B.0 SITE HEALTH ASSESSMENT OVERVIEW

This Appendix provides a description of each of the Health Assessments performed for the Motorola 52nd Street Superfund Site. The text below (with minor edits) was previously presented in the *Third Five Year Review Report, Operable Unit 1* and the *Second Five Year Review Report, Operable Unit 2* prepared by the Arizona Department of Environmental Quality (ADEQ) and LFR in September 2006. An update regarding the evaluation of potential vapor intrusion to indoor air risk at OU1 (see Section B.5) was provided for inclusion in this Appendix by United States Environmental Protection Agency (EPA) Region 9 in April 2011.

B.1 1988 Health Assessment

On May 2, 1988, the Agency for Toxic Substance and Disease Registry (ATSDR) submitted the results of a health assessment for contaminants associated with the known extent of the Site (defined at that time by the boundaries of OU1 and focusing on the then operating Motorola 52nd Street Facility). The health assessment was performed in accordance with SARA and surmised that:

- The groundwater, soil, and soil gas at the Motorola 52nd Street Facility was contaminated with high concentrations of volatile organic compounds (VOCs).
- The COCs found in groundwater, soil, and soil gas in OU1 included trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), 1,1-dichloroethane (1,1-DCA), and tetrachloroethene (PCE).
- Contaminated groundwater has migrated west of the Motorola 52nd Street Facility.
- Low concentrations of the facility-related VOCs, specifically 1,1,1-trichloroethane (1,1,1-TCA), TCE, and PCE, were detected in some off-facility wells that were currently in use.
- Off-facility groundwater was known to be used for the irrigation of crops and lawns and filling swimming pools.
- Water from some on-facility and off-facility wells contained elevated concentrations of inorganic chemicals such as arsenic, cadmium, chromium, lead, and nitrate.
- Available information did not indicate whether these inorganic compounds were naturally occurring in the water or whether their presence was related to industrial activities.

The health assessment was conducted based upon the assumption that groundwater within the investigated area would not be used for potable purposes. Environmental pathways for contaminants from OU1 included groundwater, soil, air, and food. Low concentrations of contaminants in surface water indicated that surface water and sediments were not pathways of concern for OU1.

The following exposure routes were evaluated: (1) ingestion or use of contaminated groundwater or contaminated agricultural products; (2) dermal contact of groundwater contaminants and ingestion of water during swimming; (3) inhalation of VOC contaminants and fugitive dusts; and (4) consumption of plants or animals which may have bioaccumulated groundwater contaminants.

The Health Assessment Report concluded that under current conditions (at the time of the Health Assessment) the Site is unlikely to pose any threats to human health. Although on-facility and off-facility groundwater is contaminated, contaminant levels at the points of groundwater extraction were below the levels of concern. However, the Health Assessment Report noted that future migration of groundwater contaminants may increase the level of contaminants at points of groundwater extraction and may render the groundwater unsuitable for even non-potable uses. The Health Assessment also concluded that soil and soil-gas contaminants should not pose a threat to human health.

The Health Assessment Report provided the following recommendations in order to ensure continued protection of human health: (1) continue to monitor off-facility groundwater contamination to track the movement of the contaminant plume and define the extent to which the Site has impacted groundwater quality; (2) continue to monitor off-facility wells in the impacted areas that are being used for irrigation or residential use; (3) workers conducting remedial activities should use adequate personal protective equipment which meets Occupational Safety and Health Administration (OSHA) standards and appropriate National Institute for Occupational Safety and Health (NIOSH) recommendations; (4) dust generated during remedial activities should be optimally controlled; (5) during remedial activities, real-time work site periphery air monitoring should be done in addition to on-site air monitoring; and (6) ambient air at the periphery of the Site should not exceed the National Ambient Air Quality Standards (NAAQS) or the NIOSH recommendations.

B.2 Health Assessment Update and Baseline Risk Assessment

As a follow-up to the 1988 Health Assessment, ATSDR conducted a Site Review and Update in 1993 and 1996. Additionally, the Arizona Department of Health Services (ADHS) completed a Baseline Risk Assessment in November 1992 that addressed both the OU1 and OU2 areas.

The 1992, 1993, and 1996 assessments discussed two private wells within the OU1 area: Well 4626G (Morgan well) and the Turnage well. The Morgan well is located northwest of the Freescale facility at 4626 East Granada Street, just north of McDowell Road. It is a private water supply well registered for domestic use and has been primarily used for residential swimming pool water and for grounds irrigation. The well was also used for indoor domestic purposes for a period of about six months in the late 1980s. The Baseline Risk Assessment provided a summary of the analytical data from the Morgan well collected between 1987 and 1992. During this period, boron, fluoride, and lead were determined to exceed Maximum Contaminant Levels (MCLs) for drinking water. Four organic compounds were found in the samples but none exceeded the MCLs. The assessments recommended an increase in the frequency of monitoring the Morgan well.

The Turnage well is located at 1502 North 46th Street, just south of McDowell Road. This well was used as a domestic water source for about 20 years, from 1948 to 1969 or 1970. The well was sampled by ADEQ for VOCs during the period from 1984 to 1986. Ranges in reported concentrations were: TCE at 1,300 to 8,100 micrograms per liter (µg/L); PCE at 14.2 to 60 µg/L; 1,2-dichlorobenzene (1,2-DCB) at less than 2 to 45 µg/L; 1,2-trans DCE at 3.1 to 98.7 µg/L; and methylene chloride at less than 0.5 to 6,350 µg/L. Sampling by ADEQ was discontinued in 1986 when Freescale installed monitor well DM-106 in close proximity to the Turnage well. In 1986, a locked steel housing was installed to protect the well and prevent its use. Access to the well was controlled by Freescale since installing the lock. The well was abandoned on January 25, 2005. The time at which the well became contaminated is not known and cannot be established. It is not possible to estimate past risk from domestic use of the well water for a 20-year period ending approximately in 1970. The risk can only be calculated for those periods of time that analytical data was collected. Therefore, since data was not collected until approximately 14 years after the well was removed from service, and there is no method to predict the VOC concentration levels from 1948 to 1970, it is not possible to estimate past risk. ADHS did not use the Turnage well in their quantitative risk assessment due to the lack of data and the fact that the well was not currently in use.

A list of recommendations that were made in the ATSDR 1993 Site Review and Update were reassessed in the 1996 Site Review and Update Report to ensure that they had been addressed. The

1996 Site Review and Update identified several issues specific to OU1 that still had not been addressed including (1) institutional controls were to remain in place, however, none of the agencies contacted were aware of any controls and (2) the frequency of monitoring the Morgan well had not been increased as recommended. ADEQ reported that it had not been sampled for years because Mr. Morgan did not want his well sampled any longer. Also, ATSDR reported that Mr. Morgan installed a new well in February 1996 because his original well went dry. Mr. Morgan's new well is registered with ADWR and is used for irrigation and domestic purposes.

In the early 1990s, ADEQ installed a monitor well, EW-18, directly east (upgradient) of the Morgan well. EW-18 was initially sampled in 1992 and had a TCE concentration of 23 ppb. EW-18 is sampled semiannually.

The 1992 Baseline Risk Assessment includes a map which provides the locations of the monitor wells, domestic use wells, and public irrigation wells that are located in the OU1 and OU2 areas. A well located in OU1 at 1050 North 46th Street (south of McDowell Road), referred to as the Willis well, is shown to be "closed". This well was abandoned in 1990 for construction of the Loop 202 and Hohokam freeways. There were no discussions regarding this well in the 1988, 1992, 1993, or 1996 health assessments.

The 1992 Baseline Risk Assessment concluded that the risk of public exposure to groundwater in OU2 was limited, and therefore causes no imminent health hazard.

B.3 1992 ADHS Soil Gas Exposure Assessment

ADEQ assigned a special task to ADHS to conduct an exposure assessment focusing on contaminated soil gas. Two exposure scenarios were used: indoor residential and outdoor residential. It was assumed that soil gas diffused from the soil to the ambient air and into residential structures through crawl spaces or via cracks in cement slabs. In April 1992, ADHS issued their report, *Addendum to Motorola 52nd Street Baseline Risk Assessment; Soil Gas Sampling*, which concluded that residential populations do not appear to be at risk of negative health effects from exposures to soil gases in the area west of the Motorola 52nd Street Facility. Concentrations of 1,1-DCE are high enough to suggest that further study of potential indoor exposures may be warranted. The November 1992 Baseline Risk Assessment does not address this issue nor do the ATSDR Site Reviews and Updates.

B.4 2002 Health Assessment

In April 2002, ADHS conducted a health assessment of the Motorola 52nd Street Superfund Site area to identify any current groundwater use that might result in human exposure to site

contaminants. The Report updated the 1992 well use inventory for OU1 and OU2 and provided an evaluation of potential groundwater exposure pathways in OU3. The Report concluded that for those wells whose status was verified, no exposure to contaminated groundwater was found; therefore, those wells pose no public health hazard. However, unregistered private wells might exist within the Motorola 52nd Street Superfund Site.

B.5 Evaluation of Potential Vapor Intrusion to Indoor Air Risk at OU1

Freescale submitted a memorandum entitled *Potential Indoor Air Vapor Intrusion Risks for Motorola 52nd Street Superfund Site Operable Unit 1* to ADEQ on December 6, 2005 (Sciences International, 2005). The memorandum evaluated the risks from potential vapor intrusion into residences within the OU1 Area using soil gas data collected in 1995. Shallow soil gas samples were collected from a depth of approximately five feet below ground surface (bgs) from twenty-three locations. Screening levels were generally based on EPA's published cancer and non-cancer potency factors. If no EPA factors were available, California EPA inhalation potency factors were used. The results indicated low total potential risk levels that are within the presumptively acceptable risk range of 10^{-6} (or lower) to 10^{-4}. Most of the results were below the 10^{-6} risk level. Only 2 of the 23 locations indicated COCs at concentrations that exceeded the 10^{-5} risk level (the COCs were TCE and PCE).

Since the completion of Freescale's 2005 assessment, EPA Region 9 has determined that changes in vapor intrusion to indoor air risk assessment warrant further review of the conclusions presented above (EPA Region 9, 2011). EPA's draft health risk assessments of TCE (2001 and 2009) and PCE (2008) indicate that these chemicals may pose a greater risk than previously considered for cancer as well as non-cancer health effects. EPA has proposed to upgrade both TCE and PCE's status as human carcinogens. In addition, the soil gas samples used in the 2005 assessment (collected in 1995) were taken using then-current technology, which has improved with regard to leak detection protocol and the sealing of the sampling equipment.

Using the draft TCE and PCE health risk assessments, indoor air Regional Screening Levels, and vapor intrusion attenuation factors developed by the California Environmental Protection Agency, EPA Region 9 developed health-based screening values to evaluate soil gas sample results at the site. The levels of TCE and PCE from the 1995 soil gas sampling event exceeded Region 9's soil gas screening levels at several locations. Therefore, further soil gas sampling is necessary to determine whether indoor air sampling is warranted. Additional vapor intrusion evaluations are planned or ongoing. A discussion of the additional vapor intrusion activities is presented in Section 5.1.3.3 of the 2011 Five-Year Review Report.

B.6 References

ADEQ and LFR, 2006. *Third Five Year Review, Operable Unit 1, Motorola 52nd Street Superfund Site, Phoenix, Arizona.* Dated September 25, 2006.

ADEQ and LFR, 2006. *Second Five Year Review, Operable Unit 2, Motorola 52nd Street Superfund Site, Phoenix, Arizona.* Dated September 25, 2006.

EPA Region 9, 2011. Update regarding the evaluation of potential vapor intrusion to indoor air risk at OU1. Transmitted by email on April 27, 2011.