

AZ HWMA PERMIT
EPA ID NO. AZD 980 814 479
UNIVERSAL PROPULSION COMPANY

PERMIT ATTACHMENT A
FACILITY DESCRIPTION
DRAFT PERMIT

ATTACHMENT A
FACILITY DESCRIPTION

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FACILITY DESCRIPTION

This section provides a description of the Universal Propulsion Company, Inc. (UPCO) Corrective Action Facility located in Phoenix, Arizona. For convenience, this section will refer to the UPCO Corrective Action Facility simply as the UPCO Facility.

A.1. GENERAL DESCRIPTION

The UPCO facility was an aerospace manufacturing facility that was in operation from August 14, 1972 until January 9, 2010 at its location on a 160-acre site about 25 miles north of central Phoenix, Arizona. Currently, the facility is under remedial and corrective action consisting of four engineered caps, one rip-rap cover, groundwater treatment facility, ten remediation wells with conveyance lines, groundwater monitoring wells onsite and offsite, and security fencing. Exhibit A-1 shows an aerial photograph of the entire facility with surrounding areas.

The street address of the facility is:

Universal Propulsion Company, Inc.
25401 North Central Avenue
Phoenix, Arizona 85027-7899

A.2. LOCATION INFORMATION

Seismic Standard

The UPCO facility is an existing facility; therefore, seismic standards do not pertain. Additionally, the UPCO facility is not located in a county or election district listed in Appendix VI of 40 CFR Part 264.

Floodplain Standard

The UPCO facility is not located within the 100-year floodplain as shown in the Federal Emergency Management Agency (FEMA) Flood Insurance Program (FIA) Flood Insurance Rate map (Exhibit A-2). The master drainage reports for the facility; they include all calculations, maps, and appendices for 100-year flood study were certified by Mr. Bill Liemkuhler of Amwest Engineering Company, Inc. and were completed in August 1992.

Topographical Map

A topographical map showing the UPCO facility is included as Exhibit A-7.

A.3. HYDROGEOLOGICAL CHARACTERISTICS OF THE SITE

The UPCO facility is located within the Basin and Range Physiographic Province. The basin and range are characterized by northwest trending bedrock mountain ranges separated by gently sloping alluvial valleys (basins). The UPCO facility is located between the southern flanks of the Union Hills, a northwest trending bedrock mountain range, and the northern margin of the West Salt River Valley within the Union Hills USGS 7.5' Quadrangle. Topographic relief near the facility ranges up to 800 feet within the Union Hills and slopes southward and westward towards the West Salt River Valley.

Depth to groundwater in the vicinity of the UPCO facility ranges from approximately 150 to 250 feet below surface. Regional groundwater flow direction in the vicinity is generally considered to be southwest as shown in Exhibit A-4. Well yields are low from the bedrock aquifer at and near the facility. Sixteen groundwater monitoring wells have been installed on the site as of June 1, 2010. A map showing the location of the existing monitoring network can be found in Permit Attachment F.

The geology of the Union Hills and West Salt River Valley is described below.

Bedrock Geology of the Union Hills

Near the UPCO facility, the Union Hills are composed of Early to Middle Proterozoic (1740 to 1335 Ma) metavolcanic, plutonic, and metasedimentary bedrock (Holloway and Leighty, 1998). The bedrock is often covered by a thin veneer of regolith, but it may locally outcrop in the dry washes or road cuts in the Union Hills. The geologic map in Exhibit A-3 shows the surface distribution of the bedrock to the north, east, and south of the facility as mapped by Holloway and Leighty (1998).

The bedrock unit is comprised of several different rock types (metavolcanic, plutonic, and metasedimentary) of Precambrian age.

The metavolcanic bedrock units are highly foliated, predominantly intermediate to mafic in composition, and are of greenschist or lower metamorphic grade (Holloway and Leighty (1998). These rocks have been collectively referred to as the greenstone (Wilson et al., 1957).

The plutonic bedrock units are predominantly granitic to granodioritic in composition. Two distinct intrusive bodies are present near the UPCO facility which include a foliated plutonic suite and a relatively unfoliated granitic to granodioritic plutonic suite. The foliated suite is geochemically similar to the metavolcanic bedrock discussed above, and may be related to its parent magma (Anderson, 1989a). The unfoliated plutonic rocks cross-cut the metavolcanic bedrock; and most likely belong to a group of granitic batholiths extending from the mid-continent region to the Mojave Desert (Anderson, 1989b).

The metasedimentary bedrock unit includes indurated, slightly foliated meta-greywacke, stretched pebble conglomerate, breccia, and ferruginous chert (Holloway and Leighty (1998). The metasedimentary unit forms a minor component of the bedrock in the Union Hills.

The foliated structural fabric observed in several of the Early to Middle Proterozoic bedrock units of the Union Hills is reported to have a preferred strike to the north and/or northeast and is steeply dipping to northwest.

Sedimentary Geology of the West Salt River Valley

Near the UPCO facility, the surface deposits of the West Salt River Valley are comprised of alluvial sediments likely derived from the surrounding Union Hills (Holloway and Leighty (1998)). The geologic map in Exhibit A-3 shows the surface distribution of this sedimentary unit which is interpreted to be Middle Pleistocene (1 Ma) to Holocene in age (recent). The sedimentary unit overlies the down-dropped Precambrian bedrock lows and the contact between the sedimentary unit and Precambrian basement rocks is mapped at the surface as a depositional nonconformity (Holloway and Leighty (1998)).

A.4. SOILS

Soils in the area of the UPCO facility are described as being Gachado - Rock outcrop - Quilotosa type, consisting of strongly sloping to steep, very gravelly, loamy soils and rock outcrop as shown in Exhibit A-5.

A.5. GROUNDWATER QUALITY

UPCO conducts groundwater monitoring at its monitoring well network and at private wells to the north of the facility. Groundwater quality data for the monitoring is summarized and submitted to Arizona Department of Environmental Quality (ADEQ). Details concerning groundwater monitoring frequency and reporting is contained in Permit Attachment I (Post-Closure Care).

A.6. SURFACE WATER AND WETLANDS

The UPCO facility is located in an arid, desert setting which is characterized by ephemeral streams (i.e., normally dry washes) traversing the 160-acre site from north-northeast to south-south-west. These drainage washes can be identified from the Master Drainage Report maps (Exhibit A-6) and the topographical map (Exhibit A-7). The area is subjected to very little precipitation and has high evaporation rates, especially in spring, summer and fall seasons. Storms, when they do occur, are usually intense but of short duration. Historical data indicates the maximum 24-hour precipitation event for Phoenix, Arizona was 3.07 inches in August 1943. The annual precipitation for Phoenix, Arizona is approximately seven (7) inches.

Important elements of the surface water hydrology in the vicinity of the facility include stream patterns, floodplain boundaries, the Central Arizona Project Canal, and the nearby Cave Creek Dam. Drainages (i.e., dry washes) that traverse the UPCO facility have been mapped in detail and are described in the Master Drainage Study Report (Exhibit A-6).

Ephemeral streams (i.e., normally dry washes) drain the southern portion of the Union Hills and flow

southwestward through a swale-like depression that is bounded by broad topographic highs along the western and eastern margins of the property (refer to the topographical map - Exhibit A-7). Southwest of the UPCO facility boundaries, surface water, if present during storm events, is temporarily impounded and diverted to the east by the Central Arizona Project (CAP) Canal which passes within 0.5 miles of the facility. Storm water run-off from the facility collects in dry washes which drain to the southwest through culverts under Happy Valley Road, and into the catchment under the canal through a 36-inch diameter syphon.

The Cave Creek Dam (CCD) is located on the eastern side of Union Hills, about one (1) mile east of the UPCO facility. During periods of heavy storm water run-off, surface water impounded behind the dam may cover an area in excess of one (1) square mile. The U.S. Army Corps of Engineers (CORPS) was contacted to learn whether the storm water run-off from CCD might impact the UPCO facility. Mr. Joseph Dixon (CORPS), who has extensive personal knowledge of the construction of CCD, stated that under no circumstances would storm water from the dam site be diverted toward the UPCO facility through the Union Hills. Instead, excess water during periods of heavy storm run-off would be conveyed through spillways located at the western end of CCD and then returned to Cave Creek.

There are no standing waters, surface water bodies or wetlands at the UPCO facility. The facility drains rapidly, via the washes, during storm events.

A.7. OTHER

Limited industrial activity occurs in the area of Phoenix in which the UPCO facility is located.

Although the UPCO facility is in the Phoenix metropolitan area, the area surrounding it is best characterized as rural rather than urban. The population in the nearby area is concentrated in a 0.5 square mile tract directly north of the UPCO facility. The population density in the tract is approximately 125 people per square mile, while the population density in all other areas adjoining the facility is less than 5 people per square mile. The principle reason for low population density on nearby land is that it is owned by various governmental entities, and no homebuilding or other development has occurred. This large amount of relatively vacant land provides an excellent buffer zone around the UPCO facility.

A.8. CORRECTIVE MEASURES

Corrective measures for soil and groundwater were implemented at the UPCO Facility and completed in 2018 and 2019, respectively. The following are the ADEQ-approved corrective measures alternatives for the Site:

Soil Alternative SA-2 – Soil Excavation and Off-Site Disposal, Soil Capping, and Deed Restrictions

Groundwater Alternative GW-2 – Source Area Groundwater Extraction, Ex Situ Treatment with Anaerobic Bioreactor, Reinjection, and Alluvium In-Situ Biological Reduction.

Soil Alternative SA-2 was implemented to achieve the corrective action objectives (CAOs) developed to be protective of human health as listed in the Corrective Measures Study (Arcadis 2015). Soil Alternative SA-2 activities were conducted in accordance with the approved remedial approach described in the Corrective Measures Implementation Workplan (Arcadis 2016), and include the following:

Excavation and off-site disposal of shallow soil containing constituents of concern (COCs) at concentrations above the cleanup goal at the C-Complex, Old Burn Area, SMA, Waterbore Area, and New Burn Area to eliminate the potential for leaching of COCs in soils to groundwater and eliminate the potential for direct contact with COCs in soil by potential receptors.

Installation of engineered caps in the Waterbore Area, C-Complex Area, and New Burn Area to reduce the potential for receptors to contact COCs in soil and reduce the potential for leaching of COCs in soils to groundwater. Engineered Caps are shown on Exhibits A-1, A-9, A-10, and A-11.

Installation of a rip-rap cover in the Old Burn Area to reduce the potential for receptors to contact COCs in soil and provide erosion control. The rip-rap cover is shown on Exhibits A-1 and A-12.

Placement of declaration of environmental use restrictions (DEURs) on the property to restrict the installation and use of groundwater wells, establish non-residential use areas of the property, and to restrict use of engineered cap areas. The Engineering Controls & Institutional Controls DEUR, Program File Number RID 32248, was recorded on January 24, 2020 and the Institutional Controls DEUR, Program File Number RID 32067, was recorded on December 7, 2018 with the Maricopa County Recorder Office. The DEURs are found in Permit Attachment I, Appendix B,

As part of Groundwater Alternative GW-2, a groundwater treatment plant (GWTP) was installed to address COCs present in groundwater at concentrations exceeding the ADEQ-approved site groundwater cleanup standards. The GWTP is shown on Exhibit A-13

A8.1 Waterbore Area Engineered Cap

The Waterbore Area (Exhibit A-9) consists of.

- a. The engineered cap covers an area of approximately 16,765 square feet which includes the HydroTurf® and concrete anchor trench.
- b. HydroTurf® consists of the HydroTurf® CS system made of an engineered synthetic turf (turf) and hydrobinder infill.

- c. Within the footprint of the cap, two groundwater monitoring wells (MW-13 and MW-19), and three (3) moisture monitoring wells (MMW-1, MMW-2, and MMW-3) penetrate the HydroTurf®.
- d. The cap is sealed around each well with a LLDPE liner boot seal.
- e. The concrete anchor trench encompasses the entire HydroTurf® to anchor the liner and the HydroTurf into the native ground.
- f. Due to potential scouring within the wash from rain events, and to prevent against surface water infiltrating laterally beneath the cap, the anchor trench upgradient of the cap is a minimum of four (4) feet deep, eight (8) feet wide at the surface, and four (4) feet wide at the bottom.
- g. The anchor trench downgradient of the cap is tied into the downgradient rip-rap apron.
- h. Perchlorate concentration in soil beneath the engineered cap are above the site clean-up goal.

A8.2 C-Complex Engineered Cap

The C-Complex Area (Exhibit A-10) consists of.

- a. The engineered cap covers an area of approximately 6,839 square feet which includes the HydroTurf® and concrete anchor trench.
- b. The concrete anchor trench encompasses the entire HydroTurf® to anchor the liner and HydroTurf® into the native ground.
- c. The anchor trench extends approximately two (2) feet deep.
- d. Perchlorate concentration in soil beneath the engineered cap are above the site clean-up goal.

A8.3 New Burn Area Engineered Caps

The New Burn Area (Exhibit A-11) consists of two engineered caps, a large and a small one. Below is a detailed description of the engineered caps.

- a. There are two (2) engineered caps within the New Burn Area.
- b. The larger engineered cap covers an area of approximately 9,664 square feet.
- c. The smaller engineered cap covers an area of approximately 2,486 square feet.
- d. The total area covered for each engineered cap includes the HydroTurf® and concrete anchor trench.

- e. The concrete anchor trench encompasses the entire HydroTurf® to anchor the liner and HydroTurf® into the native ground.
- f. The anchor trench extends approximately two (2) feet deep and is minimum of 2 ½ feet wide.
- g. Within the footprint of the smaller engineered cap, one (1) groundwater monitoring well (MW-21) penetrates the HydroTurf®. The engineered cap is sealed around the well with an LLDPE liner boot seal.
- h. Perchlorate concentration in soil beneath the engineered cap are above the site clean-up goal.

A8.4 Old Burn Area Rip-Rap Cover

The Old Burn Area (OBA) consists of a rip-rap cover in place where arsenic concentrations exceeded the site clean-up goal (Exhibit A-12). The rip-rap cover reduces the potential for receptors to contact COCs in soil and provides erosion control. Below is a detailed description for the rip-rap cover.

- a. A rip-rap cover is included in the OBA.
- b. Areas of soil containing arsenic above the cleanup goal were excavated to approximately 4.5 feet below ground surface and were backfilled with clean soil and compacted to within 1-foot of ground surface.
- c. A nonwoven geotextile fabric was installed on top of the clean backfill soil. Each joint of the geotextile was overlapped at least 12-inches and brought up around the edges of the excavation.
- d. A rip-rap layer was then installed within the backfilled area on top of the geotextile. The top of the rip-rap cover is at the same grade as the surrounding area.

A8.5 Groundwater Treatment Facility (GWTF)

To address COC concentrations exceeding cleanup standards in groundwater at the Site, the corrective measure includes groundwater extraction, ex-situ pretreatment of groundwater containing 1,4-dioxane and 1,1-dichloroethene with liquid granular activated carbon (GAC), treatment of groundwater containing perchlorate with an anoxic fluidized bed reactor (FBR), and reinjection of treated groundwater (Exhibit A-13). Detailed description of the groundwater treatment facilities is listed below.

- a. Ten (10) remediation wells are used for extraction and/or injection. Remediation wells include EW-1, EW-2, IW-1, IW-3, RW-1, RW-2, RW-3, MW-5, MW-11, and MW-20. Each remediation well is housed inside of a traffic rated concrete vault approximately 4 feet by 4 feet and 3 feet deep. Location of remediation wells are shown on Exhibit A-1.
- b. Conveyance lines consist of groundwater conveyance piping, electrical power conduits, and control conduits, consolidated in common trenches connected from each remediation

well vault to the GWTP. In addition, conveyance lines are stubbed near groundwater well PW-1 for potential future tie-in if necessary. All conveyance lines contain 2-inch diameter SDR 11 HDPE pipe for water and 2-inch diameter schedule 40 PVC pipe for electrical power and system communication. All conveyance lines are buried at a minimum depth of 24-inches below ground surface. Location of conveyance lines are shown on Exhibit A-1.

- c. The GWTP consists of the building structure for the process equipment, a fire tank, and a storm-water detention basin located within a central area of the site. Each item is described in more detail below.

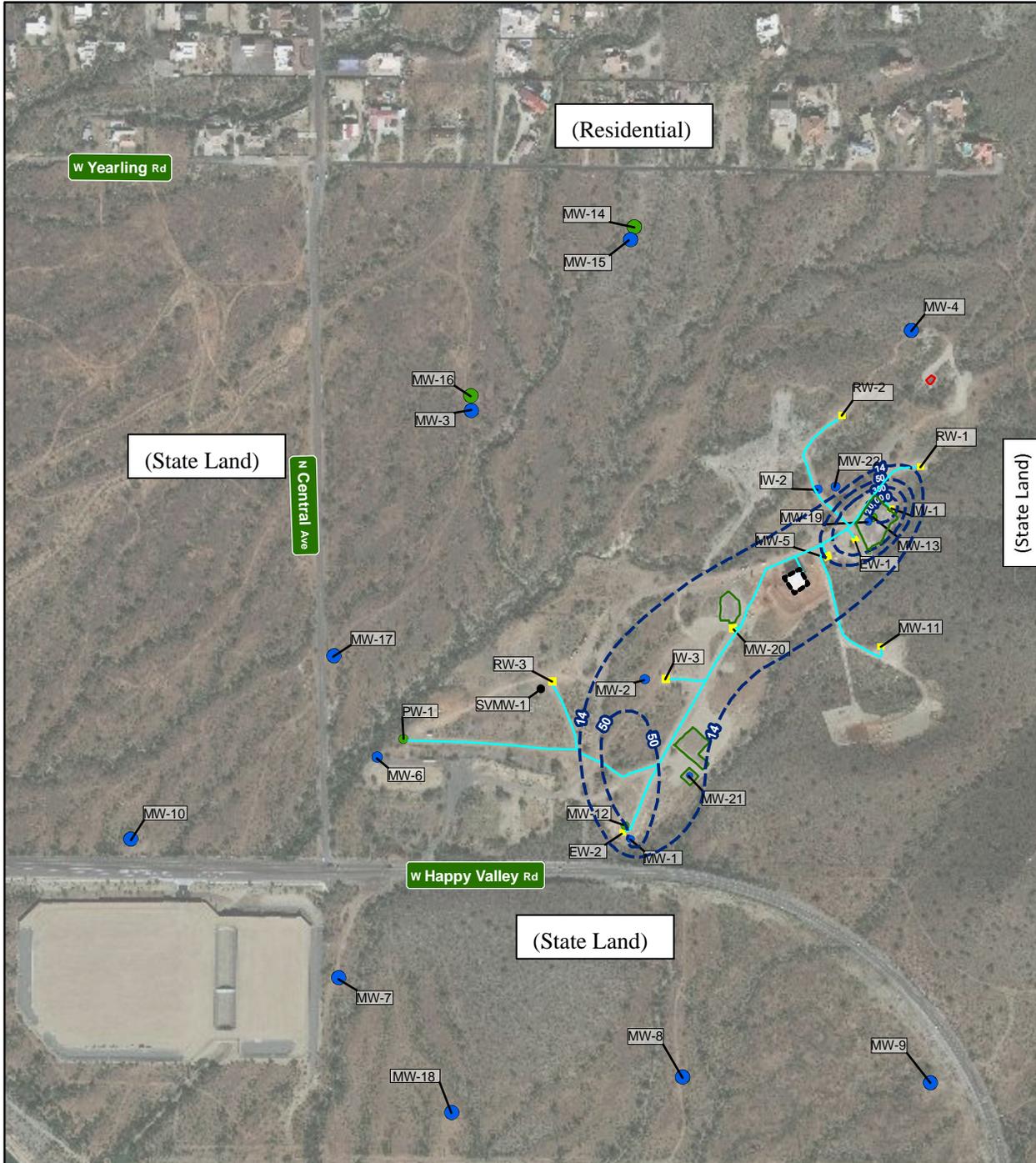
Building: The building structure is one story and approximately 3840 square feet with a control room, process room, and a canopy area. The building foundation is constructed as secondary containment with an 8-inch curb around the perimeter. A sump located in the process room and canopy area automatically transfer any water discharged to the floor back into the system. Process equipment inside the building include GAC vessels, ion exchange vessels, FBR, multi-media filter, and equalization tanks.

Fire Tank: In accordance with the Phoenix Fire Department approved appeal (FPAP 180023), a 20,000-gallon water tank was installed adjacent the building. The fire tank is filled with clean process water through a connected water conveyance line. This water tank provides the water that fire fighters need for fire protection of the building.

Detention Basin: In accordance with the City of Phoenix Storm Water Policies and Standards, a detention basin is required for the installation of the groundwater treatment facility. The detention basin must be able to contain the 100-year, 2-hour duration storm calculated at 10,585 cubic feet. The as-built volume of the detention basin is 14,440 cubic feet. To meet the required drain time, an 18-inch diameter pipe with a 4-inch orifice plate is installed to drain into the unnamed ephemeral wash along the south end of the detention basin. Rip-rap at the outfall provide erosion protection.

A8.6 Permitted Facilities Security

In accordance with R18-8-264.A (40 CFR §264.14), all permitted facilities at the site will be properly secured using fencing and locked gates to control entry. Security fence locations are shown on Exhibit B-1 of the Security Plan (Attachment B).

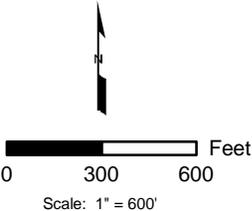


LEGEND

- Groundwater Treatment Facility
- Groundwater monitoring well
- Groundwater monitoring well (deep)
- Remediation well
- Soil vapor monitoring well
- Rip Rap Cover
- Engineered Cap
- Conveyance Lines
- Perchlorate concentration contour, January 2020 (dashed where inferred)

NOTES

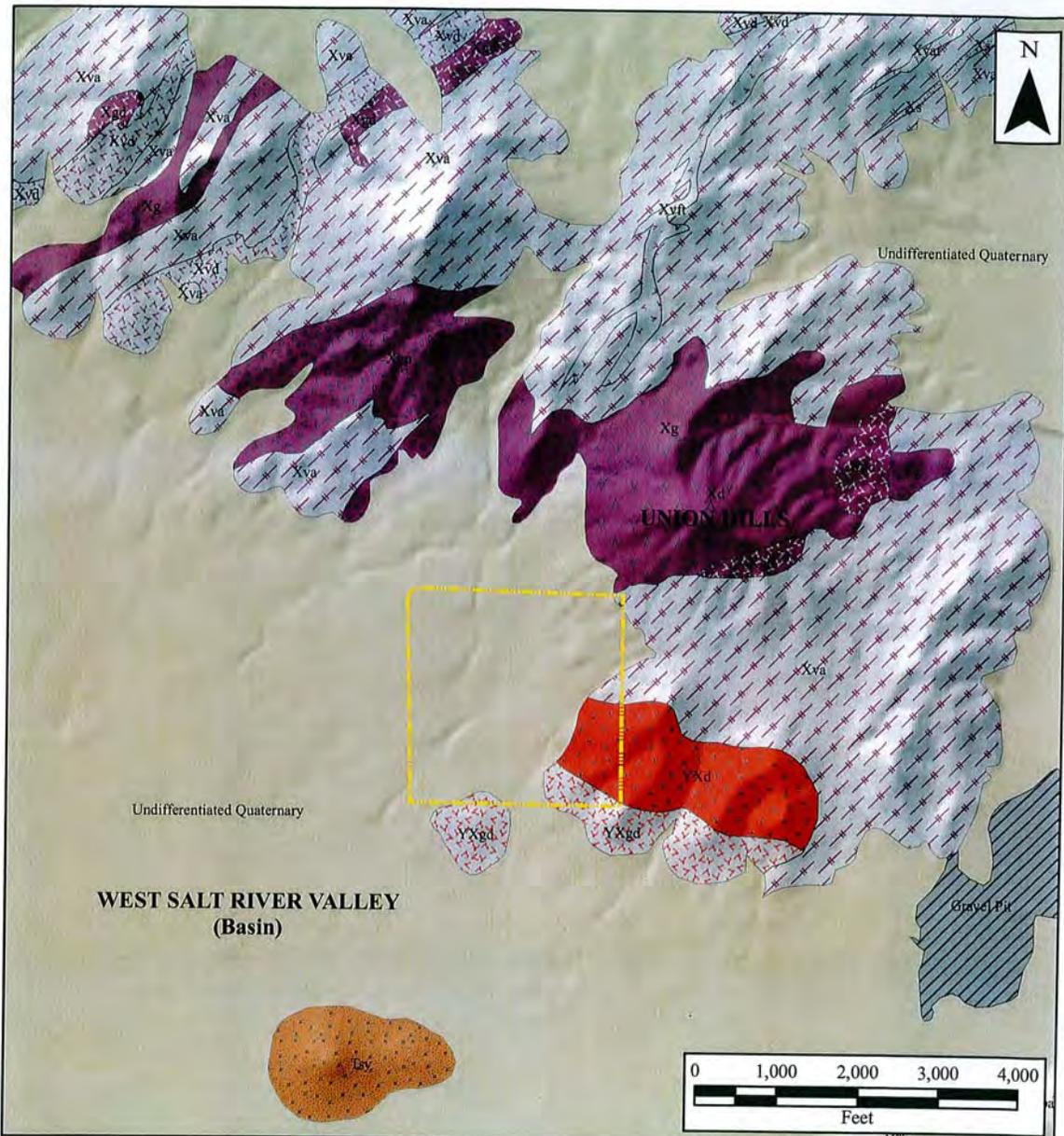
- Aerial photo source: ESRI World Imagery.
- Perchlorate concentration contours are expressed in micrograms per liter (µg/L).



FORMER UNIVERSAL PROPULSION COMPANY, INC. FACILITY
 PHOENIX, ARIZONA
 RCRA PERMIT

SITE FACILITIES





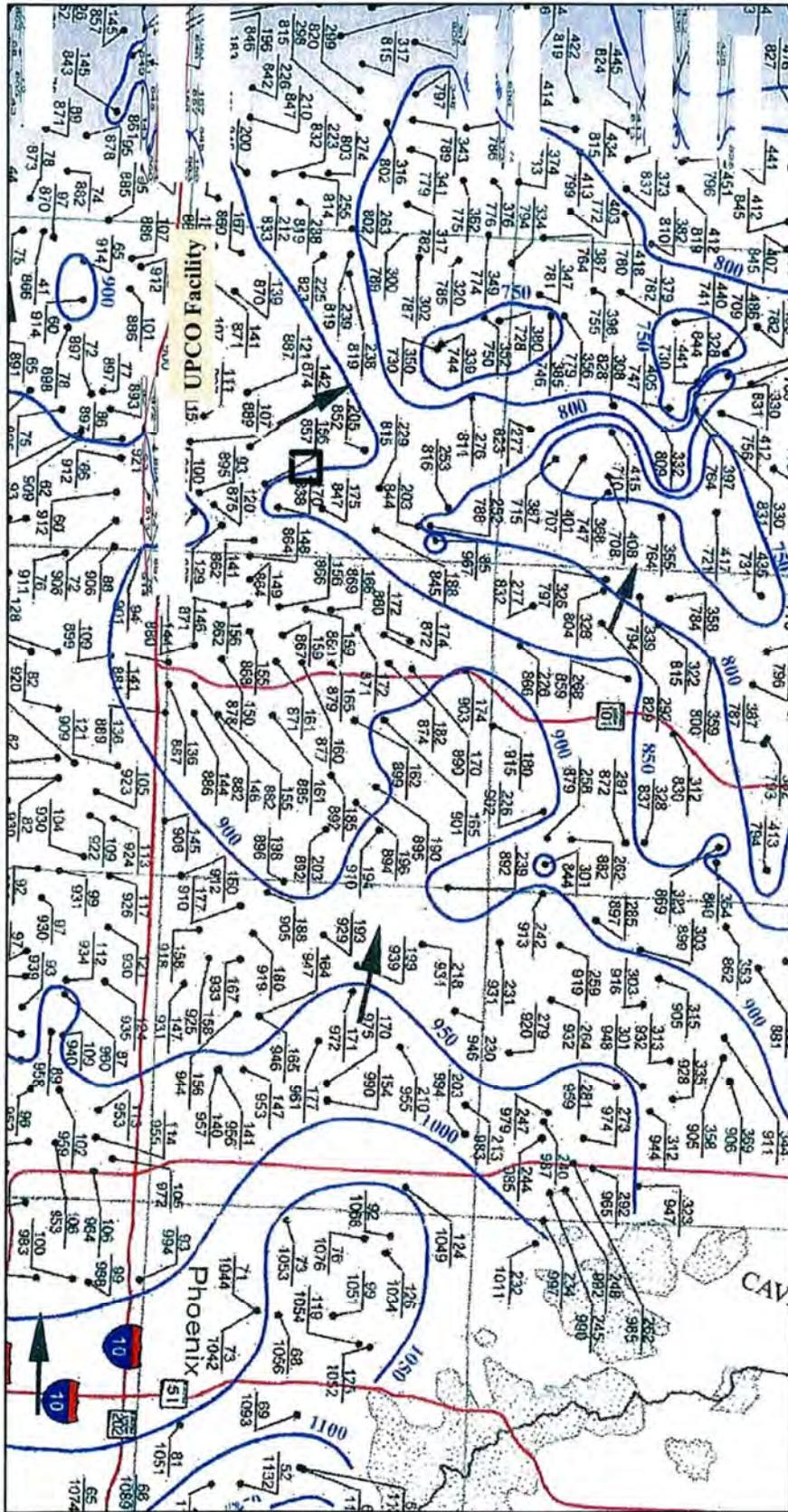
Legend

Basin		Proterozoic Bedrock Units			
Fill Deposits		Intrusive		Meta-volcanic	Meta-sedimentary
Q - Undifferentiated	YXd	Xgp	Xva	Xs	
Tsy	YXg	Xgd	Xvft		
Gravel Pit	YXgd	Xd	Xvat		
Lease Property Boundary	Xg	Xvd	Xvf		

Note: Geology taken from Holloway and Leighty, 1995.

MALCOLM PIRNIE	4646 E Van Buren St. Suite 400 Phoenix, AZ 85008
	Geologic Map UPCO RCRA Permit Renewal Universal Propulsion Company, Inc.
April 2009	Exhibit A-3

M:\3994003\GIS\Projects_MXD\RCRA_Permit_Renewal\April 2009 Submittal



Source: S.J Rascona, 2005. Base Map from USGS, Phoenix, Arizona, 1954, revised 1969, 1:250,000.

Legend

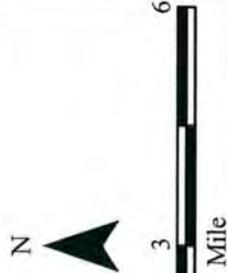
-  Bedrock
-  Valley-fill deposits
-  Well location, depth to water in feet below ground surface, and water table elevation (November 2002 to February 2003) (2003)
-  950 Water level elevation contour in feet above mean sea level. Contour interval is 50 feet

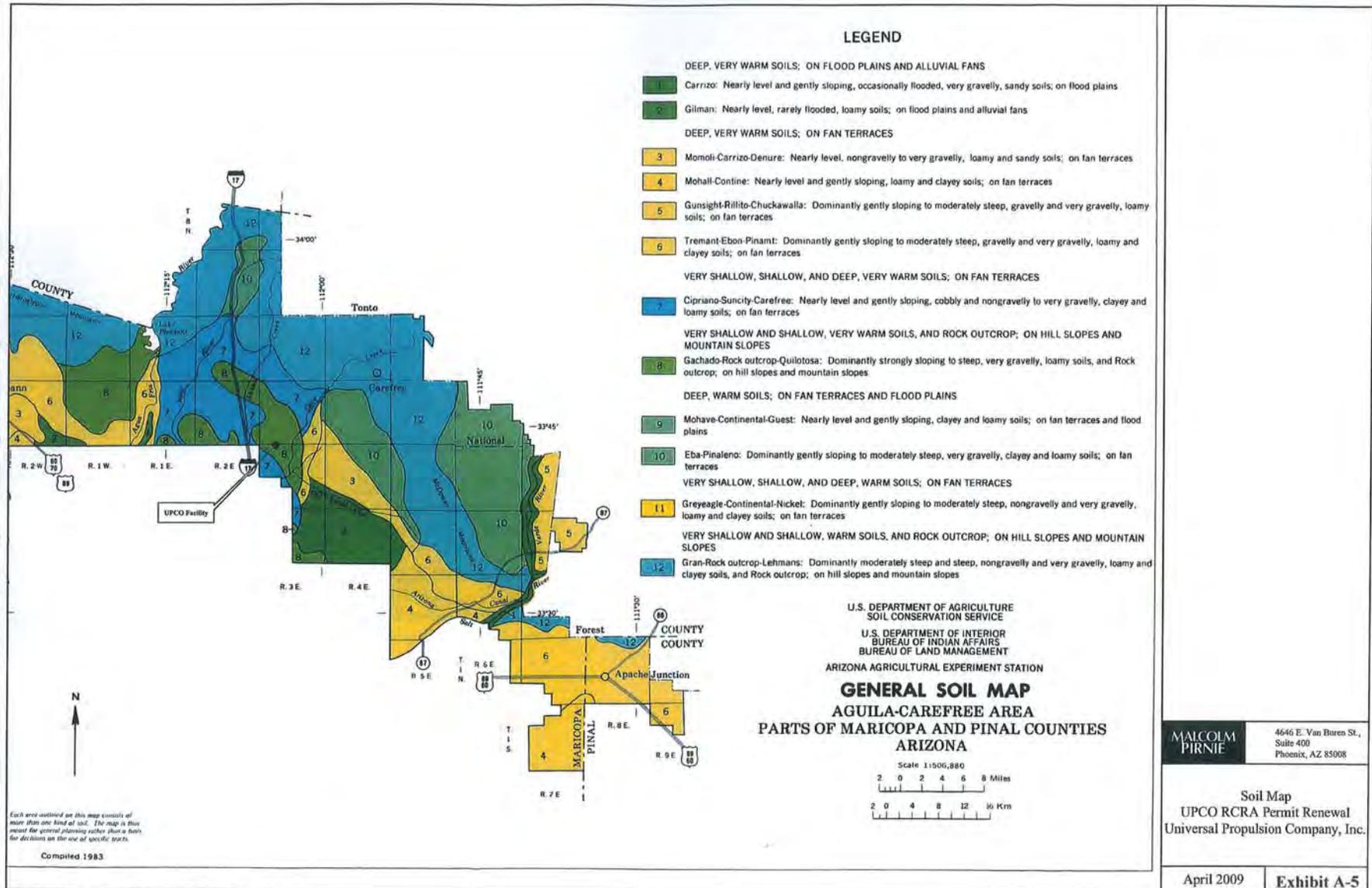
MALCOLM PIRNIE
 4646 E. Van Buren St.,
 Suite 400
 Phoenix, AZ 85008

Water Table Map
 UPCO RCRA Permit Renewal
 Universal Propulsion Company, Inc.

April 2009

Exhibit A-4

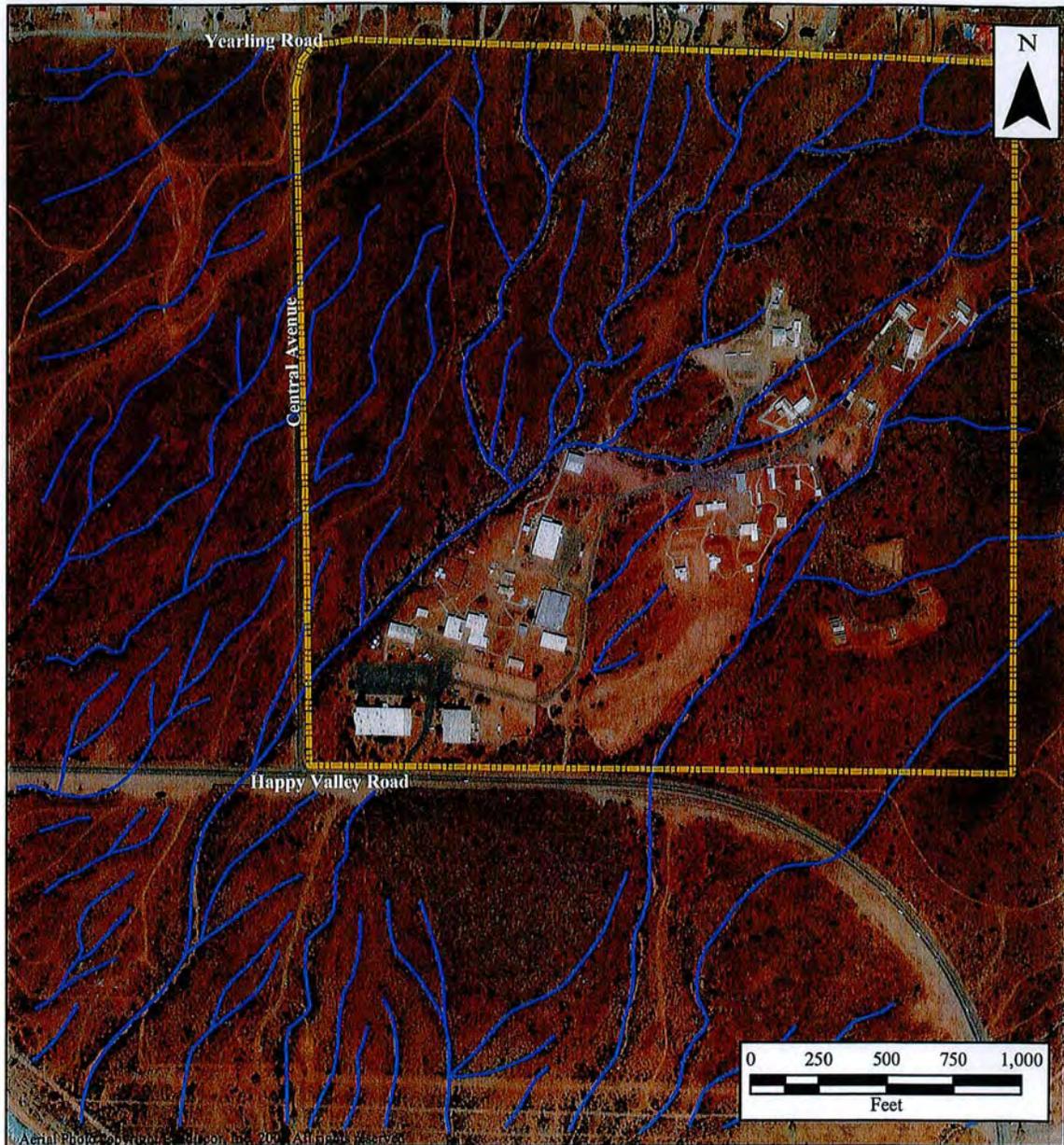




MALCOLM PIRNIE 4646 E. Van Buren St., Suite 400 Phoenix, AZ 85008

Soil Map
 UPCO RCRA Permit Renewal
 Universal Propulsion Company, Inc.

April 2009 Exhibit A-5



Legend

-  Lease Property Boundary
-  Drainage

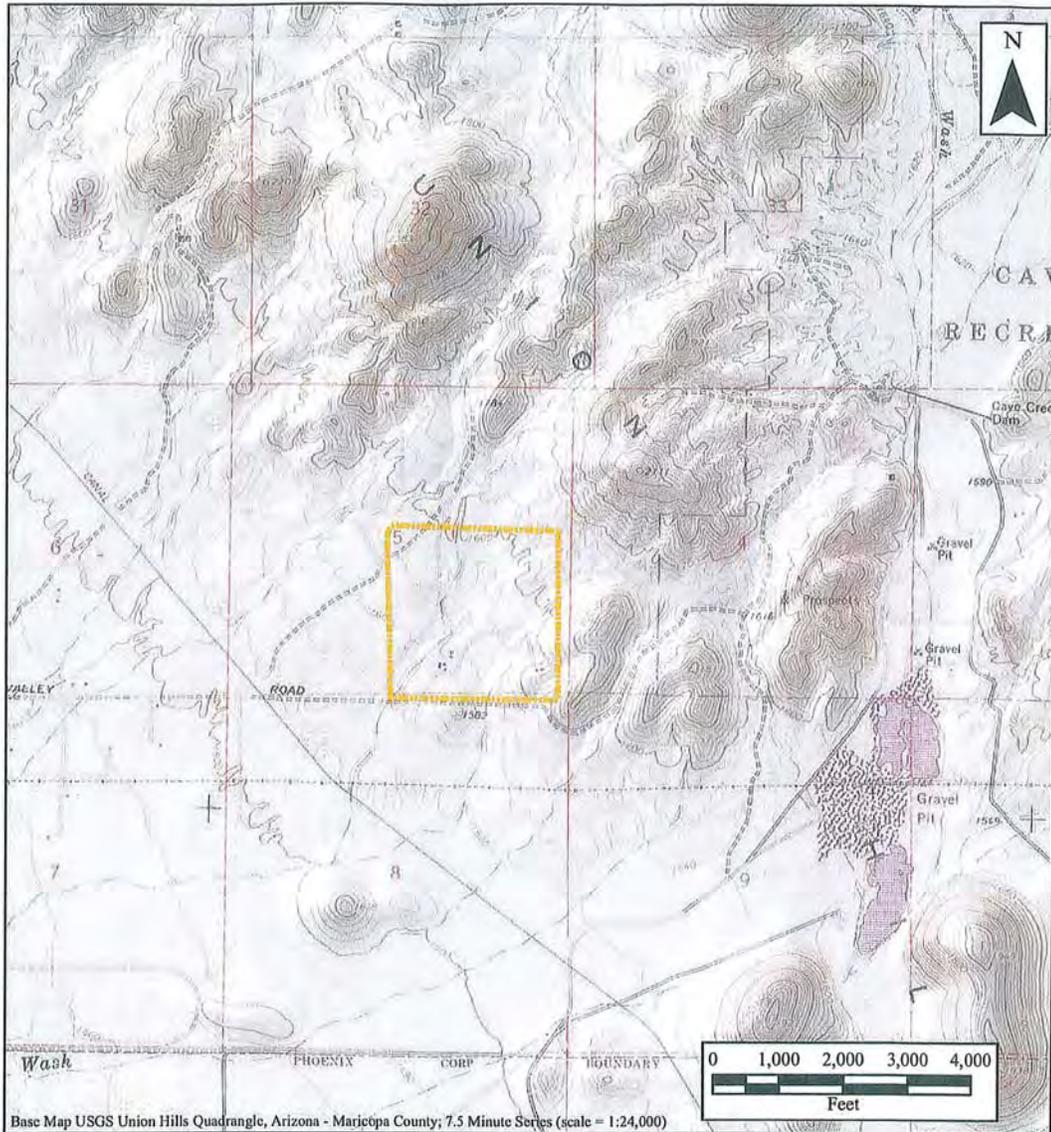
**MAICOLM
PIRNIE**

4646 E. Van Buren St.,
Suite 400
Phoenix, AZ 85008

Surface Water Drainage
UPCO RCRA Permit Renewal
Universal Propulsion Company, Inc.

April 2009

Exhibit A-6



Base Map USGS Union Hills Quadrangle, Arizona - Maricopa County; 7.5 Minute Series (scale = 1:24,000)

Legend

 Lease Property Boundary

**MALCOLM
 PIRNIE**

4646 E. Van Buren St.,
 Suite 400
 Phoenix, AZ 85008

USGS Topographic Map
 UPCO RCRA Permit Renewal

September 2008

Exhibit A-7

Exhibit A-8

Acknowledgement of Partial Closure (OBU, OBD, and TTU)



Janice K. Brewer
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.azdeq.gov



Patrick J. Cunningham
Acting Director

February 23, 2009
REF: HWP- EX2250

Mr. Jerry Ricketts
Universal Propulsion Company
Goodrich Interiors
25401 N. Central Avenue
Phoenix, AZ 85085-2837

**Re: Acknowledgement of Partial Closure;
Universal Propulsion Company, 25401 North Central Ave., Phoenix, AZ 85027;
EPA ID No. AZD 980 814 479**

Dear Mr. Ricketts:

The Arizona Department of Environmental Quality (ADEQ) has completed its review of the Closure Report, the owner/operator closure certification, and the engineer's certification submitted by Universal Propulsion Company (UPCO) on December 19, 2008. ADEQ finds that the report adequately documents closure of the Open Burn Unit, the Open Burn Devices, and the Thermal Treatment Unit, formerly covered by UPCO's Hazardous Waste Permit. The report shows that the units were properly decontaminated, characterized, and disposed. Decontamination residues were properly sampled, characterized and managed in accordance with the approved Closure Plan. The decontamination and disposition of the former water wand and former evaporation tank in the Waterbore Area were also completed in accordance with the approved Closure Plan.

ADEQ hereby acknowledges that UPCO has completed closure of the permitted hazardous waste treatment units at the facility in accordance with the approved Closure Plan. ADEQ notes that existing soil and groundwater contamination at the site will require post-closure monitoring and corrective action. Post-closure monitoring and corrective action requirements will be addressed in the new hazardous waste permit for the facility.

UPCO is notified that it must maintain the full financial assurance amounts (corrective action surety bond and closure trust fund) already established for the facility. Additional financial assurance may be required pending ADEQ's review of the permit application and/or following approval of the forthcoming correctives measures study.

Northern Regional Office
1801 W. Route 66 • Suite 117 • Flagstaff, AZ 86001
(928) 779-0313

Southern Regional Office
400 West Congress Street • Suite 433 • Tucson, AZ 85701
(520) 628-6733

February 23, 2009
Mr. Jerry Ricketts
REF: HWP-EX2250
Page 2 of 2

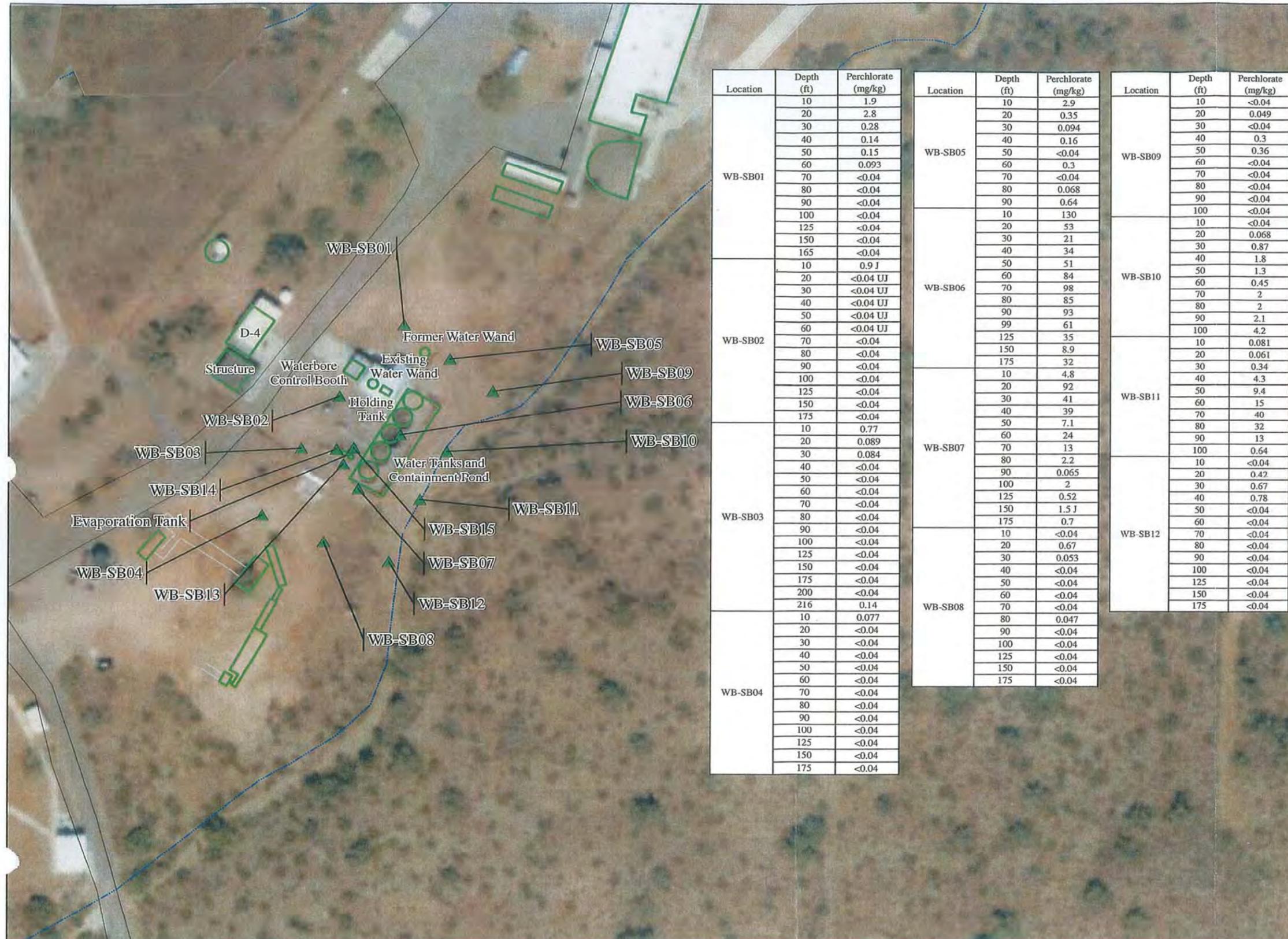
If you have any questions do not hesitate to contact me at 602-771-4160.

Sincerely,



Anthony Leverock
Hazardous Waste Permits Unit
Waste Programs Division

cc: Greg Workman, Goodrich Aircraft Interior Products
Joseph Mikitish, Attorney General's Office
Bruce Campbell, State Land Department
Robin Thomas, Manager of Waste Permits Section
Mel Bunkers, Supervisor of Hazardous Waste Inspections and Compliance Unit
Rich Olm, Environmental Engineer Sr



Legend

- Waterbore Soil Data
- D-Complex Site Facilities
- Sidewalk or Paved Area
- Ephemeral Wash
- Paved Road

mg/kg = milligram per kilogram

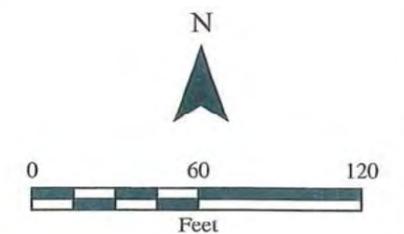
< = Analyte not reported above the listed laboratory detection limit

ft = feet below ground surface

J = Analyte was positively identified; however, the result should be considered an estimate

UJ = The listed laboratory detection limit is considered an estimate

Note: Soil Boring WB-SB13 through WB-SB15 were not analyzed for perchlorate

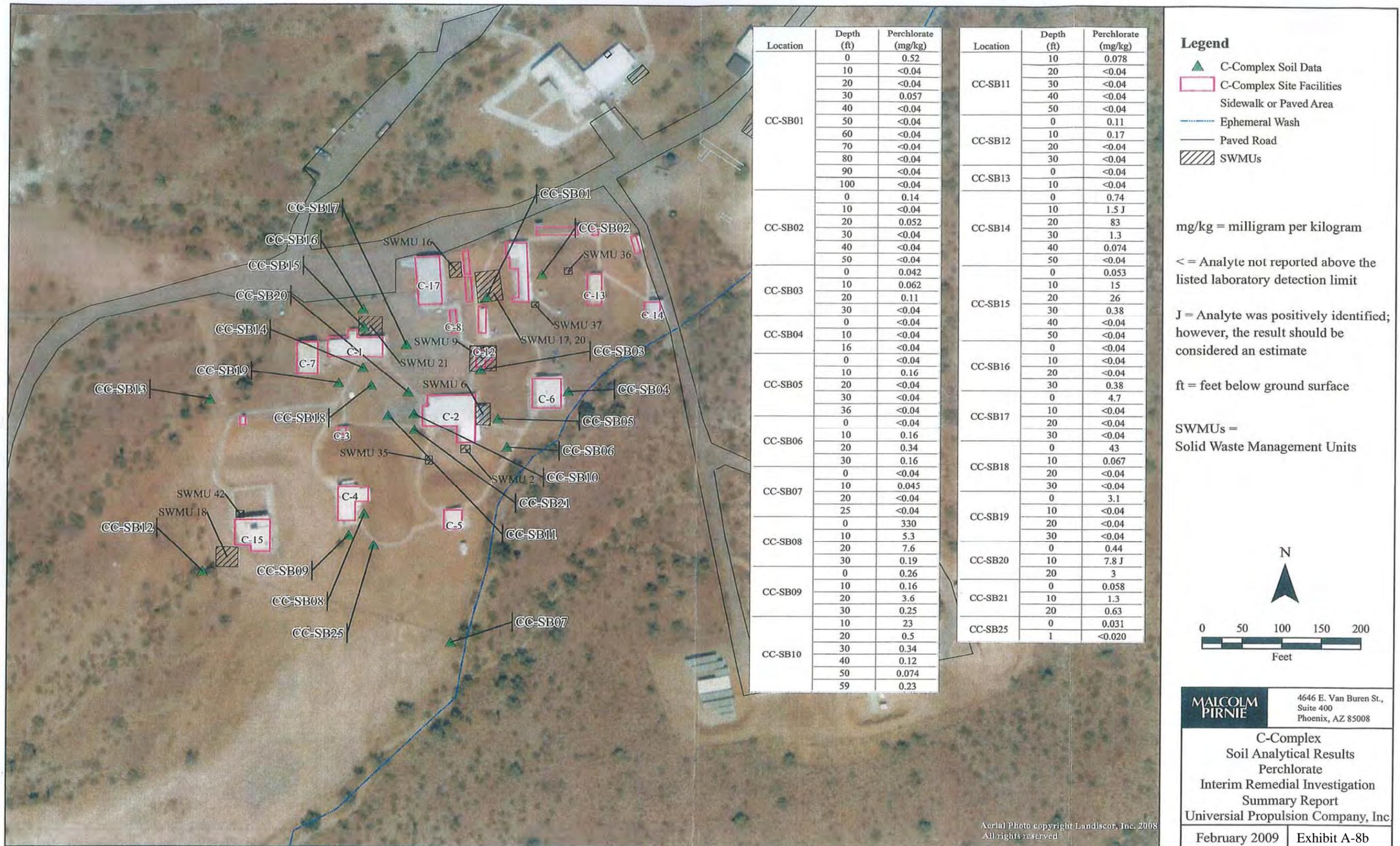


Location	Depth (ft)	Perchlorate (mg/kg)	
WB-SB01	10	1.9	
	20	2.8	
	30	0.28	
	40	0.14	
	50	0.15	
	60	0.093	
	70	<0.04	
	80	<0.04	
	90	<0.04	
	100	<0.04	
	125	<0.04	
	150	<0.04	
	165	<0.04	
	WB-SB02	10	0.9 J
		20	<0.04 UJ
30		<0.04 UJ	
40		<0.04 UJ	
50		<0.04 UJ	
60		<0.04 UJ	
70		<0.04	
80		<0.04	
90		<0.04	
100		<0.04	
125		<0.04	
150		<0.04	
175		<0.04	
WB-SB03		10	0.77
		20	0.089
	30	0.084	
	40	<0.04	
	50	<0.04	
	60	<0.04	
	70	<0.04	
	80	<0.04	
	90	<0.04	
	100	<0.04	
	125	<0.04	
	150	<0.04	
	175	<0.04	
	200	<0.04	
	216	0.14	
WB-SB04	10	0.077	
	20	<0.04	
	30	<0.04	
	40	<0.04	
	50	<0.04	
	60	<0.04	
	70	<0.04	
	80	<0.04	
	90	<0.04	
	100	<0.04	
	125	<0.04	
	150	<0.04	
	175	<0.04	

Location	Depth (ft)	Perchlorate (mg/kg)	
WB-SB05	10	2.9	
	20	0.35	
	30	0.094	
	40	0.16	
	50	<0.04	
	60	0.3	
	70	<0.04	
	80	0.068	
	90	0.64	
	10	130	
	20	53	
	30	21	
	40	34	
	50	51	
	60	84	
WB-SB06	70	98	
	80	85	
	90	93	
	99	61	
	125	35	
	150	8.9	
	175	32	
	WB-SB07	10	4.8
		20	92
		30	41
		40	39
		50	7.1
		60	24
		70	13
		80	2.2
90		0.065	
100		2	
125		0.52	
150		1.5 J	
175		0.7	
WB-SB08		10	<0.04
		20	0.67
	30	0.053	
	40	<0.04	
	50	<0.04	
	60	<0.04	
	70	<0.04	
	80	0.047	
	90	<0.04	
	100	<0.04	
	125	<0.04	
	150	<0.04	
	175	<0.04	

Location	Depth (ft)	Perchlorate (mg/kg)	
WB-SB09	10	<0.04	
	20	0.049	
	30	<0.04	
	40	0.3	
	50	0.36	
	60	<0.04	
	70	<0.04	
	80	<0.04	
	90	<0.04	
	100	<0.04	
	10	<0.04	
	20	0.068	
	30	0.87	
	40	1.8	
	WB-SB10	50	1.3
60		0.45	
70		2	
80		2	
90		2.1	
100		4.2	
10		0.081	
20		0.061	
30		0.34	
40		4.3	
WB-SB11		50	9.4
		60	15
		70	40
		80	32
		90	13
	100	0.64	
	WB-SB12	10	<0.04
		20	0.42
		30	0.67
		40	0.78
		50	<0.04
		60	<0.04
		70	<0.04
		80	<0.04
		90	<0.04
100		<0.04	
125		<0.04	
150		<0.04	
175		<0.04	

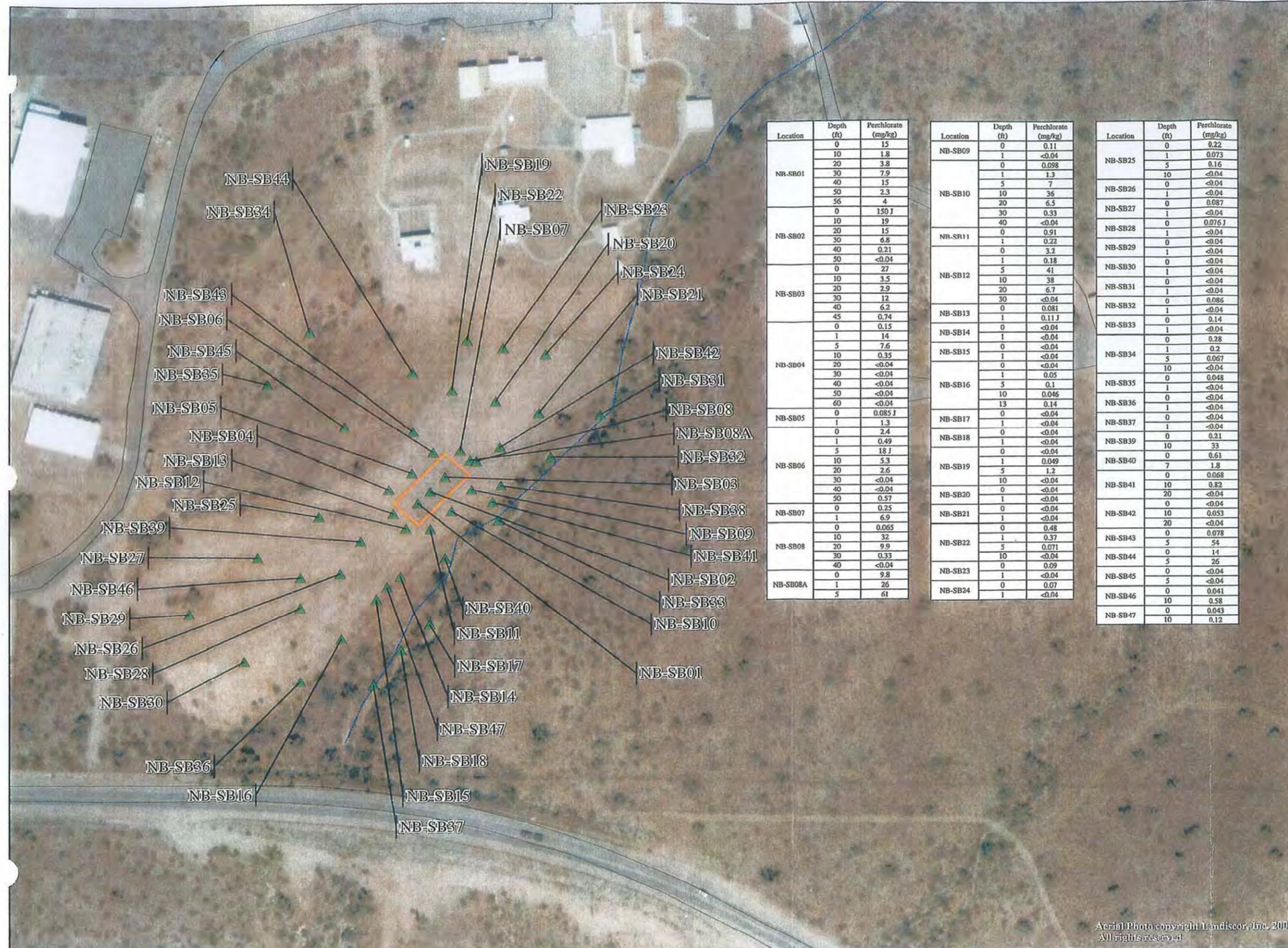
MALCOLM PIRNIE	4646 E. Van Buren St., Suite 400 Phoenix, AZ 85008
Waterbore Soil Analytical Results Perchlorate Interim Remedial Investigation Summary Report Universal Propulsion Company, Inc.	
February 2009	Exhibit A-8a



MALCOLM PIRNIE 4646 E. Van Buren St., Suite 400 Phoenix, AZ 85008

C-Complex Soil Analytical Results Perchlorate Interim Remedial Investigation Summary Report
 Universal Propulsion Company, Inc.

February 2009 Exhibit A-8b



Location	Depth (ft)	Perchlorate (mg/kg)
NB-SB01	0	15
	10	1.8
	20	3.8
	30	7.9
	40	15
	50	2.3
NB-SB02	0	150 J
	10	19
	20	15
	30	6.8
	40	0.21
	50	<0.04
NB-SB03	0	27
	10	3.5
	20	2.9
	30	12
	40	6.2
	45	0.74
NB-SB04	0	0.15
	1	14
	5	7.6
	10	0.35
	20	<0.04
	30	<0.04
NB-SB05	0	0.085 J
	1	1.3
	0	2.4
	1	0.49
	5	18 J
	10	5.3
NB-SB06	0	2.6
	30	<0.04
	40	<0.04
	50	0.57
	0	0.25
	1	6.9
NB-SB07	0	0.065
	10	32
	20	9.9
	30	0.33
	40	<0.04
	0	9.8
NB-SB08A	1	26
	5	61

Location	Depth (ft)	Perchlorate (mg/kg)
NB-SB09	0	0.11
	1	<0.04
NB-SB10	0	0.098
	1	1.3
	5	7
	10	36
	20	6.5
	30	0.33
NB-SB11	0	0.91
	1	0.22
	0	3.2
NB-SB12	1	0.18
	5	41
	10	38
	20	6.7
NB-SB13	0	<0.04
	0	0.081
	1	0.11 J
NB-SB14	0	<0.04
	1	<0.04
NB-SB15	0	<0.04
	1	<0.04
	0	<0.04
NB-SB16	1	0.05
	5	0.1
	10	0.046
NB-SB17	13	0.14
	0	<0.04
	1	<0.04
NB-SB18	0	<0.04
	1	<0.04
NB-SB19	0	<0.04
	1	0.049
	5	1.2
NB-SB20	10	<0.04
	0	<0.04
	1	<0.04
NB-SB21	0	<0.04
	1	<0.04
	0	0.48
NB-SB22	1	0.37
	5	0.071
	10	<0.04
NB-SB23	0	0.09
	1	<0.04
NB-SB24	0	0.07
	1	<0.04

Location	Depth (ft)	Perchlorate (mg/kg)
NB-SB25	0	0.22
	1	0.073
	5	0.16
NB-SB26	10	<0.04
	0	<0.04
	1	<0.04
NB-SB27	0	0.087
	1	<0.04
NB-SB28	0	0.076 J
	1	<0.04
NB-SB29	0	<0.04
	1	<0.04
NB-SB30	0	<0.04
	1	<0.04
NB-SB31	0	<0.04
	1	<0.04
	0	0.086
NB-SB32	0	<0.04
	1	<0.04
NB-SB33	0	0.14
	1	<0.04
NB-SB34	0	0.28
	1	0.2
	5	0.067
NB-SB35	10	<0.04
	0	<0.04
	1	<0.04
NB-SB36	0	0.048
	1	<0.04
NB-SB37	0	<0.04
	1	<0.04
NB-SB38	0	0.21
	10	33
NB-SB39	0	0.61
	7	1.8
	0	0.068
NB-SB40	10	0.82
	20	<0.04
	0	<0.04
NB-SB41	0	<0.04
	10	0.053
NB-SB42	20	<0.04
	0	0.078
	5	54
NB-SB43	0	14
	5	26
NB-SB44	0	<0.04
	5	<0.04
NB-SB45	0	0.041
	10	0.58
	0	0.043
NB-SB46	0	0.41
	10	0.58
NB-SB47	0	0.043
	10	0.12

Legend

- ▲ New Burn Soil Data
- Building
- ◻ Former Open Burn Unit
- ◻ Sidewalk or Paved Area
- Ephemeral Wash
- Paved Road

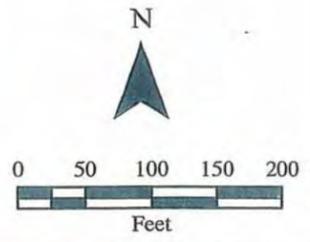
mg/kg = milligram per kilogram

< = Analyte not reported above the listed laboratory detection limit

ft = feet below ground surface

J = Analyte was positively identified; however, the result should be considered an estimate

Note: Soil samples collected at NB-SB38 were not analyzed for perchlorate

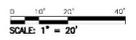
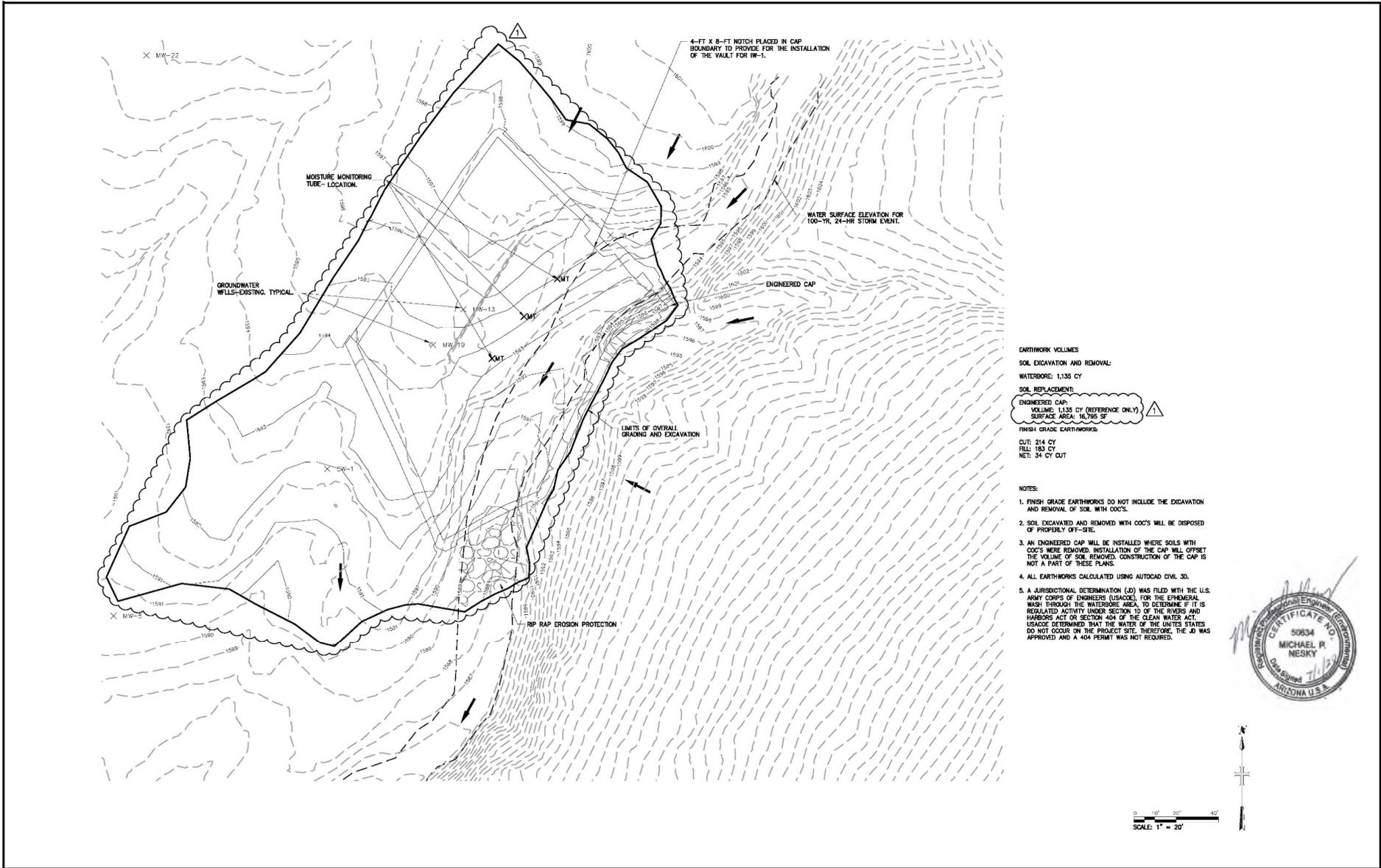


MALCOLM PIRNIE 4646 E. Van Buren St., Suite 400 Phoenix, AZ 85008

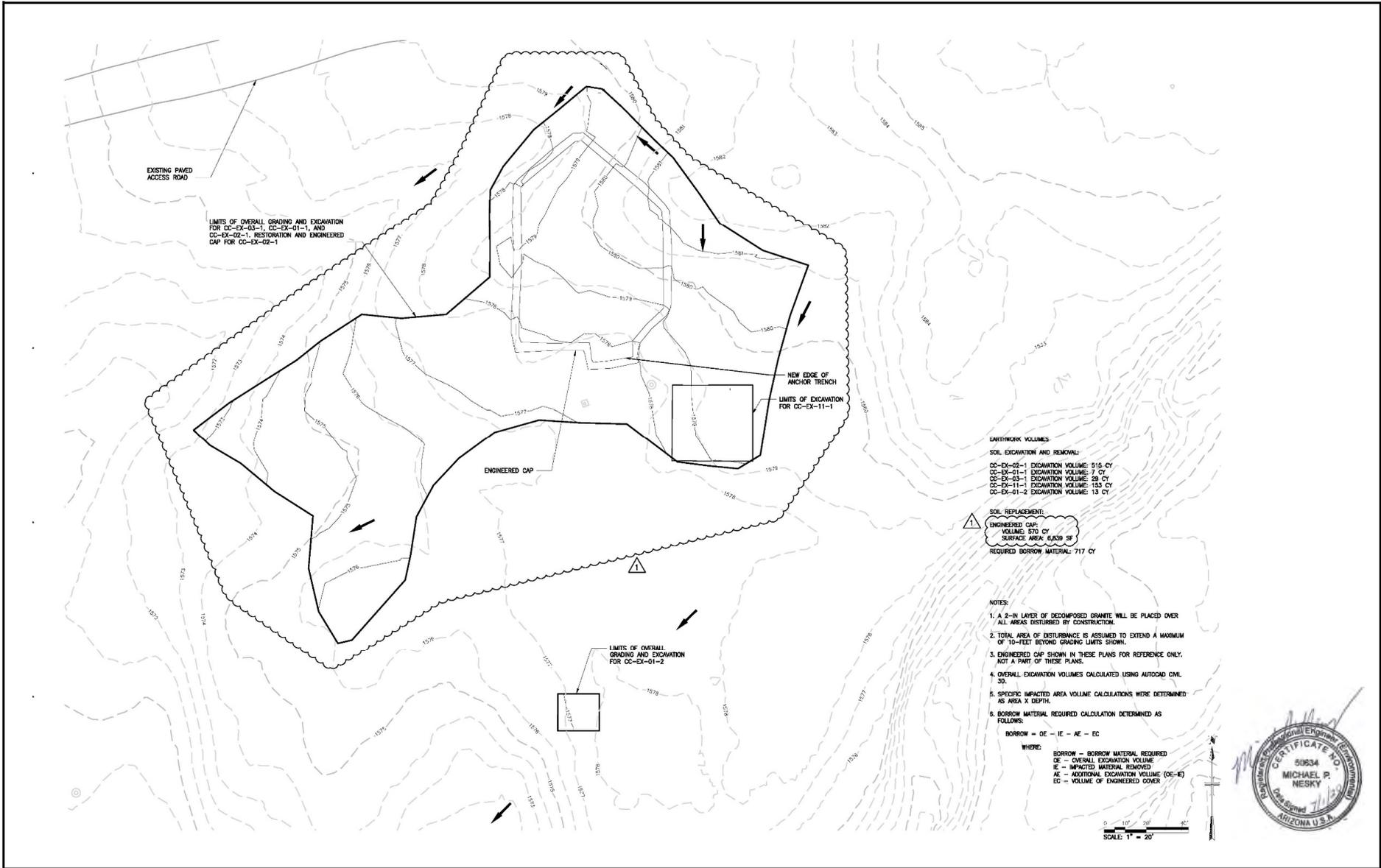
New Burn Area
 Soil Analytical Results
 Perchlorate
 Interim Remedial Investigation
 Summary Report
 Universal Propulsion Company, Inc.

February 2009 Exhibit A-8c

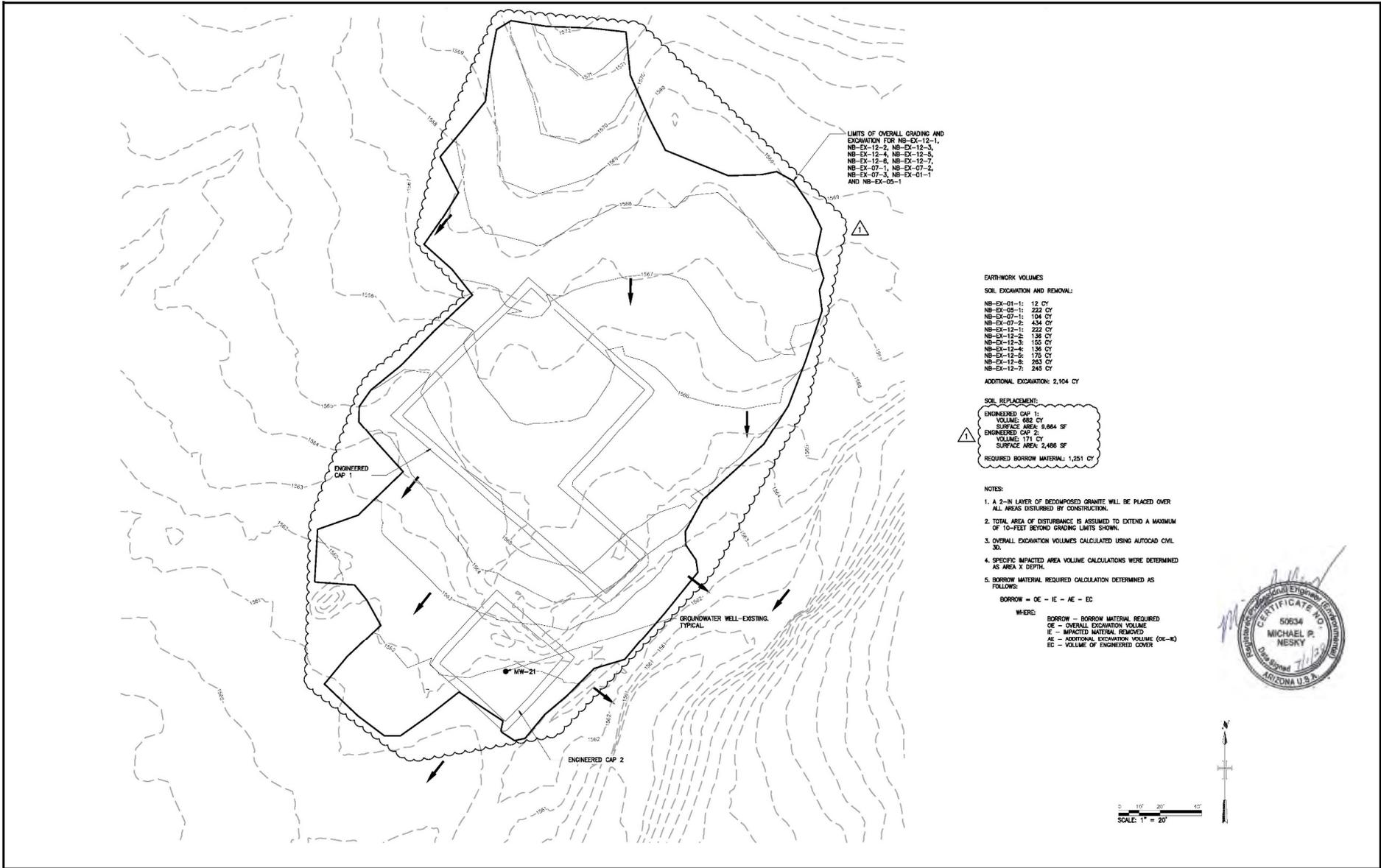
Aerial Photo copyright LandisCor, Inc. 2008
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LEGEND Approximate Surface Flow Direction Existing Groundwater Well Location Existing Moisture Monitoring Tube Location Surface Elevation Contours	NOTES - Engineered CAP area is ~16,795 square feet.	FORMER UNIVERSAL PROPULSION COMPANY, INC. PHOENIX, ARIZONA AZ HWMA PERMIT - ATTACHMENT A	EXHIBIT A-9
	WATERBORE AREA CAP		
		ARCADIS Design & Consultancy for natural and built assets	

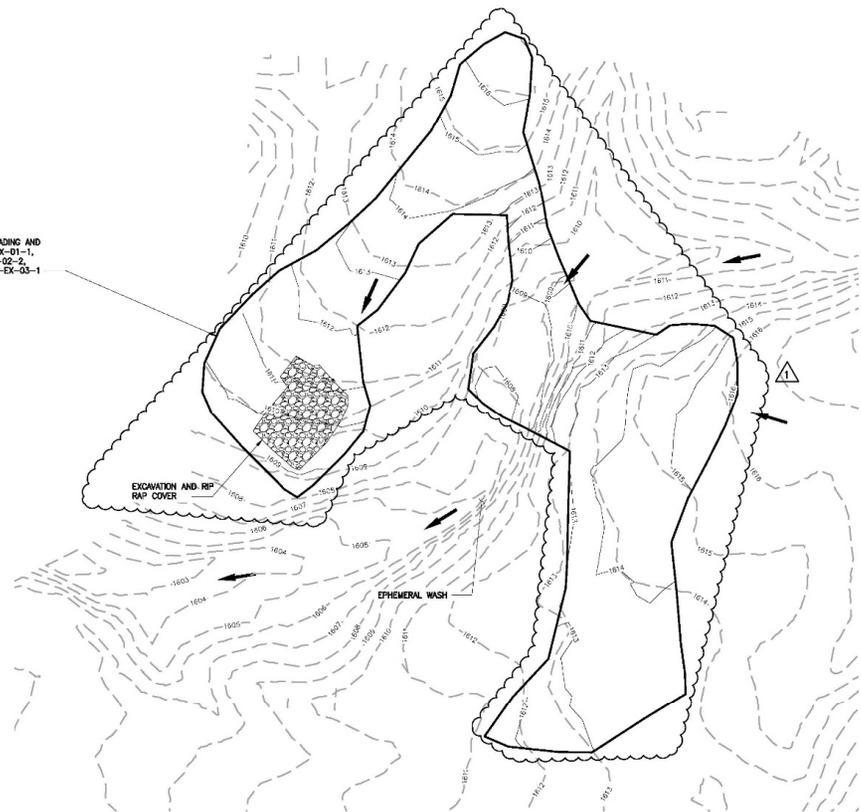


<p>LEGEND</p> <p>Approximate Surface Flow Direction</p> <p>Surface Elevation Contours</p>	<p>NOTES</p> <p>- Engineered CAP area is ~6,839 square feet.</p>	<p>FORMER UNIVERSAL PROPULSION COMPANY, INC. PHOENIX, ARIZONA AZ HWMA PERMIT - ATTACHMENT A</p> <p>C-COMPLEX AREA CAP</p> <p>ARCADIS Design & Consultancy for natural and built assets</p> <p>EXHIBIT A-10</p>
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LEGEND Approximate Surface Flow Direction Surface Elevation Contours	MW-21 Existing Groundwater Well Location	NOTES - Large Engineered CAP area (1) is ~9,664 square feet. - Small Engineered CAP area (2) is ~2,486 square feet.	FORMER UNIVERSAL PROPULSION COMPANY, INC. PHOENIX, ARIZONA AZ HWMA PERMIT - ATTACHMENT A	
	NEW BURN AREA CAPS		ARCADIS Design & Consultancy for natural and built assets	
				EXHIBIT A-11

LIMITS OF OVERALL GRADING AND EXCAVATION FOR OB-EX-01-1, OB-EX-03-2, OB-EX-02-2, OB-EX-02-1 AND OB-EX-03-1



EARTHWORK VOLUMES
SOIL EXCAVATION AND REMOVAL:
 OB-EX-01-1: 40 CY
 OB-EX-02-1 & OB-EX-03-1: 120 CY
 OB-EX-02-2: 40 CY
 OB-EX-03-2: 8 CY

SOIL REPLACEMENT:
 RIP RAP COVER:
 VOLUME: 24 CY
 SURFACE AREA: 765 SF
 REQUIRED BORROW MATERIAL: 192 CY

- NOTES:**
1. A 2-IN LAYER OF DECOMPOSED GRANITE WILL BE PLACED OVER ALL AREAS DISTURBED BY CONSTRUCTION, EXCEPT THE RIP RAP CAP AREA.
 2. TOTAL AREA OF DISTURBANCE IS ASSUMED TO EXTEND A MAXIMUM OF 10'-FEET BEYOND GRADING LIMITS SHOWN.
 3. CONTRACTOR SHALL MINIMIZE DISTURBANCE WITHIN THE EPHEMERAL WASH TO THE EXTENT PRACTICAL TO COMPLETE THE WORK.
 4. OVERALL EXCAVATION VOLUMES CALCULATED USING AUTOCAD CIVIL 3D.
 5. SPECIFIC IMPACTED AREA VOLUME CALCULATIONS WERE DETERMINED AS AREA X DEPTH.
 6. BORROW MATERIAL REQUIRED CALCULATION DETERMINED AS FOLLOWS:
 BORROW = OE - IE - AE - EC
 WHERE:
 BORROW = BORROW MATERIAL REQUIRED
 OE = OVERALL EXCAVATION VOLUME
 IE = IMPACTED MATERIAL REMOVED
 AE = ADDITIONAL EXCAVATION VOLUME (OE-IE)
 EC = VOLUME OF ENGINEERED COVER



LEGEND

- Approximate Surface Flow Direction
- Surface Elevation Contours

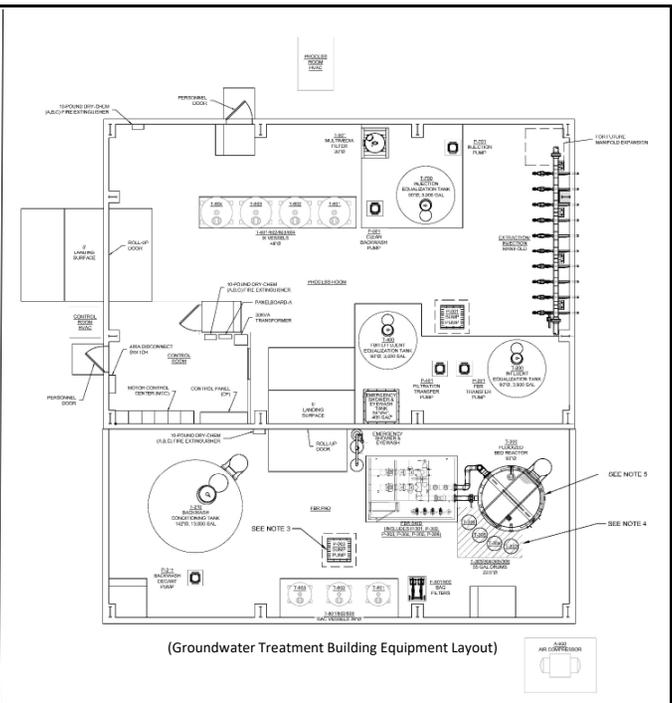
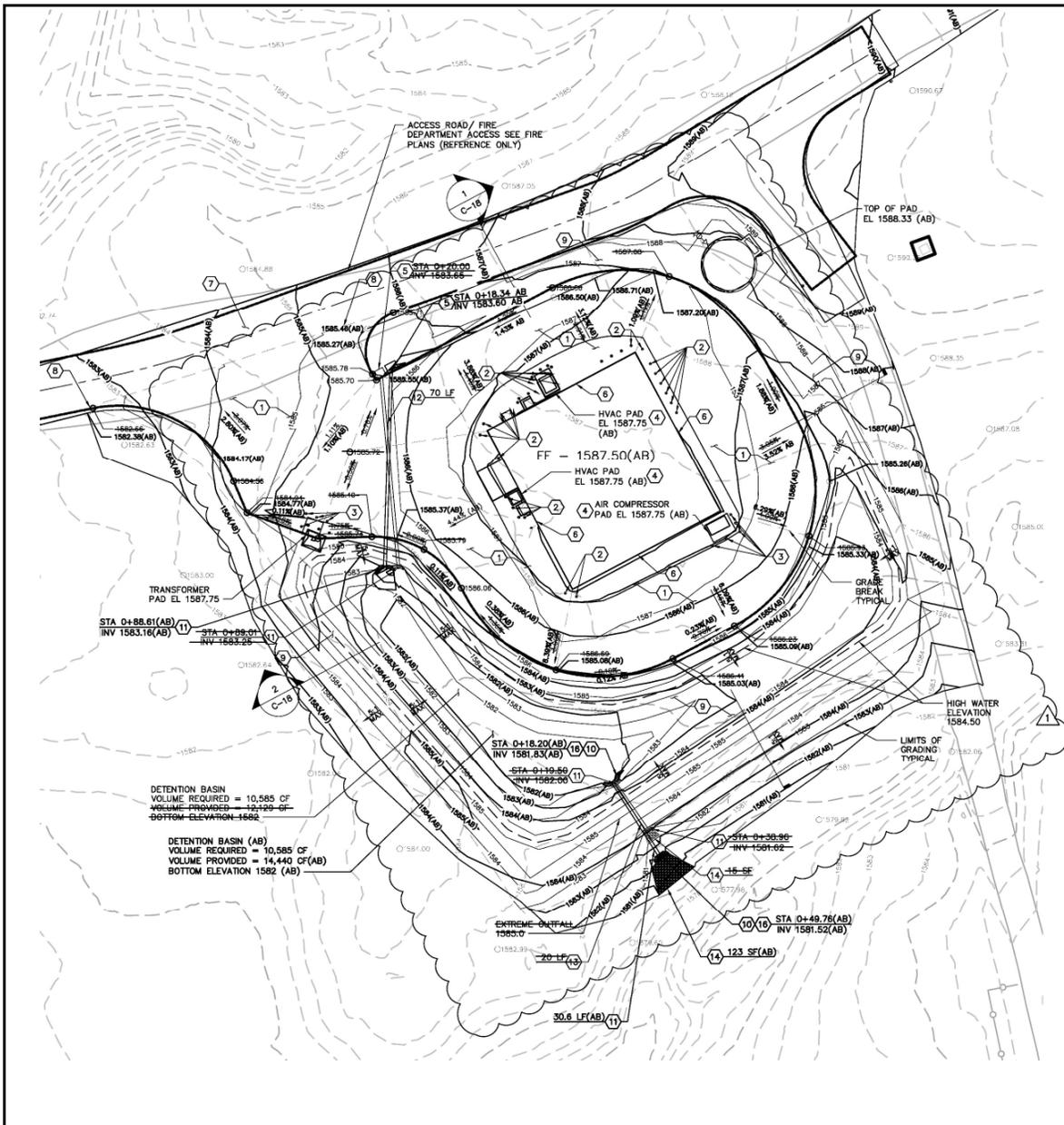
NOTES
 - RIP RAP Cover area is ~765 square feet.

FORMER UNIVERSAL PROPULSION COMPANY, INC.
 PHOENIX, ARIZONA
 AZ HWMA PERMIT - ATTACHMENT A

OLD BURN AREA RIP RAP COVER



EXHIBIT
 A-12



- CONSTRUCTION NOTES:**
- INSTALL 8-IN THICK LAYER OF TYPE B AGGREGATE BASE PER MAG SPECIFICATION SECTIONS 701 AND 702 AS NON-PAVED ROADWAY ACCESS AND PARKING AS INDICATED ABC SHALL BE COMPACTED PER MAG STANDARD SPECIFICATION SECTION 310.
 - INSTALL TYPE 1 BOLLARD PER MAG STANDARD DETAIL 140 TYPICAL SPACING UNLESS OTHERWISE NOTED IS 3'-FT FROM PROTECTED STRUCTURE.
 - INSTALL TYPE 2 BOLLARD PER MAG STANDARD DETAIL 140 TYPICAL SPACING UNLESS OTHERWISE NOTED IS 3'-FT FROM PROTECTED STRUCTURE.
 - PAD ELEVATIONS FOR HVAC TRANSFORMER, FIRE TANK AND GENERATOR PADS ARE TOP OF CONCRETE AND NOT FINISH GRADE.
 - INSTALL TYPE 7 CATCH BASIN PER MAG STANDARD DETAIL 208. SEE PROFILE ON SHEET C-21.
 - FINISH GRADE AT THE IMMEDIATE EXTERIOR OF THE BUILDING IS 1587.50.
 - CONSTRUCT 20'-FT WIDE ACCESS ROAD SEE SHEETS C-19 AND C-20 (REFERENCE ONLY).
 - MATCH EXISTING GRADE.
 - PLACE A 2-IN LAYER OF DECOMPOSED GRANITE, 10' WIDE EXTERIOR EXISTING CURBLINE OVER AREAS DISTURBED BY CONSTRUCTION THAT ARE NOT THE WATER TREATMENT FACILITY OR INDICATED FACILITY ACCESS ROAD. DECOMPOSED GRANITE SHALL MEET THE REQUIREMENTS OF THE CITY OF PHOENIX ZONING ORDINANCE 202 AND THE PHOENIX SUPPLEMENT TO MAG STANDARD SPECIFICATION SECTION 450.
 - INSTALL U-TYPE HEADWALL PER MAG STANDARD DETAIL 201. SEE SHEET C-21 FOR OUTLET PROFILE.
 - INSTALL 12-IN TYPE IV CONCRETE PIPE, INVERTS AND LENGTH AS NOTED. TRENCHING AND BACKFILL PER CITY OF PHOENIX STANDARD DETAIL 2105. TYPE C EXCEPT SURFACE REPLACEMENT PER NOTE 1. SEE STORM DRAIN PROFILE ON SHEET C-21.
 - INSTALL 12-IN HDPE PIPE WITH 4-IN HINGED ORIFICE PLATE INVERTS AND LENGTH AS NOTED. HDPE PIPE SHALL BE DUAL WALL WITH A SMOOTH INTERIOR AND 10' MINIMUM CURVE RADIUS. THE MANUFACTURER SHALL MEET THE REQUIREMENTS OF ASTM F2848. GASKETS SHALL MEET THE REQUIREMENTS OF ASTM F477 AND BE INSTALLED BY THE MANUFACTURER. TRENCHING PER CITY OF PHOENIX STANDARD DETAIL 2105 TYPE C EXCEPT DECOMPOSED GRANITE SHALL BE PLACED PER NOTE 11. SEE OUTLET PROFILE ON SHEET C-21.
 - INSTALL RIP RAP DROGON PROTECTION PER DETAIL ON SHEET C-21.
 - BASIN SLOPE SHALL NOT BE STEEPER THAN 5:1.
 - BASIN SHALL NOT BE DEEPER THAN 3'-FEET.
 - INSTALL SAFETY RAIL PER MAG STANDARD DETAIL 145.



LEGEND

1585(AB)
As-Built Surface Elevation Contour

8.20% (AB)
As-Built Surface Grade and Flow Direction

NOTES

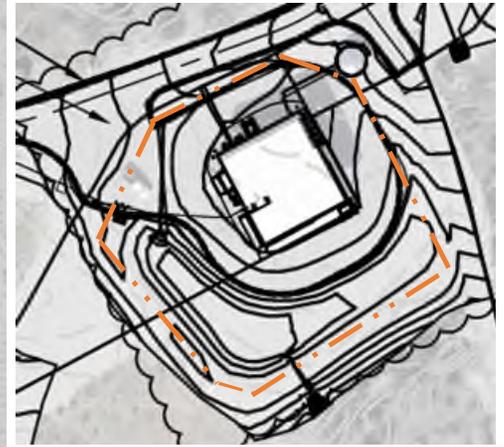
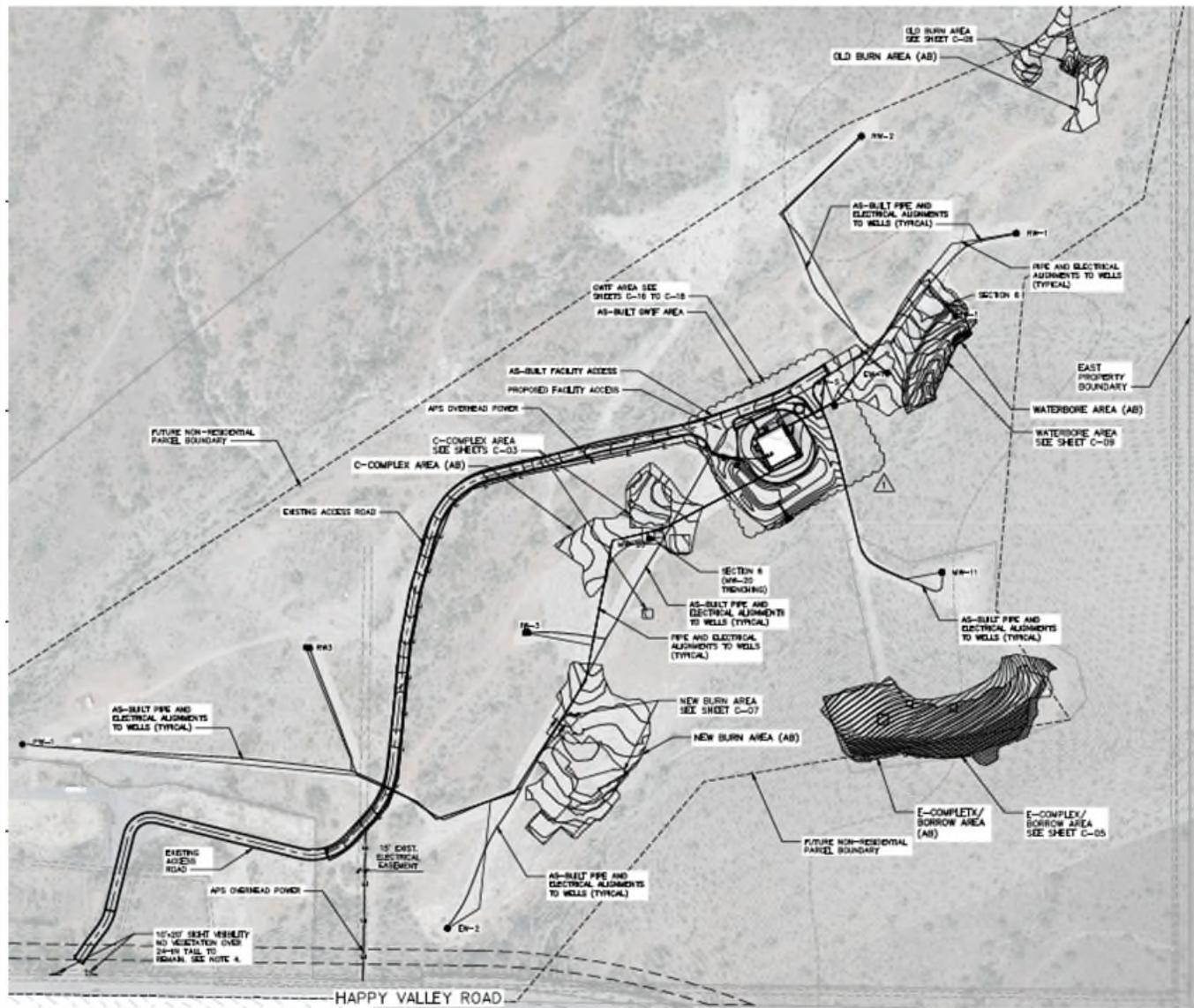
- AB = As-Built
- SF = Square Feet
- FF = Finish Floor
- CF = Cubic Feet
- EL = Elevation
- LF = Linear Feet

FORMER UNIVERSAL PROPULSION COMPANY, INC.
PHOENIX, ARIZONA
AZ HWMA PERMIT - ATTACHMENT A

GROUNDWATER TREATMENT BUILDING

ARCADIS Design & Consultancy for natural and built assets

EXHIBIT A-13



LEGEND

- | | |
|-------------------------|---|
| INJECTION WELLS: | EXTRACTION WELLS: |
| RW-1 | EW-1 |
| RW-2 | EW-2 |
| RW-3 | IW-1 |
| MW-5 | MW-20 |
| MW-11 | PW-1 - POTENTIAL FUTURE EXTRACTION WELL |
| IW-3 | |

--- Approximate Security Fence Location

NOTES
- not to scale



FORMER UNIVERSAL PROPELLSION COMPANY, INC.
PHOENIX, ARIZONA
AZ HWMA PERMIT - ATTACHMENT A

GROUNDWATER TREATMENT FACILITIES AND SECURITY FENCE



EXHIBIT
A-13