McGinley & Associates

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May 19, 2011

Nevada Division of Environmental Protection
Bureau of Corrective Actions
901 S. Stewart Street, Suite 3005
Carson City, Nevada 89701-5249

VIA: Federal Express

ATTN: Jeffrey Collins

RE: CORNERSTONE PARK BROWNFIELDS PROJECT, LIMITED PHASE II ESA AND RISK ASSESSMENT

Dear Mr. Collins:

Attached are two hard copies and one electronic copy of the Cornerstone Park Brownfields Project, Limited Phase II Environmental Site Assessment (ESA) and Risk Assessment.

McGinley and Associates, Inc. appreciates the opportunity to submit this ESA and Risk Assessment. Should you have any questions regarding this proposal, please contact us at (702) 260-4961 or at brakvica@mcgin.com. If this SAP is acceptable to you, please advise us at brakvica@mcgin.com.

Respectfully submitted,
McGinley and Associates, Inc.

Brian A. Rakvica, P.E., C.E.M
Senior Project Engineer

McGinley & Associates

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| Soil and Groundwater Remediation

| Regulatory Compliance

| Environmental Audits

| Hydrogeology

| Hazmat Response

LIMITED PHASE II ENVIRONMENTAL SITE ASSESSMENT AND RISK ASSESSMENT

Cornerstone Park Brownfields Project Henderson, Nevada

Prepared for:

City of Henderson
240 Water Street
Henderson, Nevada 89015

On behalf of:

State of Nevada
Division of Environmental Protection
901 S. Stewart Street, Suite 4001
Carson City, NV 89701

May 19, 2011
(Revision 0)

Limited Phase II Environmental Site Assessment and Risk Assessment for:

Cornerstone Park

City of Henderson

240 Water Street

Henderson, Nevada 89015

May 19, 2011 (Revision 0)

Date

Project Manager**:** _____ _____

QA Manager: _____ _____.

NDEP QC Coordinator for the Nevada Brownfields Program**:**_____

NDEP Brownfields Program Coordinator: _____

For EPA use:

Approved by EPA Project Manager: Date:

_____ _____

Expedited Review? ___ Yes ___ No

Received by QA Office: Date:

_____

_____ _____

Reviewed by: Date

Approved:

_____

Region 9 Quality Assurance Manager

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APPENDICES

EXECUTIVE SUMMARY

McGinley & Associates (MGA) conducted a limited Phase II Environmental Site Assessment (ESA) within the Cornerstone Park redevelopment area located near the northwest corner of Wigwam Parkway and Stephanie Street, in the City of Henderson, Clark County, Nevada. The property consists of six parcels of land that are listed with Clark County, Nevada as Assessor's Parcel Numbers (APNs) 178-16-501-001, 178-16-510-002, 178-16-710-002, 178-16-601-004, 178-16-601-003, and 178-16-710-001. The objective of the ESA activities was to assess for the presence of perchlorate impacts to soil and surface water within the boundaries of the site, and based upon these findings, conduct a human health risk assessment (HRA) to determine if the identified perchlorate impacts represent an acceptable risk to current and future receptors.

Surface water samples were collected for the limited Phase II ESA from each of the surface water bodies at the site and soil samples were collected from shoreline soils with a bias towards areas of salt staining. All collected samples were delivered to Alpha Analytical, Inc. (the laboratory) under proper Chain of Custody (COC) protocol and analyzed for perchlorate.

The results of the analysis indicate that detectable concentrations of perchlorate were found throughout the soils and the surface water bodies. Based upon the results of the HRA it was determined that the concentrations of perchlorate at the site do not pose an unacceptable risk to current or future receptors.

1. INTRODUCTION

McGinley & Associates (MGA) conducted a limited Phase II Environmental Site Assessment (ESA) within the Cornerstone Park redevelopment area located near the northwest corner of Wigwam Parkway and Stephanie Street, in the City of Henderson, Clark County, Nevada. The property consists of six parcels of land that are listed with Clark County, Nevada as Assessor's Parcel Numbers (APNs) 178-16-501-001, 178-16-510-002, 178-16-710-002, 178-16-601-004, 178-16-601-003, and 178-16-710-001 (hereinafter "the Site"). The objective of the ESA activities was to assess for the presence of perchlorate impacts to soils and surface water within the boundaries of the site. Following the completion of the ESA a human health risk assessment (HRA) was conducted to determine if the perchlorate concentrations represent an acceptable risk to current and future receptors.

2. OBJECTIVES AND SCOPE OF SERVICES

The objective of the ESA activities was to assess for the presence of shoreline soil and surface water perchlorate contamination within the boundaries of the site. Following these ESA activities a HRA was conducted to determine if the perchlorate concentrations represent an acceptable risk to current and future receptors. As required by the State of Nevada Administrative Code (NAC) 459, all MGA services were supervised and reviewed by a Nevada Certified Environmental Manager (CEM).

The ESA activities performed by MGA for the limited Phase II ESA consisted of the following:

- Collection of shoreline soil samples from twelve locations at the site from depths of 0' below ground surface (bgs) and 10' bgs;
- Collection of surface water samples from twelve locations at the site from depths of 2' below water surface and 10' below water surface;
- Laboratory analysis of these samples;
- Completion of a HRA on the data collected including:
    - Completion of a data usability evaluation and data gap analysis; and
    - Quantitative and qualitative assessment of exposure scenarios;
- Preparation of a technical report complete with findings and recommendations;

3. BACKGROUND

Several previous investigations were conducted in the vicinity of the Site as discussed in Section 2.3 of the *Sampling and Analysis Plan Cornerstone Park Brownfields Project Henderson, Nevada* (SAP) dated January 27, 2011. For convenience, the SAP is provided as Appendix A to this report.

The study area occupies approximately 103 acres in Henderson, Nevada (Figure 1) and is comprised of vacant lots. The area is bounded on the east by Stephanie Street, on the south by Wigwam Parkway, on the west by a residential development, and on the north by railroad tracks.

As shown on Figure 1, features of the site include several surface water bodies. These surface water bodies are believed to be the surface expression of the near-surface shallow groundwater.

Details of the Site geological information and conceptual site model are contained in Sections 2.4 and 2.6 of the SAP (Appendix A).

4. ENVIRONMENTAL INVESTIGATION

Limited Phase II ESA activities were performed on the site between April 4 and 6, 2011. Shoreline samples were initially selected in the SAP on a random basis. These sample locations were adjusted in the field based upon logistically constraints (drill rig access) and to bias samples towards areas of salt staining. Soil samples were collected at depths of 0' bgs and 10' bgs. Surface water samples were selected on a random basis in the SAP. These sample locations were modified in the field to attempt to obtain samples from the 2' below water surface and 10' below water surface horizons. Photographs are provided as Appendix B to this report.

5. ANALYTICAL TESTING

Samples were delivered under chain-of-custody protocol to Alpha Analytical, Inc. located in Sparks, Nevada. Perchlorate analyses were requested to be performed on all samples by USEPA method 314.0.

The chain-of-custody records for the samples are provided in Appendix C.

6. ANALYTICAL RESULTS

6.1 Summary of Results

The analytical results for the shoreline soil and surface water samples are summarized in Tables 1 and 2. The laboratory reports and electronic data deliverable (EDD) are provided in Appendix D.

6.2 Shoreline Soils

All collected shoreline soil samples were analyzed for perchlorate. Concentrations ranged from non-detect to 45,600 µg/Kg. Perchlorate was detected in 15 of 24 samples (approximately 63% of the time). Higher concentrations of perchlorate appear to be found in the surface soil samples. This supports the concept of evapoconcentration of perchlorate in soils from contaminated groundwater and surface water. All concentrations are below the Nevada action level of 54,800 µg/Kg.

6.3 Surface Water

All collected surface water samples were analyzed for perchlorate. Concentrations ranged from 28 to 33 µg/l. Perchlorate was detected in 100% of these samples. Concentrations are fairly uniform across all locations and all depths. All concentrations are above the Nevada provisional action level of 18 µg/l.

In addition, surface water concentrations were compared to historical surface water concentrations reported by others. For comparability purposes and to account for seasonal fluctuations only the June 2006 (Kleinfelder) and March 2006 (Kleinfelder) sampling events were reviewed. Historical perchlorate concentrations have ranged from 43 to 59 µg/l. The most recent perchlorate concentrations were reported in the June 2006 report were between

47 – 59 µg/l. Current perchlorate concentrations were less than these historical concentrations. This supports the continued trend of decreasing perchlorate concentrations.

It is acknowledged that the sampling and shipping methodologies for perchlorate analysis have evolved over time to reduce the potential for biological degradation of perchlorate. As part of this SAP, MGA implemented the most recent and stringent standard operating procedure (SOP) for sample collection, packaging and shipping for perchlorate. This SOP includes sterile filtration of the sample aliquot and chilling of the sample for shipping purposes. The historical data did not employ this methodology and hence is potentially biased low. MGA believes that the qualitative comparison discussed above is the appropriate level of rigor given the differences in these data sets.

7. DATA QUALITY

7.1 Soil and Surface Water Sampling

The soil samples were collected in accordance with the project SOPs provided in Appendix C of the project SAP (see Appendix A). Care was taken to minimize sample disturbance. Soil samples were preserved in a cooler until they were received by the laboratory (see chain-of-custody records provided in Appendix C).

7.2 Laboratory Analytical Data

The laboratory analytical data for the soil samples were in compliance with the data quality objectives established in the laboratory's SOP. These data have undergone formal data validation and the data validation report is provided as Appendix E. In addition, a data usability evaluation was conducted as part of the HRA. The HRA is provided as Appendix F. No issues were noted in either of these documents that affect the usability of this data for its intended purpose.

8. SUMMARY OF HEALTH RISK ASSESSMENT

The HRA is provided as Appendix F to this report. The HRA was prepared to assess the potential for health risks associated with recreational uses of the surface water bodies including ingestion of recreationally caught fish. The exposure pathways of interest for this HRA include incidental ingestion of surface water and soil, dermal contact with surface water and soil, and fish ingestion. The HRA focuses on the characterization of potential long-term health risks to current and future adult/youth recreators, long-term adult maintenance workers and short-term adult construction workers at the site. All scenarios assume that conditions at the time of data collection do not change over time. This is consistent with a screening baseline HRA which conservatively assumes no remedial actions are implemented (USEPA, 1989).

Future Recreator

Environmental Media	Hazard Index (HI)	
	Child	Adult
Shoreline Soil[a]	0.16	0.018
Surface Water[a]	0.033	0.011
Fish[b]	0.007	0.005
Total	0.20	0.034

Future Maintenance Worker

Environmental Media	Hazard Index (HI)
	Adult
Shoreline Soil[a]	0.071
Surface Water[a]	NA
Fish[b]	NA
Total	0.071

Future Construction Worker

Environmental Media	Hazard Index (HI)
	Adult
Soil[a]	0.221
Surface Water[a]	NA
Fish[b]	NA
Total	0.221

NA Not applicable.
a Includes incidental ingestion and dermal contact pathways.
b Includes recreational ingestion pathway.

Only non-cancer health effects were quantified in this HRA as, currently, the USEPA does not classify perchlorate as a potential human carcinogen. Therefore, the hazard index (HI) was characterized for each receptor, using the maximum measured concentration from all data collected from shoreline soil and surface water. It is important to note that inhalation of perchlorate particulates was not addressed in this HRA as the USEPA has not derived toxicity criteria for this exposure pathway. The results of this baseline HRA are as follows:

All non-cancer HIs are well below the acceptable level of 1 indicating that exposures to perchlorate in shoreline soils and surface water are not expected to pose a non-carcinogenic health hazard to the future site users evaluated in this HRA.

9. FINDINGS

- The shoreline soil and surface water analytical results are summarized in Tables 1 and 2;
- All samples were analyzed for perchlorate;
- All shoreline soil samples submitted for analysis of perchlorate showed concentrations less than the Nevada Action Level;
- All surface water samples submitted for analysis showed elevated levels of perchlorate in excess of the Nevada Provisional Action Level;
- The HRA conducted demonstrates that the concentrations of perchlorate in shoreline soils and surface water are acceptable for the proposed end uses of the Site (maintenance, construction and recreation).

10. CONCLUSIONS AND RECOMMENDATIONS

McGinley & Associates performed a limited Phase II ESA on the Site and subsequently performed a HRA to determine if the Site was suitable for its current and planned future use.

The field work conducted by MGA included collection of 12 shoreline soil samples and 12 surface water samples. All samples were delivered under Chain of Custody protocol to Alpha Analytical, Inc. for analysis of perchlorate.

The results of the sample analysis showed levels of perchlorate below the Nevada Action Level for soils and above the Nevada Provisional Action Level for surface water. The HRA was conducted with this data and it was found that the site is suitable for its current and planned future uses.

Upon conclusion of our limited Phase II ESA and HRA, and based on analytical laboratory data for samples collected at the site, MGA is of the opinion that no further action is warranted at the subject property.

11. LIMITATIONS

The conclusions presented herein are based on analytical data and observations. MGA makes no warranties or guarantees as to the accuracy or completeness of information provided or compiled by others. The results reported herein are applicable to the time the sampling occurred. Changes in site conditions may occur as a result of illegal dumping practices, prevailing winds, rainfall, or other factors.

It should be recognized that definition and evaluation of environmental conditions is a difficult and inexact science. Judgments and opinions leading to conclusions and recommendations are generally made with an incomplete knowledge of the conditions present. More extensive studies, including additional environmental investigations, can tend to reduce the inherent uncertainties associated with such studies. Additional information not found or unavailable to MGA at the time of writing this report may result in a modification to the conclusions and recommendations contained herein.

This report is not a legal opinion. The services performed by MGA have been conducted in a manner consistent with the level of care ordinarily exercised by members of our profession currently practicing under similar conditions. No other warranty, expressed or implied, is made.

The use of the word "certify" in this document constitutes an expression of professional opinion regarding those facts or findings which are the subject of the certification and does not constitute a warranty or guarantee, either expressed or implied.

12. CLOSING

Should you have any questions regarding this report please contact Brian Rakvica at (702) 260-4961 x7001 or brakvica@mcgin.com.

Respectfully submitted,

McGinley and Associates, Inc.

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.

Brian Rakvica, P.E.., C.E.M. #2260, Exp. 09/21/12
Project Manager

Reviewed by:

Joseph M. McGinley, P.E., C.E.M. #1036, Exp. 11/12
Principal

13. REFERENCES

Risk Assessment Hanson Las Vegas Quarry, Henderson, Nevada, January 2001, Brown and Caldwell (B&C).

Cornerstone Redevelopment Brownfields Phase II Site Investigation September 2005 Quarterly Sampling, Henderson, Nevada, October 27, 2005, Kleinfelder.

Cornerstone Redevelopment Brownfields Phase II Site Investigation December 2005 Quarterly Sampling, Henderson, Nevada, February 2, 2006, Kleinfelder.

Cornerstone Redevelopment Brownfields Phase II Site Investigation March 2006 Quarterly Sampling, Henderson, Nevada, April 20, 2006, Kleinfelder.

Quarterly Monitoring Report Second Quarter 2006 Cornerstone Redevelopment Brownfields Phase II Site Investigation, June 20, 2006, Kleinfelder.

Final Nevada Brownfields Program Quality Assurance Program Plan, May 20, 2007, Nevada Division of Environmental Protection (NDEP).

August 2010 Basic Comparison Levels – Updated User's Guide and Table, September 1, 2010, NDEP.

Phase I Environmental Site Assessment Cornerstone Redevelopment Area, Las Vegas, Nevada, February 24, 2004, Ninyo & Moore (N&M).

Sampling and Analysis Plan Phase II Site Investigation Cornerstone Redevelopment Area, Las Vegas, Nevada, May 27, 2004, N&M

Phase II Environmental Site Assessment Cornerstone Redevelopment Area, Las Vegas, Nevada, June 30, 2005, N&M.

Data Quality Assessment: Statistical Methods for Practitioners. February 2006. USEPA EPA QA/G-9S

TABLES

Table 1 - Shoreline Soils Perchlorate Data Summary		
Sample ID	Depth (fbgs)	Perchlorate (µg/Kg-dry)
BRN002-SB-01-00	0	22,100
BRN002-SB-01-10	10	6,690
BRN002-SB-02-00	0	38
BRN002-SB-02-10	10	68
BRN002-SB-03-00	0	74
BRN002-SB-03-10	10	ND (24.4)
BRN002-SB-04-00	0	ND (20.5)
BRN002-SB-04-10	10	ND (22)
BRN002-SB-05-00	0	4,660
BRN002-SB-05-10	10	ND (23.6)
BRN002-SB-06-00	0	ND (24.8)
BRN002-SB-06-10	10	ND (22.5)
BRN002-SB-07-00	0	1,660
BRN002-SB-07-10	10	ND (24.9)
BRN002-SB-08-00	0	ND (20.3)
BRN002-SB-08-10	10	178
BRN002-SB-09-00	0	558
BRN002-SB-09-10	10	91
BRN002-SB-10-00	0	45,600
BRN002-SB-10-10	10	124
BRN002-SB-11-00	0	ND (20.5)
BRN002-SB-11-10	10	ND (23.3)
BRN002-SB-12-00	0	4,710
BRN002-SB-12-10	10	140

Notes:

1. fbgs = feet below ground surface
2. All data is presented on a dry weight basis.
3. ND = non-detect, detection limit is in parentheses.
4. Soils action level is 54,800 ug/Kg.

Table 2 - Surface Water Perchlorate Data Summary		
Sample ID	Depth (fbws)	Perchlorate (µg/L)
BRN002-SW-01-02	2	31
BRN002-SW-01-10	10	33
BRN002-SW-02-02	2	29
BRN002-SW-02-10	10	29
BRN002-SW-03-02	2	29
BRN002-SW-03-10	10	31
BRN002-SW-04-02	2	32
BRN002-SW-04-06	6	28
BRN002-SW-05-02	2	30
BRN002-SW-05-08	8	30
BRN002-SW-06-02	2	31
BRN002-SW-06-07	7	33
BRN002-SW-07-02	2	30
BRN002-SW-07-10	10	30
BRN002-SW-08-02	2	30
BRN002-SW-08-10	10	30
BRN002-SW-09-02	2	30
BRN002-SW-09-10	10	31
BRN002-SW-10-02	2	30
BRN002-SW-10-10	10	32
BRN002-SW-11-02	2	30
BRN002-SW-11-10	10	30
BRN002-SW-12-02	2	30
BRN002-SW-12-04	4	30
BRN002-SW-25-02	2	29
BRN002-SW-25-10	10	28

Notes:

1. fbws = feet below water surface.
2. Water action level is 18 ug/l.
3. Location BRN002-SW-25 is a field duplicate for location SW-09.

FIGURES

N

0 1000 2000
FEET

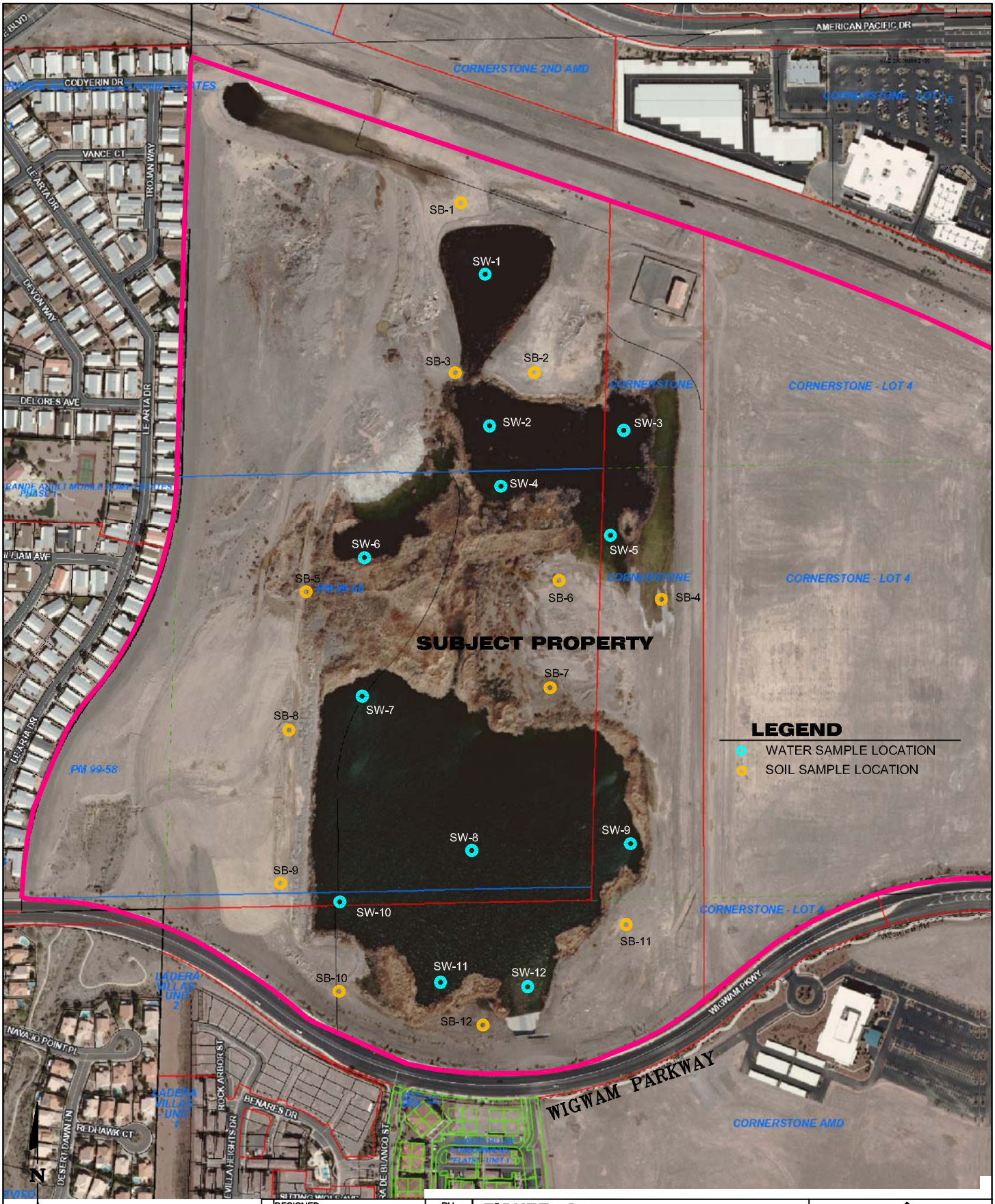
REFERENCE	DESIGNED		BH
	DRAWN		TAD
	CHECKED		
	APPROVED		
REVISIONS	No.	DESCRIPTION BY	DATE

FIGURE 1

PROJECT LOCATION MAP
-SHOWING-
CORNERSTONE SITE
LAS VEGAS, NEVADA

McGinley & Associates

SCALE: AS SHOWN	REVISION
JOB NO. LV-BRN-002	A



0 200 400
FEET

REFERENCE		
	DESIGNED	BH
	DRAWN	TAD
	CHECKED	
	APPROVED	

REVISIONS	No.	DESCRIPTION	BY	DATE

FIGURE 2

SITE MAP
-SHOWING-
CORNERSTONE SITE
LAS VEGAS, NEVADA

McGinley & Associates

SCALE: AS SHOWN	REVISION
JOB NO. LV-BRN-002	A

Z:\Projects\Drafting\LV-BRN-002\LV-BRN-002-02.dwg 01/17/11 13:23 TAD

APPENDIX A

Sampling and Analysis Plan (on disk)

APPENDIX B

Photographs

Photograph 1:
Utility Clearance by Air Knife at Location SB-9

Photograph 2:
Utility Clearance by Air Knife at Location SB-11

Photograph 3:
Grout Completion at Location SB-2

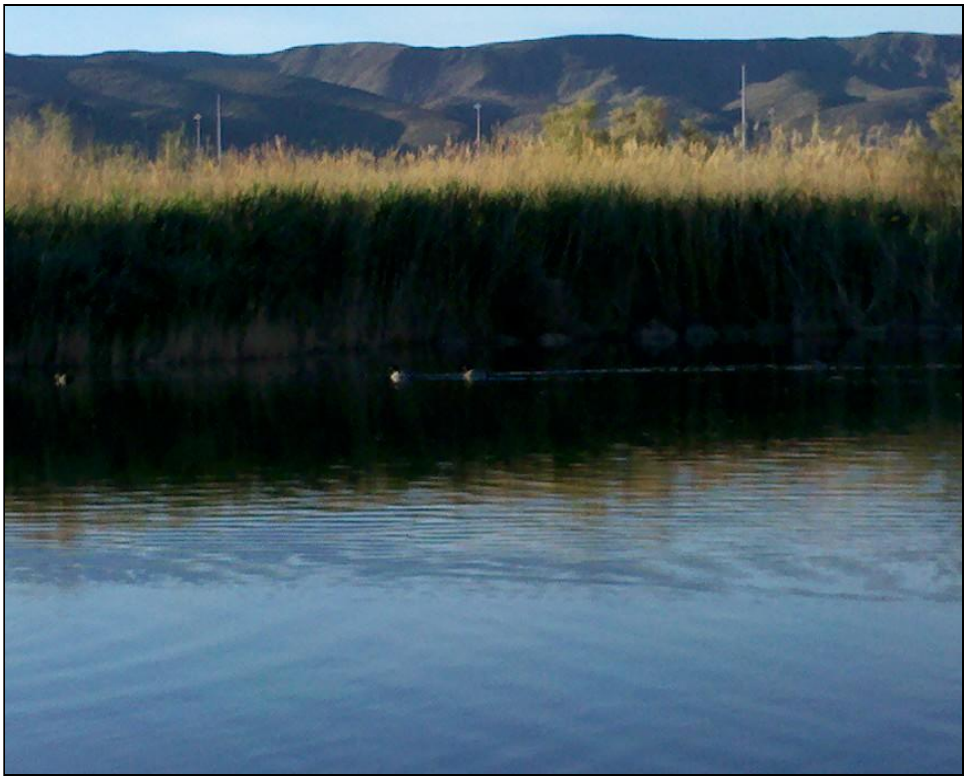
Photograph 4:
Groundwater Contact at Location B-7

Photograph 5:
Downhole View of Location SB-10

Photograph 6:
Labeling of Surface Water Samples

Photograph 7:
Surface Water Sampling Vista

Photograph 8:
Surface Water Sampling Vista



Photograph 9:
Site Vista with Local Fauna

Photograph 10:
Site Vista with Local Fauna

APPENDIX C

Chain-of-Custody Records

Alpha Analytical, Inc.

Phone : (775) 355-1044 FAX : (775) 355-0406

Sample Receipt Checklist

Date Report is due to Client : **4/13/2011** Date of Notice : **4/7/2011 11:56:01 A**

Please take note of any NO check marks. If we receive no response concerning these items within 24 hours of the date of this notice, all of the samples will be analyzed as requested.

Client Name: **McGinley & Associates**
Project ID : **LV BRN 002/ Cornerstone Park**
Project Manager: **Brian Rakvica**
Client's EMail: **brakvica@mcgin.com**
Client's Phone: **(702) 260-4961** Client's FAX: **(702) 260-4968**
Work Order Number: **MGA11040703** Date Received: **4/7/2011** Received by: Elizabeth Adcox

Chain of Custody (COC) Information

Carrier name OnTrac

Chain of custody present ?	Yes ☑	No ☐	
Custody seals intact on shippping container/cooler ?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles ?	Yes ☑	No ☐	Not Present ☐
Chain of custody signed when relinquished and received ?	Yes ☑	No ☐	
Chain of custody agrees with sample labels ?	Yes ☑	No ☐	
Sample ID noted by Client on COC ?	Yes ☑	No ☐	
Date and time of collection noted by Client on COC ?	Yes ☑	No ☐	
Samplers's name noted on COC ?	Yes ☑	No ☐	
Internal Chain of Custody (COC) requested ?	Yes ☐	No ☑	
Sub Contract Lab Used :	None ☑	See Comments ☐	

Sample Receipt Information

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐		Cooler Temperature
Container/Temp Blank temperature in compliance (0-6°C)?	Yes ☑	No ☐		0 °C
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	N/A ☐	No VOA vials submitted ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐		
TOC Water - pH acceptable upon receipt (H2SO4 pH<2)?	Yes ☐	No ☐	N/A ☑	
Are NV non-SDWA 314 samples field filtered (0.2µ)?	Yes ☐	No ☐	N/A ☑	

Analytical Requirement Information

Are non-Standard or Modified methods requested ?	Yes ☐	No ☑	
Are there client specific Project requirements ?	Yes ☐	No ☑	If YES : see the Chain of Custody (COC)
Is this a Drinking Water regulatory sample ?	Yes ☐	No ☑	

Comments : Temp Blank #8672 received @ 0°C.

54250

Billing Information:
Company Name: MCGINLEY & ASSOCIATES
Attn: BRIAN RAKVICA
Address: 6280 S. VALLEY VIEW BLVD #604
City, State, Zip: LAS VEGAS, NV 89118
Phone Number: 7022604961 Fax: 7022604968

Alpha Analytical, Inc.
255 Glendale Avenue, Suite 21
Sparks, Nevada 89431-5778
Phone (775) 355-1044
Fax (775) 355-0406

Samples Collected From Which State?
AZ ___ CA ___ NV X WA ___ DOD Site ___
ID ___ OR ___ OTHER ___ Page # ___ of ___

Consultant / Client Name: MCGINLEY & ASSOCIATES
Address: 6280 S. Valley View Blvd
City, State, Zip: Las Vegas NV 89118
P.O. #: LV 010
Job #: LV BRN 002
Job Name: CORNERSTONE PARK
Report Attention / Project Manager
Name: BRIAN RAKVICA
Email: brakvica@mcgin.com
Phone: 702 260 4961 Ex 7001 Mobile:
Data Validation Level: III or IV
EDD / EDF? YES X NO
Global ID #:

Time Sampled	Date Sampled	Matrix* See Key Below	Lab ID Number (Office Use Only)	Sample Description	TAT	Field Filtered	# Containers**	314.0	Analyses Required	REMARKS
7:00	4-4-11	SO	MGA1104070 3-01	BRN002-SB-11-00			1-S	X		
7:45	4-4-11	SO	-02	BRN002-SB-11-10			1-S	X		
810		SO	-03	BRN002-SB-07-00			1-S	X		
822		SO	-04	BRN002-SB-07-10			1-S	X		
847		SO	-05	BRN002-SB-06-00			1-S	X		
857		SO	-06	BRN002-SB-06-10			1-S	X		
9:20		SO	-07	BRN002-SB-04-00			1-S	X		
9:35		SO	-08	BRN002-SB-04-10			1-S	X		
10:20		SO	-09	BRN002-SB-02-00			1-S	X		
10:40		SO	-10	BRN002-SB-02-10			1-S	X		
11:15		SO	-11	BRN002-SB-01-00			1-S	X		
11:30		SO	-12	BRN002-SB-01-10			1-S	X		
~~	↓	SO		BRN002			1-S	X		

FOR LAB USE ONLY

ADDITIONAL INSTRUCTIONS:

I, (field sampler), attest to the validity and authenticity of this sample. I am aware that tampering with or intentionally mislabeling the sample location, date or time of collection is considered fraud and may be grounds for legal action. Sampled By: Brian W Gale

Relinquished by: (Signature/Affiliation)	Received by: (Signature/Affiliation)	Date:	Time:
Brian W Gale MGA 4-6-11 430pm	Dawn Thompson / ALPHA	4-6-11	2:40
Dawn Thompson / ALPHA	Elizabeth Cedcox / Alpha	4-7-11	1206
Relinquished by: (Signature/Affiliation)	Received by: (Signature/Affiliation)	Date:	Time:

*Key: AQ - Aqueous SO - Soil WA - Waste OT - Other AR - Air **: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense. The report for the analysis of the above samples is applicable only to those samples received by the laboratory with this coc. The liability of the laboratory is limited to the amount paid for the report.

54251

Billing Information:
Company Name MC GINLEY & ASSOCIATES
Attn: BRIAN RAKVICA
Address 6280 S. VALLEY VIEW BLVD #604
City, State, Zip LAS VEGAS, NV 89118
Phone Number 7022604961 Fax 7022604966

Alpha Analytical, Inc.
255 Glendale Avenue, Suite 21
Sparks, Nevada 89431-5778
Phone (775) 355-1044
Fax (775) 355-0406

Samples Collected From Which State?
AZ ____ CA ____ NV X WA ____ DOD Site ____
ID ____ OR ____ OTHER ____ Page # ____ of ____

Consultant / Client Name: McGINLEY & ASSOCIATES
Address: 6280 S. VALLEY VIEW. BLVD
City, State, Zip: LAS VEGAS NV 89118
P.O. # LV 010

Job # LVBRN 002
Job Name: CORNER SIGN PARK

Report Attention / Project Manager
Name: BRIAN RAKVICA
Email: brakvica@mcgin.com
Phone: 702-260-4961 EXT 7001 Mobile: ____

Data Validation Level: III or IV
EDD / EDF? YES X NO ____
Global ID # ____

Time Sampled	Date Sampled	Matrix* See Key Below	Lab ID Number (Office Use Only)	Sample Description	TAT	Field Filtered	# Containers**	3140	Analyses Required							REMARKS
12:00	4-4-11	SO	-13	BRN002-SB-03-00			1-S	X								
12:15	4-4-11	SO	-14	BRN002-SB-03-10			1-S	X								
13:20	4-4-11	SO	-15	BRN002-SB-05-00			1-S	X								
13:35	4-4-11	SO	-16	BRN002-SB-05-10			1-S	X								
12:00	4-4-11	AQ	-17	BRN002-RB-01-00			1-P	X								
8:30	4-5-11	AQ	-18	BRN002-RB-02-00			1-P	X								
7:15	4-5-11	SO	-19	BRN002-SB-08-00			1-S	X								
7:25	4-5-11	SO	-20	BRN002-SB-08-10			1-S	X								
7:45	4-5-11	SO	-21	BRN002-SB-9-00			1-S	X								
7:55	4-5-11	SO	-22	BRN002-SB-9-10			1-S	X								
8:15	4-5-11	SO	-23	BRN002-SB-10-00			1-S	X								
8:20	4-5-11	SO	-24	BRN002-SB-10-10			1-S	X								

FOR LAB USE ONLY

ADDITIONAL INSTRUCTIONS:

I, (field sampler), attest to the validity and authenticity of this sample. I am aware that tampering with or intentionally mislabeling the sample location, date or time of collection is considered fraud and may be grounds for legal action. Sampled By: Dan Wenk

Relinquished by: (Signature/Affiliation)	Received by: (Signature/Affiliation)	Date:	Time:
Dan Wenk MGA	James Thompson / ALPHA	4-6-11	2:35
James Thompson / ALPHA 4-6-11 4:30 PM	Emily Adcox / Alpha	4-7-11	1206
Relinquished by: (Signature/Affiliation)	Received by: (Signature/Affiliation)	Date:	Time:

*Key: AQ - Aqueous SO - Soil WA - Waste OT - Other AR - Air **: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense. The report for the analysis of the above samples is applicable only to those samples received by the laboratory with this coc. The liability of the laboratory is limited to the amount paid for the report.

54252

Billing Information:
Company Name MCGINLEY & ASSOC.
Attn: BRIAN RAKVICA
Address 6200 S. VALLEY VIEW BLVD # 604
City, State, Zip LAS VEGAS, NV 89118
Phone Number 7022604961 Fax 7024968

Alpha Analytical, Inc.
255 Glendale Avenue, Suite 21
Sparks, Nevada 89431-5778
Phone (775) 355-1044
Fax (775) 355-0406

Samples Collected From Which State?
AZ ____ CA ____ NV X WA ____ DOD Site ____
ID ____ OR ____ OTHER ____ Page # ____ of ____

Consultant / Client Name: McGINLEY & ASSOCIATES
Address: Per above
City, State, Zip:
Job #: LVBRN 002
Job Name: CORNER STONE PARK
Report Attention / Project Manager
Name: BRIAN RAKVICA
Email: brakvica@mcginl.com
Phone: 702-260 4961 EX 7009 Mobile:
P.O. #: LV010

Data Validation Level: III or IV
EDD / EDF? YES X NO ____
Global ID # ____

Time Sampled	Date Sampled	Matrix* See Key Below	Lab ID Number (Office Use Only)	Sample Description	TAT	Field Filtered	# Containers**	314.0	Analyses Required	REMARKS
8145	4-5-11	SO	-25	BRN002-SB-12-00			1-S	X		
8155	4-5-11	SO	-26	BRN002-SB-12-10			1-S	X		
1125 AM	4-6-11	AQ	-27	BRN002-RB-01-00			1-P			
1040 A			-28	BRN002-SW-07-02						
1038 AM			-29	BRN002-SW-07-10						
827 A			-30	BRN002-SW-05-02						
830 A			-31	BRN002-SW-05-08						
1015 A			-32	BRN002-SW-09-02						
1017 A			-33	BRN002-SW-09-10						
923 A			-34	BRN002-SW-06-02						
925 A			-35	BRN002-SW-06-07						

FOR LAB USE ONLY

ADDITIONAL INSTRUCTIONS:

I, (field sampler), attest to the validity and authenticity of this sample. I am aware that tampering with or intentionally mislabeling the sample location, date or time of collection is considered fraud and may be grounds for legal action. Sampled By: Brian Rakvica

Relinquished by: (Signature/Affiliation)	Received by: (Signature/Affiliation)	Date:	Time:
Brian Rakvica MGA	John Hughes / ALPHA	4-6-11	2:35
John Hughes / ALPHA 4-6-11 4:30 PM	Elizabeth Adcox / Alpha	4.7.11	1206
Relinquished by: (Signature/Affiliation)	Received by: (Signature/Affiliation)	Date:	Time:

*Key: AQ - Aqueous SO - Soil WA - Waste OT - Other AR - Air **: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense. The report for the analysis of the above samples is applicable only to those samples received by the laboratory with this coc. The liability of the laboratory is limited to the amount paid for the report.

54253

Billing Information:
Company Name MCGINLEY
Attn: BRIAN RAKVICA
Address 6200 S. VALLEY VIEW BLVD #604
City, State, Zip LAS VEGAS, NV 89118
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Alpha Analytical, Inc.
255 Glendale Avenue, Suite 21
Sparks, Nevada 89431-5778
Phone (775) 355-1044
Fax (775) 355-0406

Samples Collected From Which State?
AZ ____ CA ____ NV X WA ____ DOD Site ____
ID ____ OR ____ OTHER ____ Page # ____ of ____

Consultant / Client Name: MCGINLEY
Address: 6200 S. VALLEY VIEW BLVD # 604
City, State, Zip: LAS VEGAS, NV 89118
Job #: LVBRN002 Job Name: CORNERSTONE PARK
Report Attention / Project Manager
Name: BRIAN RAKVICA
Email: BRAKVICA@MCGIN.COM
Phone: 7022604961 Mobile: 7023599945
P.O. # LV010

Analyses Required: 314.0

Data Validation Level: III or (IV)
EDD / EDF? YES X NO ____
Global ID # ____

Time Sampled	Date Sampled	Matrix* See Key Below	Lab ID Number (Office Use Only)	Sample Description	TAT	Field Filtered	# Containers**	314.0	REMARKS
0835A	4/6/11	AQ	-36	BRN002-SW-03-02			1-P	X	
0840A			-37	BRN002-SW-03-10					
0851A			-38	BRN002-SW-04-02					
0853A			-39	BRN002-SW-04-06					
0842A			-40	BRN002-SW-02-02					
0849A			-41	BRN002-SW-02-10					
0745A			-42	BRN002-SW-01-02					
0755A			-43	BRN002-SW-01-10					
1105A			-44	BRN002-SW-11-02					
1103A			-45	BRN002-SW-11-10					
1050A			-46	BRN002-SW-10-02					
1055A			-47	BRN002-SW-10-10					
								X	

FOR LAB USE ONLY

ADDITIONAL INSTRUCTIONS:

I, (field sampler), attest to the validity and authenticity of this sample. I am aware that tampering with or intentionally mislabeling the sample location, date or time of collection is considered fraud and may be grounds for legal action. Sampled By: [signature]

Relinquished by: (Signature/Affiliation)	Received by: (Signature/Affiliation)	Date:	Time:
[signature] MCA	[signature] / ALPHA	4/6/11	2:55
[signature] / ALPHA 4-6-11 4:30PM	[signature] Cindy Edcox / Alpha	4-7-11	1206
Relinquished by: (Signature/Affiliation)	Received by: (Signature/Affiliation)	Date:	Time:

*Key: AQ - Aqueous SO - Soil WA - Waste OT - Other AR - Air **: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense. The report for the analysis of the above samples is applicable only to those samples received by the laboratory with this coc. The liability of the laboratory is limited to the amount paid for the report.

54254

Billing Information:
Company Name MCCONLEY & ASSOCIATES
Attn: BRIAN RAKICA
Address 6280 S. VALLEY VIEW BLVD #604
City, State, Zip LAS VEGAS, NV 89118
Phone Number 7022609961 Fax 702-2609968

Alpha Analytical, Inc.
255 Glendale Avenue, Suite 21
Sparks, Nevada 89431-5778
Phone (775) 355-1044
Fax (775) 355-0406

Samples Collected From Which State?
AZ ____ CA ____ NV X WA ____ DOD Site ____
ID ____ OR ____ OTHER ____ Page # ____ of ____

Consultant / Client Name: same as above
Address:
City, State, Zip:
Job #: LVBRNOO2
Job Name: CORNERSTONE PARK
Report Attention / Project Manager
Name:
Email:
Phone: ____ Mobile: ____

Data Validation Level: III or (IV)
EDD / EDF? YES X NO ____
Global ID # ____

Time Sampled	Date Sampled	Matrix* See Key Below	P.O. # / Lab ID Number (Office Use Only)	Sample Description	TAT	Field Filtered	# Containers**	Analyses Required: 314.0	REMARKS
1030A	4/6/11	AQ	-48	BRNOO2-SW-08-02			1-P	X	
1034A	↑	↑	-49	BRNOO2-SW-08-10			↑	X	
1015A			-50	BRNOO2-SW-25-02				X	
1017A			-51	BRNOO2-SW-25-10				X	
1003A	↓	↓	-52	BRNOO2-SW-12-02			↓	X	
1003A	4/6/11	AQ	-53	BRNOO2-SW-12-04			1-P	X	

FOR LAB USE ONLY

ADDITIONAL INSTRUCTIONS:

I, (field sampler), attest to the validity and authenticity of this sample. I am aware that tampering with or intentionally mislabeling the sample location, date or time of collection is considered fraud and may be grounds for legal action. Sampled By: Brian Rakica

Relinquished by: (Signature/Affiliation) Brian Rakica MGA	Received by: (Signature/Affiliation) John Thompson / ALPHA	Date: 4-6-11	Time: 35 2
Relinquished by: (Signature/Affiliation) John Thompson / ALPHA 4-9-11 4:30 PM	Received by: (Signature/Affiliation) Elizabeth Adcox / Alpha	Date: 4.7.11	Time: 1206
Relinquished by: (Signature/Affiliation)	Received by: (Signature/Affiliation)	Date:	Time:

*Key: AQ - Aqueous SO - Soil WA - Waste OT - Other AR - Air **: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense. The report for the analysis of the above samples is applicable only to those samples received by the laboratory with this coc. The liability of the laboratory is limited to the amount paid for the report.

APPENDIX D

Laboratory Reports and Electronic Data Deliverable (on disk)

APPENDIX E

Data Validation Summary Report

Data Validation Report: CornerStone Park Investigation

April 26, 2011 Revision 1

Prepared for:

McGinley and Associations

Prepared by:

Neptune and Company, Inc.

1505 15th Street, Los Alamos, NM 87544

Point of Contact: David Gratson, Rebecca Shircliff

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Table of Contents

List of Acronyms and Abbreviations

LCS/LCSD	Laboratory Control Sample / Laboratory Control Sample Duplicate
MS/MSD	Matrix Spike / Matrix Spike Duplicate
ND	Not Detected
NFG	National Functional Guidelines
PARCC	Precision, Accuracy, Representativeness, Comparability, Completeness
QA/QC	Quality Assurance / Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference
SDG	Sample Delivery Group
SVOC	Semivolatile Organic Compound
µg/L	Micrograms per Liter
µg/kg	Micrograms per kilogram
USEPA	United States Environmental Protection Agency
%D	Percent Difference
%R	Percent Recovery
RPD	Relative Percent Difference
%RSD	Percent Relative Standard Deviation

1. INTRODUCTION

This Data Validation Report has been prepared by Neptune and Company, Inc. to assess the validity of laboratory analytical data associated with work at the CornerStone Park Property. For this data validation laboratory reports were provided from Alpha Analytical, Inc of Sparks, Nevada. The Alpha Analytical, Inc laboratory reports were provided as Adobe Acrobat files, with file names EDD_CORNERSTONE PARK (summary wet weight basis), MGA11040703_PERC_SOIL_AQ (full), and MGA11040703FQC1_CORNERSTONE PARK (summary on dry weight basis). These laboratory reports contained the results for the samples analyzed for perchlorate using EPA Method 314.0.

Analysis	Number of Samples*	Matrix
Perchlorate (EPA Method 314.0)	53	Soil, aqueous

* Sample count does not include QC samples such as Method Blanks, LCS, ICCS, or similar.

The first set of laboratory reports provided the soil sample results on a wet weight basis. A new summary report was submitted by the laboratory with data on a dry weight basis. This revision 1 of the validation report has been updated to include the results on a dry-weight basis. No new data qualification was required in this revised report. The percent moisture of each soil sample was not provided by the laboratory. The dry versus wet perchlorate results indicate the percent moisture of the wet samples varied from 2.5% (BRN002-SB-9-00) to 27% (BRN002-SB-03-00).

The laboratory reports included summary and raw chromatogram results for both the samples and quality control samples analyzed with the sample batches. This summary information included analyte results, method blanks, LCS and MS/MSD results. The method includes the use of the internal standard compound pCBSA to monitor performance but external calibration is used.

All data appear to be censored at the PQL, with no data reported below this value. The PQL derivation was not defined in the laboratory reports but was reported to be a nominal value of 20 µg/kg for soils and 2 µg/L for the aqueous samples. Note, the lowest calibration level in the initial calibration is 1 µg/L so the PQL is fairly conservative.

The method required matrix conductivity threshold, and peak area to height ratio to be calculated by the laboratory prior to analysis. These parameters met the method requirements.

Both a summary and full report were provided by Alpha Analytical, Inc. The full laboratory report included initial and continuing calibration; all batch QC samples; raw chromatograms for all samples, initial and continuing calibrations, and QC samples; instrument sequence logs linking QC batches numbers to samples; and soil and aqueous preparation batch information.

The laboratory reports were validated based on general data validation procedures. This process follows the methods outline in the *Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review*, January, 2010. Professional judgment was used in some cases to qualify the results if needed. Acceptance criteria for spike recoveries, replicate samples, and blank contamination was based upon the EPA method first, and then any laboratory generated limits if they differ from the method. The acceptance criteria are described in Section 2.0.

This report summarizes the quality assurance evaluation of the data according to precision, accuracy, representativeness, completeness, and comparability (PARCC) relative to the National Functional Guidelines. This report provides an assessment of the data and identifies potential sources of error, uncertainty, and bias that may affect the overall usability.

Qualifiers	
J-	Estimated: The associated numerical value is an estimated quantity with a potentially negative bias. The analyte was detected but the reported value may not be accurate or precise. The "J-" qualification indicates the data fell outside the QC limits, but the exceedance was not sufficient to cause rejection of the data.
J+	Estimated: The associated numerical value is an estimated quantity with a potentially positive bias. The analyte was detected but the reported value may not be accurate or precise. The "J+" qualification indicates the data fell outside the QC limits, but the exceedance was not sufficient to cause rejection of the data.
J	Estimated: The associated numerical value is an estimated quantity. It is not possible to assess the direction of the potential bias. The analyte was detected but the reported value may not be accurate or precise. The "J" qualification indicates the data fell outside the QC limits, but the exceedance was not sufficient to cause rejection of the data.
R	Rejected: The datum is unusable (the compound or analyte may or may not be present). Use of the "R" qualifier indicates a significant variance from functional guideline acceptance criteria.
UJ	Estimated/Not detected: Analyses were performed for the compound or analyte, but it was not detected. This qualification is used to flag possible false negative results in the case where low bias in the analytical system is indicated by low calibration response, surrogate, or other spike recovery.
U	Results is a non-detect, with the PQL provided.
E	The analyte exceeded the calibration range of the instrument. There is greater uncertainty associated with the reported value.

PARCC Criteria

Precision is a measure of the agreement or reproducibility of analytical results under a given set of conditions. It is a quantity that cannot be measured directly but is calculated from percent recovery data. Precision is expressed as the relative percent difference (RPD):

$$RPD\ (\%) = \text{Absolute Value of } (D1-D2)/\{1/2(D1+D2)\} \times 100$$

Where D1 and D2 are the reported concentrations for sample and duplicate analyses.

An RPD outside the numerical QC limit in either MS/MSD samples or LCS/LCSD indicates imprecision but does not imply accuracy or allow for directional qualification (e.g. J+ or J-). For

this data set, duplicate results were only reviewed for replicate LCS and MS data. No replicate native sample results were evaluated.

Accuracy is a measure of the agreement of an experimental determination and the true value of the parameter being measured. It is used to identify bias in a given measurement system Recoveries outside acceptable QC limits may be caused by factors such as instrumentation, analyst error, or matrix interference. Accuracy is assessed through the analysis of spiked matrix samples and laboratory control samples containing analytes of interest and surrogate compounds. Surrogate spikes were added to every environmental sample, blank, LCS, MS/MSD, and standard, for the organic analyses. The soil samples analyzed in this report also included LCS and MS results. Accuracy of inorganic analyses is determined using the percent recoveries of MS and LCS analyses.

Percent recovery (%R) is calculated using the following equation:

$$\%R = (A-B)/C \times 100$$

where:
A = measured concentration in the spiked sample
B = measured concentration of the spike compound in the unspiked sample
C = concentration of the spike

Spike recoveries outside the acceptable QC accuracy limits provide an indication of bias, where the reported data may overestimate or underestimate the actual concentration of compounds detected. This directional bias information can be used to provide J- or J+ qualification, when no other qualifiers complicate the datum.

Representativeness is a qualitative parameter that expresses the degree to which the sample data are characteristic of a population. It is evaluated herein by reviewing the QC results of blanks, samples and holding times. Positive detects of compounds in the blank samples identify compounds that may have been introduced into the samples during sample collection, transport, preparation, or analysis. The QA/QC blanks collected and analyzed are method blanks, trip blanks, and field blanks.

Contamination found in a laboratory blank sample are assessed against the concentrations found in the samples. In this study, no perchlorate was found in the method blanks

Holding times are evaluated to assure that the sample integrity is intact for accurate sample preparation and analysis. Holding times will be specific for each method and matrix analyzed. Holding time exceedances can cause loss of sample constituents due to biodegradation, precipitation, volatization, and chemical degradation. In accordance with EPA guidance (USEPA-540-R-10-011, 2010 and USEPA-540-R-09-01, 2008), sample results for analyses that were performed after the method holding time but less than two times the method holding time were qualified as estimated (J- or UJ) and sample results for analyses that were performed after two times the method holding time were qualified as rejected (R) if the analyte was not detected above the PQL.

Comparability is a qualitative expression of the confidence with which one data set may be compared to another. In the data validation context it provides an assessment of the equivalence of the analytical results to data obtained from other analyses. Comparability is also

dependent upon other PARCC criteria, because only when precision, accuracy, and representativeness are known can data sets be compared with confidence.

Completeness is defined as the percentage of acceptable sample results compared to the total number of sample results. Completeness equals the total number of sample results for each fraction minus the total number of rejected sample results divided by the total number of sample results multiplied by 100. Percent completeness is calculated using the following equation:

$$\%C = (T - R)/T \times 100$$

where:
%C = percent completeness
T = total number of sample results
R = total number of rejected sample results

General basis for qualifying data**:**

Preservation and Holding Time:
The holding time for perchlorate is 28 days with no preservation required other than the general practice to cool the samples to 4 degrees Celsius.

Initial and Continuing Calibration
The analytical method utilized (EPA Method 314.0) includes the use of an Instrument Performance Check Sample (IPC), and Initial Calibration Check Standard (ICCS) and Continuing Calibration Check Standard(s) (CCCS), with an End Calibration Check Standard (ECCS). The Matrix Conductivity Threshold and Peak area to Height ratio are also checked during the initial calibration, with the conductivity monitored for each sample.

I/C/ECCS: samples were qualified with a J- / J+ for all detected analytes in those instances where the recovery was below/above the I/C/ECCS QC limit. These qualifiers apply to all samples within the associated batch. Samples were qualified with a UJ if the analytes were ND and the recovery was below limit. Samples that were ND, and the recovery exceeded the QC limit were not qualified.

LCS: samples were qualified with a J- / J+ for all detected analytes in those instances where the recovery was below/above the QC limit. These qualifiers apply to all samples within the associated batch. Samples were qualified with a UJ if the analytes were ND and the recovery was below limit. Samples that were ND, and the recovery exceeded the QC limit were not qualified.

MS/MSD: three sets of samples from the CornerStone park sampling were used as matrix spikes in this study. In general, samples were qualified with a J- / J+ for all detected analytes in those instances where the recovery was below/above the QC limit. These qualifiers only apply to the samples that were spiked. Samples were qualified with a UJ if the analytes were ND and the recovery was below limit. Samples that were ND, and the recovery exceeded the QC limit were not qualified. Matrix spike recovery is discussed in Section 2.1.4.

Blanks: Samples were only qualified based upon blank information if the analyte was detected in a sample and its concentration was equal or less than 2X the value in the associated blank.

Retention Time Window

Retention time limits are developed during the initial calibration and daily calibration standards (IPC, ICCS, CCCS). The upper and lower windows are based upon the average retention time ±3*standard deviation.

The following sections present a detailed review of QC data for each analytical batch and associated samples.

2. Perchlorate -EPA Method 314.0

A total of 53 samples soil and aqueous samples that were analyzed using EPA Method 314.0 were validated. None of the sample results were rejected based on holding time or other quality assurance/control issues. All samples were analyzed within 5 days of sampling, well within the 28 days criteria, and were received at the laboratory at approximately zero degrees Celsius.

Lab ID	Client ID	Batch	Matrix Type	Perchlorate (soils: µg/Kg-dry, Aqueous µg/L)
MGA11040703-01A	BRN002-SB-11-00	26287	Soil	<20.5
MGA11040703-02A	BRN002-SB-11-10	26287	Soil	<23.3
MGA11040703-03A	BRN002-SB-07-00	26287	Soil	1660
MGA11040703-04A	BRN002-SB-07-10	26287	Soil	<24.9
MGA11040703-05A	BRN002-SB-06-00	26287	Soil	<24.8
MGA11040703-06A	BRN002-SB-06-10	26287	Soil	<22.5
MGA11040703-07A	BRN002-SB-04-00	26287	Soil	<20.5
MGA11040703-08A	BRN002-SB-04-10	26287	Soil	<22
MGA11040703-09A	BRN002-SB-02-00	26287	Soil	38
MGA11040703-10A	BRN002-SB-02-10	26287	Soil	68
MGA11040703-11A	BRN002-SB-01-00	26287	Soil	22100
MGA11040703-12A	BRN002-SB-01-10	26287	Soil	6690
MGA11040703-13A	BRN002-SB-03-00	26287	Soil	74
MGA11040703-14A	BRN002-SB-03-10	26287	Soil	<24.4
MGA11040703-15A	BRN002-SB-05-00	26287	Soil	4660
MGA11040703-16A	BRN002-SB-05-10	26287	Soil	<23.6
MGA11040703-17A	BRN002-RB-01-00	26281	Aqueous	<2.0
MGA11040703-18A	BRN002-RB-02-00	26281	Aqueous	<2.0
MGA11040703-19A	BRN002-SB-08-00	26287	Soil	<20.3
MGA11040703-20A	BRN002-SB-08-10	26287	Soil	178
MGA11040703-21A	BRN002-SB-9-00	26287	Soil	558
MGA11040703-22A	BRN002-SB-9-10	26287	Soil	91
MGA11040703-23A	BRN002-SB-10-00	26288	Soil	45600
MGA11040703-24A	BRN002-SB-10-10	26288	Soil	124
MGA11040703-25A	BRN002-SB-12-00	26288	Soil	4710
MGA11040703-26A	BRN002-SB-12-10	26288	Soil	140
MGA11040703-27A	BRN002-RB-01-00	26281	Aqueous	<2.0
MGA11040703-28A	BRN002-SW-07-02	26281	Aqueous	30
MGA11040703-29A	BRN002-SW-07-10	26281	Aqueous	30
MGA11040703-30A	BRN002-SW-05-02	26281	Aqueous	30
MGA11040703-31A	BRN002-SW-05-08	26281	Aqueous	30
MGA11040703-32A	BRN002-SW-09-02	26281	Aqueous	30
MGA11040703-33A	BRN002-SW-09-10	26281	Aqueous	31
MGA11040703-34A	BRN002-SW-06-02	26281	Aqueous	31
MGA11040703-35A	BRN002-SW-06-07	26281	Aqueous	33
MGA11040703-36A	BRN002-SW-03-02	26281	Aqueous	29
MGA11040703-37A	BRN002-SW-03-10	26281	Aqueous	31
MGA11040703-38A	BRN002-SW-04-02	26281	Aqueous	32
MGA11040703-39A	BRN002-SW-04-06	26291	Aqueous	28
MGA11040703-40A	BRN002-SW-02-02	26291	Aqueous	29

MGA11040703-41A	BRN002-SW-02-10	26291	Aqueous	29
MGA11040703-42A	BRN002-SW-01-02	26291	Aqueous	31
MGA11040703-43A	BRN002-SW-01-10	26291	Aqueous	33
MGA11040703-44A	BRN002-SW-11-02	26291	Aqueous	30
MGA11040703-45A	BRN002-SW-11-10	26291	Aqueous	30
MGA11040703-46A	BRN002-SW-10-02	26291	Aqueous	30
MGA11040703-47A	BRN002-SW-10-10	26291	Aqueous	32
MGA11040703-48A	BRN002-SW-08-02	26291	Aqueous	30
MGA11040703-49A	BRN002-SW-08-10	26291	Aqueous	30
MGA11040703-50A	BRN002-SW-25-02	26291	Aqueous	29
MGA11040703-51A	BRN002-SW-25-10	26291	Aqueous	28
MGA11040703-52A	BRN002-SW-12-02	26291	Aqueous	30
MGA11040703-53A	BRN002-SW-12-04	26291	Aqueous	30

2.1. Quality Control Results

Four sample/QC batches were included in the CornerStone sample set. Quality control and calibration standards are associated with each batch. These control parameters are described below.

Batch	Matrix
26287	soils
26288	soils
26281	aqueous
26291	aqueous

2.1.1. Initial Calibration

An initial seven level calibration was performed on 3/28/2011, with the lowest standard at 1 µg/L and the highest standard at 100 µg/L. The initial average Calibration Factor (CF) is equal to 0.00304 (units of µS*minutes/ µg/L). The %RSD of all seven values was equal to 3.5%, meeting the initial calibration requirements.

This average CF was used to calculate the concentrations of all samples in this study. All samples were analyzed within the initial calibration range; in some cases this required sample extract dilution prior to analysis. All dilution factors are incorporated into the final reported values.

The final concentration of perchlorate in the samples was calculated using the following algorithm:

The instrument response (in units of µS*minutes) was divided by the CF, to arrive at the on-column concentration in units of µg/L. This result was then multiplied by any extract dilution factor, identified in the chromatograms, next to the Sample Names as 10X for example. This value was then converted into the final units if necessary. For soil samples, this required conversion to units of µg/kg by use of the following factor:

Sample Concentration (µg/L) * 0.030L/.003kg = µg/kg (wet weight basis). A standard factor of 10 was used in this final conversion for soils. In some cases the sample weight was not exactly 3.00 grams but was within the required limits of 2.85-3.15 grams. This concentration in a wet

weight basis was then converted to dry weight based upon the percent moisture in each sample. During this data validation process, nine soil samples and five aqueous sample concentrations were recalculated using the CF and raw instrument response – see Section 2.2 and Appendix A.

2.1.2. Continuing Calibration Check Standards

An Instrument Performance Check standard (IPC, at 25 µg/L) and an Initial (daily) Calibration Check Standard (ICCS, at 1 µg/L) was analyzed daily prior to each batch of sample analyses. During the sample runs a Continuing Check Standard (CCCS, at 25 µg/L) was also analyzed with an Ending Check Standard (ECCS, at 25 µg/L) completing the set of analyses. This sequence of initial (daily) and ending standards and sample batches was conducted from 4/8/2011 to 4/11/2011. All check standards were reviewed against the acceptance limits provided below.

Check Std Name	Spike Amount (µg/L)	Acceptance Limits (% Recovery)
IPC	25	80-120
ICCS	1	75-125
CCCS	25 or 50	85-115
ECCS	25 or 50	85-115

All check standards were within the acceptance limits, no data required qualification.

2.1.3. Laboratory Control Samples

A Laboratory Control Sample (LCS, associated with the soil sample batches) or Laboratory Fortified Blank (LFB, associated with the aqueous sample batches) was analyzed with each of the four sample batches. .

Control Sample ID	Spike Level	Acceptance Limits (% Recovery)
LCS	250 µg/kg	80-120
LFB	25 µg/L	85-115

All laboratory control and fortified blank samples were within the acceptance limits. No data were qualified.

2.1.4. Matrix Spike Samples

A Matrix Spike and Matrix Spike Duplicate sample was included in each of the four sample batches. The recovery and relative percent difference between these pair met the acceptance limits (80-120% recovery) in all cases but one. For batch 26288, the matrix spike recoveries were negative: -91% and -460% for the MS and MSD respectively.

These samples were spiked at a level of 250 µg/kg, but had native perchlorate concentrations of approximately 44000 µg/kg (wet weight). Due to this large difference in spike to native concentration and the required dilution (100X), the associated sample (11040703-23) was not qualified. The associated LCS was within the acceptance limits', indicating the instrument was within control. The poor MS/MSD recovery is a function of dilution and native perchlorate concentration.

2.1.5. Blank Samples

A Method Blank was also analyzed with each of the four sample batches. All method blanks were found to be "not detected." All responses were below the level detected by the software used to integrate a peak and well below the PQL. No data required qualification.

2.2. Raw Data Re-calculation

Samples are re-calculated from the raw response in Appendix A. These calculations are the wet weight basis. The second laboratory report provided results on a dry-weight basis; however the percentage of moisture for each sample was not reported. Differences between the reported data (final column) and the re-calculated values are attributed to the laboratory using a standard aqueous to soil conversion factor of 10. The recalculated results are based upon the actual sample weight. These differences are not considered significant.

2.3. Summary

No samples required qualification other than those values below the PQL.

With one exception, all calibration and QC samples met the method and laboratory limits. The only QC results that failed to meet the acceptance criteria were the matrix spike and matrix spike duplicate associated with sample 11040703-23 (BRN002-SB-10-00, batch 26288). The native perchlorate concentration was 44200 µg/kg (wet weight basis) or 45600 µg/kg on a dry weight basis. This sample required a dilution of 100X prior to analysis. The spike level was 250 µg/kg, significantly lower than the native concentration. The on-column ratio of native to spike was 442:2.5, making the ability to discern any spike difficult. The MS and MSD results are effectively replicates of the native sample, with the perchlorate wet weight basis concentrations equal to 44000 and 43100 µg/kg, respectively. No data were qualified due to this matrix spike issue.

Sample results that were non detects, were qualified with a U, and the reason code 1 to indicate the sample was less than the PQL (see Appendix B).

3. PARCC

Precision and accuracy assessments were included in each individual section above. Precision was assessed using the MS/MSD Relative Percent Difference indicator. Accuracy was assessed using percent recovery from the LCS/LFB and the MS/MSD pairs. The precision and accuracy of the data are considered acceptable.

Representativeness: All holding times were met as described in Section 2.0. No blank contamination was observed. The representativeness of the project data is considered acceptable.

Comparability: The laboratory used a standard analytical method for all of the analyses. No method detection limit information was provided to compare with the reporting limits. No data

was flagged by the laboratory. The results were censored at the PQL (nominally 20 µg/kg or 2 µg/L) and both values were above the lowest initial calibration level. There is no information provided that would question the comparability of the results. The overall comparability is considered acceptable.

Completeness: No results were rejected based on this data validation. The completeness level attained for the sample set was 100 percent.

Appendix A: Raw Data Re-calculation

					CF: 0.003040014			
Client ID	**Sample wt (grams)**	**Final Vol (mL)**	**Dilution Factor (from raw chromat)**	**Perchlorate response (µS*min)**	**Conc. at (no DF) instrument (µg/L)**	**Conc. with DF (µg/L)**	**Recalculated Final Conc. (µg/kg-wet or µg/L)**	**Reported Value (wet for soils)**
BRN002-SB-01-00	2.99	30.0	1000	0.06559	21.57555651	21575.56	21648	21600
BRN002-SB-01-10	3.04	30.0	100	0.19253	63.33193923	6333.19	6250	6330
BRN002-SB-08-10	2.98	30.0	10	0.04941	16.2532131	162.53	164	163
BRN002-SB-9-00	3.05	30.0	10	0.16537	54.39777069	543.98	535	544
BRN002-SB-9-10	2.94	30.0	10	0.02534	8.335487145	83.35	85	83
BRN002-SB-10-00	3.06	30.0	1000	0.13439	44.2070291	44207.03	43340	44200
BRN002-SB-10-10	2.94	30.0	10	0.03425	11.26639442	112.66	115	113
BRN002-SB-12-00	3.05	30.0	100	0.13867	45.61491722	4561.49	4487	4560
BRN002-SB-12-10	2.98	30.0	10	0.0322	10.59205549	105.92	107	106
	Initial Vol (mL)	**Final Vol (mL)**						
BRN002-RB-01-00	5.0	5.0	2	0	0	0.00	0	<2.0
BRN002-SW-07-02	5.0	5.0	2	0.0455	14.96703493	29.93	30	30
BRN002-SW-04-06	5.0	5.0	2	0.043	14.14467037	28.29	28	28
BRN002-SW-02-02	5.0	5.0	2	0.0442	14.53940536	29.08	29	29
BRN002-SW-02-10	5.0	5.0	2	0.04422	14.54598428	29.09	29	29

Appendix B: All Sample Results with Qualifiers

Lab ID	Batch	Client ID	Perchlorate (µg/kg)	Perchlorate (µg/L)	Qualifier	Reason Code
MGA11040703-01A	26287	BRN002-SB-11-00	<20		U	1
MGA11040703-02A	26287	BRN002-SB-11-10	<20		U	1
MGA11040703-03A	26287	BRN002-SB-07-00	1540			
MGA11040703-04A	26287	BRN002-SB-07-10	<20		U	1
MGA11040703-05A	26287	BRN002-SB-06-00	<20		U	1
MGA11040703-06A	26287	BRN002-SB-06-10	<20		U	1
MGA11040703-07A	26287	BRN002-SB-04-00	<20		U	1
MGA11040703-08A	26287	BRN002-SB-04-10	<20		U	1
MGA11040703-09A	26287	BRN002-SB-02-00	37			
MGA11040703-10A	26287	BRN002-SB-02-10	56			
MGA11040703-11A	26287	BRN002-SB-01-00	21600			
MGA11040703-12A	26287	BRN002-SB-01-10	6330			
MGA11040703-13A	26287	BRN002-SB-03-00	54			
MGA11040703-14A	26287	BRN002-SB-03-10	<20		U	1
MGA11040703-15A	26287	BRN002-SB-05-00	4320			
MGA11040703-16A	26287	BRN002-SB-05-10	<20		U	1
MGA11040703-17A	26281	BRN002-RB-01-00		<2.0		
MGA11040703-18A	26281	BRN002-RB-02-00		<2.0		
MGA11040703-19A	26287	BRN002-SB-08-00	<20		U	1
MGA11040703-20A	26287	BRN002-SB-08-10	163			
MGA11040703-21A	26287	BRN002-SB-9-00	544			
MGA11040703-22A	26287	BRN002-SB-9-10	83			
MGA11040703-23A	26288	BRN002-SB-10-00	44200			
MGA11040703-24A	26288	BRN002-SB-10-10	113			
MGA11040703-25A	26288	BRN002-SB-12-00	4560			
MGA11040703-26A	26288	BRN002-SB-12-10	106			
MGA11040703-27A	26281	BRN002-RB-01-00		<2.0	U	1
MGA11040703-28A	26281	BRN002-SW-07-02		30		
MGA11040703-29A	26281	BRN002-SW-07-10		30		
MGA11040703-30A	26281	BRN002-SW-05-02		30		
MGA11040703-31A	26281	BRN002-SW-05-08		30		
MGA11040703-32A	26281	BRN002-SW-09-02		30		
MGA11040703-33A	26281	BRN002-SW-09-10		31		
MGA11040703-34A	26281	BRN002-SW-06-02		31		
MGA11040703-35A	26281	BRN002-SW-06-07		33		
MGA11040703-36A	26281	BRN002-SW-03-02		29		
MGA11040703-37A	26281	BRN002-SW-03-10		31		
MGA11040703-38A	26281	BRN002-SW-04-02		32		
MGA11040703-39A	26291	BRN002-SW-04-06		28		
MGA11040703-40A	26291	BRN002-SW-02-02		29		
MGA11040703-41A	26291	BRN002-SW-02-10		29		
MGA11040703-42A	26291	BRN002-SW-01-02		31		
MGA11040703-43A	26291	BRN002-SW-01-10		33		

MGA11040703-44A	26291	BRN002-SW-11-02		30		
MGA11040703-45A	26291	BRN002-SW-11-10		30		
MGA11040703-46A	26291	BRN002-SW-10-02		30		
MGA11040703-47A	26291	BRN002-SW-10-10		32		
MGA11040703-48A	26291	BRN002-SW-08-02		30		
MGA11040703-49A	26291	BRN002-SW-08-10		30		
MGA11040703-50A	26291	BRN002-SW-25-02		29		
MGA11040703-51A	26291	BRN002-SW-25-10		28		
MGA11040703-52A	26291	BRN002-SW-12-02		30		
MGA11040703-53A	26291	BRN002-SW-12-04		30		

Reason codes:

1) The value was below the laboratory PQL. The sample is reported as a true non-detect.

APPENDIX F

Human Health Risk Assessment

HUMAN HEALTH RISK ASSESSMENT
CORNERSTONE PARK BROWNSFIELD PROJECT
Henderson, Nevada

Prepared for:
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May 2011

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EXECUTIVE SUMMARY

A baseline human health risk assessment (HRA) was conducted for the Cornerstone Park redevelopment area located north of Wigwam Parkway and west of Stephanie Street in Henderson, NV (site). The site was formerly the location of historical sand and gravel mining operations, a concrete plant, and an asphalt batch plant and is currently in the process of being redeveloped as a park that includes surface water features. Properties upgradient of the site have historically manufactured perchlorates. These practices have resulted in the contamination of groundwater underlying the site with perchlorates. The groundwater daylights in the surface water bodies at the site resulting in perchlorate levels in surface water and groundwater that exceed regulatory action levels. Surface water has also caused contamination of shoreline soils with perchlorate. The HRA was prepared to assess the potential for health risks associated with future recreational uses of the two surface water bodies, including ingestion of recreationally caught fish.

The exposure pathways of interest for this HRA include incidental ingestion of surface water and soil, dermal contact with surface water and soil, and fish ingestion. The HRA characterizes potential long-term health risks to future child and adult recreators, long-term adult maintenance workers, and short-term adult construction workers at the site. All scenarios assume that conditions at the time of data collection do not change over time. This is consistent with a screening baseline HRA which conservatively assumes no remedial actions are implemented (USEPA, 1989).

Only non-cancer health effects were quantified in this HRA as the USEPA does not classify perchlorate as a potential carcinogen. Therefore, the noncancer hazard index (HI) was characterized for each receptor, using the maximum measured concentrations from all data collected from shoreline soil and surface water. It is important to note that inhalation of perchlorate particulates was not addressed in this HRA as the USEPA has not derived toxicity criteria for the inhalation pathway and, consistent with current USEPA guidance (USEPA, 2009a), route extrapolations are no longer advised. The results of this baseline HRA are as follows:

Future Recreator

Environmental Media	**Hazard Index (HI)**	
	Child	Adult
Shoreline Soil[a]	0.16	0.018
Surface Water[a]	0.033	0.011
Fish[b]	0.007	0.005
Total	0.20	0.034

Future Maintenance Worker

Environmental Media	**Hazard Index (HI)**
	Adult
Shoreline Soil[a]	0.071
Surface Water[a]	NA
Fish[b]	NA
Total	0.071

Future Construction Worker

Environmental Media	**Hazard Index (HI)**
	Adult
Soil[a]	0.221
Surface Water[a]	NA
Fish[b]	NA
Total	0.221

NA Not applicable.
a Includes incidental ingestion and dermal contact pathways.
b Includes recreational ingestion pathway.

All non-cancer HIs are well below the acceptable level of 1 indicating that exposures to perchlorate in shoreline soils and surface water are not expected to pose a non-carcinogenic health hazard to the future site users evaluated in this HRA.

1.0 INTRODUCTION

A baseline human health risk assessment (HRA) was conducted for the Cornerstone Park redevelopment area located north of Wigwam Parkway and west of Stephanie Street in Henderson, NV (site). The site was the location of historical sand and gravel mining operations, a concrete plant, and an asphalt batch plant but is in the process of being redeveloped as a park that includes surface water features. Properties upgradient of the site have historically manufactured perchlorates that have resulted in the contamination of groundwater (McGinley and Associates, 2011). The groundwater daylights in the surface water bodies at the site, which has resulted in perchlorate levels in surface water and groundwater that exceed the Nevada action level of 18 µg/L (NDEP, 2011). Surface water has also caused contamination of shoreline soils with perchlorate. The HRA was prepared to assess the potential for perchlorate-related health risks associated with recreational uses of the two surface water features, including ingestion of recreationally caught fish.

The remainder of this assessment describes the HRA process, the data employed, the HRA assumptions, and the results of the health risk characterization.

1.1 HRA Methodology

The methodologies used in this HRA are consistent with standard risk assessment practices and information provided in key regulatory guidance documents that include, but are not limited to:

- USEPA, 1989. *Risk Assessment Guidance for Superfund (RAGS), Volume I Human Health Evaluation Manual (Part A),* December.
- USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors". OSWER Directive 9285.6-03. Office of Emergency and Remedial Response. March 25.
- USEPA, 1992. *Guidance for Data Usability in Risk Assessment*. April.
- USEPA, 1997. *Exposure Factors Handbook.* Office of Research and Development. EPA/600/P-95/002Fa.
- USEPA, 2002. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.*
- USEPA, 2004. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).*

An HRA is an appropriate analytical methodology for determining the potential health risks for any hypothetical individual visiting, working, or living at a site where a chemical release has or may have occurred (USEPA, 1989). The hypothetical individual that is evaluated in a standard HRA is assumed to have a reasonable maximum exposure by assumed exposure routes. The assumption of exposure represents a conservative approach. This approach is recommended by regulatory risk assessment guidance to ensure that the results of the HRA are applicable to the potential current and/or future receptors.

The HRA framework applies four evaluation components as the basis for characterizing potential upper bound human health risks posed to current and potential future receptors at a site. These HRA components are (USEPA, 1989):

- Data Evaluation – Environmental sampling and laboratory analysis are performed to characterize chemical concentrations in the environmental media of interest. Data quality and usability for risk assessment are evaluated with respect to completeness, adequacy of

documentation, appropriateness of analytical methods, quality of analytical results, and representativeness with respect to time and the area of interest. Chemicals of potential concern (COPCs) are identified for analysis in the HRA based on criteria established by the USEPA.

- Toxicity Assessment – Chemical-specific toxicity values established by the USEPA (and other relevant regulatory agencies) are identified and summarized for use in the HRA.
- Exposure Assessment – The human exposure routes of interest through which potential exposure to the COPCs may occur are identified and exposure concentrations and chemical doses are conservatively estimated.
- Risk Characterization – The potential incremental lifetime cancer risks and the non-cancer hazard indices are conservatively estimated for each receptor based on the toxicity assessment and the exposure assessment.

The HRA framework is employed by regulatory agencies and academic scientists as a basis for making defensible decisions regarding the safety of a particular property, as well as the need for, and level of, remedial actions. Because risk assessment is used by regulatory agencies whose mandate is to protect public health, the risk assessment process is designed to conservatively estimate a reasonable maximum upper bound potential risk. Accordingly, the actual risk associated with a given chemical exposure is most likely to be less than the risk predicted by the HRA (USEPA, 1986).

1.2 Report Organization

The organization of this report is as follows:

Section 2.0 Site Background and Conceptual Site Model – background information for the site is discussed and the conceptual site model relevant to the exposure media of interest is presented.

Section 3.0 Data Evaluation – data used in the HRA are evaluated and COPCs are identified.

Section 4.0 Toxicity Assessment – the toxicity criteria established by the regulatory agencies are defined and presented for the COPCs.

Section 5.0 Exposure Assessment – the exposure scenarios and pathways, exposure parameters, exposure concentrations, and daily dose are discussed.

Section 6.0 Risk Characterization – the potential upper-bound noncancer health effects (hazard index) are characterized for each of the receptors evaluated. A perspective on the predicted hazards and the key parameters is provided.

Section 7.0 Summary Discussion – a summary of the HRA is presented.

Section 8.0 References – the references cited in the HRA are listed.

2.0 SITE BACKGROUND AND CONCEPTUAL SITE MODEL

This section describes the area evaluated in the HRA as well as the conceptual site model (CSM). The CSM is key to the HRA in that it ties the potential site sources and exposure pathways to human exposure points and potential human receptors.

2.1 Site Background

The site is located in Henderson, Nevada (Figure 1) and was historically used as a sand and gravel pit, for concrete production, and as an asphalt batch plant. For the purposes of this HRA, the study area is comprised of the two surface water bodies and their shorelines (approximately 18 acres; Figure 2). Properties upgradient of the site have historically manufactured perchlorates and these practices have resulted in the contamination of groundwater with perchlorate. The groundwater daylights in the surface water bodies at the site resulting in perchlorate concentrations in the groundwater and surface water bodies that exceed regulatory action levels. In addition, the surface water has resulted in perchlorate contamination of shoreline soils.

2.2 Conceptual Site Model

The CSM provides a conceptual understanding of the potential for exposure to site-related chemicals based on what is known about the sources, release mechanisms, migration pathways, exposure pathways, and potential receptors. The CSM, as it relates to the HRA and potential for on-site receptors to be exposed to impacted media is presented in the following sub-sections. A diagram of the CSM is provided as Figure F-1.

2.2.1 Sources and Release Mechanisms

The primary source of perchlorate in shoreline soils and surface water at the site is contaminated groundwater from upgradient industrial operations unrelated to the site.

Migration Pathways

Perchlorate in upgradient groundwater has migrated downgradient to the site. Groundwater daylights in the surface water bodies in Cornerstone Park that has resulted in impacts to surface water and the surrounding shoreline soils.

Exposure Pathways and Potential Receptors

Potential receptors at the site include children and adults who live in nearby and may use the site for recreational purposes, including swimming, boating, fishing and shoreline activities. Adult workers may also be present on site to maintain the park and its facilities and as a consequence, be exposed to impacted shoreline soils. Finally, adult construction workers may be present during the redevelopment of the park or during other construction related operations and, thus, may also be exposed to site soils. Neither the maintenance worker nor the construction worker would be expected to have any appreciable contact with the surface water and thus, surface water exposure pathways were not considered to be significant and were not quantitatively assessed for these worker receptors.

The exposure pathways of interest for these park recreators (child and adult) include direct contact with shoreline soils and surface water, as well as ingestion of fish from the two surface water bodies. Specifically, incidental ingestion and dermal contact with shoreline soils is quantified along with incidental ingestion and dermal contact of surface water during water sports activities. It is also assumed that park recreators will consume fish caught from the surface water bodies. As stated previously, it was assumed that the long-term adult maintenance and short-term adult construction workers would only contact the impacted shoreline soils.

All scenarios evaluated in the HRA assumed that conditions at the time of data collection do not change over time. This is consistent with a screening baseline HRA which conservatively assumes no remediation actions are implemented (USEPA, 1989).

3.0 DATA EVALUATION

This section describes the site data used to characterize the potential health risks for the HRA. It also provides an evaluation of the quality of the data for purposes of estimating health risks (USEPA, 1992a). Additionally, the COPCs are identified.

3.1 Site Characterization Data for the HRA

Two types of site characterization data were collected to support the evaluation of potential health risks associated the site: (1) surface soil samples and (2) surface water samples. A full discussion of these data is provided in Section 6.1 of the main body of the report.

3.2 Data Usability

Data usability (DU) is the process of assuring or determining that the quality of data generated meets the intended use. USEPA has established a specific guidance framework to provide risk assessors a consistent basis for making decisions about the minimum quality and quantity of environmental analytical data that are sufficient to support HRA decisions (USEPA, 1992a). The DU evaluation specifically addresses procedures for (1) assessing the quality of the environmental analytical data intended for use in HRA and (2) procedures for determining the level of certainty in health risk characterization based on the uncertainty in the environmental analytical data. Uncertainty analysis is a fundamental element of each component of HRA. All components of the risk assessment, including the risk characterization estimates, are dependent upon the quality of the site data used as the basis for the risk assessment.

Six criteria are used to evaluate data usability for baseline risk assessments (USEPA, 1992a). These criteria are:

Criterion I: Reports – A site characterization report content checklist is generated.

Criterion II: Documentation - Verifies that each sample result is related to a specific geographic location.

Criterion III: Data Sources - Documents that the analytical methods are appropriate to identify chemicals of potential concern (COPCs) for each exposure area and environmental medium of interest.

Criterion IV: Analytical Methods and Detection Limits - Documents that the analytical method can appropriately identify the chemical form or species of interest, and that the sample detection limit is at or below a concentration that is associated with risk benchmark levels (e.g., USEPA, 2010).

Criterion V: Data Review - The data review of laboratory and method performance includes:

- Evaluation of data completeness,
- Measurement of laboratory precision using duplicates; measurement of laboratory accuracy using spikes,
- Examination of blanks for contamination,
- Assessment of adherence to method specifications and QC limits, and
- Evaluation of method performance in the sample matrix.

Criterion VI: **Data Quality Indicators** - The data quality indicators ("DQIs") are evaluated. DQIs address field and analytical data quality aspects as they affect uncertainties in selection of COPCs, EPCs (exposure point concentrations), and risk characterization. The DQIs include completeness, comparability, representativeness, precision, and accuracy.

It should be noted that only soil and surface water data were collected for perchlorate and were used this HRA and addressed by the DU.

3.2.1 Criterion I

As summarized in Section 6.0 of the main body of the report, McGinley & Associates conducted a shoreline soil and surface water investigation at Cornerstone Park. Twenty-four shoreline soil samples were collected between April 4th and 5th, 2011. Twenty-four aqueous (surface water) samples were collected from April 4th through April 6th, 2011. These 48 samples were analyzed by Alpha Analytical, Inc. in Sparks, Nevada for perchlorates by ion chromatography using USEPA Method 314.0. A data validation summary report (DVSR) has been prepared and is entitled, "Data Validation Report: Cornerstone Park Investigation, Revision 1, dated April 26, 2011 prepared for McGinley Associates by Neptune & Company, Inc." (Neptune & Company, 2011; see Appendix E of the main body of the report). The level 4 data package from Alpha Analytical, Inc. along with the DVSR were used as the basis to identify the shoreline soil and surface water data for this DU.

3.2.2 Criterion II

Each shoreline soil and aqueous (surface water) sample was verified in terms of geographic location, shown on Figure 2, as well as the chain of custody records, and field and analytical reports, which are provided in Appendices C and D of the main report.

3.2.3 Criterion III

USEPA Method 314.0 was used for the site investigation for laboratory analysis of all samples. This method is the appropriate method for characterization of perchlorate in shoreline soil and surface water and meets requirements for HRA.

3.2.4 Criterion IV

Detection limits for shoreline soil and surface water samples were sufficiently below health based levels, i.e., Nevada Basic Comparison Levels (residential soil – 55 mg/kg; tap water 18 µg/L; NDEP, 2011).

3.2.5 Criterion V

The specific items addressed as part of the DU are discussed below.

- Evaluation of data completeness – The data are complete for the evaluation of potential human health risk for this HRA.
- Verification of instrument calibration – No calibration issues were noted in the DVSR (Appendix E).
- Measurement of laboratory precision using duplicates; measurement of laboratory accuracy using spikes – No issues were noted with precision and accuracy except as noted in Criterion VI.
- Examination of blanks for contamination – No blank contamination was noted.
- Assessment of adherence to method specifications and QC limits – No issues were noted.
- Evaluation of method performance in the sample matrix – No issues were noted with method performance, except for one matrix spike and matrix spike duplicate that is discussed in Criterion VI.

3.2.6 Criterion VI

The specific items addressed as part of the DU are discussed below.

- Completeness – Based on the analytical results and sample locations, the data are complete for the HRA for the future Cornerstone Park.
- Comparability – A consistent sampling methodology was employed for each medium. One analytical method was used for all samples, which were collected during one investigation. Accordingly, the comparability criterion was met.
- Representativeness – A majority of the shoreline soil and surface water sample locations were biased to areas where recreators would most likely have contact with these media. Accordingly, the data are considered representative for surface water samples are biased towards the potential exposure shoreline and soil samples were biased towards accessible areas of the site where salt stains were noted.

- Precision – Field and laboratory duplicate results were within acceptable limits. Accordingly, the precision criterion was met.
- Accuracy – The DVSR and level 4 laboratory report identified one matrix spike and matrix spike duplicate soil sample that had poor recovery. The sample ID is 11040703-23AM S and SD for Batch 26288. The percent recovery for the matrix spike was -91% and the matrix spike duplicate was -460%. The sample was qualified by M3. It was noted that the accuracy of the spike recovery is reduced as the analyte concentration in the sample (shoreline soil detection of 44,200 µg/kg) is disproportionate to the spike level (250 µg/kg) that resulted in dilution of the sample by 200 fold. However, the method control sample recovery was acceptable. Therefore, the data associated with this batch sample may be considered valid to use in the HRA. Thus, the impact on the overall uncertainty in this HRA is considered low.

In summary, all data were determined to be usable for the HRA.

3.3 Selection of Chemicals of Potential Concern (COPCs)

COPCs are selected for risk assessment to ensure that the HRA evaluates those chemicals that are site related and could significantly contribute to health risks (USEPA, 1989). As perchlorate is the only chemical that has migrated to (or otherwise released at) the site, and was detected in both shoreline soil and surface water, it is identified as the COPC for all environmental media including shoreline soils, surface water and fish. While fish tissue was not directly analyzed for perchlorate, potential perchlorate concentrations in fish were estimated as discussed further in Section 5.3.

4.0 TOXICITY ASSESSMENT

This section describes the toxicity assessment step of the HRA. The toxicity assessment is based on the relationship between the exposure level ("dose") of a chemical and the potential for an adverse health effect in the exposed population. The USEPA has derived toxicity values (criteria) from quantitative dose-response data to estimate the likelihood of a specific adverse health effect occurring as a function of exposure. As discussed in Section 3.0, perchlorate, a non-carcinogenic chemical, is the only COPC for the HRA.

Non-cancer oral reference doses (RfDs), which are expressed in units of mg/kg-day, are based on no observable effect levels (NOELs) and/or lowest observable effect levels (LOELs) with additional safety factors applied to identify a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

The RfD for perchlorate of 0.0007 mg/kg-day was obtained from the USEPA Integrated Risk Information System (IRIS) online database available at http://www.epa.gov/IRIS/ (USEPA, 2011; Attachment A). The level of confidence that USEPA has assigned to the RfD for perchlorate is high, as it is based on human data and a NOEL.

It should be noted that as of this time, the USEPA has not established an inhalation toxicity value (e.g., reference concentration; RfC) for perchlorates. Accordingly, potential inhalation

exposures were not quantitatively assessed in this HRA. Uncertainties associated with the exclusion of the inhalation pathway from this HRA are discussed in Section 6.2.2.

5.0 EXPOSURE ASSESSMENT

Exposure assessment is the process of measuring or estimating the intensity, frequency, and duration of human exposure. The definition of exposure (USEPA, 1992b) is "a condition in which a chemical contacts the outer boundary of a human." The amount of chemical contacted is termed "potential dose."

This section identifies the receptors, scenarios, and exposure pathways evaluated in the HRA. It discusses the methods applied to characterize exposure concentrations in shoreline soil, surface water, and fish, including the exposure parameter values. Dose equations are also presented.

5.1 Receptors and Scenarios

As discussed in the CSM (Section 2.0), potential health impacts were characterized for long-term park recreators (children and adults), long-term adult maintenance workers and short-term adult construction workers.

5.2 Exposure Pathways

Pathways of exposure are the means through which an individual may come into contact with a chemical. 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 (e.g., air, water, soil);
- A point of potential human contact with the medium; and
- A route of exposure (e.g., inhalation, ingestion, dermal contact).

All of these four elements exist for shoreline soils, surface water and fish at the site such that potential exposures may occur via the incidental ingestion and dermal contact with soil for all receptors; incidental ingestion and dermal contact with surface water for recreators who may swim in the two surface water bodies; and ingestion of fish for the recreators who may consume recreationally caught fish from the two surface water bodies. Contact with surface water was not quantified for the adult maintenance and construction workers as their exposure would likely be infrequent and less than that of an adult recreator.

5.3 Exposure Point Concentrations

The exposure point concentration (EPC) is the representative concentration of a COPC in an environmental medium (i.e., for this HRA, shoreline soil, surface water, and fish tissue) that is potentially contacted by a receptor. Consistent with USEPA guidance (1989) the 95th upper confidence limit (UCL) was calculated for surface water. However, the UCL was greater than the maximum detected concentration. In this instance, USEPA recommends using the maximum detected concentration (USEPA, 1989). The maximum concentration was also used for the shoreline soils.

Direct measurement of perchlorate in fish tissue was not conducted. Accordingly it was necessary to estimate the concentration in fish. A literature search for bioconcentration factors for perchlorate indicates that this chemical does not accumulate to any appreciable degree in fish tissue (ATSDR, 2008). In fact, Dean et al. (2004) reported a bioconcentration factor of 0.70 for bluegill. Therefore, as a conservative measure of potential exposure, this HRA assumed a bioconcentration factor of 1 (100% of what is detected in surface water bioaccumulates in fish) meaning that the concentration in fish tissue is equal to that found in the surface water.

5.4 Calculation of Dose

Dose is defined as the amount of chemical absorbed into the body over a given period of time (USEPA, 1992b). For non-carcinogenic effects, the dose is averaged over the period of exposure and is referred to as the average daily dose (ADD).

Exposure point concentrations and the exposure parameter values are input into the dose equation to yield dose estimates. The exposure parameters used to quantify the ADD are presented in Table F-1 and are all based upon USEPA default values (USEPA, 1989, 1991, 1997, 2002, 2004) with the exception of the exposure frequency for the child and adult recreator. It was assumed that recreators may visit the site once per week for 50 weeks per year. This incorporates the USEPA assumption for residential exposure frequency of 350 days per year accounting for two weeks away for vacation (USEPA, 1989).

The pathway-specific dose equations are presented below (USEPA, 1989) and all calculation spreadsheets are provided in Attachment B.

5.4.1 Incidental Soil Ingestion

Dose via ingestion of shoreline soil is calculated according to the following equation (USEPA, 1989):

$$ADD = \frac{C_{soil} \times IR_{soil} \times CF \times EF \times ED}{BW \times AT}$$

where:

ADD = Average Daily Dose (ADD) (mg/kg-day) for noncarcinogens;

C_{soil} = Concentration in soil (mg/kg)

IR_{soil} = Ingestion rate of soil (mg/day)

CF = Conversion factor (10^{-6} kg/mg)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (period over which exposure is averaged - days)

(= ED x 365 days/yr for noncarcinogens)

5.4.2 Dermal Contact with Soil

The ADD via dermal contact with soil is calculated according to the following equation (USEPA, 2004):

$$ADD = \frac{C_{soil} \times SA_{soil} \times AF \times B \times CF \times EF \times ED}{BW \times AT}$$

where:

ADD = Average Daily Dose (ADD) (mg/kg-day) for noncarcinogens

C_{soil} = Concentration in soil (mg/kg)

SA_{soil} = Surface area of exposed skin (cm^2)

AF = Soil to skin adherence factor (mg/cm^2-day)

B = Bioavailability (fraction)

CF = Conversion factor (10^{-6} kg/mg)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (period over which exposure is averaged - days)

(= ED x 365 days/yr for noncarcinogens)

5.4.3 Incidental Surface Water Ingestion

During recreational use of the two surface water bodies at Cornerstone Park (e.g., swimming), the potential exists for incidental ingestion of surface water. Dose via incidental ingestion of surface water is calculated according to the following equation (USEPA, 1989):

$$ADD = \frac{C_{water} \times IR_{water} \times EF \times ED}{BW \times AT}$$

where:

ADD = Average Daily Dose (ADD) (mg/kg-day) for noncarcinogens;

C_{water} = Concentration in surface water (mg/L)

IR_{water} = Ingestion rate, surface water (L/day)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (period over which exposure is averaged - days)
(= ED x 365 days/yr for noncarcinogens)

5.4.4 Dermal Contact with Surface Water

Recreational activities at the two surface water bodies may include swimming. Consistent with this assumption, the ADD via dermal contact with surface water is calculated according to the following equation (USEPA, 2004):

$$ADD = \frac{C_{water} \times K_p \times T_{event} \times EV \times SA_{water} \times EF \times ED}{BW \times AT}$$

where:

ADD = Average Daily Dose (ADD) (mg/kg-day) for noncarcinogens

C_{water} = Concentration in water (mg/L)

K_p = Skin permeability constant (cm/hr)

T_{event} = Event duration (hrs/event)

EV = Number of swimming events in a day (events/day)

SA_{water} = Surface area of exposed skin (cm^2)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (period over which exposure is averaged - days)

(= ED x 365 days/yr for noncarcinogens)

The exposure parameters used to quantify the ADD are presented in Table F-1 and are all based upon USEPA default values (USEPA, 1989; 2002, 2004) with the exception of the adult/child recreator number of swimming events per day, which is assumed to be four times in a day for one hour each time (T_{event}), and the exposure frequency as discussed above.

5.4.5 Fish Ingestion

Dose via ingestion of soil is calculated according to the following equation (USEPA, 1989):

$$ADD = \frac{C_{fish} \times IR_{fish} \times EF_{fish} \times ED}{BW \times AT}$$

where:

ADD = Average Daily Dose (ADD) (mg/kg-day) for noncarcinogens;

C_{fish} = Concentration in fish (mg/kg)

IR_{fish} = Ingestion rate of fish (kg/day)

EF_{fish} = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (period over which exposure is averaged - days)

(= ED x 365 days/yr for noncarcinogens)

The exposure parameters used to quantify the ADD are presented in Table F-1 and are all based upon USEPA default values (USEPA, 1989; 2002, 2004, 2009) with the exception of the exposure frequency as discussed above. The concentration in fish, C_{fish}, was calculated as the BCF*C_{water} where BCF is the bioconcentration factor of 1 (100%) and C_{water} is the maximum detected concentration in surface water.

6.0 RISK CHARACTERIZATION

This step of the HRA combines outputs of the exposure and toxicity assessments to characterize the potential health risks for receptors evaluated. The risk characterization endpoint, non-cancer hazard index, is discussed in Sections 6.1. The uncertainties associated with the HRA are discussed in Section 6.2.

6.1 Non-cancer Hazard Index (HI)

Non-cancer health effects are evaluated by comparing the estimated average daily dose (ADD estimated in the exposure assessment) with an exposure level at which no adverse health effects are expected to occur (i.e., the RfD). ADD and RfD are compared by dividing the ADD by the RfD to obtain the ADD:RfD ratio (hazard quotient), as follows:

$$Hazard\ Quotient = \frac{ADD}{RfD}$$

where:

ADD Average daily dose (mg/kg-day)

RfD Reference dose (mg/kg-day)

A hazard quotient less than or equal to 1 indicates that the predicted exposure to that chemical should not result in an adverse non-carcinogenic health effect (U.S. EPA, 1989). When more than one exposure pathway is evaluated, the hazard quotients are summed to determine whether

exposure to a combination of pathways poses a health concern. This sum of the hazard quotients is defined as a Hazard Index (HI).

$$Hazard\ Index = \sum Hazard\ Quotients$$

The USEPA non-cancer risk management target is a hazard index (HI) value of less than or equal to 1.0 (USEPA, 1989). It should be noted that HI or HQ values greater than 1 do not necessarily mean that adverse health effects will be observed, as a substantial margin of safety is incorporated into the RfD.

Future Recreator Receptors

For this HRA, all potential exposure pathways for the recreator receptors (child and adult) were summed to arrive at the multipathway HI. Specifically, the pathways of soil ingestion, dermal contact with soil, surface water ingestion, dermal contact with surface water, and fish ingestion were summed to derive a multi-pathway total HI. The multipathway noncancer HIs for the future recreator receptors arenon-cancer HI is below the acceptable level of 1, indicating that perchlorate is not expected to pose a non-carcinogenic health hazard (Table F-2).

Future Worker Receptors

For the adult maintenance and construction workers, all HIs are below 1, indicating that perchlorate is not expected to pose a noncarcinogenic health hazard for the pathways of exposure for these future receptors (Table F-2).

6.2. Qualitative Uncertainty Analysis

USEPA guidance recommends that the risk characterization include an assessment of the level of confidence in the risk descriptor values (the incremental lifetime cancer risk and the hazard index) (USEPA, 1989, 1992). Because the risk descriptors are conditional estimates based on a number of assumptions, the level of confidence in the assumptions and the related impact on the

risk estimators warrant discussion. As recommended by USEPA, key risk inputs are addressed in the uncertainty analysis (USEPA, 1992b).

In accordance with USEPA guidance, the assumptions that have the potential to introduce the greatest uncertainty, and the effects these uncertainties have on the estimates of risk, are discussed below.

6.2.1 Site Characterization Data

Samples cannot be collected from every possible location; therefore, there is always some uncertainty associated with the representativeness of site characterization data. Cornerstone Park is approximately 103 acres in size and contains surface water bodies that were the subject of this HRA. The primary exposure points for this site are the two surface water bodies and the shoreline soil immediately adjacent to these surface water bodies. Accordingly, these locations and media were sampled; an area of approximately 18 acres. Shoreline sampling locations for perchlorate were targeted to areas most likely to be frequented by future receptors. Based on the sampling strategy and use of the maximum detected concentrations, the level of confidence in the potential exposure concentrations employed in the HRA is high. Based on the laboratory reports and the data usability evaluation, the level of confidence in the analytical data collected at the site is high non-carcinogenic

As discussed in Section 3.2.6, the DVSR and level 4 laboratory report identified one matrix spike and matrix spike duplicate soil sample that had poor recovery. The percent recovery for the matrix spike was -91% and the matrix spike duplicate was -460%. It was noted that the accuracy of the spike recovery is reduced as the analyte concentration in the sample (shoreline soil detection of 44,200 µg/kg or 44.2 mg/kg) is disproportionate to the spike level (250 µg/kg) that resulted in dilution of the sample by 200 fold. However, the method control sample recovery was acceptable and the data associated with this batch sample was considered valid to use in the HRA. This MS/MSD issue limits the ability to bound the hazard estimates due to the fact that the accuracy of this sample batch is unknown. To address this uncertainty, the maximum

detected concentration in shoreline soil was used so that potential health hazards would not be underestimated. It is also noted that the maximum detected concentration in shoreline soil is less than the residential and industrial BCLs of 55 mg/kg and 720 mg/kg, respectively. Thus, the impact on the overall uncertainty in this HRA is considered low.

6.2.2 Toxicity Assessment

The toxicity criterion for perchlorate (RfD) was obtained from the USEPA IRIS database (USEPA, 2011; Attachment A). The endpoint selected by the USEPA was thyroidal iodine uptake inhibition in humans as reported by Greer et al., (2002, as cited in USEPA, 2011). The selection of thyroidal iodine uptake inhibition in humans is a conservative endpoint for deriving an RfD in that it relies on a no effect level for a non-adverse precursor event in human volunteer studies.

6.2.3 Exposure Assessment

Uncertainties in the exposure assessment are associated with the representativeness of site characterization data and assumptions regarding exposure scenarios, exposure parameter values, and exposure point concentrations (EPCs). These are discussed below.

<u>Exposure Scenarios and Exposure Parameter Values</u>

Assumptions regarding land use and receptor activities influence the selection of input parameters employed in the exposure assessment (e.g., time spent at a particular location, environmental media contacted by the receptors, and environmental medium contact rates). Based on the planned future use of the site, long-term recreational receptors (child and adult), as well as long term (maintenance) and short-term (construction) workers, were identified as the potential site receptors.

In order to minimize uncertainty in the exposure parameter values, the USEPA has developed standard exposure factors that serve to "summarize data on human behaviors and characteristics which affect exposure to environmental contaminants" and to provide "recommend[ed] values to

use for these factors." (USEPA, 1997 [Exposure Factors Handbook]). The studies from which the recommended exposure factors are derived were selected by USEPA based on a number of considerations (e.g., peer review, reproducibility, representativeness of the population, data quality, validity) in order to minimize uncertainty in the data and their application in the HRA. The Exposure Factors Handbook provides key information regarding variability in the parameters within the general population. The guidance document provides upperbound (e.g., 90^{th} to 95^{th} percentile values) as well as central tendency (e.g., 50^{th} percentile) values for many parameters and, in many cases, full data distributions. Upperbound reasonable maximum exposure (RME) parameter values were employed in the HRA. Based on the comprehensive database for exposure factors and the use of RME values, the potential for underestimation of exposure is low (USEPA, 1997, 2002, 2004).

It was assumed that a child recreator was between the ages of 0 to 6 years old; the USEPA default age group for a child. It is highly unlikely that children under two or even three years old would consume the quantity of fish from the surface water bodies assumed in this HRA. Therefore, the potential for underestimation of exposure to a child is considered low.

Surface water exposure to long-term adult maintenance and short-term adult construction workers was not considered in this HRA. It was assumed that surface water exposure is limited for these exposure populations. If surface water contact occurs, it is likely less frequent than that of the adult recreator. In addition, the body surface area exposure to the surface water along with the amount of surface water that might be ingested by an adult worker, would also be less than that of the adult recreator who is assumed swimming or fishing in the surface water bodies. Because the adult recreator exposure to perchlorate in surface water is not expected to pose a non-carcinogenic health hazard, the uncertainty regarding the underestimation of worker exposures is considered low.

Exposure Point Concentrations (EPCs)

Exposure may be underestimated if the estimated EPCs are underestimated. Conservative methods and assumptions were used to estimate EPCs to ensure that the resulting EPCs are protective of human health. For this site, the maximum concentration of perchlorate in each

environmental medium was used in the HRA. Although fish tissue concentrations were not directly measured, the concentration in fish was conservatively assumed to be equal to that in surface water (100% bioaccumulative). This likely overestimates the perchlorate concentration in fish and the associated exposure concentration for fish ingestion,

In summary, the potential for underestimation of the potential health hazards associated with the maximum detected concentrations of perchlorate in shoreline soil and surface water is considered low.

7.0 SUMMARY DISCUSSION

A baseline human health risk assessment (HRA) was conducted for the Cornerstone Park redevelopment area located north of Wigwam Parkway and west of Stephanie Street in Henderson, NV (site). Properties upgradient of the site have contaminated the local groundwater with perchlorate. The groundwater daylights in the surface water bodies at the site resulting in levels of perchlorate in surface water and groundwater that exceed regulatory action levels. Surface water has also caused perchlorate contamination of shoreline soils. The HRA was prepared to assess the potential for future health risks associated with recreational uses of the surface water bodies including ingesting fish from the surface water bodies.

The complete and potentially complete exposure pathways for this HRA included incidental ingestion of surface water and shoreline soil, dermal contact with surface water and shoreline soil, and fish ingestion. The HRA focused on the characterization of potential long-term health risks to future child and adult recreators, long-term adult maintenance workers, and short-term adult construction workers at the site. All scenarios assume that conditions at the time of data collection do not change over time. This is consistent with a screening baseline HRA which conservatively assumes no remedial actions are implemented.

Only non-cancer health effects were quantified in this HRA as the USEPA does not classify perchlorate as a potential human carcinogen. Therefore, the hazard index (HI) was characterized for each receptor, using the maximum measured concentration from all data collected from

shoreline soil and surface water. The non-cancer HIs for all receptors are below the acceptable level of 1, indicating that perchlorate in surface water and soil does not pose a non-carcinogenic health hazard to the future human receptors at the site.

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TABLES

Table F-1. Exposure Parameters
Cornerstone Park, Henderson, NV

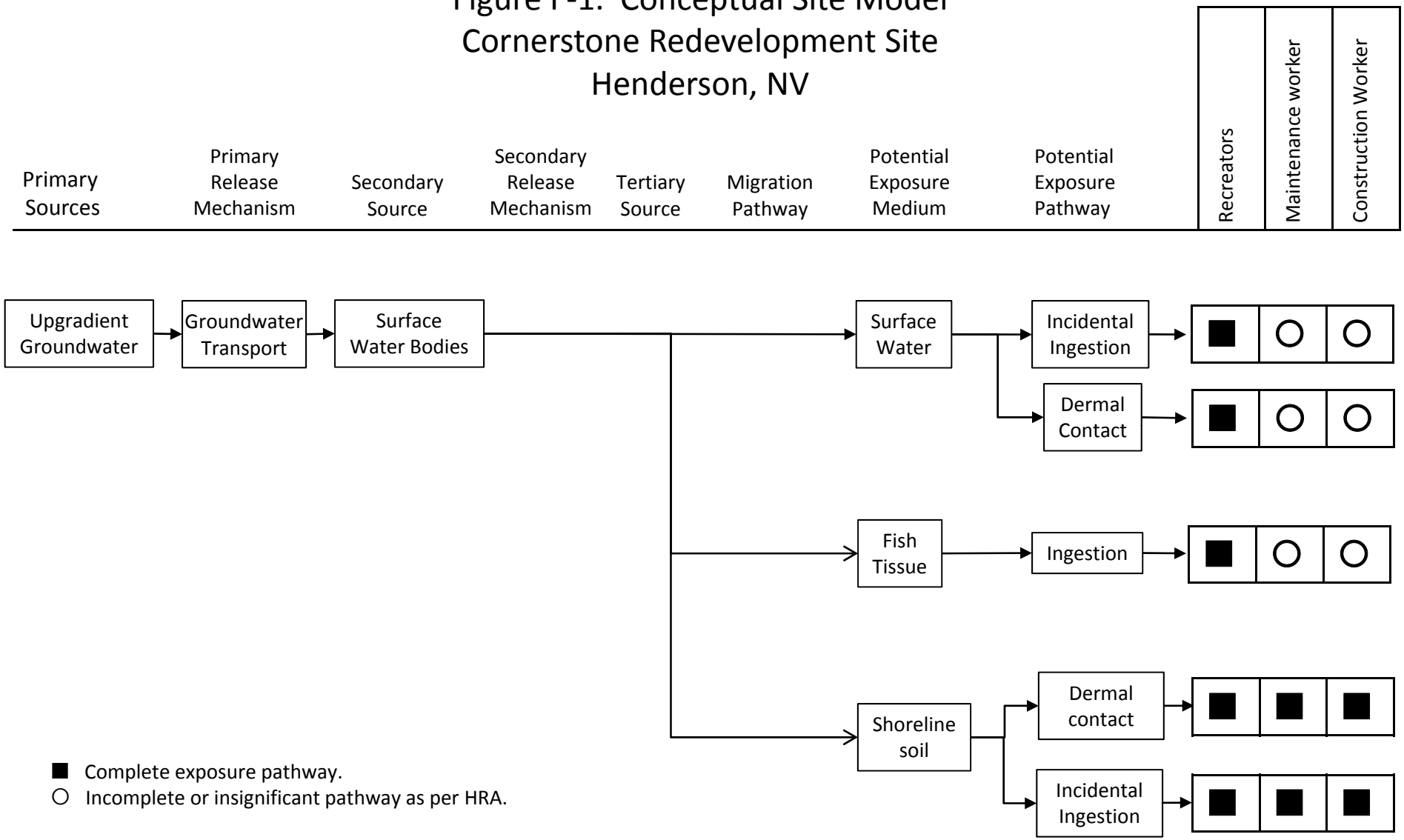
Parameter	Abbreviation	Units	Recreator			Maintenance Worker		Construction Worker	
			Child	Adult	Reference	Adult	Reference	Adult	Reference
Ingestion Rate-Soil	IR_{soil}	mg/kg	200	100	USEPA, 1989; 1991	100	USEPA, 1991	330	USEPA, 2002
Exposure Frequency	EF	days/year	50	50	Prof. Judgment	250	USEPA 1991	250	USEPA, 1991
Exposure Duration	ED	years	6	24	USEPA, 1989; 1991	25	USEPA 1991	1	Prof. Judgment
Bioavailability	B	unitless	1	1	Maximum value	1	Maximum value	1	Maxiumum value
Body Weight	BW	kg	15	70	USEPA, 1989; 1991	70	USEPA 1991	70	USEPA, 1991
Averaging Time	AT	days	2190	8760	USEPA, 1989; 1991	9125	USEPA 1991	365	USEPA, 1991
Surface Area of Skin-soil	Sasoil	cm^2	2800	5700	USEPA, 2004	5700	USEPA, 2004	5700	USEPA, 2004
Soil Adherence Factor	AF	mg/cm^2	0.2	0.07	USEPA, 2004	0.2	USEPA, 2004	0.3	USEPA, 2002
Ingestion Rate-Water	Ir_{water}	L/day	0.05	0.05	USEPA, 1989; 1991	NA	---	NA	---
Surface Area of Skin-water	SA_{water}	cm^2	6600	18000	USEPA, 2004	NA	---	NA	---
Dermal Absorption Factor	ABS	unitless	0.1	0.01	USEPA, 2004	NA	---	NA	---
Skin Permeability Constant	Kp	cm/hr	0.001	0.001	USEPA, 2004	NA	---	NA	---
Event Duration	T_{event}	hr/event	1	1	USEPA, 2004	NA	---	NA	---
Events	EV	EV/day	4	4	USEPA, 2004	NA	---	NA	---
Ingestion Rate-Fish	IR_{fish}	kg/day	0.0022	0.0075	USEPA, 2009	NA	---	NA	---
Exposure Frequency-Fish	EF_{fish}	days/year	350	350	USEPA, 1997	NA	---	NA	---

Table F-2. Summary of Hazard Indices
Cornerstone Park, Henderson, NV

Environmental Media	Hazard Index (HI)			
	Recreator		Maintanence Worker	Construction Worker
	Child	Adult	Adult	Adult
Shoreline Soil	0.157	0.018	0.071	0.221
Surface Water	0.033	0.011	NA	NA
Fish	0.007	0.005	NA	NA
Total	0.197	0.034	0.071	0.221

FIGURES

Figure F-1. Conceptual Site Model
Cornerstone Redevelopment Site
Henderson, NV



ATTACHMENT A

IRIS Summary for Perchlorates

http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showQuickView&substance_nmbr=1007
Last updated on Wednesday, May 18, 2011

Integrated Risk Information System (IRIS)

Perchlorate (ClO4) and Perchlorate Salts Quickview (CASRN 7790-98-9)

Health assessment information on a chemical substance is included in IRIS only after a comprehensive review of toxicity data by U.S. EPA health scientists from several Program Offices, Regional Offices, and the Office of Research and Development.

Disclaimer: This QuickView represents a snapshot of key information. We suggest that you read the IRIS Summary to put this information into complete context.

For definitions of terms in the IRIS Web site, refer to the IRIS Glossary.

Perchlorate (ClO4) and Perchlorate Salts Source Documents

- Perchlorate (ClO4) and Perchlorate Salts Summary
- Perchlorate (ClO4) and Perchlorate Salts Support Documents

Revision History

Date	Section	Description
02/18/2005	All	IRIS assessment for Perchlorate and Perchlorate Salts added to the database.

- See IRIS Summary for complete revision history.

Status of Data for Perchlorate (ClO4) and Perchlorate Salts

File First On-Line: 02/18/2005; **Last Significant Revision:** 02/18/2005

Category (section)	Status	Last Revised
Oral RfD Assessment	On-line	02/18/2005
Inhalation RfC Assessment	Discussion	02/18/2005
Carcinogenicity Assessment	On-line	02/18/2005

Synonyms

- Perchlorate (ClO4) and Perchlorate Salts
- Ammonium perchlorate
- 7790-98-9
- 7791-03-9
- Lithium perchlorate
- 7778-74-7
- Potassium perchlorate
- 7601-89-0
- Sodium perchlorate

Chronic Health Hazard Assessments for Noncarcinogenic Effects

Reference Dose for Chronic Oral Exposure (RfD)

Critical Effect	Point of Departure*	UF	MF	RfD
Radioactive iodide uptake inhibition (RAIU) in the thyroid	NOEL : 0.007 mg/kg-day	10	1	7×10^{-4} mg/kg-day

* The Point of Departure listed serves as a basis from which the Oral RfD was derived. See Discussion of Conversion Factors and Assumptions for more details.

- Principal and Supporting Studies (Oral RfD)
  - Adult human volunteers, Greer et al. (2002)
- Confidence in the Oral RfD
  - Study -- Medium/High
  - Database -- Medium
  - RfD -- High

Reference Concentration for Chronic Inhalation Exposure (RfC)

Information reviewed but value not estimated. See IRIS Summary.

Carcinogenicity Assessment for Lifetime Exposure

- **Weight-of-Evidence Characterization**
  - Not likely to be carcinogenic to humans
- **Weight-of-Evidence Narrative:**
  - Under U.S. EPAs 1999 Draft Revised Guidelines for Carcinogen Risk Assessment, perchlorate is not likely to pose a risk of thyroid cancer in humans, at least at doses below those necessary to alter thyroid hormone homeostasis, based on the hormonally-mediated mode of action in rodent studies and species differences in thyroid function.
  - This may be a synopsis of the full weight-of-evidence narrative. See IRIS Summary.

Quantitative Estimate of Carcinogenic Risk from Oral Exposure

- Not Assessed under the IRIS Program.

Quantitative Estimate of Carcinogenic Risk from Inhalation Exposure

- Not Assessed under the IRIS Program.

ATTACHMENT B

Hazard Index Calculations

Direct Contact Risk Calculations for Surface Water
Recreator Scenario
Cornerstone Park HRA
Henderson, Nevada

Incidental Ingestion of Surface Water

Adult:

Chemical	Max detect mg/L	Ingest. Rate L/day	Exp. Freq. days/year	Exp. Dur. years	Body Wt. kg	NC Avg. Time years	C Avg. Time years	CF2 days/year	Avg. Daily Dose mg/kg-day	Lifetime ADD mg/kg-day	RfD mg/kg-day	Sforal kg-day/mg	**Hazard Index**	**Cancer Risk**
Perchlorate	0.033	0.05	50	24	70	24	70	365	3.23E-06	1.11E-06	7.00E-04	NA	**4.61E-03**	**NA**
												Total:	**4.61E-03**	**NA**

Child:

Perchlorate	0.033	0.05	50	6	15	6	70	365	1.51E-05	1.29E-06	7.00E-04	NA	**2.15E-02**	**NA**
												Total:	**2.15E-02**	**NA**

Dermal Contact with Surface Water While Swimming

Adult:

Chemical	Max detect mg/cm3	Kp cm/hr	Tevent hr/event	DA event mg/cm2-event	Events events/day	Exp. Freq. days/year	Exp. Dur. years	SA cm2	Body Wt. kg	NC Avg. Time years	C Avg. Time years	CF2 days/year	Avg. Daily Dose mg/kg-day	Lifetime ADD mg/kg-day	RfD mg/kg-day	Sforal kg-day/mg	**Hazard Index**	**Cancer Risk**
Perchlorate	0.000033	0.001	1	0.000000033	4	50	24	18000	70	24	70	365	4.65E-06	1.59E-06	7.00E-04	NA	**6.64E-03**	**NA**
																Total:	**6.64E-03**	**NA**

Child:

Chemical	Max detect mg/cm3	Kp cm/hr	Tevent hr/event	DA event mg/cm2-event	Events events/day	Exp. Freq. days/year	Exp. Dur. years	SA cm2	Body Wt. kg	NC Avg. Time years	C Avg. Time years	CF2 days/year	Avg. Daily Dose mg/kg-day	Lifetime ADD mg/kg-day	RfD mg/kg-day	Sforal kg-day/mg	**Hazard Index**	**Cancer Risk**
Perchlorate	0.000033	0.001	1	0.000000033	4	50	6	6600	15	6	70	365	7.96E-06	6.82E-07	7.00E-04	NA	**1.14E-02**	**NA**
																Total:	**1.14E-02**	**NA**

Maximum detected surface water concentration.

		Ingestion	**Dermal**	**Total**
HI	**Adult**	**4.61E-03**	**6.64E-03**	**1.13E-02**
HI	**Child**	**2.15E-02**	**1.14E-02**	**3.29E-02**

Indirect Contact Risk Calculations for Surface Water
Recreator Scenario
Cornerstone Park HRA
Henderson, Nevada

Recreational Fish Ingestion

Adult:

Chemical	Max detect mg/kg	Ingest. Rate kg/day	Exp. Freq. days/year	Exp. Dur. years	Body Wt. kg	NC Avg. Time years	C Avg. Time years	CF2 days/year	Avg. Daily Dose mg/kg-day	Lifetime ADD mg/kg-day	RfD mg/kg-day	Sforal kg-day/mg	**Hazard Index**	**Cancer Risk**
Perchlorate	0.033	0.0075	350	24	70	24	70	365	3.39E-06	1.16E-06	7.00E-04	NA	**4.84E-03**	**NA**
												Total:	**4.84E-03**	**NA**
Child:														
Perchlorate	0.033	0.0022	350	6	15	6	70	365	4.64E-06	3.98E-07	7.00E-04	NA	**6.63E-03**	**NA**
												Total:	**6.63E-03**	**NA**

Assumed bioconcentration factor of 100% for perchlorate and multiplied by the maximum detected surface water concentration of 0.033 mg/L and assumed this amount is found in fish (1 x 0.033 mg/L = 0.033 mg/kg).

		Ingestion	Dermal	Total
HI	**Adult**	**4.84E-03**	**NA**	**NA**
HI	**Child**	**6.63E-03**	**NA**	**NA**

Direct Contact Risk Calculations for Soil
Recreator Scenario
Cornerstone Park HRA
Henderson, Nevada

Soil Ingestion:

Adult:

Chemical	Max detect mg/kg	Ingest. Rate mg/day	Exp. Freq. days/year	Exp. Dur. years	CF1 kg/mg	Body Wt. kg	NC Avg. Time years	C Avg. Time years	CF2 days/year	Avg. Daily Dose mg/kg-day	Lifetime ADD mg/kg-day	RfD mg/kg-day	Sforal kg-day/mg	**Hazard Index**	**Cancer Risk**
Perchlorate	45.6	100	50	24	1.00E-06	70	24	70	365	8.92E-06	3.06E-06	7.00E-04	NA	**1.27E-02**	**NA**
													Total:	**1.27E-02**	**NA**

Child:	Max detect mg/kg														
Perchlorate	45.6	200	50	6	1.00E-06	15	6	70	365	8.33E-05	7.14E-06	7.00E-04	NA	**1.19E-01**	**NA**
													Total:	**1.19E-01**	**NA**

Dermal Contact:

Adult:

Chemical	Max detect mg/kg	Surf. Area cm2	Ad. Factor mg/cm2	ABS	Exp. Freq. days/year	Exp. Dur. years	CF1 kg/mg	Body Wt. kg	NC Avg. Time years	C Avg. Time years	CF2 days/year	Avg. Daily Dose mg/kg-day	Lifetime ADD mg/kg-day	RfD mg/kg-day	Sforal kg-day/mg	**Hazard Index**	**Cancer Risk**
Perchlorate	45.6	5700	0.07	0.1	50	24	1.00E-06	70	24	70	365	3.56E-06	1.22E-06	7.00E-04	NA	**5.09E-03**	**NA**
															Total:	**5.09E-03**	**NA**

Child:

Chemical	Max detect mg/kg	Surf. Area cm2	Ad. Factor mg/cm2	ABS	Exp. Freq. days/year	Exp. Dur. years	CF1 kg/mg	Body Wt. kg	NC Avg. Time years	C Avg. Time years	CF2 days/year	Avg. Daily Dose mg/kg-day	Lifetime ADD mg/kg-day	RfD mg/kg-day	Sforal kg-day/mg	**Hazard Index**	**Cancer Risk**
Perchlorate	45.6	3200	0.2	0.1	50	6	1.00E-06	15	6	70	365	2.67E-05	2.28E-06	7.00E-04	NA	**3.81E-02**	**NA**
															Total:	**3.81E-02**	**NA**

Inhalation of Particulates:

Adult:

Chemical	Max detect mg/kg	PEF kg/m3	Air Conc. mg/m3	Exp. Time hrs/day	Exp. Freq. days/year	Exp. Dur. years	NC Avg. Time hours	C Avg. Time hours	CF1 ug/mg	RfC mg/m3	IUR m3/ug	**Hazard Index**	**Cancer Risk**
Perchlorate	45.6	7.58E-10	3.45E-08	4	50	24	210240	613200	1.00E+03	NA	NA	**NA**	**NA**
											Total:	**NA**	**NA**

Child:

Chemical	Max detect mg/kg	PEF kg/m3	Air Conc. mg/m3	Exp. Time hrs/day	Exp. Freq. days/year	Exp. Dur. years	NC Avg. Time hours	C Avg. Time hours	CF1 ug/mg	RfC mg/m3	IUR m3/ug	**Hazard Index**	**Cancer Risk**
Perchlorate	45.6	7.58E-10	3.45E-08	4	50	6	52560	613200	1.00E+03	NA	NA	**NA**	**NA**
											Total:	**NA**	**NA**

Maximum detected surface soil concentration (0 feet bgs).

		Ingestion	Dermal	Inhal. Part.	Total
HI	**Adult**	**1.27E-02**	**5.09E-03**	**NA**	**1.78E-02**
HI	**Child**	**1.19E-01**	**3.81E-02**	**NA**	**1.57E-01**

Direct Contact Risk Calculations for Soil
Outdoor Maintenance Worker Scenario
Cornerstone HRA
Henderson, Nevada

Soil Ingestion:

Adult:

Chemical	Max detect mg/kg	Ingest. Rate mg/day	Exp. Freq. days/year	Exp. Dur. years	CF1 kg/mg	Body Wt. kg	NC Avg. Time years	C Avg. Time years	CF2 days/year	Avg. Daily Dose mg/kg-day	Lifetime ADD mg/kg-day	RfD mg/kg-day	Sforal kg-day/mg	**Hazard Index**	**Cancer Risk**
Perchlorate	45.6	100	250	25	1.00E-06	70	25	70	365	4.46E-05	1.59E-05	7.00E-04	NA	**6.37E-02**	**NA**

Dermal Contact: **Total:** **6.37E-02** **NA**

Adult:

Chemical	Max detect mg/kg	Surf. Area cm2	Ad. Factor mg/cm2	ABS	Exp. Freq. days/year	Exp. Dur. years	CF1 kg/mg	Body Wt. kg	NC Avg. Time years	C Avg. Time years	CF2 days/year	Avg. Daily Dose mg/kg-day	Lifetime ADD mg/kg-day	RfD mg/kg-day	Sforal kg-day/mg	**Hazard Index**	**Cancer Risk**
Perchlorate	45.6	5700	0.2	0.1	250	25	1.00E-06	70	25	70	365	5.09E-05	1.82E-05	7.00E-04	NA	**7.27E-02**	**NA**
															Total:	**7.27E-02**	**NA**

Inhalation of Particulates:

Adult:

Chemical	Max detect mg/kg	PEF kg/m3	Air Conc. mg/m3	Exp. Time hrs/day	Exp. Freq. days/year	Exp. Dur. years	NC Avg. Time hours	C Avg. Time hours	CF1 ug/mg	RfC mg/m3	IUR m3/ug	**Hazard Index**	**Cancer Risk**
Perchlorate	45.6	7.58E-10	3.45E-08	8	250	25	219000	613200	1.00E+03	NA	NA	**NA**	**NA**

Maximum detected surface soil concentration (0 feet bgs). **Total:** **NA** **NA**

		Ingestion	**Dermal**	**Inhal. Part.**	**Total**
HI	**Outdoor Wkr**	**6.37E-02**	**7.27E-02**	**NA**	**1.36E-01**

Direct Contact Risk Calculations for Soil
Outdoor Construction Worker Scenario
Cornerstone HRA
Henderson, Nevada

Soil Ingestion:

Adult:

Chemical	Max detect mg/kg	Ingest. Rate mg/day	Exp. Freq. days/year	Exp. Dur. years	CF1 kg/mg	Body Wt. kg	NC Avg. Time years	C Avg. Time years	CF2 days/year	Avg. Daily Dose mg/kg-day	Lifetime ADD mg/kg-day	RfD mg/kg-day	Sforal kg-day/mg	**Hazard Index**	**Cancer Risk**
Perchlorate	45.6	330	250	1	1.00E-06	70	1	70	365	1.47E-04	2.10E-06	7.00E-04	NA	**2.10E-01**	**NA**
Dermal Contact:													**Total:**	**2.10E-01**	**NA**

Adult:

Chemical	Max detect mg/kg	Surf. Area cm2	Ad. Factor mg/cm2	ABS	Exp. Freq. days/year	Exp. Dur. years	CF1 kg/mg	Body Wt. kg	NC Avg. Time years	C Avg. Time years	CF2 days/year	Avg. Daily Dose mg/kg-day	Lifetime ADD mg/kg-day	RfD mg/kg-day	Sforal kg-day/mg	**Hazard Index**	**Cancer Risk**
Perchlorate	45.6	5700	0.3	0.1	250	1	1.00E-06	70	1	70	365	7.63E-05	1.09E-06	7.00E-04	NA	**1.09E-01**	**NA**
															Total:	**1.09E-01**	**NA**

Inhalation of Particulates:

Adult:

Chemical	Max detect mg/kg	PEF kg/m3	Air Conc. mg/m3	Exp. Time hrs/day	Exp. Freq. days/year	Exp. Dur. years	NC Avg. Time hours	C Avg. Time hours	CF1 ug/mg	RfC mg/m3	IUR m3/ug	**Hazard Index**	**Cancer Risk**
Perchlorate	45.6	1.00E-06	4.56E-05	8	250	1	8760	613200	1.00E+03	NA	NA	**NA**	**NA**
Maximum detected surface soil concentration (0 feet bgs).											**Total:**	**NA**	**NA**

		Ingestion	**Dermal**	**Inhal. Part.**	**Total**
HI	**Construction**	**2.10E-01**	**1.09E-01**	**NA**	**3.19E-01**