

Health Consultation

LONE BUTTE INDUSTRIAL PARK – PERCHLORATE

DISTRICT 4 MEMORIAL AREA
GILA RIVER INDIAN COMMUNITY

MARICOPA COUNTY, ARIZONA

MARCH 8, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

LONE BUTTE INDUSTRIAL PARK – PERCHLORATE

DISTRICT 4 MEMORIAL AREA
GILA RIVER INDIAN COMMUNITY

MARICOPA COUNTY, ARIZONA

Prepared By:

Gila River Indian Community
Office of Occupational Safety and Health Office
Under a Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

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Summary and Statement of Issues

The Gila River Indian Community (GRIC), Office of Occupational Safety and Health (OSH), through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), has prepared this health consultation which serves to address health concerns at the GRIC Lone Butte Industrial Park (LBIP) in Memorial Area in District 4. Concern was raised by the GRIC Department of Environmental Quality hydrologist, due to the perchlorate migration from a solid fuel rocket manufacturing facility, and the additional use of perchlorate at the LBIP, which has yet to be determined whether it contributes to an existing plume. This health consultation evaluates data and information regarding perchlorate contaminated monitoring well's potential public health impact on the drinking water wells situated on-site, and northeast of the LBIP site which is west of Interstate 10. Data available to the OSH office is presented in the background section, followed by a discussion of the health implications, conclusions, and recommendations.

Background

Site Description and History

The LBIP is located on the Gila River Indian Community, District 4, Memorial Area. The site is east of Interstate 10 (I-10), west of Dan Jackson Drive, south of Chandler, Arizona and the West Loop 202 Freeway. The industrial park consists of 720 prime highway frontage acres with lots ranging in size from 5 to 20 acres. The site address is 6960 W. Allison Road, Chandler, Arizona. Eighty acres are retail/commercial and the remaining 640 acres are zoned as light and heavy industrial. See Appendix A for an aerial view of the site. The master tenant plan of the LBIP consists of approximately 31 tracts with multiple units (leased spaces for businesses) in each tract. There are approximately 55 tenants. The site is currently 50% developed. (1) The units in the industrial park are serviced by the LBIP drinking water wells (Wells #1 and #2).

Site Investigation

The Gila Floodway (GFW) groundwater-monitoring well was the first well to be installed in January of 2000. The GFW was specifically installed to monitor ambient background water quality in the subsurface beneath the GFW in accordance with the LBIP groundwater Phase I Remedial Investigation of trichloroethylene (TCE) report. The monitoring well is located one mile west of I-10 and the Wild Horse Pass Road/Sundust Road exchange and west of the LBIP. The GFW monitoring well was screened from 70 to 100 feet below the ground surface (bgs). Based on the results of the ground water sampling, an investigation was prompted to find the source of the contamination and mitigate the potential impact to groundwater. To understand the site's hydrogeologic setting and the distribution of contaminants, the GRIC Department of Environmental Quality (DEQ), Water Quality Program (WQP) installed two additional groundwater-monitoring wells in August of 2002 (Wells -LB1 and LB-2).(2)

Environmental Sampling

The sampling results from the groundwater monitoring wells indicate the groundwater plume covers approximately two square miles (1,280 acres). (2) Sampling results indicated the presence of TCE, acetone, 1,1-dichloroethylene (1,1-DCE), 1,4-dioxane, and perchlorate which

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are industrial chemicals and volatile organic compounds (VOC). Perchlorate is an inorganic substance that is used as a solid fuel rocket propellant in the aerospace industry (Appendix D).

Sampling and analysis for perchlorate was initially conducted during January 2004. During the January 2004 sampling event, perchlorate was detected in monitoring wells (LB-1 and LB-2) at concentrations ranging between 1.5 µg/L and 2.9 µg/L. During the September 2004 sampling event, perchlorate was found in all three of these monitoring wells at increased concentrations of 6.3 µg/L at the GFW well, 3.8 µg/L at LB-1, and 3.7 µg/L at LB-2 .

Two additional groundwater monitoring wells (Wells LB-3 and LB-4) were installed in May of 2004. Perchlorate concentrations ranged from non detected (ND) to 3.1 µg/L at LB-3 and LB-4 in the September 2004 sampling event.(2)

In February 2005, three additional monitoring wells were installed (Wells LB-5, LB-6, and LB-7), which help define the direction and gradient of groundwater flow to gather additional data on the lateral distribution of contaminants, along with possible source (s). See Appendix A for an aerial view of these wells.

The primary concern is maintaining safe drinking water wells at:

LBIP site	Wells #1 and #2
Wild Horse Pass (WHP)	Wells north and south
Lone Butte Subdivision Water System (LBSWS)	Well #1

The LBIP drinking water wells are monitored by LBIP site water operations. The WHP and LBSWS wells are monitored by the GRIC Department of Public Works (DPW). (5) Perchlorate has not been detected in any of these production wells. Most of these production wells are screened several hundred feet below the land surface and do not produce from the same elevation currently being monitored for groundwater contamination. Monitoring wells are screened closer to the land surface where the VOC or other contaminants could be present. Further investigation is needed to determine the potential hydraulic connection between the groundwater contamination and the drinking water well.(3)

Selection of Contaminant of Concern

The process by which ATSDR evaluates the possible health impact of contaminants is summarized in the following section and described in more detail in Appendix C. There are two steps in the evaluation process. The first step involves screening the available data to determine the contaminants of concern (COCs) for each media. As part of the ATSDR screening process, maximum detected concentrations of contaminants are compared with Comparison Values (CVs) to determine which chemicals, if any, require additional evaluation. CVs are concentrations of chemicals in the environment, below which no adverse health effects are expected to occur. In the event that a contaminant concentration exceeds its respective CV, it does not necessarily indicate that health effects are expected to occur. Rather, it is indicated that further evaluation of

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the particular contaminant and the ways in which individuals might be exposed to it is necessary. It should also be noted that other contaminants may be evaluated further if concerns are received from the community regarding the presence of the particular contaminant(s)

The VOC's TCE, acetone, 1,1-dichloroethylene (1,1-DCE), 1,4-dioxane that were detected in groundwater monitoring wells, are below ATSDR'S comparison values (CV). Because these VOC's are below CV's, they will not be evaluated further in this health consultation; however, GRIC OSH will continue to monitor the levels of VOC's in these wells.

The United States Environmental Protection Agency (USEPA) has not established a Maximum Contamination Level (MCL) for perchlorate. The ATSDR chronic Minimal Risk Level (MRL) is 0.0007 milligram/kilogram/day (mg/kg/day) and chronic Child Environmental Evaluation Guide (EMEG) for water is 7 parts per billion (ppb). Arizona has established a health-based guidance level (HBGL) for perchlorate of 14 µg/L.(3) USEPA has previously indicated that perchlorate levels between 4 and 18 ppb should not cause concern and are protective of public health; however, an official MCL has not been set by the agency. Other states have adopted other values as perchlorate guidelines. The California Department of Health Services has established a drinking water Public Health Goal (PHG) of 6 ug/L for perchlorate.(4) The USEPA estimates that an MCL will be established for perchlorate in 2007 or 2008. Perchlorate has been raised as a concern by the community; however, all sampling results are below the Arizona HBGL.

Demographics

According to data received from the LBIP Business Park development office, there are currently 2,500 employees at the LBIP. No children reside on the industrial site.(1) Interstate-10 is 1 mile from the site. There are 31 homes in a subdivision west of Interstate-10 with approximately 125 residents.

Discussion

Exposure Pathway Analysis

ATSDR's pathways analysis determines whether people have contacted contaminants from a site and whether those contacts were substantial enough to cause harm. To determine this, ATSDR identifies exposure pathways or ways in which a chemical can enter a person's body (i.e., ingestion, inhalation, or dermal (skin) contact). An exposure pathway contains five major elements:

1. a source of contamination,
2. transport through an environmental medium,
3. a point of exposure,
4. a route of exposure, and
5. a receptor population.

If an exposure pathway contains all five elements and exists now or existed in the past, the pathway is considered complete. Only completed exposure pathways are evaluated to determine whether health effects could occur. If one or more of the five elements is not defined clearly but could exist, the exposure pathway is classified as potential.

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Perchlorate has been detected in all the LBIP monitoring wells; however, it has not been detected in the two drinking water wells that service the LBIP site (Wells #1 and #2) (which are monitored by Lone Butte Industrial Park Water Operations) nor the three wells down gradient from the GFW, specifically the WHP (Wells north and south) and the Lone Butte Subdivision Water System Well. Currently, the GRIC Department of Environmental Quality (DEQ) has determined that perchlorate from the Aero Dyne site has migrated to the Lone Butte site. One source for the perchlorate contamination appears to be originating from the former Aero Dyne solid fuel rocket manufacturing facility approximately one mile east of the Lone Butte Industrial Park. (2). This is based on analytical data collected from newly installed well LB-3. The Lone Butte Industrial Park Water Operations, GRIC DPW and DEQ continue to monitor the drinking water wells at all the sites. Perchlorate has not been detected in the drinking water wells; therefore, ingestion of groundwater is an incomplete exposure pathway.

In addition, there is no available soil data from the LBIP site to evaluate. Because of the lack of soil data, the exposure pathway for contact with soil at the LBIP is presently a potential exposure pathway.

Community Health Concerns

Concern:

A major concern of the surrounding residents and tenants of LBIP is that the drinking water wells may become contaminated by the perchlorate found in the groundwater monitoring wells.

Response:

The drinking water wells are monitored on a quarterly basis. Perchlorate has not been detected in the drinking water wells. If harmful levels were to be detected over the HBGL of 14 µg/L, then the LBIP Water Operations will assess the situation and act according to remedy any contamination issues.

Concern:

The potential contamination of subsequent drinking water wells, past the contaminated GFW monitoring well, that are situated across I-10 could be impacted in the future by perchlorate. These three production wells are northwest and down gradient from the existing Lone Butte Industrial Park monitoring wells.

Response:

The drinking water wells are monitored on a quarterly basis. Perchlorate has not been detected in the drinking water wells. If potentially harmful levels were to be detected, the GRIC Public Works Department will assess the situation and act according to remedy any contamination issues. The three wells will be monitored on a monthly basis if perchlorate is detected.

ATSDR Child Health Consideration

GRIC and ATSDR recognize that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination of their water, soil, air, or food.

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Children are at greater risk than adults from certain exposures to hazardous substances emitted from waste sites and from emergency events involving hazardous chemicals.

GRIC and ATSDR attempted to identify populations of children at the LBIP. According to the GRIC District Four Service Center, no children live on the industrial site. Although, TCE, benzene, perchlorate, PCE, 1,4-dioxane, and 1,1-DCE were found in monitoring wells below CV's, they have not been detected in the drinking water wells at the Lone Butte Industrial Park site, therefore there is no completed exposure pathway for children or adults.

Conclusions

- Presently, drinking water wells that service the LBIP, WHP casino and LBSWS indicate no presence of perchlorate contamination. To date, there is no completed exposure pathway for ingestion of drinking water from LBIP wells, therefore these drinking water wells pose no public health hazard.
- Based on the latest sampling results, perchlorate has migrated into the GFW monitoring well, which is across the I-10 freeway. There is a potential for contamination of the drinking water wells down gradient from the GFW monitoring well that services the Lone Butte Subdivision and the WHP casino possibly in the future.
- Due to a lack of soil data from the LBIP site, exposure to on-site soil is considered an indeterminate health hazard at this time.
- The LBIP perchlorate monitoring well contamination has been linked to abandoned Aero Dyne site per DEQ.

Recommendations

- The GRIC Department of Environmental Quality (DEQ) should continue to conduct monthly sampling of LBIP monitoring wells for perchlorate.
- The GRIC DPW should share drinking water wells sampling reports of WHP and LBSWS wells with the GRIC OHS.
- Site assessments should be conducted by DEQ to determine the full extent of contamination for groundwater.
- The GRIC DEQ Hazardous Waste Program should conduct soil sampling and develop a remediation plan, if sampling results indicate the need.

Public Health Action Plan

The OSH has developed a public health action plan to ensure the recommendations are implemented and are meaningful for the affected residents. The public health action plan is described in the following table.

Public Health Action	Who Will Implement the Action	Time Frame for Implementation	Desired Outcome When Implemented	Public Health Impact
Conduct monthly sampling of LBIP monitoring wells for perchlorate	GRIC DEQ	Monthly	Ensure tracking of plume migration	Prevent exposure to perchlorate levels that could harm health
Conduct monthly sampling of LBIP, WHP and LBSWS production wells for perchlorate	LBIP Water Operations and DPW, respectively	Monthly	Ensure safe drinking water	Prevent exposure to perchlorate levels that could harm health
Site assessment be conducted	GRIC DEQ	When funded for project	Determine full extent of contamination	Fully understand the migration, transport and fate of the contamination
Conduct soil sampling	GRIC DEQ	When funded for project	Knowledge of existing soil levels of perchlorate at LBIP	Assure remediation action if needed and prevent further and potential contamination

The GRIC Occupational Safety and Health Office will conduct additional health assessment activities for this site as more complete data becomes available for groundwater and soil originating from the Lone Butte Industrial Park site.

References

1. Lone Butte Industrial Park, 2005. Facilities and Amenities at Lone Butte Industrial Park, May. The site can be accessed at:
<http://www.lonebutteindustrialpark.com/facilities.htm>
2. Gila River Indian Community, Department of Environmental Quality, Water Quality Program, 2004. Phase I Remedial Investigation Report, TCE Investigation Site, by ATC Associate, Incorporation for Gila River Indian Community, Sacaton, Arizona, September 30.
3. Arizona Department of Health Services. Health based guidance level for *Perchlorate*. *Phoenix, Arizona, May 2000*.
4. State of California Environmental Protection Agency. Fact Sheet: Perchlorate in Surface/Groundwater Pollution in Simi Valley. Sacramento, California, 2003.
5. Gila River Indian Community Department of Public Works, 2005. Analytical data results from January 2005 of Wild Horse Pass Drinking Water Wells and Lone Butte Subdivision Water System, January 18.
6. US Environmental Protection Agency. Perchlorate Environmental Contamination. Toxicological Review and Risk Characterization. Washington, DC, 2002.
7. Gila River Indian Community Department of Environmental Quality, Water Quality Program 2005. Analytical data results from January 2005

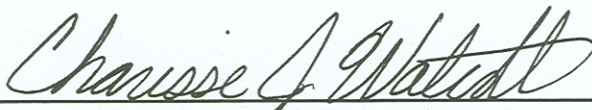
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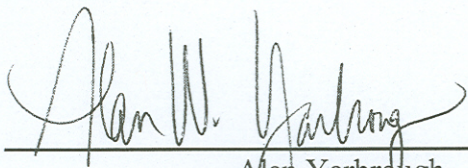
Certification

This Lone Butte Industrial Park-Perchlorate public health consultation was prepared by the Gila River Indian Community Occupational Safety and Health Office under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.



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The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.



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Appendices

Appendix A - Acronyms and Abbreviations

Appendix B - Aerial Photos of Lone Butte Industrial Park site

Appendix C - Arizona's Health-Based Guidance Level for Perchlorate

Appendix D - Contaminant of Interest - Perchlorate

Appendix A - Acronyms and Abbreviations

Acronyms and Abbreviations

1,1-DCE	1,1-dichloroethylene
ATSDR	Agency for Toxic Substance and Disease Registry
bgs	Below Ground Surface
COC	Contaminant of Concern
CV	Comparison Values
DEQ	Department of Environmental Quality
DPW	Department of Public Works
GFW	Gila Floodway Well
GRIC	Gila River Indian Community
HBGL	Health Based Guidance Level
LBIP	Lone Butte Industrial Park
MCL	Maximum Contaminant Level
µg/L	Microgram per liter
ND	Non-Detect
OSH	Occupational Safety, Health
PCE	Tetrachloroethylene/perchloroethylene
PHG	Public Health Goal
RfD	Reference Dose
TCE	Trichloroethylene
USEPA	United State Environmental Protection Agency
WQP	Water Quality Program
WHP	Wild Horse Pass

Appendix B - Aerial Photos of Lone Butte Industrial Park site

APPENDIX B

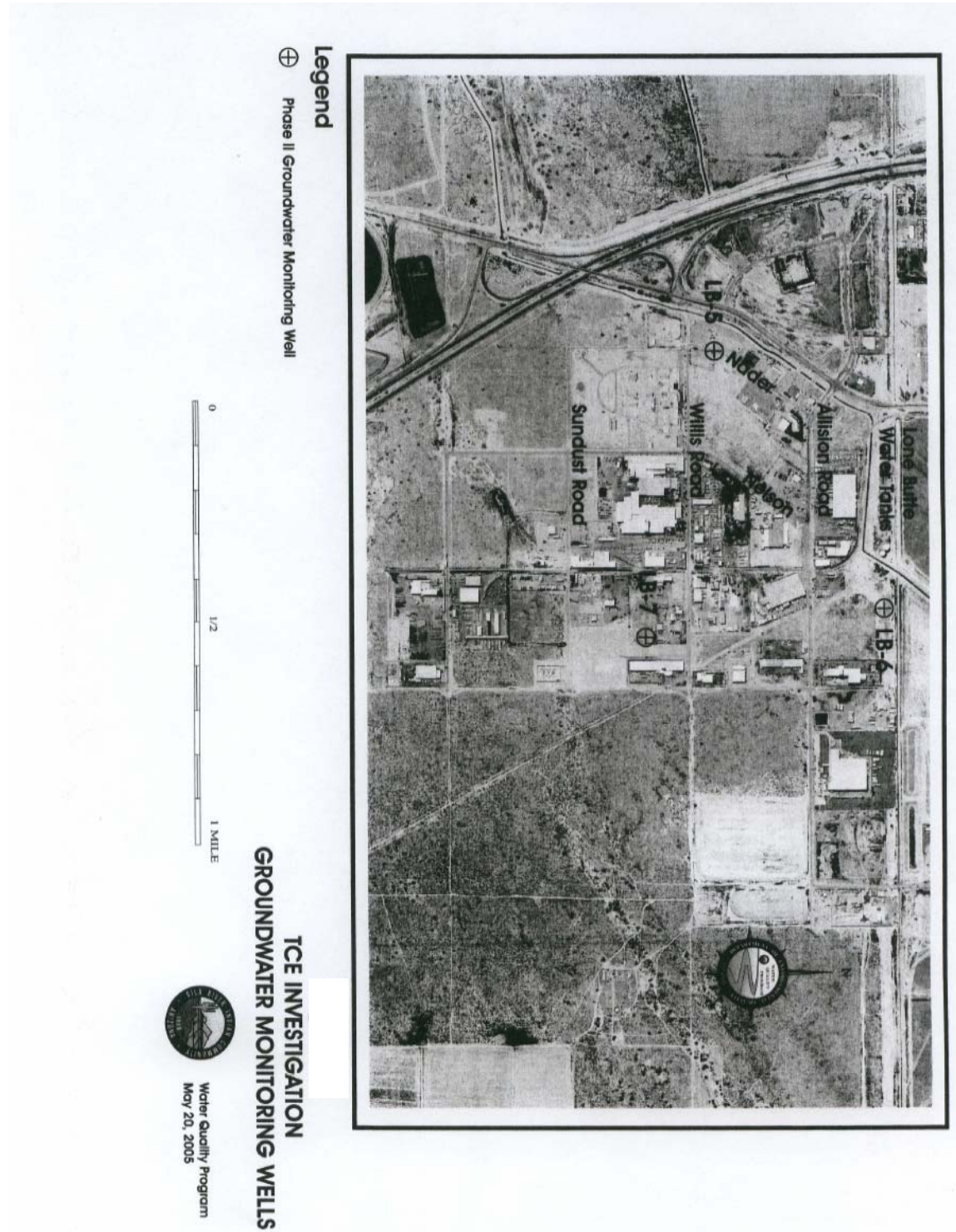
Figure 1 –Aerial view of Lone Butte of Industrial Park site



Figure 2 - Aerial Photo of Lone Butte Industrial Park and Aero Dyne Corporation



Figure 3 –Lone Butte Industrial Park Site New TCE Investigation Groundwater Monitoring Wells-2005



Appendix C - Arizona's Health-Based Guidance Level for Perchlorate

APPENDIX C

Arizona's Health-Based Guidance Level for Perchlorate

Arizona's health-based guidance level for drinking water is 14 micrograms per liter ($\mu\text{g/L}$) for perchlorate (ClO_4) and is specifically protective of childhood exposure. Health-based guidelines are developed by the Arizona Department of Health Services and represent concentrations of contaminants in drinking water that are protective of public health during long-term exposure.

The Arizona Department of Health Services uses health-based methodologies and assumptions that are consistent with risk assessment principles recommended by the EPA to develop health-based guidelines.

The health-based guideline developed for perchlorate is specifically protective of childhood ingestion exposure. Exposure assumptions reflect childhood contact rates and body weight. The focus on children is protective of the higher daily intake rates by children and their lower body weight. The exposure duration was assumed at 350 days/year for 6 years.³

The provisional reference dose (RfD) of 0.009 mg/kg-day published by the EPA in December 1998 was used to develop the health-based guideline.¹¹ The RfD is based on the assumption that a threshold exists for certain toxic effects and that threshold may not exist for other carcinogenic effects. Thus, if the critical toxic effect is prevented, then all toxic effects are prevented. The RfD is an estimate of a daily oral exposure to the human population that includes sensitive subpopulations that is unlikely to cause adverse health effects during a lifetime. The oral RfD is expressed in units of milligrams per kilogram per day.⁶

The health-based guideline has a margin of safety. Concentrations of perchlorate in excess of 14 $\mu\text{g/L}$ should not be considered a health threat. Rather, a more detailed analysis would be necessary in order to evaluate health risks from exposure to more than 14 $\mu\text{g/L}$ of perchlorate in drinking water.³

The Arizona Department of Health Services will re-evaluate this health based guidance level after the National Academy of Sciences completes their review of the draft USEPA perchlorate toxicity assessment.

APPENDIX D - CONTAMINANT OF INTEREST – PERCHLORATE

APPENDIX D

CONTAMINANT OF INTEREST - PERCHLORATE

Perchlorate is a white or colorless powder found naturally in the environment in South America or as a manufactured product. Perchlorate is a component of solid fuel propellant for rockets and missiles and is used in the manufacture of some fireworks. It is also used to make rubber, electronic tubes, lubrication oils, matches, fertilizers, paints, and enamels. It is often a component in electroplating and aluminum refining.

Perchlorate salts have been widely used as an oxidizer in solid propellants for rockets and missiles since the 1940's. Because of its finite shelf life, propellant-containing perchlorate has been periodically washed out of U.S. missile and rocket inventory to be replaced with a fresh supply. Environmental releases occurred because of past open burning and open detonation of perchlorate-containing material. As a result of past practices, soil and groundwater are contaminated near rocket fuel manufacturing and disposal facilities.(6) There is a possibility that the perchlorate contamination at the LBIP may be from several outside sources. The source is currently under investigation by the Phase I Remedial team.

Perchlorate interferes with iodide uptake into the thyroid gland. Because iodide is an essential component of thyroid hormones, perchlorate disrupts thyroid function. In adults, the thyroid helps to regulate metabolism. In children, the thyroid plays a major role in proper development and metabolism. Impairment of the thyroid function in expectant mothers may impact the fetus and newborn and result in behavior changes, delayed development, and decreased learning capability. Changes in thyroid hormone levels may also result in thyroid tumors. The disruption of iodide uptake by perchlorate is the key event leading to changes in development or tumor formation. Perchlorate is currently not classified by the USEPA as a carcinogen.

The types of perchlorate salt used at LBIP, ammonium perchlorate and potassium perchlorate, are extremely soluble in water, absorb weakly to most soil minerals, and are very persistent over time. At this time the LBIP companies located on-site use perchlorate, but they are not considered a source of perchlorate contamination, because of low usage. There is evidence from the preliminary Phase I analytical data (DEQ WQP sampling results) that the perchlorate found at the LBIP and as far west as the GFW well comes from the abandoned Aero Dyne site. The Aero Dyne site was used to test jet engines. (7) However, the source and extent of the groundwater contamination plume has not yet been fully characterized. Perchlorate is the primary focus of this health consultation at the LBIP. GRIC OSH has conducted a separate health consultation to address contaminants at the Aero Dyne site.