.000075	7 E-8	1.1 E-2	Surface Flux
	STA-4S	0.000011	1 E-8	1.6 E-3	Surface Flux
	STA-4W	0.000050	5 E-8	7.4 E-3	Surface Flux
Side-by-Side Comparison Study	Minimum Risk	0.000011	1 E-8	1.6 E-3	Surface Flux
	Minimum Risk	0.000094	9 E-8	1.4 E-2	Soil Gas
	Maximum Risk	0.00011	1 E-7	1.6 E-2	Surface Flux
	Maximum Risk	0.00098	9 E-7	1.4 E-1	Soil Gas

HQ = Hazard Quotient

ILCR = Incremental Lifetime Cancer Risk

APPENDIX K

LEGAL DESCRIPTION OF THE PARCEL 9 SOUTH SUB-AREA



Atkins North America, Inc.
2270 Corporate Circle, Suite 200
Henderson, Nevada 89074-7755

Telephone: 702.263.7275
Fax: 702.263.7200

www.atkinsglobal.com/northamerica

**LEGAL DESCRIPTION
NFA – PARCEL 9 SOUTH SUBAREA**

A PORTION OF LOT 3 AS SHOWN IN FILE 99 OF PARCEL MAPS, PAGE 70, OFFICIAL RECORDS, CLARK COUNTY, NEVADA, AND A PORTION OF THE EAST HALF (E 1/2) OF SECTION 12, TOWNSHIP 22 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, NEVADA, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHEAST CORNER OF THE SOUTHEAST QUARTER (SE 1/4) OF SAID SECTION 12; THENCE SOUTH 00°05'44" EAST, ALONG THE EAST LINE THEREOF, 295.18 FEET; THENCE NORTH 63°37'22" WEST, DEPARTING SAID EAST LINE, 1935.28 FEET; THENCE NORTH 09°12'47" WEST, 99.57 FEET TO THE SOUTHERLY RIGHT-OF-WAY LINE OF WARM SPRINGS ROAD; THENCE SOUTH 57°48'55" EAST, ALONG SAID SOUTHERLY RIGHT-OF-WAY LINE, 298.66 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE NORTHERLY HAVING A RADIUS OF 1250.00 FEET; THENCE ALONG SAID CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 45°23'09", AN ARC LENGTH OF 990.16 FEET; THENCE NORTH 76°47'56" EAST, 277.36 FEET TO THE SOUTHWESTERLY RIGHT-OF-WAY LINE OF BOULDER HIGHWAY; THENCE SOUTH 42°44'37" EAST, DEPARTING SAID SOUTHERLY RIGHT-OF-WAY LINE AND ALONG SAID SOUTHWESTERLY RIGHT-OF-WAY LINE, 406.07 FEET; THENCE SOUTH 00°13'43" WEST, DEPARTING SAID SOUTHWESTERLY RIGHT-OF-WAY LINE, 109.90 FEET TO THE **POINT OF BEGINNING**.

CONTAINING 417,946 SQUARE FEET (9.59 ACRES), MORE OR LESS, AS DETERMINED BY COMPUTER METHODS.

BASIS OF BEARINGS:

THE BASIS OF BEARING FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE (2701), OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

PARCEL 9 SOUTH SUBAREA

Point of Beginning : North: 17184.0566' East: 26476.8055'

Segment #1 : Line

Course: S00° 05' 44"E Length: 295.18'

North: 16888.8751' East: 26477.2975'

Segment #2 : Line

Course: N63° 37' 22"W Length: 1935.28'

North: 17748.6776' East: 24743.5067'

Segment #3 : Line

Course: N09° 12' 47"W Length: 99.57'

North: 17846.9640' East: 24727.5648'

Segment #4 : Line

Course: S57° 48' 55"E Length: 298.66'

North: 17687.8842' East: 24980.3290'

Segment #5 : Curve

Length: 990.16' Radius: 1250.00'

Delta: 045°23'09" Tangent: 522.70'

Chord: 964.48' Course: S80° 30' 30"E

Course In: N32° 11' 05"E Course Out: S13° 12' 04"E

RP North: 18745.8037' East: 25646.1415'

End North: 17528.8357' East: 25931.6042'

Segment #6 : Line

Course: N76° 47' 56"E Length: 277.36'

North: 17592.1764' East: 26201.6344'

Segment #7 : Line

Course: S42° 44' 37"E Length: 406.07'

North: 17293.9566' East: 26477.2442'

Segment #8 : Line

Course: S00° 13' 43"W Length: 109.90'

North: 17184.0566' East: 26476.8055'

Perimeter: 4412.18' Area: 417946.38 Sq. Ft.

NFA PARCEL 9 SOUTH EXHIBIT

A PORTION OF THE EAST HALF (E½) OF SECTION 12, TOWNSHIP 22 SOUTH, RANGE 62 EAST, M.D.M.,
CITY OF HENDERSON, CLARK COUNTY, NEVADA,

C
N1/16
S. 12
C



SCALE: 1"= 200'

ROAD
PABCO

WARM SPRINGS RD.

AMERICAN POTASH
& CHEMICAL CORP
178-12-601-004

PARCEL MAP
FILE 99, PAGE 70
A PORTION OF LOT 3

US HIGHWAY 93
BOULDER HIGHWAY

N63°37'22"W
1935.28'

1/4
12

P.O.B.

LINE TABLE

LINE	BEARING	DISTANCE
L1	S0°05'44"E	295.18'
L2	N9°12'47"W	99.57'
L3	S57°48'55"E	298.66'
L4	N76°47'56"E	277.36'
L5	S42°44'37"E	406.07'
L6	N0°13'43"E	109.90'

CURVE TABLE

CURVE	RADIUS	DELTA	LENGTH	TANGENT
C1	1250.00'	45°23'09"	990.16'	522.70'

TITANIAUM METALS
CORPORATION
178-12-601-003

ATKINS

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Henderson, NV 89074-63
Telephone: 702/263-7275
Fax: 702/263-7200