FINAL REMEDIAL INVESTIGATION REPORT

HARRISON ROAD AND MILLMAR ROAD
DROSS WQARF SITE
TUCSON, ARIZONA

December 20, 2017

Prepared for:

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
1110 West Washington Street
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EXECUTIVE SUMMARY

This Remedial Investigation (RI) report for the Harrison Road and Millmar Road Water Quality Assurance Revolving Fund (WQARF) Registry Site (Site) in Tucson, Arizona, presents the results of site characterization, Early Response Action (ERA) and remedy installation activities that began in 1988 and were conducted through June 2017. Investigation and ERA activities conducted prior to 2017 are documented in greater detail in previous documents (ADEQ, 1989a; ADEQ, 2015; ADEQ, 2016; HGC, 2016a; HGC, 2016b).

Site Description

The Site is located on the east side of the City of Tucson (COT) and was originally comprised of two aluminum dross piles: the Harrison Millmar Dross-East pile (HMD-East) and the Harrison Millmar Dross-West pile (HMD-West). Soils at the Site have been impacted by metals including aluminum, antimony, arsenic, cadmium, copper, lead and nickel at levels above Arizona residential soil remediation levels (rSRLs). These metals are the primary contaminants of concern (COCs) at the Site.

The study area is generally bounded by East Millmar Road to the north, Harrison Hills Wash to the west, the private driveway of 9880 East Millmar Road to the east and the Pantano Vista Mobile Home Park (MHP) to the south. The study area encompasses approximately 20 acres including the Site; surrounding areas on Properties A, B and C; and Property D (Figure 1). Private residences are located on Properties B, C and D. Harrison Hills wash, an ephemeral stream with peak discharge between 500 to 1,000 cfs, is located along the western edge of the Site immediately adjacent to HMD-West.

Investigations

1988 and 1992 soil investigations at HMD-East reported metals at levels in exceedance of Health Based Guidance Levels (HBGLs) and current rSRLs.

Preliminary Investigation (PI) activities were conducted within the study area in 2015 and 2016. X-ray fluorescence (XRF) measurements, with confirmatory laboratory soil samples, were taken across Properties A, B, C and D, including the HMD-East and HMD-West piles, as well as in the MHP and on the East Berm of the Harrison Hills Wash. The PI findings indicated that more dross was present at HMD-East and HMD-West than recognized in earlier investigations and that significant dross was present in the East Berm of the Harrison Hills Wash along the western edge of Property A. The PI also indicated significant COC impacts on Property B, away from the

visible dross piles and near a residence at that location. Groundwater was found to not be impacted, based on the sampling of 6 exempt wells in the Site vicinity.

Recommendations from PI activities included removal of contaminated soils from Property B; stabilization of the berm along the Harrison Hills wash; and capping of HMD-East and HMD-West.

ERA and Remedy

During ERA activities, the majority of HMD-West was removed to a depth of 2 ft and replaced with clean fill; contaminated soil was removed from around the private residence on Property B and replaced with clean fill; the berm along the Harrison Hills wash was stabilized by backfilling and lacement of rip-rap; and contaminated soil from HMD-West and Property B was consolidated onto HMD-East with a temporary soil cover to mitigate dust hazards.

During remedial actions, the soil from the East Tail of HMD-East was removed and replaced with clean fill; the contaminated soil was consolidated onto HMD-East and HMD-East was capped with approximately 2 ft of soil based on an engineering design.

Land and Water Use

Current land use in the vicinity of the Site is a mixture of low-density residential and small-scale agricultural uses and this is unlikely to change in the foreseeable future. Multiple exempt groundwater wells are present in the Site vicinity; however, groundwater has not been impacted by the Site and is unlikely to be impacted in the future. Evaluation of water use is not required for the RI, as there are no current or threatened impacts to waters of the state from this Site.

Evaluation of Human Health Concerns

Potential exposure pathways of concern involve direct contact with the COCs in dross material or contaminated soils, primarily through inhalation and incidental ingestion of wind-blown dust. ERA and remedial action activities have mitigated the risks to residents of the Site properties.

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ACRONYMS AND ABBREVIATIONS

AAC	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AMA	Active Management Area
amsl	above mean sea level
ARS	Arizona Revised Statutes
ASRAC	Arizona Superfund Response Action Contract
ASTM	American Society of Testing Materials
AWQS	Aquifer Water Quality Standards
bgs	below ground surface
bls	below land surface
COC	Contaminant of Concern
COT	City of Tucson
EPA	United States Environmental Protection Agency
ERA	Early Response Action
FS	Feasibility study
ft	feet / foot
GPL	Groundwater Protection Level
GPS	Global Positioning System
HBGL	Health Based Guidance Levels
HGC	Hydro Geo Chem, Inc.
HI	Hazard Index
LWUS	Land and Water Use Study
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MPE	MP Environmental Services, Inc.
RI	Remedial Investigation
RO	Remedial Objective
SRL	Soil Remediation Levels
TCLP	Toxicity Characteristic Leaching Procedure
µg/L	micrograms per liter
WQARF	Water Quality Assurance Revolving Fund

1. INTRODUCTION

This final Remedial Investigation (RI) report includes the results of Preliminary Investigation (PI), Early Response Action (ERA) and remedial action activities performed at the Harrison Road and Millmar Road Dross (HMD) Water Quality Assurance Revolving Fund (WQARF) Registry Site (Site). Hydro Geo Chem, Inc. (HGC) has prepared this RI report on behalf of the Arizona Department of Environmental Quality (ADEQ) under the Arizona Superfund Response Action Contract (ASRAC) No. 14-077537. The RI was conducted to satisfy the requirements pursuant to Arizona Revised Statutes (ARS) §49-287.03 and Arizona Administrative Code (AAC) R18-16-406. As ADEQ determined that the necessary remedy for the Site could be completed within 180 days, no community involvement activities were required, pursuant to AAC R18-16-404(C), prior to proceeding with the RI. Pursuant to AAC R18-16-404(D), general public notice was directly communicated to those who could be impacted by the ERA and remedial work.

Notice to the public of a 30-day opportunity to comment on the draft RI report, pursuant to AAC R18-16-406(F), was given on November 15, 2017. No public comments were received on the draft RI report during the 30-day period, nor have other concerns been voiced by the public. Therefore, the Responsiveness Summary (Appendix L), included in this report pursuant to AAC R18-16-406(J), does not contain any responses to public comments or concerns.

1.1 Remedial Investigation Objectives

The RI was conducted at the Site as part of the WQARF program, with goals to assess the following (per A.A.C. R18-16-406(A)):

1. Establish the nature and extent of the contamination and the sources thereof;
2. Identify current and potential impacts to public health, welfare, and the environment;
3. Identify current and reasonably foreseeable uses of land and waters of the state; and
4. Obtain and evaluate any other information necessary for identification and comparison of alternative remedial actions.

The RI process is designed to provide a stepwise evaluation of the presence, magnitude, and extent of contamination, to assess potential contaminant source areas, and to identify potential exposure pathways. The objective of the RI is to provide sufficient information to identify appropriate Remedial Objectives (ROs) for the Site. The Remedial Objectives Report (ADEQ, 2017) has been included as Appendix K and presents the ROs for land use at the Site. The

Feasibility study (FS) phase of the WQARF process will evaluate specific remedial measures and strategies required to meet the established ROs.

1.2 Report Organization

This RI report includes the compilation of data from Site investigations, Early Response Actions (ERAs) and remedial actions and summarizes the following information and data pertaining to the Site:

- Physical setting of the Site, including topography, climate, geology, and hydrogeologic setting;
- The extent and characteristics of the hazardous substance released;
- Soil x-ray fluorescence (XRF) analyzer and analytical results, and groundwater analytical results, including comparisons to appropriate regulatory standards, criteria, and guidance [e.g., ADEQ Soil Remediation Levels (SRLs) and Aquifer Water Quality Standards (AWQS)];
- A conceptual site model of the Site;
- A land and water use study;
- A risk evaluation, including potential exposure routes.

1.3 Site Description

The study area, shown in Figure 1, is located in the southwestern portion of Section 35, Township 14 South, Range 15 East on the east side of the City of Tucson (COT), south of East Millmar Road, east of the Harrison Hills Wash, west of the private driveway of 9880 East Millmar Road and north of the Pantano Vista Mobile Home Park (MHP).

The Site was originally comprised of two aluminum dross piles (see Figure 1): the Harrison Millmar Dross-East pile (HMD-East) located on parcel 136-31-0159 (9880 E. Millmar Rd; Property C), and the Harrison Millmar Dross-West pile (HMD-West) located on parcels 136-31-0130 (no address; Property A) and 136-31-0140 (9696 E. Millmar Rd; Property B). Surrounding soils impacted above Arizona residential SRLs (rSRLs) are considered part of the study area. Concentrations of contaminants of concern (COCs) at the Site represented an unacceptable risk to public health, welfare, or the environment because of potential exposure through inhalation and ingestion of wind-blown dross dust, as well as dermal contact with dross. During ERA activities, the majority of HMD-West was consolidated onto HMD-East (HGC, 2016b).

Soils at the site have been affected by metals including aluminum, antimony, arsenic, cadmium, copper, lead and nickel at levels above rSRLs. These metals are the primary COCs at the Site.

The study area encompasses approximately 20 acres including the Site; surrounding areas on Properties A, B and C; and parcel 136-31-0160 (9886 E. Millmar Rd; Property D) (Figure 1). Several private residences are located on Properties B, C and D. Multiple exempt groundwater wells are present in the Site Vicinity.

Aluminum dross is a by-product of aluminum scrap meltdown and consists of an ash-like substance with sporadic metal pieces. The dross at the Site originated in the 1960s from facilities that legally purchased obsolete aircraft parts from Davis-Monthan Air Force Base and melted them down for scrap metals (Toeroek, 2017). Soil impacts at the Site were originally discovered in the late 1980s and early 1990s (ADHS, 1988; ADEQ, 1989a; PDEQ, 1992). A Preliminary Investigation at the Site was initiated by ADEQ in 2015 and completed in 2016, with ERA activities following in 2016 and remedial action activities in 2017. The RI report summarizes groundwater and soil investigations and their results from 2015 through 2017.

Harrison Hills Wash is located along the western edge of the Site immediately adjacent to HMD-West. Harrison Hills Wash is ephemeral, with peak discharge between 500 to 1,000 cubic feet per second (cfs) (ADEQ, 2016). This wash discharges into Pantano Wash roughly 3,200 feet (ft) north of the Site. Groundwater flow direction in the Site vicinity is to the northwest, and the water table is relatively deep (circa 280 ft below ground surface [bgs]; COT, 2017a&b). Detailed data pertaining to vadose zone and aquifer lithology in the Site vicinity are not available; however, the proximity of the Site to the Pantano Wash suggests that vadose zone and aquifer materials are likely basin fill alluvium, similar to those characterized at the Broadway-Pantano WQARF site located several miles downstream along the Pantano Wash (Stantec, 2012).

Historical aerial photographs of the Site vicinity dating to 1958 (NETROnline, 2016) indicate historical land uses prior to the 1970s were primarily open desert and agriculture with associated low-density residential. Land use in the study area has remained consistent since the 1970s. In the 1970s, the Irvington and Harrison Landfills began operation near the Site. The Irvington Landfill was taken out of operation in 1987. By the 1990s, higher-density residential development, including the MHP, was underway. In 1997, the Harrison Landfill ceased operation.

1.4 Site Chronology

This section outlines a general chronology of events and investigative milestones for the Site:

1960s: Dross is emplaced at the Site (Toeroek, 2017).

1988: Two downgradient wells are sampled by ADEQ; no metals exceed AWQS (ADEQ, 1989b). Arizona Department of Health Services (ADHS) collects samples of dross from HMD-East for metals analysis, finding aluminum, cadmium, copper, lead and thallium above rSRLs (ADHS, 1988). ADEQ conducts soil sampling on land surrounding HMD-East; the only metal measured above its rSRL is thallium, at two locations (ADEQ, 1989a).

1992: Pima County Department of Environmental Quality (PDEQ) collects one XRF measurement and one dross sample at HMD-East. The XRF reports arsenic, antimony, cadmium, copper and lead above rSRLs, and an aluminum content of 23.2 percent; laboratory results indicate aluminum, arsenic, antimony, cadmium, copper and lead are above rSRLs (PDEQ, 1992).

2015—2016: PI activities are conducted at the Site by ADEQ and HGC (ADEQ, 2016; HGC, 2016a).

2016: ERA and investigation activities are conducted at the Site by ADEQ and HGC (HGC, 2016b).

2017: The Site is added to the WQARF Registry on April 3, 2017. Remedial action activities are conducted at the Site by ADEQ and HGC.

1.5 Potentially Responsible Party Search

Pursuant to A.R.S. §49-287.02, ADEQ has initiated the process of identifying potentially responsible parties (PRPs) who may be liable for the release at this site. The Final Remedial Investigation Letter Report (RI Letter Report; Toeroek, 2017) in Appendix A details this search and the operational history of the Site. Information from the RI Letter Report relevant to PRPs is summarized as follows:

- Davis-Monthan Air Force Base was the source of the surplus aircraft and parts that were legally purchased for processing;
- The processing of obsolete aircraft parts resulted in the production of dross, a byproduct of the melting of aluminum scrap. The aluminum dross was generated by National Aircraft or one of its affiliate companies, National Metals Company or Southwestern Alloys, at a facility located at Kolb Road and Irvington Road;
- National Metals organized the dumping of the aluminum dross at the Site in the 1960s; and
- Manuel Escalante or Frank Escalante, Site parcel owners, may have given permission for the dross to be dumped and may have been paid for these activities.

2. PHYSICAL SETTING

2.1 Topography

Arizona is primarily divided into two main physiographic provinces: the Colorado Plateau and the Basin and Range (USGS, 1996). The Site is situated within the Basin and Range physiographic province which consists of broad alluvial basins dissected by northwest-southeast trending block-faulted Precambrian through Tertiary igneous, sedimentary, and metamorphic highlands. These basins are filled with Holocene age alluvial sediments that are primarily derived from the weathering of these adjacent highlands and consist primarily of fine-grained, well-sorted sediments, but also include coarse to gravelly channel, terrace, and alluvial fan deposits at depth (Hendricks, 1985).

The Site is situated in southeastern Arizona at the edge of the Tucson basin, an alluvial basin like those described above that covers roughly 1,000 square miles and is bounded by mountain ranges to the west, northeast and east. Elevations at the Site are between roughly 2,750 and 2,770 feet above mean sea level (ft amsl). Based on the U.S. Geological Survey Tucson, Arizona 7.5' topographic quadrangle, the topography at the Site and the immediate vicinity is relatively flat with a slight regional gradient to the north-northwest, toward the Pantano Wash roughly 2,500 ft away, at about 0.01 ft/ft. The Site is located at the eastern extremity of the Tucson basin, near the toe of the Rincon Mountains roughly three miles to the east. The area between the Site and the mountains, beginning across the Pantano Wash from the Site, is characterized by a sloping, rilled bajada comprised of alluvial materials from the Rincon Mountains.

2.2 Climate

The Site is located in the northern Sonoran Desert, where the climate is characterized as semiarid. The region experiences hot, extended summers and mild winters, with an average annual high temperature of 83°F and an average annual low temperature of 56°F (between 1981 and 2010). Over the same period, daytime high temperatures were typically hottest in June, sometimes exceeding 110°F and averaging 100°F, with overnight lows averaging around 70°F; daytime highs also averaged 100°F in July, but were less likely to exceed 110°F, with overnight lows averaging around 75°F. January and December were typically the coolest months between 1895 and 2010, with daytime highs around 65°F on average and nighttime lows averaging around 40°F (NWS, 2017).

Based on data recorded between 1981 and 2010, total annual precipitation in Tucson averages 11.6 inches, roughly half of which falls during the summer monsoon season (July to September)

in intense thunderstorm events; July and August are historically the wettest months, averaging 2.3 and 2.4 inches of rainfall, respectively. The remaining precipitation falls in late fall and winter storms, which tend to be less severe; average precipitation in December, January and February is 0.9 inches (NWS, 2017).

2.3 Geology

The Site is located near the eastern edge of the Tucson basin, a north- to northwest-trending, relatively large, late Cenozoic extensional basin developed in the upper plate of the Catalina detachment fault (Houser et al., 2005). The basin fill consists of Tertiary and Quaternary age deposits eroded from the surrounding uplifted fault blocks and attaining a thickness of greater than 2,000 feet (Davidson, 1973). Basin-fill sediments unconformably overlie pre-Basin and Range sediments that consist of moderately to highly consolidated deposits that range from clay, silt and claystone to gravel and conglomerate (Anderson et al., 1992). Basin-fill sediments are divided into lower and upper units that are in turn overlain by surficial alluvium. The lower basin-fill deposits generally are finer grained and more consolidated and deformed than the upper basin-fill deposits (Anderson et al., 1992).

Recent surficial alluvium at and around the Site is comprised chiefly of modern floodplain terrace materials and recently or currently active channel deposits (McKittrick, 1988). The alluvium is moderately fine-grained and roughly 25 to 50 ft thick, except in the Pantano Wash channel and floodplain where they are around 100 ft thick (Davidson, 1973).

Recent groundwater monitoring data from the Irvington and Harrison Landfills indicate the depth to groundwater in the Site vicinity is approximately 280 ft bgs (COT, 2017a; 2017b). No wells or borings were installed at the Site as part of Site investigation activities.

3. PREVIOUS INVESTIGATIONS

3.1 1988 Investigation and Results

In August 1988, ADHS conducted dross sampling in several locations along a northwest-southeast transect across HMD-East; exact sample locations and depths are not documented, but approximate locations are provided in Appendix C. Samples were analyzed for metals, and the results indicated levels exceeding health based guidance levels at that time; current rSRLs were exceeded for aluminum, cadmium, copper, lead and thallium (Table 1; ADHS, 1988).

In December 1988, ADEQ conducted soil sampling in multiple locations adjacent to HMD-East. Three samples were collected along each of two transects extending northeast from the northeast edge of the dross pile, and south from the southern edge of the dross pile. Seven additional samples were collected to the north of HMD-East, four immediately north in the apparent path of surface runoff from the pile, one further north, and two most distant to the northwest. Only rough documentation of these sampling locations is available and is provided in Appendix C. Samples were analyzed for metals, and only thallium exceeded its current rSRL, at two location northwest of the HMD-East pile (Table 2; ADEQ, 1989a). In 1988, ADEQ also conducted groundwater sampling at two wells (55-622102 and 55-801508) situated downgradient of HMD-East (Figure 2); metals analysis found no concentrations that exceeded AWQS (Table 3). These wells are located roughly 0.2 and 0.75 mi downgradient (north to northwest) of the Site (ADEQ, 1989a).

3.2 1992 Investigation and Results

In 1992, PDEQ reported on additional dross investigation activities at HMD-East. An XRF measurement of a sample of dross material was recorded (Table 4), and a sample was submitted for laboratory metals analysis (Table 5). The sampling location in relation to the XRF measurement location is unknown. The dross sample was a composite sample depth-integrated to a depth of 1.5 ft below the top of the HMD-East pile. The metals arsenic, antimony, lead, cadmium and copper were recorded at levels in exceedance of the current rSRLs in the XRF measurement; aluminum, arsenic, antimony, lead, cadmium and copper exceeded rSRLs in laboratory results. Assuming the same sample was used for the XRF measurement and the laboratory analyses, the field and laboratory metals concentrations generally showed an acceptable correlation, though barium, molybdenum, selenium and silver were an order of magnitude lower in laboratory results than in XRF results (PDEQ, 1992).

3.3 Preliminary Investigation

Preliminary Investigation (PI) activities were initiated in 2015 and included groundwater sampling of six exempt wells in the Site vicinity in December 2015; field x-ray fluorescence (XRF) analyzer measurements of dross and soil metals content at the HMD-East and HMD-West piles and adjacent areas (including around residences); and confirmatory soil sampling at about 20 percent of XRF measurement locations (ADEQ, 2016; HGC, 2016a).

3.3.1 Groundwater Investigation Results

In December 2015, six exempt wells in the Site vicinity were sampled, including one well located on Property B (55-803959) and one well located on Property D (55-629263). Samples were analyzed for the metals aluminum, arsenic, cadmium, copper, lead, manganese, nickel, tin, zinc, antimony and thallium. Only manganese and zinc were reported above the laboratory detection limit, in one and five of the wells, respectively. No AWQS is established for manganese nor zinc. Figure 2 shows well locations within one mile of the Site parcels; groundwater sampling results from the PI are shown in Table 6.

3.3.2 Soil Investigation Results

3.3.2.1 December 2015

In December 2015, 30 XRF measurements were recorded at the Site at 20 locations on or immediately adjacent to HMD-East and at 10 locations on or near HMD-West (Figure 3). Reported concentrations of antimony, arsenic, cadmium, copper, lead and nickel exceeded rSRLs at multiple locations (Table 7), including locations with visually obvious dross impacts and some without. Lead and copper exceeded rSRLs at one XRF measurement location on the East Berm of the Harrison Hills Wash, outside the boundary of the HMD-West pile.

At eight XRF locations, confirmatory soil samples were collected for metals analysis by EPA Method 6010B for aluminum, arsenic, antimony, cadmium, copper, lead, manganese, nickel, thallium, tin and zinc. Laboratory analysis indicated that rSRLs were exceeded at multiple locations on the HMD-East and HMD-West piles for aluminum (four locations), antimony (three locations, although reported concentrations were below the laboratory practical quantification limit [PQL]), copper (five), lead (five) and cadmium (five) (Table 8). The laboratory data showed a strong correlation with XRF measurement data (Appendix F).

3.3.2.2 January 2016

In January 2016, additional XRF measurements were conducted across Properties A, B, C and D, including the HMD-East and HMD-West piles, as well as in the MHP. On Properties A, B, C and D, XRF measurements were recorded on a grid with roughly 100 ft spacing in the east-west and north-south directions (Figure 3). The grid included measurement locations on the East Berm of the Harrison Hills Wash. Overall, the grid consisted of 130 measurement points, of which 11 were in HMD-East and HMD-West. Within the grid area but not at grid nodes, an additional 33 XRF measurements were recorded at locations chosen by field personnel.

Ten XRF measurements were collected in the driplines and at the corners of each of three residences located on Property B, C and D (Figure 3). Ten XRF measurements were also collected surrounding each of nine homes in the MHP immediately south of HMD-East, and one XRF measurement was collected further south in the MHP (Figure 3).

Antimony, arsenic, cadmium, cobalt, copper, manganese, molybdenum, lead and nickel were measured at concentrations above rSRLs in one or more XRF measurements in Site soils (Table 9).

Of the 11 XRF measurement locations within the dross piles, nine exceeded the rSRL for cadmium, nine for copper, seven for lead, six for arsenic with an additional four where the XRF detection limit was higher than the rSRL, and five for antimony with an additional six where the XRF detection limit was higher than the rSRL.

Of the 272 XRF measurement locations outside of the dross pile, seven exceeded the rSRL for antimony, 20 for arsenic, seven for cadmium, 14 for copper and seven for lead. Manganese was detected at concentrations greater than rSRLs in XRF measurements at only two locations on HMD-East; molybdenum at only one location at HMD-East; and nickel at only one location at HMD-East (Table 9). The XRF detection limit for cobalt was higher than the rSRL at two locations; however, no cobalt XRF measurements had a known exceedance.

Confirmatory soil samples were collected for aluminum, antimony, cadmium, copper, lead and nickel analysis by EPA Method 6010B at 82 of the January 2016 XRF measurement locations (roughly 30 percent); arsenic was also measured in 35 of these samples. Aluminum, arsenic, antimony, cadmium, copper, lead and nickel were reported in confirmatory soil samples above their respective rSRLs (Table 10).

January 2016 XRF lead concentrations were higher than confirmatory soil sample lead results and exceeded or were close to exceeding the rSRL at three MHP locations. In March 2016,

twelve additional soil samples were collected at and within two to four feet of these locations and analyzed for lead. The results (Table 10) showed concentrations below the lead rSRL, consistent with the original soil sample results. These supplemental sample results support the conclusion that lead concentrations at the MHP lots did not exceed the rSRL.

3.3.2.3 Background Soil Sampling

Four background surface soil composite samples were collected from the Harrison Hills state land parcel along the north side of Irvington Road (Figure 4), and analyzed for metals by EPA Method 6010B. All metals analyzed were reported at significantly lower concentrations than the rSRLs (Table 11).

3.3.3 Preliminary Investigation Findings and Recommendations

The PI findings indicated that more dross was present at HMD-East and HMD-West than recognized in earlier investigations and that significant dross was present in the East Berm of the Harrison Hills Wash along the western edge of Property A. The PI also indicated significant COC impacts on Property B, away from the visible dross piles (though possibly contiguous with HMD-West) and near a residence at that location. Figure 5 presents the approximate extent of dross contamination in surficial soils (prior to any excavation activities) based on PI and other sampling activities.

Throughout PI activities, despite the inherently heterogeneous composition of the dross, XRF measurements and corresponding laboratory results were strongly correlated (Appendix F).

The PI Report (ADEQ, 2016) recommended that a WQARF Registry listing package be prepared for the Site. The Addendum to the PI Report (HGC, 2016a) recommended removal of contaminated soils from Property B; stabilization of the berm along the Harrison Hills wash; and capping of HMD-East and HMD-West.

3.4 TCLP Sampling

3.4.1 Scope and Procedures

In May 2016, soil samples were collected from Properties A, B and C, including the HMD-East and HMD-West dross piles, for Toxicity Characteristic Leaching Procedure (TCLP) analysis by EPA Method 1311/6010B and 1311/7471. The TCLP is used to measure the potential mobility of toxic organics and inorganics in liquid, solid and multiphase wastes. The goal of collecting samples from the Site for TCLP analysis was to determine the toxicity characteristic of solid

waste that would be generated by the excavation and disposal of dross and contaminated soils from the Site.

Because the contaminants of concern at the Site are heavy metals, TCLP samples were evaluated for the RCRA 8 metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver. Analyses for VOCs and PAHs were also performed on Property B samples (see laboratory report in Appendix D), as the assumption at the time was that these soils were likely to be disposed of at a solid waste landfill following excavation. No organic chemical analyses were performed for Property A and C samples.

Properties A, B and C were divided into sections for TCLP sampling based on visual and XRF characterization of soil dross content. Sections covered areas of roughly 3,000 to 10,000 square feet (ft^2). Each section was subdivided into four subsections. Soil samples were collected using a hand auger from the top one to two feet at a random location in each subsection. If refusal was encountered on native rock at a depth of less than one foot, a different sampling location was chosen; if refusal was encountered on cohesive dross material, overlying loose dross material was considered representative. A 500 milliliter beaker was filled with a representative sample from the subsection. A composite sample for each section was generated by combining and mixing the four subsection samples, and then resampling the composite material by placing it into a 500 milliliter glass sample jar with a Teflon-lined cap and no preservative. Sample jars were labeled with the appropriate property and section number, and transported by HGC to Turner Laboratories for TCLP analysis.

3.4.2 Results

Based on visual and XRF characterization of soil dross content, composite samples for TCLP analysis were collected from six sections on Property A, six sections around Property B residence and from 12 sections of the HMD-East Pile on Property C.

The TCLP results indicated that material in the HMD-East Pile and around the Property B residence contained cadmium and lead above RCRA limits and, therefore, met the RCRA guidance for being a characteristic hazardous waste. Material in the HMD-West Pile and the East Berm on Property A did not exceed RCRA limits for the RCRA 8 metals and was not considered hazardous for solid waste disposal purposes.

3.5 West Berm Soil Sampling

3.5.1 Scope and Procedures

In May 2016, to determine if COCs from the Site were present, soil samples were collected from the West Berm of the Harrison Hills Wash (Figure 3). Prior visual inspection had indicated the possible presence of dross material and metal chunks. The West Berm is located across the wash from the East Berm. The southern portion of the West Berm is located on Property A, and the northwestern portion is located on Arizona State Land Department land to the west (parcel 136-31-0260).

The West Berm was divided into four sections for soil sampling based on visual characterization of soil dross content. Sections covered areas of roughly 1,000 to 1,200 ft^2. Each section was subdivided into four subsections. Sections are shown on Figure 3.

Soil samples were collected using a hand auger from the top one to two feet at a random location in each subsection. If refusal was encountered on native rock at a depth of less than one foot, a different sampling location was chosen. A 500 milliliter beaker was filled with a representative sample from the subsection. A composite sample for each section was generated by combining and mixing the four subsection samples, and then resampling the composite material by placing it into a 500 milliliter glass sample jar with a Teflon-lined cap and no preservative. Sample jars were labeled with the appropriate property and section number, and transported by HGC to Turner Laboratories for EPA Method 6010B analysis.

3.5.2 Results

Laboratory analyses indicated that no samples exceeded existing rSRLs for cadmium, copper, lead or nickel. Aluminum results for the West Berm (8,000 to 12,000 mg/kg) were below the rSRL (76,000 mg/kg), and generally below those seen in contaminated areas of the Site (up to 160,000 mg/kg). West Berm metals results are summarized in Table 13.

4. EARLY RESPONSE ACTIONS

In 2016, ADEQ began ERA activities that consisted primarily of excavating shallow contaminated materials from Property A (HMD-West and East Berm) and Property B, consolidating them on HMD-East (Property C) beneath a temporary cover of clean material, and backfilling excavated areas with clean fill material.

Figure 6 shows the approximate extent of excavation of dross materials. Soil removal was not expected to eliminate all existing dross from Property B and the HMD-West pile on Property A; rather the intent was to reduce surface exposure to dross and eliminate inhalation hazards. The goal of the Property A East Berm excavation was to remove all dross material from the berm to prevent heavy metals contamination during ephemeral flows in the adjacent Harrison Hills Wash and off-Site migration of dross material. Excavated material was stockpiled on the HMD-East pile on Property C, which was compacted and graded. Clean soil was then placed over the disturbed area of HMD-East and compacted to create a temporary soil cover.

Excavations were conducted to a maximum of two feet bgs on Property B; a maximum of two feet bgs at the HMD-West pile on Property A; and to the maximum depth of dross contamination at the East Berm on Property A (as much as nearly six feet below the base of the berm). Excavations were conducted in sections, which were divided into subsections roughly 500 ft^2 in area. During excavations, XRF measurements was used to screen soil samples from the base of excavated subsections for COCs. XRF monitoring results were used to guide excavation activities. Soil samples were collected at 20 percent of XRF measurement locations and submitted for confirmatory laboratory analysis for metals by EPA Method 6010B. Field notes from ERA activities are provided in Appendix E, and analytical laboratory reports and chain-of-custody forms for confirmation samples are provided in Appendix D. Photo documentation of ERA activities is provided in in the ERA report (HGC, 2016b).

During backfilling, HGC staff followed the Harrison Hills Wash downstream from the Site to its discharge point into the Pantano Wash, roughly 0.5 mile north of the Site. Any dross contamination visible in the Harrison Hills Wash bed or banks was removed by hand, documented and stockpiled on the HMD-East pile (see HGC [2016b] for photo documentation).

Dust was controlled in excavated areas and at the HMD-East pile using water trucks. A Dust Control Permit was obtained from Pima County and is provided in the ERA report (HGC, 2016b). HGC also obtained a Floodplain Use Permit from the City of Tucson for excavation and backfilling activities near the Harrison Hills Wash on Property A. A copy of this permit is provided in the ERA report (HGC, 2016b).

Detailed descriptions of ERA procedures and results are provided below; complete descriptions are provided in the ERA Report (HGC, 2016b).

4.1 Property B

Approximately 2,460 cubic yards (3,845 tons) of impacted soil were excavated from around the Property B residence between July 25 and August 11, 2016. The excavation was conducted to a maximum of two feet bgs, with the goal of removing near-surface dross material. If clean native soil or fill material was encountered above two feet bgs, with no underlying dross found in exploratory digging at greater depth, the excavation ceased. The excavation was, therefore, conducted to depths between eight inches and two feet bgs at Section 1 and to the planned maximum of two feet bgs at all other sections (Figure 7). Excavated material was stockpiled on the HMD-East Pile on Property C. Figure 7 shows the area excavated on Property B, including sections and subsections. The XRF was used to measure metals content of soils at the floor of the excavation. Table 14 presents XRF and confirmation sample results with depths from the base of the excavation.

XRF measurements and confirmation sampling indicated that dross material with metals above rSRLs was still present at the total depth at subsection 6 in Section 1. Copper, lead and cadmium XRF measurements, and the XRF detection limits for arsenic and antimony, exceeded rSRLs at two feet bgs in this subsection. A confirmation sample was collected at Section 1 subsection 6, with analytical results above rSRLs for aluminum (150,000 mg/kg), antimony (31 mg/kg), cadmium (110 mg/kg), copper (17,000 mg/kg) and lead (810 mg/kg).

Dross material was more extensive at Sections 3 through 7, with multiple subsections in each showing dross material with metals measurements above rSRLs at the total excavation depth (two feet bgs). Cadmium, copper and lead exceeded rSRLs (up to 355 mg/kg, 41,227 mg/kg and 2,189 mg/kg, respectively) in XRF measurements at multiple locations in each of Sections 3 through 7. Antimony, arsenic and nickel exceeded rSRLs (up to 247 mg/kg, 124 mg/kg and 2,814 mg/kg, respectively) at multiple locations in these sections, though somewhat less frequently (the XRF detection limit for arsenic and antimony frequently exceeded the rSRLs for these metals). Confirmation samples exceeded rSRLs for aluminum (up to 170,000 mg/kg), antimony (up to 38 mg/kg), cadmium (up to 250 mg/kg), copper (up to 32,000 mg/kg) and lead (up to 1,900 mg/kg) at various locations in Sections 3 through 7.

Clean fill was imported to backfill the excavated areas to the preexisting grade. Fill material was compacted in 12-inch lifts. Backfilling at Property B was conducted while the excavation was ongoing, between July 28 and August 12, 2016. Approximately 1,780 cubic yards (1,830 tons) of

backfill material was delivered to the Site, moved into place, compacted and graded. Approximately 196 tons of one-inch gravel was delivered, moved and spread to cover roughly 35,000 ft^2 of Property B, including the excavated areas and adjacent exposed areas, to depths from one to six inches on August 12 and 15, 2016. The approximate extent of dross-impacted soils remaining under the Property B clean fill is shown in Figure 5.

4.2 Property A

The Property A excavation was conducted in two phases: at the East Berm, and at the HMD-West Pile. Excavated material was stockpiled on the HMD-East Pile on Property C. Figure 7 shows the areas excavated at the East Berm and HMD-West pile, including sections and subsections. Table 14 presents XRF and confirmation soil analytical results with depths for the base of the East Berm and HMD-West pile excavations, respectively.

4.2.1 East Berm

Approximately 1,425 cubic yards (2,227 tons) of impacted soil were excavated from the East Berm between August 12 and 22, 2016. The East Berm excavation was conducted in three sections to a maximum depth of roughly six feet below the local grade (the base of the berm). Figure 7 shows the East Berm excavation area including sections and subsections. The goal of the East Berm excavation was complete removal of dross material from the berm in contact with the Harrison Hills Wash. The deepest and most extensive dross material was present in East Berm Section 3 and the northern portion of Section 2. This metals-contaminated dross material appeared to follow a historical tributary wash channel that was apparently filled with dross material and continued south beneath HMD-West. The excavation was conducted to depths of 1.5 to 5.5 feet below the base of the East Berm in these areas. Dross material was shallower in East Berm Section 1, where the excavation was conducted to depths between one and two feet below the base of the East Berm.

The XRF was used to confirm that material at the base of the excavation was clean (below rSRLs). No dross material with metals above rSRLs remained at the total depth of the East Berm excavation, as indicated by XRF measurements and confirmation sampling. Arsenic exceeded the rSRL at several locations, but at levels (10-11 mg/kg) that are likely to be naturally occurring (Table 14). Table 14 summarizes XRF measurements and confirmation sample results. The placement of clean fill over the excavated area is discussed in the section below in conjunction with the HMD-West Pile.

4.2.2 HMD-West Pile

Approximately 222 cubic yards (347 tons) of impacted soil were excavated from the HMD-West Pile between August 22 and 26, 2016. The HMD-West Pile excavation was conducted in three sections to a maximum of two feet bgs, with the goal of removing near-surface dross material. If clean native soil or fill material was encountered above two feet bgs, with no apparent underlying dross, the excavation ceased. The deepest and most extensive dross material was present in HMD-West Pile Sections 2 and 3. This contamination appeared to follow a historical tributary wash channel that was apparently filled with dross material, and may have continued south across Property B. Figure 7 shows the HMD-West Pile excavation area, including sections and subsections. The XRF was used to measure metals content of soils at the floor of the excavation. Table 14 summarizes XRF measurements and confirmation soil sample results with depths.

The excavation was conducted to depths of eight to ten inches bgs in Section 1 at the southwestern portion of HMD-West. No dross material with metals above rSRLs remained at the total depth of the excavation in Section 1, as indicated by XRF measurements and a confirmation sample (Table 14). The excavation was conducted to depths of 1.5 to two feet bgs in Sections 2 and 3, the northern and southeastern portions of HMD-West.

Dross material with metals above rSRLs remained at the total depth of the excavation on most of Section 2. Cadmium, copper and lead exceeded rSRLs at most Section 2 subsections (up to 192 mg/kg, 23,262 mg/kg and 960 mg/kg, respectively); antimony and nickel were detected above the rSRL at one subsection each of Section 2 (118 mg/kg and 1,617 mg/kg, respectively); detection limits for antimony exceeded the rSRL at all other Section 2 subsections; and arsenic was not detected in most Section 2 subsections, with a detection limit above the rSRL at most subsections. A confirmation soil sample collected from Section 2 subsection 3 exceeded rSRLs for aluminum (92,000 mg/kg), copper (12,000 mg/kg) and lead (530 mg/kg).

Cadmium, copper and lead exceeded rSRLs at all Section 3 subsections (up to 324 mg/kg, 32,161 mg/kg and 1,635 mg/kg, respectively); antimony was detected above the rSRL at two subsections of Section 3 (up to 256 mg/kg); detection limits for antimony exceeded the rSRL at all other Section 3 subsections; and arsenic was not detected in all Section 3 subsections, with a detection limit above the rSRL at all subsections. A confirmation soil sample collected from Section 3 subsection 1 exceeded the rSRL for copper (6,600 mg/kg), and a confirmation soil sample collected from Section 3 subsection 5 exceeded rSRLs for aluminum (99,000 mg/kg), cadmium (64 mg/kg), copper (14,000 mg/kg) and lead (820 mg/kg).

Clean fill material was used to backfill excavated areas to the pre-excavation grade, to grade the former HMD-West area to drain to the north, and to rebuild the East Berm to preserve existing high flow conditions at the Harrison Hills Wash. Grading of fill material in the former HMD-West area created a slight northward slope, to limit the collection of water in this area. The replacement berm was constructed to a maximum of roughly seven feet above the surrounding grade and the ordinary high water mark of the wash; the east side of the replacement berm was gently sloped at around 15 degrees until it matched the grade of the final HMD-West area.

Fill material was compacted in 12-inch lifts. Backfilling and rebuilding of the East Berm, and backfilling of the HMD-West excavation, were conducted between August 29 and September 2, 2016. Approximately 1,130 cubic yards (about 1,716 tons) of backfill material was delivered, moved into place, compacted and graded. Roughly 109 tons of six to twelve-inch rip-rap were delivered and a double layer of rip-rap was used to armor the rebuilt East Berm against erosion.

One hundred and thirty five cubic yards of topsoil were delivered to the Site and spread on the rebuilt East Berm and capped HMD-West pile. The topsoil was blended into the upper approximately two feet of fill material to increase the organic content of the surface soil. The entire area was broadcast seeded with a blend of native grasses and the seeded area was then chained and watered.

The approximate extent of dross-impacted soils remaining under the HMD-West Pile following excavation and backfill is shown in Figure 5.

4.3 Harrison Hills Wash

During backfilling, the Harrison Hills Wash was followed downstream from the Site to its discharge point into the Pantano Wash, roughly 0.5 mile north of the Site. Any dross contamination visible in the Harrison Hills Wash bed or banks was removed by hand, documented, and stockpiled on the HMD-East pile.

Roughly 250 pounds of dross material and dross-related metal chunks, as well as metal pieces that appeared to be normal litter, were removed, nearly all of it south of Millmar Road. Several pieces of metal were recovered in the wash north of Millmar Road, but were likely litter not originating at the Site. Airplane components were evident in the material removed from the wash. Dross material was present in intermittent, partially buried pockets in the bank walls of the wash, as well as accumulated in the wash channel curves and broad areas, where storm flows would lose energy. The ERA report (HGC, 2016b) provides photos showing dross material removed from the Harrison Hills Wash.

4.4 HMD-East Pile

Roughly 4,100 cubic yards (6,420 tons) of dross material and dross-impacted soil excavated from other areas of the Site were stockpiled on the HMD-East pile. This material was spread, compacted and graded on the HMD-East pile as it was delivered throughout excavation activities. During this process, as the HMD-East pile gained height, stable slopes were maintained at the edges of the pile.

At the conclusion of excavation activities, approximately 1,100 cubic yards (about 1,716 tons) of clean fill material were delivered to the Site to create a temporary soil cover over the HMD-East pile. The cover material was spread, compacted and graded across the HMD-East pile, including on the sloped edges. The soil cover was applied to a thickness of about six to nine inches. The finished maximum height of the HMD-East pile with temporary cover was roughly six feet above the surrounding grade. Photos of ERA activities at the HMD-East pile, including dross stockpiling and grading, and soil cover application and grading, are provided in the ERA report (HGC, 2016b). An aerial view of the temporary cover following ERA activities is provided in Figure 8.

5. REMEDY IMPLEMENTATION

5.1 WQARF Listing

The Site was added to the WQARF Registry on April 3, 2017. Pursuant to AAC R18-16-403(A) and R18-16-404(C), for a remedy that is completed in less than 180 days of listing, a scope of work, a fact sheet, a community involvement plan and other community involvement activities described in R18-16-404(C) are not required.

5.2 Remedy Determination

Consolidation of dross material and installation of an engineered cap was determined to be the remedy for the Site, based upon best engineering judgment. The HMD-East engineered cap remedy was based on preventing exposure from COC migration off the HMD-East footprint by wind or water, including severe wind and precipitation events, and limiting infiltration of rainwater through the cap and thus protecting groundwater quality.

5.3 Consolidation of HMD-East Margins and East Tail

Prior to engineered cap construction on the HMD-East, materials from the HMD-East margins and the East Tail were consolidated onto the HMD-East. Between April 3 and April 20, 2017, MP Environmental Services (MPE) conducted excavation activities on the HMD-East East Tail, with oversight by HGC. The goal of the East Tail excavation was to completely remove dross material to a depth of 2 ft bgs from the portion of HMD-East closest to a residence on Property C, followed by importing of clean fill. A dust control permit was obtained from Pima County for all excavation and grading activities (Appendix H).

Clearing and grubbing of vegetation and debris from the margins of the main HMD-East pile, and consolidation of marginal, surficial dross onto the main pile, were conducted on April 11, 12 and 14, 2017.

Dross and dross-contaminated soil excavated from the East Tail was stockpiled on the southeastern portion of the HMD-East pile main body and used to bring the surface of this portion of the pile up to roughly the same grade as the rest of HMD-East. Surficial dross material along the margins of HMD-East, likely derived from erosion of the main pile, was scraped back onto the main pile.

During the East Tail excavation, an XRF was used to screen soil samples for COCs and to guide excavation activities (Figure 9; Table 15). Soil samples were collected at about 20 percent of

XRF reading locations and submitted for confirmatory laboratory analysis for metals by EPA Method 6010B (Table 15). After the East Tail excavation and backfilling, XRF measurements were recorded on the margins of the excavation to determine the extent of any shallow dross materials remaining.

Based on these XRF data, on April 11 and 12, 2017, the East Tail excavation was expanded to the south where soils were removed to two ft bgs, and in the northwestern corner where the excavation pit was deepened to two ft bgs. Arsenic concentrations slightly elevated above the rSRL were not deemed cause for deepening the excavation where observed, as visual inspection suggested native material which can contain slightly elevated arsenic. The final excavation footprint is shown on Figure 6. Small, known areas of dross contamination were left in place along the southern edge and at the southeast corner of the East Tail area; this decision was made to avoid impacting the MHP retaining wall south of the East Tail area and an overhead powerline running along the southern edge of the East Tail area.

The excavated area was backfilled to the previously existing grade with imported clean fill material compacted in six-inch lifts between April 6 and April 12, 2017. Backfill soil was emplaced, compacted and graded by MPE between April 11 and 14, 2017.

A six-inch temporary cover of clean fill material was emplaced on the southeastern portion of the HMD-East pile where material excavated from the East Tail had been stockpiled. To the extent possible, clean fill material was scattered atop those limited areas of dross contamination left in place. Upon completion of backfill, the East Tail area was hand broadcast-seeded with a native seed mix obtained from Granite Seed Arizona, chained and watered by MPE.

On April 20, 2017, an additional 16 XRF measurements were recorded along the southern margin of the finished East Tail area (Figure 10). Of the eleven XRF measurements recorded outside the excavated area, five showed at least one COC above the rSRL (Table 15). All of these measurements were recorded in the roughly two feet of space between the MHP retaining wall and a barbed wire fence that parallels it. The excavation did not extend to this area, despite visual dross impacts, due to the presence of the barbed wire fence, the retaining wall and an overhead powerline. Figure 5 presents the approximate extent of surficial dross-impacted soils (denoted in pink) remaining in this area.

5.4 HMD-East Engineered Cap

5.4.1 Engineering Design

On April 15, 2017, RES Land Surveys, Incorporated (RES) was retained to conduct a topographic survey of the HMD-East pile prior to installation of the engineered cap. The goal of the topographic survey was to provide a detailed picture of existing drainage at HMD-East, and to inform the design of the engineered cap and the quantity and placement of imported material required for the engineered cap. The detailed elevation survey resulted in a contour interval of 1 ft and included the temporary cover of the HMD-East pile, the East Tail area, and nearby property boundaries. The topographic survey map is provided in Appendix I.

Lishner CAD Design, LLC (Lishner) was retained to collaborate with HGC engineering staff on the design of the engineered cap for HMD-East.

The engineered cap design has the following features:

- On the eastern, southern and western sides of the pile, side slopes with a more gradual gradient than was previously present on the dross pile, cross-ripped to retard surface flow;
- On the northern side slope, where historically the most severe surface runoff was observed, a rock apron consisting of six- to 12-inch rip-rap overlying a geotextile fabric atop clean fill material;
- A 1 percent grade to the north and an inverse crown along the long axis (south-north) of the main body of the dross pile, to prevent pooling of precipitation on the pile and side slope runoff of precipitation incident on the upper surface of the soil cap to the west or east, instead funneling the majority of runoff to the rock apron;
- A soil cap thickness of at least two ft, compacted in one ft lifts (to 85 to 90 percent of maximum dry density), to retain infiltrating moisture for a period long enough to maximize evapotranspiration; and
- Organic material worked into the upper six inches to one ft of the cap material, and native seed mix broadcast-seeded across the cap.

The final engineered cap design is provided in the Grading and Drainage Plan in Appendix J.

5.4.2 Cap Construction

The engineered cap was constructed by MPE between May 22 and June 8, 2017, with HGC providing oversight. During the construction of the engineered cap, the engineering design plans were used to survey in the emplacement of cap materials.

Approximately 2 ft of clean fill material was emplaced over the entire HMD-East cap, with compaction and grading throughout the process, to generate a soil cap as described in Section 5.4.1. Additionally, the previously-placed temporary soil cover increased the total cap thickness to greater than 2 ft. A rock apron was constructed between June 7 and June 8 by manually laying the geotextile fabric and laying the rip-rap by hand and with the front loader. On June 8, organic topsoil was blended with a mixture of native grass seed within the upper portion of the cap material and the entire cap was watered to set the cap materials in place and to establish the seed.

The approximate extent of dross-impacted soils remaining under the HMD-East and East Tail cap is shown in Figure 5.

Field notes from remedial action activities are provided in Appendix E, and analytical laboratory reports and chain-of-custody forms for confirmation samples are provided in Appendix D. Photo documentation of remedial action activities is provided in Appendix G.

An as-built diagram of the final engineered cap for HMD-East is provided in Figure 11.

5.5 Additional XRF Measurements

Subsequent to completion of the engineered cap, a final round of XRF measurements was taken along the southern edge of the HMD-East pile where no excavation or cover activities had occurred (Table 16). These XRF measurements were used to assist in risk evaluation calculations (Section 8) of COC contamination remaining following remedial activities.

Overall, the area characterized by the additional XRF measurements showed little contamination by COCs (see Figure 5).

6. LAND AND WATER USE

This section summarizes information regarding the current and reasonably foreseeable future uses of land or waters that have been or could be impacted by a contaminant release, pursuant to A.A.C. R18-16-406 (D). Reasonably foreseeable future land uses are those that are likely to occur at the Site. Reasonably foreseeable future uses of water are those that are likely to occur within 100 years, unless a longer time period is shown to be reasonable based on site-specific circumstances. Evaluation of water use is not required for the RI, pursuant to A.C.C. R18-16-406 (D)(1), as there are no current or threatened impacts to waters of the state from this Site.

Land use information was obtained from publicly available environmental and municipal databases and from reports and planning documents generated by relevant municipalities, government agencies, and utilities. Land use questionnaires were sent to relevant entities in order to obtain current information and responses, and are included with the Land and Water Use study (LWUS) in Appendix B.

6.1 Land Use

6.1.1 Planning and Zoning

Land use within the study area consists of low-density residential properties, in compliance with COT zoning (COT, 2013a; Pima County, 2017). Figure B.2 of the LWUS presents COT zoning for parcels within the Site, as well as the immediately surrounding area. The following COT zoning categories are representative of the study area and its immediate vicinity:

- SR – Suburban ranch
- RX-1 – Low density residential
- MH-2 – Medium density residential, mobile homes

At the current time, 100 percent of the land within the study area and within the Site is zoned for suburban ranch use. The MHP adjacent to the south is zoned MH-2, and smaller parcels immediately surrounding the study area are zoned RX-1, for lower-density mobile home residential (MH-1) and suburban residential (RX-2) uses. Moving further from the study area, SR zoning continues to dominate, along with low or medium density residential zoning (Figure B.2 of the LWUS). Small patches of commercial zoning are present along the Houghton Road and Irvington Road corridors. Southeast of the study Area, across Houghton Road and upgradient along the Pantano Wash, the Civano Master Planned Area Development is present.

6.1.2 Current and Projected Land Use

6.1.2.1 Current Land Use

Property A is a single 5-acre parcel (136-31-0130) consisting of open land with no structures, with the Harrison Hills Wash along its western edge and the northern portion of the HMD-West dross pile located on its southwestern corner. The Harrison Hills Wash was re-routed from its historical course across the southwestern portion of Property A as part of the development of Property B. Property A is utilized by the property owner for grazing and firewood harvesting. HMD-West dross materials were removed from Property A, up to two ft bgs, as part of ERA activities in 2016 and consolidated onto HMD-East. Dross materials present in the east berm of the Harrison Hills Wash on the western portion of Property A were completely removed as part of ERA activities in 2016 and consolidated onto HMD-East (HGC, 2016b).

Property B is a single 5-acre parcel (136-31-0140). The Harrison Hills Wash was re-routed from its historical source across the western portion of Property B when Property B was developed with a residence and rodeo grounds in the late 1960s. Historical aerial imagery suggests that surface development of this property, which includes a residence and structures and land areas associated with horse husbandry, has remained similar since at least 1972 (NETROnline, 2016). The Harrison Hills Wash currently runs along the western margin of Property B. The residence present on the western portion of Property B was found to rest atop dross material that may have been contiguous with HMD-West (ADEQ, 2016; HGC, 2016a). Dross materials associated with HMD-West on Property B were removed to a depth of two ft bgs and consolidated onto HMD-East as a part of ERA activities (HGC, 2016b). The land owner reported that Property B is currently utilized for residential uses and for equestrian boarding and training (Appendix B).

Property C is a single 5-acre parcel (136-31-0160) consisting of open land with multiple structures, and is utilized by the property owner for swine farming and residential uses as well as the storage and dumping of building and landscaping waste materials. Dross materials from HMD-West (Property A) and from the southeastern portion of HMD-East (Property C) were consolidated onto the main HMD-East pile (Property C), and a temporary cap of clean fill installed, as part of 2016 ERA and 2017 remedial activities (HGC, 2016b).

Property D is a single 5-acre parcel (136-31-0150) consisting of open land and multiple structures associated with swine farming and residential uses. Dross materials are not known to have been emplaced on this parcel and the impact from Property C dross pile runoff has been minimal (HGC, 2016a).

The land owner reported that Properties A, D and C are currently utilized for residential and agricultural purposes (Appendix B).

6.1.2.2 Projected Land Use

Future land use at the study area and Site is anticipiated to remain the same as it is currently, i.e., a mixture of low-density residential and small-scale agricultural uses. At present, the land owners of Properties A, B, C and D do not plan to to add structures to or otherwise develop these properties, or sell the properties in the foreseeable future.

The COT's population was 524,295 in 2012, grew by roughly 7 percent between 2000 and 2010 (COT, 2013b), and is expected to grow by more than 50 percent by the year 2050 (ADES, 2013). Both residential and commercial densities in the COT are expected to increase in intensity in an effort to accommodate this growth. In the 2013 COT General & Sustainability Plan's future growth scenario, much of the area surrounding the study area, despite its low density, is designated as an existing neighborhood, considered to be largely built-out with minimal new development expected with the goal of maintaining the existing character of the neighborhood (COT, 2013b).

Significant development may occur to the southeast of the study area along Houghton Road, where mixed-use and master-planned development is to be given priority. Infill development west of the study area across Harrison Road will also be promoted, with the goal of creating a more urban environment. The COT has also flagged unincorporated areas east of the study area as targets for potential future annexation (COT, 2013b). Provided that remedial actions will mitigate the potential for off-Site migration of contamination, future growth and development is not expected to be impacted by contamination at the Site.

6.2 Water Use

Groundwater sampling of private wells within the Site area showed no impacts to groundwater quality from Site contaminants. Residences in the Site vicinity are within the City of Tucson (COT) drinking water system service area (COT, 2011). Despite this fact, some residences are not currently served by the COT and obtain water for domestic use from private wells. ARS § 45-454(C) states that on or after January 1, 2006, drilling of a private well on land within 100 feet of the operating water distribution system of a municipal water provider within the boundaries of an Active Management Area (AMA) is prohibited. Therefore, future development of private wells at the Site is unlikely. Existing water supply wells identified from within a one-mile radius of the Site are summarized in the LWUS (Appendix B).

6.3 Potential Sensitive Receptors

Four potential sensitive receptors have been identified within approximately 1.0 mile of the Site. These include one public school, two special needs schools/child care centers, and one mountain bike trail park. Figure 2 shows the potential sensitive receptors located within 1.0 mile of the Site. Table 17 provides a list of potential sensitive receptors located within 1.0 mile of the Site.

Secrist Middle School, part of the Tucson Unified School District, is located roughly 1.0 mile northeast of the Site across Pantano Wash. Angels in Autism, LLC, and Horses with Wings, organizations that provide services for children with special needs, are located roughly 0.6 mile east-southeast of the Site at the northeast corner of the intersection of Houghton and Irvington Roads. The Fantasy Island Mountain Bike Park is located roughly 0.4 mile south to southwest of the Site across Irvington Road on Arizona State Trust and City of Tucson land adjacent to the Irvington landfill. The Fantasy Island Mountain Bike Park is included as a potential sensitive receptor due to its popularity, and the fact that users are potentially more vulnerable to airborne dust.

7. CONCEPTUAL SITE MODEL

7.1 Material Properties

Aluminum dross is a mixture of aluminum, aluminum oxides and other impurities that result from fluxing aluminum oxide film out of the metal before pouring the mold for aluminum metal-casting. All forms of aluminum dross contain aluminum carbides and nitrides, as well as small globules of aluminum alloy. Dross obtained from primary melting operations (so-called "white dross") consists primarily of aluminum oxide (with some oxides of other alloying elements such as magnesium and silicon) that may contain from 15 to 70 percent recoverable metallic aluminum (Hwang et al., 2006). Analysis of aluminum white dross indicated crystalline phases of 77.8 percent aluminum, 7.3 percent corundum (Al_2O_3), 10.2 percent spinels ($MgAl_2O_4$), 1.8 percent diaoyudaoite ($NaAl_{11}O_{17}$), and 2.9 percent aluminum nitride (AlN) (Gómez *et al*., 2008).

Dross from secondary smelting operations (so-called "black dross") typically contains a mixture of aluminum/alloy oxides and slag that frequently shows recoverable aluminum contents ranging from 12 to 18 percent (Hwang *et al*., 2006). Aluminum salt slag (also known as aluminum salt cake), which is produced by the secondary aluminum industry, is formed during aluminum scrap/dross melting and contains 15 to 30 percent aluminum oxide, 30 to 55 percent sodium chloride, 15 to 30 percent potassium chloride, 5 to 7 percent metallic aluminum, approximately 2 percent cryolite (aluminum sodium fluoride) and other impurities (carbides, nitrides, sulfides and phosphides) (Tsakiridis, 2012).

Available information indicates that the origin of the dross at the Site was from secondary smelting operations in the 1960s that recovered metals from obsolete aircraft parts (ADEQ, 2015; Toeroek, 2017). The character of the material observed at the Site is a gray ash-like substance interspersed with metal pieces and is consistent with black dross and aluminum salt slag. Elevated concentrations of aluminum, antimony, arsenic, cadmium, copper, lead and nickel are consistently present in both the dross and contaminated soils at the Site.

7.2 Extent of Contamination

The dross was placed primarily in two piles on the east and west parts of the Site. The HMD-East dross pile on Property C (Figure 7) is the largest, measuring approximately 300 by 300 ft; the area of the HMD-West dross pile on Property B (Figure 6) was smaller, measuring approximately 30 by 100 ft. The area of Property B south of the HMD-West pile is also impacted. Dross chunks were also found within the Harrison Hills wash and elevated metals

concentrations in soil were found north of the HMD-East pile on Property D, presumably transported by stormwater in both areas.

Anecdotal and physical evidence suggests that the dross historically was used to reroute stormwater flow at various locations. A tributary of the Harrison Hills wash was re-routed on the western portion of Property B when the property was developed (NETROnline, 2016) and the former channel apparently filled with dross material; a dross-filled former wash channel was uncovered during the ERA excavation (HGC, 2016b).

The residence on the western portion of Property was built on top of significant dross material (Toeroek, 2017). Historical aerial imagery suggests that development of this property, which includes a residence together with structures and land areas associated with horse husbandry, occurred in the late 1960s and has remained similar since at least 1972 (NETROnline, 2016).

No contamination was observed immediately surrounding the two residences on Properties C and D. Significant contamination was observed across the western portion of Property B, though not immediately surrounding the residence located in this area. During the ERA excavation on Property B, subsurface COC contamination on this property was found to be more extensive and severe than that observed on the surface.

Inspection of the Harrison Hills wash along and downstream of the Site to its terminus at the Pantano Wash, roughly 3,200 ft north of the Site, indicated that migration of dross materials into the Harrison Hills wash was mostly limited to an area immediately adjacent to HMD-West, and that no significant off-Site migration of dross material has occurred.

The HMD-East pile does not appear to have historically extended to the south onto the area currently developed as the MHP (Toeroek, 2017). This suggests that the small area of known dross contamination that remains to the south of the HMD-East and the East Tail does not extend beneath the MHP.

7.3 Contaminants of Concern

The contaminants of concern (COCs) for the site are metals and no organic chemicals are of consequence. The COCs are identified based on their presence in soils at concentrations greater than their respective soil remediation levels (SRLs) as defined in Arizona Administrative Code (A.A.C.) R18-7-203. Metals reported at concentrations exceeding residential soil remediation levels (rSRLs) and identified as COCs, include:

- Aluminum (Al)

- Antimony (Sb)
- Arsenic (As)
- Cadmium (Cd)
- Copper (Cu)
- Lead (Pb)
- Nickel (Ni)

Aluminum, cadmium, copper and lead are consistently present at elevated concentrations; elevated concentrations of antimony are common, but somewhat less frequent, and arsenic, manganese and nickel are occasionally elevated. Manganese is not included as a COC since a concentration exceeding the rSRL was only encountered in a few measurements.

In addition, previous sample results (ADHS, 1988; ADEQ, 1989a) indicated thallium (Tl) concentrations exceeding the rSRL (5.2 mg/kg) from both dross (35 mg/kg) and soil (140-254 mg/kg) at various locations. Reporting limits were elevated for many samples in subsequent analyses. While thallium is likely present and a COC, it's distribution would be consistent with the other identified COCs.

7.4 Transport and Exposure Pathways

The dross material *per se* is relatively immobile, with the exception of potential channel erosion of the berm along Harrision Hills wash during flood events, and the primary potential for exposure would be through direct handling of the dross that might transfer contaminants from the dross surface to the hands and potentially result in dermal adsorption or incidental ingestion. The associated aluminum salt cake is an ash-like material that is subject to physical transport by water and wind erosion.

Soils associated with the dross contain contaminants transferred from the dross material by leaching and weathering. Potential for exposure would be through dermal adsorption or incidental ingestion associated with direct contact with the soils, or through inhalation and incidental ingestion of wind-blown dust (particulates). The actual exposure through inhalation is strongly dependent on the particle size of the wind-blown material. Wind-blown particulates can also accumulate in surficial materials (soils) and on surfaces of adjacent properties, leading to potential dermal adsorption or incidental ingestion associated with direct contact.

The prevailing wind direction in the vicinity of the Site is from the southeast and south with wind speeds most commonly in the range of 4-13 miles per hour (Figure 12). This indicates that transport of any wind-blown particulates is predominantly to the northwest and north. However,

wind direction and speed is variable and wind-blown particulates could impact any of the surrounding properties at various times.

Sediment transport with runoff from the dross piles can redistribute contaminants to adjacent surficial soils. Direct transport of dissolved contaminants leached from the dross material in runoff is unlikely to be of consequence due to the typically short durations of rain events producing surface runoff and kinetic limitations on contaminant dissolution from the dross. Sediment transport is reflected by the observed elevated metals concentrations in soil to the north of HMD-East pile. The engineered cap on the HMD-East pile is designed to shed water, primarily to the north into the rock apron, and to resist erosion of cap material and the exposure of buried dross material (Figure 10).

Surface water flow is to the north. The Site is drained by Harrison Hills wash, an ephemeral stream channel located on the west side of the Site that flows north. The wash flows with heavy precipitation with a maximum discharge of between 500 and 1,000 cubic ft per second (cfs) (ADEQ, 2016) and the channel is deeply incised. Harrison Hills wash is adjacent to the HMD-West dross pile and is located approximately 750 ft west of the HMD-East dross pile. Transport of dross material by stream channel erosion during flood events has been observed to impact the HMD-West dross pile and could become significantly more important as the stream channel morphology changes with lateral erosion of the channel during future flood events. The removal of all apparent dross material from the East Berm of the Harrison Hills wash and armoring of the reconstructed East Berm with rip-rap has reduced the potential for floodwaters to interact with dross materials, as has the burial of remaining HMD-West dross materials beneath two ft of clean fill.

While minimum groundwater protection levels (GPLs) are exceeded for several of the site COCs, no leaching to groundwater at the Site has been found or is suspected. The potential for contaminant leaching and migration to groundwater at the Site in the future is low. Depth to groundwater in the vicinity is approximately 280 ft bgs and groundwater flow is to the northwest (COT, 2017a; 2017b). Groundwater recharge is not significant in the central parts of the basin; average precipitation is 11.6 inches, while average annual standardized potential evapotranspiration for Tucson is 68.2 inches (Brown, 2005), exceeding precipitation by a factor of about six. This indicates that net soil moisture fluxes are upward. The installation of the engineered cap over the HMD-East dross pile, as well as the covering of dross material with clean fill on Property A, Property B and the East Tail, will increase the residence time of infiltrating precipitation in shallow soil and increase evapotranspiration before it contacts dross material, further reducing the potential for contaminant leaching.

Based on available private well data, there have been no groundwater impacts from Site contaminants. The most likely potential groundwater impact related to the dross would be nitrate derived from the nitrification of ammonium generated by hydrolysis of aluminum nitride in the dross. Other readily leachable constituents from aluminum dross include chloride, potassium, and sodium, and any impact to groundwater would be expected to be associated with an increase in electrical conductivity reflecting elevated total dissolved solids. Leaching of COC metals by soil moisture contacting the dross material is unlikely to be significant due to the typically alkaline nature of leachate solutions (Li *et al*., 2012) which would generally result in reduced dissolution of metals. Additionally, metals concentrations would be expected to be significantly attenuated during transport through the thick vadose zone below the Site.

The areas of known dross contamination remaining at the surface on the south side of HMD-East between the dross pile and the MHP retaining wall remain subject to physical transport by wind and runoff. However, these areas are sheltered by the retaining wall and by fairly heavy vegetation, which stabilizes these materials against erosion. In addition, the topography is quite flat in this area, and runoff will be contained between the rise of the HMD-East pile and the barrier of the MHP retaining wall.

7.5 Potential Receptors

Potential receptors for exposure to contaminants from the Site include surface water, , on-site and off-site residents, and on-site livestock.

7.5.1 Surface Water

The Harrison Hills wash represents the only surface water body likely to be impacted by contamination from the Site. During PI and ERA activities, dross material and metal pieces associated with the dross were observed along the Harrison Hills Wash where it runs on the western edge of Property A. These materials were primarily in the East Berm, which was excavated and rebuilt with rip-rap-armored clean fill material during the ERA.

7.5.2 Residents

Two households occupy the Site properties (Properties A, B, C and D). The MHP is located immediately south of Properties B and C, and represents the most densely developed residential area near the Site. Less-dense residential properties border the Site properties to the north. Therefore, potential receptors include both children and adults in a residential setting.

7.5.3 Livestock at Site Properties

As described in Appendix B, Property D and potentially portions of Property A are utilized by the property owner for raising swine. The hogs eat a mixture of feed and forage and may have been exposed to COCs from the HMD-East pile, which is adjacent to their pasture, via direct contact with dross-contaminated soil or water, inhalation of airborne dross particulates, the ingestion of water or forage containing COCs from HMD-East runoff, or even the ingestion of solid dross chunks. However, the hogs are generally confined to areas of Property D on which no COC contamination was observed during PI activities and, therefore, are unlikely to have been exposed to levels of COCs necessary to risk exposing humans consuming them. In addition, according to anecdotal information from the property owner, the pigs are primarily sold for show and not for human consumption.

8. EVALUATION OF HUMAN HEALTH CONCERNS

The objective in the WQARF program is to evaluate potential human health concerns associated with the Site which will support decision-making regarding appropriate remedial actions. This evaluation identifies relevant human receptors and exposure scenarios; evaluates potential exposures; and characterizes human health concerns associated with Site-related chemicals through a comparison to relevant promulgated Arizona standards for groundwater and soil and risk-based screening levels calculated for soil vapor. Evaluation of ecological receptors is not included as none are suspected.

Characterization of the exposure setting is based on an evaluation of current land and water use in the vicinity of the Site. Land use in the area of the Site includes residential settings; potential receptors including residents, and agricultural and ranching help are therefore identified. The impacted media is restricted only to soil.

The identification of potentially complete exposure pathways is based on the following four components: 1) a source and mechanism of chemical release, 2) a retention or transport medium, 3) an exposure point (i.e., a setting where potential human contact with the chemical-affected medium or media occurs), and 4) a route of exposure at the exposure point (e.g., ingestion). A complete exposure pathway is present when all four of these components are present.

As the remedial action for the Site is already in place, for the purpose of this risk evaluation the conditions prior to any remedial action being taken (prior conditions) and residual conditions after remediation (residual conditions) are compared. Contaminant concentrations from all areas prior to remedial actions being implemented provided the basis for necessary remedial actions. Contaminant concentrations from areas that were not, or could not be, addressed by remedial action activities provide definition of risk reduction achieved and residual health risk from the remaining potential exposures.

The COCs are metals and metalloids that are also naturally occurring in soils. Background soil concentrations from the vicinity of the Site (Table 11) indicate that the COCs are not present at levels exceeding the rSRLs.

8.1 Data Evaluation

The correlation between portable XRF measurements and laboratory measurements for the COCs was evaluated to determine suitability of the XRF data for use in risk evaluation (Appendix F). “Less than” values for laboratory measurements were set to the reporting limit; those for portable XRF measurements were set to the instrument limit of detection. The linear

correlation ranges from relatively poor (e.g., antimony R=0.26) to reasonably strong (e.g., cadmium R=0.86) based on the complete data sets for each COC. The relatively poor correlations for arsenic, antimony and nickel are influenced by notable outliers in the data sets, and when these points are removed the correlations improve by a factor of almost two. In general, the limits of detection for the COCs from the portable XRF measurements exceeded the corresponding laboratory reporting limits from confirmatory samples. Inclusion of "less than" values from both laboratory and XRF data also biases the correlations for arsenic, antimony and nickel. In general, the portable XRF measurements for all COCs tend to overpredict concentrations compared to laboratory data making use of these data conservative in terms of comparision with SRLs. Based on the forgoing discussion, the portable XRF measurements appear adequate for use in risk evaluation.

8.2 Groundwater Use

Consumptive use of groundwater is not considered a complete exposure pathway of concern at the Site. Groundwater sampling conducted at wells located on or near the Site showed that groundwater concentrations of COCs were not elevated and none exceeded the relevant AWQS.

8.3 Soil Direct Contact

The SRLs do not include consideration of inhalation exposure of particulates. Airborne particle size is important for evaluating inhalational exposure to particulates by delineating potential penetration depth of the respiratory tract, with the PM_{10} (particles with a nominal mean aerodynamic diameter ≤ 10 µm) and $PM_{2.5}$ (particles with a nominal mean aerodynamic diameter ≤ 2.5 µm) fractions generally considered most significant. Larger particles can be inhaled, but are typically trapped in the upper portion of the respiratory tract where they can be subsequently ingested. Since no airborne particulate data are available for the Site, potential inhalational exposure cannot be evaluated directly.

8.3.1 Prior Conditions

Under the prior conditions when characterization activities were undertaken at the Site, the dross material in the piles was exposed at the surface and contaminated surficial soil was present. The potential for generation of wind-blown dust from the dross material was high. Residents occupying the Site properties (Properties A, B, C and D) could be exposed to COCs by incidental ingestion or dermal contact through direct contact with dross material, as well as inhalation or incidental ingestion of airborne particulates. Potential exposure for off-Site residents of the MHP and residential properties to the north of the Site would primarily be through inhalation or

incidental ingestion of airborne particulates. The MHP is elevated above the Site properties behind a retaining wall roughly six ft in height, and thus was not at risk of being impacted by surface runoff from the Site.

Data collected during PI activities showed no apparent contamination attributable to the Site in surficial soil surrounding several MHP residences immediately south of HMD-East and little to no apparent contamination in surficial soil on the northern and eastern portions of Property A and on Property D that border residential properties to the north of the site.

8.3.2 Current Conditions

Residual dross material is present at depths of >2 ft bgs in the excavated areas of the Site that are now covered with clean backfill material. Residual dross material associated with the HMD-West and HMD-East piles is still present, but is now capped with at least two ft of clean material. These excavated and/or capped areas (Figure 6) are effectively "clean" since the potential for exposure through direct contact with the contaminants has been eliminated and no complete exposure pathway currently exists. Residual risk is associated with the excavated and/or capped areas of the Site should the soil cap material be breached either deliberately or by erosion.

The area of the East Tail and along the southern margin of the HMD-East pile was not accessible during remediation activities and residual dross material remains at the surface in these areas, although clean fill was broadcast over the residual dross where possible. Available data indicate that residual health risk associated with these areas is minimal with COC concentrations exceeding rSRLs present in less than 10 percent of samples (Table 16).

8.4 Surface Water

Migration of dross materials into the Harrison Hills wash was observed to be mostly limited to an area immediately adjacent to HMD-West, with no significant off-Site migration appearing to have occurred. Based on data collected during the ERA, the East Berm excavation effectively removed dross material from contact with flow in the Harrison Hills wash channel. The reconstruction of the East Berm with clean fill armored with rip-rap presents a significant barrier between flow in the wash and remaining dross material at HMD-West. The HMD-West excavation capped remaining dross materials with two feet of clean fill, and the surface grade developed on the finished cap drains to the north, parallel to the wash but separated from it by the East Berm. Combined with the native vegetation seeded across the excavated area near the wash, these factors should prevent any migration of dross materials into the Harrison Hills wash and off Site.

9. CONCLUSIONS

The Site consists of two distinct areas that originally contained the HMD-West and HMD-East aluminum dross piles. Figure 5 presents the approximate extent of dross contamination in surficial soils prior to excavation activities; the approximate extent of dross-impacted soil remaining under clean fill after excavation activities; and the remaining dross-impacted surficial soils after ERA and remedial activities. The primary COCs for the Site include the metals aluminum, antimony, arsenic, cadmium, copper, lead and nickel in soils at levels above Arizona rSRLs. The study area encompasses approximately 20 acres including the Site; surrounding areas on Properties A, B and C; and Property D (Figure 1). Several private residences are located on Properties B, C and D. Harrison Hills wash, an ephemeral stream with peak discharge between 500 to 1,000 cfs, is located along the western edge of the Site immediately adjacent to HMD-West.

Current land use in the vicinity of the Site is a mixture of low-density residential and small-scale agricultural uses and this is unlikely to change in the foreseeable future. Multiple exempt groundwater wells are present in the Site vicinity; however, groundwater has not been impacted by the Site and is unlikely to be impacted in the future. Evaluation of water use is not required for the RI, as there are no current or threatened impacts to waters of the state from this Site.

Potential exposure pathways of concern involve direct contact with the COCs in dross material or contaminated soils, primarily through inhalation and incidental ingestion of wind-blown dust.

The ERA and remedial action activities mitigate the risks to residents of the Site properties, but care should be taken to inform the residents of the location and depth of dross materials remaining at depth or beneath the engineered cap. Digging activities undertaken by the residents could risk exposure. In addition, dross materials are known to remain at the surface along the southern edge of the former East Tail area, near the Property C southern boundary and the MHP retaining wall. These materials are limited in extent, but could still present a risk to residents of the Site properties via direct contact.

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11. LIMITATIONS

The opinions and recommendations presented in this report are based upon the scope of services and information obtained through the performance of the services, within the schedule and budget as agreed upon by HGC and ADEQ. Results of any investigations, tests, or findings presented in this report apply solely to conditions existing at the time HGC's investigative work was performed and are inherently based on and limited to the available data and the extent of the investigation activities. The content and level of detail reflected in this document is as specifically directed by ADEQ and HGC makes no representation of its completeness. No representation, warranty, or guarantee, express or implied, is intended or given. HGC makes no representation as to the accuracy or completeness of any information provided by other parties not under contract to HGC to the extent that HGC relied upon that information. Figures produced by other contractors have been presented "as is" in this report using HGC's logo and with the source referenced appropriately. HGC makes no representations regarding the accuracy of the depicted data in those figures. This report is expressly for the sole and exclusive use of ADEQ and for the particular purpose that it was intended. Reuse of this report, or any portion thereof, for other than its intended purpose, or if modified, or if used by third parties, shall be at the sole risk of the user.

TABLES

TABLE 1
Dross Sampling Results, August 1988
Harrison Rd and Millmar Rd Dross Site
Tucson, Arizona

Sample ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium*	Cobalt	Copper	Lead	Lithium	Manganese	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
	[mg/kg]																	
GA-01	12,000	<10	<10	790	20	**85**	1200**	<10	**20,000**	**1,500**	<10	940	460	<10	100	<10**	20	3,300
GA-02	**130,000**	<10	<10	930	3	**110**	1500**	<10	**30,000**	**1,700**	<10	1,100	840	<10	130	<10**	20	3,700
GA-03 Duplicate	15,000	<10	<10	970	2	**107**	1500**	<10	**26,000**	**2,100**	<10	1,300	640	<10	107	**140**	20	4,500
GA-04	**94,000**	<10	<10	660	3	**100**	1000**	NA**	**14,800**	**2,200**	NA**	750	620	NA	<10	**35**	17	3,500
GA-05 Background	7,300	<10	<10	140	<10	<10	10**	<10	20	20	<10	300	11	<10	<10	<10**	16	38
rSRL	**76,000**	**31**	**10**	**15,000**	**150**	**39**	**30 / 120,000**	**1,400**	**3,100**	**400**	**1,600**	**3,300**	**1,600**	**390**	**390**	**5**	**78**	**23,000**

Notes:
mg/kg = milligrams per kilogram
rSRL = residential soil remediation level
Bold values indicate exceedance of rSRL
**Results were for total chromium; SRLs are for Cr(VI) and Cr(III)*
***Indicates detection limit or method not appropriate to compare to SRLs.*
Results for magnesium, iron, sodium, calcium not shown as there is no SRL.
Data from Arizona Department of Health Services Hazardous Waste Inspection Supplemental Report, Garigan Property, August 1988

TABLE 2
Soil Sampling Results, 1989
Harrison Rd and Millmar Rd Dross Site
Tucson, Arizona

Sample ID	Direction From Dross Pile	Distrance From Dross Pile	Depth of Sample	Aluminum	Barium	Cadmium	Chromium*	Copper	Lead	Manganese	Nickel	Thallium	Zinc
		[Feet]	[Inches]	[mg/kg]									
G-01	Northwest	21	1	14,800	127	<10	<10**	466	<10	327	23	<100**	223
G-01A	Northwest	21	7	9,340	50	<10	<10**	119	<10	224	13	**126**	33
G-02	Northwest	50	1	11,400	127	<10	<10**	161	<10	397	13	<100**	135
G-03 (Duplicate)	Northwest	50	1	9,240	101	<10	<10**	119	<10	334	13	<100**	135
G-04	Northwest	100	1	8,100	56	<10	<10**	35	<10	197	13	<100**	47
G-05	Northwest	260	1	12,700	92	<10	<10**	30	<10	299	13	**254**	69
G-09	Northeast	20	1	>8,000**	70	<10	<10**	190	<50	203	<20	<100**	146
GA-10	Northeast	70	1	7,950	58	<10	<10**	81	<50	216	<10	<100**	48
G-11	Northeast	100	1	8,170	52	<10	<10**	68	<50	178	20	<100**	40
G-12	South	35	1	>10,000**	69	<10	<10**	238	<50	230	23	<100**	99
G-12A	South	35	7	>10,000**	103	<10	<10**	38	<50	525	24	<100**	41
G-13	South	70	1	7,740	46	<10	<10**	49	<50	174	<10	<100**	32
G-14 (Duplicate)	South	70	1	9,170	53	<10	<10**	73	<50	194	<10	<100**	40
G-15	South	100	1	9,000	54	<10	<10**	26	<50	215	<10	<100**	27
G-16	"Field North"	Unknown	1	9,020	65	<10	<10**	21	<10	255	<10	<100**	44
G-17	"Field North"	Unknown	1	8,080	79	<10	<10**	51	<50	263	<10	<100**	59
G-18 (Duplicate)	"Field North"	Unknown	1	10,100	76	<10	<10**	48	<50	296	<10	<100**	60
G-19	"Field North"	Unknown	1	>10,200**	83	<10	<10**	27	<50	269	<20	<100**	45
DR-21	Background, WSW	~7350	1	14,700	88	<10	<10**	27	<10	NA**	18	NA**	47
DR-22	Background, WSW	~24700	1	>10,000**	143	<10	<10**	41	<10	NA**	20	NA**	63
DR-23 (Duplicate)	Background, WSW	~24700	1	>10,000**	136	<10	<10**	41	<10	NA**	21	NA**	62
DR-24	Background, WNW	~54200	1	>10,000**	127	<10	<10**	49	<10	NA**	12	NA**	136
rSRL				**76,000**	**15,000**	**39**	**30 / 120,000**	**3,100**	**400**	**3,300**	**1,600**	**5**	**23,000**

Notes:
mg/kg = milligrams per kilogram
rSRL = residential soil remediation level
">10,000" = exceeded method detection limit
Bold values indicate exceedance of rSRL
**Results were for total chromium; SRLs are for Cr(VI) and Cr(III)*
***Indicates detection limit or method not appropriate to compare to SRLs.*
Data from Arizona Department of Environmental Quality Arizona, Garigan Property Soil Sampling Report, May 1989

TABLE 3
Groundwater Well Sampling, 1988
Harrison Rd and Millmar Rd Dross Site
Tucson, Arizona

Sample ID	Arsenic	Beryllium	Cadmium	Chromium	Mercury	Nickle	Lead	Antimony	Selenium	Thallium
	(µg/L)									
Douglas 55-622102	<2	<1	<5	<6	<0.2	<8	4	<29**	<1	<2
Escalante-2 55-801508	<2	<1	<5	<6	<0.2	<8	3.8	<29**	<1	<2
AWQS	**50**	**4**	**5**	**100**	**2**	**100**	**50**	**6**	**50**	**2**

Notes:
µg/L = microgram per liter
AWQS = Aquifer Water Quality Standard
Bold values indicate exceedance of AWQS
*** Indicates detection limit or method not appropriate to compare to AWQS*

TABLE 4
XRF Results of Dross Pile, 1992
Harrison Rd and Millmar Rd Dross Site
Tucson, Arizona

Sample ID	Aluminum*	Arsenic	Antimony	Barium	Cadmium	Copper	Lead	Molybdenum	Selenium	Silver	Zinc
	(mg/kg)										
Dross Sample	**232,000**	**15**	**95**	1,800	**175**	**32,500**	**1,350**	110	2	100	4,650
rSRL	**76,000**	**10**	**31**	**15,000**	**39**	**3,100**	**400**	**390**	**390**	**390**	**23,000**

Notes:
mg/kg = milligrams per kilogram
rSRL = residential soil remediation level
Bold values indicate exceedance of rSRL
**XRF reported aluminum as a percentage. Detection limit or method not appropriate to compare to SRLs.*
Data from Pima County Department of Environmental Quality, Sampling Investigation Dross/WQARF, January 1992

TABLE 5
Laboratory Results of Dross Pile Samples, 1992
Harrison Rd and Millmar Rd Dross Site
Tucson, Arizona

Sample ID	Aluminum	Arsenic	Antimony	Barium	Cadmium	Copper	Lead	Molybdenum	Selenium	Silver	Zinc
	[mg/kg]										
Dross Sample	**140,000**	**10**	**50**	230	**130**	**19,000**	**1,400**	20	0	15	3,200
Method	***7020***	***7060***	***7040***	***7080***	***7130***	***7210***	***7420***	***7481***	***7740***	***7760***	***7950***
rSRL	**76,000**	**10**	**31**	**15,000**	**39**	**3,100**	**400**	**390**	**390**	**390**	**23,000**

Notes:
mg/kg = milligrams per kilogram
rSRL = residential soil remediation level
Bold values indicate exceedance of rSRL
Data from Pima County Department of Environmental Quality, Sampling Investigation Dross/WQARF, January 1992

TABLE 6
Groundwater Well Sampling, December 2015
Harrison Rd and Millmar Rd Dross Site
Tucson, Arizona

ADWR 55 #	Well location (relative to Site)	Sample Date/Time	Aluminum	Arsenic	Cadmium	Copper	Lead	Manganese	Nickel	Tin	Zinc	Antimony	Thallium
			[mg/L]										
55-210178	0.2 mi N (crossgradient)	12/1/2015 10:30	<2.0	<0.040	<0.0020	<0.020	<0.040	**0.071**	<0.050	NA	**0.48**	NA	NA
55-210352	0.2 mi N (crossgradient)	12/1/2015 10:25	<2.0	<0.040	<0.0020	<0.020	<0.040	<0.020	<0.050	<0.20	**0.063**	<0.00050	<0.00050
55-803959	200 ft E or W (up to downgradient)	12/1/2015 9:15	<2.0	<0.040	<0.0020	<0.020	<0.040	<0.020	<0.050	<0.20	**0.32**	<0.00050	<0.00050
55-629263*	150 ft E (up to crossgradient)	12/4/2015 10:40	<2.0/<2.0	<0.040/<0.040	<0.0020/<0.0020	<0.020/<0.020	<0.040/<0.040	<0.020/<0.020	<0.050/<0.050	<0.20/<0.20	**0.064/0.064**	<0.00050/ <0.00050	<0.00050/ <0.00050
55-608088	0.3 mi NW (downgradient)	12/1/2015 13:40	<2.0	<0.040	<0.0020	<0.020	<0.040	<0.020	<0.050	<0.20	**0.074**	<0.00050	<0.00050
55-546165	0.1 mi N (crossgradient)	12/1/2015 12:45	<2.0	<0.040	<0.0020	<0.020	<0.040	<0.020	<0.050	<0.20	<0.040	<0.00050	<0.00050
AWQS			**NE**	**0.05**	**0.005**	**NE**	**0.05**	**NE**	**0.1**	**NE**	**NE**	**0.006**	**0.002**

Notes:
mg/L = milligrams per liter
AWQS = Aquifer Water Quality Standard
Bold *values indicate recorded above laboratory method detection limit*
NA = not analyzed for
NE = not established
** = blind duplicate sample collected*

TABLE 7
XRF Measurements, December 2015
Harrison Rd and Millmar Rd Dross Site
Tucson, Arizona

Sample ID	Date	Time	UTM Easting	UTM Northing	Antimony	Arsenic	Barium	Cadmium	Chromium**	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Rubidium	Selenium	Silver	Strontium	Tin	Titanium	Zinc	Zirconium
					[mg/kg]																				
Sample-1	12/3/2015	10:15	520541.88	3558916.10	***<64***	<8	310	<34	149	<95	1,075	16,297	123	427	<6	11	69	95	<2	<25	157	74	3,067	508	244
Sample-2	12/3/2015	10:45	520547.20	3558897.24	***<63***	<5	191	<33	89	<48	188	3,859	35	207	<6	<7	<21	98	2	<25	174	<59	658	133	52
Sample-3*	12/3/2015	11:15	520525.62	3558920.80	**77**	***<12***	306	<37	510	<108	**3,718**	18,106	221	529	<7	16	105	88	<2	<28	140	93	2,325	1,068	169
Sample-4	12/3/2015	11:25	520499.88	3558934.96	***<68***	<7	376	<36	148	<108	505	18,853	58	408	<6	<8	33	89	<2	<27	170	<63	2,943	298	379
Sample-5	12/3/2015	11:35	520481.37	3558951.27	**108**	***<16***	556	**55**	663	<121	**5,918**	23,179	**453**	544	<9	<8	202	92	5	<27	143	182	2,659	2,174	242
Sample-6	12/3/2015	11:45	520468.65	3558974.87	***<69***	***<10***	532	<36	215	<103	1,957	17,489	150	395	<7	<8	112	97	<2	<27	157	<64	2,574	831	318
Sample-7	12/3/2015	12:00	520451.87	3558997.55	***<68***	***<11***	451	<36	196	<102	1,710	17,189	191	459	<7	9	73	109	<2	<27	161	71	2,723	944	123
Sample-8*	12/3/2015	12:10	520431.28	3558998.01	***<67***	<8	281	<35	110	<90	581	13,986	89	305	<6	<7	63	128	<2	32	177	<63	2,198	320	125
Sample-9	12/3/2015	12:25	520427.46	3558977.07	***<63***	***<11***	481	<34	299	<108	2,275	21,051	239	627	<7	15	108	140	<2	<26	221	<60	7,388	1,056	110
Sample-10*	12/3/2015	12:35	520426.65	3558956.71	***<74***	***<25***	648	**134**	1,083	<170	**10,263**	39,411	**927**	997	<11	26	254	65	6	<30	129	290	2,728	5,004	15
Sample-11	12/3/2015	12:50	520426.31	3558936.23	**126**	**25**	<466	***<47***	2,136	<342	**9,073**	>10%	**445**	1,828	<12	141	132	88	<4	<36	149	142	3,632	3,937	<12
Sample-12	12/3/2015	13:05	520427.12	3558914.25	***<67***	<9	410	<35	117	<102	679	16,723	116	409	<7	<7	49	97	<2	<27	156	<63	2,429	743	147
Sample-13	12/3/2015	13:35	520460.20	3558907.77	**124**	***<21***	480	**50**	576	<130	**4,340**	26,857	**891**	772	<9	10	161	103	<3	33	156	120	3,889	1,916	139
Sample-14	12/3/2015	13:45	520489.93	3558896.66	***<97***	***<26***	<517	**121**	1,462	<464	**12,317**	>10%	**580**	1,529	<15	20	**2,115**	45	<4	<39	70	205	<1419	6,190	<11
Sample-15	12/3/2015	13:55	520519.88	3558897.26	**93**	***<25***	323	**129**	878	<110	**12,045**	17,300	**1,013**	797	<11	15	222	63	8	<29	106	235	2,183	5,583	115
Sample-16	12/3/2015	14:10	520508.21	3558912.63	**236**	***<35***	927	**209**	3,784	<118	**29,948**	39,382	**1,547**	1,604	<15	37	735	24	<5	58	79	558	2,668	9,541	10
Sample-17	12/3/2015	14:25	520473.85	3558924.89	**199**	***<34***	714	**200**	4,612	<219	**30,944**	60,906	**1,667**	1,755	<16	53	851	45	9	<31	93	534	1,647	11,037	<8
Sample-18*	12/3/2015	14:35	520444.35	3558970.70	**135**	***<21***	519	**145**	2,395	<137	**14,341**	29,041	**777**	803	<11	28	358	99	6	<28	125	245	2,602	5,340	117
Sample-19	12/3/2015	14:45	520444.01	3558950.34	**189**	**53**	491	**253**	3,068	<191	**26,947**	45,722	**2,177**	1,615	<16	33	711	47	<5	72	109	735	2,199	12,601	26
Sample-20*	12/3/2015	14:55	520446.90	3558922.11	**268**	***<33***	698	**210**	2,326	<171	**19,761**	37,671	**1,554**	1,474	<15	31	561	49	19	<31	114	574	2,649	10,106	57
Sample-21	12/3/2015	16:15	520242.59	3559006.68	***<66***	**25**	537	**66**	575	<123	**5,348**	26,110	**453**	732	<8	10	322	106	6	<26	161	158	1,927	1,914	186
Sample-22	12/3/2015	16:25	520243.75	3559028.90	***<63***	<8	501	<33	1,677	<94	1,077	16,486	85	449	<6	8	178	100	<2	<25	153	<59	2,215	366	155
Sample-23*	12/3/2015	16:35	520248.60	3559060.02	**94**	***<26***	363	**100**	1,422	<145	**19,266**	31,929	**1,175**	984	<12	33	706	62	25	<28	108	344	1,647	6,853	65
Sample-24	12/3/2015	16:45	520257.17	3559041.97	**131**	***<27***	452	**112**	2,458	<177	**20,446**	45,705	**1,142**	1,357	<12	35	805	68	5	<29	118	326	2,338	6,287	42
Sample-25	12/3/2015	16:50	520269.66	3559019.76	**113**	***<29***	803	**86**	2,412	<215	**31,524**	56,627	**1,137**	1,630	<14	60	**1,681**	64	9	<32	128	358	1,911	7,545	<9
Sample-26	12/4/2015	8:40	520257.05	3559021.61	***<68***	***<22***	493	**64**	660	<119	**11,537**	22,621	**891**	817	<11	21	232	75	<3	<27	131	210	3,169	3,956	108
Sample-27	12/4/2015	8:55	520260.17	3559005.53	**88**	***<24***	<307	**100**	1,234	<156	**15,217**	29,861	**830**	1,135	<12	24	325	48	<3	<31	90	268	2,535	4,835	120
Sample-28*	12/4/2015	9:05	520277.76	3559002.29	**245**	**37**	724	**214**	3,744	<277	**34,632**	87,883	**1,593**	2,170	<16	75	1,254	32	<5	<33	79	574	1,222	9,431	<9
Sample-29	12/4/2015	9:50	520232.75	3559093.80	***<64***	6	422	<34	<65	<75	158	10,386	22	236	<5	<7	27	107	<2	<25	169	<59	1,426	72	120
Sample-30*	12/4/2015	10:00	520237.38	3559051.46	***<69***	***<18***	414	**55**	812	458	**7,206**	63,279	**436**	1,135	<9	32	188	112	6	<30	201	162	3,141	2,397	106
rSRL					**31**	**10**	**15,000**	**39**	**30 / 120,000****	**900**	**3,100**	**NE**	**400**	**3,300**	**23**	**390**	**1,600**	**NE**	**390**	**390**	**47,000**	**47,000**	**310,000**	**23,000**	**NE**

Notes:
mg/Kg = milligrams per kilogram
rSRL = residential Soil Remedation Level
Bold *values indicate exceedance of rSRL*
Bold italic *values indicate detection limit exceeds rSRL*
NE = Not Established
** confirmatory sample collected for laboratory analysis*
*** results were for total chromium; SRLs are for Cr(VI) and Cr(III)*

TABLE 8
Soil Metals Laboratory Results, December 2015
Harrison Rd and Millmar Rd Dross Site
Tucson, Arizona

Sample ID	Sample Date	Sample Time	Aluminum	Antimony*	Arsenic**	Cadmium	Copper	Lead	Manganese	Nickel	Thallium	Tin*	Zinc
			[mg/kg]										
Sample-3	12/3/2015	11:20	23,000	*1.6*	*4.3*	16	2,000	110	370	51	<13	*16*	440
Sample-8	12/3/2015	12:15	19,000	*1.2*	*5.9*	17	1,500	150	410	62	<13	*16*	770
Sample-10	12/3/2015	12:40	73,000	*15*	*5.2*	**94**	**10,000**	**830**	860	470	<13	110	2,600
Sample-18	12/3/2015	14:40	**78,000**	*20*	*7.3*	**93**	**21,000**	**840**	1,100	980	<13	190	3,000
Sample-20	12/3/2015	14:55	**140,000**	***42***	*5.0*	**170**	**24,000**	**1,500**	1,200	750	<13	270	5,000
Sample-23	12/3/2015	16:40	**76,000**	***34***	*4.3*	**81**	**18,000**	**1,200**	750	490	<13	170	3,700
Sample-28	12/4/2015	9:10	**160,000**	***41***	*7.1*	**150**	**32,000**	**1,600**	1,500	**1,700**	<13	280	4,400
Sample-30	12/4/2015	10:05	25,000	*3.2*	*6.9*	14	2,900	180	420	130	<13	*34*	490
rSRL			**76,000**	**31**	**10**	**39**	**3,100**	**400**	**3,300**	**1,600**	**5**	**47,000**	**23,000**
Minimum GPL			**NE**	**35**	**290**	**29**	**NE**	**290**	**NE**	**590**	**NE**	**NE**	**NE**

Notes:
mg/Kg = milligrams per kilogram
rSRL = residential Soil Remediation Level
GPL = Groundwater Protection Level
Bold *values indicate exceedance of rSRL*
NE = Not Established
** Practical Quantification Limit (PQL) = 50 mg/kg*
*** PQL = 10 mg/kg*
Italics = below PQL

TABLE 9
XRF Measurements, January 2016
Harrison Rd. and Millmar Rd. Dross Site
Tucson, Arizona

Sample ID	Date	Time	UTM Easting	UTM Northing	Antimony	Arsenic	Barium	Cadmium	Chromium[a]	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Rubidium	Selenium	Silver	Strontium	Tin	Titanium	Zinc	Zirconium
					(mg/kg)																				
C-0	1/13/2016	15:24	520228.00	3559096.00	***<69***	<6	485	<36	97	<101	342	16,553	60	315	<6	<8	53	92	<2	<27	156	<64	4,214	159	264
C-1	1/12/2016	11:18	520239.00	3559097.00	***<70***	<5	265	<36	<69	<78	18	9,823	24	210	9	<7	34	129	<2	<27	278	<64	1,816	41	44
C-2	1/12/2016	11:46	520267.97	3559096.00	***<62***	<5	420	<32	85	<67	28	855	23	178	11	<6	83	117	3	36	164	<57	1,373	30	121
C-3	1/12/2016	12:10	520296.11	3559095.57	***<61***	<4	458	<32	<59	<59	23	6,955	19	179	<5	<6	28	100	<2	<24	152	<7	1,460	38	131
C-4	1/12/2016	12:25	520330.00	3559095.00	***<60***	<5	411	<32	73	<104	66	22,099	39	542	<6	<6	52	111	2	<24	147	<56	13,766	118	201
C-5	1/12/2016	12:42	520360.00	3559095.24	***<49***	<4	<142	<27	<46	<56	45	747	20	303	<4	18	<18	56	<2	<21	119	<46	917	100	87
C-6	1/12/2016	12:55	520389.00	3559095.44	***<61***	<5	388	<33	<64	<93	58	17,358	30	487	<5	<7	43	101	<2	<24	138	<56	2,611	115	123
C-7	1/12/2016	14:10	520417.76	3559094.52	***<61***	<4	215	<23	<58	90	23	4,399	22	123	<5	<7	<21	84	<2	33	179	<57	673	27	79
C-8	1/12/2016	14:17	520452.00	3559095.89	***<65***	<5	293	<34	<63	<59	20	8,733	24	227	<5	>7	<22	115	<2	<25	174	<22	1,556	44	137
C-9	1/12/2016	14:30	520481.00	3559095.89	***<58***	<4	250	<31	<56	<56	38	6,654	21	265	<5	<6	21	91	<2	<23	193	<54	1,595	80	110
C-10	1/12/2016	14:36	520512.00	3559096.33	***<61***	<5	<140	<32	66	<79	26	12,166	23	309	<5	<7	23	68	<2	<24	119	<57	2,029	96	188
C-11	1/12/2016	15:01	520543.00	3559095.89	***<62***	<4	287	<32	65	<71	26	10,234	18	310	<5	<6	30	106	<2	<24	151	<57	1,748	74	93
C-12	1/12/2016	15:10	520572.00	3559095.33	***<62***	<4	<162	<28	<54	<71	34	11,816	22	358	<5	11	<20	76	<2	<22	137	<49	1,710	146	75
C-13	1/12/2016	15:32	520602.44	3559094.67	***<65***	<4	300	<34	<61	<69	22	8,599	19	204	<6	<7	27	91	<2	<25	130	<60	1,398	51	142
C-14	1/13/2016	9:56	520620.44	3559095.56	***<59***	<5	324	<31	80	<72	29	11,121	29	358	<5	<6	48	118	2	<23	175	<54	1,794	93	105
C-15	1/13/2016	10:07	520621.00	3559065.11	***<64***	<5	365	<33	<64	<74	31	10,134	18	234	<6	<7	<22	99	<2	<25	167	<59	1,815	47	145
C-16	1/13/2016	10:19	520603.78	3559066.00	***<61***	<4	<177	<32	<61	<65	21	7,772	19	260	<5	7	<22	84	<2	<24	223	<57	1,621	62	146
C-17	1/13/2016	10:23	520573.00	3559065.89	***<68***	<6	414	<36	104	<106	57	19,112	36	394	<6	<8	52	113	<2	<27	167	<63	3,566	137	256
C-18	1/13/2016	10:36	520541.00	3559065.00	***<65***	<5	456	<34	101	<58	25	6,181	20	174	<5	<7	28	126	<2	43	181	<60	1,004	55	63
C-19	1/13/2016	11:28	520512.00	3559065.00	***<62***	<5	328	<33	<63	<77	29	11,173	21	277	<5	8	24	85	<2	<25	170	<58	1,835	63	235
C-20	1/13/2016	11:35	520482.00	3559063.00	***<66***	<5	<196	<35	<67	<74	17	9,140	17	188	<5	<7	<23	92	<2	<26	155	<62	1,224	38	95
C-21[b]	1/13/2016	11:44	520451.00	3559063.56	***<66***	<9	<180	<35	127	<52	759	4,733	153	171	<6	<7	144	47	<2	<26	87	92	1,227	141	39
C-22	1/13/2016	11:54	520422.00	3559065.27	***<63***	<4	363	<33	<59	<58	17	5,893	19	218	<5	<7	<22	89	<2	28	181	<59	802	31	140
C-23	1/13/2016	12:01	520389.00	3559064.00	***<69***	6	313	<36	<71	<90	36	13,286	22	217	<6	<8	33	121	<2	<27	165	<64	2,566	46	372
C-24	1/13/2016	12:07	520357.00	3559064.00	***<66***	<5	301	<34	72	<96	49	16,240	23	323	<6	<7	50	93	<2	<26	139	<61	3,075	68	264
C-25	1/13/2016	12:17	520326.00	3559066.00	***<68***	8	431	<36	<80	<124	56	26,110	28	545	<6	<8	36	109	<2	<27	155	<63	4,909	93	292
C-26	1/13/2016	12:25	520296.00	3559068.00	***<69***	<5	341	<36	<67	<67	23	7,077	18	179	<6	<7	<24	88	<2	<27	137	<64	4,387	28	98
C-27	1/13/2016	12:32	520265.78	3559066.89	***<65***	<5	282	<34	68	<77	39	10,398	23	205	<5	<7	36	95	<2	<26	163	<60	2,488	46	257
C-28	1/13/2016	15:30	520237.00	3559068.00	***<74***	<7	467	<38	159	<151	1,044	37,206	62	750	<8	<8	127	100	<2	57	150	<69	2,288	936	288
C-29[c]	1/13/2016	15:37	520239.00	3559038.00	***<77***	***<17***	437	**46**	1,932	<220	**9,316**	68,503	396	1,155	<10	33	344	111	<3	<30	172	213	1,529	3,455	<8
C-29-25N	1/28/2016	14:32	520239.00	3559045.00	***<80***	<9	355	***<42***	188	<81	1,038	7,697	77	150	<7	<9	43	53	<2	<32	199	<75	<634	3,178	57
C-30	1/13/2016	15:46	520261.56	3559038.44	***<62***	<7	357	<33	92	<92	692	15,855	83	401	<5	<7	44	79	<2	<25	201	<58	2,559	315	184
C-31	1/13/2016	15:52	520291.67	3559037.56	***<67***	<5	388	<35	<64	<61	<14	6,371	18	200	<5	<7	26	123	<2	<26	181	<62	963	22	126
C-32	1/13/2016	16:02	520321.00	3559038.00	***<63***	<4	275	<33	<59	<52	<13	4,778	17	159	<5	<7	<21	110	<2	<25	143	<59	785	25	95
C-33	1/13/2016	16:10	520352.67	3559036.56	***<64***	<5	421	<34	<67	<84	39	12,968	23	229	<5	<7	24	104	<2	<25	175	<59	2,503	58	298
C-34	1/13/2016	16:18	520383.67	3559035.11	***<66***	<5	300	<35	<63	<62	<14	6,332	19	176	<6	10	<23	106	<2	<26	161	73	1,445	28	155
C-35	1/13/2016	16:24	520415.52	3559036.00	***<66***	<5	337	<34	83	<98	57	16,928	25	389	<6	<7	40	107	<2	<26	176	<61	3,605	79	249
C-36	1/13/2016	16:30	520450.32	3559036.33	***<69***	<5	134	<36	<246	<109	672	19,985	28	422	<6	<8	58	101	<2	32	153	<64	4,835	99	333
C-37	1/13/2016	16:37	520480.00	3559033.00	***<65***	<4	<180	<34	<58	<53	15	4,603	13	113	<5	<7	<21	90	<2	<26	125	<61	722	27	67
C-38	1/13/2016	16:43	520511.00	3559034.00	***<65***	<4	242	<34	<61	<67	17	7,911	27	256	<6	<7	<22	97	<2	<26	139	<60	1,217	35	119
C-39	1/13/2016	16:48	520541.00	3559032.00	***<65***	<4	<184	<34	<62	<59	16	6,058	19	130	<6	<7	<21	115	<2	<25	140	<60	1,206	71	92
C-40	1/13/2016	16:55	520570.00	3559033.11	***<61***	<4	381	<32	<64	<77	24	11,635	18	327	<5	<7	24	98	<2	<24	174	<57	2,256	66	181
C-41	1/14/2016	11:23	520593.00	3559035.00	***<61***	<2	<106	<32	<61	<64	19	7,549	17	222	<5	<7	<22	58	<2	<24	141	<56	1,326	61	100
C-42	1/14/2016	13:15	520622.00	3559037.00	***<62***	<5	245	<33	<55	<67	27	8,760	22	255	<5	<7	27	121	2	<24	170	<58	1,863	88	111
C-43	1/14/2016	13:25	520621.00	3559004.78	***<69***	<6	602	<36	<71	<90	25	13,347	39	261	<6	<8	<26	154	<2	29	175	<63	2,595	65	288

TABLE 9
XRF Measurements, January 2016
Harrison Rd. and Millmar Rd. Dross Site
Tucson, Arizona
(Continued)

Sample ID	Date	Time	UTM Easting	UTM Northing	Antimony	Arsenic	Barium	Cadmium	Chromium[a]	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Rubidium	Selenium	Silver	Strontium	Tin	Titanium	Zinc	Zirconium
					(mg/kg)																				
C-44	1/14/2016	14:35	520591.00	3559005.00	***<66***	<6	388	<35	<70	<88	29	13,772	42	306	<5	<7	27	104	<2	<26	169	<62	2,415	121	196
C-45	1/14/2016	14:55	520571.78	3559010.22	***<60***	<4	327	<32	<60	<57	16	6,591	19	458	<5	<7	<21	91	<2	<24	137	<56	1,529	60	88
C-46	1/14/2016	15:04	520542.67	3559004.44	***<65***	<5	414	<34	81	<76	33	10,345	21	210	<5	<7	<3	95	<2	<25	156	<60	1,608	129	149
C-47	1/14/2016	15:10	520513.09	3559004.65	***<64***	<5	412	<34	<52	<55	42	7,951	22	200	<5	<7	<22	116	<2	27	130	<59	1,317	58	157
C-48	1/14/2016	15:17	520478.78	3559004.41	***<68***	<5	326	<35	<65	<64	23	6,893	20	228	<5	<7	<23	112	<2	<25	203	<62	1,061	84	66
C-49	1/14/2016	15:24	520450.95	3559005.19	***<66***	<6	<196	<35	81	<69	451	7,917	56	275	<6	<7	<24	70	<2	<26	144	<61	1,222	277	108
C-50	1/14/2016	15:33	520417.07	3559004.00	***<66***	<5	461	<34	<66	<70	79	8,475	24	192	<6	<7	<23	105	<2	<26	163	<61	1,277	55	166
C-51	1/15/2016	10:23	520386.00	3559004.00	***<67***	<5	301	<35	82	<96	38	15,798	28	272	<6	<8	<26	101	<2	<26	160	<62	3,083	69	392
C-52	1/15/2016	10:28	520356.00	3559005.00	***<65***	<5	250	<34	100	<87	48	13,543	22	241	<5	<7	<24	86	<2	<25	156	<60	3,185	83	253
C-53	1/15/2016	10:34	520327.11	3559004.89	***<65***	<7	343	<34	<67	<82	43	12,346	39	282	<6	<7	32	115	<2	<25	165	<60	2,545	73	207
C-54	1/15/2016	10:45	520296.67	3559004.78	***<68***	<5	265	<36	72	<69	79	7,834	25	226	<6	<7	<23	120	<2	<27	166	<63	1,515	94	89
C-55[d]	1/15/2016	10:53	520269.67	3559006.67	***<69***	**22**	<282	**46**	562	<185	**6,876**	42,924	353	711	<9	54	141	26	<3	<30	372	279	892	2,127	196
C-56[c, d]	1/15/2016	11:03	520246.11	3559010.00	***<69***	**23**	<254	**48**	542	<136	**8,296**	26,601	385	623	<9	22	360	87	<3	<28	127	126	1,459	2,475	45
C-57[c]	1/15/2016	11:14	520238.94	3559009.89	***<87***	***<16***	<432	***<45***	668	<366	**4,763**	>10%	277	889	<9	<9	174	36	<4	<34	92	131	<1183	1,128	<9
C-57-25S[c]	1/28/2016	14:03	520239.44	3559003.06	**114**	***<20***	360	**86**	685	<146	**10,158**	31,058	**685**	654	<10	34	252	70	5	<28	155	199	1,174	3,578	32
C-57-50S	1/28/2016	14:09	520239.34	3558996.40	***<65***	<4	404	<34	<64	<74	37	10,348	18	224	<5	<7	27	65	<2	<25	133	<50	1,482	196	87
C-57-25N[c]	1/28/2016	14:18	520238.56	3559017.22	***<67***	***<14***	437	**46**	405	<98	**6,800**	16,495	346	582	<9	<7	144	100	<3	<26	141	148	2,132	2,721	197
C-57-50N	1/28/2016	14:23	520239.00	3559025.33	***<73***	<8	395	<39	152	<130	665	22,896	69	312	<6	29	<34	84	<2	<29	170	<58	967	386	110
C-58	1/15/2016	14:08	520623.89	3558973.78	***<79***	<6	<253	***<41***	86	<103	23	13,061	26	215	<7	<9	<30	113	<2	<31	147	<73	2,478	75	307
C-59	1/15/2016	14:14	520603.67	3558973.33	***<62***	<4	263	<33	<65	<78	18	11,253	19	340	<5	8	<23	82	<2	<25	133	<58	1,734	76	158
C-60	1/15/2016	14:21	520573.78	3558971.67	***<65***	<5	392	<34	<61	<58	<13	5,737	27	119	<5	<7	<22	133	<2	<25	192	<60	1,521	25	78
C-61	1/15/2016	14:27	520543.00	3558973.00	***<65***	<5	342	<34	<62	<65	32	7,303	23	166	<6	<7	<23	125	<2	<25	140	<60	1,389	166	123
C-62	1/15/2016	14:35	520514.67	3558976.00	***<76***	<5	347	***<40***	<73	<94	48	11,905	21	285	<6	<8	<27	98	<2	<30	148	<70	2,333	133	193
C-63	1/15/2016	14:45	520477.78	3558972.00	***<68***	<5	225	<36	<66	<67	30	6,995	26	220	<6	<7	<24	117	<2	<27	167	<64	1,307	28	84
C-64[c, d]	1/15/2016	15:06	520445.89	3558975.78	**111**	**40**	574	**177**	2,142	<270	**25,158**	77,204	**1,032**	1,471	<14	39	580	49	<5	88	89	619	2,839	6,052	28
C-65[c, d]	1/15/2016	15:14	520447.33	3558940.56	**120**	**40**	756	**165**	2,475	<255	**18,740**	73,559	**1,293**	1,562	<14	38	483	68	<5	<34	95	452	1,789	9,052	<9
C-66[d]	1/15/2016	15:23	520476.33	3558939.89	**94**	**38**	362	**69**	1,292	<256	**7,917**	90,637	**408**	672	<9	35	382	72	<3	<30	83	188	<881	1,848	<7
C-67[b]	1/15/2016	14:53	520513.00	3558938.00	***<89***	<6	<259	***<47***	<85	<92	505	8,649	19	293	<7	<10	<30	73	<3	39	166	<83	1,073	132	126
C-68	1/15/2016	15:39	520547.00	3558935.78	***<70***	<5	241	<37	<73	<87	60	11,567	19	266	<6	<8	<26	93	<2	<23	123	<65	1,714	151	136
C-69[c]	1/18/2016	10:45	520574.33	3558940.22	***<63***	**12**	189	<34	<64	<71	15	9,031	21	237	<5	<7	29	99	<2	<25	189	<60	1,113	59	57
C-70	1/18/2016	10:50	520603.56	3558943.56	***<62***	<4	208	<33	68	<63	31	8,518	18	412	<5	<7	25	146	<2	<25	141	<53	1,465	94	100
C-71	1/18/2016	10:55	520621.67	3558943.78	***<65***	<5	249	<34	<65	<78	31	10,555	23	302	<5	<7	29	92	<2	<26	208	<60	2,529	87	232
C-72	1/18/2016	11:05	520621.00	3558914.33	***<64***	6	333	<33	<63	<73	18	9,779	20	256	<6	<7	<23	96	<2	<25	153	<59	1,362	122	162
C-73	1/18/2016	11:27	520592.89	3558912.00	***<65***	<5	<211	<34	<56	<78	53	10,875	29	322	<6	12	26	88	<2	<26	142	<60	2,755	337	156
C-74	1/18/2016	11:35	520573.56	3558910.44	***<67***	<5	502	<35	82	<81	20	11,769	19	309	<5	<7	40	104	<2	37	147	<62	2,022	57	131
C-75[c, d]	1/18/2016	11:40	520541.00	3558908.78	***<73***	***<11***	292	<35	300	<114	175	18,706	170	432	<7	<8	43	71	<3	<29	152	<68	3,379	868	180
C-76[c, d]	1/18/2016	13:28	520500.00	3558912.00	**6,008**	**81**	295	**100**	831	<110	**12,264**	15,983	**899**	723	<11	9	**12,401**	27	12	<29	145	153	1,587	3,309	24
C-77[d]	1/18/2016	13:36	520473.67	3558912.56	***<65***	<5	315	<34	<63	<62	167	6,907	30	199	<5	<7	29	114	<2	<25	143	<50	1,287	103	145
C-78[c, d]	1/18/2016	13:42	520446.22	3558912.78	**98**	***<20***	<26	**134**	886	<121	**11,923**	23,000	**774**	493	<10	21	289	100	<1	<21	130	419	1,926	4,232	102
C-79	1/18/2016	13:49	520445.78	3558900.00	***<66***	<5	281	<35	<69	<96	45	15,963	19	331	<6	<7	31	107	<2	<26	137	<61	2,794	61	191
C-80[d]	1/18/2016	13:57	520499.89	3558898.22	***<65***	***<15***	318	**77**	432	<109	**9,959**	20,437	**420**	543	<9	9	142	82	<3	<26	143	189	1,499	2,778	173
C-80B	1/18/2016	15:25	520473.00	3558898.89	***<60***	<5	<163	<32	<58	<56	115	5,547	28	230	<5	21	<20	64	<2	<24	190	<56	171	113	129
C-82[d]	1/18/2016	11:50	520540.22	3558900.33	***<118***	***<34***	<1306	***<62***	11,226	**<1260**	**9,232**	>10%	**727**	**7,666**	<19	**566**	652	59	<8	<48	<8	140	<3281	1,849	<14
C-83	1/18/2016	11:20	520573.56	3558898.89	***<65***	<5	207	<34	95	<84	44	12,320	21	346	<5	<7	37	96	<2	<26	140	<60	2,499	151	219

TABLE 9
XRF Measurements, January 2016
Harrison Rd. and Millmar Rd. Dross Site
Tucson, Arizona
(Continued)

Sample ID	Date	Time	UTM Easting	UTM Northing	Antimony	Arsenic	Barium	Cadmium	Chromium[a]	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Rubidium	Selenium	Silver	Strontium	Tin	Titanium	Zinc	Zirconium
					(mg/kg)																				
C-84	1/18/2016	11:15	520602.00	3558900.22	***<68***	<5	213	<36	<65	<76	29	9,088	27	247	<6	<7	<24	100	<2	<27	129	<63	1,781	348	112
C-85	1/18/2016	11:09	520620.22	3558899.78	***<72***	<5	296	<36	<75	<91	24	12,256	18	239	<7	<8	<27	73	<2	<28	114	<67	2,022	446	254
C-86	1/18/2016	14:30	520431.97	3559004.58	***<65***	<6	320	<35	111	<87	220	13,104	49	413	<6	<7	38	103	<2	<26	173	<61	1,617	234	113
C-86-50E	1/22/2016	14:20	520447.00	3559004.52	***<65***	<6	287	<34	95	<74	354	9,777	53	410	<6	<7	35	101	<2	<25	181	<60	1,989	245	112
C-87[c]	1/18/2016	14:37	520434.00	3559036.00	***<79***	**16**	597	***<41***	118	<103	204	13,791	36	1,774	<7	10	52	96	<3	45	240	<73	2,994	120	112
C-87-50E	1/22/2016	14:32	520447.00	3559035.47	***<75***	<6	365	<39	<77	<98	60	13,645	23	275	<6	<8	<27	101	<2	<29	156	<69	2,649	56	156
C-87-50W	1/22/2016	14:40	520419.03	3559036.36	***<71***	<6	495	<37	124	<122	79	23,566	35	364	<6	<8	55	101	<2	<28	157	<65	5,125	94	496
C-88	1/18/2016	14:42	520433.56	3559065.00	***<66***	<6	404	<35	113	<107	205	20,380	47	415	<6	<7	57	101	<2	<26	145	<62	4,303	137	239
C-88-50E	1/22/2016	14:50	520447.00	3559063.72	***<84***	<6	301	***<44***	<83	<99	44	10,477	26	242	<7	<9	<31	99	<2	<93	156	<78	1,798	75	222
C-88-50W	1/22/2016	14:53	520418.44	3559065.11	***<73***	<5	325	<38	<79	<102	34	15,096	23	358	<6	<8	<28	111	<2	<29	186	<67	3,792	55	352
C-89	1/18/2016	14:50	520432.22	3559095.75	***<73***	<6	486	<38	122	<169	28	39,251	25	605	<7	<8	74	112	<2	<29	143	<68	7,325	70	276
C-90	1/19/2016	10:46	520238.33	3558983.36	***<66***	8	300	<34	137	<81	316	11,257	45	333	<6	<7	28	104	<2	<26	167	<61	2,564	229	139
C-90-25E[c]	1/28/2016	13:25	520245.00	3558983.56	**105**	***<22***	501	**132**	2,475	<56	**13,852**	36,589	**829**	1,114	<11	28	797	83	10	41	151	310	2,569	5,347	132
C-90-50E	1/28/2016	13:31	520252.00	3558983.89	***<81***	<8	336	<37	151	<94	807	13,474	74	312	<7	<8	40	94	<2	<25	177	<66	2,509	389	246
C-90-25N[c]	1/28/2016	13:37	520239.56	3558991.33	***<74***	***<10***	<229	<39	333	<91	3,025	11,976	121	355	<7	15	115	87	3	<29	122	97	1,109	1,014	108
C-90-25SE	1/28/2016	13:45	520244.89	3558976.89	***<72***	<5	525	<37	88	<96	68	1,460	21	278	<6	<8	40	100	<2	<28	174	<67	2,398	63	368
C-90-25NE	1/28/2016	13:50	520247.22	3558990.56	***<84***	<7	308	***<44***	125	<112	250	14,674	35	440	<7	<9	49	76	<3	<33	155	<78	3,005	197	216
C-91	1/19/2016	10:52	520268.00	3558982.89	***<65***	<6	402	<34	91	<77	430	10,475	50	231	<6	7	33	109	<2	<26	147	<61	1,385	142	137
C-92[c]	1/19/2016	11:02	520297.00	3558983.78	**103**	**27**	<438	**84**	913	<310	**6,007**	77,307	**451**	1,682	<13	<11	246	35	<4	<40	200	136	2,305	2,199	<10
C-92-25N	1/28/2016	10:30	520296.89	3558992.49	***<65***	<8	412	<34	162	<93	807	15,297	94	423	<6	<7	63	101	<2	<26	191	<60	2,671	385	186
C-92-35N[c]	1/28/2016	10:36	520296.86	3558994.00	***<132***	***<31***	<1525	<31	1,430	**<1630**	2,914	>10%	**554**	**10,864**	<21	325	468	71	<7	<85	<10	176	<4054	780	<17
C-92-25E	1/28/2016	10:41	520305.00	3558983.56	***<66***	8	326	<35	88	<97	115	15,828	32	350	<6	<7	36	112	<2	<26	164	<62	2,667	120	212
C-92-35NE[c]	1/28/2016	10:47	520305.00	3558994.00	***<70***	**24**	446	<36	111	<84	246	12,415	38	310	<6	<7	60	58	<2	42	125	<65	1,574	132	100
C-92-25W[c]	1/28/2016	10:54	520290.11	3558983.67	**83**	***<16***	<381	***<42***	652	<314	**9,615**	>10%	346	1,182	<10	12	276	81	<3	<31	118	217	1,275	2,072	<8
C-92-35NW[c]	1/28/2016	11:00	520290.22	3558994.11	***<93***	***<21***	<653	***<52***	1,304	<604	**7,872**	>10%	334	1,459	<13	<11	210	18	<5	<40	25	206	<1697	2,198	<10
C-92-60NW	1/28/2016	11:07	520281.67	3558994.11	***<68***	<6	284	<36	69	<64	287	6,307	38	196	<6	14	30	100	<2	<27	225	<65	647	218	79
C-92-50W	1/28/2016	11:15	520281.67	3558983.56	***<64***	<6	297	***<39***	67	<50	368	6,660	46	181	<6	<7	44	112	<2	<25	215	<59	1,141	208	44
C-92-25S	1/28/2016	13:03	520297.44	3558974.78	***<66***	<6	599	<34	124	<63	365	6,889	57	223	8	<7	29	181	<2	34	151	<61	1,420	115	127
C-92-50S[c]	1/28/2016	13:07	520297.75	3558966.08	***<77***	**13**	342	***<40***	383	<120	**3,588**	20,010	195	392	<7	<8	181	80	<2	<30	140	94	2,359	931	101
C-92-75S	1/28/2016	13:12	520297.71	3558956.86	***<66***	<8	260	<34	246	<106	1,012	19,905	112	284	<7	<7	109	113	<2	<26	216	<61	3,477	364	293
C-92-25SE	1/28/2016	13:18	520305.00	3558975.33	***<63***	<9	<169	<33	<59	<45	232	3,624	27	239	<5	8	<21	86	4	<25	124	<58	729	107	56
C-93	1/19/2016	11:07	520327.78	3558983.78	***<95***	<7	<298	***<49***	<95	<109	39	10,910	28	212	<8	<10	<34	105	<3	<37	151	<87	2,457	51	143
C-94	1/19/2016	11:16	520356.89	3558989.89	***<96***	<7	411	***<50***	<93	<111	23	11,613	24	261	<9	<10	57	79	<3	<37	146	<88	1,952	49	137
C-95	1/19/2016	11:23	520386.89	3558989.56	***<74***	<5	256	<39	80	<81	32	9,363	21	236	<6	<8	27	100	<2	<29	145	<68	1,725	48	144
C-96	1/19/2016	11:28	520419.00	3558985.00	***<66***	<5	384	<35	<66	<69	44	8,371	29	191	<6	<7	26	118	<2	<26	153	<61	1,756	59	167
C-97	1/19/2016	11:35	520425.78	3558985.00	***<62***	<5	<213	<33	<69	<93	96	15,573	35	311	<5	<7	30	95	<2	<25	185	<58	3,155	123	199
C-98[b]	1/19/2016	11:38	520425.00	3558954.00	***<76***	<8	<240	***<40***	183	<99	735	13,193	79	360	<7	<8	52	80	<2	<30	184	<70	2,258	441	115
C-99	1/19/2016	11:48	520419.00	3558954.00	***<73***	5	276	<38	<73	<98	32	13,975	19	224	<6	<8	37	106	<2	<28	156	<67	3,405	62	275
C-100	1/19/2016	11:54	520392.00	3558953.00	***<64***	<5	340	<34	<66	<82	43	12,780	24	285	<5	<7	31	103	<2	<25	174	<59	2,713	74	152
C-101[c]	1/19/2016	12:00	520361.00	3558952.00	***<65***	**12**	343	<34	<65	<87	85	13,849	19	286	<6	<7	59	104	<2	<25	154	<60	2,718	108	149
C-102	1/19/2016	12:06	520330.00	3558951.00	***<64***	<4	422	<34	<65	<62	30	6,898	17	199	<5	<7	26	94	<2	<25	143	<60	2,520	33	123
C-103	1/19/2016	12:11	520298.11	3558950.57	***<74***	<6	312	<39	<71	<74	89	7,696	29	253	<6	<8	31	95	<2	<29	131	<68	1,578	59	130
C-104[c]	1/19/2016	13:08	520254.00	3558957.00	***<66***	**10**	252	<35	<72	<98	209	16,145	57	365	<6	<7	<26	91	<2	<26	195	<61	3,327	1,046	140
C-105	1/19/2016	13:13	520233.00	3558957.00	***<78***	<7	345	***<41***	120	<84	449	8,757	49	192	<6	<9	49	73	<2	<31	138	<72	1,388	298	98

TABLE 9
XRF Measurements, January 2016
Harrison Rd. and Millmar Rd. Dross Site
Tucson, Arizona
(Continued)

Sample ID	Date	Time	UTM Easting	UTM Northing	Antimony	Arsenic	Barium	Cadmium	Chromium[a]	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Rubidium	Selenium	Silver	Strontium	Tin	Titanium	Zinc	Zirconium
					(mg/kg)																				
C-106	1/20/2016	9:16	520227.78	3558927.00	***<75***	<7	403	<39	<83	<115	422	17,565	40	353	<7	13	48	100	<2	<30	154	<70	3,464	131	105
C-107	1/20/2016	9:23	520258.00	3558928.00	***<69***	<5	235	<36	96	<91	48	14,150	16	213	<6	<7	38	74	<2	<26	139	<64	2,486	45	196
C-108	1/20/2016	9:28	520289.00	3558926.00	***<70***	<5	350	<37	<75	<97	35	14,865	30	229	<6	<8	39	109	<2	<28	171	<65	3,175	55	294
C-109	1/20/2016	9:38	520319.00	3558923.00	***<62***	<5	<186	<33	79	<68	141	8,491	34	328	<5	9	<23	107	<2	<25	224	<57	1,109	170	79
C-110	1/20/2016	9:43	520352.00	3558926.00	***<71***	<5	456	<37	<76	<89	37	11,968	16	193	<6	<9	33	89	<2	<28	148	<66	3,321	79	741
C-111	1/20/2016	9:50	520400.00	3558924.00	***<80***	<6	401	***<41***	<80	<82	18	8,030	20	299	<7	<8	<27	118	<2	<31	199	<74	1,574	19	45
C-112	1/20/2016	9:56	520421.00	3558925.00	***<70***	<6	371	<37	<69	<65	26	6,349	53	178	<6	<8	<24	94	<2	<28	170	<65	795	40	132
C-113[b]	1/20/2016	10:01	520425.00	3558925.00	***<65***	<6	291	<34	86	<85	318	12,897	49	325	<6	<7	34	81	<2	<26	139	<61	2,465	139	220
C-114	1/20/2016	10:06	520424.00	3558898.00	***<71***	6	422	<37	<74	<97	66	14,763	25	324	<6	<8	41	127	<2	<28	165	<66	2,404	140	189
C-115	1/20/2016	10:16	520418.00	3558898.00	***<69***	<5	234	<37	<73	<92	22	13,635	25	137	<6	<7	<26	108	<2	<27	237	<64	1,178	46	63
C-116	1/20/2016	10:21	520390.00	3558897.22	**70**	<5	<191	<36	<66	<68	22	6,979	17	175	<6	<8	<23	90	<2	<27	156	<63	1,268	75	177
C-117	1/20/2016	10:26	520359.00	3558897.00	***<70***	6	531	<37	95	<79	24	9,236	20	375	<6	<8	<25	174	<2	<28	91	<66	1,831	114	234
C-118	1/20/2016	10:33	520327.00	3558898.00	***<75***	<6	308	<39	<77	<98	54	12,870	26	344	<6	<8	<28	98	<2	<30	157	<69	2,067	93	118
C-119	1/20/2016	10:39	520299.00	3558901.00	***<77***	<6	<240	***<41***	<80	<98	65	11,364	21	295	<7	14	<29	72	<2	<32	153	<72	2,012	102	124
C-120	1/20/2016	10:47	520269.00	3558898.00	***<60***	5	312	<32	<58	<71	203	10,095	17	310	<5	<7	<22	63	<2	<24	138	<56	1,829	124	182
C-121[b]	1/20/2016	10:55	520238.00	3558899.00	***<84***	<8	<299	***<43***	262	<111	35	15,867	56	241	<7	<9	102	65	3	54	213	<77	6,877	241	165
C-122	1/20/2016	11:01	520226.44	3558898.00	***<74***	<5	451	<39	76	<72	30	6,995	14	163	<6	<8	31	70	<2	<29	343	<69	1,209	61	197
C-123[c]	1/21/2016	9:51	520231.11	3558934.11	***<84***	***<15***	461	***<44***	3,219	<190	**12,553**	44,848	281	1,467	<10	20	384	53	<4	<34	121	236	1,150	1,845	36
C-123-25E[c]	1/28/2016	9:50	520237.92	3558933.24	**149**	**64**	899	**104**	2,379	<185	**18,470**	36,888	**880**	1,169	<12	20	536	54	10	<28	130	304	2,031	6,368	20
C-123-50E	1/28/2016	9:56	520245.78	3558933.46	***<73***	<6	275	<38	227	<121	359	22,104	40	288	<6	<8	37	93	<2	<28	167	<57	4,388	135	377
C-123-25N[c]	1/28/2016	10:01	520230.78	3558942.00	***<74***	**31**	447	<39	1,050	<213	2,655	65,693	395	780	<8	41	288	90	<3	<29	114	126	<11	711	<8
C-123-50N	1/28/2016	10:08	520231.05	3558950.02	***<77***	<8	305	***<40***	<76	<75	344	7,061	74	156	<6	<8	<27	97	<2	<30	203	<72	1,078	164	92
C-123-25NE	1/28/2016	10:19	520237.78	3558941.89	***<79***	<6	264	<36	117	<71	283	8,224	36	190	<6	<7	33	104	<2	<28	175	<63	1,159	178	73
C-123-25W	1/28/2016	10:22	520223.67	3558933.67	***<60***	<5	<189	<32	<62	<75	265	10,746	40	346	<5	11	25	81	<2	<24	188	<56	1,696	145	89
C-124	1/21/2016	10:01	520235.38	3558974.66	***<65***	<5	262	<34	<62	<88	75	5,198	22	180	<5	<7	<23	95	<2	<26	167	<61	804	56	122
C-125	1/21/2016	10:08	520234.04	3558977.66	***<70***	<5	330	<36	<67	<68	53	7,022	14	160	<6	<7	113	81	<2	<24	220	<63	1,209	43	57
C-126	1/21/2016	10:13	520229.28	3558980.20	***<64***	<4	295	<33	<65	<81	36	11,825	18	269	<6	<7	30	66	<2	<25	141	<58	2,067	45	265
C-127[b]	1/21/2016	10:20	520297.33	3558969.67	***<67***	<9	480	<35	361	<117	**6,723**	23,815	112	647	<8	<7	116	105	<2	<26	219	<52	1,657	2,330	26
C-128[c]	1/21/2016	10:40	520299.22	3558971.00	**85**	***<25***	555	**155**	8,209	<204	**14,564**	52,088	**876**	1,375	<12	39	1,362	53	15	<31	223	290	1,684	5,938	<8
C-129[c]	1/21/2016	10:47	520301.56	3558972.67	***<69***	**26**	1,472	<36	186	<119	**4,668**	23,386	307	551	<8	<8	229	150	3	31	124	95	2,404	1,460	176
H-1	1/20/2016	12:26	520252.33	3558953.67	***<93***	<7	<283	***<49***	<96	<104	115	8,611	28	367	<8	15	<33	48	<3	<38	137	<86	1,603	737	53
H-2[b]	1/20/2016	12:31	520254.97	3558948.64	***<65***	7	431	<34	76	<101	205	18,409	34	436	<6	8	42	93	<2	<26	220	<61	3,508	226	179
H-3	1/20/2016	12:37	520263.33	3558941.44	***<74***	<5	<234	<39	<76	<76	70	7,535	17	158	<6	<8	<26	103	<2	<30	272	<69	2,414	97	99
H-4	1/20/2016	12:42	520267.89	3558938.78	***<70***	<5	<198	<37	<68	<72	36	7,196	22	228	<6	<8	<24	64	<2	<28	129	<66	1,286	138	62
H-5[b]	1/20/2016	12:49	520274.44	3558944.56	***<76***	<5	<234	***<40***	79	<76	143	7,653	18	308	<5	<8	<27	84	<2	<30	145	<71	2,217	118	66
H-6	1/20/2016	12:56	520278.00	3558952.56	***<70***	<6	431	<36	<77	<112	64	20,335	40	376	<7	<8	53	100	<2	41	207	<65	4,170	220	263
H-7[b]	1/20/2016	13:01	520272.89	3558956.22	***<76***	<5	329	<39	79	<69	20	6,192	13	119	<6	<8	<25	75	<2	<29	140	<70	1,416	66	102
H-8	1/20/2016	13:08	520267.67	3558961.33	***<71***	<4	<194	<37	<62	<53	<14	4,179	8	224	<6	<7	<24	50	<2	<28	106	<66	887	60	55
H-9	1/20/2016	13:14	520263.00	3558965.00	***<65***	<5	390	<34	<64	<63	15	7,148	20	173	<6	<7	38	188	<2	<25	142	<60	2,831	88	99
H-10[b]	1/20/2016	13:19	520258.56	3558961.56	***<73***	8	446	<38	<74	<75	39	8,458	18	288	<6	<8	<25	146	<2	<28	142	<67	8,241	182	257
G2-1	1/20/2016	13:50	520579.11	3559008.00	***<67***	<6	212	<35	<70	<84	42	11,436	46	241	<6	<7	<24	93	<2	<26	168	<62	2,037	103	227
G2-2[b]	1/20/2016	13:55	520574.89	3559010.11	***<65***	<5	234	<34	<62	<69	32	8,448	24	226	<5	<7	<23	89	<2	<25	130	<59	2,509	76	190
G2-3	1/20/2016	14:02	520569.22	3559009.78	***<71***	<5	386	<37	<67	<74	<15	8,288	20	256	<6	<8	<24	103	<2	<28	165	<66	1,201	79	136
G2-4[b]	1/20/2016	14:08	520566.00	3559008.33	***<66***	<4	<182	<35	<63	<57	16	5,370	17	218	<5	<7	<22	98	<2	<26	154	<61	854	112	40

TABLE 9
XRF Measurements, January 2016
Harrison Rd. and Millmar Rd. Dross Site
Tucson, Arizona
(Continued)

Sample ID	Date	Time	UTM Easting	UTM Northing	Antimony	Arsenic	Barium	Cadmium	Chromium[a]	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Rubidium	Selenium	Silver	Strontium	Tin	Titanium	Zinc	Zirconium
					(mg/kg)																				
G2-5	1/20/2016	14:15	520564.93	3559002.65	***<67***	<6	276	<35	<65	<61	<13	6,123	56	102	<6	<7	<23	82	<2	<26	116	<62	996	92	67
G2-6	1/20/2016	14:20	520565.89	3558998.89	***<65***	<5	272	<34	<62	<56	16	5,345	20	117	<6	<7	27	92	<2	<25	153	<61	681	101	47
G2-7[b]	1/20/2016	14:25	520570.11	3558997.44	***<60***	<5	227	<32	66	<72	50	9,949	46	341	<6	<7	27	90	<2	<24	201	<56	1,749	275	175
G2-8	1/20/2016	14:31	520579.56	3558997.78	***<59***	<5	<174	<31	<57	<63	52	7,992	42	267	<5	11	<21	75	<2	<24	147	<55	1,214	161	109
G2-9[b]	1/20/2016	14:37	520583.22	3559000.00	***<64***	<7	306	<34	<63	<69	27	8,511	81	196	<6	<7	24	88	<2	<25	179	<59	1,479	210	92
G2-10	1/20/2016	14:42	520583.11	3559003.78	***<61***	<5	291	<32	<58	<63	15	8,082	33	196	<5	<7	23	81	<2	<24	130	<56	1,146	484	134
G1-11[b]	1/20/2016	14:59	520593.00	3558917.33	***<66***	<6	<215	<35	<70	<92	51	14,681	40	307	<5	<7	<25	95	<2	<26	167	<61	2,858	212	257
G1-12	1/20/2016	15:05	520594.11	3558904.78	***<71***	<6	<239	<37	155	<110	102	18,796	34	364	<6	<8	30	105	<2	30	161	<66	3,109	102	214
G1-13	1/20/2016	15:11	520599.92	3558904.00	***<71***	**18**	277	<38	<76	<109	45	16,524	44	342	<6	<8	<28	80	<2	<29	197	<66	2,537	204	142
G1-14[b]	1/20/2016	15:16	520607.33	3558903.22	***<66***	7	315	<34	81	<77	27	10,462	23	229	<5	<7	<23	94	<2	<26	182	<61	2,030	171	118
G1-15	1/20/2016	15:24	520612.33	3558905.22	***<74***	8	306	<39	<72	<86	30	10,623	30	231	<6	<8	28	110	<2	<29	216	<69	1,953	103	159
G1-16[b]	1/20/2016	15:31	520613.00	3558911.00	***<69***	8	440	<36	81	<84	36	11,620	56	221	<5	<7	35	235	<2	36	192	<64	2,201	131	164
G1-17	1/20/2016	15:51	520612.67	3558917.56	***<66***	**10**	336	<35	<71	<87	33	12,739	55	399	<6	<7	<25	101	<2	<26	178	<61	2,122	239	119
G1-18[b]	1/20/2016	15:58	520606.44	3558920.67	***<57***	<4	<163	<32	<53	<50	125	3,964	16	237	<6	32	<20	33	<2	<25	176	<53	446	1,911	99
G1-19	1/20/2016	16:04	520600.00	3558921.00	***<55***	<4	<160	<30	<54	<60	268	6,949	19	624	<6	36	<21	51	<2	<24	221	<51	490	1,902	90
58-1[b]	1/26/2016	15:25	520538.51	3558846.43	***<68***	<6	358	<35	104	<98	131	16,438	39	307	<6	8	31	106	<2	<26	155	<63	4,510	214	215
103-1	1/26/2016	14:24	520568.37	3558866.36	***<67***	6	<216	<35	<73	<103	150	19,104	25	254	<5	30	50	86	<2	<26	141	<62	2,292	163	79
103-2	1/26/2016	14:29	520568.12	3558872.48	***<67***	<5	438	<35	83	<82	47	13,940	31	222	<6	<7	39	114	<2	<26	176	<62	2,086	58	195
103-3[b]	1/26/2016	14:33	520566.12	3558879.23	***<65***	7	351	<34	<65	<85	71	12,992	35	209	<6	<7	27	107	<2	<25	127	<61	3,079	81	217
103-4	1/26/2016	14:38	520565.90	3558883.41	***<66***	<6	<203	<36	<67	<72	15	9,037	19	213	<6	<7	<23	110	<3	<26	130	<62	2,443	42	94
103-5	1/26/2016	14:44	520561.86	3558883.27	***<73***	<5	299	<38	85	<98	26	13,722	23	369	<6	<8	<25	97	<2	<26	131	<57	2,818	72	271
103-6[b]	1/26/2016	14:48	520555.73	3558882.54	***<67***	<6	408	<35	<70	<70	79	13,374	42	273	<6	<7	34	87	<2	<26	171	<62	2,334	124	125
103-7	1/26/2016	14:53	520554.41	3558879.86	***<68***	<7	368	<36	<72	<96	82	15,252	65	258	<6	<7	32	92	<2	<27	144	<63	2,942	89	166
103-8	1/26/2016	14:58	520553.55	3558875.99	***<68***	<6	305	<36	<69	<87	85	9,441	37	276	<7	<8	<24	96	<2	<27	197	<53	2,123	116	139
103-9[b]	1/26/2016	15:07	520553.29	3558867.40	***<72***	<9	364	<38	<82	<124	98	23,611	102	375	<7	<8	51	113	<2	<28	147	<51	4,525	163	224
103-10[b]	1/26/2016	15:16	520559.74	3558866.71	***<68***	<5	356	<36	98	<90	49	13,953	25	269	<7	<7	30	125	<2	<27	128	<63	2,128	62	92
104-1[c]	1/26/2016	13:07	520550.00	3558865.60	***<76***	***<15***	567	<39	<91	<151	104	32,942	312	1,250	<8	<8	60	110	<3	<27	150	<70	4,539	295	180
104-2[c]	1/26/2016	13:14	520550.23	3558873.60	***<83***	**27**	502	***<43***	<100	<154	45	28,593	222	1,233	<8	<9	67	106	<3	<33	108	<77	4,465	248	114
104-3	1/26/2016	13:20	520550.59	3558880.51	***<67***	<6	418	<35	<65	<70	27	8,772	47	243	<5	<7	<23	111	<2	<26	176	<61	2,414	79	70
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104-5[b]	1/26/2016	13:32	520545.00	3558888.55	***<57***	<6	522	<35	<75	<89	75	13,973	50	342	<6	<7	39	108	<2	33	194	<62	3,548	229	88
104-6	1/26/2016	13:41	520540.99	3558889.03	***<67***	<6	309	<35	<67	<74	32	9,263	45	208	8	<7	<23	128	<2	<26	131	<62	2,280	59	97
104-7	1/26/2016	13:47	520537.90	3558883.54	***<66***	<9	299	<35	<71	<96	47	16,087	128	690	<6	9	52	104	<2	<26	151	<61	2,598	123	112
104-8	1/26/2016	13:55	520539.95	3558879.39	***<67***	<6	233	***<85***	<66	<68	18	8,010	55	335	<5	<7	53	117	<2	<26	205	<62	1,742	56	65
104-9[c]	1/26/2016	14:03	520539.25	3558866.41	***<73***	**42**	438	<38	102	<129	47	25,460	**665**	565	<8	<8	48	117	<3	<28	209	<67	3,130	134	171
104-10	1/26/2016	14:11	520543.38	3558866.11	***<74***	**11**	293	<35	<80	<127	44	23,092	86	465	<6	<8	97	99	<2	<29	193	<68	3,369	108	99
105-1[c]	1/26/2016	12:03	520533.74	3558866.99	***<79***	**22**	256	<38	<86	<129	89	24,940	120	929	<7	17	58	112	<2	<29	183	<69	4,264	301	101
105-2	1/26/2016	12:09	520533.99	3558874.74	***<66***	<3	<233	<25	85	<120	99	26,985	94	469	<6	<7	74	111	<2	<26	106	<62	3,250	203	56
105-3[b]	1/26/2016	12:16	520530.78	3558882.51	***<76***	<6	541	<39	<92	<147	489	31,726	28	400	<2	52	57	127	<2	<29	106	<70	6,012	469	171
105-4	1/26/2016	12:20	520527.00	3558882.62	***<74***	<6	622	<38	<84	<127	35	24,269	38	434	<6	<8	62	115	<2	<29	187	<59	2,113	174	99
105-5	1/26/2016	12:26	520526.52	3558886.01	***<69***	<6	289	<34	<74	<97	55	13,161	30	303	<6	<8	<28	83	<2	<29	151	<69	2,221	120	126
105-6	1/26/2016	12:31	520521.25	3558886.89	***<64***	<5	425	<35	<62	<61	16	6,639	31	127	<5	<7	23	143	3	<25	232	<59	1,127	36	76
105-7	1/26/2016	12:37	520521.51	3558882.97	***<71***	<5	<197	<37	<67	<57	22	4,830	25	161	<6	<7	<23	147	<2	33	164	<66	1,072	28	39
105-8[b]	1/26/2016	12:42	520518.00	3558883.14	***<69***	<6	461	<36	88	<99	122	16,316	37	333	<6	13	38	98	<2	<27	176	<64	4,025	275	170

TABLE 9
XRF Measurements, January 2016
Harrison Rd. and Millmar Rd. Dross Site
Tucson, Arizona
(Continued)

Sample ID	Date	Time	UTM Easting	UTM Northing	Antimony	Arsenic	Barium	Cadmium	Chromium[a]	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Rubidium	Selenium	Silver	Strontium	Tin	Titanium	Zinc	Zirconium
					(mg/kg)																				
105-9	1/26/2016	12:48	520517.54	3558869.26	***<69***	<6	<222	<36	92	<95	90	14,793	42	233	<6	20	28	117	<2	<27	153	<64	2,738	70	178
105-10[b]	1/26/2016	12:55	520524.86	3558867.22	***<71***	8	496	<37	<79	<119	129	21,780	36	254	<7	<8	35	121	<2	<28	143	<66	3,521	105	166
106-1	1/26/2016	9:57	520515.73	3558871.27	***<78***	<5	343	<36	<67	<72	<14	8,183	21	257	<5	<7	<23	120	<2	<22	157	<53	1,658	41	109
106-2[b]	1/26/2016	10:01	520515.71	3558876.64	***<69***	8	394	<36	<76	<108	26	19,571	62	429	<6	<8	38	98	<2	<27	167	<64	2,910	89	135
106-3	1/26/2016	10:06	520514.49	3558881.15	***<72***	<5	<230	<37	84	<97	33	14,848	16	363	<6	<8	33	115	<2	32	146	<67	3,179	115	89
106-4[b]	1/26/2016	10:15	520507.25	3558881.15	***<66***	<6	379	<34	124	<94	118	15,590	48	422	<6	<7	31	93	<2	<25	156	<61	3,368	273	151
106-5	1/26/2016	10:22	520499.75	3558894.01	***<64***	<4	<171	<33	<59	<55	44	5,133	24	144	<5	<7	<22	84	<2	<25	189	<59	764	54	114
106-6	1/26/2016	10:29	520498.14	3558884.52	***<67***	<6	407	<35	89	<114	63	21,426	34	512	<6	<8	29	104	<2	<27	178	<62	5,394	160	264
106-7	1/26/2016	10:36	520497.54	3558873.52	***<63***	7	376	<33	66	<63	22	7,751	16	208	7	<7	25	117	2	<25	238	<59	2,380	49	168
106-8[b]	1/26/2016	10:40	520497.77	3558867.99	***<78***	<5	<246	***<41***	107	<86	<16	8,856	14	194	<6	<9	<27	87	<2	<31	137	<73	2,693	46	74
106-9	1/26/2016	10:46	520503.63	3558868.97	***<72***	<5	286	<38	<71	<69	<14	6,939	17	126	<6	<8	<24	82	<2	30	125	<67	1,495	32	81
106-10[b]	1/26/2016	10:51	520513.11	3558868.62	***<69***	<6	<221	<36	<75	<126	27	24,870	31	267	<6	8	38	124	<2	<27	166	<64	1,809	37	65
107-1	1/25/2016	16:00	520496.23	3558868.64	***<70***	<5	516	<36	92	<97	47	15,480	24	333	<6	<7	51	120	<2	<27	196	<65	2,798	62	141
107-2[b]	1/25/2016	16:05	520496.23	3558874.52	***<73***	8	458	<39	188	<134	209	24,198	44	434	<7	24	<31	111	<2	<30	168	<68	6,384	339	249
107-3	1/25/2016	16:16	520496.33	3558880.89	***<56***	<4	223	<34	88	<52	14	4,427	18	110	<5	<7	<22	107	<2	<25	125	<61	3,303	35	68
107-4	1/25/2016	16:21	520493.14	3558884.03	***<66***	<5	490	<35	87	<79	17	10,851	25	345	<5	<7	34	86	<2	<26	187	<62	2,073	66	160
107-5[b]	1/26/2016	9:05	520489.12	3558884.29	***<61***	<5	380	<32	108	<93	81	16,804	33	438	<6	<7	35	100	<2	<24	179	<57	3,061	153	157
107-6	1/26/2016	9:17	520483.75	3558884.03	***<56***	<5	296	<35	114	<87	70	12,925	29	324	<6	8	<25	110	<2	<26	150	<61	3,473	145	160
107-7[b]	1/26/2016	9:20	520482.03	3558879.75	***<65***	<6	529	<34	111	<100	180	18,534	39	390	9	12	62	117	<2	<25	210	<51	4,000	222	237
107-8	1/26/2016	9:25	520480.75	3558872.60	***<68***	9	584	<35	111	<104	134	18,989	32	403	<6	<7	63	117	<2	45	192	<63	4,043	207	177
107-9[b]	1/26/2016	9:30	520480.62	3558866.60	***<72***	<8	334	<37	82	<94	33	13,744	96	311	<6	<8	32	114	<2	<28	178	<67	3,409	99	113
107-10	1/26/2016	9:38	520491.23	3558865.23	***<80***	<5	229	***<86***	84	<87	53	12,210	84	273	<6	<8	<25	93	<2	<27	214	<65	3,362	105	102
108-1	1/25/2016	14:43	520480.00	3558875.78	***<69***	***<12***	392	<36	<77	<104	150	17,730	257	1,519	<7	22	36	58	<2	<27	109	<64	2,675	305	141
108-2[b]	1/25/2016	14:55	520480.48	3558881.54	***<72***	<8	358	<38	<32	<23	434	42,116	72	689	<7	30	70	156	<2	<28	138	<57	4,217	280	123
108-3	1/25/2016	15:01	520480.11	3558886.90	***<73***	<7	443	<38	88	<106	230	16,796	55	303	<7	26	<28	120	<2	<28	158	<68	3,871	237	139
108-4	1/25/2016	15:08	520473.62	3558890.23	***<68***	<6	295	<36	75	<98	182	15,438	45	392	<6	17	38	113	<2	<27	146	<63	4,300	269	136
108-5[b]	1/25/2016	15:15	520466.77	3558889.15	***<67***	8	552	<35	82	<120	130	24,877	44	573	<6	<7	39	114	<2	<26	153	<62	7,083	473	174
108-6	1/25/2016	15:21	520462.74	3558889.15	***<73***	<7	564	<38	92	<120	619	21,225	58	621	<7	24	31	143	<2	<29	162	<68	3,784	294	112
108-7[b]	1/25/2016	15:27	520462.64	3558879.89	***<70***	<7	365	<37	<77	<114	311	21,086	63	543	<6	18	30	101	<2	<27	151	<65	2,452	256	63
108-8	1/25/2016	15:33	520462.41	3558869.77	***<72***	<7	428	<37	94	<137	179	28,814	56	502	<7	10	35	122	<2	<28	110	<67	6,242	394	189
108-9	1/25/2016	15:46	520470.00	3558875.00	***<73***	<6	369	<37	<75	<95	174	13,921	37	333	<6	10	32	96	<2	<28	133	<67	4,789	352	119
108-10[c]	1/25/2016	15:50	520475.26	3558875.48	***<72***	***<14***	492	<37	95	<143	197	31,160	314	1,372	<7	10	56	98	<3	<28	155	<67	5,282	269	133
109-1	1/25/2016	13:39	520461.14	3558866.23	***<76***	<5	364	<39	145	<113	101	18,251	18	262	<6	13	<29	94	<2	<30	118	<70	2,211	77	99
109-2	1/25/2016	13:44	520461.48	3558873.90	***<66***	<4	329	<34	83	<60	35	6,497	19	140	<5	<7	<22	111	<2	<26	146	<61	1,741	40	121
109-3[b]	1/25/2016	13:50	520461.36	3558882.25	***<87***	<5	364	<34	<75	<89	166	12,938	30	223	<6	<8	48	150	<2	<28	160	<56	958	219	109
109-4	1/25/2016	13:53	520458.88	3558888.11	***<64***	<5	383	<34	<63	<64	38	7,557	22	295	<6	<7	45	120	<2	43	204	<59	2,559	49	65
109-5	1/25/2016	13:58	520455.88	3558888.52	***<66***	<4	303	<35	73	<54	<13	4,747	15	101	<5	<7	<22	89	<2	<26	103	<62	1,539	30	85
109-6[b]	1/25/2016	14:03	520452.10	3558888.15	***<64***	<4	503	<33	141	<52	19	5,072	18	201	<5	<6	26	115	<2	44	144	<59	1,136	20	56
109-7	1/25/2016	14:11	520452.73	3558880.29	***<65***	<5	491	<34	140	<73	154	9,841	19	250	<5	<7	27	109	<2	32	147	<60	2,651	228	102
109-8[b]	1/25/2016	14:17	520450.12	3558875.64	***<68***	<6	259	<36	80	<92	210	14,055	37	335	<6	<7	<26	115	<2	<8	158	<53	4,148	216	144
109-9[b]	1/25/2016	14:23	520449.74	3558866.80	***<70***	<6	327	<37	<78	<116	236	20,467	42	423	<6	33	<29	99	<2	<28	149	<55	5,733	332	199
109-10	1/25/2016	14:32	520456.62	3558865.11	***<63***	<4	222	<33	<56	<49	25	4,148	15	127	<5	<7	<21	107	<2	<25	125	<59	800	23	40
110-1[c]	1/25/2016	11:27	520443.51	3558866.73	***<69***	**13**	422	<35	<85	<142	489	32,346	89	355	<6	41	66	126	<2	<27	147	<64	3,727	369	164
110-2	1/25/2016	11:31	520443.75	3558875.86	***<71***	<7	587	***<40***	<90	<152	436	31,683	40	318	<7	23	42	167	<2	<30	125	<71	4,147	124	139

TABLE 9
XRF Measurements, January 2016
Harrison Rd. and Millmar Rd. Dross Site
Tucson, Arizona
(Continued)

Sample ID	Date	Time	UTM Easting	UTM Northing	Antimony	Arsenic	Barium	Cadmium	Chromium[a]	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Rubidium	Selenium	Silver	Strontium	Tin	Titanium	Zinc	Zirconium
					(mg/kg)																				
110-3[b]	1/25/2016	11:58	520443.67	3558883.73	***<70***	<6	347	<36	<83	<132	469	27,803	39	337	<6	35	44	139	<2	<27	157	<64	4,608	125	219
110-4	1/25/2016	11:46	520438.26	3558883.63	***<73***	<6	323	<38	105	<135	452	21,814	29	337	<6	32	<30	111	<2	<29	149	<68	2,754	105	102
110-5[b]	1/25/2016	11:53	520430.01	3558883.03	***<76***	<7	423	<35	<76	<121	334	24,782	57	366	<7	73	42	137	<2	<26	162	<62	5,192	445	214
110-6	1/25/2016	12:08	520429.03	3558877.26	***<76***	<8	621	***<40***	101	<167	670	38,731	61	430	<8	45	48	139	<2	<30	151	<70	5,597	198	86
110-7	1/25/2016	12:14	520429.03	3558869.29	***<68***	<5	335	***<56***	89	<89	62	12,698	19	276	<6	<7	<25	105	<2	<27	122	<64	2,222	53	117
110-8[b]	1/25/2016	12:23	520434.49	3558869.48	***<74***	<6	402	***<88***	<81	<123	79	22,593	29	280	<6	<8	<30	113	<2	<29	157	<69	4,378	51	129
110-9	1/25/2016	12:30	520439.14	3558870.27	***<57***	<7	659	<35	122	<134	537	31,168	55	362	<7	41	44	128	<2	<26	149	<62	3,360	105	143
110-10	1/25/2016	12:37	520438.88	3558867.60	***<59***	8	509	<26	<80	<119	295	21,993	43	363	<7	49	35	115	<2	<27	182	<64	3,799	208	160
111-1	1/25/2016	9:42	520427.74	3558865.60	***<66***	<5	364	<35	<56	<78	37	10,442	21	128	<6	13	<24	88	<2	<26	143	<61	1,413	131	108
111-2	1/25/2016	9:49	520427.46	3558869.27	***<66***	<4	<177	<35	<59	<5	16	2,549	12	135	<8	<7	21	66	<2	<26	118	<42	749	3,023	23
111-3[b]	1/25/2016	9:55	520427.86	3558875.49	***<77***	6	<249	***<40***	<74	<71	22	6,470	15	158	<6	<8	<25	109	<3	<30	113	<71	4,305	130	47
111-4	1/25/2016	10:04	520427.36	3558882.86	***<66***	<4	362	<34	84	<52	21	5,874	16	140	<6	<6	32	109	<2	53	116	<61	1,858	275	39
111-5	1/25/2016	10:10	520424.60	3558885.15	***<63***	<4	358	<33	<69	<44	<13	3,385	20	138	<5	<7	<21	102	<2	<25	209	<58	818	262	85
111-6[c]	1/25/2016	10:16	520416.12	3558891.66	***<68***	**28**	341	<37	<71	<101	90	17,095	29	1,362	<6	10	42	103	<2	<27	156	<63	8,085	162	204
111-7	1/25/2016	10:33	520409.86	3558886.90	***<69***	<6	401	<36	125	<105	218	17,743	50	539	<7	8	40	112	<2	<27	165	<64	7,855	1,728	89
111-8[c]	1/25/2016	10:41	520409.86	3558876.41	***<68***	**13**	243	***<86***	<72	<89	60	13,048	126	736	<7	<8	32	98	<2	<27	117	<64	2,827	405	137
111-9B[b]	1/25/2016	11:07	520409.73	3558863.90	***<64***	<6	246	<32	71	<102	90	21,712	87	331	<6	<7	79	24	<2	37	35	<59	1,876	579	<5
111-10	1/25/2016	10:55	520422.11	3558870.27	***<76***	<6	<353	***<40***	111	<119	141	18,641	30	311	<9	15	<31	104	<2	<30	211	<71	16,312	3,617	247
rSRL					**31**	**10**	**15,000**	**39**	**30 / 120,000[a]**	**900**	**3,100**	**NE**	**400**	**3,300**	**23**	**390**	**1,600**	**NE**	**390**	**390**	**47,000**	**47,000**	**310,000**	**23,000**	**NE**

Notes:
rSRL = residential Soil Remediation Level
Bold *values indicate exceedance of rSRL*
Bold italic *values indicate detection limit exceeds rSRL*
NM = Not measured
NE = Not established
mg/Kg = milligrams per kilogram
[a] *results were for total chromium; rSRLs are for Cr(VI) and Cr(III)*
[b] *sample collected for SW6010B analysis for Al, Cd, Cu, Ni, Pb, Sb*
[c] *sample collected for SW6010B analysis for As, Al, Cd, Cu, Ni, Pb, Sb*
[d] *sample collected from HMD-East or HMD-West*

TABLE 10
Soil Metals Laboratory Results, January 2016
Harrison Rd and Millmar Rd Dross Site
Tucson, Arizona

Sample ID	Sample Date	Aluminum	Antimony	Arsenic	Cadmium	Copper	Lead	Nickel
		(mg/kg)						
C-21	01/29/16	8,000	<5.0	NA	0.80	83	13	9.8
C-29	01/22/16	23,000	<5.0	3.4	8.9	**3,400**	110	110
C-56	01/22/16	44,000	6.2	3.7	28	**4,800**	**550**	290
C-57	01/29/16	42,000	***<50***	<10	31	**5,100**	270	220
C-57-25N	01/29/16	25,000	<5.0	3.0	12	**3,100**	110	100
C-57-25S	01/29/16	41,000	***<50***	<10	**40**	**4,600**	330	250
C-64	01/22/16	61,000	***<50***	**14**	**80**	**19,000**	**710**	1,400
C-65	01/22/16	**110,000**	***<50***	<10	**330**	**16,000**	**1,200**	480
C-67	01/29/16	8,700	<5.0	NA	1.3	150	16	7.7
C-69	01/22/16	6,000	<5.0	2.5	0.35	27	11	2.9
C-75	01/29/16	31,000	<5.0	3.4	14	3,000	240	94.0
C-76	01/22/16	**92,000**	***<50***	<10	**130**	**15,000**	**960**	970
C-78	01/22/16	**110,000**	***<50***	<10	**110**	**17,000**	**1,300**	610
C-87	01/22/16	12,000	<5.0	2.6	2.0	260	24	10
C-90-25N	01/29/16	6,100	<5.0	3.0	0.65	89	10	6.3
C-90-25E	01/29/16	**81,000**	***<50***	<10	**67**	**10,000**	**830**	490
C-92	01/22/16	14,000	<5.0	2.5	8.2	1,100	70	44
C-92-35N	01/29/16	12,000	<5.0	3.3	4.6	600	61	34
C-92-35NE	01/29/16	11,000	<5.0	3.5	2.7	300	36	14
C-92-35NW	01/29/16	54,000	***<50***	<10	**95**	**14,000**	**540**	400
C-92-50S	01/29/16	29,000	***<50***	<10	24	**5,400**	270	240
C-92-25W	01/29/16	15,000	<5.0	3.8	10	1,600	94	82
C-98	01/29/16	49,000	***<50***	NA	**44**	**5,600**	**470**	220
C-101	01/22/16	7,800	<5.0	2.5	0.51	54	12	4.0
C-104	01/29/16	6,300	<5.0	4.7	0.67	74	21	4.9
C-113	01/29/16	10,000	<5.0	NA	3.2	400	39	16
C-121	01/29/16	8,900	<5.0	NA	0.33	140	9.4	12
C-123	01/22/16	46,000	5.2	5.0	24	**7,600**	240	370
C-123-25N	01/29/16	9,300	<5.0	3.5	1.6	290	22	16
C-123-25E	01/29/16	7,800	<5.0	3.6	1.3	300	35	25
C-127	01/22/16	50,000	***<50***	NA	**42**	**12,000**	**400**	770
C-128	01/29/16	**140,000**	***<50***	<10	**150**	**18,000**	**1,600**	980
C-129	01/22/16	24,000	<5.0	3.1	12	**3,100**	94	210
H-2	01/21/16	11,000	<5.0	NA	1.2	270	25	11
H-5	01/21/16	9,600	<5.0	NA	0.83	140	21	6.2
H-7	01/21/16	9,500	<5.0	NA	0.58	55	14	4.9
H-10	01/21/16	8,000	<5.0	NA	1.4	140	23	9.4
G1-11	01/22/16	8,000	<5.0	NA	0.42	38	21	4.2
G1-14	01/22/16	7,500	<5.0	NA	0.52	32	27	6.7
G1-16	01/22/16	9,400	<5.0	NA	0.92	39	26	5.7
G1-18	01/22/16	8,500	<5.0	NA	0.52	29	17	3.9
G2-2	01/22/16	6,800	<5.0	NA	0.23	18	10	2.9
G2-4	01/22/16	7,200	<5.0	NA	0.32	18	14	3.1
G2-7	01/22/16	7,600	<5.0	NA	0.31	25	23	3.5
G2-9	01/22/16	8,700	<5.0	NA	0.28	20	42	4.6
58-1	01/26/16	11,000	<5.0	NA	0.42	80	13	5.1
103-3	01/26/16	7,600	<5.0	NA	<0.050	13	6.8	3.9
103-6	01/26/16	6,400	<5.0	NA	<0.050	15	5.5	2.9
103-9	01/26/16	7,800	<5.0	NA	0.31	32	29	6.0
103-10	01/26/16	9,100	<5.0	NA	0.11	20	6.0	3.8
104-1	01/26/16	7,300	<5.0	3.6	0.31	24	31	4.5
104-2	01/26/16	7,300	<5.0	3.0	0.26	16	28	3.9
104-5	01/26/16	9,500	<5.0	NA	0.30	25	16	10
104-9	01/26/16	8,600	<5.0	5.0	0.36	20	25	4.9
104-1-0	03/03/16	NA	NA	NA	NA	NA	22	NA

TABLE 10
Soil Metals Laboratory Results, January 2016
Harrison Rd and Millmar Rd Dross Site
Tucson, Arizona
(Continued)

Sample ID	Sample Date	Aluminum	Antimony	Arsenic	Cadmium	Copper	Lead	Nickel
		(mg/kg)						
104-1-2S	03/03/16	NA	NA	NA	NA	NA	42	NA
104-1-2E	03/03/16	NA	NA	NA	NA	NA	33	NA
104-1-2N	03/03/16	NA	NA	NA	NA	NA	14	NA
104-9-0	03/03/16	NA	NA	NA	NA	NA	30	NA
104-9-3N	03/03/16	NA	NA	NA	NA	NA	11	NA
104-9-4NW	03/03/16	NA	NA	NA	NA	NA	64	NA
104-9-2W	03/03/16	NA	NA	NA	NA	NA	48	NA
105-1	01/26/16	5,500	<5.0	3.4	0.21	29	15	3.1
105-3	01/26/16	6,700	<5.0	NA	0.29	81	10	3.3
105-8	01/26/16	7,600	<5.0	NA	0.42	64	11	4.2
105-10	01/26/16	6,100	<5.0	NA	<0.050	64	7.0	2.6
106-2	01/26/16	7,100	<5.0	NA	0.22	16	18	4.6
106-4	01/26/16	5,900	<5.0	NA	0.075	15	6.1	2.8
106-8	01/26/16	7,800	<5.0	NA	0.093	14	6.3	4.0
106-10	01/26/16	8,900	<5.0	NA	0.50	53	26	7.1
107-2	01/25/16	10,000	<5.0	NA	0.35	46	12	4.7
107-5	01/26/16	9,200	<5.0	NA	0.075	18	5.8	4.3
107-7	01/26/16	7,800	<5.0	NA	0.36	39	14	6.2
107-9	01/26/16	8,400	<5.0	NA	<0.050	12	4.9	3.1
108-2	01/25/16	8,000	<5.0	NA	0.36	240	14	3.5
108-5	01/25/16	7,400	<5.0	NA	0.57	1,000	24	6.5
108-7	01/25/16	7,700	<5.0	NA	0.11	21	6.9	3.4
108-10	01/25/16	6,700	<5.0	2.4	0.50	350	19	4.3
108-10-0	03/03/16	NA	NA	NA	NA	NA	31	NA
108-10-2E	03/03/16	NA	NA	NA	NA	NA	28	NA
108-10-3W	03/03/16	NA	NA	NA	NA	NA	39	NA
108-10-2S	03/03/16	NA	NA	NA	NA	NA	83	NA
109-3	01/25/16	8,800	<5.0	NA	0.16	49	6.7	3.2
109-6	01/25/16	8,400	<5.0	NA	0.095	17	5.0	3.1
109-8	01/25/16	6,700	<5.0	NA	0.13	24	5.9	3.0
109-9	01/25/16	11,000	<5.0	NA	0.25	43	7.5	4.3
110-1	01/25/16	10,000	<5.0	2.7	0.10	110	7.5	3.1
110-3	01/25/16	11,000	<5.0	NA	0.20	180	11	3.7
110-5	01/25/16	8,300	<5.0	NA	0.28	230	14	3.6
110-8	01/25/16	7,500	<5.0	NA	0.061	21	5.0	3.4
111-3	01/25/16	11,000	<5.0	NA	0.22	50	7.9	4.8
111-6	01/25/16	10,000	<5.0	6.2	0.17	19	6.6	4.2
111-8	01/25/16	6,100	<5.0	2.6	0.17	15	14	2.6
111-9B	01/25/16	10,000	<5.0	NA	0.39	130	9.4	6.5
Comp-1	01/28/16	8,800	<5.0	3.1	0.16	19	14	4.1
Comp-2	01/27/16	9,700	<5.0	4.5	0.16	20	9.6	3.8
Comp-3	01/27/16	8,100	<5.0	3.1	0.22	25	8.8	3.4
Comp-4	01/27/16	12,000	<5.0	4.0	0.30	43	8.8	6.2
rSRL		**76,000**	**31**	**10**	**39**	**3,100**	**400**	**1,600**
Minimum GPL		**NE**	**35**	**290**	**29**	**NE**	**290**	**590**

Notes:
rSRL = residential Soil Remediation Level
Bold *= exceeds SRL*
Bold italic *values indicate detection limit exceeds rSRL*
GPL - Groundwater Protection Level
NE = Not Established
NA = Not Analyzed For This Analyte
mg/Kg = milligrams per kilogram
This table presents an abridged list of EPA Method 6010B compounds.

TABLE 11
Analytical Results for Background Composite Samples
Harrison Rd and Millmar Rd Dross
Tucson, Arizona

Sample ID	Sample Date	Aluminum	Antimony	Arsenic	Cadmium	Copper	Lead	Nickel
		[mg/kg]						
Comp-1	01/28/16	8,800	<5.0	3.1	0.16	19	14	4.1
Comp-2	01/27/16	9,700	<5.0	4.5	0.16	20	9.6	3.8
Comp-3	01/27/16	8,100	<5.0	3.1	0.22	25	8.8	3.4
Comp-4	01/27/16	12,000	<5.0	4.0	0.30	43	8.8	6.2
	Minimum	8,100	--	3.1	0.16	19	8.8	3.4
	Maximum	12,000	--	4.5	0.3	43	14	6.2
	Median	9,250	--	3.55	0.19	22.5	9.2	3.95
	Mean	9,650	--	3.675	0.21	26.75	10.3	4.375
	SD	1,698	--	0.695	0.066	11.1	2.50	1.25
SRL - Residential		**76,000**	**31**	**10**	**39**	**3,100**	**400**	**1,600**
Minimum GPL		**NE**	**35**	**290**	**29**	**NE**	**290**	**590**

Notes:

Turner Laboratories, Inc. performed analysis by EPA Method 6010B for a reduced list of metals.

mg/kg = milligrams per kilogram

rSRL = residential Soil Remediation Level

GPL = Groundwater Protection Limit

***Bold** values indicate exceedance of rSRL.*

SD = standard deviation

TABLE 12
Analytical Results for Toxicity Characteristic Leaching Procedure RCRA 8 Metals
Harrison Rd and Millmar Rd Dross
Tucson, Arizona

Sample ID	Sample Date	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
		(mg/L)							
B-1	5/9/2016	<0.40	**2.4**	**0.28**	<0.30	**0.86**	<0.0010	<0.40	<0.10
B-3	5/9/2016	<0.40	**2.7**	**0.53**	<0.30	**5.3**	<0.0010	<0.40	<0.10
B-4	5/9/2016	<0.40	**3.4**	**0.87**	<0.30	**3.3**	<0.0010	<0.40	<0.10
B-5	5/9/2016	<0.40	**3.9**	**0.98**	<0.30	**2.6**	<0.0010	<0.40	<0.10
B-6	5/9/2016	<0.40	**2.8**	**1.5**	<0.30	**5.4**	<0.0010	<0.40	<0.10
B-7	5/9/2016	<0.40	**3.6**	**0.94**	<0.30	**3.2**	<0.0010	<0.40	<0.10
WP-1	5/11/2016	<0.40	**2.0**	**0.20**	<0.30	<0.40	<0.0010	<0.40	<0.10
WP-2	5/11/2016	<0.40	**2.7**	**0.46**	<0.30	**0.87**	<0.0010	<0.40	<0.10
WP-3	5/11/2016	<0.40	**2.1**	**0.44**	<0.30	**1.4**	<0.0010	<0.40	<0.10
EB-1	5/12/2016	<0.40	**4.1**	**0.77**	<0.30	**4.1**	<0.0010	<0.40	<0.10
EB-2	5/12/2016	<0.40	**3.3**	**0.52**	<0.30	**1.6**	<0.0010	<0.40	<0.10
EB-3	5/12/2016	<0.40	**2.3**	**0.25**	<0.30	**0.82**	<0.0010	<0.40	<0.10
EP-1	5/17/2016	<0.40	**2.8**	**0.34**	<0.30	**0.65**	<0.0010	<0.40	<0.10
EP-2	5/17/2016	<0.40	**3.6**	**0.81**	<0.30	**3.2**	<0.0010	<0.40	<0.10
EP-3	5/17/2016	<0.40	**2.4**	**0.89**	<0.30	**2.1**	<0.0010	<0.40	<0.10
EP-4	5/17/2016	<0.40	**4.1**	**1.0**	<0.30	**3.8**	<0.0010	<0.40	<0.10
EP-5	5/17/2016	<0.40	**3.2**	**1.8**	<0.30	**10**	<0.0010	<0.40	<0.10
EP-6	5/17/2016	<0.40	**3.7**	**1.5**	<0.30	**8.0**	<0.0010	<0.40	<0.10
EP-7	5/17/2016	<0.40	**3.9**	**2.5**	<0.30	**7.1**	<0.0010	<0.40	<0.10
EP-8	5/17/2016	<0.40	**3.5**	**1.4**	<0.30	**4.9**	<0.0010	<0.40	<0.10
EP-9	5/18/2016	<0.40	**4.1**	**0.56**	<0.30	**4.0**	<0.0010	<0.40	<0.10
EP-10	5/18/2016	<0.40	**5.0**	**0.83**	<0.30	**9.8**	<0.0010	<0.40	<0.10
EP-11	5/18/2016	<0.40	**5.1**	**1.3**	<0.30	**3.4**	<0.0010	<0.40	<0.10
EP-12	5/18/2016	<0.40	**3.5**	**1.0**	<0.30	**2.1**	<0.0010	<0.40	<0.10
TCLP Limit		**5**	**100**	**1**	**5**	**5**	**0.2**	**1**	**5**

Notes:

Turner Laboratories, Inc. analyzed by EPA Method 7471A/6010B TCLP for RCRA 8 metals.
Bold *values indicate detection above the reporting limit.*
Highlighted values indicate an exceedance of the RCRA limit
mg/L = milligrams per liter
Sample Locations: B = Haney property; WP = West Pile; EB = East Berm; EP = East Pile

TABLE 13
West Berm Soil Analytical Results for Metals
Harrison Rd and Millmar Rd Dross
Tucson, Arizona

Sample ID	Sample Date	UTM Easting	UTM Northing	Aluminum	Antimony	Cadmium	Copper	Lead	Nickel
		(m)		(mg/kg)					
WB-1	5/13/2016	520229.93	3559040.21	**9,900**	<5.0	**0.31**	**46**	**9.4**	**6.3**
WB-2	5/13/2016	520229.19	3559059.52	**11,000**	<5.0	**1.8**	**320**	**19**	**23**
WB-3	5/13/2016	520228.09	3559078.31	**12,000**	<5.0	**0.29**	**59**	**21**	**6.3**
WB-4	5/13/2016	520218.32	3559093.79	**8,100**	<5.0	**0.30**	**150**	**9.0**	**9.7**
rSRL				**76,000**	**31**	**39**	**3,100**	**400**	**1,600**

Notes:

Turner Laboratories, Inc. performed all analyses.
EPA Method 6010B analysis for the included metals only.
rSRL = residential Soil Remediation Level
***Bold** values indicate detection above the reporting limit.*
mg/kg = milligrams per kilogram
Sample locations: WB = West Berm

TABLE 14
XRF and Analytical Results - Early Response Action
Harrison Rd and Millmar Rd Dross
Tucson, Arizona

Sample ID	Date	Time	UTM Easting	UTM Northing	XRF or Laboratory	Aluminum	Antimony	Arsenic	Cadmium	Copper	Lead	Nickel
			(m)			(mg/kg)						
B-1-1-8	7/28/2016		520230.19	3558948.70	XRF		***<90***	**10**	***<47***	93	15	<34
B-1-2-8	7/28/2016		520238.00	3558948.70	XRF		***<69***	<6	<36	32	16	<27
B-1-3-12*	7/28/2016	7:05	520230.18	3558940.84	XRF		***<66***	<6	**39**	301	27	36
					Laboratory	16,000	<5.0	2.3	6.9	780	50	33
B-1-4-16	7/28/2016		520238.01	3558940.85	XRF		***<65***	7	<34	123	17	40
B-1-5-16	7/28/2016		520230.19	3558933.09	XRF		***<63***	<7	35	1,784	118	174
B-1-6-24*	7/28/2016	6:55	520238.03	3558933.10	XRF		***<64***	***<21***	**134**	**8,797**	**755**	190
					Laboratory	**150,000**	**31**	<2.0	**110**	**17,000**	**810**	520
B-1-7-24	7/28/2016		520245.51	3558933.15	XRF		***<65***	<5	<34	57	19	<25
B-1-8-10	7/28/2016		520253.17	3558933.16	XRF		***<64***	<5	<36	36	8	40
B-1-9-15	7/28/2016		520230.19	3558925.69	XRF		***<64***	<7	***<40***	21	19	<30
B-1-10-14	7/28/2016		520238.04	3558925.67	XRF		***<63***	<5	<32	53	15	37
B-1-11-12	7/28/2016		520245.57	3558925.68	XRF		***<68***	8	<36	26	10	<36
B-1-12-10	7/28/2016		520253.19	3558925.70	XRF		***<70***	<6	<36	19	13	<29
B-1-13-10	7/28/2016		520239.02	3558918.86	XRF		***<68***	<6	<34	29	16	36
B-1-14-10*	7/28/2016	7:29	520246.74	3558918.82	XRF		***<69***	<6	<34	19	17	41
					Laboratory	10,000	<5.0	2.8	1.2	13	6.8	3.7
B-1-15-10	7/28/2016		520239.09	3558912.47	XRF		***<63***	6	<34	26	15	41
B-1-16-10	7/28/2016		520246.76	3558912.46	XRF		***<64***	<6	<36	18	18	33
B-3-1-24	7/29/2016		520237.92	3558992.83	XRF		***<74***	<10	**61**	1,379	100	120
B-3-2-24	7/29/2016		520244.12	3558992.83	XRF		***<77***	***<17***	**98**	**10,302**	**457**	514
B-3-3-24*	7/29/2016	8:47	520250.38	3558992.83	XRF		**104**	***<20***	**139**	**15,731**	**563**	256
					Laboratory	**130,000**	<25	6.3	**100**	**25,000**	**940**	680
B-3-4-24	7/29/2016		520256.64	3558992.84	XRF		***<68***	<9	<38	1,095	90	88
B-3-5-24	7/29/2016		520237.93	3558986.63	XRF		***<63***	<6	<32	55	37	38
B-3-6-24	7/29/2016		520244.12	3558986.64	XRF		***<69***	***<12***	**59**	**5,137**	208	254
B-3-7-24	7/29/2016		520250.41	3558986.64	XRF		**129**	***<29***	**204**	**22,069**	**935**	1,420
B-3-8-24*	7/29/2016	9:03	520256.68	3558986.65	XRF		***<65***	***<11***	**49**	**5,445**	199	285
					Laboratory	70,000	**38**	4.9	**40**	**21,000**	**990**	370
B-3-9-24	7/29/2016		520237.93	3558979.59	XRF		***<61***	<6	<34	80	21	31
B-3-10-24	7/29/2016		520244.12	3558979.59	XRF		***<63***	<9	**62**	2,726	101	105
B-3-11-24	7/29/2016		520250.45	3558979.58	XRF		***<88***	**17**	***<46***	46	131	<34
B-3-12-24	7/29/2016		520256.72	3558979.61	XRF		***<61***	<7	<31	593	70	45
B-4-1-24*	8/3/2016	7:52	520263.01	3558992.84	XRF		***<71***	<8	<37	513	54	43
					Laboratory	24,000	<5.0	1.9	11	1,600	81	85
B-4-2-24	8/3/2016		520269.41	3558992.85	XRF		***<65***	8	<34	161	23	36
B-4-3-24	8/3/2016		520275.71	3558992.84	XRF		***<70***	<7	<37	235	27	43
B-4-4-24	8/3/2016		520281.96	3558992.85	XRF		**76**	***<18***	**119**	**8,713**	**526**	337
B-4-5-24	8/3/2016		520263.01	3558986.65	XRF		**87**	**13**	**42**	**3,902**	72	138
B-4-6-24*	8/3/2016	8:12	520269.39	3558986.66	XRF		***<79***	***<19***	**108**	**7,736**	**428**	**1,937**
					Laboratory	30,000	<5.0	3.5	18	**3,300**	230	170
B-4-7-24	8/3/2016		520275.70	3558986.65	XRF		***<63***	***<34***	**138**	**30,894**	**2,189**	1,074
B-4-8-24	8/3/2016		520281.97	3558986.67	XRF		**68**	**24**	**146**	**18,266**	**779**	775
B-4-9-24	8/3/2016		520263.01	3558979.60	XRF		***<53***	9	<33	109	21	52
B-4-10-24	8/3/2016		520269.36	3558979.60	XRF		***<60***	<5	<31	67	25	<20
B-4-11-24*	8/3/2016	8:37	520275.68	3558979.59	XRF		***<58***	***<12***	**146**	**13,212**	263	207
					Laboratory	**170,000**	<25	<5.0	**140**	**15,000**	390	190
B-4-12-24	8/3/2016		520281.99	3558979.60	XRF		**130**	***<26***	**187**	**23,718**	**967**	602
B-5-1-24	8/4/2016		520288.67	3558992.85	XRF		**247**	***<27***	**184**	**24,318**	**996**	1,343
B-5-2-24	8/4/2016		520295.76	3558992.86	XRF		***<69***	***<20***	**104**	**10,347**	**573**	203
B-5-3-24	8/4/2016		520302.86	3558992.86	XRF		***<66***	**19**	<34	2,168	135	131
B-5-4-24*	8/4/2016	7:40	520288.67	3558986.67	XRF		**125**	**124**	**257**	2,885	**1,359**	611
					Laboratory	**140,000**	<25	<5.0	**200**	**30,000**	**1,400**	960
B-5-5-24	8/4/2016		520295.73	3558986.68	XRF		***<65***	***<18***	**81**	**7,154**	**505**	303
B-5-6-24	8/4/2016		520302.83	3558986.68	XRF		***<70***	***<12***	**42**	2,196	208	111
B-5-7-24	8/4/2016		520288.66	3558979.29	XRF		**121**	**38**	**194**	**41,227**	**1,504**	945
B-5-8-24	8/4/2016		520295.70	3558979.30	XRF		<25	**120**	**202**	**21,182**	**951**	523
B-5-9-24*	8/4/2016	8:01	520302.80	3558979.29	XRF		***<61***	<10	<35	1,819	136	92
					Laboratory	17,000	<5.0	3.9	9.6	2,400	100	94
B-6-1-24	8/8/2016		520288.67	3558972.14	XRF		**107**	***<32***	**186**	**31,105**	**1,139**	532
B-6-2-24	8/8/2016		520295.67	3558972.14	XRF		**172**	***<39***	**153**	**26,876**	**1,420**	728
B-6-3-24	8/8/2016		520302.77	3558972.14	XRF		**183**	**50**	**355**	**18,568**	**1,238**	531
B-6-4-24	8/8/2016		520288.68	3558965.99	XRF		**96**	***<39***	**252**	**33,186**	**1,593**	1,156
B-6-5-24*	8/8/2016	9:08	520295.65	3558966.00	XRF		<36	***<25***	**117**	**15,530**	**786**	567
					Laboratory	**110,000**	<25	<5.0	**110**	**18,000**	**1,900**	1,100
B-6-6-24	8/8/2016		520302.74	3558966.00	XRF		***<75***	***<13***	**49**	**3,404**	203	148
B-6-7-24	8/8/2016		520288.68	3558960.12	XRF		**176**	***<41***	**283**	**39,656**	**1,944**	1,081
B-6-8-24	8/8/2016		520295.63	3558960.14	XRF		**134**	***<29***	**228**	**20,191**	**1,028**	569
B-6-9-24	8/8/2016		520302.71	3558960.14	XRF		**108**	***<25***	**78**	**6,716**	326	311
B-7-1-24*	8/11/2016	7:22	520288.65	3558954.26	XRF		***<66***	***<14***	**45**	**5,638**	302	206
					Laboratory	56,000	5.5	2.1	**41**	**6,300**	390	290
B-7-2-24	8/11/2016		520295.60	3558954.26	XRF		***<80***	***<21***	**129**	**9,450**	**452**	344
B-7-3-24	8/11/2016		520302.66	3558954.26	XRF		**124**	***<35***	**140**	**35,630**	**1,232**	**2,814**
B-7-4-24	8/11/2016		520288.65	3558948.20	XRF		***<68***	**30**	**91**	**9,320**	**514**	368
B-7-5-24	8/11/2016		520295.58	3558948.24	XRF		**97**	***<29***	**174**	**24,201**	**1,007**	519
B-7-6-24*	8/11/2016	7:53	520302.64	3558948.25	XRF		**102**	***<33***	**216**	**36,741**	**1,326**	635
					Laboratory	**140,000**	**36**	5.2	**250**	**32,000**	**1,900**	930
B-7-7-24	8/11/2016		520288.65	3558942.01	XRF		***<73***	**12**	<38	**3,662**	167	99
B-7-8-24	8/11/2016		520295.55	3558942.01	XRF		***<74***	***<26***	**143**	**27,212**	**922**	1,080
B-7-9-24	8/11/2016		520302.63	3558941.97	XRF		**98**	**48**	**135**	**31,512**	**1,074**	1,097
EB-3-1-45	8/22/2016		520238.10	3559069.48	XRF		***<65***	6	<34	156	11	27
EB-3-2-36*	8/22/2016	7:47	520243.65	3559068.07	XRF		***<70***	9	<36	216	20	34
					Laboratory	8,700	<5.0	2.1	1.7	270	14	10

TABLE 14
XRF and Analytical Results - Early Response Action
Harrison Rd and Millmar Rd Dross
Tucson, Arizona
(Continued)

Sample ID	Date	Time	UTM Easting	UTM Northing	XRF or Laboratory	Aluminum	Antimony	Arsenic	Cadmium	Copper	Lead	Nickel
			(m)			(mg/kg)						
EB-3-3-54	8/22/2016		520238.60	3559064.27	XRF		***<65***	<8	<34	743	93	92
EB-3-4-30	8/22/2016		520245.03	3559064.10	XRF		***<73***	<10	<37	571	129	53
EB-3-5-60	8/22/2016		520238.99	3559059.20	XRF		***<70***	<7	<37	568	44	68
EB-3-6-18	8/22/2016		520245.94	3559059.09	XRF		***<70***	<6	<37	134	21	44
EB-3-7-54*	8/22/2016	8:15	520239.13	3559053.55	XRF		***<77***	<7	<40	148	26	50
					Laboratory	11,000	<5.0	4.4	0.70	130	12	10
EB-3-8-60	8/22/2016		520246.44	3559053.47	XRF		***<70***	**10**	<37	273	20	47
EB-2-1-48	8/23/2016		520238.93	3559047.93	XRF		***<68***	**11**	<36	900	68	76
EB-2-2-30	8/23/2016		520246.45	3559047.95	XRF		***<63***	<6	<33	122	26	32
EB-2-3-66	8/23/2016		520238.93	3559042.71	XRF		***<65***	**11**	<34	52	10	46
EB-2-4-10*	8/23/2016	8:59	520246.50	3559042.82	XRF		***<71***	<8	<37	477	43	56
					Laboratory	13,000	<5.0	3.3	0.51	74	13	9.3
EB-2-5-10	8/23/2016		520239.36	3559037.22	XRF		***<66***	8	<34	192	27	51
EB-2-6-36	8/23/2016		520246.40	3559037.35	XRF		***<64***	<5	<34	114	13	27
EB-2-7-24	8/23/2016		520239.83	3559030.92	XRF		***<67***	<6	37	23	14	38
EB-2-8-18	8/23/2016		520245.84	3559031.08	XRF		***<67***	<10	<36	1,782	119	86
EB-1-1-18*	8/23/2016	8:04	520239.81	3559025.02	XRF		***<68***	8	<36	42	12	<28
					Laboratory	12,000	<5.0	2.6	1.6	91	19	6.3
EB-1-2-24	8/23/2016		520245.05	3559025.08	XRF		***<70***	<6	<37	27	19	33
EB-1-3-36	8/23/2016		520239.64	3559019.38	XRF		***<65***	6	<34	379	13	32
EB-1-4-18	8/23/2016		520244.42	3559019.38	XRF		***<67***	**10**	<35	23	12	<27
EB-1-5-24	8/23/2016		520239.39	3559012.72	XRF		***<66***	**10**	<35	902	52	73
EB-1-6-24*	8/24/2016	8:33	520243.86	3559012.84	XRF		***<73***	**11**	<39	965	66	71
					Laboratory	12,000	<5.0	2.4	1.6	86	13	6.2
EB-1-7-18	8/24/2016		520239.79	3559005.75	XRF		***<67***	<6	<35	176	24	39
EB-1-8-12	8/24/2016		520243.23	3559004.79	XRF		***<66***	<6	<34	49	20	<25
WP-1-1-10	8/26/2016		520250.53	3559019.02	XRF		***<68***	7	<36	49	9	<27
WP-1-2-8	8/26/2016		520247.91	3559012.59	XRF		***<63***	<6	<33	42	19	38
WP-1-3-8*	8/26/2016	7:55	520253.27	3559012.79	XRF		***<64***	8	<34	1,188	83	80
					Laboratory	10,000	<5.0	3.6	0.32	120	7.6	4.8
WP-1-4-10	8/26/2016		520247.28	3559004.38	XRF		***<70***	<7	<37	394	25	31
WP-1-5-10	8/26/2016		520253.33	3559005.15	XRF		***<67***	<7	<35	781	39	<27
WP-2-1-24	8/26/2016		520253.91	3559050.29	XRF		***<68***	<10	<36	2,140	144	112
WP-2-2-24	8/26/2016		520254.27	3559044.16	XRF		**118**	***<24***	**192**	**16,176**	**907**	475
WP-2-3-24*	8/26/2016	8:10	520252.02	3559036.09	XRF		***<72***	***<26***	**124**	**23,262**	**960**	**1,617**
					Laboratory	**92,000**	7.5	3.8	34	**12,000**	**530**	400
WP-2-4-24	8/26/2016		520257.16	3559035.88	XRF		***<66***	9	<34	219	21	66
WP-2-5-18	8/26/2016		520250.34	3559026.34	XRF		***<64***	<6	<33	59	20	65
WP-2-6-24	8/26/2016		520255.39	3559025.59	XRF		***<65***	***<11***	**53**	**4,437**	184	123
WP-2-7-24	8/26/2016		520259.98	3559026.89	XRF		***<71***	***<20***	**96**	**10,515**	**541**	339
WP-3-1-24*	8/26/2016	8:43	520263.73	3559019.80	XRF		***<64***	***<18***	**84**	**9,555**	**538**	220
					Laboratory	31,000	<5.0	2.1	13	**6,600**	180	150
WP-3-2-24	8/26/2016		520262.01	3559012.71	XRF		***<66***	***<17***	**41**	**7,128**	**466**	184
WP-3-3-24	8/26/2016		520272.83	3559012.12	XRF		***<66***	***<16***	**77**	**6,527**	**420**	215
WP-3-4-24	8/26/2016		520262.15	3559005.01	XRF		**256**	***<36***	**324**	**32,161**	**1,635**	603
WP-3-5-24*	8/26/2016	8:56	520278.55	3559003.74	XRF		**121**	***<24***	**112**	**15,932**	**897**	462
					Laboratory	**99,000**	16	4.8	**64**	**14,000**	**820**	690
SRL (Residential)						**76,000**	**31**	**10**	**39**	**3,100**	**400**	**1,600**
Minimum GPL						**NE**	**35**	**290**	**29**	**NE**	**290**	**590**

Notes:
mg/kg = milligrams per kilograms
Turner Laboratories, Inc. analyzed soil samples by EPA Method 6010B, shortened list. All analyzed constituents are included in this table.
rSRL = residential Soil Remedation Levels
GPL = Groundwater Protection Levels
NE = Not Established
Bold *measurements exceed the SRL.*
Bold italic *measurements below detection limit indicate the detection limit exceeded the SRL.*
** confirmatory soil sample collected for laboratory analysis*
Sample locations: B = Property B; EB = East Berm; WP = HMD-West pile
UTM coordinates are for centroid of composite area, based on NAD 1983 UTM Zone 12N

TABLE 15
XRF and Laboratory Results, April 2017
Harrison Rd and Millmar Rd Dross WQARF Site
Tucson, Arizona

Sample ID	Date	Time	XRF or Laboratory	UTM Easting (m)	UTM Northing (m)	Aluminum (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Bismuth (mg/kg)	Bromium (mg/kg)	Cadmium (mg/kg)	Chromium** (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Gallium (mg/kg)	Gold (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)
ET-1-0	4/6/2017		XRF	520547.80	3558897.13		***<61***	<10	2,377	8	12	<34	514	34	482	<9	<7	14,891	56	2,794
ET-2-0	4/6/2017		XRF	520545.44	3558901.92		***<59***	***<13***	2,141	7	15	<33	594	35	1,269	<10	<7	13,244	104	2,446
ET-3-0	4/6/2017		XRF	520544.51	3558906.59		***<59***	***<12***	1,990	9	<5	<33	463	30	860	<9	<7	15,647	87	2,507
ET-4-0	4/6/2017		XRF	520540.76	3558914.17		***<58***	<10	2,005	<5	<5	<32	413	29	553	<8	<7	13,830	63	2,022
ET-5-0*	4/6/2017	16:05	XRF	520536.37	3558917.03		***<56***	***<11***	1,934	<5	<5	<31	408	37	634	<9	<7	16,329	79	2,178
			Laboratory			15,000	<5.0					7.8			740				51	
ET-6-0	4/6/2017		XRF	520540.51	3558898.25		***<74***	***<32***	2,701	8	<10	**96**	1,380	47	**8,471**	<19	<12	20,770	**557**	**3,508**
ET-7-24	4/6/2017		XRF	520539.87	3558903.37		***<57***	**14**	2,489	<5	<5	<32	476	37	1,651	<9	<7	15,858	82	2,783
ET-8-24	4/6/2017		XRF	520538.90	3558910.87		***<60***	<9	2,494	10	<5	<33	406	35	321	<8	<7	14,126	23	2,078
ET-9-15	4/6/2017		XRF	520533.14	3558914.59		***<56***	<10	2,137	8	<5	<31	404	36	656	<8	<6	15,961	59	2,308
ET-10-12*	4/6/2017	16:10	XRF	520532.58	3558906.99		***<55***	**10**	1,874	5	9	<31	394	33	684	<8	<7	17,579	47	2,730
			Laboratory			12,000	<5.0					1.1			67				9.2	
ET-11-18	4/7/2017		XRF	520534.81	3558912.86		***<59***	<7	2,355	7	<5	<32	480	27	244	<8	<7	12,306	13	2,087
ET-12-24	4/7/2017		XRF	520538.16	3558906.62		***<65***	**19**	2,810	9	<6	<36	783	41	2,308	<11	<9	19,260	87	3,172
ET-13-12	4/7/2017		XRF	520532.15	3558903.80		***<61***	**9**	2,566	10	6	<34	477	38	382	<9	<7	19,143	20	2,727
ET-14-6	4/7/2017		XRF	520534.00	3558900.91		***<62***	***<21***	2,738	<6	<7	**39**	670	28	3,046	<13	10	16,759	385	2,952
ET-15-0	4/7/2017		XRF	520536.56	3558899.47		***<55***	***<16***	1,565	10	13	34	534	34	**3,767**	<11	<8	10,386	209	2,676
ET-16-0	4/7/2017		XRF	520526.97	3558898.97		***<61***	***<22***	2,234	<6	8	**58**	716	38	**4,069**	<14	<9	21,686	384	**4,034**
ET-17-15*	4/7/2017	10:05	XRF	520529.44	3558902.32		***<60***	**10**	1,863	<5	<5	<33	333	31	310	<9	<7	16,344	22	2,432
			Laboratory			18,000	<5.0					0.32			18				8.9	
ET-18-6	4/7/2017		XRF	520525.56	3558905.44		***<60***	<9	1,970	<5	<5	<33	420	43	295	<8	<7	19,419	29	2,796
ET-19-10	4/7/2017		XRF	520527.30	3558909.96		***<58***	<9	1,611	<5	<5	<32	376	27	322	<8	<7	15,413	32	1,934
ET-20-6*	4/7/2017	10:55	XRF	520530.30	3558912.34		***<58***	9	2,078	<5	<5	<32	320	24	435	<8	<7	15,662	20	2,520
			Laboratory			14,000	<5.0					0.30			18				8.3	
ET-21-24	4/7/2017		XRF	520524.21	3558914.81		***<62***	<8	2,074	5	<5	<35	366	28	254	<8	<6	14,403	14	2,029
ET-22-24	4/7/2017		XRF	520523.06	3558918.26		***<55***	<8	1,461	8	<5	<30	276	29	302	<7	<6	16,838	33	2,167
ET-23-12*	4/7/2017	13:15	XRF	520527.65	3558919.23		***<61***	**21**	1,891	<5	<5	<34	354	29	1,060	<9	<7	17,114	70	2,460
			Laboratory			14,000	<5.0					0.54			34				9.1	
ET-24-6	4/7/2017		XRF	520521.91	3558921.79		***<62***	***<12***	2,080	<5	<5	<35	366	22	1,181	<10	<7	13,264	87	1,788
ET-25-0	4/7/2017		XRF	520516.62	3558897.61		***<61***	***<23***	1,827	8	<7	<34	787	35	**5,054**	<14	<9	19,395	**421**	2,894
ET-26-24	4/7/2017		XRF	520520.33	3558901.31		***<59***	<8	2,059	7	<5	<33	393	37	231	<8	<7	15,011	24	2,421
ET-27-24	4/7/2017		XRF	520515.38	3558904.49		***<63***	***<24***	2,269	8	<7	**55**	790	37	**5,159**	<15	<9	20,803	**412**	3,179
ET-28-6*	4/7/2017	13:25	XRF	520520.94	3558908.02		***<57***	***<12***	1,824	6	<5	33	372	42	778	<9	<7	18,358	99	2,789
			Laboratory			27,000	<5.0					5.6			430				65	
ET-29-6	4/7/2017		XRF	520518.47	3558911.20		***<55***	<10	1,601	<5	<5	<31	368	27	649	<8	<7	14,597	62	2,212
ET-30-12	4/7/2017		XRF	520515.21	3558914.46		***<58***	<9	1,690	6	5	<32	330	15	693	<8	<7	11,888	27	1,947
ET-31-24	4/7/2017		XRF	520518.21	3558916.84		***<61***	<8	2,054	<5	<5	<34	331	30	307	<8	<7	15,286	17	2,045
ET-32-24*	4/7/2017	13:40	XRF	520519.71	3558919.84		***<58***	8	1,561	<5	<5	<32	319	37	245	<8	<7	17,489	16	2,200
			Laboratory			12,000	<5.0					0.76			100				10	
ET-33-18	4/7/2017		XRF	520515.30	3558922.58		***<54***	***<19***	1,193	<5	29	<32	309	43	**4,085**	<12	<8	13,954	278	2,748
ET-34-0	4/7/2017		XRF	520500.22	3558903.50		***<56***	***<14***	1,023	6	25	<32	295	16	1,220	<11	<8	11,772	134	2,271
ET-35-0	4/20/2017		XRF	520544.19	3558896.51		***<55***	***<28***	1,704	12	39	**71**	906	34	**7,917**	<17	<10	15,386	**647**	2,976
ET-36-0	4/20/2017		XRF	520543.24	3558896.54		***<69***	***<35***	3,120	13	22	**77**	2,089	47	**13,657**	<22	<12	27,229	**722**	**5,529**
ET-37-0	4/20/2017		XRF	520543.45	3558899.17		***<56***	<8	2,015	<5	<4	<31	268	9	197	<7	<6	7,167	24	1,159
ET-38-0	4/20/2017		XRF	520542.08	3558899.17		***<73***	<10	2,541	<6	<6	***<40***	442	<11	297	<10	<9	6,025	26	1,297
ET-39-0	4/20/2017		XRF	520547.67	3558896.38		***<101***	***<15***	3,834	<9	37	***<56***	737	19	713	<17	<16	6,006	25	2,519
ET-40-0	4/20/2017		XRF	520547.48	3558897.55		***<213***	***<35***	10,105	<17	<26	***<120***	2,353	<31	1,407	<42	<34	4,810	<38	**4,594**
ET-41-0	4/20/2017		XRF	520547.20	3558900.90		***<226***	***<49***	10,614	<22	<30	***<127***	2,782	<49	2,753	<47	<40	15,097	111	**4,040**
ET-42-0	4/20/2017		XRF	520536.52	3558899.23		***<120***	***<26***	3,952	13	<13	***<67***	922	26	1,395	<22	<17	9,100	120	2,720
ET-43-0	4/20/2017		XRF	520539.76	3558896.50		***<127***	***<22***	4,042	<11	21	**74**	972	<20	895	<24	<19	6,658	33	2,543
ET-44-0	4/20/2017		XRF	520529.93	3558900.64		**383**	***<73***	**16,159**	<36	<52	***<199***	5,010	<55	2,966	<80	<76	8,008	<90	**6,950**
ET-45-0	4/20/2017		XRF	520531.46	3558896.36		***<343***	***<87***	**16,783**	<34	<54	***<196***	2,815	<62	**4,816**	<83	<67	9,677	103	**8,089**
ET-46-0	4/20/2017		XRF	520522.27	3558899.21		***<132***	***<20***	5,085	<11	<12	***<72***	766	<19	594	<19	<18	5,669	39	2,013
ET-47-0	4/20/2017		XRF	520525.80	3558896.22		***<86***	***<13***	2,521	<7	<9	***<48***	432	<15	468	<13	<10	8,780	43	2,272
ET-48-0	4/20/2017		XRF	520515.20	3558899.85		***<351***	***<66***	**15,690**	<42	<51	**218**	3,823	<54	2,817	<81	<63	4,787	<79	**5,798**
ET-49-0	4/20/2017		XRF	520515.38	3558896.47		***<101***	***<33***	2,793	<10	<12	**86**	912	<7	**3,331**	<21	<14	12,451	308	2,435
ET-50-0	4/20/2017		XRF	520518.50	3558896.50		***<95***	***<20***	2,653	<8	13	***<52***	522	<7	920	<17	<12	15,766	89	2,304
rSRL						**76,000**	**31**	**10**	**15,000**	**NE**	**NE**	**39**	**30 / 120,000****	**NE**	**3,100**	**NE**	**NE**	**NE**	**400**	**3,300**
Minimum GPL						**NE**	**35**	**290**	**12,000**	**NE**	**NE**	**29**	**590**	**NE**	**NE**	**NE**	**NE**	**NE**	**290**	**NE**

Notes:
mg/kg = milligrams per kilogram
Turner Laboratories, Inc. analyzed soil samples by EPA Method 6010B, shortened list. All analyzed constituents are included in this table.
rSRL = residential Soil Remedation Levels
GPL = Groundwater Protection Levels
NE = Not Established
Grey shading = no result or not analyzed
Bold *measurements exceed the SRL.*
Bold italic *measurements below detection limit indicate the detection limit exceeded the SRL.*
** confirmatory soil sample collected for laboratory analysis*
*** results were for total chromium; SRLs are for Cr(VI) and Cr(III)*
Sample identifactions: ET-33-18 = East Tail location 33, depth 18 inches below ground surface
UTM coordinates based on NAD 1983 UTM Zone 12N

Sample ID	Date	Time	XRF or Laboratory	UTM Easting	UTM Northing	Mercury	Molybdenum	Nickel	Rubidium	Selenium	Silver	Strontium	Thallium	Tin	Titanium	Uranium	Zinc	Zirconium
				(m)		(mg/kg)												
ET-1-0	4/6/2017		XRF	520547.80	3558897.13	<13	<23	92	109	<5	<28	194	***<15***	<57	3,759	***<17***	302	197
ET-2-0	4/6/2017		XRF	520545.44	3558901.92	<14	28	63	97	<5	<27	216	***<17***	<56	2,947	***<17***	496	175
ET-3-0	4/6/2017		XRF	520544.51	3558906.59	<13	<22	74	110	<5	<26	191	***<14***	68	4,172	***<17***	419	209
ET-4-0	4/6/2017		XRF	520540.76	3558914.17	<12	<21	68	114	<4	<26	188	***<14***	<54	3,846	***<16***	261	264
ET-5-0*	4/6/2017	16:05	XRF	520536.37	3558917.03	13	<21	78	108	<4	<25	184	***<14***	53	3,837	***<16***	305	249
			Laboratory					38										
ET-6-0	4/6/2017		XRF	520540.51	3558898.25	**24**	63	268	82	<8	44	144	***<32***	187	2,494	***<20***	2,637	118
ET-7-24	4/6/2017		XRF	520539.87	3558903.37	<13	<21	103	103	<5	<25	184	***<15***	80	3,065	***<16***	490	207
ET-8-24	4/6/2017		XRF	520538.90	3558910.87	<12	<22	94	147	<5	32	183	***<13***	<56	2,944	***<18***	88	240
ET-9-15	4/6/2017		XRF	520533.14	3558914.59	18	<20	73	133	<4	<25	189	***<13***	<53	3,600	***<17***	289	156
ET-10-12*	4/6/2017	16:10	XRF	520532.58	3558906.99	<12	<20	96	119	<5	<25	201	***<13***	<51	3,097	***<16***	231	208
			Laboratory					6.7										
ET-11-18	4/7/2017		XRF	520534.81	3558912.86	<12	<20	87	112	<4	<26	172	***<12***	<54	3,848	***<16***	47	133
ET-12-24	4/7/2017		XRF	520538.16	3558906.62	<16	<24	127	112	<6	<29	196	***<17***	<61	3,404	***<19***	553	191
ET-13-12	4/7/2017		XRF	520532.15	3558903.80	<14	<22	76	123	<5	<27	205	***<14***	<57	3,905	***<18***	119	207
ET-14-6	4/7/2017		XRF	520534.00	3558900.91	<16	<22	140	103	<6	36	171	***<22***	113	2,559	***<17***	1,232	191
ET-15-0	4/7/2017		XRF	520536.56	3558899.47	<15	25	94	84	<5	<25	158	***<17***	53	2,572	***<15***	1,246	131
ET-16-0	4/7/2017		XRF	520526.97	3558898.97	<17	<23	177	101	<6	33	179	***<22***	136	3,759	***<17***	1,589	262
ET-17-15*	4/7/2017	10:05	XRF	520529.44	3558902.32	<13	<22	50	118	<4	<27	192	***<14***	<56	2,871	***<17***	108	180
			Laboratory					6.3										
ET-18-6	4/7/2017		XRF	520525.56	3558905.44	<13	<21	54	133	<4	31	172	***<13***	<56	3,785	***<18***	102	180
ET-19-10	4/7/2017		XRF	520527.30	3558909.96	<12	<21	43	138	<4	<26	212	***<13***	55	3,611	***<17***	115	197
ET-20-6*	4/7/2017	10:55	XRF	520530.30	3558912.34	<12	<21	60	143	<5	<26	180	***<13***	<54	2,604	***<17***	103	159
			Laboratory					5.2										
ET-21-24	4/7/2017		XRF	520524.21	3558914.81	<12	<22	65	117	<4	<28	191	***<13***	<58	3,261	***<17***	67	226
ET-22-24	4/7/2017		XRF	520523.06	3558918.26	<11	<20	69	155	<4	<24	193	***<11***	<51	3,940	***<17***	87	189
ET-23-12*	4/7/2017	13:15	XRF	520527.65	3558919.23	<14	<22	65	118	<5	<27	171	***<14***	58	2,986	***<17***	438	175
			Laboratory					5.4										
ET-24-6	4/7/2017		XRF	520521.91	3558921.79	<14	<22	103	130	<4	<28	177	***<15***	<58	2,757	***<17***	376	163
ET-25-0	4/7/2017		XRF	520516.62	3558897.61	19	<22	180	108	<5	48	197	***<21***	73	3,347	***<17***	2,356	242
ET-26-24	4/7/2017		XRF	520520.33	3558901.31	<12	<21	64	111	<4	<26	182	***<13***	<56	3,142	***<16***	74	236
ET-27-24	4/7/2017		XRF	520515.38	3558904.49	<18	<22	205	101	9	<28	145	***<23***	106	3,079	***<17***	1,826	138
ET-28-6*	4/7/2017	13:25	XRF	520520.94	3558908.02	<13	<20	<42	129	<5	<25	189	***<14***	<53	3,234	***<17***	361	171
			Laboratory					20										
ET-29-6	4/7/2017		XRF	520518.47	3558911.20	<12	<20	81	130	<4	30	195	***<13***	<51	3,203	***<16***	206	209
ET-30-12	4/7/2017		XRF	520515.21	3558914.46	<12	<20	66	187	<4	<25	155	***<13***	<54	2,455	***<17***	105	167
ET-31-24	4/7/2017		XRF	520518.21	3558916.84	<13	<22	51	110	<5	<28	220	***<13***	58	3,526	***<17***	65	185
ET-32-24*	4/7/2017	13:40	XRF	520519.71	3558919.84	<11	<21	51	114	<4	<26	168	***<12***	<54	3,358	***<16***	56	197
			Laboratory					5.4										
ET-33-18	4/7/2017		XRF	520515.30	3558922.58	<15	42	100	64	<5	<26	342	***<20***	54	1,940	**22**	1,250	127
ET-34-0	4/7/2017		XRF	520500.22	3558903.50	<13	39	<42	62	<5	<27	286	***<18***	74	2,833	**20**	839	151
ET-35-0	4/20/2017		XRF	520544.19	3558896.51	<19	46	154	54	<6	<26	282	***<28***	129	2,104	**20**	2,319	78
ET-36-0	4/20/2017		XRF	520543.24	3558896.54	***<27***	59	610	63	8	44	180	***<34***	233	2,458	**32**	4,465	118
ET-37-0	4/20/2017		XRF	520543.45	3558899.17	<11	<20	48	157	<4	<25	285	***<12***	54	1,350	***<18***	55	76
ET-38-0	4/20/2017		XRF	520542.08	3558899.17	<15	<26	100	142	<5	<33	286	***<17***	<68	2,004	***<22***	55	58
ET-39-0	4/20/2017		XRF	520547.67	3558896.38	***<25***	<38	<76	42	<9	<48	198	***<28***	<94	<2,164	***<28***	292	75
ET-40-0	4/20/2017		XRF	520547.48	3558897.55	***<67***	<83	323	73	<25	<107	157	***<63***	<202	<6,348	***<59***	196	41
ET-41-0	4/20/2017		XRF	520547.20	3558900.90	***<78***	<90	<213	56	<25	<115	145	***<68***	<217	<6,811	***<62***	455	44
ET-42-0	4/20/2017		XRF	520536.52	3558899.23	***<33***	<45	101	81	<11	<58	150	***<34***	137	2,769	***<35***	392	104
ET-43-0	4/20/2017		XRF	520539.76	3558896.50	***<36***	<47	112	67	<13	<61	181	***<36***	<119	<2,814	***<36***	331	45
ET-44-0	4/20/2017		XRF	520529.93	3558900.64	***<132***	<147	<373	58	<49	<196	73	***<127***	<330	<12,244	***<102***	389	<42
ET-45-0	4/20/2017		XRF	520531.46	3558896.36	***<136***	<149	<379	<45	<42	<191	103	***<115***	354	<11,884	***<101***	678	69
ET-46-0	4/20/2017		XRF	520522.27	3558899.21	***<30***	<47	160	99	<12	<61	234	***<31***	<123	<2,826	***<36***	<50	41
ET-47-0	4/20/2017		XRF	520525.80	3558896.22	21	<31	<60	87	8	<39	166	***<22***	<80	<1,562	***<24***	213	107
ET-48-0	4/20/2017		XRF	520515.20	3558899.85	***<134***	<152	<373	<51	<45	<203	105	***<123***	<345	<13.134	***<114***	<242	<42
ET-49-0	4/20/2017		XRF	520515.38	3558896.47	***<27***	<38	114	77	<10	55	147	***<35***	133	2,481	***<28***	1,585	213
ET-50-0	4/20/2017		XRF	520518.50	3558896.50	***<23***	<35	<72	94	<8	<43	172	***<27***	93	3,331	***<26***	499	221
rSRL						**23**	**390**	**1,600**	**NE**	**390**	**390**	**47,000**	**5.2**	**47,000**	**310,000**	**16**	**23,000**	**NE**
Minimum GPL						**12**	**NE**	**590**	**NE**	**290**	**NE**	**NE**	**12**	**NE**	**NE**	**NE**	**NE**	**NE**

Notes:
mg/kg = milligrams per kilogram
Turner Laboratories, Inc. analyzed soil samples by EPA Method 6010B, shortened list. All analyzed constituents are included in this table.
rSRL = residential Soil Remedation Levels
GPL = Groundwater Protection Levels
NE = Not Established
Grey shading = no result or not analyzed
Bold *measurements exceed the SRL.*
Bold italic *measurements below detection limit indicate the detection limit exceeded the SRL.*
** confirmatory soil sample collected for laboratory analysis*
*** results were for total chromium; SRLs are for Cr(VI) and Cr(III)*
Sample identifactions: ET-33-18 = East Tail location 33, depth 18 inches below ground surface
UTM coordinates based on NAD 1983 UTM Zone 12N

TABLE 16
XRF and Laboratory Results, August 2017
Harrison Rd and Millmar Rd Dross WQARF Site
Tucson, Arizona

Sample ID	Date	UTM Easting	UTM Northing	Antimony	Arsenic	Barium	Bismuth	Bromium	Cadmium	Chromium*	Cobalt	Copper	Gallium	Gold	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Rubidium	Selenium	Silver	Strontium	Thallium	Tin	Titanium	Uranium	Zinc	Zirconium
		(m)		XRF Measurements (mg/kg)																										
1	8/11/2017	520426.63	3558897.48	***<56***	<8	1,994	<5	6	<31	409	17	247	<8	<6	11,452	30	2,185	<12	<20	76	113	<4	<25	185	***<12***	<52	3,058	<16	164	124
2	8/11/2017	520436.29	3558897.29	***<56***	<8	1,911	<5	17	<31	399	26	285	<8	<6	10,512	28	2,209	<12	<20	96	107	5	<25	193	***<13***	<52	2,131	<16	525	119
3	8/11/2017	520447.28	3558897.29	***<51***	<7	1,609	5	14	<29	276	29	235	<7	<6	7,413	23	2,238	<10	<19	47	82	<4	<23	199	***<12***	<48	1,437	**17**	400	71
4	8/11/2017	520461.11	3558896.91	***<55***	<8	1,646	6	6	<31	205	21	214	<8	<6	11,791	32	1,676	<12	<20	77	119	<4	<24	213	***<12***	<52	3,736	<16	285	170
5	8/11/2017	520474.55	3558897.10	***<56***	<8	1,530	<5	<5	<31	377	26	320	<8	<7	14,492	34	2,326	<12	<20	73	133	<4	<25	199	***<12***	<52	3,021	***<17***	135	167
6	8/11/2017	520487.06	3558896.53	***<47***	<9	1,018	4	17	<27	233	22	785	<7	<6	8,218	75	1,939	<10	27	<32	84	<3	<22	267	***<12***	<44	1,347	<14	305	83
7	8/11/2017	520497.28	3558896.53	***<52***	<9	1,150	<4	36	<30	219	15	468	<8	<6	5,645	38	1,195	<11	47	<36	60	<4	<25	244	***<15***	<49	<LOD	<16	281	74
8	8/11/2017	520507.13	3558896.53	***<54***	<8	1,374	8	<4	<30	233	30	446	<7	<6	13,949	35	2,075	<11	<19	64	116	<4	<24	189	***<11***	<51	3,082	<15	132	159
9	8/11/2017	520515.39	3558895.76	***<55***	<10	1,495	<5	<5	<31	188	32	555	<9	<7	15,420	70	2,185	<12	<20	56	156	<4	<25	257	***<13***	<52	2,482	***<17***	370	121
10	8/11/2017	520526.89	3558896.13	***<50***	**33**	1,017	7	9	**41**	344	29	2,550	<16	<9	10,394	**792**	1,713	<16	26	77	62	<5	<23	192	***<24***	<47	2,298	<14	1,270	72
11	8/11/2017	520535.73	3558896.34	***<55***	<8	1,584	<4	<4	<31	244	15	166	<7	<7	15,080	31	1,858	<11	<20	56	148	<4	<24	177	***<12***	<52	2,717	<16	56	213
12	8/11/2017	520546.70	3558896.32	***<50***	<6	866	<4	<4	<28	147	10	122	<6	<5	6,248	17	1,257	<9	<18	<32	103	<3	<23	251	***<10***	<47	1,633	<15	40	62
13	8/11/2017	520508.46	3558899.56	***<52***	<7	1,266	<4	<4	<29	225	11	103	<7	<5	9,063	20	1,263	12	<18	53	144	<4	<23	242	***<11***	<49	1,762	<15	38	66
14	8/11/2017	520497.54	3558904.57	***<63***	<9	1,559	<6	<5	<35	176	26	98	<9	<7	19,484	19	1,881	16	<22	<46	201	<4	<28	264	***<13***	<58	4,867	***<21***	64	103
15	8/11/2017	520484.02	3558910.73	***<52***	<7	1,226	4	<4	<29	194	13	84	<7	<5	6,885	23	1,668	<11	<18	35	119	<4	<23	297	***<11***	<49	1,318	<16	40	93
16	8/11/2017	520470.77	3558909.22	***<60***	<8	1,342	<5	<5	<33	252	<11	212	<8	<6	8,811	20	1,095	<12	<22	40	104	<4	<27	144	***<12***	<56	1,619	<16	76	205
17	8/11/2017	520460.35	3558907.70	***<58***	<8	1,304	<5	<5	<32	251	<11	300	<7	<6	9,916	24	**5,511**	<11	<21	<39	99	<4	<26	280	***<12***	56	2,243	***<17***	87	179
18	8/11/2017	520448.04	3558906.95	***<57***	<7	1,090	<4	<4	<32	208	<8	113	<7	<6	5,076	20	1,416	<11	<20	37	127	<4	<25	284	***<11***	<53	925	***<17***	28	42
19	8/11/2017	520437.37	3558907.17	***<53***	<7	960	<4	<4	<30	213	10	109	<7	<6	8,097	20	1,671	<11	<19	39	120	<4	<24	287	***<11***	<50	1,732	***<17***	35	60
20	8/11/2017	520425.12	3558910.92	***<53***	<9	1,061	<4	<4	<29	256	28	275	<8	<6	12,329	59	1,714	<11	<19	<35	109	<4	28	215	***<12***	<49	4,226	<15	209	165
21	8/11/2017	520429.66	3558904.10	***<54***	***<12***	1,345	<5	<5	**41**	448	32	1,550	<9	<6	17,637	120	2,146	<13	<20	75	115	<4	<24	218	***<14***	86	3,892	<16	628	198
22	8/11/2017	520441.78	3558902.78	***<54***	***<15***	1,358	6	6	38	437	32	2,311	<10	<7	19,456	208	2,749	<13	23	83	113	<5	<25	193	***<17***	106	3,114	<16	1,028	156
23	8/11/2017	520454.48	3558902.21	***<52***	<7	1,206	<4	<4	<29	180	<9	114	<7	<6	7,980	19	1,458	<10	<18	60	128	<4	<23	251	***<11***	<49	1,644	<15	31	58
24	8/11/2017	520466.98	3558902.78	***<54***	***<11***	1,218	<4	<5	<30	317	16	899	<8	<6	11,998	84	1,880	<12	<20	67	116	<4	<24	194	***<13***	<51	2,630	<15	400	195
25	8/11/2017	520478.97	3558904.12	***<53***	<8	1,300	6	<5	<30	271	28	267	<8	<6	16,027	39	1,660	<11	<20	54	122	<4	<24	180	***<12***	<50	3,700	<15	122	304
26	8/11/2017	520490.65	3558904.67	***<57***	***<11***	1,451	7	<5	<32	267	17	826	<8	<6	13,235	76	1,621	<12	<21	<40	126	<4	<25	150	***<14***	58	2,620	<15	377	300
rSRL				**31**	**10**	**15,000**	**NE**	**NE**	**39**	**30 / 120,000***	**NE**	**3,100**	**NE**	**NE**	**NE**	**400**	**3,300**	**23**	**390**	**1,600**	**NE**	**390**	**390**	**47,000**	**5.2**	**47,000**	**310,000**	**16**	**23,000**	**NE**
Minimum GPL				**35**	**290**	**12,000**	**NE**	**NE**	**29**	**590**	**NE**	**NE**	**NE**	**NE**	**NE**	**290**	**NE**	**12**	**NE**	**590**	**NE**	**290**	**NE**	**NE**	**12**	**NE**	**NE**	**NE**	**NE**	**NE**

Notes:
mg/kg = milligrams per kilogram
rSRL = residential Soil Remedation Levels
GPL = Groundwater Protection Levels
NE = Not Established
Bold *measurements exceed the SRL.*
Bold italic *measurements below detection limit indicate the detection limit exceeded the SRL.*
** results were for total chromium; SRLs are for Cr(VI) and Cr(III)*
UTM coordinates based on NAD 1983 UTM Zone 12N

TABLE 17
Potential Sensitive Receptors within 1.0 Mile of the Site
Harrison Millmar Dross Site
Tucson, Arizona

Name	Type	Address	Position Relative to Site
Secrist Middle School	Public school	3400 S. Houghton Rd	1.0 mile northeast
Angels In Autism, LLC	Child care	4885 S. Houghton Rd	0.6 mile east-southeast
Horses with Wings	Child care	4885 S. Houghton Rd	0.6 mile east-southeast
Fantasy Island Mountain Bike Park	Trails park	9500 E. Irvington Rd	0.4 mile south to southwest

FIGURES

Spatial Reference: NAD 1983 UTM Zone 12N
Data: ESRI, DigitalGlobe, USDA, USGS, Pima County
Imagery Date: February 2017

Study area parcels with ID

HMD Site

0 500 1,000

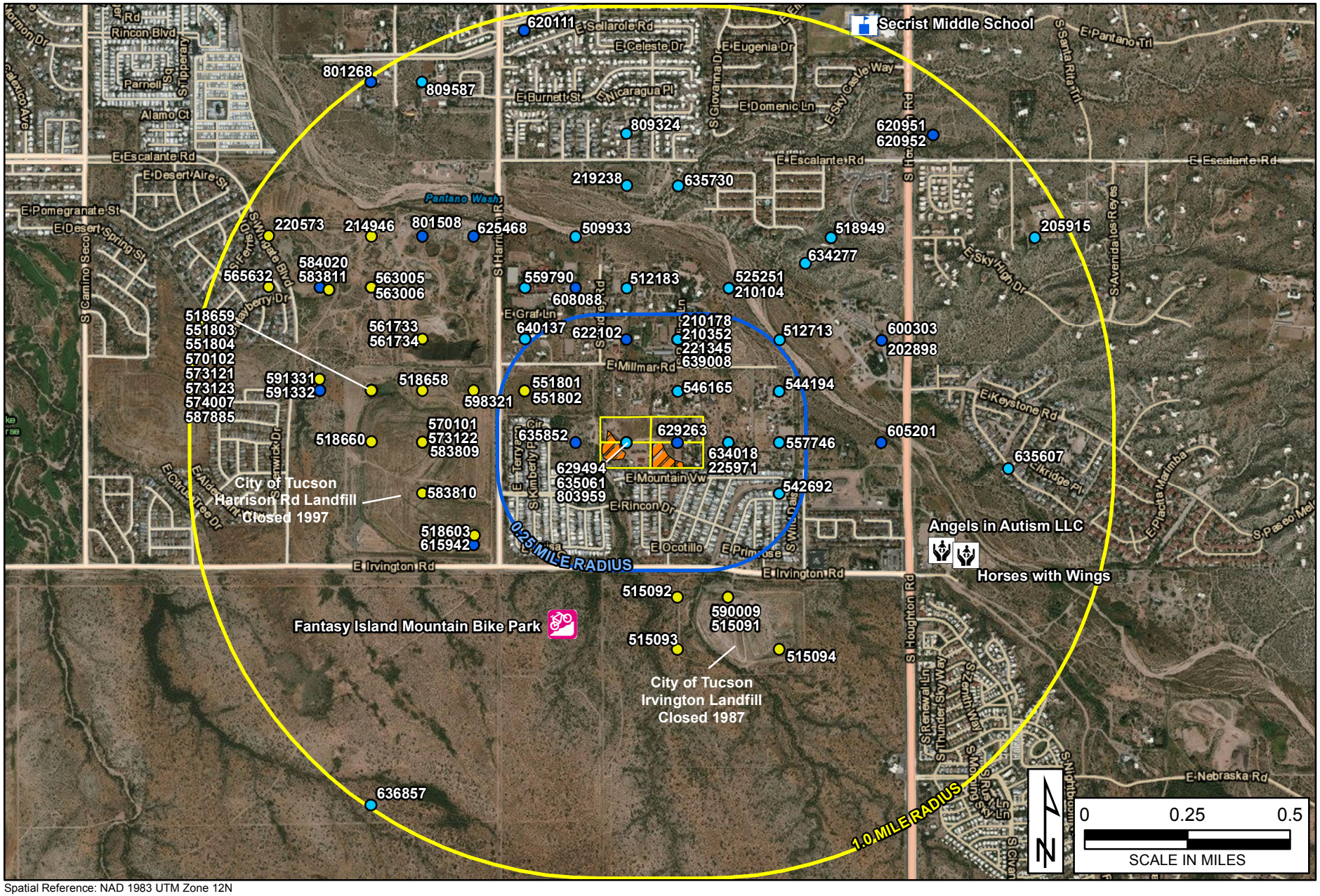
SCALE IN FEET

N

HYDRO GEO CHEM, INC.

SITE LOCATION MAP
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	Author	Date	File Name	Figure
AJB	7/27/17	GEM	7/27/17	2015053074G	1



Spatial Reference: NAD 1983 UTM Zone 12N
Data: ESRI, DigitalGlobe, USDA, USGS, Pima County, and ADWR (2017)
Imagery Date: February 2017

Study area parcels with ID

HMD Site

Wells within 1.0 mile of Site parcels:
- Exempt
- Non-exempt
- Monitoring or environmental

School

Mountain bike park

Child care facility

HYDRO GEO CHEM, INC.

WELLS AND POTENTIAL SENSITIVE RECEPTORS NEAR THE HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	Author	Date	File Name	Figure
AJB	9/05/17	GEM	09/04/17	2015053071G	2

C-106 soil sample/XRF location with ID (below rSRL)

C-123 soil sample/XRF location with ID (above rSRL)

WB-3 composite soil sample location with ID (below rSRL)

Note: rSRL = residential Soil Remediation Level
Results for aluminum, arsenic, antimony, cadmium, copper, lead and nickel are shown.

Moderate exceedances of arsenic rSRL were not considered dross contamination.

0 100 200

APPROXIMATE SCALE IN FEET

N

HYDRO GEO CHEM, INC.

PRE-EXCAVATION XRF AND SOIL SAMPLING LOCATIONS
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	File	Figure
AJB	10/18/17	2015053123G	3

Spatial Reference: NAD 83 UTM Zone 12N
Data: Pima Association of Governments (2015), ESRI

Surface soil background sampling locations

0 250 500
SCALE IN FEET

N

HYDRO GEO CHEM, INC.

SURFACE SOIL BACKGROUND SAMPLING LOCATIONS
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	Author	Date	File Name	Figure
AJB	09/04/16	GEM	1/12/16	2015053003G	4

approximate extent of dross-impacted soil remaining under soil cover and backfill

approximate extent of surficial dross-impacted soils (pre-excavation)

approximate extent of surficial dross-impacted soils (post-excavation)

Note: rSRL = residential Soil Remediation Level
Results for aluminum, arsenic, antimony, cadmium, copper, lead and nickel are shown.

Moderate exceedances of arsenic rSRL were not considered dross contamination.

0 100 200

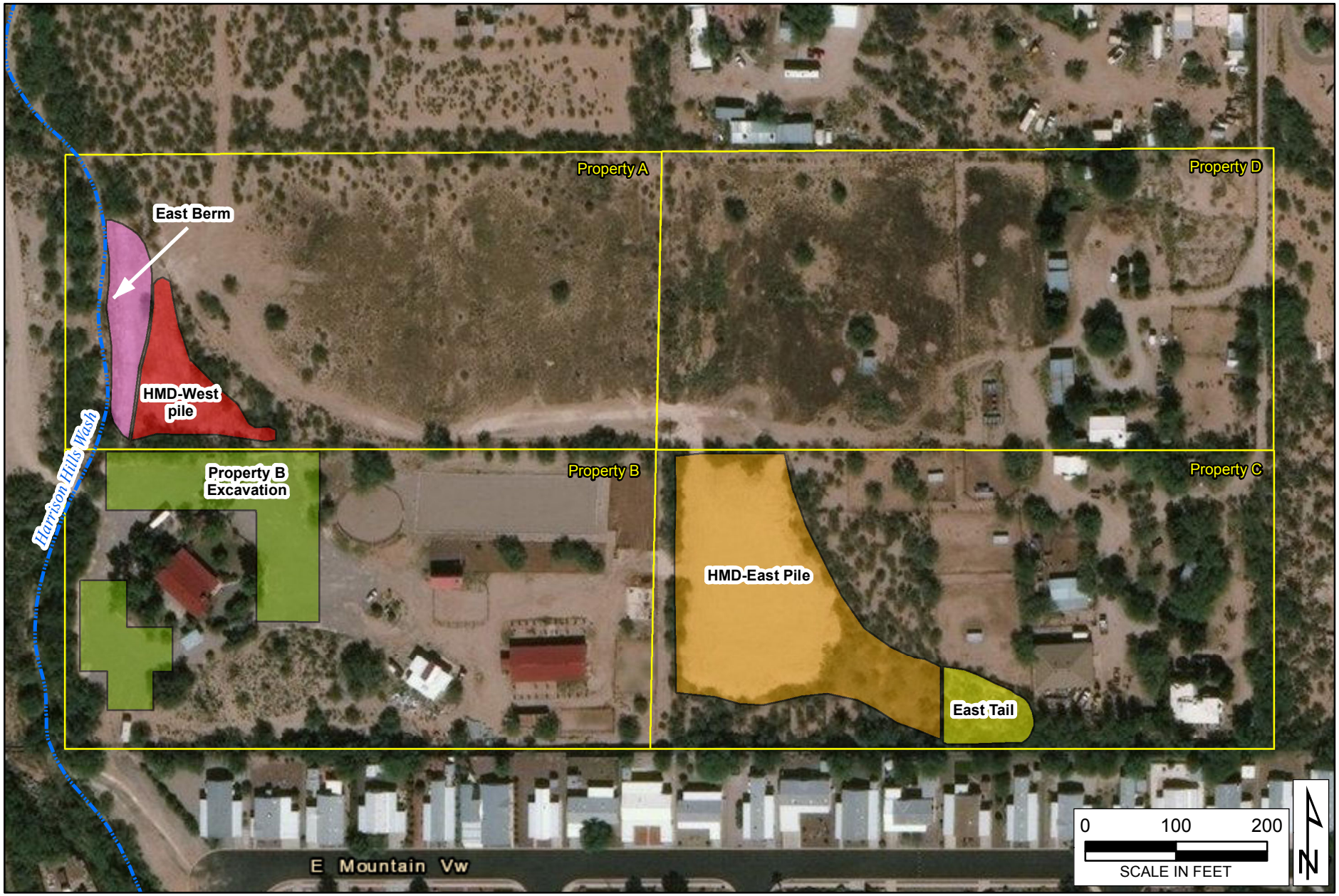
APPROXIMATE SCALE IN FEET

N

HYDRO GEO CHEM, INC.

PRE-EXCAVATION AND POST-EXCAVATION EXTENT OF DROSS CONTAMINATION
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	File	Figure
AJB	10/23/17	2015053124G	5



Spatial Reference: NAD 1983 UTM Zone 12N
Data: ESRI, DigitalGlobe, USDA, USGS, Pima County

- Study area parcels with ID
- Property B ERA excavation and cap footprint
- East Berm excavation and rebuild footprint
- HMD-West Pile ERA excavation and cap footprint
- East Tail RA excavation and cap footprint
- HMD-East RA engineered cover footprint

HYDRO GEO CHEM, INC.

EXTENT OF EXCAVATION AND COVER AREAS
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	Author	Date	File Name	Figure
AJB	9/13/17	GEM	9/13/17	2015053112G	6

Excavation footprint with section (red) and subsection numbers (black)
Shading indicates exceedance of rSRL at excavation base.

ET-32-24 East Tail excavation base soil sample/XRF location with ID (below rSRL)

ET-27-24 East Tail excavation base soil sample/XRF location with ID (above rSRL)

Note: rSRL = residential Soil Remediation Level
Results for aluminum, arsenic, antimony, cadmium, copper, lead and nickel are shown.

Moderate exceedances of arsenic rSRL were not considered dross contamination.

0 100 200
SCALE IN FEET

N

HYDRO GEO CHEM, INC.

BASE OF EXCAVATION XRF AND SOIL SAMPLING LOCATIONS
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	File	Figure
AJB	10/23/17	2015053125G	7

Spatial Reference: NAD 1983 UTM Zone 12N
Data: ESRI, DigitalGlobe, USDA, USGS, Pima County

Study area parcels with ID

0 100 200
SCALE IN FEET

N

HYDRO GEO CHEM, INC.

AERIAL VIEW OF SITE AFTER ERA ACTIVITIES
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	Author	Date	File Name	Figure
AJB	9/11/17	GEM	9/11/17	2015053090G	8

Last two digits of ID indicates depth in inches. Following these measurements, excavation was deepened to 24 inches at shallower locations exceeding rSRLs (solid circles).

HMD-East East Tail

HMD-East Main Pile

ET-33-18
ET-24-6
ET-32-24
ET-23-12
ET-22-24
ET-31-24
ET-5-0
ET-30-12
ET-21-24
ET-9-15
ET-4-0
ET-11-18
ET-20-6
ET-29-6
ET-8-24
ET-19-10
ET-28-6
ET-10-12
ET-12-24
ET-3-0
ET-18-6
ET-27-24
ET-34-0
ET-13-12
ET-7-24
ET-17-15
ET-2-0
ET-26-24
ET-14-6
ET-15-0
ET-16-0
ET-6-0
ET-25-0
ET-1-0

Spatial Reference: NAD 1983 UTM Zone 12N Imagery: Pima Association of Governments (2015)

Extent, HMD-East East Tail excavation

Utility pole

Barbed-wire fence

Retaining wall

ET-18-6 Soil sample/XRF location with ID (below rSRL)

ET-12-24 Soil sample/XRF location with ID (above rSRL)

Note: rSRL = residential Soil Remediation Level
Results for aluminum, arsenic, antimony, cadmium, copper, lead and nickel are shown.

Moderate exceedances of arsenic rSRL were not considered dross contamination.

0 25 50
SCALE IN FEET

N

HYDRO GEO CHEM, INC.

HMD-EAST EAST TAIL EXCAVATION FOOTPRINT AND XRF MEASUREMENT LOCATIONS
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	File	Figure
AJB	10/31/17	2015053091G	9

Sb	<53
As	<9
Cd	<29
Cu	275
Pb	59
Ni	<35

20 XRF location with ID (below rSRL) and results. **Red** indicates above rSRL; *Red* indicates below detection limit and detection limit above rSRL.

Sb	<54
As	<12
Cd	41
Cu	1550
Pb	120
Ni	75

21 XRF location with ID (above rSRL) and results. **Red** indicates above rSRL; *Red* indicates below detection limit and detection limit above rSRL.

Note: rSRL = residential Soil Remediation Level
Results for arsenic, antimony, cadmium, copper, lead and nickel are shown. XRF instrument does not measure aluminum concentration.

Moderate exceedances of arsenic rSRL were not considered dross contamination.

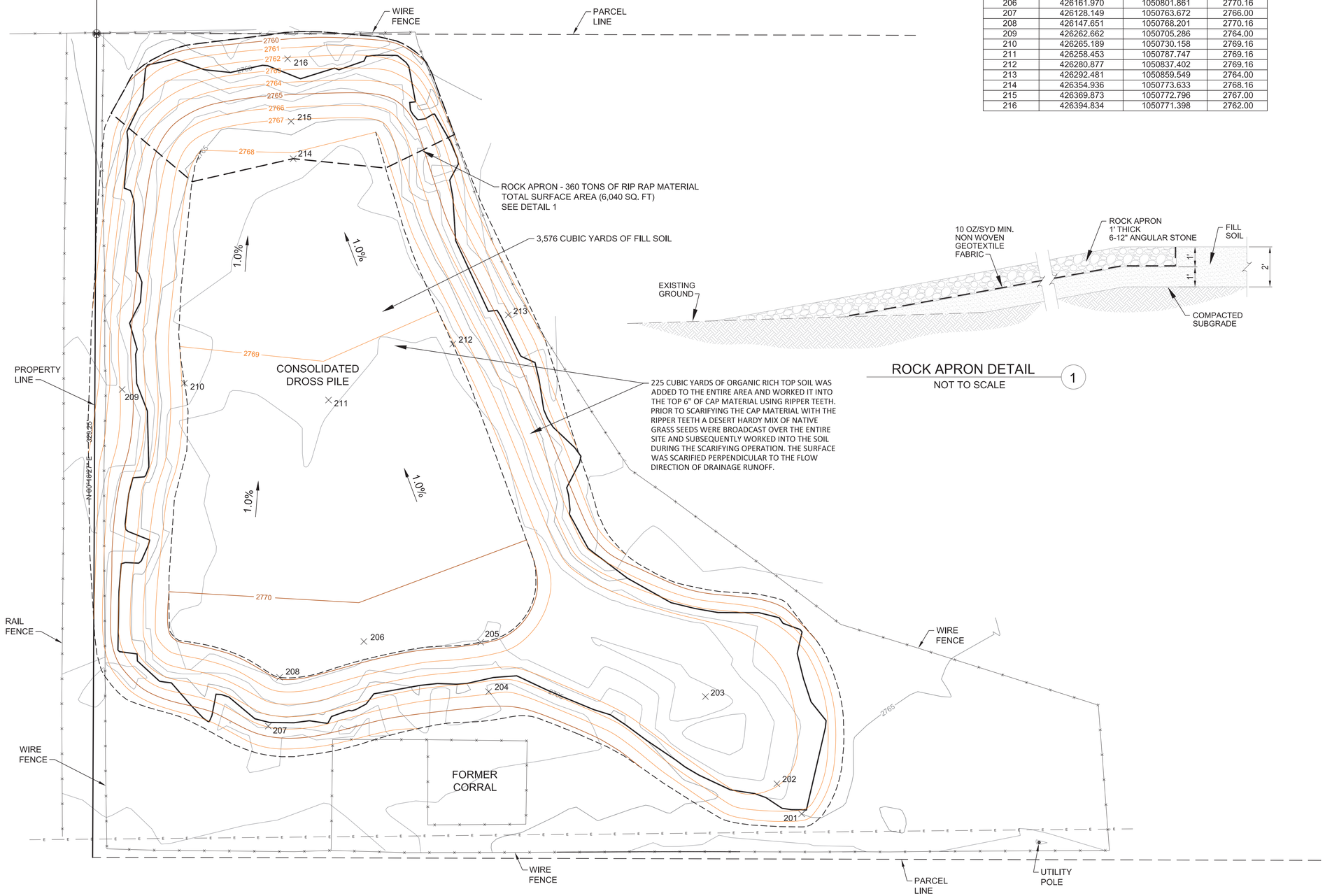
0 25 50
APPROXIMATE SCALE IN FEET

N

HYDRO GEO CHEM, INC.

POST-EXCAVATION XRF RESULTS
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	File	Figure
AJB	10/31/17	2015053128G	10



ROCK APRON DETAIL (1)
NOT TO SCALE

Top of Cover Point Table

Point No.	Northing	Easting	Elevation
201	426093.055	1050976.778	2767.00
202	426105.117	1050966.890	2768.00
203	426139.951	1050938.336	2768.00
204	426141.920	1050851.705	2766.00
205	426161.672	1050848.547	2770.16
206	426161.970	1050801.861	2770.16
207	426128.149	1050763.672	2766.00
208	426147.651	1050768.201	2770.16
209	426262.662	1050705.286	2764.00
210	426265.189	1050730.158	2769.16
211	426258.453	1050787.747	2769.16
212	426280.877	1050837.402	2769.16
213	426292.481	1050859.549	2764.00
214	426354.936	1050773.633	2768.16
215	426369.873	1050772.796	2767.00
216	426394.834	1050771.398	2762.00

NO.	DATE	BY	REVISION

BASE SURVEY:
BY: RES LAND SURVEYS, INC.
DATED: APRIL 14, 2017

LEGEND

- FOUND SURVEY MONUMENT
- PARCEL LINE
- PROPERTY LINE
- FENCE
- ELECTRICAL LINE
- 2386 EXISTING 2017 CONTOUR
- 2386 COVER CONTOUR
- SLOPE BREAK
- LIMITS OF DROSS PILE
- ROCK APRON

N

0' 20' 40'
SCALE IN FEET
CONTOUR INTERVAL - 1 FOOT

NOTES:

1. PLACE FILL SOIL IN LIFTS NOT TO EXCEED 12-INCHES IN THICKNESS.
2. LIGHTLY COMPACT FILL SOIL TO 85 TO 90 PERCENT OF MAXIMUM DRY DENSITY AS PER STANDARD PROCTOR TEST.
3. UNIFORMLY GRADE THE SURFACE OF THE FILL SOIL. PROVIDE A SMOOTH TRANSITION BETWEEN ABRUPT CHANGES IN SLOPE.
4. PROVIDE A SMOOTH TRANSITION FROM FILL SOIL SURFACE TO ROCK APRON.
5. ANY ORGANIC MATERIAL IS TO BE WORKED INTO THE TOP 6 TO 12 INCHES OF FILL SOIL.
6. FINISHED SURFACE TO BE ROUGHENED BY ROLLING WITH KNOBBY-TIRED EQUIPMENT.
7. SCARIFY THE SURFACE OF SIDESLOPES BY CROSS RIPPING PARALLEL TO THE GROUND SURFACE.

	SIGNATURE	DATE
PROJECT ENGR:	J. PECK	
PROJECT MGR:	AJB	
CLIENT:	ADEQ	

HYDRO GEO CHEM, INC.
51 W. WETMORE ROAD
SUITE 101
TUCSON, AZ 85705
520.293.1500 OFFICE / 520.293.1550 FAX
website; www.hgcinc.com

AS-BUILT TOP OF COVER CONDITIONS

HMD EAST PILE
TUCSON, ARIZONA

ARIZONA DEPARTMENT OF ENVIROMENTAL QUALITY
HMD EAST PILE
400 West Congress Street
Tucson, AZ 85701
(520) 628-6733

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
JGP	TML	JGP

DATE: 6/17/2017	FILE: MDS_003.dwg
PROJECT NO.: 2015053.40	CONTRACT: ADEQ14-077537

DRAWING:

APPENDIX A

FINAL REMEDIAL INVESTIGATION LETTER REPORT

TOEROEK
ASSOCIATES, INC.

June 30, 2017

Ms. Christina Silva
Arizona Department of Environmental Quality
1110 W. Washington Street
Phoenix, AZ 85007

Re: Contract # ADEQ16-137176, Task Order No. 02
Harrison Rd. and Millmar Rd. Dross WQARF Registry Site
Final Remedial Investigation Letter Report

Dear Ms. Silva:

Toeroek Associates, Inc. (Toeroek) is pleased to submit to the Arizona Department of Environmental Quality (ADEQ) the Remedial Investigation Letter Report for the Harrison Rd. and Millmar Rd. Dross Water Quality Assurance Revolving Fund (WQARF) Registry Site (H&M Dross Site or the Site), located in Tucson, Pima County, Arizona. ADEQ requested Toeroek to investigate the operational and regulatory history of the Site, and prepare a letter report summarizing the results of this research. Toeroek conducted this investigation under Contract No. ADEQ16-137176, Task Order No. 02.

This letter report is divided into four sections. The first section contains the Site background. The second section presents the operational history of the Site. The third section presents the regulatory history summary for the Site. The fourth and final section consists of conclusions.

The letter report contains one attachment. Attachment 1 is an index of the source documents used in preparation of the report.

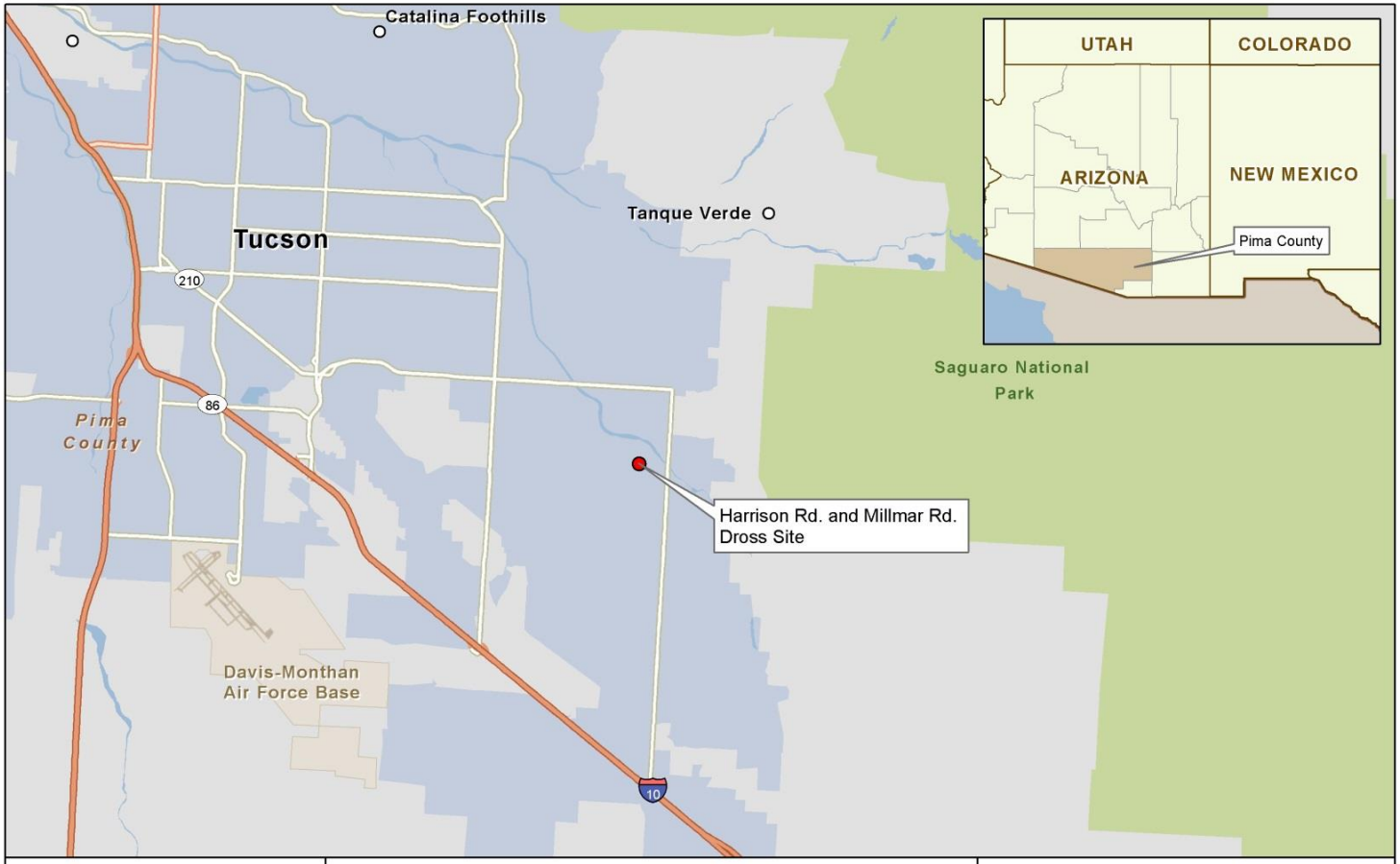
Source documents collected as part of Toeroek's research were assigned alphanumeric numbers (herein called document numbers) to each page of a document. The document number includes a three-digit letter prefix, "HMD," signifying the WQARF Site, and a nine-digit number. Document numbers are located on the bottom right-hand corner of each PDF page of the source document. Toeroek references an abbreviated version of the document number, dropping the preceding zeros, in parenthesis following a statement or a group of statements to identify the source of information in this letter report.

SITE BACKGROUND

The H&M Dross Site is located at 9880 E. Millmar Road, in the south eastern portion of Tucson, Pima County, Arizona (HMD 1039). See Figure 1 for the general location of the Site.

The Site consists of two large, distinct piles of aluminum dross and dross spread across surrounding soils impacted above Arizona residential Soil Remediation Levels (rSRLs). It is located approximately 2,000 feet to the east of the Harrison Landfill Voluntary Remediation Program site and approximately 2,000 feet to the north northwest of the former Irvington Landfill. The Harrison Landfill operated from the 1970s through 1997 and the Irvington Landfill operated from the 1970s through 1987. The Harrison Hills wash runs next to the west dross pile and approximately 750 feet from the east dross pile on the Site (see Figure 2 for a depiction of these features). This wash flows directly into the Pantano Wash, approximately 3,200 feet north of the Site. The east dross pile is located immediately adjacent to the Harrison Hills Mobile Home Park / Pantano Vista Mobile Home Park (HMD 1288-1289, 941).

300 Union Blvd., Suite 520
Lakewood, CO 80228
Phone: 303-420-7735
Fax: 303-420-7658



TOEROEK ASSOCIATES, INC.

N

0 1.5 3 Miles

Sources: Roads and City data obtained from ESRI.

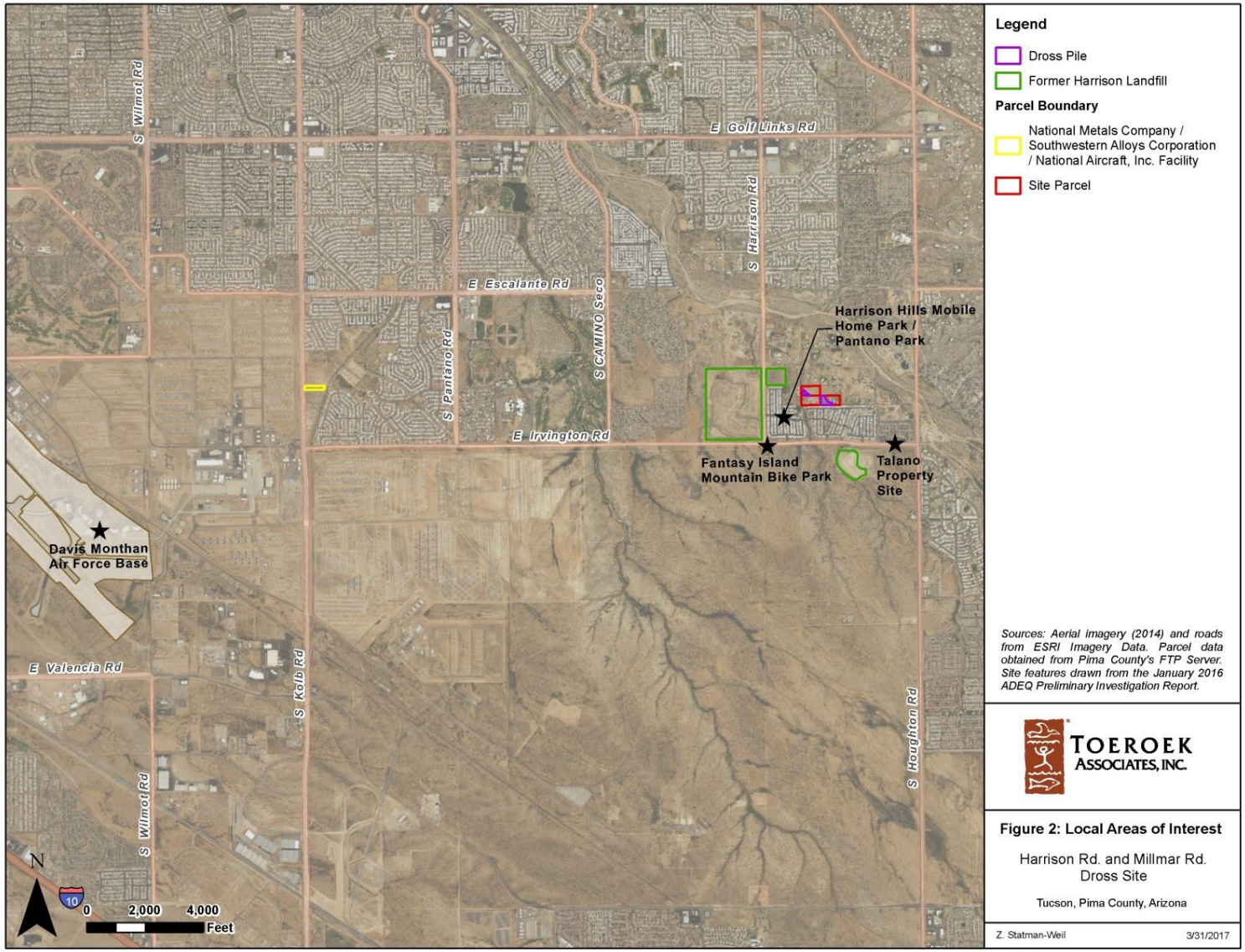
Figure 1: Site Location

Harrison Rd. and Millmar Rd. Dross Site

Tucson, Pima County, Arizona

Z. Statman-Weil

February 2017



Sources: Aerial imagery (2014) and roads from ESRI Imagery Data. Parcel data obtained from Pima County's FTP Server. Site features drawn from the January 2016 ADEQ Preliminary Investigation Report.

TOEROEK ASSOCIATES, INC.

Figure 2: Local Areas of Interest

Harrison Rd. and Millmar Rd.
Dross Site

Tucson, Pima County, Arizona

Z. Statman-Weil 3/31/2017

Current land use in the area of the H&M Dross Site consists of low-density residential area along with low-intensity agricultural use. Higher-density residential areas are present in the immediate Site vicinity. The nearby Irvington Landfill remains out of service, is capped, and is subject to environmental monitoring. In 1994, groundwater contaminated by volatile organic compounds was detected near the Harrison Landfill. Monitoring and remediation has been ongoing since then, including soil vapor extraction activities from 1999 to 2006 and groundwater pumping and treatment since 2001. South of the Site across Irvington Road is the Fantasy Island Trails Park, a popular recreation area surrounding the former Irvington Landfill (HMD 587, 1289). See Figure 2 for the location of areas of interest within and in the area of the Site.

In 1986, ADEQ and Pima County Department of Environmental Quality (PDEQ) became aware of several dross sites located in the area around the Site and around Davis-Monthan Air Force Base (Davis-Monthan). The majority of the dross sites were remediated by the responsible party or a government agency. The H&M Dross Site was not made a part of any remedial actions, potentially due to the large amount of dross at the Site and the estimated costs for removal (HMD 1039).

In August 1993, ADEQ referred the Site to the U.S. Environmental Protection Agency (EPA) to determine if removal of the dross at the Site could occur under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). ADEQ prepared a proposal in 1995 to use funding from WQARF for the removal of the larger of the two dross piles, referred to as the east dross pile. ADEQ also addressed remediation plans for the smaller of the two dross piles, the west dross pile, but these plans were withdrawn later in 1995 for unspecified reasons (HMD 1039-1040).

Multiple individuals associated with the Site have stated in interviews that the dross was placed at the Site by the facility located at Kolb and Irvington Roads (4851 S. Kolb Road, Kolb Road Facility). This facility was owned and/or operated by multiple entities including: National Aircraft, Inc.; National Metals Company; and Southwestern Alloys Corporation. The companies legally purchased obsolete aircraft parts from Davis-Monthan, located across the street from this facility, and melted them down for scrap metals. According to Stephanie Escalante, a Site property owner, the dross was brought to the Site in the 1960s (HMD 234, 239, 725, 250, 892-894, 493, 1039-1040).

ADEQ took samples of the dross and soils in the Site area in 2015 and 2016; some of the samples exceeded rSRLs for multiple metals. According to ADEQ, the Site chemicals of concern (COCs) are metals, including aluminum, antimony, arsenic, cadmium, copper, lead and nickel. ADEQ sampling events have shown that the Site has not affected groundwater; however, the risk of public exposure to dross and soil contamination is high. Exposure pathways include inhalation of particulates and dermal contact for people salvaging metal out of the dross piles and from wind and water erosion (HMD 942, 944, 588, 1289-1290, 1302).

Please note that the H&M Dross Site was formerly referred to as the Garigan Dross Site, the Garigan Property and the Escalante Property in historical documentation and by state and local regulators.

OPERATIONAL HISTORY SUMMARY

The operational history is predominantly based on reviewing files maintained by ADEQ regarding this Site and other dross sites in the Tucson area. Historical interviews and responses to Information Request letters formed the primary source of this information. This section addresses the operations of the Site and briefly describes the facility that reportedly generated the dross brought to the Site. It also includes a summary of site conditions as depicted in aerial photography. Due to the large number of interviews and often inconsistent information from them, this section concludes with a summary of interviews.

ADEQ and PDEQ were first notified of the existence of aluminum dross disposal in the Tucson area in 1986. Aluminum dross is a grey ash-like substance interspersed with metal pieces. The dross at the Site is a byproduct of the melting of aluminum scrap from obsolete military aircraft. This type of dross is known to contain high levels of lead and cadmium. The lead may have originated from batteries, ballast, screw stock, and paint, while the cadmium may have originated from the paint and the plating on the aircraft bolts. Before 1980, discarded or abandoned materials containing hazardous concentrations of toxic heavy metals were regulated by ADEQ and EPA as solid waste; however, minimal regulatory controls were in place at that time to address proper disposal. The dross in the Tucson area was generated and disposed by local area companies prior to the passage of the Resource Conservation and Recovery Act (RCRA) and the Arizona Hazardous Waste Management Act. The dross at the Site was deposited by a local area companies before current industry practices of removing unwanted materials prior to placing the aircraft parts in a furnace. The dross piles may also contain asbestos (HMD 166, 189, 191, 1040).

As of 2005, there were two aluminum dross piles located at the Site that had a combined weight of 6,620 tons, and were each surrounded by a barbed wire fence (see Figure 3).[1] According to a May 23, 2005 ADEQ Memorandum, the Site was originally one of several aluminum dross sites in the Tucson area that, in 1991, were included in the Aluminum Dross WQARF Priority List. The H&M Dross Site is the only remaining open WQARF site that was originally part of the Aluminum Dross WQARF Priority List Site. The Site was not made a part of any remedial actions. ADEQ issued the other aluminum dross sites No Further Investigation or Action Determinations (HMD 410, 1039).

Dross is a waste material resulting from the melting down of aircraft scrap; a process that has been employed since the 1940s. The scrap is placed into a furnace, which is heated specifically to melt the aluminum, but not the ferrous parts such as bolts, electrical components, etc. The industry refers to the heating and melting process as "sweating." Once the molten aluminum is separated from the other solids, it is cooled as ingots. The dross remains as a dark-colored mostly granular material containing metal parts of various sizes. According to ADEQ, the potential hazardous nature of dross was recognized in the early 1980s. As noted above, the existence of dross waste piles in the Tucson area came to ADEQ's attention in 1986 (HMD 630).

ADEQ has analyzed samples of dross from various sites. ADEQ indicated the material was toxic based upon the lead and/or cadmium content. Prior to 1980, no State or Federal legal definition existed for this type of hazardous waste, which exhibited the characteristic of extraction procedure toxicity, and thus it was not regulated except as a solid waste (HMD 630).

[1] In 2016, lesser amounts of dross was discovered on Parcel No. 136-31-0140 where surface water runoff had eroded a small trench in the surface soil on the west, northwest, and north side of the residential structure on the parcel (HMD 1292).

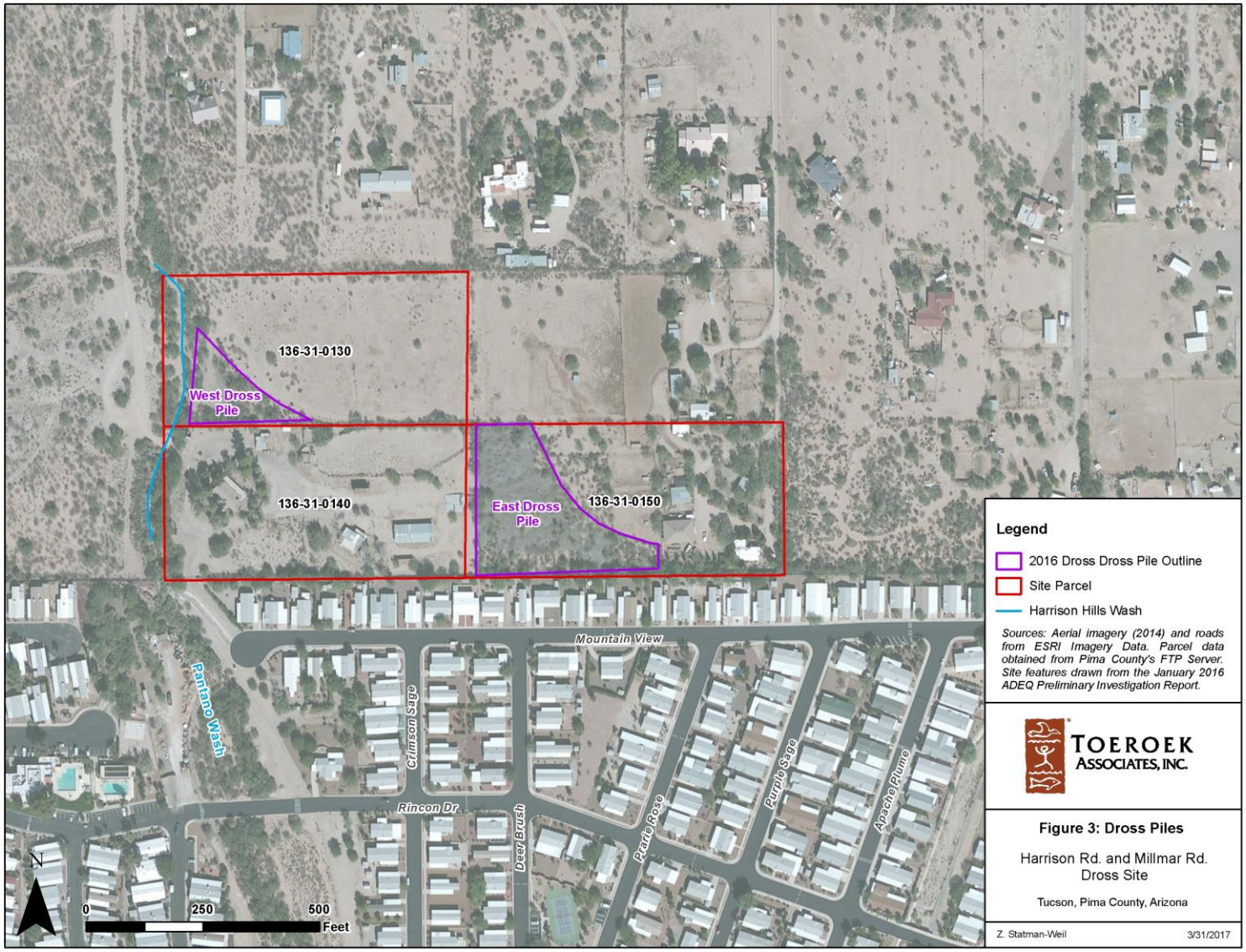

136-31-0130
West Dross Pile
136-31-0140
East Dross Pile
136-31-0150
Mountain View
Pantano Wash
Crimson Sage
Rincon Dr
Deer Brush
Prairie Rose
Purple Sage
Apache Plume
N
0
250
500
Feet
Legend
2016 Dross Dross Pile Outline
Site Parcel
Harrison Hills Wash
Sources: Aerial imagery (2014) and roads from ESRI Imagery Data. Parcel data obtained from Pima County's FTP Server. Site features drawn from the January 2016 ADEQ Preliminary Investigation Report.
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Figure 3: Dross Piles
Harrison Rd. and Millmar Rd.
Dross Site
Tucson, Pima County, Arizona
Z. Statman-Weil
3/31/2017

A number of Tucson-area companies have engaged in the practice of purchasing obsolete military aircraft from Davis-Monthan. The general processes are described as follows:

- Airplanes are stripped of their useful parts, such as instruments and engines; the useful parts can be sold.
- The airplane is chopped into large pieces with a large crane-mounted blade.
- Airplane scrap metal is sorted and separated.
- Steel scrap metal is prepared and transported to a steel processing facility.
- Aluminum scrap is loaded into an aluminum sweat furnace; it is heated to about 1,200 degrees, enough to melt the aluminum but not enough to melt the ferrous parts such as bolts and electrical components. Other metallic components such as iron or stainless steel do not melt at this temperature.
- The molten aluminum flows out along the sloped furnace floor and is poured into molds and solidified into 1,200-pound ingots. Aluminum ingots, also called pigs or sows, are purchased by car and airplane manufacturers as well as other companies that use aluminum.
- After the sweating process the material remaining in the furnace consists of both fine ash like material and chunks of iron and other material that did not burn or melt. This ferrous byproduct, known as dross, remains as a dark colored, mostly granular, material containing metal parts of various sizes (HMD 312, 811).

The majority of the dross piles located in the Tucson area was located on commercial sites. ADEQ investigations also found several piles of illegally disposed dross located in residential areas. ADEQ found residential dross piles at the Talano Property, the Olive Grove Neighborhood and this Site (HMD 166-167).

Roy Long of Roy H. Long Realty Company reported the dross piles at the Site and in the vicinity of the Site to ADEQ in 1988. ADEQ conducted a Hazardous Waste Inspection of the area on July 20, 1988. In the Hazardous Waste Inspection Report, Roy Long represented to ADEQ that the State Land Department owned the property containing the dross piles. Long was planning on future residential development in the area (HMD 172-173).

A State Lands Department Institutional Grant Lands logbook shows prior to 1921, the Site was unoccupied desert, state-owned land. From 1921 through 1935, various individuals leased the Site from the State of Arizona for unknown uses. Manuel Escalante leased the Site and additional area property from the State of Arizona for grazing from 1935 through 1955. Manuel Escalante purchased the Site and additional area property from the State on April 28, 1953. Manuel and Florentina Escalante owned the Site until February 12, 1957, when the property was conveyed to Frank M. and Stephanie W. Escalante. The dross was reportedly placed on the Site property by local companies under the ownership of Frank M. Escalante. His sister, Delores Sanchez, or her son Rafael Rabago, also owned a portion of the Site at the time the dross was dumped by local companies. A number of individuals owned the Site or portions of the Site after 1957. Bryon William Garigan, Jr., Sandra Ann Garigan and Susan A. Haney currently own the Site (HMD 381, 11, 12, 17-22). The date(s) of disposal of dross at the Site could not be verified by Toeroek through available Site documentation. Table 1 below summarizes general ownership of the Site and if dross was present during the time of ownership.

City directories for the Site address list the Lazy SR, a cattle ranch; and Custom Woodwork, a cabinet business operating at the Site in 1986 (HMD381-386). Garigan Enterprises occupied the property between 1986 through 1991 (HMD 381). Toeroek has no information about these activities, but it is

unlikely that the operations of a cattle ranch and cabinet business would have been a source of dross contamination at the Site.

Table 1: Site Ownership Summary

Owner(s)	Dates of Ownership	Dross Present?	Source(s)
State (Owner) / Various Individuals (Lessees)	1921 – 1935	No	HMD 381
State (Owner) / Manuel and Florentina Escalante (Lessees) Manuel and Florentina Escalante (Owners)	1935 – 4/28/1953 4/28/1953 – 2/12/1957	No *(Manuel Escalante reportedly authorized disposal)*[2]	HMD 381 HMD 11
Frank M. and Stephanie W. Escalante	2/12/1957 – 4/29/2013	Yes *(Frank Escalante reportedly authorized disposal)*	HMD 11
Delores Sanchez	2/12/1957 – 5/22/1958	Not likely	HMD 12, 1
Rafael Rabago	5/22/1958 – 11/10/1969	Yes	HMD 1, 123
Philip T. and Mary A. Garigan	7/10/1964 – 10/30/1989	Yes	HMD 41-48
Garigan Enterprises, Inc., aka Garigan Enterprises	11/10/1969 – 8/28/1974	Yes	HMD 123, 124, 125, 126
Bryon William Garigan Jr. and Sandra Ann Garigan	11/14/1980 – **Current**	Yes	HMD 147-148
Descendants of Philip T. and Mary A. Garigan – Garigan Family	10/30/1989 – 5/20/1999	Yes	HMD 41-48, 68-72, 73-76
Susan A. Haney	4/29/2013 – **Current**	Yes	HMD 20-22

Frank Escalante, Jr. (son of Frank Escalante, Sr.) forwarded a letter to ADEQ, dated July 25, 1990, indicating "neither my father, Frank Escalante, nor my grandfather [Manual Escalante], to the best of our knowledge ever gave anyone permission to dump aluminum dross on state land." The letter also indicated there were "no written agreements or contracts signed by National Metal" (HMD 361).

ADEQ states in Letter of Intent for a Proposed Remedial Action Project, dated September 15, 1994, that Davis-Monthan was the source of the aircraft parts that were processed and resulted in the production of the dross found within the Site and other area dross sites. On January 13, 1994, ADEQ sent a 288 letter to Davis-Monthan, requesting more information on the source of the airplane parts. Davis-Monthan responded in a letter of March 3, 1994, indicating it sold aircraft to local companies, which then "smelted them down for their own benefit to obtain the aluminum and dross was the byproduct." The Davis-Monthan letter further indicated: "[t]he Air Force and Davis-Monthan AFB has not generated, transported, or disposed of dross anywhere within the State of Arizona. We did remediate dross deposited on base by commercial operators" (HMD 195, 200).

On May 15, 1991, ADEQ interviewed Ben Klimist, President of Southwestern Alloys Corporation (Southwestern Alloys) and National Aircraft, Inc. (National Aircraft). Ben Klimist stated that Davis-

[2] Based on available information, Manuel Escalante may not have been the owner of the Site parcels at the time the dumping of the dross at the Site occurred, but he reportedly authorized disposal.

Monthan operated three mobile furnaces at the corner of Kolb Road and Irvington Road. Davis-Monthan located the mobile furnaces near gas lines. Davis-Monthan never installed permanent furnaces at these locations. Ben Klimist stated that eight to ten people over 30 years operated the mobile furnaces at Davis-Monthan. Ben Klimist also indicated that the dross from the operation of the mobile furnaces was shipped to Phoenix or Mexico (HMD 232, 493).

Facility Located at Kolb and Irvington Roads - National Metals Company and Affiliated Entities

On January 26, 1994, Frank Escalante, Jr. spoke with ADEQ and stated that "his father used to talk about a Mr. Stone from the facility located on Kolb and Irvington Roads" (HMD 415).

To confirm the information, in the May 15, 1991 ADEQ-Ben Klimist interview, Klimist stated that he employed Frank Stone until approximately 1983.[3] He did not know of any employees who either knew or witnessed the past dross disposal. Klimist also indicated that the "old-timers at Davis Monthan died after retiring" (HMD 232-233).

National Metals Company (National Metals) was located at 19th Avenue in Phoenix, Arizona in 1989. An ADEQ inspection conducted at the National Metals 19th Avenue facility on March 28, 1989 produced documents that National Metals had an aluminum recovery furnace located east of 19th Avenue, across the street from its main facility. National Metals operated its furnace on an as need basis and sold its dross to Link Tech International, a dross broker /recycler. Link Tech International was reportedly known to export dross to Taiwan. ADEQ's inspection indicated that National Metals claimed its dross was non-hazardous. ADEQ found no records to substantiate the claim. National Metals' main waste stream at the time of the 1989 inspection was auto shredder fluff generated from the shredding of automobiles (HMD 375).

On April 5, 1995, EPA and ADEQ interviewed Sharyn Lind, the office manager for National Aircraft. Sharyn Lind told EPA that records were available detailing National Aircraft's business with Davis-Monthan beginning in 1969. Before the mid-1960s, National Aircraft was "located on DM [Davis-Monthan] property and did engage in transporting dross from DM to the surrounding areas" (HMD 251). Sharyn Lind could not identify any area where the dross was dumped.

On November 21, 1996, EPA also interview Garland Powers, a retired employee of AMCEP, Inc., another area metal recovery company. Garland Powers said some of the area companies, including Allied Precious Metals and Litz Metals, had furnaces located at Davis-Monthan. He indicated that Southwestern Alloys may have had a furnace located on-base, but National Aircraft did not (HMD 465-466).

EPA interviewed Sharyn Lind again on November 20, 1996. During this interview, she stated that since 1953, National Aircraft or one of its affiliated companies was located at 4851 S. Kolb Road (Kolb Road Facility). National Aircraft affiliated companies included Southwestern Alloys and National Metals. Sharyn Lind also stated that sometime in the late 1960s a fire destroyed all of National Aircraft's records (HMD 459, 461).

In her subsequent 1996 interview with EPA, Sharyn Lind explained how aircraft were obtained from Davis-Monthan. From time-to-time, Davis-Monthan had surplus sales which could include military aircraft. Davis-Monthan sent out invitations to bid to companies on its mailing list. The invitation described the material being sold. Surplus aircraft, especially military configured aircraft, were rendered inoperable by Davis-Monthan prior to removal from Davis-Monthan, in accordance with instructions in the bid package. Sharyn Lind stated she believed the instructions to destroy the aircraft also pertained to airplanes smelted on base (HMD 460).

[3] Per information provided to Toeroek during a February 2, 2017 project meeting with ADEQ, Frank Stone is deceased.

In March 1988, ADEQ conducted a Hazardous Waste Inspection of the Kolb Road Facility at which time ADEQ interviewed Ben Klimist, President of Southwestern Alloys and National Aircraft. Ben Klimist stated that between 1980 and 1988, Southwestern Alloys processed 50 to 100 airplanes at its Kolb Road Facility. He estimated that approximately 6,000 pounds of aluminum was recovered per airplane, the actual amount would vary. The most common alloys used in the airplanes were "No. 24 or No. 75 and small amounts of No. 63 aluminum sheet material, and No. 356 or 355 aluminum ribs or heavy forgings." The most common type of aircraft processed were World War II vintage aircraft, including T-29s, KC-97s, B47s, S2Fs and B-29s. Ben Klimist also estimated a total of 2,500 to 3,000 airplanes were processed at the Kolb Road Facility during its years of operations. He said that from the start of airplane processing activities at the Kolb Road Facility through 1974, aluminum dross was accumulated on the north field of the facility property. Ben Klimist explained that in 1974 a man, identified as "Mr. Williams," began processing and removing the dross accumulated at the facility from its years of airplane processing (HMD 812-813).

During a May 15, 1991 ADEQ interview, Ben Klimist stated that he shipped dross to "a Thomas or Thompson in Litchfield Park." He again stated that a man named Williams came to his facility to process the dross prior to shipment from the facility to an unknown location. Ben Klimist also stated he "took dross to Shapiro" (HMD 232).[4] Additional details about these activities were not provided in the ADEQ interview.

Toeroek summarized the following history of the Kolb Road Facility based on information Ben Klimist provided to ADEQ and EPA as well as from a report submitted to ADEQ for the Kolb Road Facility for Southwestern Alloys, National Metals, and National Aircraft. The information is presented as provided.

- Prior to 1955 – the Kolb Road Facility property was "bare land."
- 1955-1959 – Page Airways, Inc. of Rochester, New York subleased the Kolb Road Facility property from a woman who held a lease for the property with the State of Arizona. Page Airways, Inc. operated a scrap plane processing facility on the property.
- 1959-1965 – National Aircraft took over the sublease for the Kolb Road Facility property in 1959 and began operations. At that time, National Aircraft was a joint venture between Ben Klimist and Sam Shapiro, representing National Metals, both parties owning 50% of National Aircraft. National Aircraft was the entity operating the facility.
- 1965 – In 1965, Southwestern Alloys was incorporated by Ben Klimist and National Metals. During that year, Southwestern Alloys purchased the facility property from the State while National Aircraft conducted operations.
- 1986 – Ben Klimist became sole owner of National Aircraft. Upon the death of Sam Shapiro in 1986, Ben Klimist bought out National Metals' 50% share of National Aircraft. After 1986, National Metals was not involved with the operations of National Aircraft (HMD 813, 775).[5]

During an April 3, 1995 interview with EPA and ADEQ, Barry Shapiro, President of National Metals stated that National Metals owned the Kolb Road Facility until 1969 when it sold the facility/property

[4] Toeroek assumed Shapiro refers to Barry Shapiro, President of National Metals (HMD 1658). This company was operating out of the Phoenix, Arizona area in 1991.

[5] Toeroek has identified contrary information about the parties associated with the Kolb Road Facility. For example, National Aircraft was not incorporated in Arizona until 1986; consequently, it is unclear what entity operated the Kolb Road Facility in 1965 (HMD 1573). These inconsistencies are identified in this report when they occur. On this occasion, it is possible Ben Klimist confused the names of the entities that were operating during this period. Alternatively, National Aircraft may have operated under some other business type, such as a joint venture or partnership (HMD 775).

to National Aircraft.[6] At the time of the 1995 interview, National Metals was located in Phoenix, Arizona (HMD 250).

Toeroek collected Pima County records for the Kolb Road Facility that were available online. National Aircraft also provided documents to an A.R.S. § 49-288 Request for Information Letter. This information confirms that National Aircraft currently owns the Kolb Road Facility. The Kolb Road Facility consists of two Pima County Parcels, Nos. 136-28-002A (larger original property) and 136-28-006L (smaller parcel obtained in 1997) (HMD 892-894, 1741-1742).[7] Table 2 summarizes the ownership history of the Kolb Road Facility. This facility was located approximately four miles west of the Site (Figure 2).

Table 2: Kolb Road Facility Ownership History Summary

Owner(s)	Dates of Ownership	Source(s)	Parcel
State of Arizona	Unknown – 1997	HMD 1741-1742	136-28-006L
State of Arizona	Unknown – 1967	HMD 1754-1756	136-28-002A
National Metals Company	1967 – 1975	HMD 1754-1756	136-28-002A
Southwestern Alloys Corporation	1975 – 2011	HMD 1744-1748	136-28-002A
National Aircraft, Inc.	1997 – Current	HMD 1741-1742	136-28-006L
National Aircraft, Inc.	2011 – Current	HMD 1744-1748	136-28-002A

A 1987 ADEQ inspection report for a neighboring dross site, the Talano Property Site, outlines details of how dross was placed on the Talano Property. According to the inspection report, "Mr. Stone of the aluminum dross outfit on Kolb and Irvington roads (National Aircraft aka Southwestern Alloys) asked permission . . . to deposit the dross . . . the aluminum dross was transported in 20 to 30 separate loads using ten-wheeler dump trucks" (HMD 447).

National Aircraft, National Metals, and Southwestern Alloys all have a connection with the Kolb Road Facility, located at 4851 South Kolb Road, and with each other. In a May 25, 1994 response to an ADEQ Request for Information, National Metals stated as of 1994 it was "located at 1525 W. Miracle Mile (across town form [*sic*] the properties identified in your letter)". National Metals also declared that it does not now, nor has it in the years since 1969 (when it began operations in Tucson), melted aluminum or handled dross. National Metals also denies owning any property in the areas identified (HMD 477).[8]

A February 12, 1988 ADEQ Memorandum identifies that Southwestern Alloys owned the property that National Aircraft occupied at 4851 S. Kolb Road, Tucson, Arizona (Ben Klimist was President of both entities) (HMD 493).[9]

[6] This statement is contrary to title information that indicates the Kolb Road Facility property was owned by National Metals until 1975 when the property was conveyed to Southwestern Alloys. National Aircraft did not own the property until 1997 and 2011 (HMD 1741, 1744, 1756).
[7] Toeroek did not conduct title research for the Kolb Road Facility. Pima County lists the address for Parcel No. 136-28-002A as 4555 Kolb Road (HMD 893).
[8] National Metals' statement is inconsistent with the limited property ownership information on the Kolb Road Facility provided by National Aircraft in its response to the 2017 Information Request Letter. This response includes title records, specifically a Certificates of Purchase, indicating National Metals owned the property between 1967 and 1975 (HMD 1754-1756).
[9] Ben Klimist passed away on January 21, 2015 (HMD 1714).

Aerial Photographs to Establish Dross Disposal Timeline

Toeroek reviewed a number of sources of available aerial photographs between 1950 and 1975 in an attempt to establish when the dross was placed at the Site. These sources included:

- The U.S. Geological Survey EarthExplorer;
- NETR Online;
- The University of Arizona Library Special Collections;
- Google Earth;
- Arizona Department of Transportation; and
- Phoenix Burton Barr Public Library.

Toeroek's research located four aerial photographs with the best available coverage of the Site.[10] Figures 4 and 5 show aerial photographs of the Site area for the years 1958, 1964, 1966 and 1972 with an overlay of the Site Parcels and the dross piles. Toeroek's review and interpretation of the shaded areas (e.g., identifiable and notable changes) of the aerial photographs determined that locations within the shaded areas (both lighter and darker areas) associated with the dross piles do not exist inside the current dross pile outlines in the 1958 and 1964 aerial photographs. It is possible, however, that limited lighter areas, indicating dross is present, may represent the edges of reduced vegetation in the 1964 aerial photograph, but positive identification is not possible. The poor resolution of the 1966 aerial photograph hinders the interpretation for Site activities related to the presence of dross piles. The dross piles cannot be positively identified in 1966 there appears to be a noted contrast in shading. This contrast would appear to support the presence of new material or dross piles. This darker material was clearly not visible on the 1964 aerial photograph.

Toeroek's research specifically concluded:

- The darkened areas at the eastern dross pile area appear to be present in the 1966 aerial photograph based solely on contrast and comparison to previous aerial photographs and to the same areas in the subsequent 1972 aerial photograph. The areal extent of darkened areas does expand when comparing the eastern dross pile areas of the 1966 and 1972 aerial photographs. The lighter areas that appear in the 1966 aerial photograph at the edges of the dross pile outlines can be noted to change color and aerial extent in the 1972 aerial photograph. The areas are specifically notable in the north-eastern half of Parcel No. 136-31-0150, and the western portion of Parcel No. 136-31-0130.
- The darkened areas at the western dross pile appear in the 1972 aerial photograph, but are not generally identifiable in the 1966 aerial photograph. The lighter areas on the western boundary of the dross pile outline are not readily identifiable in the 1966 aerial photograph.
- Based on the appearance and comparisons of the aerial photographs, both darker shaded areas of the western and eastern dross pile areas are apparent after the date of the 1964 aerial photograph and prior to the date of the 1972 aerial photograph.
- Both dross pile areas appear to increase in areal extent from 1966 to 1972. The resolution of the 1996 aerial photograph is of poor quality, and it is not possible to specifically identify the areal extent of the darkened areas or dross piles in the 1966 aerial photograph, although some

[10] Toeroek conducted a basic evaluation of the aerial photographs it located. Toeroek was not tasked to conduct nor should this basic review be considered a formal aerial photographic interpretation.

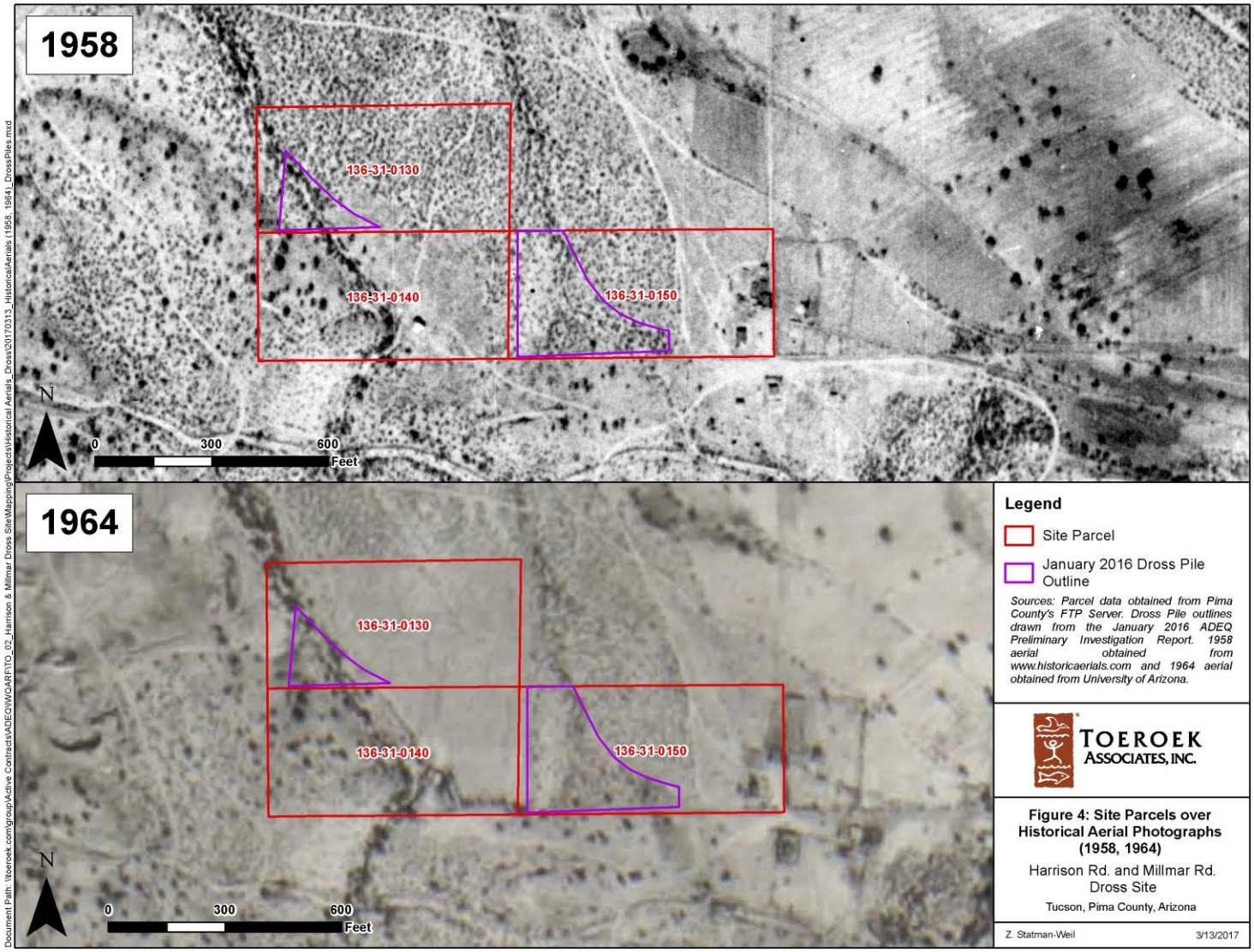
1958
136-31-0130
136-31-0140
136-31-0150
N
0
300
600
Feet
1964
136-31-0130
136-31-0140
136-31-0150
N
0
300
600
Feet
Legend
Site Parcel
January 2016 Dross Pile Outline
Sources: Parcel data obtained from Pima County's FTP Server. Dross Pile outlines drawn from the January 2016 ADEQ Preliminary Investigation Report. 1958 aerial obtained from www.historicaerials.com and 1964 aerial obtained from University of Arizona.
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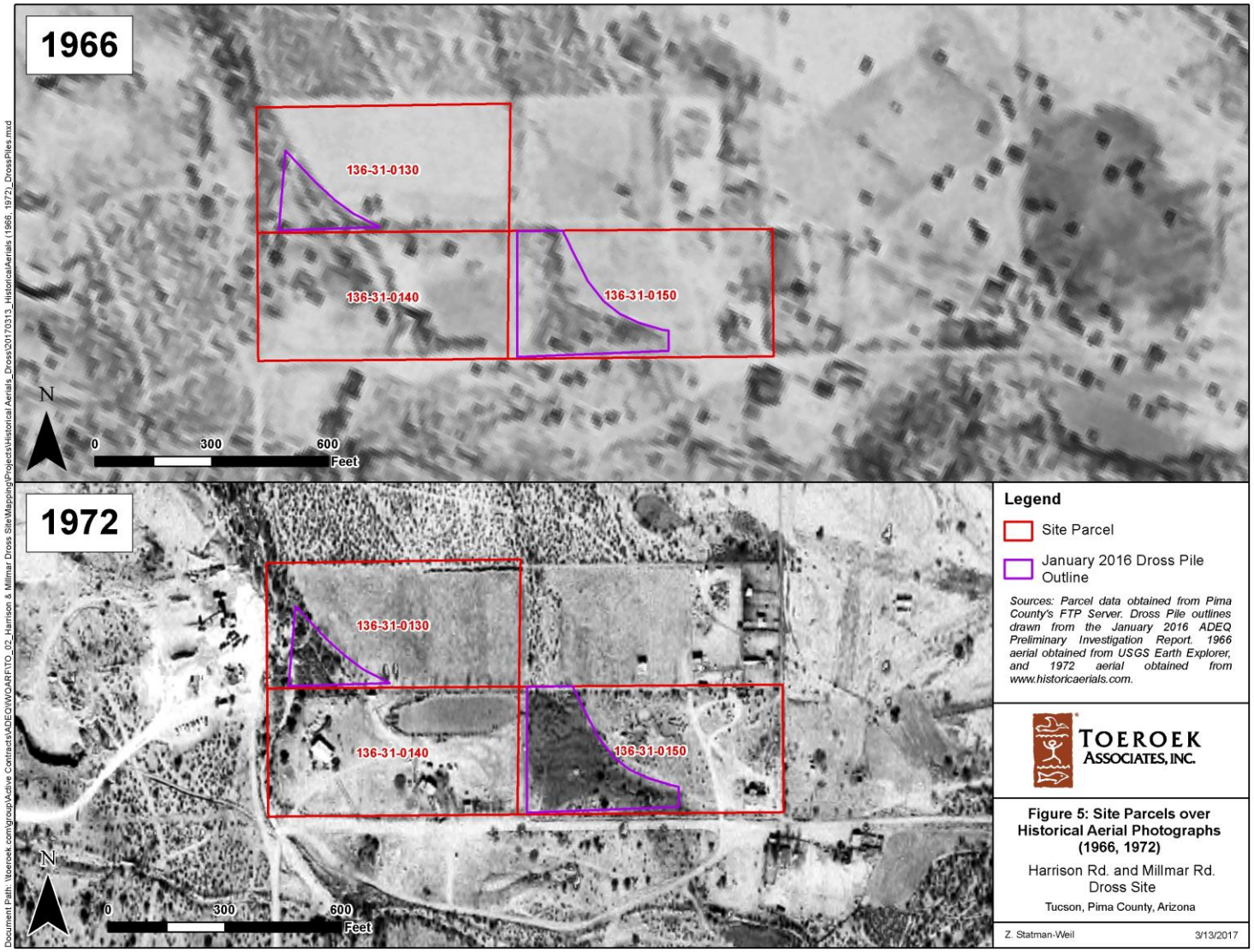
Figure 4: Site Parcels over Historical Aerial Photographs (1958, 1964)
Harrison Rd. and Millmar Rd.
Dross Site
Tucson, Pima County, Arizona
Z. Statman-Weil
3/13/2017
Document Path: \\toeroek.com\group\Active Contracts\ADEQ\WQARF\TO_02_Harrison & Millmar Dross Site\Mapping\Projects\Historical Aerials_Dross\20170313_HistoricalAerials (1958, 1964)_DrossPiles.mxd


1966
136-31-0130
136-31-0140
136-31-0150
N
0
300
600
Feet
1972
136-31-0130
136-31-0140
136-31-0150
N
0
300
600
Feet
Legend
Site Parcel
January 2016 Dross Pile Outline
Sources: Parcel data obtained from Pima County's FTP Server. Dross Pile outlines drawn from the January 2016 ADEQ Preliminary Investigation Report. 1966 aerial obtained from USGS Earth Explorer, and 1972 aerial obtained from www.historicaerials.com.
TOEROEK
ASSOCIATES, INC.
Figure 5: Site Parcels over Historical Aerial Photographs (1966, 1972)
Harrison Rd. and Millmar Rd.
Dross Site
Tucson, Pima County, Arizona
Z. Statman-Weil
3/13/2017
Document Path: \\toeroek.com\group\Active Contracts\ADEQ\IWQARF\TO_02_Harrison & Millmar Dross Site\Mapping\Projects\Historical Aerials_Dross\20170313_Historical Aerials (1966, 1972)_DrossPiles.mxd

specific observations can be inferred. Conversely, no inference can be made of the eastern areas (of Parcel No. 136-31-0150) based on the lighter shaded areas in the 1966 aerial photograph as no true distinction can be identified between the dross pile outline areas and the surrounding areas. The western area of Parcel No. 136-31-0130 show a notable difference in shading from review of the 1966 and 1972 photographs although the clarity of the 1966 photograph remains problematic for a definitive determination.

- Specifically for the eastern dross pile located on Parcel No. 136-31-0150, it can be inferred that these darker piles appear after the date of the 1964 aerial photograph and most likely, prior to the date of the 1966 aerial photograph.
- Specifically for the western dross pile area within Parcel No. 136-31-0130, it can be inferred that these piles do not appear on Site prior to the 1966 aerial photograph; however, substantial changes in shading occur, particularly to the southern portion of this area, and can be seen by comparing the 1966 and 1972 aerial photographs. After reviewing the 1972 photograph, no lighter shaded areas are readily apparent within the dross pile boundary and some areas of darker shading appear to have vegetation growth with the dross pile outlines.

Interviews / Information from Individuals

The Site records have no documentation definitively addressing the disposal of dross at the Site. During their investigation activities for the Site, ADEQ and EPA have conducted a number of interviews with individuals related to the Site and issued Information Request letters regarding it. Without documentation, statements from individuals appear to be the best available source of information. Toeroek described the information from various interviews or letters in previous subsections. The following are further documentation and a summary table of information received from individuals throughout the investigations conducted for the Site.

Further Information:

In a letter dated September 18, 1989, to U.S. Representative Jim Kolbe, Sandra Garigan stated that she had purchased a portion of the Site in 1980. She stated “approximately one-third of the property is covered with what we had always known to be burnt airplane parts, black ash with pieces of metal everywhere.” She further stated that she had been told the dross was dumped on her property between 1955 and 1962 (HMD 732).

In an ADEQ Telephone Contact memorandum, on July 26, 1990, Sandra Garigan stated she felt that [Manuel] Escalante was paid to allow dross to be placed on his property (HMD 787).

In ADEQ handwritten notes from an August 8, 1990 interview of Sandra Garigan, Frank Escalante told Ron Garigan in 1977 that dross had been dumped on the Garigan property to fill in a low spot and channel drainage. Sandra Garigan also told ADEQ that in a conversation between Lydia Peltier and Frank Escalante, her uncle, Frank Escalante told Lydia Peltier that dross had been dumped on the property between 1955 and 1962, and that his home was built over dross. There is also a handwritten note attached stating that Frank Escalante worked at the Air Force Base and had an arrangement with them where he got paid to allow them to dump dross at the Site (HMD 782-784).

In an ADEQ interview conducted on February 5, 1991, Nacho Brocamonte, who worked for the Garigan family, stated that the dross was received by Frank Escalante and dumped onto the Escalante property in the early 1960s (HMD 241).

In an ADEQ interview conducted on February 5, 1991, Jim Young, a friend of Mary Bialk (daughter of Philip and Mary Garigan), stated that the dross was dumped in the early 1960s around the time President Kennedy was killed (HMD 242).

In an ADEQ interview conducted on April 26, 1991, Don Garigan, a local resident, stated that Frank Escalante and his sister, Delores Sanchez, owned the property where the dross was dumped.[11] Don Garigan stated Frank Escalante dumped the dross onto his sister Delores Sanchez's property in the 1960s. He thought that Frank Escalante was paid for allowing the dross to be dumped at the Site. He also stated that trucks from National Metals on Kolb Road and Irvington Road would dump the dross (HMD 239).

In an ADEQ interview with Mary Elizabeth Garigan Bialk and Bernie Bialk conducted on April 26, 1991, Mary Bialk stated that her parents purchased five acres from Frank Escalante in 1962.[12] Mary Bialk stated Frank Escalante worked at the Air Force Base and was dumping dross onto Delores Sanchez's property from 1958 to 1959 (HMD 240).

In an ADEQ interview with Fred Talano (involved with the neighboring Talano Property Site, conducted on April 26, 1991, Fred Talano stated "the dross was dumped on the Escalante property about the same time as the Talano dross." He stated that Frank Escalante did not give permission for the dross to be dumped. Fred Talano remembered that Frank Stone was involved with the company on the corner of Kolb and Irvington Roads. He recalled knowing of Frank Stone from 1962 through 1965 (HMD 235).

On September 30, 1991, Stephanie Escalante was interviewed by ADEQ concerning the origins of the dross. Stephanie Escalante stated her husband, Frank Escalante, worked at Davis-Monthan until he was injured in the early 1960s. Frank Escalante worked on airplanes as a foreman, but Stephanie Escalante could not offer additional details. She stated she "heard that Frank Stone of the business located at Kolb Road was responsible." She also thought that Frank Escalante's sister, Delores Sanchez, gave permission for the dross to be dumped on her property. Stephanie Escalante stated that Frank Stone could have been involved in the dross dumped on Delores Sanchez's property, but she was not positive. She also indicated that dross located on State land, to the south of the Site, was present when she and Frank Escalante moved into their home at the Site in the early 1970s (HMD 234).

During a January 26, 1994 interview, Frank Escalante, Jr. told ADEQ that his father (Frank Escalante, Sr.) used to talk about a Mr. Stone from the facility located on Kolb and Irvington Roads. He further stated "Mr. Stone was probably the one who was responsible for the dross being placed on the properties" (HMD 415).

During a November 21, 1996 ADEQ interview, Stephanie Escalante stated that she supposed Manuel Escalante gave permission to have the dross dumped at the Site. She also recognized the name Frank Stone and National Aircraft (HMD 463-464).

Table 3 summarizes ADEQ and EPA interviews and statements made or documented by various individuals over the years of investigations conducted for the Site. The summary table includes statements or information outlined in this subsection and other subsections. Statements that seem to be in common with multiple interviewees are show in <u>underlined</u> text for added emphasis. To summarize, the common information indicates the dross was dumped by National Metals located at Kolb and Irvington Roads between the late 1950s and the early 1960s. Frank Stone with National Metals was the organizer of the dumping. Manuel Escalante or Frank Escalante may have given permission for the dross to be dumped and may have been paid for the activities.

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[11] Delores Sanchez owned Site Parcel No. 136-31-0150 from February 12, 1957 until May 22, 1958 when she conveyed the property to her son, Rafael Rabago (HMD 1).

[12] Philip and Mary Garigan purchased a portion of the Site from Frank Escalante on July 10, 1964 (HMD 41-48).

Table 3: Summary of ADEQ and EPA Interviews and Statements

Source	Date of Information	Statement	Source(s)
Frank Escalante	7/20/1988	Manuel Escalante gave permission to National Metals Company to dump dross on his land in the late 1950s or early 1960s.	HMD 725
Sandra Garigan	9/18/1989	Sandra Garigan stated she was told the dross was dumped on her property between 1955 and 1962.	HMD 732
Sandra Garigan	7/26/1990	Sandra Garigan stated that she felt [Manuel] Escalante had been paid to dump dross on his property.	HMD 787
Sandra Garigan	8/8/1990	Sandra Garigan stated that Frank Escalante had told Ron Garigan in 1977 that the dross was dumped on the property between 1955 and 1962 to fill in a low spot and to channel drainage.	HMD 782-784
Nacho Brocamonte	2/5/1991	Dross was received by Frank Escalante and dumped it on his property in the early 1960s.	HMD 241
Jim Young	2/5/1991	Jim Young stated that the dross was dumped in the early 1960s.	HMD 242
Don Garigan	4/26/1991	Don Garigan stated Frank Escalante dumped the dross onto his sister Delores' property in the 1960s. He thought that Frank Escalante was paid for allowing the dross to be dumped. He also stated that trucks from National Metals Company on Kolb Road and Irvington Road would dump the dross.	HMD 239
Mary Elizabeth Garigan Bialk	4/26/1991	Mary Bialk stated that dross was being dumped on the Site property between 1958 and 1959.	HMD 240
Fred Talano	4/26/1991	Fred Talano remembered that Frank Stone was involved with the company on the corner of Kolb and Irvington Roads. He recalled knowing of Frank Stone from 1962 through 1965.	HMD 235
Ben Klimist	5/15/1991	Ben Klimist with Southwestern Alloys Corporation and National Aircraft, Inc. stated he employed Frank Stone until approximately 1983.	HMD 232-233
Stephanie Escalante	9/30/1991	Stephanie Escalante stated that she thought Frank Stone of National Metals Company was responsible for dumping the dross on the Site property and it was on the property when she moved into her home in 1970.	HMD 234
Frank Escalante, Jr.	1/26/1994	Frank Escalante, Jr. stated that Mr. Stone of the facility on Kolb and Irvington Roads was likely responsible for the dross being placed on the properties.	HMD 415

REGULATORY HISTORY SUMMARY

The first investigation for the Site was an ADEQ Hazardous Waste Inspection Report dated July 20, 1988. This was the initial discovery of the Site; at this time, ADEQ only located the east dross pile (HMD 172-174).

PDEQ and ADEQ were the agencies historically conducting studies of aluminum dross disposal in the Tucson area. PDEQ requested ADEQ WQARF assistance in 1986. A Record of Decision was signed

on August 24, 1990, and a PDEQ Remedial Action Plan was forwarded by PDEQ on October 12, 1991. PDEQ and ADEQ signed an Intergovernmental Agreement in June 1991 giving Pima County (not PDEQ) authority to conduct investigations on the aluminum dross sites located in residential areas and washes. EPA placed the Site and other area residential dross pile sites on the Comprehensive Environmental Response, Compensation, and Liability Information System in August 1993 (HMD 183-186).

In 1988, ADEQ collected soil samples at the Site. Testing of the samples indicated that the dross was a characteristic hazardous waste, containing lead and cadmium. The highest cadmium level was 110 milligrams per kilogram (mg/kg), which exceeded the Arizona rSRL of 38 mg/kg. Also in 1988, EPA sampled a domestic well located on property adjacent to one of the dross piles. No metals above the EPA Maximum Contaminant Levels were detected in the domestic well at the adjacent property (HMD 410).

The Arizona Department of Health Services (ADHS) collected dross samples along a strip of the east dross pile in 1988. The exact sample locations and depths were not recorded. Sampling results of the dross for cadmium, lead, copper, aluminum and thallium exceeded rSRLs (HMD 1040, 168). Samples were not collected from the west dross pile as it was not included in the investigations until after 1995.

Two private groundwater wells in the area were sampled in 1988. Low levels of lead were detected below Aquifer Water Quality Standards (AWQS). All other metals analyzed for were below detection limits. From this limited sampling, it was determined that groundwater was not affected by the Site (HMD 1041).

According to an August 25, 1989 ADEQ Dross Evaluation of dross sites in the Tucson area, the east dross pile was determined to endanger state waters and posed a moderate risk to public health. WQARF was listed as the enforcement mechanism (HMD 626).

ADEQ collected soil samples in 1989 in three lines extending from the east dross pile to the south, the northeast, and the northwest. Exact locations of the samples are not known. Samples were taken 0.5 inches below ground surface in all locations, with additional samples at 7 inches collected at two of the locations. Additional samples were collected randomly in the direction of surface water flow in the area to the north of the east dross pile. Two samples exceeded the rSRL for thallium; all other metals analyzed for were below regulatory levels (HMD 1040-1041).

In 1992, ADEQ conducted additional dross sampling investigations. Field X-ray fluorescence (XRF) was used in addition to laboratory analysis methods. The XRF reading location on the dross pile is not known. The dross sample was collected from one unspecified location in the east pile. The XRF indicated exceedances of rSRLs for arsenic, antimony, lead, cadmium, and copper. Laboratory analyses of the dross sample indicated exceedances of rSRLs for aluminum, arsenic, antimony, lead, cadmium and copper (HMD 1041).

ADEQ's contractor characterized the dross at the Site after samples were analyzed from a 1992 sampling event. The Site dross was described as follows:

> . . . representative of material derived from the shredding of airplane bodies and engine parts, dating perhaps from the late 1940's to late 1960's. It includes numerous metallic fragments of steel, stainless steel, copper, ceramic, and asbestos or fiberglass. It appears the airplane bodies were simply chopped up without segregation of metallic parts, and stuffed into the furnace. The aluminum parts melted, while everything with a higher melting point did not. The higher melting point material includes bolts and fasteners, copper motor winding, copper tubing, etc. A significant proportion of the dross is represented by this material. Additionally, firebrick and ceramic material mixed with unrecovered aluminum, as well as furnace created minerals apparently

including pyrite (iron sulfide), created within the furnace by the reaction of sulfur with iron fragments (HMD 177).

On September 15, 1994, ADEQ filed a Letter of Intent for a proposed remedial action project to include dross removal at the Site (HMD 257).

On September 30, 1994, ADEQ approved a Letter of Intent to initiate funding to remediate three of the four residential dross sites, including the Talano Property Site, the Site and the Olive Grove Neighborhood (HMD 190).

A December 22, 1994 ADEQ letter discusses that EPA would take the lead for cleanup activities to be conducted at the Site. The Site reportedly contained the highest levels of dioxins/furans and was the largest compared to the other Tucson-area dross sites (HMD 412).

Although it is assumed that the west dross pile was placed at the Site in the same time-period as the east dross pile, regulatory officials did not include the west dross pile in the Site under investigation until 1995 (HMD 168).

On April 29, 1997, ADEQ placed the Site on the WQARF PI List (HMD 410).

An EPA Remedial Site Assessment Decision, dated September 19, 2000, determined that the waste at the Site was not considered waste of federal interest. The Site was removed from further remedial site assessment under CERCLA (HMD 425).

Due to its lower priority in relation to other sites on the WQARF PI List, ADEQ removed the Site from the WQARF PI List on August 25, 2004. ADEQ recommended that the Site be placed on the Remediation and Declaration of Environmental Use Restriction Tracking database and its status be reviewed periodically to determine if it should be placed on the WQARF PI List (HMD 410-411).

A 2015 ADEQ Memorandum/Desktop Summary of the Site discussed that dross samples were last collected from the east dross pile in 1992 and soil samples were last collected from the surrounding area in 1989. No dross samples were ever collected at the west dross pile. In all dross and soil sampling events, metals were detected above regulatory levels. ADEQ recommended that both dross piles and nearby soils be sampled to determine current levels of metals (HMD 1042).

The 2015 ADEQ Memorandum also noted that groundwater was last sampled directly downgradient of the dross piles in 1988, and had lead detections below AWQS. Samples slightly cross-gradient at the Harrison Landfill in 2006 and 2008 were also below AWQS for lead. ADEQ recommended that the potential for groundwater impacts from the Site be re-evaluated due to the high concentrations of metals in the dross piles and the amount of time that had passed since the most recent sampling event (HMD 1042).

ADEQ conducted PI activities, which were summarized in the January 2016 PI Report. Groundwater sampling of six groundwater wells in the Site vicinity in December 2015 resulted in no regulated metals concentrations above reporting limits. Zinc and manganese were reported at low concentrations in one or more of the groundwater wells. Thirty metal-content measurements of soil and dross were made using a field XRF analyzer on or near both of the Site dross piles, including adjacent to private residences, near the piles, and within drainage channels receiving runoff from the piles. ADEQ collected eight soil samples from the Site dross piles for metals analysis. Antimony, arsenic, cadmium, copper, lead and nickel were detected in the Site dross piles and other locations on and off site at levels exceeding rSRLs in the XRF measurements. Aluminum, antimony, cadmium, copper, lead and nickel concentrations were detected above rSRLs in the soil samples (HMD 587-588).

At the time of the 2016 PI Report, the east pile had many holes likely created by small burrowing animals. The surface was often unstable to walk on, collapsing under very minimal pressure. When the

wind picked up during the PI events, fine particles were observed to be blowing off the pile. Pieces of dross materials ranging in size from less than half an inch in diameter to over two feet in diameter were observed in the field to the north of the east pile (HMD 943).

Figures 6 and 7 show the dross piles during 2015 reconnaissance activities. The west pile was less distinct than the east pile. The main part of the west pile was covered by the property owners with waste consisting mainly of heavy shrubbery. The majority of the pile is dross mixed with soil. Dross mixed with soil also appeared to have been used to create a berm between the main part of the west pile and the Harrison Hills wash; this berm is manmade. Multiple pieces of dross one to two feet in diameter were observed in the berm and the side wall of the wash along with smaller dross particles ranging from less than half an inch to a few inches in diameter in multiple places in the berm, the side wall of the wash, and the bottom of the wash. The main surface water flow paths from the two dross piles are to the north (HMD 943, PIR p. 13).

Figure 6: East Pile, December 3, 2015 (HMD 1033)

Figure 7: West Pile Dross and Soil Berm Area, December 3, 2015 (HMD 1035)

ADEQ concluded in its PI Report that the sources of contamination are the two dross piles on Site likely including a berm made of a mix of soil and dross located near the west dross pile. The east pile size was estimated to be approximately 96,000 square feet in area. The height of the pile above land surface ranges from approximately one foot to eight feet high. The total estimated dross above land surface is approximately 438,000 cubic feet (16,222 cubic yards). This is greater than the1994 estimates in ADEQ files of approximately 180,000 cubic feet (6,667 cubic yards). This discrepancy is mostly driven by different depth estimates (previous calculations assumed the pile was two feet deep). No estimate of area or height for the west pile was provided; the west pile was covered with green waste some of the dross has been incorporated into the soil and berm (HMD 944).

Dross and soil surrounding the dross exceeded rSRLs for multiple metals. While evidence has not indicated that the Site contamination affected groundwater, the risk of public exposure to dross and soil contamination is high. ADEQ included a recommendation in the 2016 PI Report to prepare a WQARF Registry listing package for the Site (HMD 944).

ADEQ conducted supplemental PI activities, results of which are summarized in a PI Report Addendum dated April 15, 2016. Based on the results of the 2015 PI, the 2016 PI Addendum further investigated the Site and adjacent areas. XRF measurements and confirmatory soil sampling were conducted (HMD 1294-1295).

During reconnaissance activities conducted for the 2016 PI Addendum, ADEQ found exposed dross on the southwestern parcel owned by Susan Haney (Parcel No. 136-31-0140). The dross was found where surface water runoff had eroded a small trench in the surface soil. Additional exposed dross was found on the west, northwest, and north side of the residential structure on this parcel. ADEQ also found dross north of the east dross pile where surface soil appeared to have been slightly eroded from surface water runoff (HMD 1292).

During the 2016 PI Addendum sampling activities, aluminum, cadmium, copper and lead concentrations exceeding rSRLs were measured by XRF screening on the east and west dross piles; on and next to the Harrison Hills Wash berm (next to the west dross pile); and to the north, northeast and southwest of the home on the southwestern parcel (Parcel No. 136-31-0140). Confirmatory soil samples generally correlated with the XRF screening results. XRF screening and laboratory results are not expected to consistently correlate due to inherent differences in the nature of the measurements and small scale variation in material composition. Furthermore, the presence of rock and metal chunks may have biased the XRF screening measurements (HMD 1304).

The recommendations of the 2016 PI Addendum included:

- Air quality sampling for particulates and analysis of the samples for regulated metals should be conducted to evaluate the potential inhalation exposure from the east dross pile. A risk evaluation should be performed based on air quality and soil sample results. Alternatively, if a cap is going to be constructed regardless, then this step may not be necessary.
- Soil samples should be collected for analysis by toxicity characteristic leaching procedure of the eight RCRA metals to determine the toxicity characteristic of the solid waste generated if the dross or other contaminated soils are excavated from the Site. As part of this sampling, the extent of dross contamination should be determined, visually or otherwise, on Site Parcel 136-31-0140.
- Contaminated soils from Site Parcel 136-31-0140 that may cause exposure should be removed and clean fill imported to replace it.

- A cap for the east and west dross piles should be designed and constructed to eliminate the potential exposure from those locations. Additionally, the berm along the Harrison Hills Wash should be stabilized (HMD 1304).

Site COCs are metals including aluminum, antimony, arsenic, cadmium, copper, lead and nickel (HMD 588).

The Site was originally one of several dross sites in the Tucson area, which became the Aluminum Dross WQARF Priority List site in 1991. The Site is the only remaining open WQARF site that was originally part of the Aluminum Dross WQARF Priority List site. The other aluminum dross sites were issued No Further Investigation or Action Determinations (HMD 567-568, 410).

CONCLUSIONS

Toeroek conducted research for the H&M Dross Site. Toeroek's research and historical interviews with individuals related to the Site indicate the dross was likely brought to the Site in the 1960s although some documentation indicates disposal may have occurred in the mid- to late-1950s. ADEQ and PDEQ were notified of the existence of the Site in 1986, along with multiple other dross sites located in the area around the Site and around Davis-Monthan.

ADEQ found through sampling of the dross and soils in the Site area exceed Arizona's rSRLs for multiple metals. The Site COCs are metals, including aluminum, antimony, arsenic, cadmium, copper, lead and nickel. ADEQ sampling events show that the Site contamination has not affected groundwater; however, the risk of public exposure to dross and soil contamination is high.

An estimated 2,500 to 3,000 airplanes were processed at the Kolb Road Facility during its years of operations. Dross is a waste created as a result of the airplane processing operations. During the time period when the dross was dumped at the Site, this Kolb Road Facility was reportedly owned and/or operated by multiple entities including: National Aircraft, National Metals, and Southwestern Alloys. The companies legally purchased obsolete aircraft parts from Davis-Monthan and melted them down for scrap metals. Available documentation does not clearly delineate the roles and timeframes of operations/ownership of these entities.

If you have any questions or comments regarding this deliverable, please contact me or Sarah Cook, Toeroek's project manager for the H&M Dross Site at (303) 420-7735. We appreciate the opportunity to support ADEQ on this project.

Sincerely,

Lisa Contreras-Hendler

Lisa Contreras-Hendler, Esq.
Program Manager

Attachment

ATTACHMENT 1
INDEX OF SOURCE DOCUMENTS

Attachment 1 - Index of Source Documents

DOCUMENT BATES RANGE	DATE	SUBJECT	AUTHOR	RECIPIENT
HMD-000000001-HMD-000000001	5/22/1958	Deed, Parcel No. 136-31-0150	Dolores Sanchez	Rafael Rabago
HMD-000000011-HMD-000000011	2/12/1957	Deed, Parcel No. 136-31-0130 and Parcel No. 136-31-0140	Manuel and Florentina Escalante	Frank M. and Stephanie W. Escalante
HMD-000000012-HMD-000000012	2/12/1957	Deed, Parcel No. 136-31-0150	Manuel and Florentina Escalante	Dolores Sanchez
HMD-000000017-HMD-000000019	8/8/2011	Warranty Deed	Byron William Garigan, Jr.	Byron William Garigan, Jr. and Sandra Ann Garigan
HMD-000000020-HMD-000000022	4/29/2013	Warranty Deed, Parcel No. 136-31-0140	Stephanie W. Escalante	Susan A. Haney
HMD-000000038-HMD-000000040	4/20/1989	Affidavit Terminating Joint Tenancy, Parcel No. 136-31-0140	Stephanie W. Escalante	Francisco Escalante, deceased
HMD-000000041-HMD-000000048	10/30/1989	Special Warranty Deed, Parcel No. 136-31-0130	First Interstate Bank of Arizona, N.A.	Byron William Garigan, Jr.; Anna Trojanovich; Cassie A. Hansen; Hap Russell Garigan; Philip Thomas Garigan, III; Elizabeth Garigan
HMD-000000068-HMD-000000072	3/31/1999	Joint Tenancy Deed, Parcel No. 136-31-0130	Phillip Thomas Garigan, III, as Successor Trustee; Bryon William Garigan, Jr.; Anna Marie Trojanovich; Cassie A. Hansen; Hap Russell Garigan; Philip Thomas Garigan, III, as an Individual; Elizabeth Garigan	Byron William Garigan, Jr. and Sandra Ann Garigan
HMD-000000073-HMD-000000076	12/15/2000	Quit Claim Deed, Parcel No. 136-31-0130	Sandra Garigan, Glen Hansen, Dana Garigan, Doyle Soper, Jane Stewart Garigan, and John Trojanovich	Phillip Thomas Garigan, III; Byron William Garigan, Jr.; Anna Marie Trojanovich; Cassie A. Hansen; Hap Russell Garigan; Philip Thomas Garigan, III; Elizabeth Garigan
HMD-000000123-HMD-000000123	11/10/1969	Deed, Parcel No. 136-31-0150	Rafael Rabago	Garigan Enterprises
HMD-000000124-HMD-000000124	10/16/1970	Deed, Parcel No. 136-31-0130	P. T. Garigan, f/k/a Philip T. and Mary A Garigan	Garigan Enterprises, Inc.
HMD-000000125-HMD-000000125	8/28/1974	Transfer and Assignment, Parcel No. 136-31-0130 and Parcel No. 136-31-0150	Garigan Enterprises	Philip T. and Mary A. Garigan
HMD-000000126-HMD-000000126	8/28/1974	Quit Claim Deed, Parcel No. 136-31-0130 and Parcel No. 136-31-0150	Garigan Enterprises	Philip T. and Mary A. Garigan
HMD-000000147-HMD-000000148	11/14/1980	Special Joint Tenancy Warranty Deed, Parcel No. 136-31-0150	First National Bank of Arizona	Byron William Garigan, Jr. and Sandra Ann Garigan
HMD-000000166-HMD-000000171	2/1/1995	Draft Conceptual Strategy for Aluminum Dross Removal Action	Arizona Department of Environmental Quality (ADEQ)	N/A
HMD-000000172-HMD-000000174	7/20/1988	Hazardous Waste Inspection Report, State Land Department	ADEQ	N/A
HMD-000000175-HMD-000000178	1/22/1992	Preliminary Field Trip Report on Sampling of Dross Piles for Baseline Studies	Jaba Inc.	Pima County Department of Environmental Quality

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DOCUMENT BATES RANGE	DATE	SUBJECT	AUTHOR	RECIPIENT
HMD-000000183-HMD-000000186	6/30/1995	Aluminum Dross Project Summary	ADEQ	N/A
HMD-000000187-HMD-000000190	12/30/1994	Aluminum Dross Project Summary	ADEQ	N/A
HMD-000000191-HMD-000000195	9/15/1994	Arizona Water Quality Assurance Revolving Fund Letter of Intent, Aluminum Dross	Linda L. Burgess	ADEQ
HMD-000000230-HMD-000000242	9/30/1991	Interview Report for Larry Kotz - Vice President of Kotz Metals	Larry Kotz	Bill Solberg
HMD-000000250-HMD-000000255	7/31/1995	Investigation Report - Dross Sites/Tucson AZ	Environmental Protection Agency (EPA)	Jere Johnson
HMD-000000256-HMD-000000260	9/15/1994	Arizona Water Quality Assurance Revolving Fund Letter of Intent, Aluminum Dross	Linda L. Burgess	ADEQ
HMD-000000309-HMD-000000321	6/16/1992	Preliminary Assessment, AMCEP, Inc.	Bechtel Environmental, Inc.	EPA
HMD-000000361-HMD-000000361	7/25/1990	Response to Information Request to Stephanie Escalante	Frank W. Escalante	ADEQ
HMD-000000366-HMD-000000378	3/1/1993	Draft Aluminum Dross Sites in Arizona	ADEQ	N/A
HMD-000000381-HMD-000000386	00/00/0000	Extract, Site History and Activities for 9880 East Millmar Road	Unknown	Unknown
HMD-000000410-HMD-000000411	5/23/2005	Garigan Dross WQARF Preliminary Investigation Site Status	ADEQ	ADEQ
HMD-000000412-HMD-000000413	12/22/1994	Aluminum Dross - Garigan Property	ADEQ	EPA
HMD-000000415-HMD-000000415	1/26/1994	Contact Report, Escalante Property	Nicole L. Spence	N/A
HMD-000000425-HMD-000000425	9/28/2000	Remedial Site Assessment Decision, Garigan Property	ADEQ	N/A
HMD-000000444-HMD-000000448	2/14/1994	Consultation Packet, Talano Property	ADEQ	N/A
HMD-000000457-HMD-000000466	1/23/1997	Second Interim Investigation Report, Aluminum Dross Sites	EPA	ADEQ
HMD-000000476-HMD-000000477	5/25/1994	Response to Request for Information on Dross Properties	National Metals Company	ADEQ
HMD-000000493-HMD-000000494	2/12/1988	Memo, Southwestern Alloys, Inc., National Aircraft	ADEQ	ADEQ
HMD-000000567-HMD-000000568	5/23/2005	Garigan Dross WQARF Preliminary Investigation Site Status	ADEQ	ADEQ
HMD-000000580-HMD-000000589	4/15/2016	Preliminary Investigation Report Addendum, Harrison Road and Millmar Road Dross	Hydro Geo Chem, Inc.	ADEQ
HMD-000000623-HMD-000000629	8/25/1989	Dross Evaluation Sheet	Unknown	Unknown

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DOCUMENT BATES RANGE	DATE	SUBJECT	AUTHOR	RECIPIENT
HMD-000000630-HMD-000000640	6/27/1989	Options for Dealing with Aluminum Dross	ADEQ	N/A
HMD-000000724-HMD-000000731	7/20/1988	Hazardous Waste Inspection Report, State Land Department	ADEQ	N/A
HMD-000000732-HMD-000000732	9/18/1989	Letter to US Representative Jim Kolbe	Sandy Garigan	US Representative Jim Kolbe
HMD-000000775-HMD-000000776	00/00/0000	Extract, Present/Historical Data for National Aircraft, Inc.	Mesch, Clark & Rothschild, PC	Unknown
HMD-000000782-HMD-000000784	8/8/1990	Handwritten Notes About Site History	ADEQ	N/A
HMD-000000787-HMD-000000787	7/26/1990	Telephone Contact with Sandra Garigan	ADEQ	N/A
HMD-000000810-HMD-000000815	3/1/1988	Hazardous Waste Inspection, Southwestern Alloys/National Aircraft	ADEQ	N/A
HMD-000000892-HMD-000000894	1/27/2017	Pima County Geographic Information for Parcel No. 136-28-006L	Pima County Recorders Office	N/A
HMD-000000934-HMD-000000936	1/31/2017	Arizona Daily Star Death Notices	Tucson.com	N/A
HMD-000000937-HMD-000001278	1/1/2016	Preliminary Investigation Report, Harrison Road and Millmar Road Dross	ADEQ	N/A
HMD-000001280-HMD-000001559	4/15/2016	Preliminary Investigation Report Addendum, Harrison Road and Millmar Road Dross	Hydro Geo Chem Inc.	ADEQ
HMD-000001711-HMD-000001775	5/12/2017	288 Letter Response from National Aircraft, Inc.	Mesch Clark Rothschild	ADEQ

APPENDIX B

LAND AND WATER USE STUDY

LAND AND WATER USE STUDY
HARRISON & MILLMAR DROSS WQARF SITE
REMEDIAL INVESTIGATION
TUCSON, ARIZONA

October 31, 2017

Prepared for:

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
SOUTHERN REGIONAL OFFICE
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HYDRO GEO CHEM, INC.
Environmental Science & Technology

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B.1 Information Requests and Responses
B.2 City of Tucson General & Sustainability Plan 2013 (Excerpt)

1. INTRODUCTION

This Land and Water Use Study (Study) has been performed to gather information regarding the current and reasonably foreseeable future uses of land that have been or could be impacted by the contaminant release at the Harrison and Millmar Dross Water Quality Assurance Revolving Fund (WQARF) site (Site) in Tucson, Arizona (Figure B.1). The Study is required as part of the Remedial Investigation (RI) process, pursuant to AAC R18-16-406(D). It will be used to assess the potential for exposure to Site-related contaminants during completion of the Risk Assessment and is being conducted for Arizona Department of Environmental Quality (ADEQ) under the Arizona Superfund Response Action Contract (ASRAC) No. 14-077537.

1.1 Process Overview

A site can be any parcel(s) of land that is suspected of being contaminated with hazardous chemicals, substances or wastes. The investigation and remediation process for WQARF sites consists of a sequence of steps, set forth in AAC R-18-16, to evaluate and subsequently remediate a site contaminated with hazardous substances. After a preliminary investigation, it may be determined that a site poses an actual hazard or potential risk to public health and the environment and may qualify as a registry site under the WQARF program.

An Early Response Action (ERA) may be deemed necessary by ADEQ at any time during the WQARF process. An ERA was conducted by Hydro Geo Chem, Inc. (HGC) in 2016 (HGC, 2016b) for the Site and consisted of excavation and consolidation of dross materials and placement of soil over excavated areas and consolidated dross. A remedial action was completed by HGC at the Site in 2017 and consisted of excavation, consolidation and an engineered soil cover over consolidated dross. The Site is now in the Remedial Investigation/Feasibility Study (RI/FS) process. This Study is included as an appendix to the RI report.

Evaluation of water use is not required for the RI, as there are no current or threatened impacts to waters of the state from this Site. Groundwater sampling of private wells within the Site area showed no impacts to groundwater quality from Site contaminants. Residences in the Site vicinity are within the City of Tucson (COT) drinking water system service area (COT, 2011; Appendix B.2). Despite this fact, some residences are not currently served by the COT and obtain water for domestic use from private wells. ARS § 45-454(C) states that on or after January 1, 2006, drilling of a private well on land within 100 feet of the operating water distribution system of a municipal water provider within the boundaries of an Active

Management Area (AMA) is prohibited. Therefore, future development of private wells at the Site is unlikely.

There are no surface water uses at the Site. The ephemeral Harrison Hills Wash flows north in a deeply incised channel along the western edge of the Site. The eastern bank of the Harrison Hills Wash was historically augmented with a berm (East Berm) containing dross material. As part of ERA activities, dross materials were completely removed from the East Berm, which was reconstructed with clean fill and armored with rip-rap (HGC, 2016b). The rebuilt East Berm functions as a barrier between flow in the wash channel and dross material remaining beneath clean fill at HMD-West. Any dross materials and metal chunks found in the Harrison Hills Wash at or downstream from the Site were removed by hand during ERA activities (HGC, 2016b). Because there are no current or threatened impacts to waters of the state from this site, the remainder of this report shall focus on land use.

1.2 Land Use Study Report

This Land Use Study report includes information regarding current and reasonably foreseeable uses of land impacted or threatened to be impacted by the contaminant release from the Site. General land use information includes the current type of use, density, character, and governmental jurisdictions. Future land use changes may be considered using population projections, growth, plans for future development and local land use plans. Current and reasonably foreseeable land use information has been collected, in part, through request-for-information letters and questionnaires sent to the owners of the source properties on July 18, 2017 (Appendix B.1). The questionnaire responses include specific uses and property ownership for land that is impacted or threatened to be impacted by the release. The following are included in this Land Use Study report:

- Figures showing the locations of the affected parcels and their COT zoning;
- Responses to questionnaires submitted to and collected from the source property owners regarding “current and reasonably foreseeable uses of land”;
- A copy and brief discussion of all municipally or privately written land use plans and any future proposed land use plans for parcels; and
- A discussion of the current and reasonably foreseeable uses information.

This Land Use Study report is used to guide development of the baseline risk assessment and to help formulate Remedial Objectives (ROs). Pursuant to R18-16-406G, in the formulation of ROs for a soil remediation remedy, the land owner has the right to identify the type of land use for the site. Data evaluation for the risk assessment will consider current land use zoning.

1.3 Site Description and Background

The Study area is located in the southwestern portion of Section 35, Township 14 South, Range 15 East on the east side of the COT (Figure B.1), south of East Millmar Road, east of the Harrison Hills Wash, west of the private driveway of 9880 East Millmar Road and north of the Pantano Vista Mobile Home Park (MHP).

The Site was originally comprised of two aluminum dross piles: the Harrison Millmar Dross-East pile (HMD-East) located on parcel 136-31-0159 (9880 E. Millmar Rd; Property C), and the Harrison Millmar Dross-West pile (HMD-West) located on parcel 136-31-0130 (no address; Property A). A significant quantity of dross material was found on parcel 136-31-0140 (9696 E. Millmar Rd; Property B), and may have been continuous with the HMD-West pile. Surrounding soils impacted above Arizona residential Soil Remediation Levels (rSRLs) are considered part of the Study area. During ERA activities, the majority of HMD-West and dross material from Property B was consolidated onto HMD-East, which itself was consolidated onto a smaller area (HGC, 2016b).

Soils at the site have been affected by metals including aluminum, antimony, arsenic, cadmium, copper, lead and nickel, at levels above Arizona residential Soil Remediation Levels (rSRLs). The Study area encompasses approximately 20 acres including the Site; surrounding areas on Properties A, B and C; and parcel 136-31-0160 (9886 E. Millmar Rd; Property D) (Figure B.1). Several private residences are located on Properties B, C and D. Multiple exempt groundwater wells are present in the Site Vicinity.

Aluminum dross is a by-product of aluminum scrap meltdown and consists of an ash-like substance with sporadic metal pieces. The dross at the Site may have originated from facilities in the 1950s, 60s and 70s that legally purchased obsolete aircraft parts from Davis-Monthan Air Force Base and melted them down for scrap metals. Soil impacts at the Site were originally discovered in the late 1980s and early 1990s (ADHS, 1988; ADEQ, 1989a; PDEQ, 1992). A Preliminary Investigation at the Site was initiated by ADEQ in 2015 and completed in 2016, with ERA activities following in 2016 and remedial action in 2017. The RI report summarizes groundwater and soil investigations and results from 2015 through 2017.

Harrison Hills Wash is located along the western edge of the Site immediately adjacent to HMD-West. Harrison Hills Wash is ephemeral, with peak discharge between 500 to 1,000 cubic feet per second (cfs) (ADEQ, 2016). This wash discharges into Pantano Wash roughly 3,200 feet (ft) north of the Site. Groundwater flow direction in the Site vicinity is to the northwest, and the water table is relatively deep (circa 280 ft below ground surface; COT, 2017a; 2017b). Detailed data pertaining to vadose zone and aquifer lithology in the Site vicinity are not available;

however, the proximity of the Site to the Pantano Wash suggests that vadose zone and aquifer materials are likely basin fill alluvium, similar to those characterized at the Broadway-Pantano Water Quality Assurance Revolving Fund (WQARF) site located several miles downstream along the Pantano Wash (Stantec, 2012).

Historical aerial photographs of the Site vicinity dating to 1958 (NETROnline, 2016) indicate historical land uses prior to the 1970s were primarily open desert and agriculture with associated low-density residential. Land use in the Study area has remained consistent since the 1970s. In the 1970s, the Irvington and Harrison Landfills began operation near the Site (Figure B.2). The Irvington Landfill was taken out of operation in 1987. By the 1990s, higher-density residential development, including the MHP, was underway in the Study area vicinity. In 1997, the Harrison Landfill ceased operation.

1.4 Soil Impacts and Groundwater Quality

Based upon data collected during the PI, groundwater has not been impacted by metals contamination from the Site. As part of PI, ERA and remedial activities, measurements of soil metal concentrations were conducted across the Study area and found antimony, arsenic, cadmium, copper, lead and nickel at levels exceeding rSRLs. Laboratory analysis confirmed that antimony, cadmium, copper, lead and nickel concentrations in soil exceeded rSRLs, and found aluminum concentrations above rSRLs. Soil samples collected from Property B and from HMD-East on Property C were found to be characteristically hazardous for cadmium and lead in Toxic Characteristic Leaching Procedure (TCLP) analysis (ADEQ, 2016; HGC, 2016a; HGC, 2016b).

2. LAND USE EVALUATION

The following presents current and foreseeable land uses for the Study area. Reasonably foreseeable uses for land are those that are likely to occur in the Study area within a reasonable time period. The Study area is located at the eastern edge of the COT incorporated area; future land use and development plans for the COT are outlined in the 2013 General & Sustainability Plan (COT, 2013b), excerpted in Appendix B.2.

2.1 Current Site-Specific Land Use

The Study area is presented in Figure B.1. The entire Study area is located in census tract 004058; at the 2010 census 4,409 persons were recorded as residents in this tract, for a density of 1,682 persons per square mile (USCB, 2017). Land use within the Study area consists of low-density residential properties, in compliance with COT zoning (COT, 2013a; Pima County, 2017). Figure B.2 presents COT zoning for parcels within the Site, as well as the immediately surrounding area. The following COT zoning categories are representative of the Study area and its immediate vicinity:

- SR – Suburban ranch
- RX-1 – Low density residential
- MH-2 – Medium density residential, mobile homes

At the current time, 100% of the land within the Study area and within the Site is zoned for suburban ranch use. The MHP adjacent to the south is zoned MH-2, and smaller parcels immediately surrounding the Study area are zoned RX-1, for lower-density mobile home residential (MH-1) and suburban residential (RX-2) uses. Moving further from the Study area, SR zoning continues to dominate, along with low or medium density residential zoning (Figure B.2). Small patches of commercial zoning are present along the Houghton Road and Irvington Road corridors. Southeast of the Study Area, across Houghton Road and upgradient along the Pantano Wash, the Civano Master Planned Area Development is present.

Land ownership in the vicinity of the Site is predominantly private, with the exception of Arizona State Trust land immediately west and south of the Study area, including the land where the MHP is located (Figure B.3). State Trust land is also present south of the Study area across Irvington road. Federal land ownership associated with the nearby Davis-Monthan Air Force Base begins at the southwest corner of the Harrison Road/Irvington Road intersection and stretches west and south from there (Figure B.3).

2.1.1 Properties A, D and C

Properties A, D and C have common ownership and are utilized contiguously. Each is zoned as SR and covers five acres, measuring roughly 335 ft north-south and 650 ft east-west. Historical aerial imagery suggests that these properties may have been cultivated for crops prior to the mid-late 1990s (NETROnline, 2016). Other than the emplacement of dross materials at HMD-West and HMD-East by 1972, little land-use change has occurred on Property A since it was transitioned from open rangeland, the apparent use in aerial imagery dating to 1958 (NETROnline, 2016).

Property A is a single 5-acre parcel (136-31-0130) consisting of open land with no structures, with the Harrison Hills Wash along its western edge and the HMD-West dross pile located on its southwestern corner. A tributary of the Harrison Hills Wash was re-routed from its historical course across the southwestern portion of Property A as part of the development of Property B. Property A is utilized by the property owner for grazing and firewood harvesting. HMD-West dross materials were removed from Property A, up to two ft bgs, as part of ERA activities in 2016 and consolidated onto HMD-East. Dross materials present in the east berm of the Harrison Hills Wash on the western portion of Property A were completely removed as part of ERA activities in 2016 and consolidated onto HMD-East (HGC, 2016b).

Property C is a single 5-acre parcel (136-31-0160) consisting of open land with multiple structures, and is utilized by the property owner for swine farming and residential uses as well as the storage and dumping of building and landscaping waste materials. Dross materials from HMD-West (Property A) and from the southeastern portion of HMD-East (Property C) were consolidated onto the main HMD-East pile (Property C), and a temporary cap of clean fill installed, as part of 2016 ERA and 2017 remedial activities (HGC, 2016b).

Property D is a single 5-acre parcel (136-31-0150) consisting of open land and multiple structures associated with swine farming and residential uses. Dross materials are not known to have been emplaced on this parcel and the impact from Property C dross pile runoff has been minimal (HGC, 2016a).

The land owner reported that Properties A, D and C are currently utilized for residential and agricultural purposes (Appendix B.1).

2.1.2 Property B

Property B is a single parcel (136-31-0140) zoned as SR and covers five acres, measuring roughly 335 ft north-south and 650 ft east-west. A tributary of the Harrison Hills Wash was re-

routed from its historical source across the western portion of Property B when Property B was developed with a residence and rodeo grounds in the late 1960s (Leighton, 2013; NETROnline, 2016). Historical aerial imagery suggests that surface development of this property, which includes a residence and structures and land areas associated with horse husbandry, has remained similar since at least 1972 (NETROnline, 2016). The Harrison Hills Wash currently runs along the western margin of Property B. Dross material was found to be present on much of the western portion of Property B during PI activities, and may have been continuous with dross material in the HMD-West pile (ADEQ, 2016; HGC, 2016a). Dross materials on Property B were removed to a depth of two ft bgs and consolidated onto HMD-East as a part of ERA activities (HGC, 2016b).

The land owner reported that Property B is currently utilized for residential uses and for equestrian boarding and training (Appendix B.1).

2.2 Future Study Area and Site Land Use

Future land use at the Study area and the Site is anticipated to remain the same as it is currently, i.e., a mixture of low-density residential and small-scale agricultural uses.

2.2.1 Property A, D and C

At present, the land owner does not plan to add structures to or otherwise develop these properties, or sell the properties in the foreseeable future (Appendix B.1).

2.2.2 Property B

The land owner currently does not plan to add structures to or otherwise develop the property, or sell the property in the foreseeable future (Appendix B.1).

2.2.3 Surrounding Areas

The COT's population was 524,295 in 2012, grew by roughly 7% between 2000 and 2010 (COT, 2013b), and is expected to grow by more than 50 percent by the year 2050 (ADES, 2013). Both residential and commercial densities in the COT are expected to increase in intensity in an effort to accommodate this growth. In the 2013 COT General & Sustainability Plan's future growth scenario, much of the area surrounding the Study area, despite its low density, is designated as an existing neighborhood, considered to be largely built-out with minimal new development expected with the goal of maintaining the existing character of the neighborhood (COT, 2013b).

Significant development may occur to the southeast of the Study area along Houghton Road, where mixed-use and master-planned development is to be given priority. Infill development west of the Study area across Harrison Road will also be promoted, with the goal of creating a more urban environment. The COT has also flagged unincorporated areas east of the Study area as targets for potential future annexation (COT, 2013b). Provided that any action undertaken to remedy contamination at the Site will mitigate the potential for off-Site migration of contamination, future growth and development is not expected to be impacted by contamination at the Site.

3. WATER USE EVALUATION

Residences in the Site vicinity are within the City of Tucson (COT) drinking water system service area (COT, 2011). Despite this fact, some residences are not currently served by the COT and obtain water for domestic use from private wells. ARS § 45-454(C) states that on or after January 1, 2006, drilling of a private well on land within 100 feet of the operating water distribution system of a municipal water provider within the boundaries of an Active Management Area (AMA) is prohibited. Therefore, future development of private wells at the Site is unlikely.

Arizona Department of Water Resources (ADWR) Well Registry (ADWR, 2017) was used to search for groundwater wells located within 1.0 mile of the study area. The results of the well survey are shown in Table B.1 and on Figure B.4. It should be noted that the Well Registry locates wells based on the centroid of their cadastral location, and thus well locations obtained from the Well Registry can only be considered approximate. ADWR classifies wells into four primary types: monitoring and environmental wells, used for groundwater monitoring or remediation; exempt wells, used for production at pumping rates no higher than 35 gallons per minute (gpm); non-exempt wells, used for production at pumping rates higher than 35 gpm; and other wells, which include geotechnical, mineral exploration, cathodic protection, and other non-production wells. Monitoring, environmental and other wells have not been included in Table B.1.

Four private groundwater wells are located in the study area based on Well Registry data, including three exempt wells and one non-exempt well. These wells range from 275 to 350 ft in depth, and two of them, the non-exempt well 55-629263 and exempt well 55-803959, were sampled during the PI (Table 6).

Fourteen groundwater wells were und to be located within 0.25 mile of the study area boundary, including ten private exempt wells, two COT monitoring wells, and two private non-exempt wells. These wells are completed to depths up to 500 ft bgs. Three exempt wells located within 0.25 mile of the study area boundary were sampled during the PI (Table 6).

An additional 59 groundwater wells are located between 0.25 and 1.0 mile of the study area boundary. These include 30 monitoring or environmental wells (all owned by the City of the Tucson), 16 private exempt wells, and 13 non-exempt wells. The non-exempt wells are owned by the COT, private citizens, and a ranch. These wells are completed to depths of up to 950 ft bgs.

4. SUMMARY

The current and future land uses, described previously (Section 2.0) are summarized below for the Study area properties and the surrounding area.

4.1 Study Area

Current land use at the Study area is low-density residential and small-scale agricultural, as well as open space. The property owners do not anticipate significant changes in land use, sale of the Study area properties, nor additional construction or development on the properties.

4.2 City of Tucson

The Study area is located at the eastern edge of the COT. Land use in the vicinity of the source property is predominantly low- to medium-density residential use, and in its planning efforts the COT has not targeted the immediate vicinity of the Study area for intensification of current development or additional infill residential or commercial development. Additional commercial and residential development is likely to the southeast of the Study area along Houghton Road, and possibly to the west across Harrison Road. Provided that any remedy pursued at the Site mitigates the potential for off-Site migration of contamination, such development is not anticipated to be impacted by contamination at the Site.

5. REFERENCES

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TABLE

TABLE B.1
Groundwater Wells within 1.0 Miles of the Study Area
Harrison Millmar Dross Site
Tucson, Arizona

ADWR 55#	Cadastral	UTM X (m)	UTM Y (m)	Owner	Type	Depth	Casing Diameter (inches)
Wells Located on Site Parcels							
629263	D14015035CAD	520525.4	3558995	First Interstate Bank	Non-Exempt	275	8
629494	D14015035CAC	520325.8	3558995	Pflug, L.	Exempt	350	8
635061	D14015035CAC	520325.8	3558995	Pflug, L.	Exempt	350	8
803959	D14015035CAC	520325.8	3558995	Haney, Susan A.	Exempt	275	8
Wells Located within 0.25 Mile of Site Parcels							
210178	D14015035BDD	520526.4	3559397	Carter, Jeff	Exempt	500	5
210352	D14015035BDD	520526.4	3559397	Carter, Jeff	Exempt	510	7
221345	D14015035BDD	520526.4	3559397	Wimmer, Bryan H.	Exempt	410	6
225971	D14015035DBC	520725.1	3558995	Eikenberry, Eugene	Exempt	ND	ND
542692	D14015035DCA	520924.1	3558793	Alicio, Ray	Exempt	230	6
544194	D14015035DBA	520925.4	3559195	Burkel Richard	Exempt	400	8
546165	D14015035CAA	520525.9	3559196	Schadler, Robert	Exempt	300	8
557746	D14015035DBD	520924.7	3558994	Lutter, Bernard	Exempt	418	8
622102	D14015035BDC	520326.5	3559398	Douglas, Peter, Philip & Marjorie	Non-Exempt	402	12
634018	D14015035DBC	520725.1	3558995	Eikenberry, Eugene	Exempt	259	6
635852	D14015035CBD	520126.1	3558995	Columbia Sand Co.	Non-Exempt	ND	ND
639008	D14015035BDD	520526.4	3559397	Wimmer, Bryan H.	Exempt	ND	ND
Wells Located between 0.25 and 1.0 Mile of Site Parcels							
202898	D14015035ADD	521325.9	3559395	Medella Vina Ranch, LLC	Non-Exempt	ND	ND
205915	D14015036BAC	521927	3559797	Kreinbrink, Kim	Exempt	466	6
210104	D14015035ACB	520726.8	3559598	Teyechea, Jose Benjamin III	Exempt	390	6
219238	D14015035BAB	520327.6	3560002	Shechter, Jacob	Exempt	320	5
509933	D14015035BBD	520127.2	3559801	Brock, J.J.	Exempt	311	7
512183	D14015035BDB	520326.9	3559599	Poedel, David Rev	Exempt	405	8
512713	D14015035ACD	520926	3559396	Miels, Tony	Exempt	273	6
518949	D14015035AAC	521127.3	3559797	Klasic, Emil	Exempt	450	4
525251	D14015035ACB	520726.8	3559598	Teyechea, Jose Benjamin III	Exempt	280	8
559790	D14015035BCB	519927	3559600	Shechter, Leslie	Exempt	350	8
584020	D14015034ACB	519124.2	3559602	City of Tucson Environmental Services	Non-exempt	330	8
591332	D14015034DBB	519123.5	3559199	City of Tucson Environmental Services	Non-exempt	320	8
600303	D14015035ADD	521325.9	3559395	Shinn, Betty J.	Non-Exempt	300	8
605201	D14015035DAD	521324.3	3558994	Pima County Board of Supervisors	Non-Exempt	550	12
608088	D14015035BCA	520126.9	3559600	Buseck, Paul	Non-Exempt	360	8
615942	D14015034DDD	519726.7	3558592	City of Tucson	Non-Exempt	950	16
620111	D14015026CBC	519924.3	3560609	City of Tucson	Non-Exempt	710	12
620951	D14015025CCC	521528	3560199	City of Tucson	Non-Exempt	386	8
620952	D14015025CCC	521528	3560199	City of Tucson	Non-Exempt	470	12
625468	D14015034AAD	519727	3559803	Harvey, Laurence E. Jr.	Non-Exempt	ND	ND
634277	D14015035A00	521026.9	3559697	Klasic, M.H.	Exempt	353	6
635607	D14015036C00	521823.2	3558893	St. Pierre, Robert & Gloria	Exempt	275	8
635730	D14015035BAA	520527.7	3560001	Roth, B.J.	Exempt	350	6
636857	D15015003DBA	519323.8	3557572	7 V T Ranch	Exempt	40	48
640137	D14015035BCC	519926.9	3559399	Sykes, M.R.	Exempt	300	ND
801268	D14015027DCA	519323.8	3560408	Friedrichs, Judy Ann	Non-Exempt	293	8
801508	D14015034AAC	519526.3	3559803	Harvey, Laurence E. Jr.	Non-Exempt	488	10
809324	D14015026CDC	520326.4	3560204	Gutierrez, Ramona M.	Exempt	254	7
809587	D14015027DDB	519524.4	3560408	Anna Taylor Revocable Trust	Exempt	250	9

Notes:
UTMs based on NAD 83 UTM Zone 12N
ND = no data

FIGURES

Spatial Reference: NAD 1983 UTM Zone 12N
Data: ESRI, DigitalGlobe, USDA, USGS, Pima County

Study area parcels with ID

HMD Site

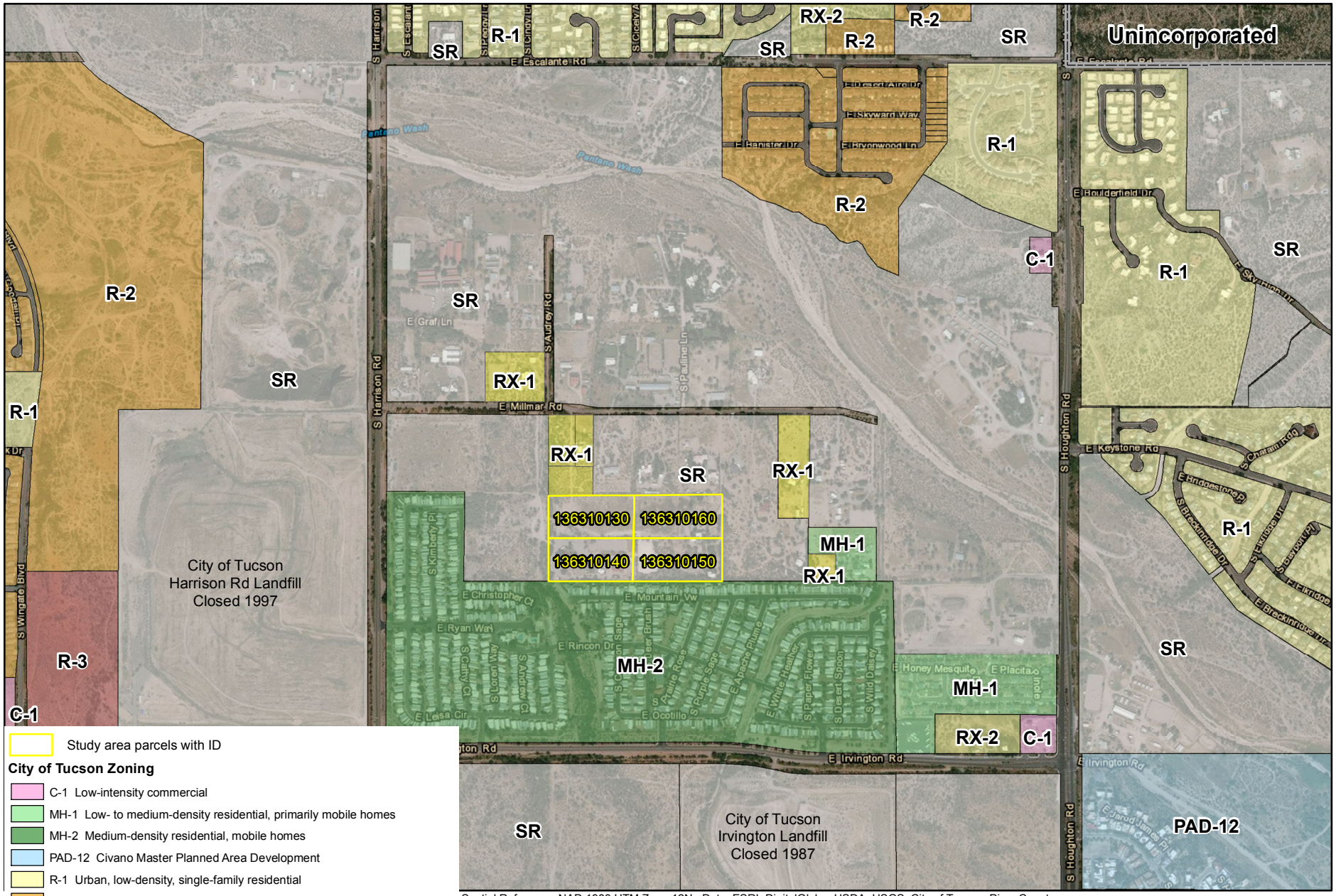
0 500 1,000
SCALE IN FEET

N

HYDRO GEO CHEM, INC.

SITE LOCATION MAP
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	Author	Date	File Name	Figure
AJB	7/27/17	GEM	7/27/17	2015053067G	B.1



Study area parcels with ID

City of Tucson Zoning

- C-1 Low-intensity commercial
- MH-1 Low- to medium-density residential, primarily mobile homes
- MH-2 Medium-density residential, mobile homes
- PAD-12 Civano Master Planned Area Development
- R-1 Urban, low-density, single-family residential
- R-2 Medium-density, single- and multifamily residential
- R-3 High-density residential
- RX-1 Suburban, low-density, single-family residential and agricultural
- RX-2 Suburban, low-density, single-family residential and agricultural
- SR Very low density, large lot, single-family residential and suburban ranch

Spatial Reference: NAD 1983 UTM Zone 12N Data: ESRI, DigitalGlobe, USDA, USGS, City of Tucson, Pima County

0 500 1,000
SCALE IN FEET

N

HYDRO GEO CHEM, INC.

STUDY AREA ZONING
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	Author	Date	File Name	Figure
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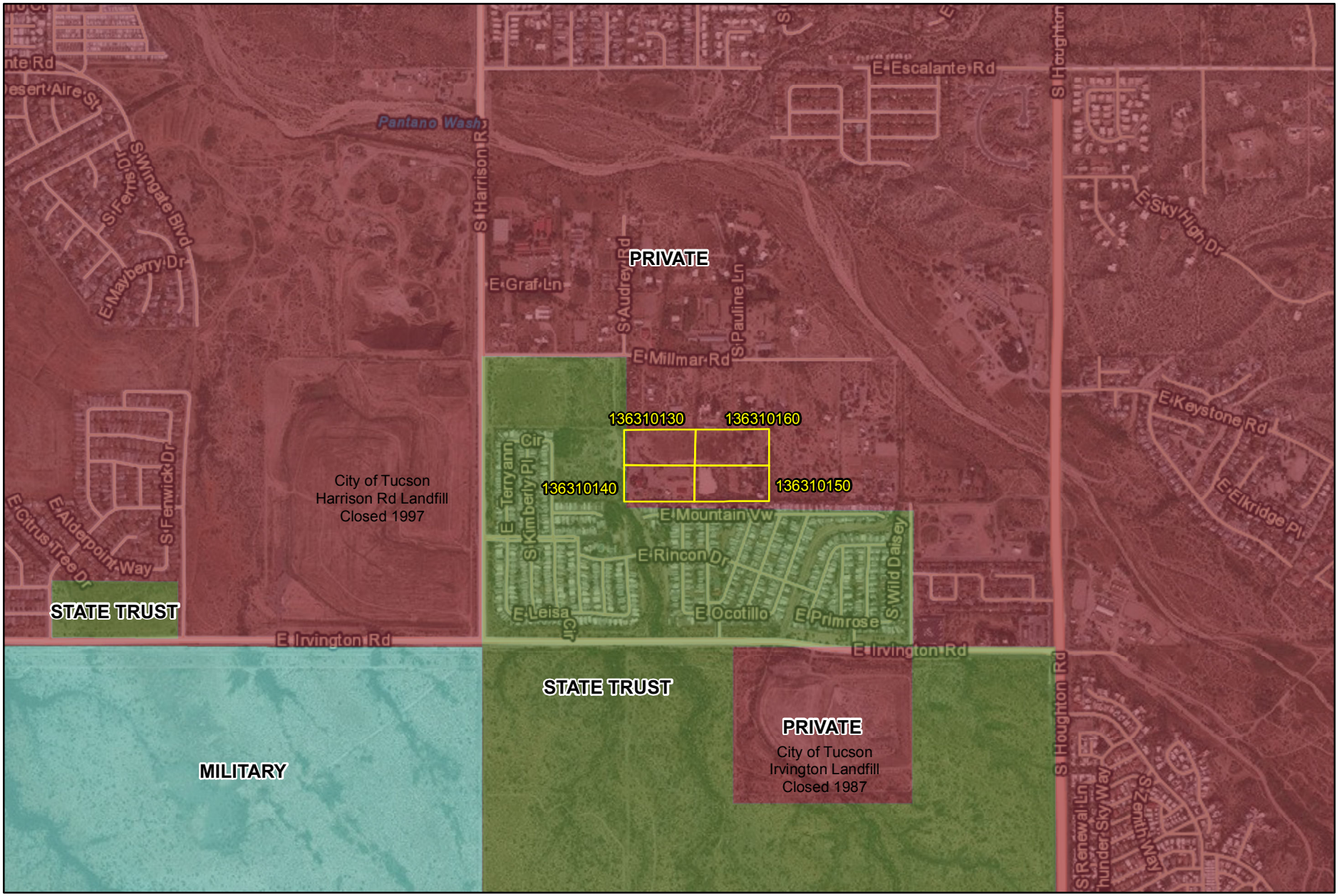

Spatial Reference: NAD 1983 UTM Zone 12N Data: ESRI, DigitalGlobe, USDA, USGS, Pima County, City of Tucson

Study area parcels with ID

State Trust

Private

Military

N

HYDRO GEO CHEM, INC.

STUDY AREA LAND OWNERSHIP
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	Author	Date	File Name	Figure
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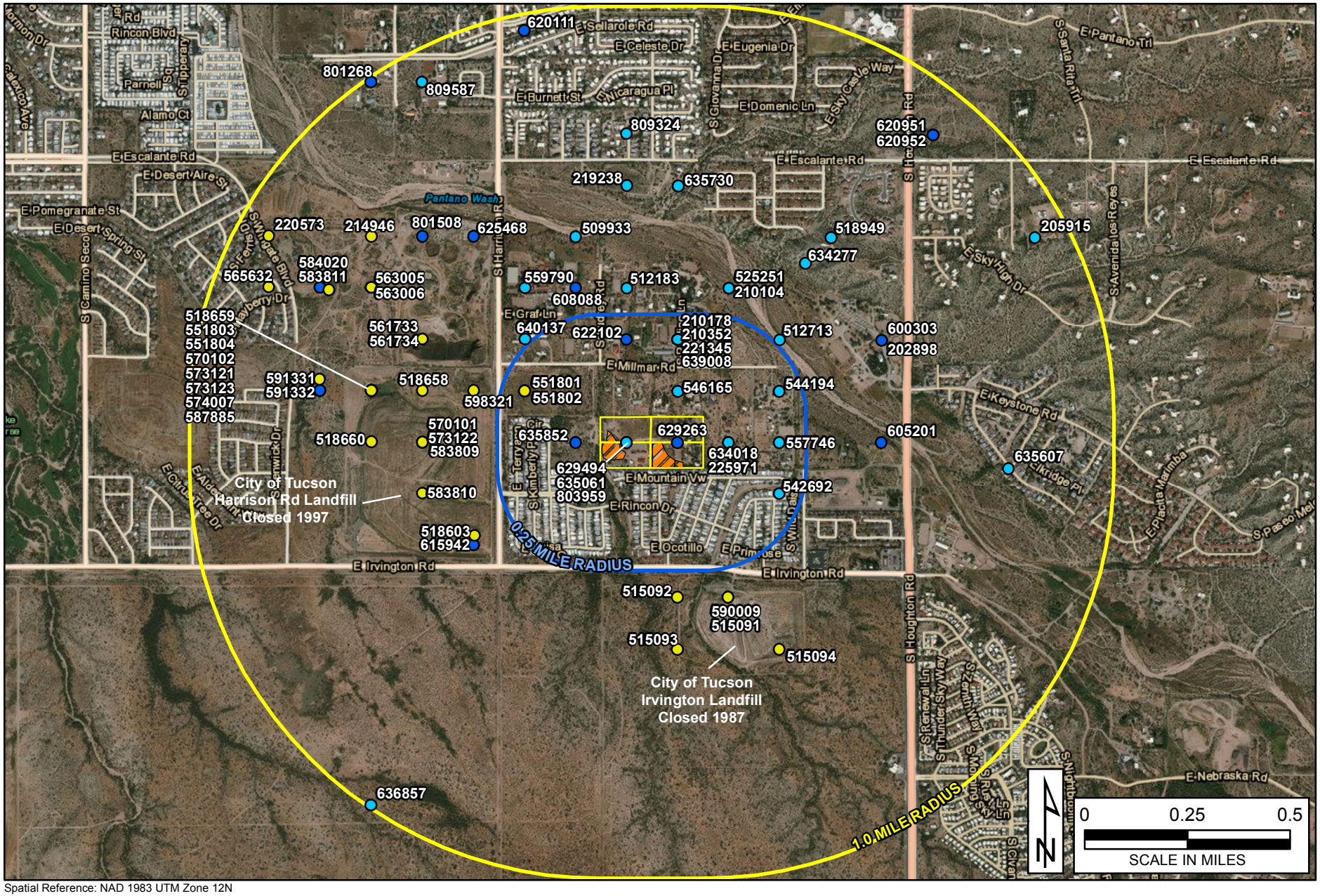


Spatial Reference: NAD 1983 UTM Zone 12N
Data: ESRI, DigitalGlobe, USDA, USGS, Pima County, and ADWR (2017)
Imagery Date: February 2017

Study area parcels with ID

HMD Site

Wells within 1.0 mile of Site parcels:
- Exempt
- Non-exempt
- Monitoring or environmental

HYDRO GEO CHEM, INC.

GROUNDWATER WELLS NEAR THE HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	Author	Date	File Name	Figure
AJB	10/31/17	GEM	10/31/17	2015053127G	B.4

APPENDIX B.1

INFORMATION REQUESTS AND RESPONSES

HYDRO GEO CHEM, INC.
Environmental Science & Technology

July 18, 2017

Ron and Sandra Garigan
PO Box 17359
Tucson, Arizona 85731-7359

Subject: ADEQ Request for Information - Land Use Related to the HMD WQARF Site

Dear Mr. and Mrs. Garigan:

Hydro Geo Chem, Inc. (HGC) is sending this letter on behalf of the Arizona Department of Environmental Quality (ADEQ) to request information with regard to land use for the Harrison Rd & Millmar Rd Dross WQARF site (Site). ADEQ and HGC will be completing a Remedial Investigation (RI) for the Site, pursuant to Arizona Administrative Code R18-16-406 A(3).

As part of the RI process, information must be collected regarding current and reasonably foreseeable uses of lands that are threatened to be affected by the release of contaminants, in this case metals from aluminum dross dumping activities. The attached figure (Figure 1) details the area that is relevant to this land use request.

We ask that you provide information using the attached form for current and future land uses of parcels that are owned by you within the boundary shown on Figure 1. We would appreciate a response to this request by August 7, 2017, so that the RI process can proceed on schedule.

Please return the form to my attention at: 51 W. Wetmore Rd, Ste 101, Tucson, AZ 85705 or abrab@hgcinc.com. If you have any questions regarding this request, please contact me at (520) 293-1500 extension 115.

Sincerely,
HYDRO GEO CHEM, INC.

Abra J. Bentley
Project Scientist

Attachment(s): *Figure 1 Approximate WQARF Boundary, July 2017*
Land Use Study Questionnaire

cc: Hazel Cox, ADEQ

H:\2015053.50 Harrison & Millmar RIFS\Land Use Study\HMD Garigan Land Use RFI 20170718.doc

Spatial Reference: NAD 1983 UTM Zone 12N
Imagery: ESRI, DigitalGlobe, USDA, USGS

9696, 9886 & 9880 E. Millmar Rd. parcels with ID

0 500 1,000
SCALE IN FEET

N

HYDRO GEO CHEM, INC.

SITE LOCATION MAP
HARRISON ROAD & MILLMAR ROAD DROSS SITE
TUCSON, ARIZONA

Approved	Date	Author	Date	File Name	Figure
AJB	1/12/16	GEM	1/12/16	2015053006G	1

LAND USE STUDY QUESTIONNAIRE
FOR PROPERTIES OWNERS WITHIN THE
HARRISON ROAD AND MILLMAR ROAD WQARF REGISTRY SITE

Please answer all questions. Mark "NA" for questions that are not applicable. Mark "UNK" if the answer is unknown to you at the time of completion. Please attach any additional pages as needed.

Date Questionnaire was completed: _____

Name of person completing Questionnaire: _____

Address: _____

_____

_____

Contact Name: _____

Address: _____

_____

Phone Number: _____

Property Information

1. What is the current use of the property? Please include a detailed description.

2. What are the foreseeable plans for the property (extension of buildings, increased production, etc.) as far into the future as they are known and up to 100 years, if possible?

3. Is the property owned or leased?

4. Who is the owner of the property?

   Name: _____

   Address: _____

   _____

   _____

   Phone Number: _____

5. If the property is leased, how long is the lease term?

6. If the property is leased, are there plans to renew the lease and for how long?

7. If the property is owned, do you plan on relocating and if so in what timeframe?

Thank you for your time. The ADEQ Project Manager, Hazel Cox, or a representative from ADEQ's consultant, Hydro Geo Chem, Inc., may follow-up on answers provided.

HYDRO GEO CHEM, INC.
Environmental Science & Technology

July 18, 2017

Susan Haney
9696 E. Millmar Rd
Tucson, Arizona 85730-4517

Subject: ADEQ Request for Information - Land Use Related to the HMD WQARF Site

Dear Ms. Haney:

Hydro Geo Chem, Inc. (HGC) is sending this letter on behalf of the Arizona Department of Environmental Quality (ADEQ) to request information with regard to land use for the Harrison Rd & Millmar Rd Dross WQARF site (Site). ADEQ and HGC will be completing a Remedial Investigation (RI) for the Site, pursuant to Arizona Administrative Code R18-16-406 A(3).

As part of the RI process, information must be collected regarding current and reasonably foreseeable uses of lands that are threatened to be affected by the release of contaminants, in this case metals from aluminum dross dumping activities. The attached figure (Figure 1) details the area that is relevant to this land use request.

We ask that you provide information using the attached form for current and future land uses of parcels that are owned by you within the boundary shown on Figure 1. We would appreciate a response to this request by August 7, 2017, so that the RI process can proceed on schedule.

Please return the form to my attention at: 51 W. Wetmore Rd, Ste 101, Tucson, AZ 85705 or abrab@hgcinc.com. If you have any questions regarding this request, please contact me at (520) 293-1500 extension 115.

Sincerely,
HYDRO GEO CHEM, INC.

Abra J. Bentley
Project Scientist

Attachment(s): *Figure 1 Approximate WQARF Boundary, July 2017*
Land Use Study Questionnaire

cc: Hazel Cox, ADEQ

H:\2015053.50 Harrison & Millmar RIFS\Land Use Study\HMD Haney Land Use RFI 20170718.doc

Spatial Reference: NAD 1983 UTM Zone 12N
Imagery: ESRI, DigitalGlobe, USDA, USGS

9696, 9886 & 9880 E. Millmar Rd. parcels with ID

0 500 1,000
SCALE IN FEET

N

HYDRO GEO CHEM, INC.

SITE LOCATION MAP
HARRISON ROAD & MILLMAR ROAD DROSS SITE
TUCSON, ARIZONA

Approved	Date	Author	Date	File Name	Figure
AJB	1/12/16	GEM	1/12/16	2015053006G	1

LAND USE STUDY QUESTIONNAIRE
FOR PROPERTIES OWNERS WITHIN THE
HARRISON ROAD AND MILLMAR ROAD WQARF REGISTRY SITE

Please answer all questions. Mark "NA" for questions that are not applicable. Mark "UNK" if the answer is unknown to you at the time of completion. Please attach any additional pages as needed.

Date Questionnaire was completed: _____

Name of person completing Questionnaire: _____

Address: _____

_____

_____

Contact Name: _____

Address: _____

_____

Phone Number: _____

Property Information

1. What is the current use of the property? Please include a detailed description.

2. What are the foreseeable plans for the property (extension of buildings, increased production, etc.) as far into the future as they are known and up to 100 years, if possible?

3. Is the property owned or leased?

4. Who is the owner of the property?

   Name: _____

   Address: _____

   _____

   _____

   Phone Number: _____

5. If the property is leased, how long is the lease term?

6. If the property is leased, are there plans to renew the lease and for how long?

7. If the property is owned, do you plan on relocating and if so in what timeframe?

Thank you for your time. The ADEQ Project Manager, Hazel Cox, or a representative from ADEQ's consultant, Hydro Geo Chem, Inc., may follow-up on answers provided.

LAND USE STUDY QUESTIONNAIRE
FOR PROPERTIES OWNERS WITHIN THE
HARRISON ROAD AND MILLMAR ROAD WQARF REGISTRY SITE

Please answer all questions. Mark "NA" for questions that are not applicable. Mark "UNK" if the answer is unknown to you at the time of completion. Please attach any additional pages as needed.

Date Questionnaire was completed: 8-5-17

Name of person completing Questionnaire: BYRON GARIGAN

Address: 9880 E. MILLMAR Rd
TUCSON, AZ 85730

Contact Name: BYRON GARIGAN

Address: P.O. BOX 17359
TUCSON, AZ 85731

Phone Number: 520-906-9100

Property Information

1. What is the current use of the property? Please include a detailed description.

RESIDENCE
HOG FARM

2. What are the foreseeable plans for the property (extension of buildings, increased production, etc.) as far into the future as they are known and up to 100 years, if possible?

UNK

3. Is the property owned or leased?

OWNED

4. Who is the owner of the property?

Name: BYRON & SANDRA GARRIGAN

Address: P.O. BOX 17359
TUCSON, AZ 85731

Phone Number: 520-906-9100, 520-425-7457

5. If the property is leased, how long is the lease term?

NA

6. If the property is leased, are there plans to renew the lease and for how long?

NA

7. If the property is owned, do you plan on relocating and if so in what timeframe?

UNK

Thank you for your time. The ADEQ Project Manager, Hazel Cox, or a representative from ADEQ's consultant, Hydro Geo Chem, Inc., may follow-up on answers provided.

Spatial Reference: NAD 1983 UTM Zone 12N
Imagery: ESRI, DigitalGlobe, USDA, USGS

9696, 9886 & 9880 E. Millmar Rd. parcels with ID

0 500 1,000
SCALE IN FEET

N

HYDRO GEO CHEM, INC.

SITE LOCATION MAP
HARRISON ROAD & MILLMAR ROAD DROSS SITE
TUCSON, ARIZONA

Approved	Date	Author	Date	File Name	Figure
AJB	1/12/16	GEM	1/12/16	2015053006G	1

LAND USE STUDY QUESTIONNAIRE
FOR PROPERTIES OWNERS WITHIN THE
HARRISON ROAD AND MILLMAR ROAD WQARF REGISTRY SITE

Please answer all questions. Mark "NA" for questions that are not applicable. Mark "UNK" if the answer is unknown to you at the time of completion. Please attach any additional pages as needed.

Date Questionnaire was completed: 7-21-17

Name of person completing Questionnaire: Susan Hardy

Address: 9696 E Millmar Rd
Tucson Az 85730

Contact Name: Same

Address:

Phone Number: 520-749-2975

Property Information

1. What is the current use of the property? Please include a detailed description.

Residence people & Animals

2. What are the foreseeable plans for the property (extension of buildings, increased production, etc.) as far into the future as they are known and up to 100 years, if possible?

Residence & possible boarding of a few horses

3. Is the property owned or leased? Owned

4. Who is the owner of the property?

Name: Susan Haney

Address: 9696 E Millmar Rd
Tucson Az 85730

Phone Number: 520-749-2975

5. If the property is leased, how long is the lease term?

N/A

6. If the property is leased, are there plans to renew the lease and for how long?

N/A

7. If the property is owned, do you plan on relocating and if so in what timeframe? Not in near future

Thank you for your time. The ADEQ Project Manager, Hazel Cox, or a representative from ADEQ's consultant, Hydro Geo Chem, Inc., may follow-up on answers provided.

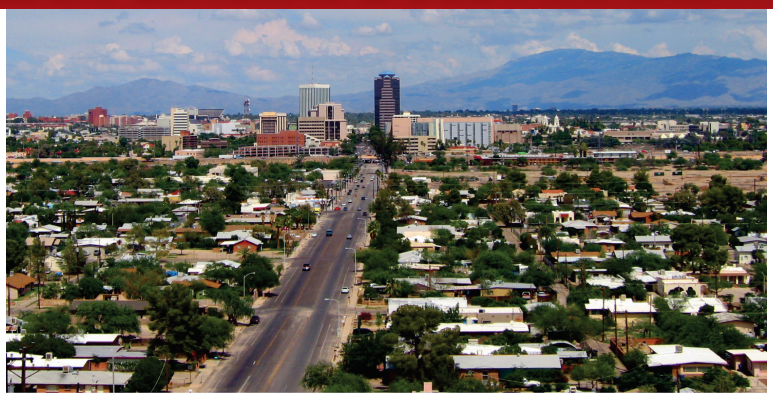
APPENDIX B.2

CITY OF TUCSON GENERAL & SUSTAINABILITY PLAN 2013
(Excerpt)

NOVEMBER 13, 2013

PLAN TUCSON

CITY OF TUCSON GENERAL & SUSTAINABILITY PLAN 2013



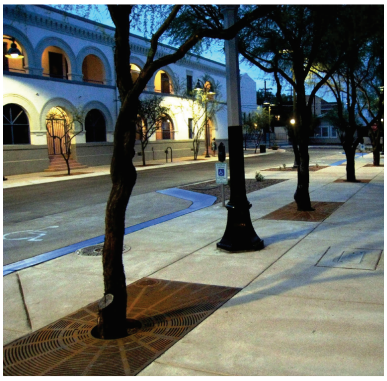
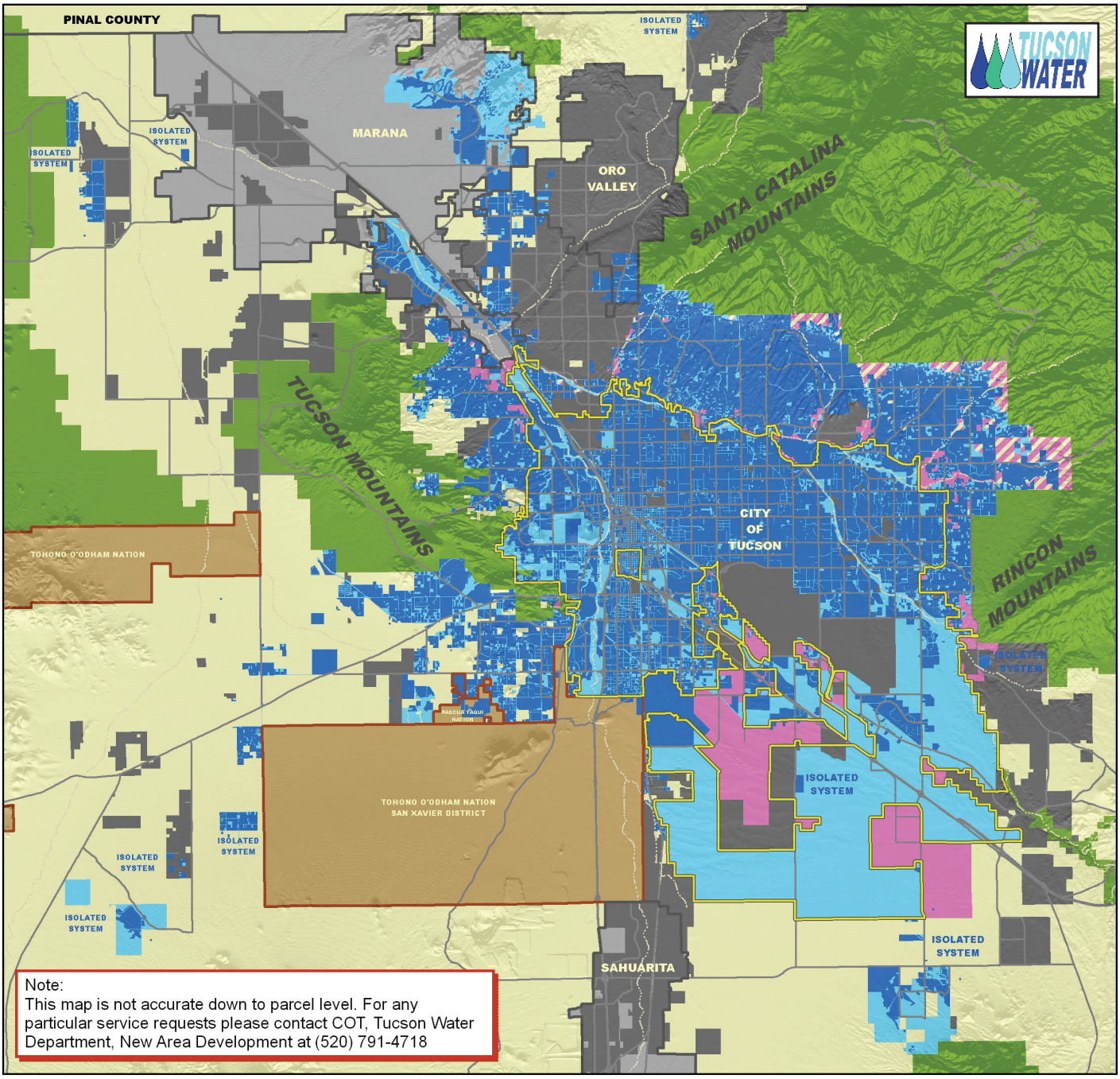


EXHIBIT WR-2 Tucson Water Service Area, Established 2010



Source: City of Tucson Water Department

Map as of 06/03/2013

N 0 2.5 5 10 Miles

Existing Obligated Service Area

- Current Service Area
- Obligated Area Currently Not Served

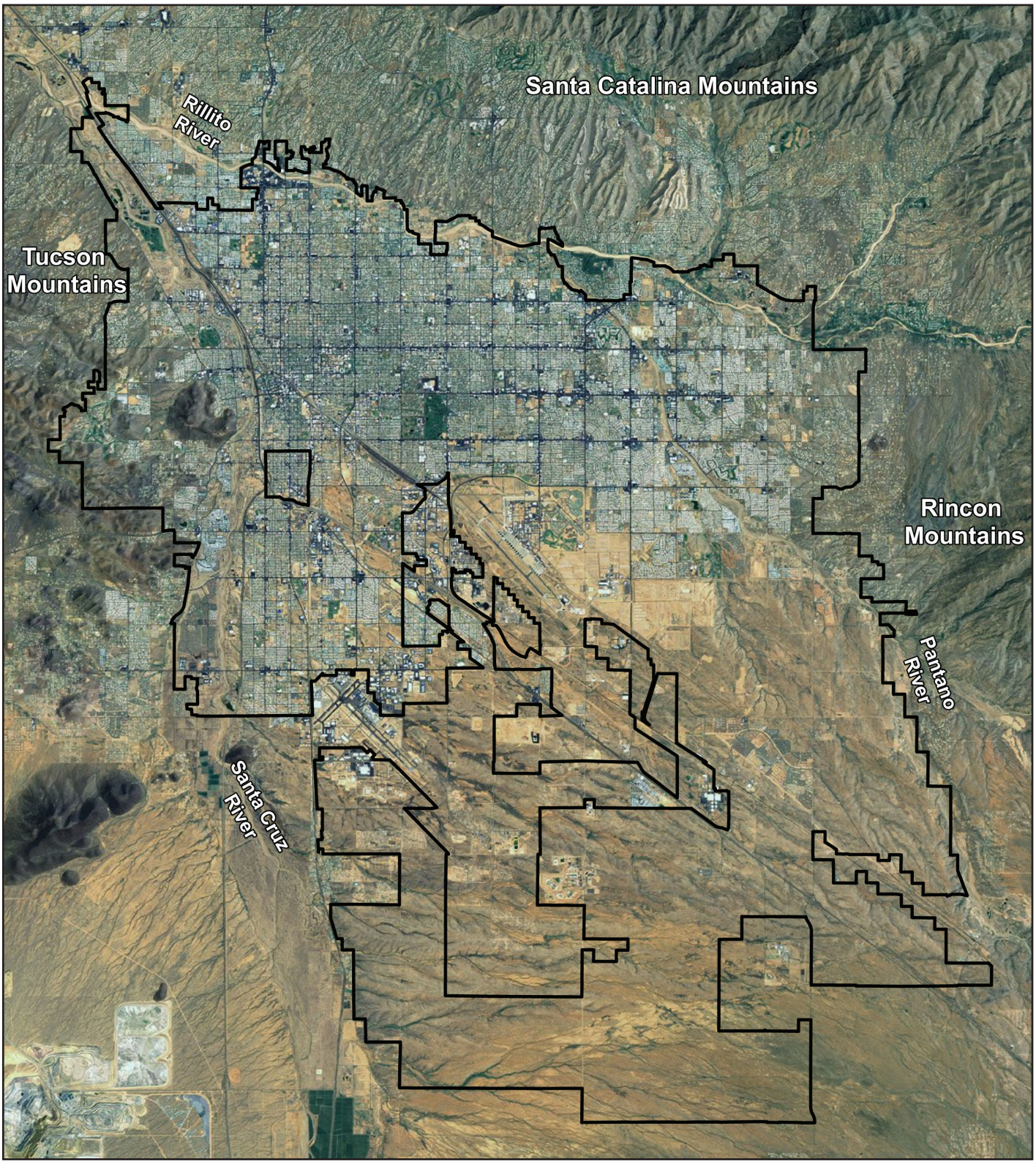
Expansion Areas

- Proposed Service Area—Annexation required
- Proposed Service Area—Annexation may be required

Non-Expansion Areas

- Unincorporated Pima County
- Other Water Provider
- Other Jurisdiction
- Reservation
- Parks

EXHIBIT LT-1 Tucson Satellite Image

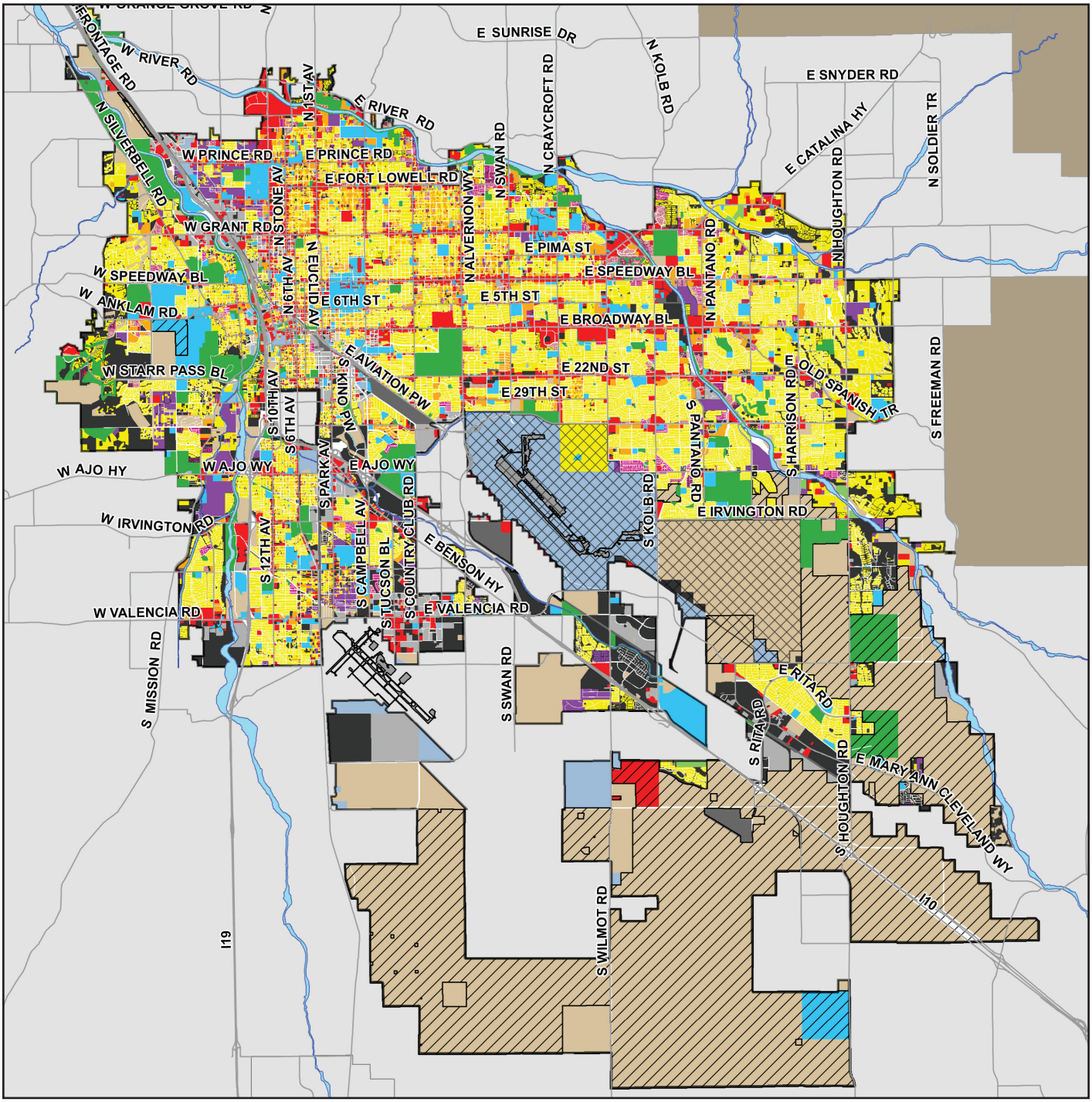


Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
Map as of 06/03/2013

City of Tucson

N 0 2.5 5 10 Miles

EXHIBIT LT-3 Existing Land Uses, 2013



Source: City of Tucson IT-GIS Section
Map as of 06/03/2013
Dates reflect original dates of adoption by Mayor and Council

N

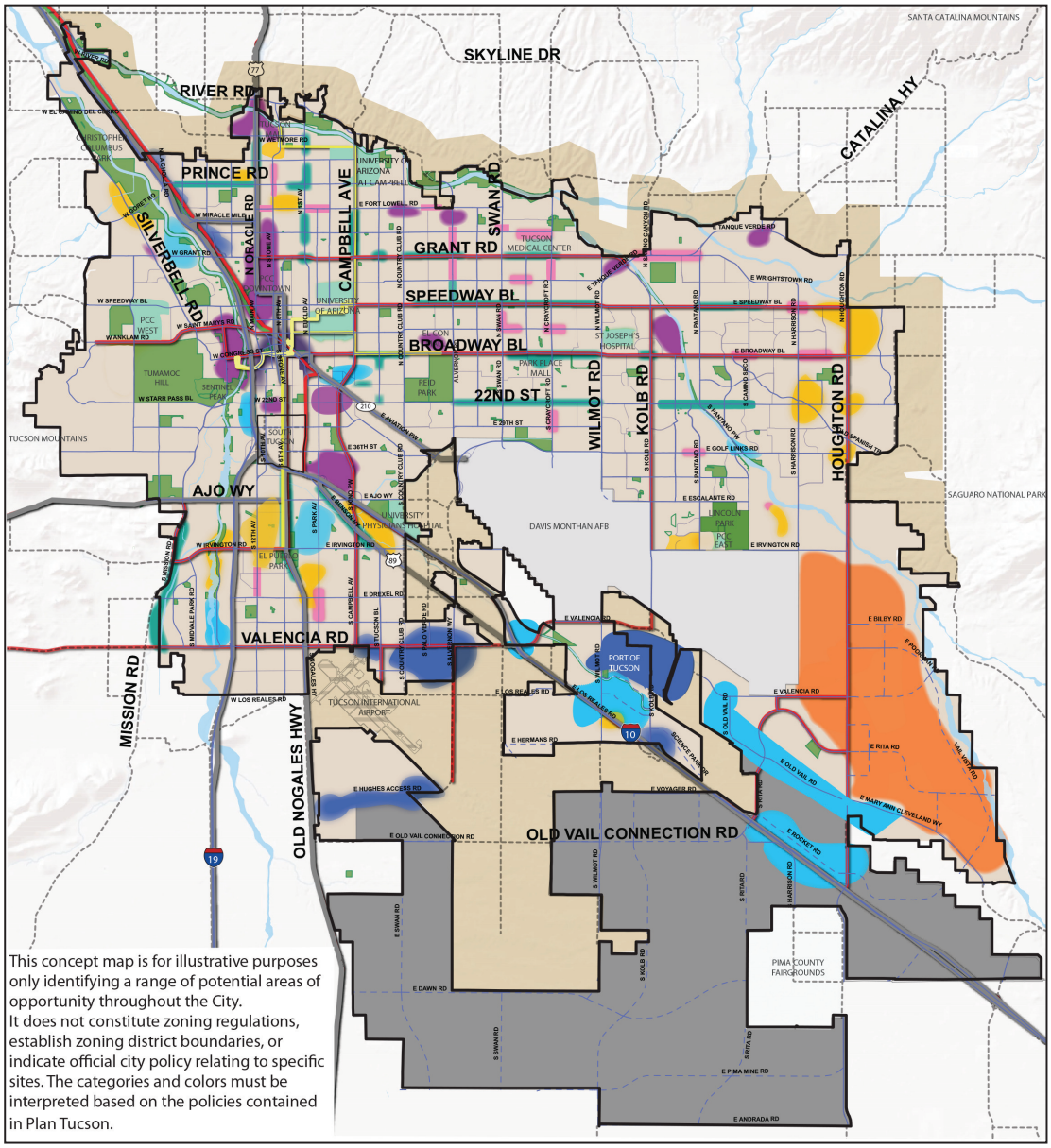
0 2.5 5 10
Miles

Existing Land Uses as of 06/2013

- Vacant
- Single-Family Housing
- Townhomes
- Multi-Family Housing
- Mobile Homes
- Commercial
- Institutional
- Industrial
- Utilities
- Parks and Recreation
- Open Space/Common Area
- Public/Tax Exempt; Military
- Agriculture
- Major Washes
- Federal Lands
- Davis-Monthan AFB
- State Land
- City of Tucson
- Other Jurisdictions

EXHIBIT LT-7 Future Growth Scenario Map

Map and legend colors may vary slightly from each other. Colors may also vary depending on printer used.



Source: City of Tucson IT-GIS Section. Map as of 07/09/2013.
Map available on-line at www.tucsonaz.gov/plantucson

N

0 2.5 5 10

Miles

Building Blocks

(See Exhibit LT-8 for general descriptions of the building blocks.)

- Existing Neighborhoods
- Neighborhoods with Greater Infill Potential
- Neighborhood Centers
- Downtown
- Business Centers
- Mixed-Use Centers
- Mixed-Use Corridors
- Campus Areas
- Industrial Areas
- Houghton Corridor Area
- Southlands
- Potential Annexation Areas
- Existing Parks/Open Space
- City of Tucson Boundary

From Major Streets and Routes Plan

- Future Roads
- County Major Routes
- Major Highways
- Major Roads

From 2040 Regional Transportation Plan

- Planned Bus Routes (BRT, Express and Circulator)
- Planned Streetcar
- Planned Commuter/Intercity Rail

EXHIBIT LT-8 Future Growth Scenario Building Blocks

Existing Neighborhoods	Existing neighborhoods are primarily developed and largely built-out residential neighborhoods and commercial districts in which minimal new development and redevelopment is expected in the next several decades. The goal is to maintain the character of these neighborhoods, while accommodating some new development and redevelopment and encouraging reinvestment and new services and amenities that contribute further to neighborhood stability.
Neighborhoods with Greater Infill Potential	Neighborhoods with greater infill potential are residential neighborhoods and commercial districts for which there is potential for new development and redevelopment in the next several decades. In some areas, entire new neighborhoods may be built. These neighborhoods are characterized by an urban scale that allows for more personal interaction, while providing safe and convenient access for all ages and abilities to goods and services needed in daily life. These neighborhoods include a mix of such uses as a variety of housing types, grocery stores and other retail and services, public schools, parks and recreational facilities, and multi-modal transportation choices.
Neighborhood Centers	Neighborhood centers feature a mix of small businesses surrounded by housing and accessed internally and from nearby neighborhoods by pedestrian and bike friendly streets and by transit.
Downtown	Downtown Tucson acts not only as a regional employment and administrative center, but also as a major hub for public transit services and connections (light and commuter rail, regional buses, streetcar). It is a vital pedestrian-oriented urban area that provides higher-density housing, retail, art and culture, and entertainment for its residents and those of greater Tucson.
Business Centers	Business centers are major commercial or employment districts that act as major drivers of Tucson's economy. These centers generally contain corporate or multiple-use office, industrial, or retail uses. Existing examples in Tucson include the University of Arizona Science and Technology Park, Tucson Mall, and the Tucson International Airport area.
Mixed-Use Centers	Mixed-use centers combine a variety of housing options, retail, services, office, and public gathering places, located close to each other, providing occupants of the center and the residents and workers in the surrounding neighborhoods with local access to goods and services. Public transit, bicycles, and walking will get priority in these areas although cars will still play an important role. Existing examples in Tucson include Williams Centre, Gateway Centre, and the Bridges.
Mixed-Use Corridors	Mixed-use corridors provide a higher-intensity mix of jobs, services, and housing along major streets. The businesses and residences within these corridors will be served by a mix of high-frequency transit options, as well as pedestrian and bicycle facilities.
Campus Areas	Campus areas include and surround large master-planned educational, medical, or business facilities. A fully-realized campus area serves the local workforce and student population and includes a range of housing, a variety of retail opportunities, and convenient transit options. Campus areas often accommodate businesses that are the spin-off of economic development opportunities generated by the primary employers. Existing examples include the University of Arizona, Pima Community College, Tucson Medical Center, Saint Joseph's Hospital, Saint Mary's Hospital, University Physicians Hospital, and the Veterans Affairs Medical Center.
Industrial Areas	Industrial areas are strategically located for efficient handling of intermodal freight movements. These areas support national and international freight movement through Tucson by connecting existing major regional commercial transportation routes, including railway, major highways, and the airports
Houghton Corridor Area	Development in the Houghton Corridor Area is to be master planned with a cohesive system of mixed-use centers and neighborhoods, providing a variety of housing types and densities, a compact development pattern, a transportation and circulation system that offers alternatives for mobility, and a regional open space system. A phased approach to development will provide for increased efficiency of infrastructure and services for residents.
Southlands	Southlands is a long-term growth area, formed predominantly by large tracts of undeveloped land located at the southeastern and southern perimeters of the city. A large portion of this area is administered by the State Land Department. Prior to releasing these lands for development, the State will initiate planning efforts to promote orderly phased development that reflects sustainable and innovative community design.
Potential Annexation Areas	Potential Annexation Areas are areas that the City of Tucson may be pursuing for annexation within the next decade, working with other local jurisdictions with the ultimate goal of having urban commercial and residential areas located within incorporated cities and towns.

APPENDIX C

HISTORICAL INVESTIGATION MAPS

7. WASTE UNIT LOCATION DRAWING

GARIGAN PROPERTY DROSS 11-Aug-88

Locations are approximate
Not to Scale

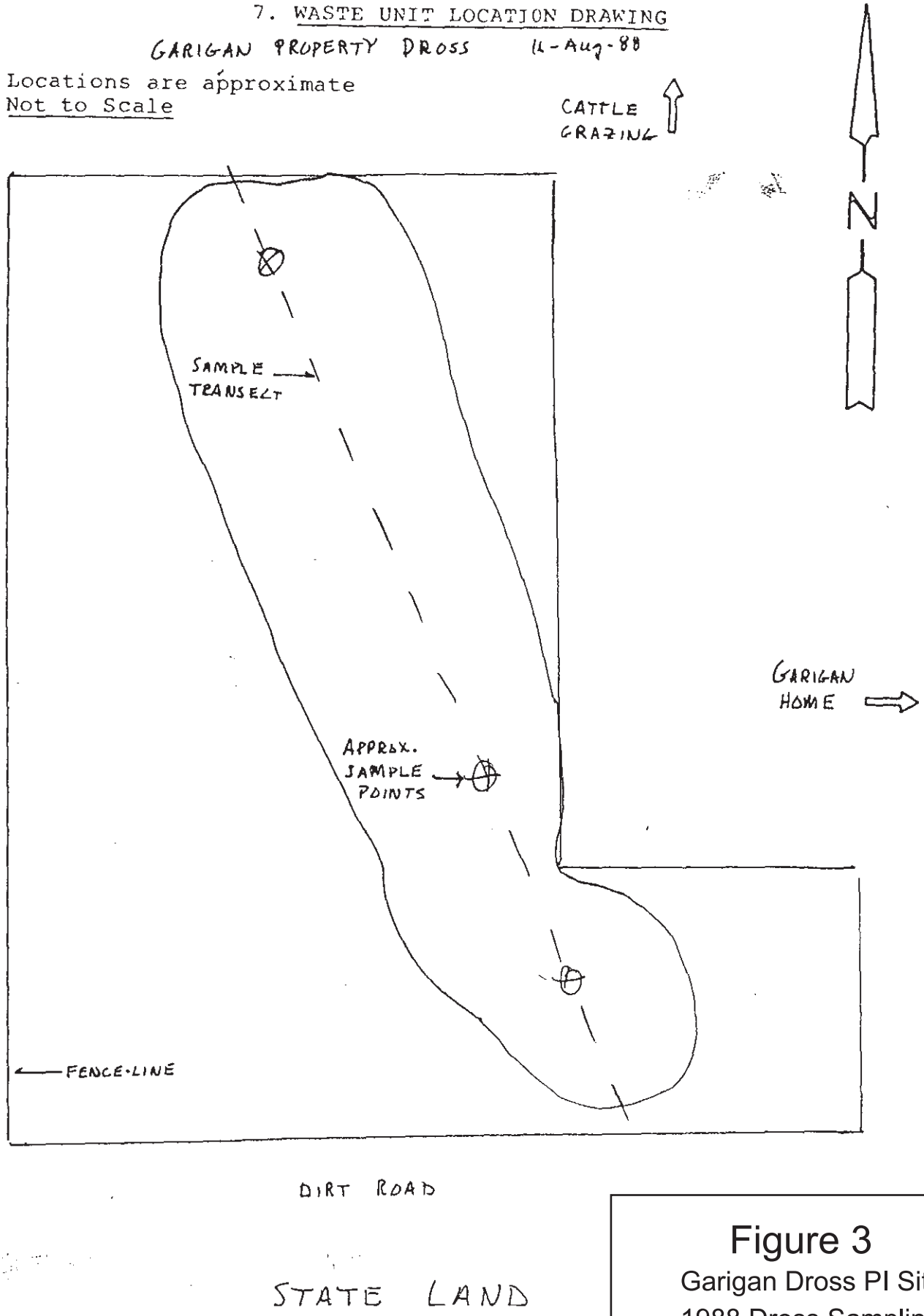
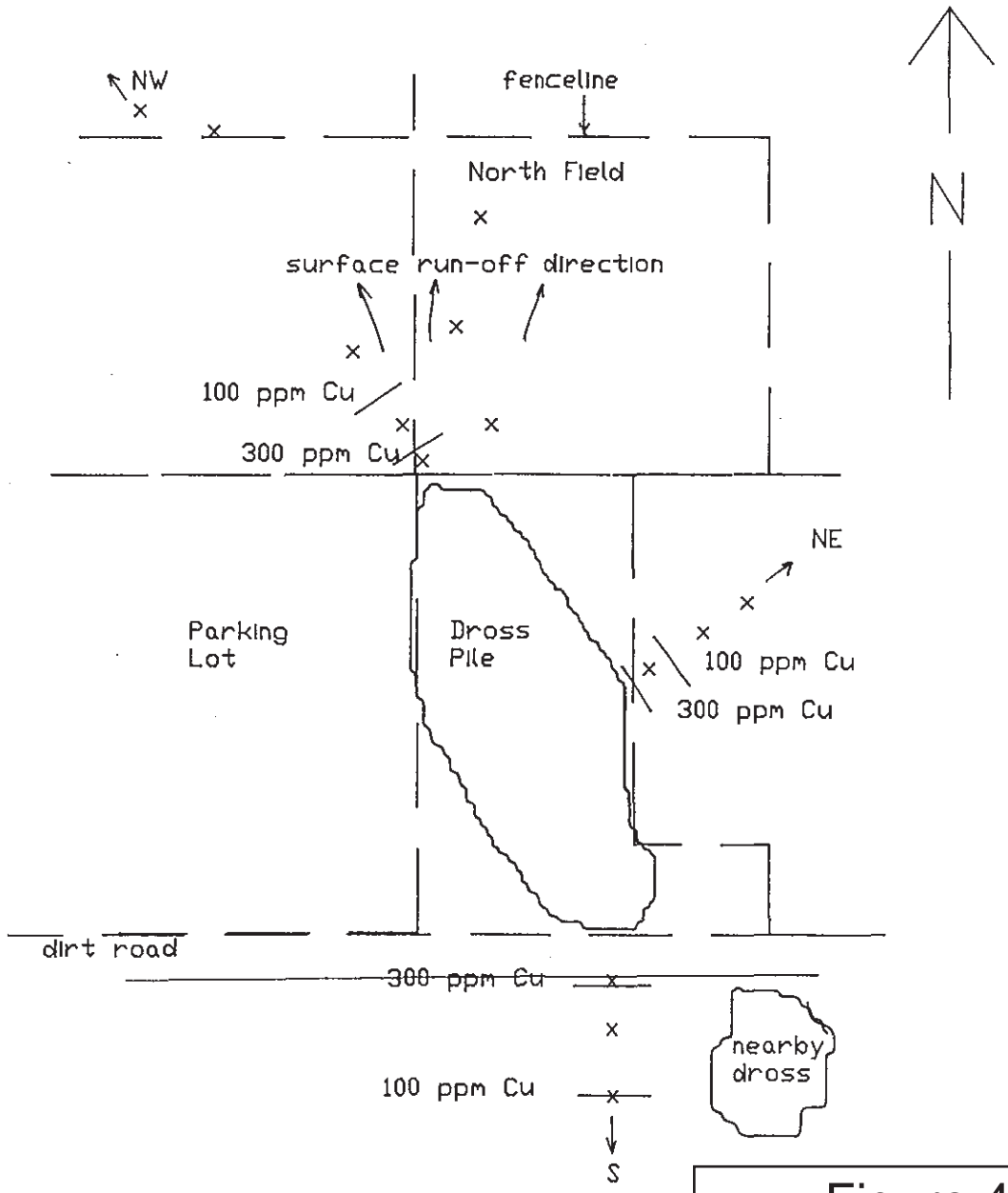


Figure 3
Garigan Dross PI Site
1988 Dross Sampling Locations

Garigan Property Sampling

07 - Dec - 88

Drawing not to scale - locations are approximate



Key

x - sample points

FIGURE 1

Figure 4

Garigan Dross PI Site 1989 Soils Sampling Locations

Original figure from Arizona Department of Environmental Quality Arizona, 1989, Garigan Property Soil Sampling Report, May 1989

APPENDIX D

LABORATORY RESULTS, CHAIN-OF-CUSTODY FORMS AND QUALITY CONTROL DATA

(Laboratory results before 2017 are not included as they were previously reported)

April 24, 2017

Abra Bentley
Hydro Geo Chem, Inc.
51 W. Wetmore Rd., Suite 101
Tucson, AZ 85705

TEL (520) 293-1500
FAX (520) 293-1550

Work Order No.: 17D0358
Order Name: HMD East Tail

RE: Solid Waste Profiling

Dear Abra Bentley,

Turner Laboratories, Inc. received 7 sample(s) on 04/10/2017 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Max DiSante
Laboratory Director

Client: Hydro Geo Chem, Inc.
Project: Solid Waste Profiling
Work Order: 17D0358
Date Received: 04/10/2017

Order: HMD East Tail

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date/Time
17D0358-01	ET-5-0	Soil	04/06/2017 1605
17D0358-02	ET-10-12	Soil	04/06/2017 1610
17D0358-03	ET-17-15	Soil	04/06/2017 1005
17D0358-04	ET-20-6	Soil	04/06/2017 1055
17D0358-05	ET-23-12	Soil	04/06/2017 1315
17D0358-06	ET-28-6	Soil	04/06/2017 1325
17D0358-07	ET-32-24	Soil	04/06/2017 1340

Client: Hydro Geo Chem, Inc.
Project: Solid Waste Profiling
Work Order: 17D0358
Date Received: 04/10/2017

Case Narrative

M3 The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated LCS/LCSD recovery was acceptable.

M7 Matrix spike recovery was low. Data reported per ADEQ policy 0154.000. Matrix interference was confirmed.

All soil, sludge, and solid matrix determinations are reported on a wet weight basis unless otherwise noted.

ND Not Detected at or above the PQL

PQL Practical Quantitation Limit

DF Dilution Factor

Turner Laboratories, Inc.

Date: 04/24/2017

Client:	Hydro Geo Chem, Inc.	**Client Sample ID:**	ET-5-0
Project:	Solid Waste Profiling	**Collection Date/Time:**	04/06/2017 1605
Work Order:	17D0358	**Matrix:**	Soil
Lab Sample ID:	17D0358-01	**Order Name:**	HMD East Tail

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-SW6010C								
Aluminum	15000	500		mg/Kg	10	04/17/2017 1035	04/18/2017 1432	MH
Antimony	ND	5.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1323	MH
Cadmium	7.8	0.050		mg/Kg	1	04/17/2017 1035	04/18/2017 1323	MH
Copper	740	0.50		mg/Kg	1	04/17/2017 1035	04/18/2017 1323	MH
Lead	51	1.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1323	MH
Nickel	38	1.8		mg/Kg	1	04/17/2017 1035	04/18/2017 1323	MH

Turner Laboratories, Inc.

Date: 04/24/2017

Client:	Hydro Geo Chem, Inc.	**Client Sample ID:**	ET-10-12
Project:	Solid Waste Profiling	**Collection Date/Time:**	04/06/2017 1610
Work Order:	17D0358	**Matrix:**	Soil
Lab Sample ID:	17D0358-02	**Order Name:**	HMD East Tail

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-SW6010C								
Aluminum	12000	50		mg/Kg	1	04/17/2017 1035	04/18/2017 1327	MH
Antimony	ND	5.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1327	MH
Cadmium	1.1	0.050		mg/Kg	1	04/17/2017 1035	04/18/2017 1327	MH
Copper	67	0.50		mg/Kg	1	04/17/2017 1035	04/18/2017 1327	MH
Lead	9.2	1.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1327	MH
Nickel	6.7	1.8		mg/Kg	1	04/17/2017 1035	04/18/2017 1327	MH

Turner Laboratories, Inc.

Date: 04/24/2017

Client:	Hydro Geo Chem, Inc.	**Client Sample ID:**	ET-17-15
Project:	Solid Waste Profiling	**Collection Date/Time:**	04/06/2017 1005
Work Order:	17D0358	**Matrix:**	Soil
Lab Sample ID:	17D0358-03	**Order Name:**	HMD East Tail

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-SW6010C								
Aluminum	18000	500		mg/Kg	10	04/17/2017 1035	04/18/2017 1436	MH
Antimony	ND	5.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1331	MH
Cadmium	0.32	0.050		mg/Kg	1	04/17/2017 1035	04/18/2017 1331	MH
Copper	18	0.50		mg/Kg	1	04/17/2017 1035	04/18/2017 1330	MH
Lead	8.9	1.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1331	MH
Nickel	6.3	1.8		mg/Kg	1	04/17/2017 1035	04/18/2017 1330	MH

Turner Laboratories, Inc.

Date: 04/24/2017

Client:	Hydro Geo Chem, Inc.	**Client Sample ID:**	ET-20-6
Project:	Solid Waste Profiling	**Collection Date/Time:**	04/06/2017 1055
Work Order:	17D0358	**Matrix:**	Soil
Lab Sample ID:	17D0358-04	**Order Name:**	HMD East Tail

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-SW6010C								
Aluminum	14000	500		mg/Kg	10	04/17/2017 1035	04/18/2017 1440	MH
Antimony	ND	5.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1334	MH
Cadmium	0.30	0.050		mg/Kg	1	04/17/2017 1035	04/18/2017 1334	MH
Copper	18	0.50		mg/Kg	1	04/17/2017 1035	04/18/2017 1334	MH
Lead	8.3	1.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1334	MH
Nickel	5.2	1.8		mg/Kg	1	04/17/2017 1035	04/18/2017 1334	MH

Turner Laboratories, Inc.

Date: 04/24/2017

Client:	Hydro Geo Chem, Inc.	**Client Sample ID:**	ET-23-12
Project:	Solid Waste Profiling	**Collection Date/Time:**	04/06/2017 1315
Work Order:	17D0358	**Matrix:**	Soil
Lab Sample ID:	17D0358-05	**Order Name:**	HMD East Tail

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-SW6010C								
Aluminum	14000	500		mg/Kg	10	04/17/2017 1035	04/18/2017 1444	MH
Antimony	ND	5.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1338	MH
Cadmium	0.54	0.050		mg/Kg	1	04/17/2017 1035	04/18/2017 1338	MH
Copper	34	0.50		mg/Kg	1	04/17/2017 1035	04/18/2017 1338	MH
Lead	9.1	1.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1338	MH
Nickel	5.4	1.8		mg/Kg	1	04/17/2017 1035	04/18/2017 1338	MH

Turner Laboratories, Inc.

Date: 04/24/2017

Client:	Hydro Geo Chem, Inc.	**Client Sample ID:**	ET-28-6
Project:	Solid Waste Profiling	**Collection Date/Time:**	04/06/2017 1325
Work Order:	17D0358	**Matrix:**	Soil
Lab Sample ID:	17D0358-06	**Order Name:**	HMD East Tail

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-SW6010C								
Aluminum	27000	500		mg/Kg	10	04/17/2017 1035	04/18/2017 1448	MH
Antimony	ND	5.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1342	MH
Cadmium	5.6	0.050		mg/Kg	1	04/17/2017 1035	04/18/2017 1342	MH
Copper	430	0.50		mg/Kg	1	04/17/2017 1035	04/18/2017 1342	MH
Lead	65	1.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1342	MH
Nickel	20	1.8		mg/Kg	1	04/17/2017 1035	04/18/2017 1342	MH

Turner Laboratories, Inc.

Date: 04/24/2017

Client:	Hydro Geo Chem, Inc.	**Client Sample ID:**	ET-32-24
Project:	Solid Waste Profiling	**Collection Date/Time:**	04/06/2017 1340
Work Order:	17D0358	**Matrix:**	Soil
Lab Sample ID:	17D0358-07	**Order Name:**	HMD East Tail

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-SW6010C								
Aluminum	12000	50		mg/Kg	1	04/17/2017 1035	04/18/2017 1307	MH
Antimony	ND	5.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1307	MH
Cadmium	0.76	0.050		mg/Kg	1	04/17/2017 1035	04/18/2017 1307	MH
Copper	100	0.50		mg/Kg	1	04/17/2017 1035	04/18/2017 1307	MH
Lead	10	1.0		mg/Kg	1	04/17/2017 1035	04/18/2017 1307	MH
Nickel	5.4	1.8		mg/Kg	1	04/17/2017 1035	04/18/2017 1307	MH

Client: Hydro Geo Chem, Inc.
Project: Solid Waste Profiling
Work Order: 17D0358
Date Received: 04/10/2017

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1704194 - SW6010C										
Blank (1704194-BLK1)				Prepared: 04/17/2017 Analyzed: 04/18/2017						
Aluminum	ND	50	mg/Kg							
Antimony	ND	5.0	mg/Kg							
Cadmium	ND	0.050	mg/Kg							
Copper	ND	0.50	mg/Kg							
Lead	ND	1.0	mg/Kg							
Nickel	ND	1.8	mg/Kg							
LCS (1704194-BS1)				Prepared: 04/17/2017 Analyzed: 04/18/2017						
Aluminum	45	50	mg/Kg	50.00		90	80-120			
Antimony	48	5.0	mg/Kg	50.00		97	80-120			
Cadmium	47	0.050	mg/Kg	50.00		93	80-120			
Copper	46	0.50	mg/Kg	50.00		92	80-120			
Lead	46	1.0	mg/Kg	50.00		91	80-120			
Nickel	43	1.8	mg/Kg	50.00		86	80-120			
LCS Dup (1704194-BSD1)				Prepared: 04/17/2017 Analyzed: 04/18/2017						
Aluminum	45	50	mg/Kg	50.00		90	80-120	0.003	20	
Antimony	49	5.0	mg/Kg	50.00		97	80-120	0.8	20	
Cadmium	47	0.050	mg/Kg	50.00		94	80-120	0.6	20	
Copper	46	0.50	mg/Kg	50.00		91	80-120	0.9	20	
Lead	46	1.0	mg/Kg	50.00		92	80-120	0.6	20	
Nickel	43	1.8	mg/Kg	50.00		86	80-120	0.2	20	
Matrix Spike (1704194-MS1)	**Source: 17D0358-07**			Prepared: 04/17/2017 Analyzed: 04/18/2017						
Aluminum	18000	500	mg/Kg	50.00	12000	NR	75-125			M3
Antimony	21	5.0	mg/Kg	50.00	1.1	39	75-125			M7
Cadmium	39	0.050	mg/Kg	50.00	0.76	76	75-125			
Copper	120	0.50	mg/Kg	50.00	100	39	75-125			M7
Lead	48	1.0	mg/Kg	50.00	10	76	75-125			
Nickel	48	1.8	mg/Kg	50.00	5.4	85	75-125			
Matrix Spike Dup (1704194-MSD1)	**Source: 17D0358-07**			Prepared: 04/17/2017 Analyzed: 04/18/2017						
Aluminum	17000	500	mg/Kg	50.00	12000	NR	75-125	7	20	M3
Antimony	18	5.0	mg/Kg	50.00	1.1	34	75-125	12	20	M7
Cadmium	38	0.050	mg/Kg	50.00	0.76	74	75-125	3	20	M7
Copper	110	0.50	mg/Kg	50.00	100	15	75-125	10	20	M7
Lead	46	1.0	mg/Kg	50.00	10	73	75-125	4	20	M7
Nickel	47	1.8	mg/Kg	50.00	5.4	82	75-125	3	20	

Chain of Custody

ALS Environmental - Tucson
ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 FAX +1 520 573 1063
ALS Group

Work Order No.: 17D0358

Project Manager:	Abra Bentley	Bill to:	
Client Name:	Hydro Geo Chem	Company:	
Address:	5151 W. Wetmore Rd, Ste 101	Address:	
City, State ZIP:	Tucson, AZ 85743	City, State ZIP:	
Email:	abra@hgcinc.com Phone: 293-1500	Email:	Phone:
Project Name:	HMD East Pail		
Project Number:	2015053		
P.O. Number:			
Sampler's Name:	Gabe McGowan		

SAMPLE RECEIPT

Temperature (°C):	22.5	Temp Blank Present		
Received Intact:	(Yes)	No	N/A	Wet Ice / Blue Ice
Cooler Custody Seals:	Yes	No	N/A	Total Containers:
Sample Custody Seals:	Yes	No	N/A	7

REQUESTED ANALYSIS

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	6010B
ET-5-0	soil	4/6/17	16:05		1	X
ET-10-12	soil	4/6/17	16:10		1	X
ET-17-15	soil	4/7/17	10:05		1	X
ET-20-6	soil	4/7/17	10:55		1	X
ET-23-12	soil	4/7/17	13:15		1	X
ET-28-6	soil	4/7/17	13:25		1	X
ET-32-24	soil	4/7/17	13:40		1	X

TAT

- [ ] Routine
- [ ] Same Day *
- [ ] Next Day *
- [ ] 3 Day*
- [ ] 6 Day*

* Please call for availability. Rush charges will apply.

Due Date:

Comments

* Metals Ash Analysis - D6349	Al, Ba, Ca, Fe, Mg, Mn, P, K, Si, Na, Sr, Ti plus Total S
** Metal Scan - Total	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Se, Si, Sn, Sr, Ti, V, Zn, Zr

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
Gabe McGowan	[signature]	4/10/17 9:51	Kyle Brown	[signature]	4-10-17 0951

Revised : 12/6/2016

Kevin Brim

From: Abra Bentley <abrab@hgcinc.com>
Sent: Tuesday, April 11, 2017 11:29 AM
To: Kevin Brim
Subject: RE: HMD soil samples

Hi Kevin,
I'm glad that you called earlier regarding the 6010B analysis for the HMD samples submitted yesterday. This should be for a reduced metals list: Al, Ni, Cu, Pb, Cd, Sb

Thank you,

Abra Bentley, R.G.
HYDRO GEO CHEM, INC
51 W. Wetmore Road, Suite 101
Tucson, Arizona 85705
cell: 520-990-7698
office: 520-293-1500 ext 115
www.hgcinc.com

From: Kevin Brim [mailto:kbrim@turnerlabs.com]
Sent: Monday, March 27, 2017 9:48 AM
To: Abra Bentley
Subject: RE: HMD soil samples

Sounds good, we have them ready up front for him.

Thanks

Kevin Brim
Project Manager
Turner Laboratories, Inc.
2445 N. Coyote Drive, Suite #104
Tucson, Arizona 85745
(520) 882-5880
(520) 882-9788 fax
www.turnerlabs.com

TURNER
LABORATORIES INC.

APPENDIX E

FIELD NOTES

(Field notes before 2017 are not included as they were previously reported)

W. Thompson

4/3/17

9:00 On Site. Met with Subterra Utility locating to Clear the Site.

9:15 MPe ~~and~~ Crew arrives on site and are moving equipment around. Met with Ron Georigen and went over plan for day. He gave us keys to the gate on the NW corner of property.

Note the meter has been set by Tucson water at the 9700 plot on Milner Rd Fire Plug (across from Audrey Rd, 4400S
Meter # ~~1196948~~ → 1196948
Initial reading: 3154777 ft^3

13:00 Abra P. is on site. Walk site with MPe to make sure crew on is on the same page in terms of what we need to accomplish this time around.

14:30 Abra P leaves site. We spoke with Ron Georgich about putting lumber ~~out~~ we located on top of dross pile and move it to the wood corral on the SE side of the dross pile. He is "OK" with that

1433 Roll off bin is on site for a drop off - 40cu yd

1508 Conduct HASP Tailgate Safety meeting and have Crew sign off on acknowledgement sheet.

MPe CREW: Chad Hendon: Lead man
Ron Broadway: Second lead
Daniel Forsyth: helper

080 4/4/17 W. Thompson / G. McGowan

700 Picked up water buggy from storage lot and drove to ~~Geraldon~~ HMD site with Gabe McGowan. Working on East side of East cross pile.

830 On site MPE is here and their crew has started removing green material and disposing of it in 40 cuyd roll off box.

9:00 Filled up water buggy (HGCS) with 500 gal of H_2O for dust control and parked on East side of main HMD pile

NOTE → measured foot print of material removal today and overall excavation foot print per site plan and posted on base map.
→ Moved truck load from work area and hauled to North pasture area per property owners instruction.
→ Completed grubbing operation on east begin east HMD pile. Will begin excavating site in the AM.
1652 Leave site for PM.

Note → MPE filled one roll-off w/ green waste today

G. McGowan / W. Thompson

4/5/12 HNID East Excavation

8:00 on site MPe's crew is on site and are continuing the grubbing process to remove green material.

8:30 MPe pushing/moving buckets of dross, dross-impacted soil, miscellaneous metal waste from East Tail to E edge of E.P. HGC + MPe providing dust control

9:30 MPe dragging out small pile of dross-impacted soil from SE corner of E.P. They are making a flat area from which to push material to West into E.P. MPe providing dust control

9:50 MPe begins using excavator to grub out more vegetation on E/NE perimeter of East Pile

10:10 Chad shows us dross exposed in area along NE/E edge of E.P. where he has been grubbing. Appears that it does not extend past Bangan fence line in this area. Will pull it back w/ excavator + see extent.

1032 Cabe M. left site to get gas for HGC's water buggy pump as we are all out.

1345 Fill up HGC's water buggy at fire plug to continue dust control.

082

M. McBowman / w. Thompson

9/5/07

14 Continuing to push dross from East side of North to South fence line to dross deposits west of fence line.

14:30 MPe sends David to get bucket w/sharp edge from CAT to allow excavator to pull dross in specific areas to ∂'bls (currently they have a toothed bucket)

14:50 Note: Daniel is back from Empire CAT with Excavator backhoe Scraper blade.

15:00 calibrate XRF. ~~Written~~ Will collect three XRF measurements along E fence line of G.T.

15:10 resume excavating so will hold off on XRF. Providing dust control.

16:50 leaving site. Excavated E. portion of G.T. finding dross intermittently 5 ∂ 87 bls

15 7734

G. McGrowen / W. Thompson

4/6/13

800 on site continuing to work the East leg of the East HMD pile with MPe crew.

MPe equipment: CAT 950H front-loader
CAT 313F excavator
Kenworth water truck

8:42 MPe scraping along S. edge of E.T. Dross to <1 ft in this area generally. Reaching it requiring removing additional veg. previously left.

8:50 calibrating XRF. Will shoot several XRFs along E + southern edge of E.T. so we know where we are.

9:00 locate admin password to change XRF settings to show results for all metals.

9:07 record ET-1-0 on surface 18" W + 18" N of Garigan barbed wire fence SE corner.
East Till XRF# depth (inches)
This is ~4' N of trailer park retaining wall.

9:11 record ET-2-0 on surface (under ~3" of duff) at S. edge of gate in Garigan E. fence about 7' 6" W of fenceline + 19' N of T.P. retaining wall.

9:15 record ET-3-0 on surface 12' W of E. fence, ~~35'~~ 31' S of N. fence.

9:19 record ET-4-0 on surface 9' S of N. fence, 37' W of E. fence

084 4/6/17 GM/WT

9:25 record ET-5-0 on surface 3' south of N fence, 55' W of E. fence

9:30 record ET-6-0 on surface 7' N of T.P. retaining wall & 27' W of E. fence. 4' W + 1' N of utility pole

Note: ET-1 through ET-6 recorded along or near edge of excavation (non-excavated area circa 4/6 a.m.)
Results on next page.

10:30 MPe resumes work after break. Chad spoke with Matt on the phone, B planning to be here through Tuesday 4/11. Matt B good with this.

11:00 break for lunch

12:15 back on site w/ Abra, MPe refilling our water tank w/ their tanker

13:10 5 truckloads of fill material have been delivered

14:20 1st Roll off bin has been removed from site
Sofar 8 truck loads of ~~fill~~ back fill have been delivered so far. 1.5 tons per cu yd and 16 cu yds/load (~24 tons/load)

(ppm) 4/16/17 085

Element/Loc	ET-1-0	ET-2-0	ET-3-0	ET-4-0	ET-5-0	ET-6-0
Ti	3759 ± 386	2947 ± 357	4172 ± 363	3846 ± 353	3837 ± 336	2494 ± 480
Ba	2377 ± 195	2141 ± 184	1990 ± 180	2005 ± 176	1934 ± 167	2701 ± 257
Cr	514 ± 50	594 ± 50	463 ± 46	413 ± 44	408 ± 43	1380 ± 83
Mn	2794 ± 170	2446 ± 159	2507 ± 157	2022 ± 144	2178 ± 143	3508 ± 239
Fe	14891 ± 176	13244 ± 156	15647 ± 175	13830 ± 156	16329 ± 171	20770 ± 284
Co	34 ± 5	35 ± 5	30 ± 5	29 ± 4	37 ± 5	47 ± 7
Ni	92 ± 16	63 ± 15	74 ± 15	68 ± 14	78 ± 14	268 ± 25
Cu	482 ± 20	1269 ± 27	860 ± 22	553 ± 19	634 ± 18	8471 ± 116
Zn	302 ± 10	496 ± 13	419 ± 11	261 ± 9	305 ± 9	2637 ± 45
Br	12 ± 2	15 ± 2	<5 ~~87 ± 5~~	< 5	< 5	< 10
Pb	56 ± 4	104 ± 5	87 ± 5	63 ± 4	79 ± 4	557 ± 14
Bi	8 ± 2	7 ± 2	9 ± 2	< 5	< 5	8 ± 3
Rb	109 ± 3	97 ± 3	110 ± 3	114 ± 3	108 ± 3	82 ± 4
Sr	194 ± 4	216 ± 4	191 ± 4	188 ± 4	184 ± 3	144 ± 4
Zr	197 ± 3	175 ± 3	209 ± 3	264 ± 4	249 ± 4	118 ± 3
Hg	< 13	< 14	< 13	< 12	13 ± 4	24 ± 8
Ga	< 9	< 10	< 9	< 8	< 9	< 19
As	< 10	< 13	< 12	< 10	< 11	< 32
Se	< 5	< 5	< 5	< 4	< 4	< 8
Au	< 7	< 7	< 7	< 7	< 7	< 12
Tl	< 15	< 17	< 14	< 14	< 14	< 32
U	< 17	< 17	< 17	< 16	< 6	< 20
Mo	< 23	28 ± 7	< 22	< 21	< 21	63 ± 9
Ag	< 28	< 27	< 26	< 26	< 25	44 ± 11
Cd	< 34	< 33	< 33	< 22	< 31	36 ± 14
Sn	< 57	< 36	68 ± 18	< 54	53 ± 18	137 ± 24
Sb	< 61	< 59	< 59	< 58	< 56	< 74

9/6/17 GM/WT

14:25 Chad is going to finish digging to W. boundary of E.T. Then he will begin pulling dross on S. portion of dross area W. of E.T. N to be in line w/ S. border of E.P.
Will be laying out XRF/Sampling locations + measuring behind Chad.

15:00 record ET-7-24 25' W of G fence + 25' N of T.P. ret. wall

15:09 record ET-8-24 44' S of N. fence + 27' W of G fence

15:30 120 y^3 of fill material have been delivered (220 tons)

15:40 record ET-9-15

15:44 record ET-10-12

16:05 collect confirmation sample ET-5-0 in 250mL unpres. glass jar for 6010B

16:10 collect conf. sample ET-10-12 in 250mL unpres. glass jar for 6010B

16:30 leave site

17:15 arrive office 157789 3/4 tank

4/6/17

Element	ET-7-24	ET-8-24	ET-9-15	ET-10-12
Ti	3065 ± 347	2944 ± 354	3600 ± 338	3097 ± 324
Ba	2489 ± 179	2494 ± 183	2137 ± 170	1874 ± 164
Cr	476 ± 46	406 ± 45	404 ± 43	394 ± 42
Mn	2783 ± 158	2078 ± 147	2308 ± 145	2730 ± 152
Fe	15858 ± 171	14126 ± 160	15961 ± 168	17579 ± 181
Co	37 ± 5	35 ± 5	36 ± 5	33 ± 5
Ni	103 ± 15	94 ± 15	73 ± 14	96 ± 15
Cu	1651 ± 28	321 ± 17	656 ± 18	684 ± 19
Zn	490 ± 12	88 ± 6	289 ± 9	231 ± 8
As	14 ± 4	< 9	< 10	10 ± 3
Pb	82 ± 4	23 ± 3	59 ± 4	47 ± 4
Rb	103 ± 3	147 ± 4	133 ± 3	119 ± 3
Sr	184 ± 3	183 ± 4	189 ± 3	201 ± 3
Zr	207 ± 3	240 ± 4	156 ± 3	208 ± 3
Sn	80 ± 18	< 66	~~18 ± 4~~ < 53	< 51
Hg	< 13	< 12	18 ± 4	< 12
Cd	< 9	< 8	< 8	< 8
Se	< 5	< 5	< 4	< 5
Au	< 7	< 7	< 6	< 7
Br	< 5	< 5	< 5	9 ± 2
Tl	< 15	< 13	< 13	< 13
Bi	< 5	10 ± 2	8 ± 2	5 ± 2
U	< 16	< 18	< 17	< 16
Mo	< 21	< 22	< 20	< 20
Ag	< 25	32 ± 9	< 25	< 25
Cd	< 32	< 33	< 31	< 31
Sb	< 57	< 60	< 56	< 55

088 4/7/17 W.T. / G.M.

800 on site → MPe is on site and on continuing to work on the East legs of the East HMD pile

8:30 XRF is calibrated, begin laying out measurement locations

8:40-9:10 record XRFs
ET-11-18
ET-12-24
ET-13-12
ET-14-16
ET-15-0

9:10 tabulate above XRF results

9:15 MPe begins spreading excavated material on SE edge of E.P. main body. They finished excavating the E.T. this morning at about 1:00.

10:05 have collected XRFs ET-16-0
ET-17-15
collect confirmation sample ET-17-15
250mL soil in 250mL glass N.P. jar

10:35 have collected XRFs ET-18, -19, -20
recording data then will collect conf. sample

10:55 collect confirmation sample ET-20-6
250mL soil in 250mL glass N.P. jar

11:00 record XRF ET-21 thru ET-25
11:15 break for lunch

Element/ Location	ET-11-18	ET-12-24	ET-13-12	ET-14-6	ET-15-0
Ti	3848±355	3404±426	3905±392	2559±374	2572±308
Ba	2355±179	2810±221	2566±199	2738±198	1565±158
Cr	480±45	783±61	477±50	670±54	534±45
Mn	2087±143	3172±196	2727±170	2452±175	2676±150
Fe	12306±140	19260±232	19143±214	16759±191	10386±121
Co	27±4	11±6	38±5	28±5	34±4
Ni	87±14	127±18	76±16	140±17	94±14
Cu	244±15	2308±40	382±19	3046±43	3767±46
Zn	47±5	553±15	119±7	1232±22	1246±20
Pb	13±3	87±5	20±3	385±9	209±6
Bi	7±2	9±2	10±2	<6	10±2
Rb	112±3	112±4	123±4	103±3	84±3
Sr	172±3	196±4	205±4	171±4	158±3
Zr	133±3	191±4	207±4	191±3	131±3
Hg	<12	<16	<14	<16	<15
Ga	<8	<11	<9	<13	<11
As	<7	19±5	9±3	<21	<16
Se	<4	<6	<5	<6	<5
Au	<7	<9	<7	10±3	<8
Br	<5	<6	6±2	<7	13±2
Tl	<12	<17	<14	<22	<17
U	<16	<19	<18	<17	<15
Mo	<20	<24	<22	<22	25±7
Ag	<26	<29	<27	36±9	<25
Cd	<32	<36	<34	39±11	34±10
Sn	<54	<61	<57	113±19	53±17
Sb	<59	<65	<61	<62	<55

location/element	ET-16-0	ET-17-15	ET-18-6	ET-19-10	ET-20-6
Ti	3759±385	2871±351	3785±363	3611±339	2604±335
Ba	2234±195	1863±179	1970±181	1611±168	2078±173
Cr	716±55	333±45	420±46	376±43	320±42
Mn	4034±197	2432±159	2796±166	1934±143	2520±153
Fe	21686±238	16344±186	19419±210	15413±170	15662±172
Co	38±6	31±5	43±5	27±5	24±5
Ni	177±18	50±15	54±15	43±14	60±14
Cu	4069±53	310±18	295±17	322±16	435±18
Zn	1581±25	108±7	102±6	115±7	103±6
Br	8±2	<5	<5	<5	<5
Pb	384±9	22±3	21±4	32±3	20±3
Rb	101±3	118±3	133±4	138±4	143±4
Sr	179±4	192±4	172±3	212±4	180±3
Zr	262±4	180±3	180±3	197±3	159±3
Ag	33±9	<27	31±9	<26	<26
Cd	58±12	<33	<33	<32	<32
Sn	136±19	<36	<56	55±18	<64
Hg	<17	<13	<13	<12	<12
Ga	<14	<9	<8	<8	<8
As	<22	10±3	<9	<9	9±3
Se	<6	<4	<4	<4	<5
Au	<9	<7	<7	<7	<7
Tl	<22	<14	<13	<13	<13
Bi	<6	<5	<5	<5	<5
U	<17	<17	<18	<17	<17
Mo	<23	<22	<21	<21	<21
Sb	<61	<60	<60	<58	<58

Element/Location	ET-21-24	ET-22-24	ET-23-12	ET-24-6	ET-25-0
Ti	3261±368	3940±321	2986±355	2757±361	3347±357
Ba	2074±187	1461±156	1891±180	2080±186	1827±181
Cr	366±46	276±39	354±45	366±46	787±54
Mn	2029±153	2167±139	2460±161	1788±148	2894±173
Fe	14403±170	16838±173	17114±193	13264±160	19395±212
Co	28±5	29±5	29±5	22±6	35±5
Ni	65±15	69±14	65±15	103±16	180±18
Cu	254±18	302±15	1060±25	1181±27	$\boxed{5054 \pm 61}$
Zn	67±6	87±6	438±12	376±12	2356±37
Pb	14±3	33±3	~~21±4~~ 70±4	87±5	$\boxed{421 \pm 10}$
Bi	5±2	8±2	~~70±4~~ <5	<5	8±2
Rb	117±4	155±4	118±3	130±4	168±3
Sr	191±4	193±3	171±3	177±4	197±4
Zr	226±4	181±3	175±3	163±3	242±4
Hg	<12	<11	<14	<14	19±6
Ga	<8	<7	<9	<10	<14
As	<8	<8	<21±4	<12	<23
Se	<4	<4	<5	<4	<5
Au	<6	<6	<7	<7	<9
Br	<5	<5	<5	<5	<7
Tl	<13	<11	<14	<15	<21
U	<17	<17	<17	<17	<17
Mo	<22	<20	<22	<22	~~48±9~~ <22
Ag	<28	<24	<27	<28	~~48±9~~
Cd	<35	<30	<34	<35	<34
Sn	<58	<51	58±19	<58	73±19
Sb	<62	<55	<61	<62	<61

~~4/7/97 GM/WAT~~

12:15 return from lunch, resume XRF

13:15 collect conf. sample ET-23-12
250mL N.P. glass jar, soil for 6010B

13

GM/WT
4/27/17

13:15 ET-23-12 collect sample for 6010b analysis in 250ml Jar

13:20 Decon Sampling equipment Using alconox and Triple rinse with potable water

13:25 Sample location ID: ET-28-6 for 6010b analysis in 250ml Jar
→ DECON as above

13:40 Sample ID: ET-32-24 collected for 6010b analysis in 250 ml Jar
→ Decon as above
NOTE: Collected a duplicate Sample at this location labeled as ET-32-24D and will archive in case we need it for QA

14:00 finish XRF through location ET-34 (attempted ET-35 but was not recorded). ET-34 was removed west of E.T. to S. of drw.

14:05 back to office

4/10/12 W. Thompson

9:00 On site MPE is on site. We are going to begin capping the excavated dross deposit to the west side of Corner Lines like. We are also continuing to import back fill material.

9 @ 24 tons/load

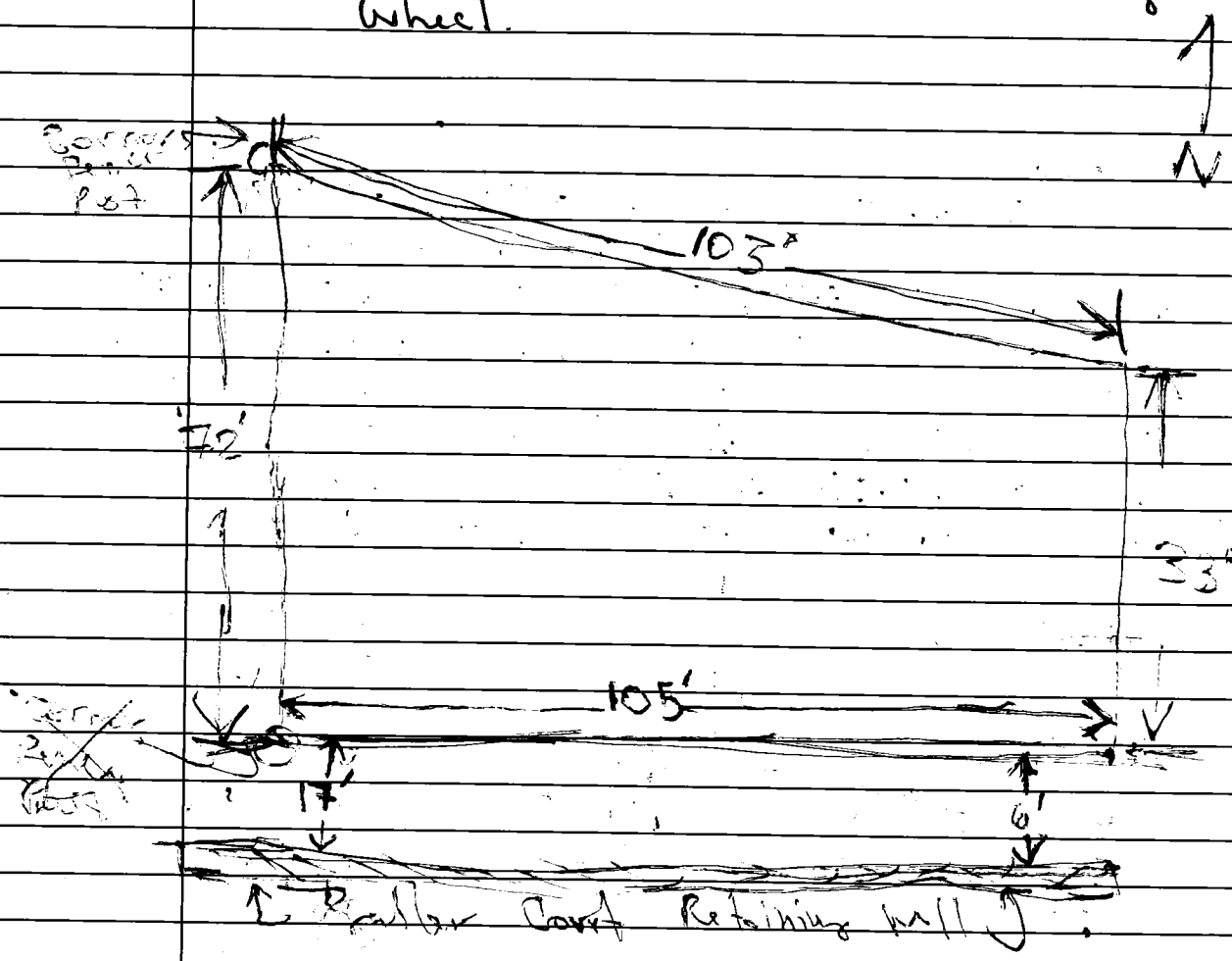
14:00 We have been working on capping the east leg of the East HMD pile and are still in the process of doing so. MPE has begun clearing the greenery away from the south side of HMD east to cap.

15:48 Calling trucks off with last loads being delivered. We have been running 4 trucks each truck has dropped of 9 loads at 24 tons each. Each truck hauls about 16 yd³/trip. Total haul for today:
36 loads 24 tons each 576 yd³ total

W. Thompson

4/10/17

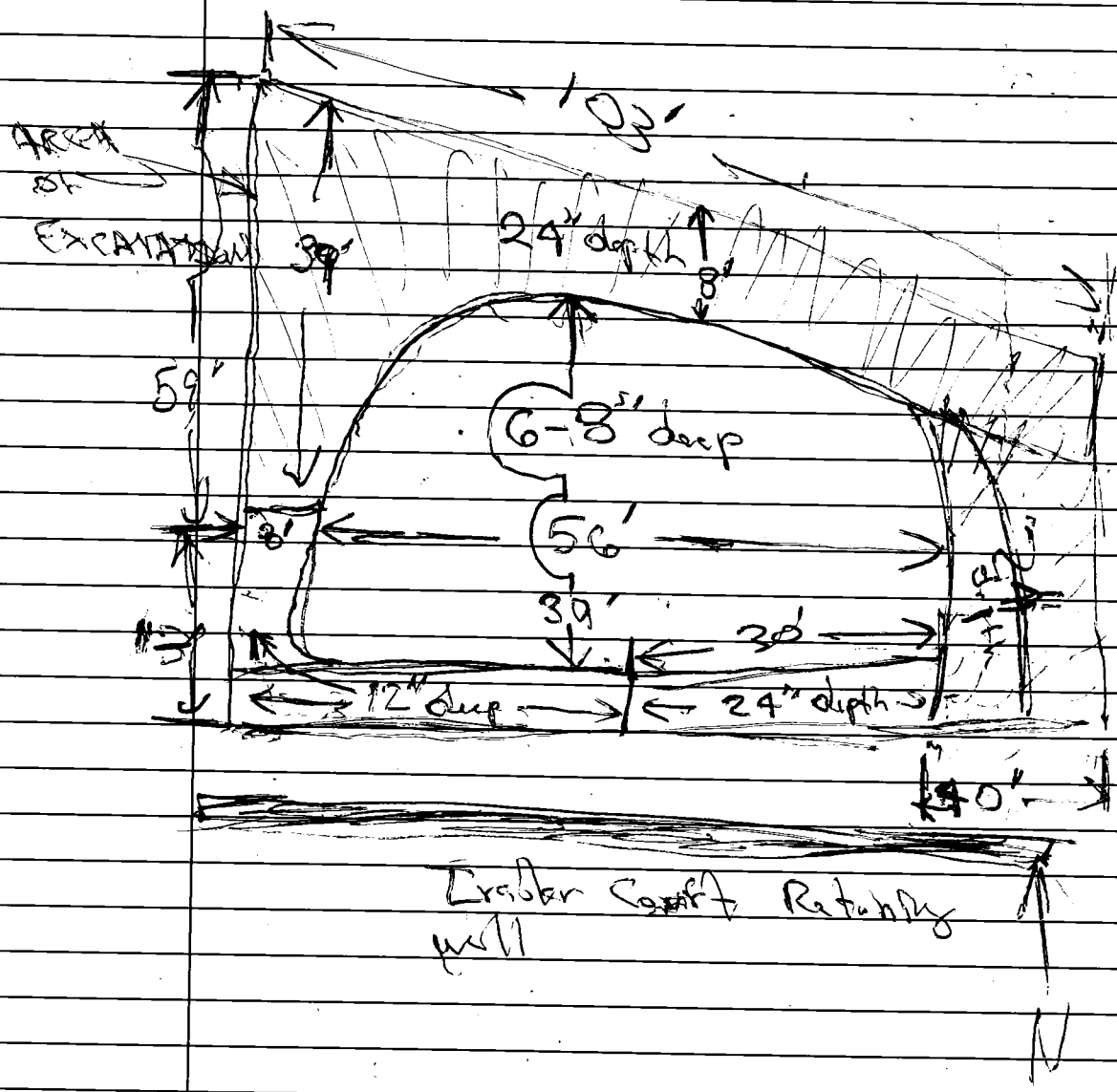
Footprint Map of Excavated area
Measurements were made using a wheel.



Approx Depth Map next Page →

096 Art Thompson 4/10/17 59

Approximate Excavation Depth plot map



4/11/17 AJB
~~7/11/17~~ W. Thompson

7:00 On site. Chad Hendron of MJe is on site with his helper. Ron Broadway an equipment operator is going to be late as he has to update CDL paperwork. We are continuing to backfill the East leg of the East HMD pile and cap the dross excavated from the eastern portion of the east leg and deposited west of the ~~fence~~ North South fence line.

13:00 We have been clearing debris ~~and~~ up to this point from the Eastern side of the HMD East pile and are now working along the Northern Slope of the Pile. We are still moving cap and backfill soil from stockpile to eastern leg of East dross pile. We still need to remove dross and some vegetation from the Southern side of the east leg excavation and areas just west of the ~~east~~ South east side of the excavation near the power pole.

No deliveries of backfill material were expected today

17:30 Off site. Afternoon was spent mostly excavating South side of east leg of HDM east pile to within about 2' of the ~~S~~ South retaining wall at the west end of the east leg to 2-feet bgs and then backfilled.

W. Thompson ~~3/12/17~~ 4/12/17 AJB

7:30 On Site Ron Broadway and Daniel are on site from MPe. Chad Hendron MPe's lead man is not on site today as his wife is having a baby and he had to leave last night for Phoenix. We are in the process of cleaning up the edges of the east leg of the east pile. Today the emphasis will be on cleaning up and shaping the cover filling in low spots etc.

~~Got~~

1330 - 1430 Abra is on site to check up on progress.

17:30 Completed the east leg and compacted all fill materials in place. We excavated an area on the South side of the east leg to a depth of about 2' bls in order to remove the existing dross from the area between the north retaining wall of the adjacent trailer park and the south side of the east dross pile leg.

Crews and equipment left site at 17:30 will need to spend an ~~additional~~ additional day on site to concentrate on the north dross pile west of the east leg.

W. Thompson 90699100
158254
~~7/14/17~~ 4/14/17 AJB

13:30 On site. (I was on another project and arrived late on site.)

MPe ~~has and~~ Environmental Services has been on site from 7:00 ~~AM~~ AM. Today has been spent finishing up the perimeter slopes of the main HDM East pile and dragging dross at the edges of the pile to incorporate into the main pile. ~~the~~ The last chore of the day has been to back drag the entire pile with the front end loader to smooth out any rough ~~dg~~ edges.

17:00 MPe and crew are done with all work on the HMD east pile and have packed their equipment near the West pile completion for pick up.

7/15/17

9:00 On site to meet with Surveyor Ronald E. Stoll from Res ~~Sur~~ Land Surveying, Inc. 520-490-6500 (cell). He is shooting elevation points and property boundaries to develop a contour map for the engineers to use in ~~designing a~~ designing a finished HMD East pile cap.

~~158195~~

1530 Survey data has been collected.
~~Final~~ Water Meter Reading:
3158370 cu ft

W. Thompson

100 4/17/17

1200 * Site visit to pick up HGC's water buggy and pump for drop off in Storage Yard.

1541 Back in office.

4/20/17 GM

9:15 mob from office 158254

10:00 arrive site, power up XRF + calibrate

10:10 XRF iPAQ computer will not start, calling

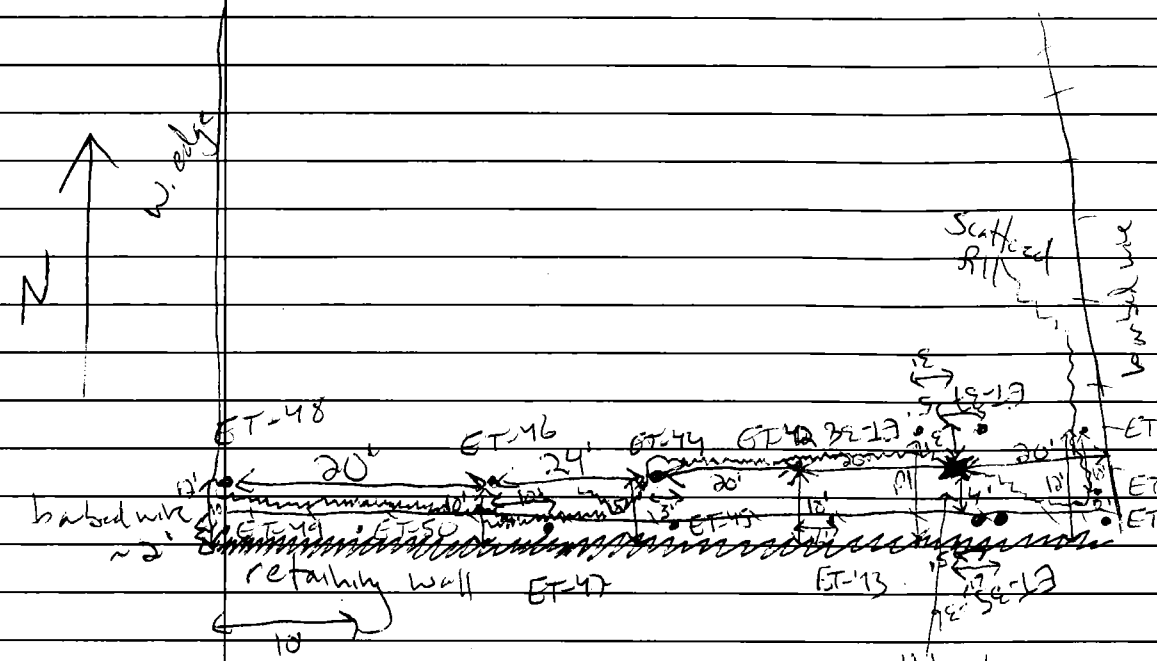
10:17 will have to wait for iPAQ to charge, despite having left it on charging dock all night

10:20 collect photographs of capped East Tail

10:25 measure out XRF locations
will begin with
ET-35-0
East Tail # depth (inches)

all will be depth 0 as measured on surface outside excavation, on native material or light fill/cap material

10:30 S. boundary is roughly 105' long. Will start just E. of utility pole @ S.E. corner, btwn barbed wire + retaining wall + measure 1 XRF every ~20' for 5 total. Then will move 10' off wall + record 5 additional XRFs on this alignment. Utility pole is 20' W. of E. fence + 4' N. of retaining wall. 2nd row of XRFs will be staggered for more coverage. Additional XRF next to utility pole so both sides are covered. 11 readings total.



hot?	Designation	Instrument	Ready	on fill?
X	ET-35-0	45	4/20	X
X	-36-0	46	4/20	X
	-37-0	47	4/20	✓
	-38-0	48	4/20	✓
	-39-0	49	4/20	X
	-40-0	50	4/20	X
	-41-0	51	4/20	X
	-42-0	52	4/20	X
	-43-0	53	4/20	X
	-44-0	54	4/20	X
	-45-0	55	4/20	X
	-46-0	56	4/20	✓
	-47-0	57	4/20	X
	-48-0	58	4/20	✓
	-49-0	59	4/20	X
	-50-0	60	4/20	X

12:30 pub to office 13:00 arrive office 158302

3/4 tank

12N Imagery: ESRI, DigitalGlobe, USDA, USGS

25 50 100

SCALE IN FEET

ET-16-0
9' N of
T.P. at w.H

65' W of E. fence
4.8' E of W bank

HYDRO GEO CHEM, INC.

APPROXIMATE EXCAVATION LOCATIONS
EAST PILE
HARRISON ROAD & MILLMAR ROAD DROSS S

Approved	Date	File
AJB	06/30/16	2015053048G

12N Imagery: ESRI, DigitalGlobe, USDA, USGS

25 50 100

SCALE IN FEET

N

HYDRO GEO CHEM, INC.

APPROXIMATE EXCAVATION LOCATIONS
EAST PILE
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	File	Figure
AJB	06/30/16	2015053048G	X

5/22/13 W. Thompson

9:00 On site. Chad Henderson from MPe is on site waiting for rest of crew → Going over drawings set with him for project.

9:30 Rest of crew is on site.

METER ⟹ Tucson Water has set meter on site plus initial meter reading: 2012400 Cu ft.

10:00 Health & Health and Safety meeting with MPe crew.
Crew: lead - Chad Henderson
Bruce Utter > operators
Zach Skinner

10:30 Begin hauling material on site → from Speedway landfill.

14:00 Picked up HGC's water buggy and dropped off on site.
Ron dropped off MPe ~~to~~ 2000 gal H_2O truck. Bruce is here logging in fill material as it is being dropped off.

Chad is picking up permits and staking stakes. No work anticipated for today.

002

W. Thompson
5/23/17

7:00 ON site → watering down RD for dust control. Deliveries of cap material continue

7:45 Begin section grade elevation stakes using laser level and stadia rod set up

5/27/17

Note: Pages 3 + 4 of this notebook were purposely torn out

005

Relative Elevations

← 26' → ← 45 →

	~~4.44~~	~~4.44~~	~~4.44~~	
Relative Elevation →	3.72	3.72	3.72	
	+2.72	+2.09	+1.42	→ Add Material at Station
	~~6.44~~	~~5.81~~	~~5.14~~	
	6.41	Actual Elevation	4.10	Actual Elevation 40
80'	+2.26	+1.71	+1.39	← Fill
	5.48	4.93	4.61	Actual Elevation
Relative Elevation →	3.22	3.22	3.22	40
	+1.98	+2.01	+1.19	Fill
	4.70	4.73	4.31	
Relative Elevation →	2.72	2.72	2.72	Actual Elevation 45
Fill →	+2.34	+1.96	+1.71	← Fill
	4.52	4.18	3.93	Actual Elevation
Relative Elevation →	2.22	2.22	2.22	45
	4.02	3.94	3.72	Actual elevation
			+2'	→ Add Material at Station
	+2.30	+2.22	1.72	
Relative Elevation →	1.72	1.72		

LASER Station

← 49 → ← 56' →

Note: Station Elevation = 4.69' a/s

5/23/17

15 02 All grade stakes have been placed. Still need to ~~do~~ stake out the ~~east~~ South east leg of the dross pile.

Note 19 truck loads of fill were brought on site yesterday and 20 loads were brought on site today for a total of 700 tons

---

5/24/17

7:00 Continue to haul fill material on site and start building up 2' HMD (1' per lift) over entire HMD Pile.

Desert Trucking is using 4-20 ton load dump trucks to deliver fill material from the Speedway landfill

→ Set lazer level up on ~~East~~ South east leg of dross pile and shoot back to Southeast elevation stake to establish a station correction factor for relative elevations.

Southeast Stake elevation = 3.72'
At Station #1, Station 1 = 4.69
New Station #2 elevation = 4.71
South east stake elevation = 5.19

Station 2 to Station 1 correction factor = ~~5.19~~ 3.72 - 5.19 = -1.47

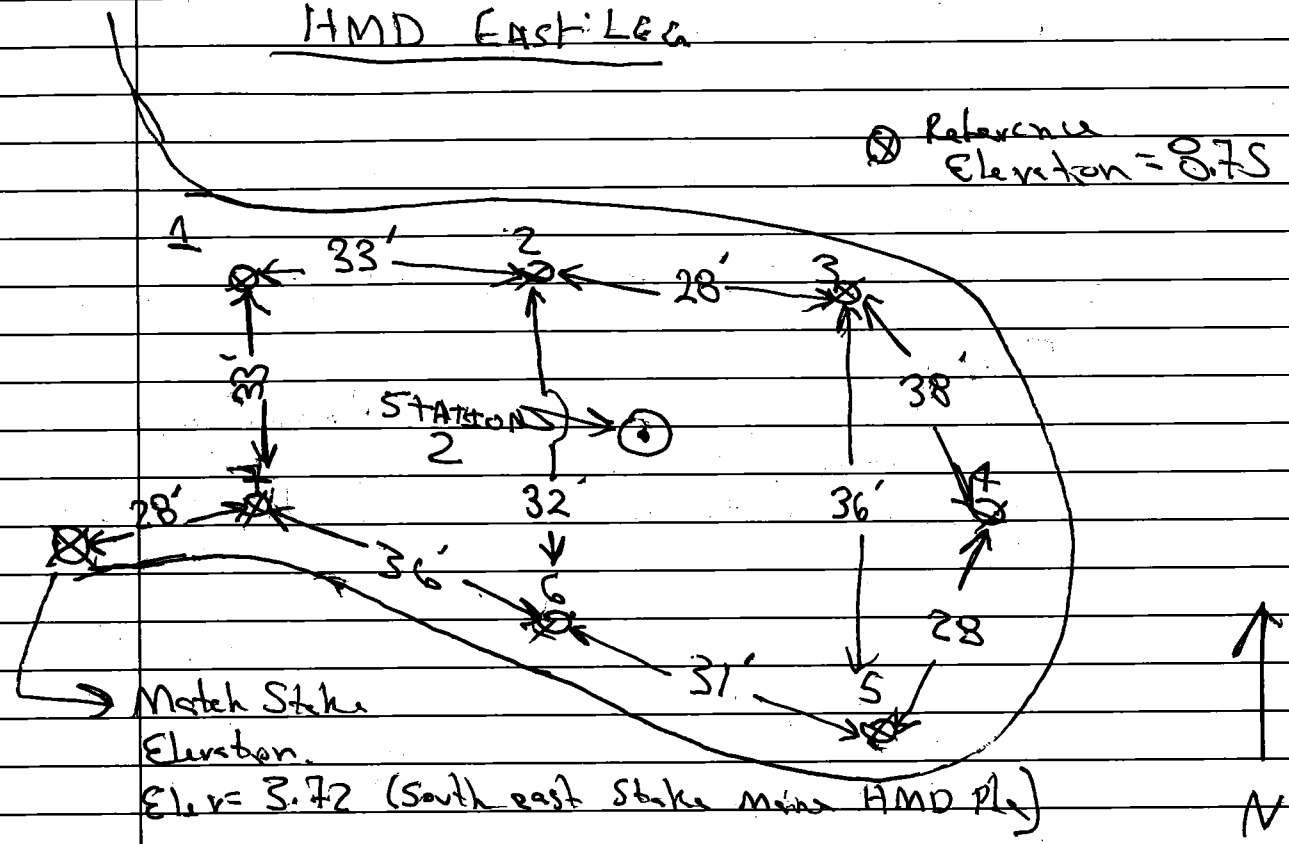
W. Thompson
5/24/17

Elevation Correction Factor = −1.47

3.8
.7
8.5

Relative Elevations

HMD East Leg



Match Stake Elevation.
Elev = 3.72 (South east Stake Main HMD Pl.)

Stake ID	Elevation	Corrected Elevation (−1.47)	Fill (Feet)
1	5.08	3.61	+ 1.89
2	5.24	3.77	+ 2.05
3	5.26	3.79	+ 2.07
4	4.74	3.27	+ 1.59
5	4.78	3.31	+ 1.59
6	5.30	3.83	+ 2.11
7	5.36	3.89	+ 2.17

Fence Post Reference Elevation = 8.75'
Relative Elevation from south side of Main HMD = 1.72' after fill

5/24/17

W. Thompson

12:52 Shot elevations on east lay of HMD E. Pile and marked fill depths on each. Continue with placing ~~fill material~~ cap material on pile.

1431 Last loads ~~for the 25~~ of cap material have been delivered to site.
28 32-loads delivered today for ~~539 yd³~~ ~~or 75~~ 464 yd³ or 696 tons.

5/25/17

Continuing to place and compact cap material. Trucking company is running 4-trucks from Spurway Landfill to site.

1511 Truck runs of cap material has stopped for day. A total of 28 loads were dropped off today 21 tons / load

---

5/26/17

7:00 on site → Continue transporting cap material stockpiled at North end of site to begin second 1' lift over HMD pile.

9:50 All dirt has been used we are not having any fill material being delivered today as the crew are breaking early due to the Holiday weekend.

→ 10:15 crew left site to get grease to lubricate loader. Will leave for weekend after this chore is complete.

5/30/17 GEM

7:30 mob from office, 158849 5/8 tank

8:05 arrive site. Ms. Grigan is around w/ truck, she says dump trucks of fill were locked out this morning & she let them in. They said they were told they would be under a rule. WAT told me he gave key to MPE. Will talk to MPE when they arrive.

8:50 6 loads of fill have been delivered so far this morning (2x 3 trucks)

9:00 8 loads

9:05 port-a-let pump truck on site

9:35 10 loads of fill have been delivered. Have taken photos of site as of this a.m.

9:50 12 loads

9:55 MPE arrives on site (Bruce + Zach). They are filling water wagon & will wet down the road & the East pile area

10:05 Zach begins moving + grading fill SW portion of East Pile

10:30 ~~14~~ 15 loads of fill delivered.

11:00 16 loads of fill delivered.

11:05 Zach has spread the first 15 loads on W portion. 16th ~~last~~ load dropped at SE corner

5/30/17 GEM

11:23 17 loads on site

11:35 ~~19~~ 20 loads on site

11:50 Zach now working SE corner
Note: Only Zach & Bruce are on-site for MPE today, operating one 950H loader & the water truck.

12:00 break for lunch. Note truck battery is dead.

13:00 return from lunch & jump truck.
21 loads on site, ~~unless so~~

13:15 23 loads Zach says 4 loads were dropped while we were at lunch.
Total is 27, then.

11

14:05 ~~30~~ 31 loads

14:30 last grading & final dust control. MPE have to go assist at another site. Will return tomorrow w/ larger crew.

14:45 off site

15:15 arrive office 158898 1/2 tank

W. Thompson

5/31/17

730 on Site. Still constructing final cap should be able to finish top of cap today and begin working around side slopes and contouring into a finished state. Continuing to mix water with cap material and compact into place.

15:30 last load of cap material has been dropped off on site. 480 cu yd total has been delivered to site in 32 separate loads using 4 trucks.

6/1/17

7:30 on site we have completed the top portion of the E. HMD pile and have begun to contour the ~~Stop~~ East slope of the East pile. adding 2' lift of fill as in 1-ft inc. lifts mixing with water and compacting into place. We are running 4-dump trucks.

13:30 Completed sloping the East bank of the HMD pile from crown to toe. Start working on contouring the east leg of the pile

15:30 called off the last truck bringing cap material to site for PM.

16:30 left site for PM.

Total load count for day = 31

~~Total Cu yd for days~~

Total Cu yds delivered to site so far = 2931 yd³

1.41 tons/cu yd = 4133 tons total.

W. Thompson
6/2/17

7:30 On site. MPE is on site and are continuing work on the East leg of the HMD E pile. We will then begin work on the South slope of the main pile.

1130 Last load of cap material has been delivered to day
4- trucks running 5 loads/truck
20 loads total
75 cubic yards/truck for tolerance tolly
300 cubic yards total

2931 + 300 = 3231 yd³ total for this project or 4556 tons

6/5/19

930 on site → MPE ~~tr~~ crew has just now arrived. We are continuing to apply cap soil to the west and north slopes of the main HMD East pile and using water truck to wet soils prior to placement and compaction using the cat 950M front end loader.

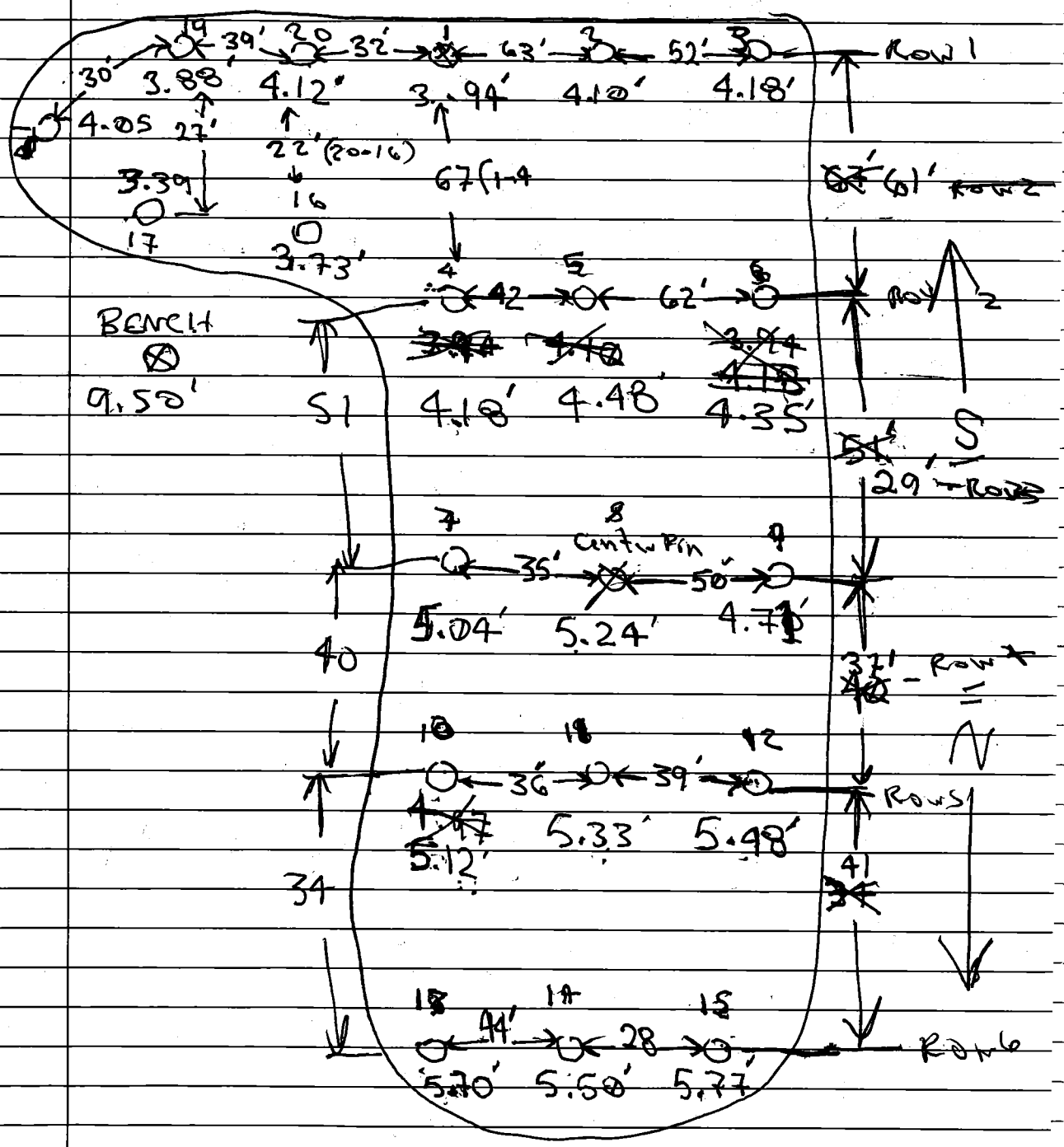
11:30 Driver on MPE left site to pick up Geo fabric for north slope on HMD east pile.

1245 Back on site from picking up Geo textile. 2- Rolls 156 lb each, 600 sq yds each

6/6/17 Rough FINISHED CAP Elevations

HMD EAST ELEVATIONS

Reference elevation (Bench) = Original = 8.75'
New Bench mark = 9.50'



W. Thompson
6/5/17

14:30 Total yardage of cap soil delivered to site today = 345 yds @ 1.41/ton
486 tons
Total tonage and yardage delivered to site thus far: 3231 (previously) ~~plus~~ + 345 today
= 3576 CV yds or X 1.41 tons/yd³ = 5042 tons

→ We will not need any additional cap material ~~Continue~~ Continuing to work North Slope and NE area of HMD east pile.

6/6/17
7:00 On site MP has brought a new worker on site Chris Leahy on site. Went over Health and Safety Plan for site with entire crew.
7:30 Signed off on HASP acknowledge sheet.

9:00 working on west drainage trench at foot of western slope

9:15 Start measuring elevations on top of HMD-East

NEXT

W. Thompson
6/6/12

→ Shot new elevation grades (see base map Page 17 of this note book)

Need to add material at the South end of the west side of HMD ℄ pile and tapper ~~toward~~ toward center to better establish engineered grade. ~~not~~ need to build up back side of HMD pile South end to decrease slopes even ~~to~~ ~~as~~ drainage toward the South and maximize drainage ~~to~~ west the north.

14-1530 James Rich (HGC's project engineer) is on site with Abra Bentley to discuss project and update plans.

W. Thompson
6/7/17

800 on site MPe crew is here — ~~Dr~~
Desert trucking is dropping off
top soil which will be used primarily
on the side slopes of HMD E to
encourage plant growth.

— 930 Note: we had called for 200 yd³
of top soil but 300 yd³ have been
dropped off → Original 200 yd³ plus
100 yd³ is enroute. Although we have
300 yd³ being delivered Zack MPe's
lead man said that Chad Henderson
MPe's Project manager will only
charge us for 200 yd³.
We are actively spreading the
top soil over excavated area. We will
then broadcast a desert seed mix
over entire area and work in using
the backhoe gannon ripper teeth

11:23 keyway has been cut at ~~north~~ top
of north slope to install Geotextile.

12 00 Begin laying out fabric (Geo membrane)
and cover with 6x12 Rip rap using
front end loader.

1530 Completed about 3/4 of the North
Slope face of HMD. East. A storm
is moving in quickly and we are
going to have to call it a day.

W. Thompson
6/8/17

800 on site → MPE is on site and are continuing with placing rip rap on north HMD slope. The Gannon with ripper teeth is on site to work the top soil into existing to 6" of cap material and work the native fibers seeds into the soil

10:04 We have broadcast the grass seed over the entire area of excavation. We are now running the gannon teeth over the area to create ridges and troughs perpendicular to run off flow paths over entire surface. The gannon teeth are set to penetrate 6" into the cap material.

Final meter reading = 2024037 ft³

15:30 Completed Rip rapping North slope / Seeding / Mixing top soil and rapping entire excavation area.

Job is now complete

Point / Reading #

8/11/17		1/2	2/3	3/4	4/5	5/6	6/7
Ti	310,000						
Ba	15,000						
Cr	120,000[a]						
Mn	3,300	2185/141	2209/142	2238/128	1676/125	2326/144	1939/114
Fe	NE						
Co	900						
Cu	3,100	247/15	285/16	235/13	214/14	320/16	785/17
Zn	23,000	164/7	525/12	400/10	285/9	135/7	305/8
As	10	ND<8	ND<8	ND<7	ND<8	ND<8	ND<9
Pb	400	30/3	28/3	23/3	32/3	34/3	75/4
Bi	NE						
Rb	NE						
Sr	47,000						
Zr	NE						
Ni	1,600	76/14	96/14	47/12	77/13	73/14	ND<32
Hg	23	ND<12	ND<12	ND<10	ND<12	ND<12	ND<10
Ga	NE						
Se	390						
Au	NE						
Br	NE						
Tl	5.2	ND<12	ND<13	ND<12	ND<12	ND<12	ND<12
U	16						
Mo	390						
Ag	390						
Cd	39						
Sn	47,000						
Sb	31	ND<56	ND<56	ND<51	ND<55	ND<56	ND<47

Shot Number

Date

Page

8/11/17		7/8	8/9	9/10	10/11	11/12	12/13
Ti	310,000						
Ba	15,000						
Cr	120,000[a]						
Mn	3,300	1195/115	2075/131	2185/138	1713/119	1858/132	1257/103
Fe	NE						
Co	900						
Cu	3,100	468/18	446/16	555/17	2550/32	166/14	122/12
Zn	23,000	281/9	132/6	370/10	1270/19	56/5	40/4
As	10	ND<9	ND<8	ND/10	33/9	ND<8	ND<8
Pb	400	38/3	35/3	70/4	792/12	31/3	17/3
Bi	NE						
Rb	NE						
Sr	47,000						
Zr	NE						
Ni	1,600	ND<36	64/13	56/14	77/13	56/13	ND<32
Hg	23	ND<11	ND<11	ND<12	ND<16	ND<11	ND<9
Ga	NE						
Se	390						
Au	NE						
Br	NE						
Tl	5.2	ND<15	ND<11	ND<13	ND<24	ND<12	ND<10
U	16						
Mo	390						
Ag	390						
Cd	39	ND<30	ND<30	ND<31	41/10	ND<31	ND<28
Sn	47,000						
Sb	31	ND<52	ND<54	ND<55	ND<50	ND<55	ND<50

Shot Number

Date

Page

8/11/17		13/14	14/15	15/16	16/17	17/18	18/19
Ti	310,000						
Ba	15,000						
Cr	120,000[a]						
Mn	3,300	1263/108	1881/154	1668/115	1095/123	5511/196	1416/118
Fe	NE						
Co	900						
Cu	3,100	103/12	98/17	84/12	212/17	300/16	113/14
Zn	23,000	38/4	64/6	40/4	76/6	87/6	28/5
As	10	ND<7	ND<9	ND<7	ND<8	ND<8	ND<7
Pb	400	20/3	19/3	23/3	20/3	24/3	20/3
Bi	NE						
Rb	NE						
Sr	47,000						
Zr	NE						
Ni	1,600	53/12	ND<46	35/11	40/13	ND<39	37/12
Hg	23	12/4	16/5	ND<11	ND<12	ND<11	ND<11
Ga	NE						
Se	390						
Au	NE						
Br	NE						
Tl	5.2	ND<11	ND<13	ND<11	ND<12	ND<12	ND<11
U	16						
Mo	390						
Ag	390						
Cd	39	ND<29	ND<35	ND<29	ND<33	ND<32	ND<32
Sn	47,000						
Sb	31	ND<52	ND<63	ND<52	ND<60	ND<58	ND<57

Shot Number

Date

Page

8/17		19/20	20/21	21/22	22/23	23/24	24/25
Ti	310,000						
Ba	15,000						
Cr	120,000[a]						
Mn	3,300	1671/119	1714/121	2146/140	2749/154	1458/110	1880/128
Fe	NE						
Co	900						
Cu	3,100	109/13	275/14	1550/26	2311/33	114/12	899/20
Zn	23,000	35/4	209/7	628/13	1028/18	31/4	400/10
As	10	ND<7	ND<9	ND<12	ND<15	ND<7	ND<11
Pb	400	20/3	59/4	120/5	208/6	19/3	84/4
Bi	NE						
Rb	NE						
Sr	47,000						
Zr	NE						
Ni	1,600	39/12	ND<35	75/14	83/15	60/12	67/13
Hg	23	ND<11	ND<11	ND<13	ND<13	ND<10	ND<12
Ga	NE						
Se	390						
Au	NE						
Br	NE						
Tl	5.2	ND<11	ND<12	ND<14	ND<17	ND<11	ND<13
U	16						
Mo	390						
Ag	390						
Cd	39	ND<30	ND<29	41/10	38/10	ND<29	ND<30
Sn	47,000						
Sb	31	ND<53	ND<53	ND<54	ND<54	ND<52	ND<54

Shot Number

Date

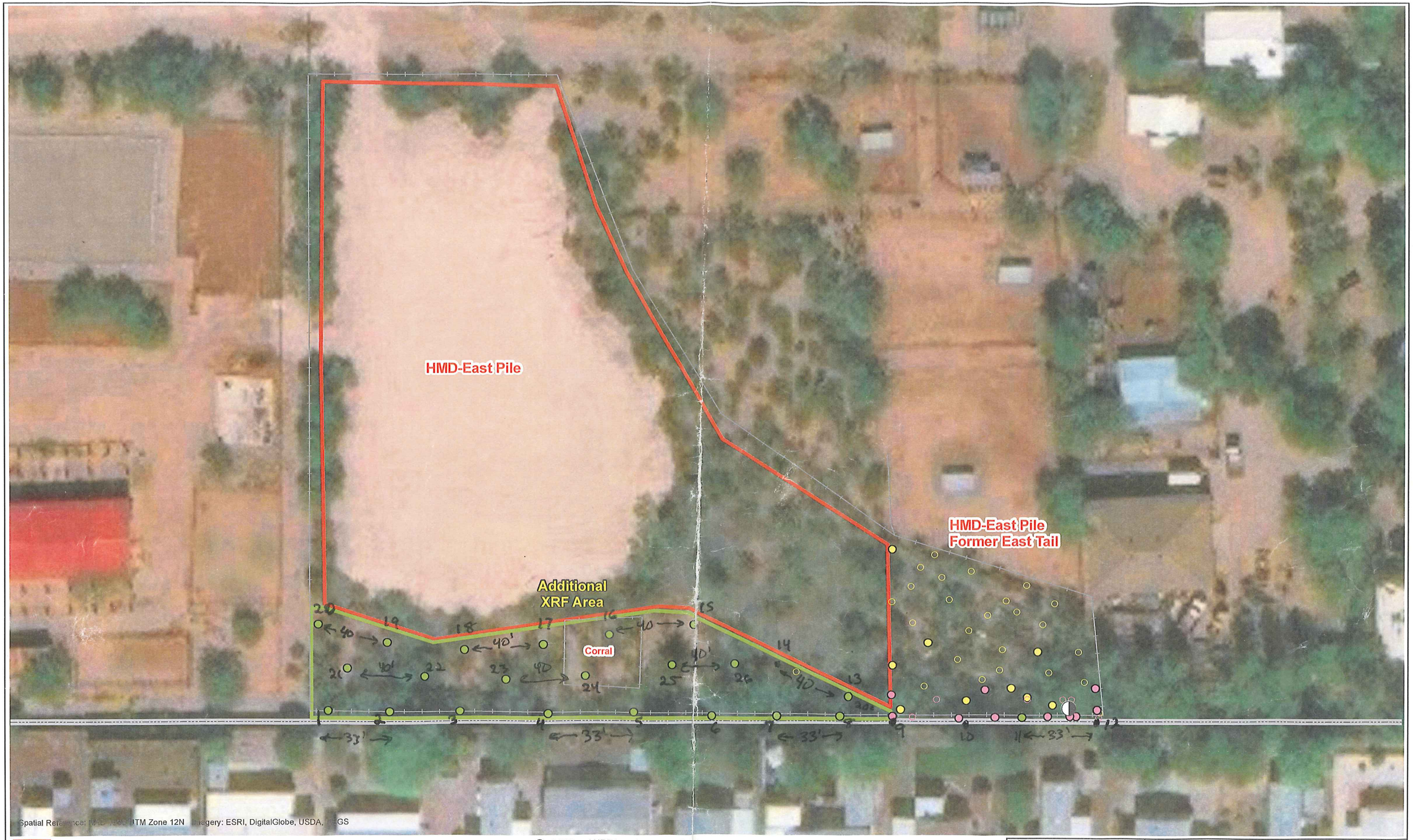
Page

8/11/17		25/26	26/27				
Ti	310,000						
Ba	15,000						
Cr	120,000[a]						
Mn	3,300	1660/126	1621/131				
Fe	NE						
Co	900						
Cu	3,100	267/14	826/21				
Zn	23,000	122/6	327/10				
As	10	ND<8	ND<11				
Pb	400	39/3	76/4				
Bi	NE						
Rb	NE						
Sr	47,000						
Zr	NE						
Ni	1,600						
Hg	23	ND<11	ND<12				
Ga	NE						
Se	390						
Au	NE						
Br	NE						
Tl	5.2	ND<12	ND<14				
U	16						
Mo	390						
Ag	390						
Cd	39	ND<30	ND<32				
Sn	47,000						
Sb	31	ND<54	ND<57				

Shot Number

Date

Page



Approximate extents, HMD-East main pile

Additional XRF area

XRF measurement location. Yellow points were recorded after initial excavation; pink points were recorded after final excavation and backfill. Solid circle indicates metals detected above rSRL.

Additional XRF location, approximate

Utility pole

Barbed-wire fence

0 50 100

SCALE IN FEET

N

HYDRO GEO CHEM, INC.

HMD-EAST SOUTH AREA, ADDITIONAL XRF
HARRISON ROAD & MILLMAR ROAD DROSS SITE

Approved	Date	File	Figure
AJB	09/22/16	2015053069G	2

APPENDIX F

XRF AND LABORATORY RESULTS CORRELATION

TABLE F.1
Correlation of XRF and Laboratory Measurements
Harrison Rd Millmar Rd Dross Site

Sample ID	Sample Date/Time	pXRF Measurement (mg/kg)									Lab Measurement (mg/kg)								
		As	Cd	Cu	Mn	Ni	Pb	Sb	Sn	Zn	As	Cd	Cu	Mn	Ni	Pb	Sb	Sn	Zn
SRL - Residential		10	39	3,100	3,300	1,600	400	31	47,000	23,000	10	39	3,100	3,300	1,600	400	31	47,000	23,000
Sample-3	3-Dec-15	<12	<37	**3718**	529	105	221	**77**	93	1068	4.3	16	2000	370	51	110	1.6	16	440
Sample-8	3-Dec-15	<8	<35	581	305	63	89	<67	<63	320	5.9	17	1500	410	62	150	1.2	16	770
Sample-10	3-Dec-15	<25	**134**	**10263**	997	254	**927**	<74	290	5004	5.2	**94**	**10000**	860	470	**830**	15	110	2600
Sample-18	3-Dec-15	<21	**145**	**14341**	803	358	**777**	**135**	245	5340	7.3	**93**	**21000**	1100	980	**840**	20	190	3000
Sample-20	3-Dec-15	<33	**210**	**19761**	1474	561	**1554**	**268**	574	10106	5	**170**	**24000**	1200	750	**1500**	**42**	270	5000
Sample-23	3-Dec-15	<26	**100**	**19266**	984	706	**1175**	**94**	344	6853	4.3	**81**	**18000**	750	490	**1200**	**34**	170	3700
Sample-28	4-Dec-15	**37**	**214**	**34632**	2170	1254	**1593**	**245**	574	9431	7.1	**150**	**32000**	1500	**1700**	**1600**	**41**	280	4400
Sample-30	4-Dec-15	<18	**55**	**7206**	1135	188	**436**	<69	162	2397	6.9	14	2900	420	130	180	3.2	34	490
C-21	29-Jan-16	<9	<35	759	171	144	153	**<66**	92	141	-	0.8	83	-	9.8	13	<5.0	-	-
C-29	22-Jan-16	**<17**	**46**	**9316**	1155	344	396	**<77**	213	3455	3.4	8.9	**3400**	-	110	110	<5.0	-	-
C-56	22-Jan-16	**23**	**48**	**8296**	623	360	385	**<69**	126	2475	3.7	28	**4800**	**-**	290	**550**	6.2	**-**	**-**
C-57	29-Jan-16	**<16**	**<45**	**4763**	889	174	277	**<87**	131	1128	<10	31	**5100**	-	220	270	**<50**	-	-
C-57-25S	29-Jan-16	**<20**	**86**	**10158**	654	252	**685**	**114**	199	3578	<10	**40**	**4600**	-	250	330	**<50**	-	-
C-57-25N	29-Jan-16	**<14**	**46**	**6800**	582	144	346	**<67**	148	2721	3	12	**3100**	-	100	110	<5.0	-	-
C-64	22-Jan-16	**40**	**177**	**25158**	1471	580	**1032**	**111**	619	6052	**14**	**80**	**19000**	**-**	1400	**710**	**<50**	**-**	**-**
C-65	22-Jan-16	**40**	**165**	**18740**	1562	483	**1293**	**120**	452	9052	<10	**330**	**16000**	-	480	**1200**	**<50**	-	-
C-67	29-Jan-16	<6	**<47**	505	293	<30	19	**<89**	<83	132	-	1.3	150	-	7.7	16	<5.0	-	-
C-69	22-Jan-16	**12**	<34	15	237	29	21	**<63**	<60	59	2.5	0.35	27	-	2.9	11	<5.0	-	-
C-75	29-Jan-16	**<11**	<35	175	432	43	170	**<73**	<68	868	3.4	14	3000	**-**	94	240	<5.0	**-**	**-**
C-76	22-Jan-16	**81**	**100**	**12264**	723	**12401**	**899**	**6008**	153	3309	<10	**130**	**15000**	-	970	**960**	**<50**	-	-
C-78	22-Jan-16	**<20**	**134**	**11923**	493	289	**774**	**98**	419	4232	<10	**110**	**17000**	-	610	**1300**	**<50**	-	-
C-87	22-Jan-16	**16**	**<41**	204	1774	52	36	**<79**	<73	120	2.6	2	260	-	10	24	<5.0	-	-
C-90-25E	29-Jan-16	**<22**	**132**	**13852**	1114	797	**829**	**105**	310	5347	<10	**67**	**10000**	-	490	**830**	**<50**	-	-
C-90-25N	29-Jan-16	**<10**	**<39**	3025	355	115	121	**<74**	97	1014	3	0.65	89	**-**	6.3	10	<5.0	**-**	**-**
C-92	22-Jan-16	**27**	**84**	**6007**	1682	246	**451**	**103**	136	2199	2.5	8.2	1100	-	44	70	<5.0	-	-
C-92-35N	29-Jan-16	**<31**	<31	2914	**10864**	468	**554**	**<132**	176	780	3.3	4.6	600	-	34	61	<5.0	-	-
C-92-35NE	29-Jan-16	**24**	<36	246	310	60	38	**<70**	<65	132	3.5	2.7	300	**-**	14	36	<5.0	**-**	**-**
C-92-25W	29-Jan-16	**<16**	**<42**	**9615**	1182	276	346	**83**	217	2072	3.8	10	1600	-	82	94	<5.0	-	-
C-92-35NW	29-Jan-16	**<21**	**<52**	**7872**	1459	210	334	**<93**	206	2198	<10	**95**	**14000**	-	400	**540**	**<50**	-	-
C-92-50S	29-Jan-16	**13**	**<40**	**3588**	392	181	195	**<77**	94	931	<10	24	**5400**	-	240	270	**<50**	-	-
C-98	29-Jan-16	<8	**<40**	735	360	52	79	**<76**	<70	441	**-**	**44**	**5600**	**-**	220	**470**	**<50**	**-**	**-**
C-101	22-Jan-16	**12**	<34	85	286	59	19	**<65**	<60	108	2.5	0.51	54	-	4	12	<5.0	-	-
C-104	29-Jan-16	**10**	<35	209	365	<26	57	**<66**	<61	1046	4.7	0.67	74	-	4.9	21	<5.0	-	-
C-113	29-Jan-16	<6	<34	318	325	34	49	**<65**	<61	139	-	3.2	400	-	16	39	<5.0	-	-
C-121	29-Jan-16	<8	**<43**	35	241	102	56	**<84**	<77	241	-	0.33	140	**-**	12	9.4	<5.0	**-**	**-**
C-123	22-Jan-16	**<15**	**<44**	**12553**	1467	384	281	**<84**	236	1845	5	24	**7600**	-	370	240	5.2	-	-
C-123-25E	29-Jan-16	**64**	**104**	**18470**	1169	536	**880**	**149**	304	6368	3.6	1.3	300	-	25	35	<5.0	-	-
C-123-25N	29-Jan-16	**31**	**<39**	2655	780	288	395	**<74**	126	711	3.5	1.6	290	-	16	22	<5.0	-	-
C-127	22-Jan-16	<9	<35	**6723**	647	116	112	**<67**	<52	2330	-	**42**	**12000**	**-**	770	**400**	**<50**	**-**	**-**
C-128	29-Jan-16	**<25**	**155**	**14564**	1375	1362	**876**	**85**	290	5938	<10	**150**	**18000**	-	980	**1600**	**<50**	-	-
C-129	22-Jan-16	**26**	<36	**4668**	551	229	307	**<69**	95	1460	3.1	12	**3100**	-	210	94	<5.0	-	-

TABLE F.1
Correlation of XRF and Laboratory Measurements
Harrison Rd Millmar Rd Dross Site
(Continued)

Sample ID	Sample Date/Time	pXRF Measurement (mg/kg)									Lab Measurement (mg/kg)								
		As	Cd	Cu	Mn	Ni	Pb	Sb	Sn	Zn	As	Cd	Cu	Mn	Ni	Pb	Sb	Sn	Zn
SRL - Residential		10	39	3,100	3,300	1,600	400	31	47,000	23,000	10	39	3,100	3,300	1,600	400	31	47,000	23,000
H-2	21-Jan-16	7	<34	205	436	42	34	**<65**	<61	226	-	1.2	270	-	11	25	<5.0	-	-
H-5	21-Jan-16	<5	**<40**	143	308	<27	18	**<76**	<71	118	-	0.83	140	-	6.2	21	<5.0	-	-
H-7	21-Jan-16	<5	**<39**	20	119	<25	13	**<76**	<70	66	-	0.58	55	-	4.9	14	<5.0	-	-
H-10	21-Jan-16	8	<38	39	288	<25	18	**<73**	<67	182	-	1.4	140	-	9.4	23	<5.0	-	-
G2-2	22-Jan-16	<5	<34	32	226	<23	24	**<65**	<59	76	-	0.23	18	-	2.9	10	<5.0	-	-
G2-4	22-Jan-16	<4	<35	16	218	<22	17	**<66**	<61	112	-	0.32	18	-	3.1	14	<5.0	-	-
G2-7	22-Jan-16	<5	<32	50	341	27	46	**<60**	<56	275	-	0.31	25	-	3.5	23	<5.0	-	-
G2-9	22-Jan-16	<7	<34	27	196	24	81	**<64**	<59	210	-	0.28	20	-	4.6	42	<5.0	-	-
G1-11	22-Jan-16	<6	<35	51	307	<25	40	**<66**	<61	212	-	0.42	38	-	4.2	21	<5.0	-	-
G1-14	22-Jan-16	7	<34	27	229	<23	23	**<66**	<61	171	-	0.52	32	-	6.7	27	<5.0	-	-
G1-16	22-Jan-16	8	<36	36	221	35	56	**<69**	<64	131	-	0.92	39	-	5.7	26	<5.0	-	-
G1-18	22-Jan-16	<4	<32	125	237	<20	16	**<57**	<53	1911	-	0.52	29	-	3.9	17	<5.0	-	-
58-1	26-Jan-16	<6	<35	131	307	31	39	**<68**	<63	214	-	0.42	80	-	5.1	13	<5.0	-	-
103-3	26-Jan-16	7	<34	71	209	27	35	**<65**	<61	81	-	<0.050	13	-	3.9	6.8	<5.0	-	-
103-6	26-Jan-16	<6	<35	79	273	34	42	**<67**	<62	124	-	<0.050	15	-	2.9	5.5	<5.0	-	-
103-9	26-Jan-16	<9	<38	98	375	51	102	**<72**	<51	163	-	0.31	32	-	6	29	<5.0	-	-
103-10	26-Jan-16	<5	<36	49	269	30	25	**<68**	<63	62	-	0.11	20	-	3.8	6	<5.0	-	-
104-1	26-Jan-16	**<15**	**<39**	104	1250	60	312	**<76**	<70	295	3.6	0.31	24	-	4.5	31	<5.0	-	-
104-2	26-Jan-16	**27**	**<43**	45	1233	67	222	**<83**	<77	248	3	0.26	16	-	3.9	28	<5.0	-	-
104-5	26-Jan-16	<6	<35	75	342	39	50	**<57**	<62	229	-	0.3	25	-	10	16	<5.0	-	-
104-9	26-Jan-16	**42**	<38	47	565	48	**665**	**<73**	<67	134	5	0.36	20	-	4.9	25	<5.0	-	-
105-1	26-Jan-16	**22**	<38	89	929	58	120	**<79**	<69	301	3.4	0.21	29	-	3.1	15	<5.0	-	-
105-3	26-Jan-16	<6	**<39**	489	400	57	28	**<76**	<70	469	-	0.29	81	-	3.3	10	<5.0	-	-
105-8	26-Jan-16	<6	<36	122	333	38	37	**<69**	<64	275	-	0.42	64	-	4.2	11	<5.0	-	-
105-10	26-Jan-16	8	<37	129	254	35	36	**<71**	<66	105	-	<0.050	64	-	2.6	7	<5.0	-	-
106-2	26-Jan-16	8	<36	26	429	38	62	**<69**	<64	89	-	0.22	16	-	4.6	18	<5.0	-	-
106-4	26-Jan-16	<6	<34	118	422	31	48	**<66**	<61	273	-	0.075	15	-	2.8	6.1	<5.0	-	-
106-8	26-Jan-16	<5	**<41**	<16	194	<27	14	**<78**	<73	46	-	0.093	14	-	4	6.3	<5.0	-	-
106-10	26-Jan-16	<6	<36	27	267	38	31	**<69**	<64	37	-	0.5	53	-	7.1	26	<5.0	-	-
107-2	25-Jan-16	8	**<39**	209	434	<31	44	**<73**	<68	339	-	0.35	46	-	4.7	12	<5.0	-	-
107-5	26-Jan-16	<5	<32	81	438	35	33	**<61**	<57	153	-	0.075	18	-	4.3	5.8	<5.0	-	-
107-7	26-Jan-16	<6	<34	180	390	62	39	**<65**	<51	222	-	0.36	39	-	6.2	14	<5.0	-	-
107-9	26-Jan-16	<8	<37	33	311	32	96	**<72**	<67	99	-	<0.050	12	-	3.1	4.9	<5.0	-	-
108-2	25-Jan-16	<8	<38	434	689	70	72	**<72**	<57	280	-	0.36	240	-	3.5	14	<5.0	-	-
108-5	25-Jan-16	8	<35	130	573	39	44	**<67**	<62	473	-	0.57	1000	-	6.5	24	<5.0	-	-
108-7	25-Jan-16	<7	<37	311	543	30	63	**<70**	<65	256	-	0.11	21	-	3.4	6.9	<5.0	-	-
108-10	25-Jan-16	**<14**	<37	197	1372	56	314	**<72**	<67	269	2.4	0.5	350	-	4.3	19	<5.0	-	-
109-3	25-Jan-16	<5	<34	166	223	48	30	**<87**	<56	219	-	0.16	49	-	3.2	6.7	<5.0	-	-
109-6	25-Jan-16	<4	<33	19	201	26	18	**<64**	<59	20	-	0.095	17	-	3.1	5	<5.0	-	-

TABLE F.1
Correlation of XRF and Laboratory Measurements
Harrison Rd Millmar Rd Dross Site
(Continued)

Sample ID	Sample Date/Time	pXRF Measurement (mg/kg)									Lab Measurement (mg/kg)								
		As	Cd	Cu	Mn	Ni	Pb	Sb	Sn	Zn	As	Cd	Cu	Mn	Ni	Pb	Sb	Sn	Zn
SRL - Residential		10	39	3,100	3,300	1,600	400	31	47,000	23,000	10	39	3,100	3,300	1,600	400	31	47,000	23,000
109-8	25-Jan-16	<6	<36	210	335	<26	37	**<68**	<53	216	-	0.13	24	-	3	5.9	<5.0	-	-
109-9	25-Jan-16	<6	<37	236	423	<29	42	**<70**	<55	332	-	0.25	43	-	4.3	7.5	<5.0	-	-
110-1	25-Jan-16	**13**	<35	489	355	66	89	**<69**	<64	369	2.7	0.1	110	**-**	3.1	7.5	<5.0	**-**	**-**
110-3	25-Jan-16	<6	<36	469	337	44	39	**<70**	<64	125	-	0.2	180	-	3.7	11	<5.0	-	-
110-5	25-Jan-16	<7	<35	334	366	42	57	**<76**	<62	445	-	0.28	230	-	3.6	14	<5.0	-	-
110-8	25-Jan-16	<6	**<88**	79	280	<30	29	**<74**	<69	51	-	0.061	21	-	3.4	5	<5.0	-	-
111-3	25-Jan-16	6	**<40**	22	158	<25	15	**<77**	<71	130	-	0.22	50	**-**	4.8	7.9	<5.0	**-**	**-**
111-6	25-Jan-16	**28**	<37	90	1362	42	29	**<68**	<63	162	6.2	0.17	19	-	4.2	6.6	<5.0	-	-
111-8	25-Jan-16	**13**	**<86**	60	736	32	126	**<68**	<64	405	2.6	0.17	15	-	2.6	14	<5.0	-	-
111-9B	25-Jan-16	<6	<32	90	331	79	87	**<64**	<59	579	-	0.39	130	-	6.5	9.4	<5.0	-	-
ET-5-0	6-Apr-17	<11	<31	634	2178	78	79	**<56**	53	305	-	7.8	740	-	38	51	<5.0	-	-
B-1-3-12	28-Jul-16	<6	**39**	301	-	36	27	<66	-	-	2.3	6.9	780	-	33	50	<5.0	-	-
B-1-6-24	28-Jul-16	<21	**134**	**8797**	-	190	**755**	<64	-	-	<2.0	**110**	**17000**	-	520	**810**	**31**	-	-
B-1-14-10	28-Jul-16	<6	<34	19	-	41	17	<69	-	-	2.8	1.2	13	-	3.7	6.8	<5.0	-	-
B-3-3-24	29-Jul-16	<20	**139**	**15731**	-	256	**563**	**104**	-	-	6.3	**100**	**25000**	-	680	**940**	<25	-	-
B-3-8-24	29-Jul-16	<11	**49**	**5445**	-	285	199	<65	-	-	4.9	**40**	**21000**	-	370	**990**	**38**	-	-
B-4-1-24	3-Aug-16	<8	<37	513	-	43	54	<71	-	-	1.9	11	1600	-	85	81	<5.0	-	-
B-4-6-24	3-Aug-16	<19	**108**	**7736**	-	**1937**	**428**	<79	-	-	3.5	18	**3300**	-	170	230	<5.0	-	-
B-4-11-24	3-Aug-16	<12	**146**	**13212**	-	207	263	<58	-	-	<5.0	**140**	**15000**	-	190	390	<25	-	-
B-5-4-24	4-Aug-16	**124**	**257**	2885	-	611	**1359**	**125**	-	-	<5.0	**200**	**30000**	-	960	**1400**	<25	-	-
B-5-9-24	4-Aug-16	<10	<35	1819	-	92	136	<61	-	-	3.9	9.6	2400	-	94	100	<5.0	-	-
B-6-5-24	8-Aug-16	<25	**117**	**15530**	-	567	**786**	<36	-	-	<5.0	**110**	**18000**	-	1100	**1900**	<25	-	-
B-7-1-24	11-Aug-16	<14	**45**	**5638**	-	206	302	<66	-	-	2.1	**41**	**6300**	-	290	390	5.5	-	-
B-7-6-24	11-Aug-16	<33	**216**	**36741**	-	635	**1326**	**102**	-	-	5.2	**250**	**32000**	-	930	**1900**	**36**	-	-
EB-3-2-36	22-Aug-16	9	<36	216	-	34	20	<70	-	-	2.1	1.7	270	-	10	14	<5.0	-	-
EB-3-7-54	22-Aug-16	<7	<40	148	-	50	26	<77	-	-	4.4	0.7	130	-	10	12	<5.0	-	-
EB-2-4-10	23-Aug-16	<8	<37	477	-	56	43	<71	-	-	3.3	0.51	74	-	9.3	13	<5.0	-	-
EB-1-1-18	23-Aug-16	8	<36	42	-	<28	12	<68	-	-	2.6	1.6	91	-	6.3	19	<5.0	-	-
EB-1-6-24	24-Aug-16	**11**	<39	965	-	71	66	<73	-	-	2.4	1.6	86	-	6.2	13	<5.0	-	-

TABLE F.1
Correlation of XRF and Laboratory Measurements
Harrison Rd Millmar Rd Dross Site
(Continued)

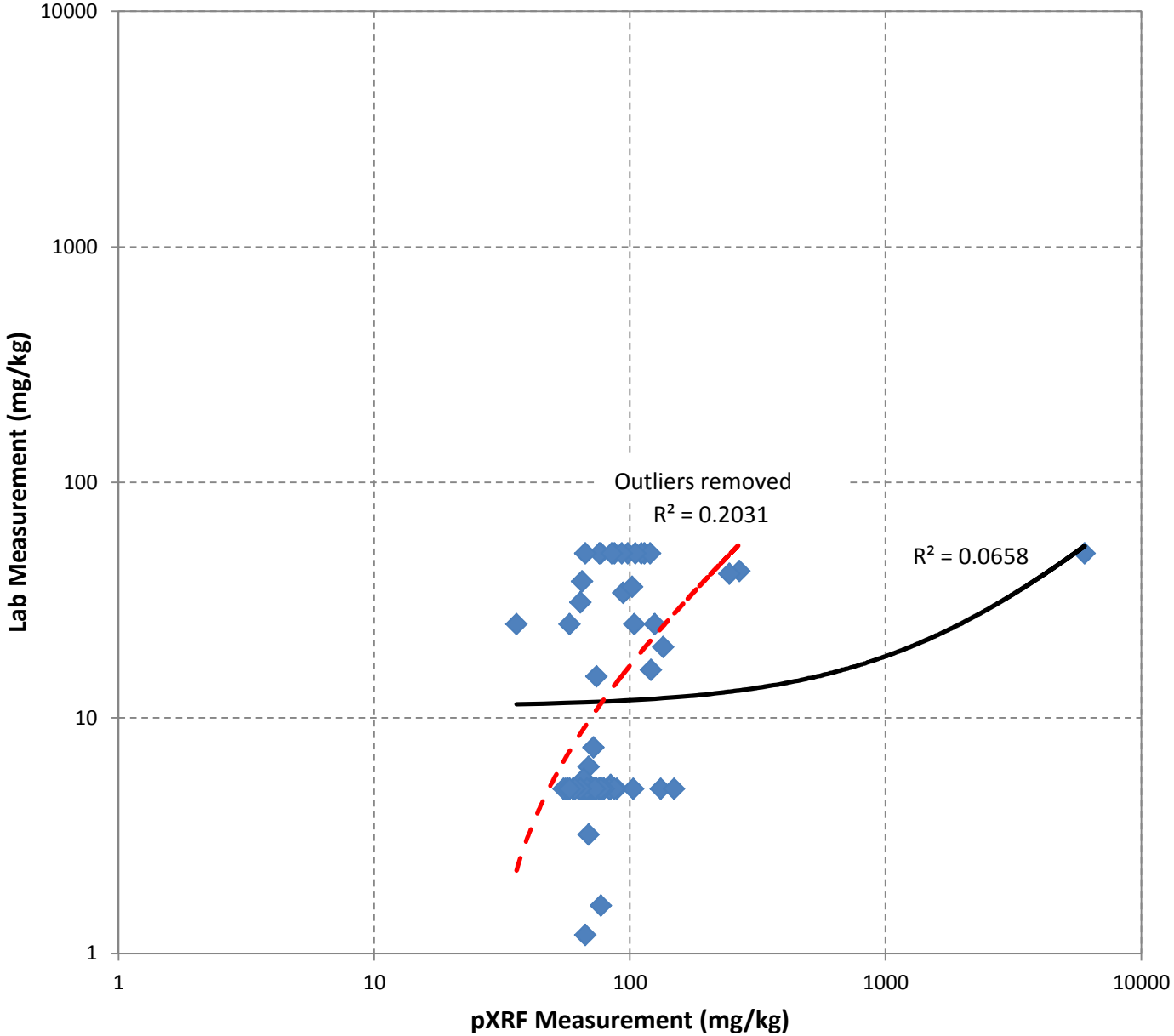
Sample ID	Sample Date/Time	pXRF Measurement (mg/kg)									Lab Measurement (mg/kg)								
		As	Cd	Cu	Mn	Ni	Pb	Sb	Sn	Zn	As	Cd	Cu	Mn	Ni	Pb	Sb	Sn	Zn
SRL - Residential		10	39	3,100	3,300	1,600	400	31	47,000	23,000	10	39	3,100	3,300	1,600	400	31	47,000	23,000
WP-1-3-8	26-Aug-16	8	<34	1188	-	80	83	<64	-	-	3.6	0.32	120	-	4.8	7.6	<5.0	-	-
WP-2-3-24	26-Aug-16	<26	**124**	**23262**	-	**1617**	**960**	<72	-	-	3.8	34	**12000**	-	400	**530**	7.5	-	-
WP-3-1-24	26-Aug-16	<18	**84**	**9555**	-	220	**538**	<64	-	-	2.1	13	**6600**	-	150	180	<5.0	-	-
WP-3-5-24	26-Aug-16	<24	**112**	**15932**	-	462	**897**	**121**	-	-	4.8	**64**	**14000**	-	690	**820**	16	-	-
ET-10-12	6-Apr-17	**10**	<31	684	-	96	47	**<55**	-	-	-	1.1	67	-	6.7	9.2	<5.0	-	-
ET-17-15	7-Apr-17	**10**	<33	310	-	50	22	**<60**	-	-	-	0.32	18	-	6.3	8.9	<5.0	-	-
ET-20-6	7-Apr-17	9	<32	435	-	60	20	**<58**	-	-	-	0.3	18	-	5.2	8.3	<5.0	-	-
ET-23-12	7-Apr-17	**21**	<34	1060	-	65	70	**<61**	-	-	-	0.54	34	-	5.4	9.1	<5.0	-	-
ET-28-6	7-Apr-17	**<12**	33	778	-	<42	99	**<57**	-	-	-	5.6	430	-	20	65	<5.0	-	-
ET-32-24	7-Apr-17	8	<32	245	-	51	16	**<58**	-	-	-	0.76	100	-	5.4	10	<5.0	-	-

Notes:

This table presents an abridged list of EPA Method 6010B compounds.
Turner Laboratories, Inc. performed analysis
mg/Kg = milligrams per kilogram
- = Not Analyzed For This Analyte
***Bold** = exceeds SRL*
SRL - Soil Remediation Level

TABLE F.2
Correlation Coefficents for pXRF and Laboratory Measurements

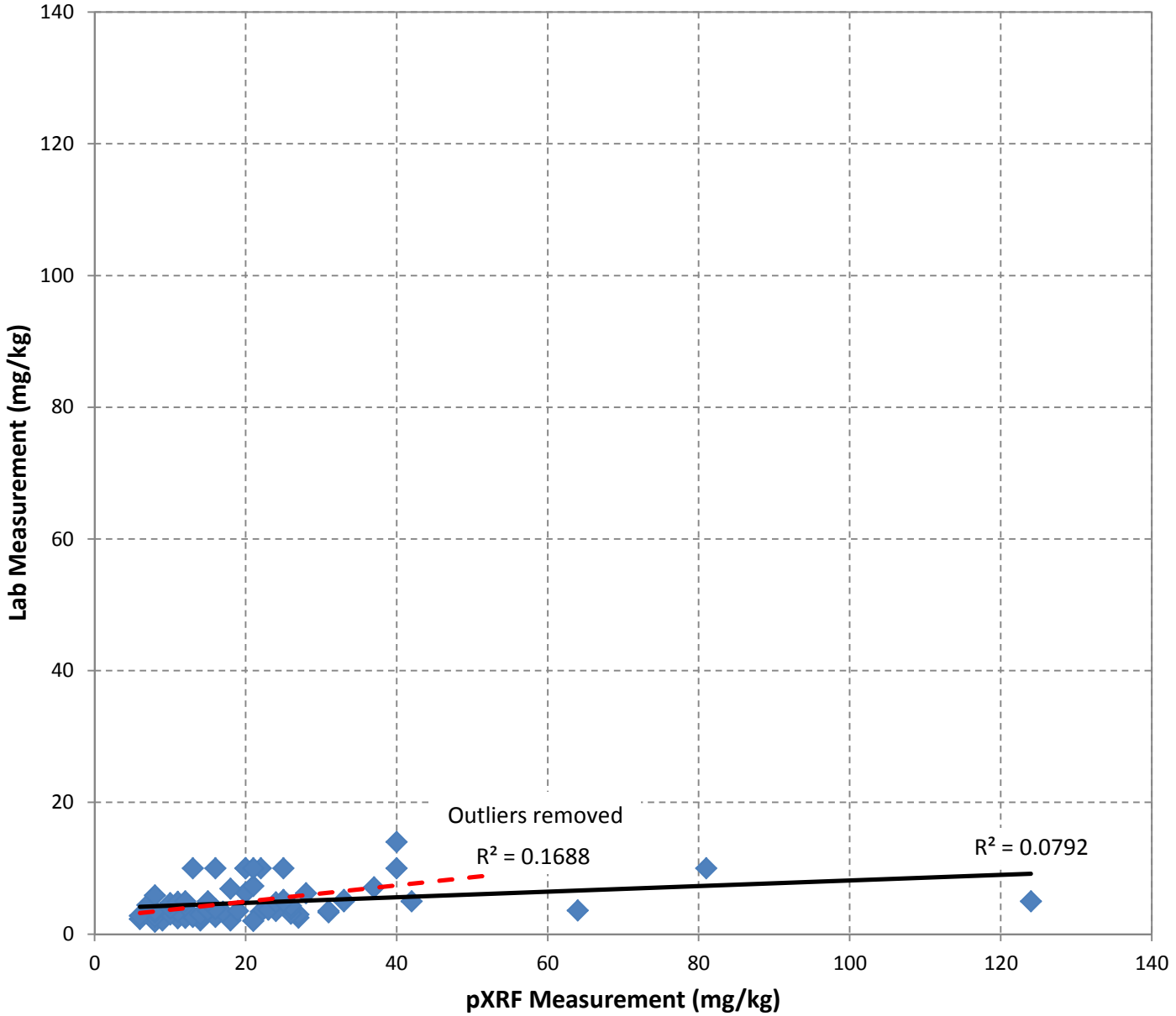
Metal	Correlation Coefficent (R)	Note
Antimony (Sb)	0.26	full data set
	0.45	outlier removed (1)
Arsenic (As)	0.28	full data set
	0.41	outliers removed (3)
Cadmium (Cd)	0.86	
Copper (Cu)	0.83	
Nickel (Ni)	0.39	full data set
	0.63	outlier removed (1)
Lead (Pb)	0.85	



HYDRO GEO CHEM, INC.

ANTIMONY (Sb)

Approved	Date	Author	Date	File Name	Figure
AJB	9/11/17	MJB	9/11/17	E.6 Antimony	F.1

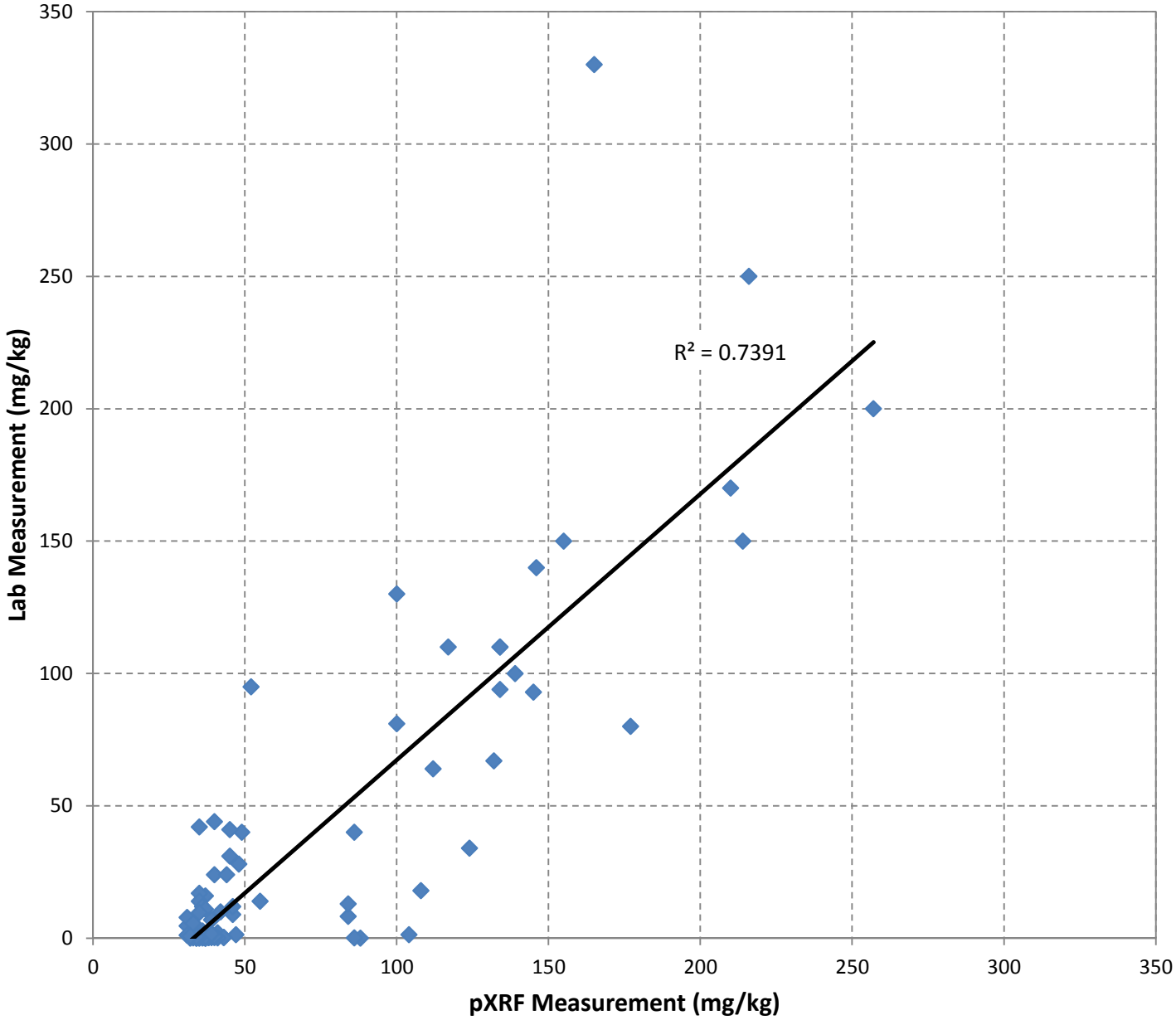


HYDRO GEO CHEM, INC.

ARSENIC (As)

Approved	Date	Author	Date	File Name	Figure
AJB	9/11/17	MJB	9/11/17	E.1 Arsenic	F.2

H:\2015053.50 Harrison & Millmar RIFS\Reporting\RI Report\Appendices\Appendix F - XRF & Lab data correlation\Appendix F - Summary Tables.xlsx: Fig F.2 Arsenic

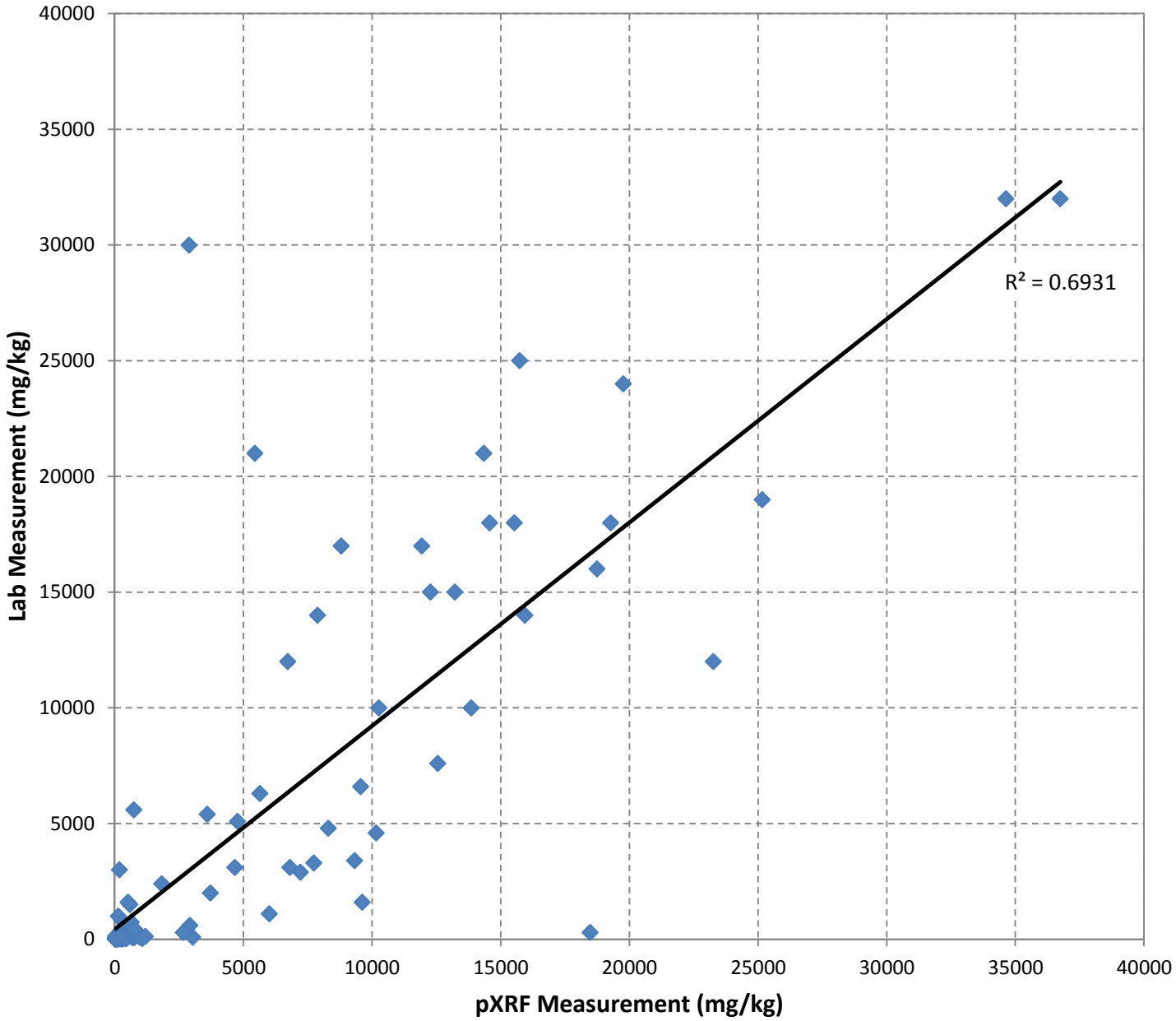


HYDRO GEO CHEM, INC.

CADMIUM (Cd)

Approved	Date	Author	Date	File Name	Figure
AJB	9/11/17	MJB	9/11/17	E.2 Cadium	F.3

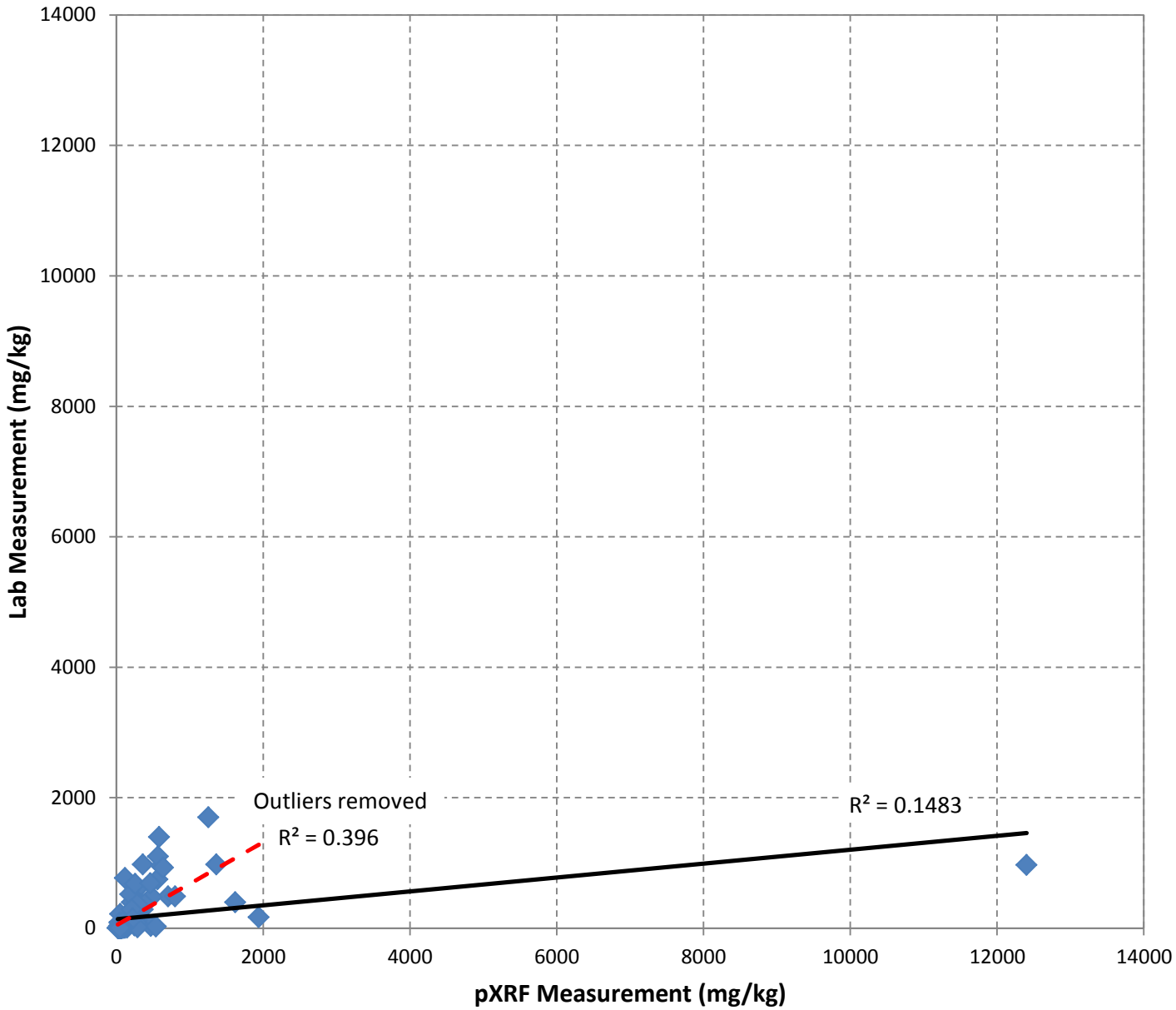
H:\2015053.50 Harrison & Millmar RIFS\Reporting\RI Report\Appendices\Appendix F - XRF & Lab data correlation\Appendix F - Summary Tables.xlsx: Fig F.3 Cadium



HYDRO GEO CHEM, INC.

COPPER (Cu)

Approved	Date	Author	Date	File Name	Figure
AJB	9/11/17	MJB	9/11/17	E.3 Copper	F.4

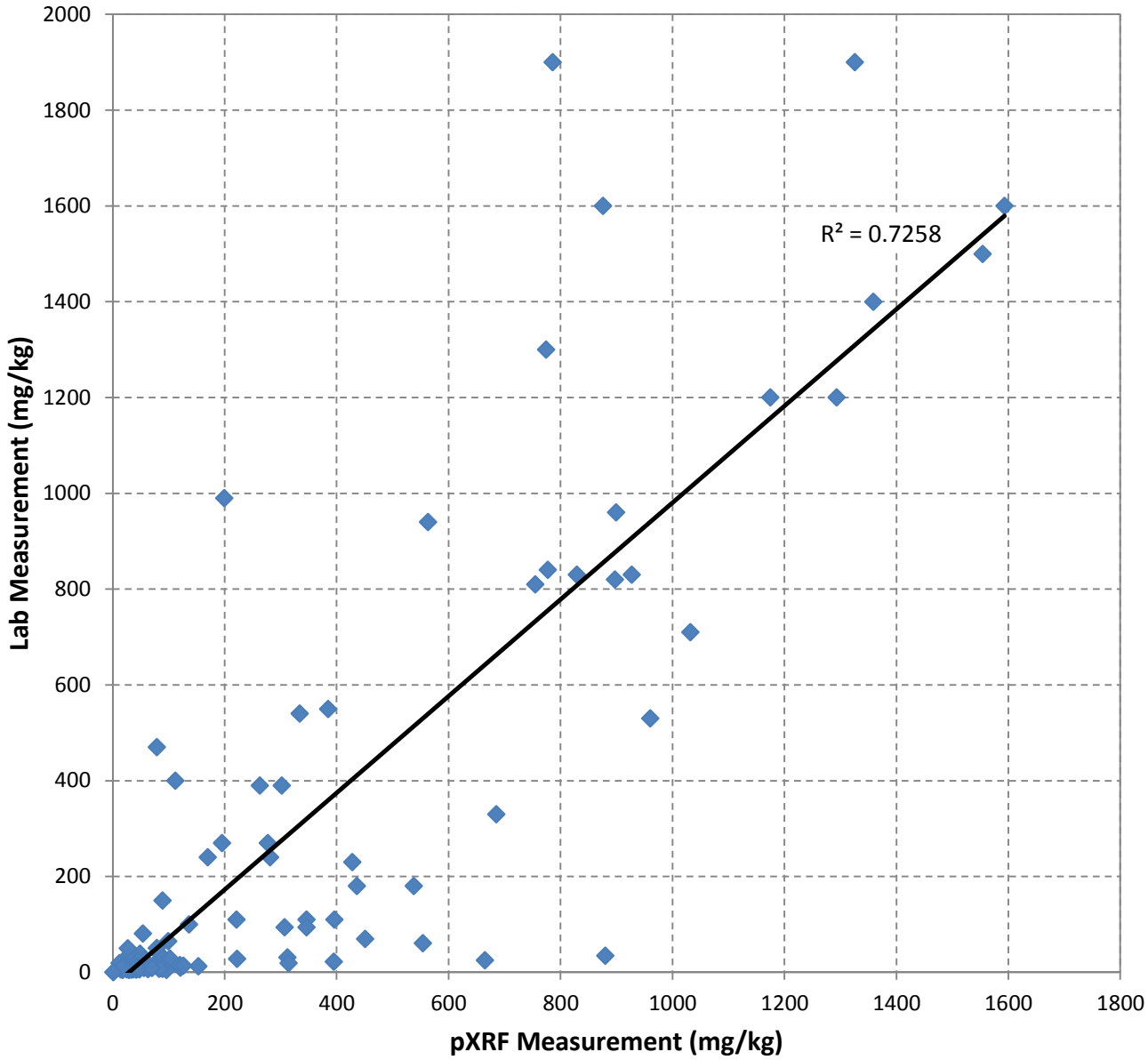


HYDRO GEO CHEM, INC.

NICKEL (Ni)

Approved	Date	Author	Date	File Name	Figure
AJB	9/11/17	MJB	9/11/17	E.4 Nickel	F.5

H:\2015053.50 Harrison & Millmar RIFS\Reporting\RI Report\Appendices\Appendix F - XRF & Lab data correlation\Appendix F - Summary Tables.xlsx: Fig F.5 Nickel



HYDRO GEO CHEM, INC.

LEAD (Pb)

Approved	Date	Author	Date	File Name	Figure
AJB	9/11/17	MJB	9/11/17	E.5 Lead	F.6

APPENDIX G

PHOTO DOCUMENTATION LOG

1. Grubbing east tail of HMD east pile.

2. Piling debris from east tail in preparation for removal.

3. Dross exposed on east tail of HMD east.

4. Dross from east tail piled up in preparation to move to main pile.

5. Dross has been removed to expose clean native soils from east tail of HMD east.

6. Measuring metal concentrations in freshly exposed clean soils using an x-ray fluorescence analyzer (XRF).

7. Clean imported soil stock piled on south side of HMD east pile in preparation for covering east tail.

8. Covering east tail of HMD east with newly imported clean soil.

9. Continue covering east tail of main pile, working from west end of east tail and progressing to east end.

10. East tail cover of HMD East pile nearly complete

11. Completed cover on east tail of HMD east pile looking west.

12. Completed cover on east tail of HMD east pile looking northeast.

1. Setting elevation stakes with fill lines to define final surface elevation of completed cap.

2. Fill elevation survey stakes over top of HMD east pile.

3. Stockpiled clean fill material, looking north from north end of HMD east pile.

4. Begin placing clean fill material on main HMD east pile, looking south.

5. Continue placing fill material on main HMD east pile, looking south. Fill implaced in two 1-foot lifts, each compacted in place.

6. Cap material emplacement is nearly complete. Note: the elevation stake is almost completely buried as fill has been placed to proper elevation.

7. Typical survey stake showing final elevation fill line. Fill operation is almost complete at this location.

8. Wetting cap fill material to maximize compaction, looking south.

9. Placing clean imported cap material on west slope of HMD east pile, looking north.

10. Completed cap cover on south slope of main HMD east pile, looking west.

11. Nearly completed west slope cap, looking north.

12. Cap on north slope of HMD east pile, looking south. Note: this slope is being prepared for emplacement of geosynthetic fabric liner and rip rap

13. Delivery of organic rich topsoil to enhance plant growth.

14. Spreading topsoil over top of main HMD pile, looking east.

15. Hand broadcasting native seed mix over entire east HMD main pile, looking south. Note: the entire surface is covered with a layer of topsoil.

16. Scarifying seeded area to create crests and troughs to capture rain and promote seed germination, looking southeast. Note: the arrow points in the direction of slope and the troughs are perpendicular to this direction for rain water runoff control.

17. Scarification of HMD east pile is complete, looking south.

18. Excavating key trench at top of north HMD east pile slope in preparation for installation of geotextile fabric. Note: arrow is pointing to roll of fabric ready for deployment down slope.

19. Placing geotextile on north slope of east pile to control base flow cap erosion from rainfall runoff, looking north.

20. Installing geotextile in key trench. Note: riprap placed in trench to secure fabric in place.

21. Installing geotextile in key trench and covering with riprap as construction progresses, looking east from top of north HMD east pile slope.

22. Nearly complete riprap cover over geotextile liner, looking east toward the northwest of the HMD east pile.

23. Completed riprap installation, looking east.

24. Slope geosynthetic liner/riprap system is complete with one foot of riprap over liner.

25. Post-construction photo showing plant growth. *Note: photo taken mid-monsoon season.*

26. Second post-construction photo showing plant growth, looking west from southeast side of cap. Note: photo taken mid-monsoon season.

27. Close up showing newly emerging plant growth on finished cap.

APPENDIX H

PERMITS

Department of Environmental Quality
33 N Stone Ave
Tucson, Arizona 85701-1429
Phone: (520) 724-7400 Fax: (520) 838-7432
www.deq.pima.gov

FUGITIVE DUST ACTIVITY PERMIT

Permit Number	P17FD0111
Issuance Date	05/09/2017
Expiration Date	05/08/2018
Permittee	MP Environmental Services, Inc.
Address	3045 S. 51st Avenue phoenix, AZ 85043
Project Location	Parcel: 136310150 9880 E MILLMAR RD TUCSON, AZ 85730

THIS PERMIT WAS ISSUED FOR THE FOLLOWING ACTIVITIES

Landstripping/Earthmoving	2+ to 10 acres

Dustin Fitzpatrick
Authorized PDEQ representative

05/09/2017
Date

PIMA COUNTY

http://www.pima.gov

Receipt

Department of Environmental Quality
B of A Building
33 N Stone Ave, Suite 700
Tucson, Arizona 85701-1429
(520) 724-7400
deq@pima.gov

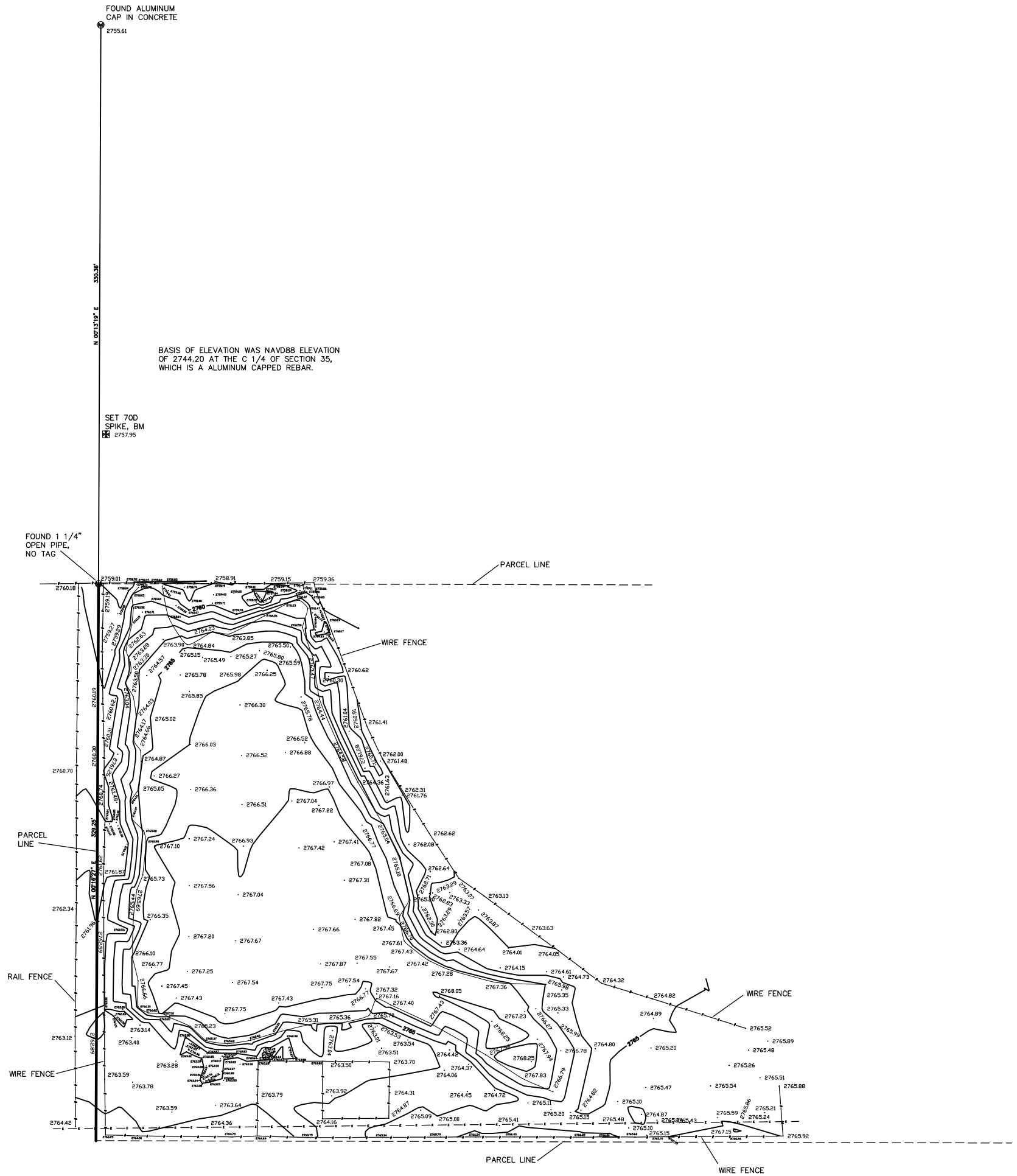
Receipt Date: 05/09/2017
Receipt Time: 5:07 PM
Receipt #: 532213

		Invoice #	Amount
Record # / Type:	**P17FD0111, Fugitive Dust Activity Permit**		
Location:	**9880 E MILLMAR RD, TUCSON, AZ 85730**	456909	$500.00
		Total Due:	**$500.00**
		Payment by Credit Card:	$500.00

Print Date: 5/9/2017
Cashier: Online Accela Citizen Access

APPENDIX I

TOPOGRAPHIC SURVEY



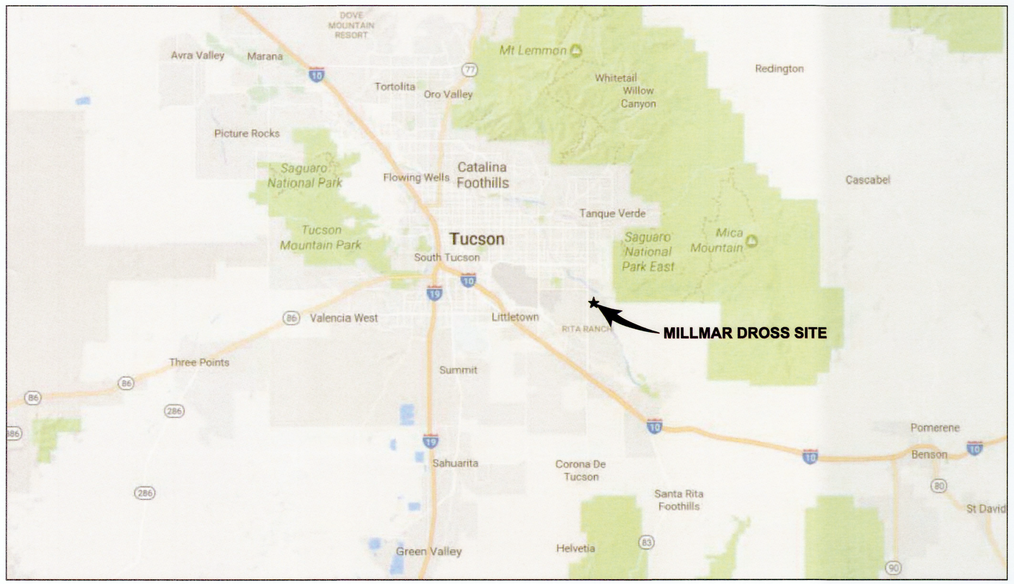
TOPOGRAPHIC SURVEY
(from GIS Digital File)

RES Land Surveys, Inc.
1910 E 14th Street
Tucson, AZ. 85719
520-624-1142 Office

APPENDIX J

ENGINEERED GRADING AND DRAINAGE PLAN

HMD EAST PILE
GRADING AND DRAINAGE PLAN
TUCSON, ARIZONA
MAY 15, 2017



SITE LOCATION MAP
SCALE: 1" = 5 MILES

SITE VICINITY MAP
SCALE: 1"=400'

DRAWING INDEX	
DWG. NO.	**DESCRIPTION**
1	TITLE SHEET
2	EXISTING SITE CONDITIONS
3	TOP OF COVER CONDITIONS
4	DRAINAGE CONDITIONS

PREPARED FOR:

ARIZONA DEPARTMENT OF ENVIROMENTAL QUALITY
400 WEST CONGRESS STREET
TUCSON, ARIZONA 85701
TEL#: 520-628-6733
FAX#: 520-628-6745

PREPARED BY:

HYDRO GEO CHEM, INC.
51 WEST WETMORE ROAD, SUITE 101
TUCSON, ARIZONA 85705
TEL#: 520-293-1500
FAX#: 520-293-1550

Registered Professional Engineer (Civil) CERTIFICATE NO. 37554 JAMES G. PECK Date Signed 5.15.17 ARIZONA, U.S.A.
Exp 3/31/2020

NO.	DATE	BY	REVISION

NOTES:

1. CONTRACTOR RESPONSIBLE TO INSPECT SITE CONDITIONS TO CONFIRM ACCESSIBILITY PROJECT LAYOUT PRIOR TO BEGINNING WORK.
2. THE CONTRACTOR SHALL PROVIDE MATERIALS AND EQUIPMENT, INCLUDING WATER FOR USE IN CONSTRUCTION.
3. CONTRACTOR TO PROVIDE NECESSARY TEMPORARY SERVICES AND FACILITIES, INCLUDING PORTABLE TOILET UNITS.
4. CONTRACTOR TO PROVIDE POTABLE WATER TO ALL PERSONNEL WORKING AT THE SITE.
5. CONTRACTOR TO OBTAIN ANY DUST CONTROL AND STORMWATER DISCHARGE PERMITS NECESSARY TO PERFORM THE WORK.
6. MEASUREMENT AND PAYMENT FOR SERVICES TO BE PROVIDED AS PER CONTRACT.
7. CONTRACTOR TO PROVIDE RECORD DRAWINGS OF FINAL GRADES PRIOR TO PROJECT CLOSEOUT. SURVEYS OF FINAL GRADES TO BE PREPARED BY AN ARIZONA-LICENSED SURVEYOR.

SIGNATURE		DATE
PROJECT ENGR:	J. PECK	
PROJECT MGR:	AJB	
CLIENT:	ADEQ	

HYDRO GEO CHEM, INC.
51 W. WETMORE ROAD
SUITE 101
TUCSON, AZ 85705
520.293.1500 OFFICE / 520.293.1550 FAX
website: www.hgcinc.com

TITLE SHEET

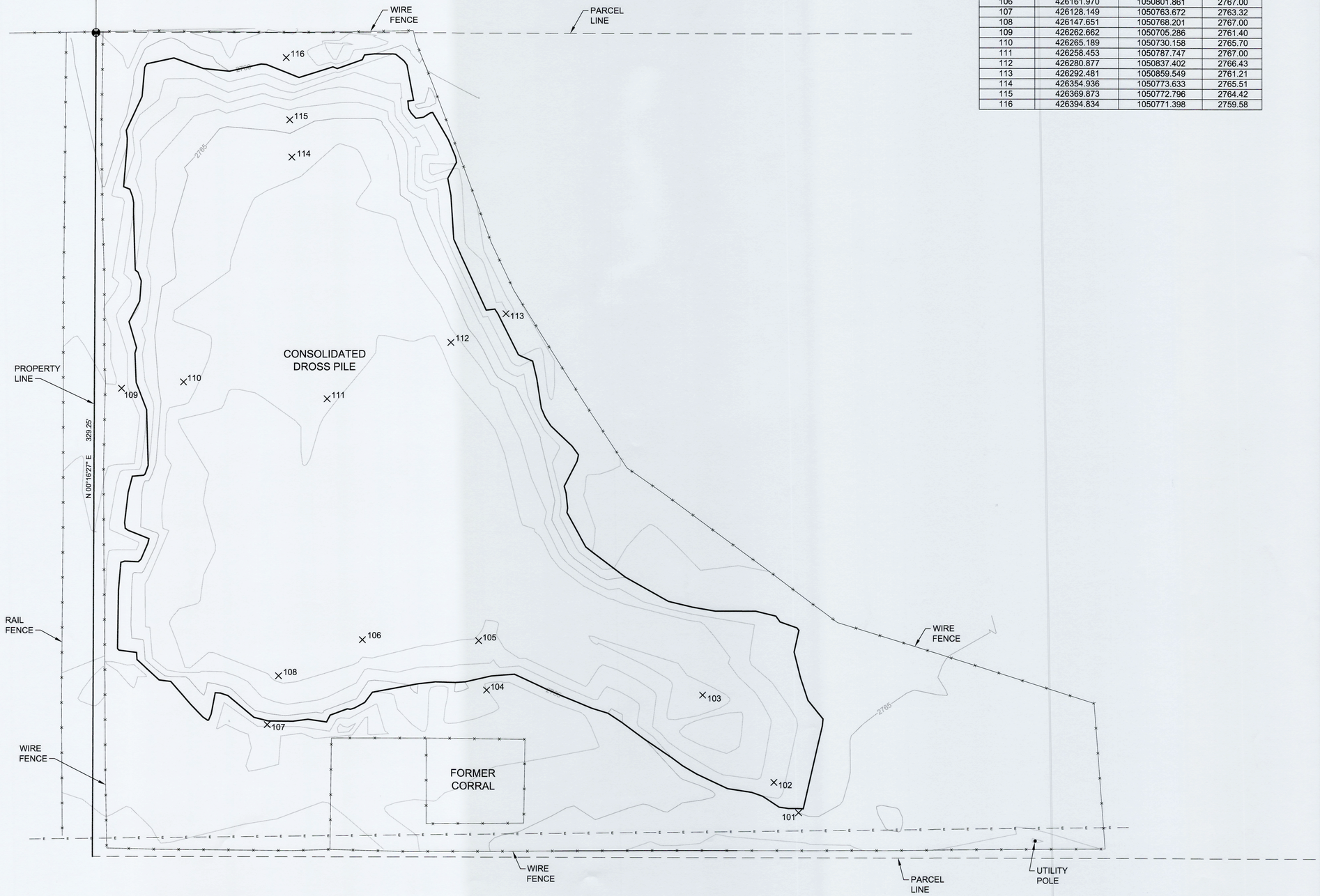
HMD EAST PILE
TUCSON, ARIZONA

ARIZONA DEPARTMENT OF ENVIROMENTAL QUALITY
HMD EAST PILE
400 West Congress Street
Tucson, AZ 85701
(520) 628-6733

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
JGP	TML	JGP

DATE: 5/15/2017	FILE: MDS_001.dwg
PROJECT NO.: 2015053.40	CONTRACT: ADEQ14-077537

DRAWING: 1



Existing Ground Surface Point Table

Point No.	Northing	Easting	Elevation
101	426093.055	1050976.778	2765.00
102	426105.117	1050966.890	2766.44
103	426139.951	1050938.336	2768.00
104	426141.920	1050851.705	2764.00
105	426161.672	1050848.547	2766.90
106	426161.970	1050801.861	2767.00
107	426128.149	1050763.672	2763.32
108	426147.651	1050768.201	2767.00
109	426262.662	1050705.286	2761.40
110	426265.189	1050730.158	2765.70
111	426258.453	1050787.747	2767.00
112	426280.877	1050837.402	2766.43
113	426292.481	1050859.549	2761.21
114	426354.936	1050773.633	2765.51
115	426369.873	1050772.796	2764.42
116	426394.834	1050771.398	2759.58

NO.	DATE	BY	REVISION

BASE SURVEY:
BY: RES LAND SURVEYS, INC.
DATED: APRIL 14, 2017

LEGEND

- FOUND SURVEY MONUMENT
- PARCEL LINE
- PROPERTY LINE
- FENCE
- ELECTRICAL LINE
- 2386 EXISTING 2017 CONTOUR
- LIMITS OF DROSS PILE TOTAL SURFACE AREA 1.03 AC.

N

0' 20' 40'
SCALE IN FEET
CONTOUR INTERVAL - 1 FOOT

NOTES:

1. CONTRACTOR TO CONFIRM GRADES PRIOR TO BEGINNING WORK.
2. LIMITS OF DROSS PILE ARE APPROXIMATE.
3. EXISTING SOIL COVER ON CONSOLIDATED DROSS PILE APPROX. 6-INCHES THICK.
4. TRACE DROSS MAY BE PRESENT OUTSIDE OF THE CONSOLIDATED DROSS PILE.
5. ADDITIONAL UTILITIES MAY BE PRESENT.
5. CONTRACTOR TO CLEAR AND GRUB VEGETATION AS NECESSARY TO CONSTRUCT SUBGRADE.
6. SUBGRADE SOIL TO BE COMPACTED TO 95 PERCENT OF MAXIMUM DRY DENSITY PER STANDARD PROCTOR TEST.
7. TOP SURFACE OF SUBGRADE: PLUS OR MINUS 6 INCHES IN 10 FEET.

	SIGNATURE	DATE
PROJECT ENGR:	J. PECK	
PROJECT MGR:	AJB	
CLIENT:	ADEQ	

HYDRO GEO CHEM, INC.
51 W. WETMORE ROAD
SUITE 101
TUCSON, AZ 85705
520.293.1500 OFFICE / 520.293.1550 FAX
website: www.hgcinc.com

EXISTING SITE CONDITIONS

HMD EAST PILE
TUCSON, ARIZONA

ARIZONA DEPARTMENT OF ENVIROMENTAL QUALITY
HMD EAST PILE
400 West Congress Street
Tucson, AZ 85701
(520) 628-6733

Registered Professional Engineer (Civil) CERTIFICATE NO. 37554 JAMES G. PECK Date Signed 3/13/20 ARIZONA, U.S.A.

Exp 3/31/2020

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
JGP	TML	JGP

DATE:	FILE:
5/15/2017	MDS_002.dwg
PROJECT NO.: 2015053.40	CONTRACT: ADEQ14-077537

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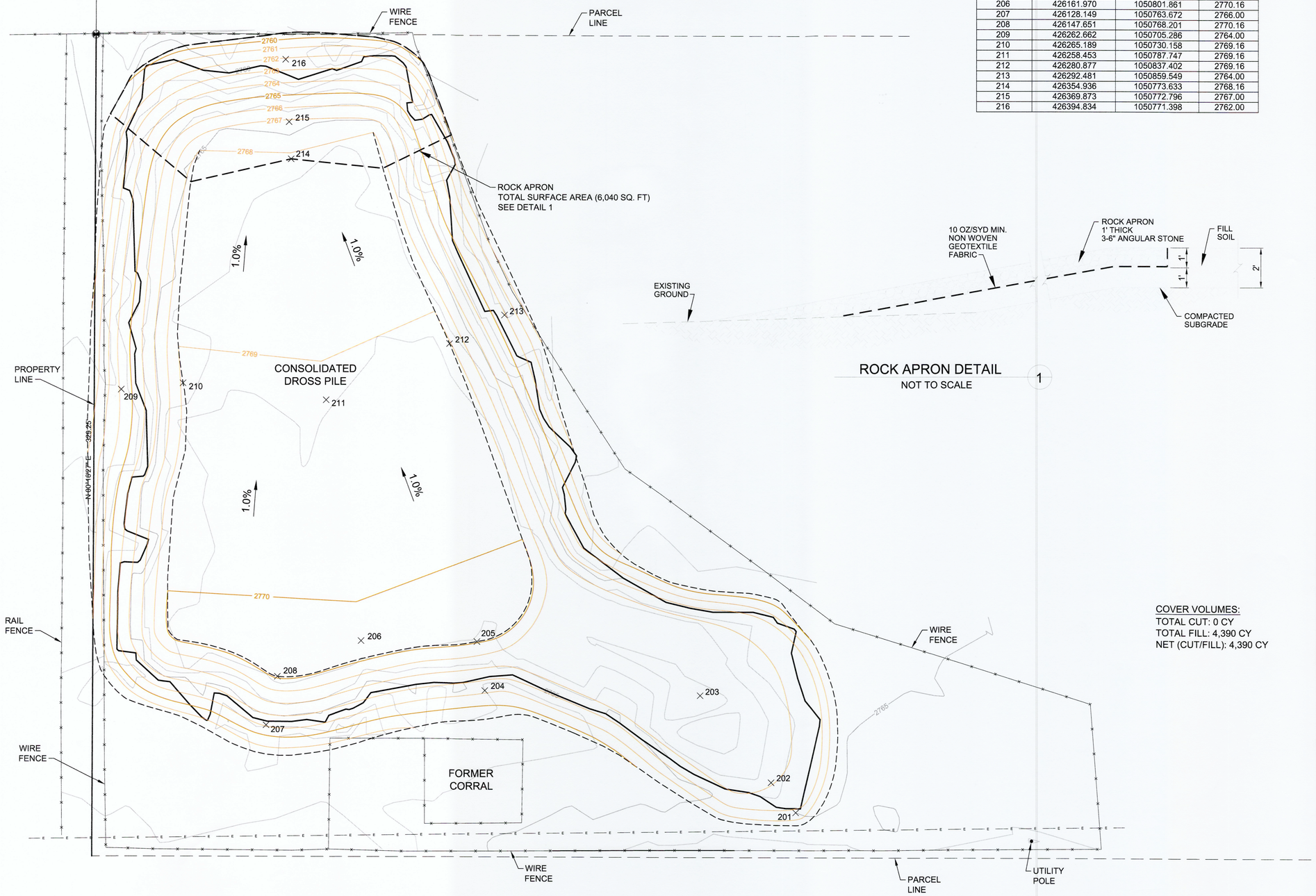


ROCK APRON DETAIL 1
NOT TO SCALE

Top of Cover Point Table

Point No.	Northing	Easting	Elevation
201	426093.055	1050976.778	2767.00
202	426105.117	1050966.890	2768.00
203	426139.951	1050938.336	2768.00
204	426141.920	1050851.705	2766.00
205	426161.672	1050848.547	2770.16
206	426161.970	1050801.861	2770.16
207	426128.149	1050763.672	2766.00
208	426147.651	1050768.201	2770.16
209	426262.662	1050705.286	2764.00
210	426265.189	1050730.158	2769.16
211	426258.453	1050787.747	2769.16
212	426280.877	1050837.402	2769.16
213	426292.481	1050859.549	2764.00
214	426354.936	1050773.633	2768.16
215	426369.873	1050772.796	2767.00
216	426394.834	1050771.398	2762.00

COVER VOLUMES:
TOTAL CUT: 0 CY
TOTAL FILL: 4,390 CY
NET (CUT/FILL): 4,390 CY

NO.	DATE	BY	REVISION

BASE SURVEY:
BY: RES LAND SURVEYS, INC.
DATED: APRIL 14, 2017

LEGEND

- FOUND SURVEY MONUMENT
- PARCEL LINE
- PROPERTY LINE
- FENCE
- ELECTRICAL LINE
- 2386 EXISTING 2017 CONTOUR
- 2386 COVER CONTOUR
- SLOPE BREAK
- LIMITS OF DROSS PILE
- ROCK APRON

N

0' 20' 40'
SCALE IN FEET
CONTOUR INTERVAL - 1 FOOT

NOTES:

1. PLACE FILL SOIL IN LIFTS NOT TO EXCEED 12-INCHES IN THICKNESS.
2. LIGHTLY COMPACT FILL SOIL TO 85 TO 90 PERCENT OF MAXIMUM DRY DENSITY AS PER STANDARD PROCTOR TEST.
3. UNIFORMLY GRADE THE SURFACE OF THE FILL SOIL. PROVIDE A SMOOTH TRANSITION BETWEEN ABRUPT CHANGES IN SLOPE.
4. PROVIDE A SMOOTH TRANSITION FROM FILL SOIL SURFACE TO ROCK APRON.
5. ANY ORGANIC MATERIAL IS TO BE WORKED INTO THE TOP 6 TO 12 INCHES OF FILL SOIL.
6. FINISHED SURFACE TO BE ROUGHENED BY ROLLING WITH KNOBBY-TIRED EQUIPMENT.
7. SCARIFY THE SURFACE OF SIDESLOPES BY CROSS RIPPING PARALLEL TO THE GROUND SURFACE.

SIGNATURE		DATE
PROJECT ENGR:	J. PECK	
PROJECT MGR:	AJB	
CLIENT:	ADEQ	

HYDRO GEO CHEM, INC.
51 W. WETMORE ROAD
SUITE 101
TUCSON, AZ 85705
520.293.1500 OFFICE / 520.293.1550 FAX
website: www.hgcinc.com

TOP OF COVER CONDITIONS

HMD EAST PILE
TUCSON, ARIZONA

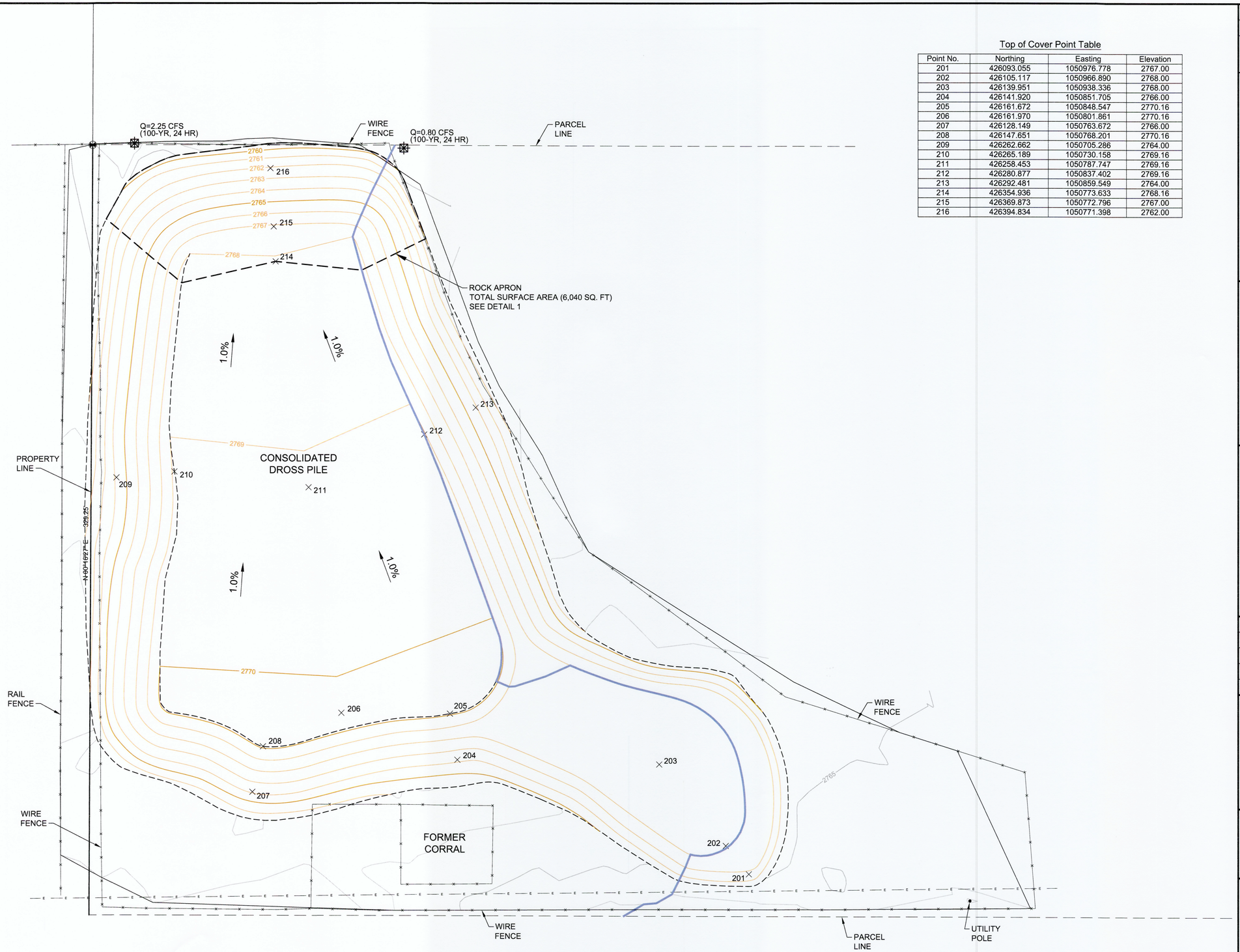
ARIZONA DEPARTMENT OF ENVIROMENTAL QUALITY
HMD EAST PILE
400 West Congress Street
Tucson, AZ 85701
(520) 628-6733

Registered Professional Engineer (Civil) CERTIFICATE NO. 37554 JAMES G. PECK Date Signed 9.13.17 ARIZONA, U.S.A.
EXP 3/31/2020

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
JGP	TML	JGP

DATE: 5/15/2017	FILE: MDS_003.dwg
PROJECT NO.: 2015053.40	CONTRACT: ADEQ14-077537

DRAWING: 3



Top of Cover Point Table

Point No.	Northing	Easting	Elevation
201	426093.055	1050976.778	2767.00
202	426105.117	1050966.890	2768.00
203	426139.951	1050938.336	2768.00
204	426141.920	1050851.705	2766.00
205	426161.672	1050848.547	2770.16
206	426161.970	1050801.861	2770.16
207	426128.149	1050763.672	2766.00
208	426147.651	1050768.201	2770.16
209	426262.662	1050705.286	2764.00
210	426265.189	1050730.158	2769.16
211	426258.453	1050787.747	2769.16
212	426280.877	1050837.402	2769.16
213	426292.481	1050859.549	2764.00
214	426354.936	1050773.633	2768.16
215	426369.873	1050772.796	2767.00
216	426394.834	1050771.398	2762.00

NO.	DATE	BY	REVISION

BASE SURVEY:
BY: RES LAND SURVEYS, INC.
DATED: APRIL 14, 2017

LEGEND

- FOUND SURVEY MONUMENT
- PARCEL LINE
- PROPERTY LINE
- FENCE
- ELECTRICAL LINE
- 2386 EXISTING 2017 CONTOUR
- 2386 COVER CONTOUR
- ROCK APRON
- DRAINAGE BASIN BOUNDARY
- STORMWATER OUTFALLS

N

0' 20' 40'
SCALE IN FEET
CONTOUR INTERVAL - 1 FOOT

	SIGNATURE	DATE
PROJECT ENGR:	J. PECK	
PROJECT MGR:	AJB	
CLIENT:	ADEQ	

HYDRO GEO CHEM, INC.
51 W. WETMORE ROAD
SUITE 101
TUCSON, AZ 85705
520.293.1500 OFFICE / 520.293.1550 FAX
website: www.hgcinc.com

DRAINAGE CONDITIONS

MILLMAR DROSS SITE
TUCSON, ARIZONA

ARIZONA DEPARTMENT OF
ENVIROMENTAL QUALITY
MILLMAR DROSS SITE
400 West Congress Street
Tucson, AZ 85701
(520) 628-6733

Registered Professional Engineer (Civil)
CERTIFICATE NO. 37564
JAMES G. PECK
Date Signed 5/15/17
ARIZONA, U.S.A.
EXP 3/31/2020

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
JGP	TML	JGP

DATE: 5/15/2017	FILE: MDS_004.dwg
PROJECT NO.: 2015053.40	CONTRACT: ADEQ14-077537

DRAWING: 4

APPENDIX K

REMEDIAL OBJECTIVES REPORT

REMEDIAL OBJECTIVES REPORT
HARRISON ROAD AND MILLMAR ROAD DROSS
WQARF REGISTRY SITE
TUCSON, ARIZONA

December 2017

Arizona Department of Environmental Quality
Remedial Projects Unit
1110 West Washington
Phoenix, Arizona 85007

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LIST OF ABBREVIATIONS & ACRONYMS

AAC	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
COC	Chemicals of Concern
ERA	Early Response Action
HMD	Harrison Road and Millmar Road Dross
RI	Remedial Investigation
RO	Remedial Objective
SRL	Soil Remediation Level
R-SRL	Residential Soil Remediation Level
WQARF	Water Quality Assurance Revolving Fund

1.0 INTRODUCTION

The Arizona Department of Environmental Quality (ADEQ) has prepared this Remedial Objectives (ROs) Report for the Harrison Road and Millmar Road Dross (HMD) Water Quality Assurance Revolving Fund (WQARF) Registry Site (the Site) to meet requirements established under Arizona Administrative Code (A.A.C.) R18-16-406.

ROs are established for the current and reasonably foreseeable uses of land and waters of the state that have been or are threatened to be affected by a release of a hazardous substance. Pursuant to A.A.C. R18-16-406(D), it is specified that reasonably foreseeable uses of land are those likely to occur at the site and the reasonably foreseeable uses of water are those likely to occur within one hundred years unless site-specific information suggests a longer time period is more appropriate.

As the remedy for the Site does not address waters of the state, pursuant to A.A.C. R18-16-406(H) ADEQ may prepare a listing of remedial objectives that are based on the current and reasonably foreseeable uses of the property and stated in accordance with A.A.C. R18-16-406 (I)(4). The solicitation of ROs, RO public meetings, and the RO public comment period are not required.

In addition, as the remedy at the Site is a soil remedy and addresses non-soil materials, the landowners may establish the current and reasonably foreseeable land uses pursuant to A.A.C. R18-16-406 (G). Therefore this listing of ROs relies upon the land use study questionnaires collected in 2017 from the landowners at the site. The land use questionnaires are included in Appendix B of the HMD Remedial Investigation (RI) Report prepared by Hydro Geo Chem, Inc., for ADEQ.

Pursuant to A.A.C. R18-16-406 (I)(4), the ROs must be stated in the following terms: (1) protecting against the loss or impairment of each use; (2) restoring, replacing, or otherwise providing for each use; (3) when action is needed to protect or provide for the use; and (4) how long action is needed to protect or provide for the use.

2.0 REMEDIAL OBJECTIVES FOR LAND USE

The HMD WQARF site is located on the east side of the City of Tucson. The boundaries of this Site are irregular and the site boundaries are defined by the extent of dross and dross-related soil contamination above the residential soil remediation levels (R-SRL) (see Figure 5 in HMD RI Report). The Site comprised of two aluminum dross piles: the Harrison Millmar Dross-East pile (HMD-East) and the Harrison Millmar Dross-West pile (HMD-West) and surrounding impacted soils.

Contaminants of concern (COCs) for the site are aluminum, antimony, arsenic, cadmium, copper, lead and nickel.

2.1 Summary of Impacts to Current and Reasonably Foreseeable Land Use

The site is located in a mixed area of low-density residential and small-scale agricultural operations, and medium density residential (mobile homes). Based on land use study questionnaires provided by property owners at the site, land use in the area is characterized as mixed use residential and agricultural. Agricultural uses are predominately swine farming, horse husbandry, some cattle grazing, and firewood harvesting. According to the questionnaires, there are no immediate plans to change the land use or zoning for properties in the site.

Early Response Actions (ERAs) were performed prior to listing of the Site on the WQARF registry. These ERAs included removal of dross and dross-impacted soils from HMD-West that were near one residence and near the bank of the Harrison Hills Wash; replacement with at least two feet of clean fill in the excavated areas; and consolidation and temporary capping of the HMD-East dross pile. These ERAs reduced the exposure to COCs detected in the surface soils at the site. In addition, the final remedy of further dross consolidation and the installation of an engineered cover over the consolidated dross for the site was completed within 180 days of site listing.

The removal actions described above are based on the assumption that removal of surficial contaminated soils and placement of a cover of clean soil over the consolidated dross will be protective of human health and the environment. Furthermore, the removal actions are based on the assumption that a 24-inch thick soil cover is adequate. *(U.S. EPA, 2003. Superfund Lead-Contaminated Residential Sites Handbook. OSWER 9285.7-5).*

2.2 Soil Remedial Objective

Because the properties in the site are currently, and will for the foreseeable future, be zoned for residential use, residential SRLs apply. Therefore, the ROs for land use at the site are:

To restore soil conditions to the remediation standards for residential use specified in A.A.C. R18-7-203 (specifically background remediation standards prescribed in R18-7-204, predetermined remediation standards prescribed in R18-7-205, or site specific remediation standards prescribed in R18-7-206) that are applicable to the hazardous substances identified. This action is needed for the present time and for as long as the level of contamination in the soil on the property threatens the use as a residential property.

APPENDIX L

RESPONSIVENESS SUMMARY

(No comments received)