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DRAFT FINAL
SAMPLING AND ANALYSIS PLAN
Leverton Property
Phase II Environmental Site Assessment
901 to 905 North Avondale Boulevard
Avondale, Arizona

11/15/07

Prepared for:

City of Avondale
11465 West Civic Center Drive
Avondale, Arizona 85323

Prepared by:

AMEC Earth & Environmental, Inc.
1405 West Auto Drive
Tempe, Arizona 85284

November 15, 2007
AMEC Project No. 7-114-003042

Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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

Stephen A. Owens
Director

November 19, 2007
Ref: R&BU07-034

Ms. Nuria Muniz
Arizona Project Officer
U. S. EPA - Region IX
75 Hawthorne Street, SFD-5 8th Floor
San Francisco, CA 94105-3901

RE: Brownfields Phase II Environmental Site Assessment (ESA) Sampling and Analysis Plan for the Leverton Properties, Avondale

Dear Nuria:

Enclosed, please find two copies of the Sampling and Analysis Plan for the Leverton Properties project. ADEQ looks forward to your comments. If you have any comments or questions regarding the report or the project, please contact me at (602) 771-4453.

Sincerely,

Debi Goodwin, M.S.
Brownfields Project Manager

Enclosure

cc: Site File
Reading File

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

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SAMPLING AND ANALYSIS PLAN

APPROVALS AND CONCURRENCES

_____	_____	_____
USEPA Project Manager	Signature	Date
Debi Goodwin _____	_____	_____
ADEQ Project Manager	Signature	Date
Paul Lopez _____	_____	_____
City of Avondale Project Manager	Signature	Date
Julianne Hamilton _____	_____	_____
AMEC Project Manager	Signature	Date
Marilyn Hoyt _____	_____	_____
AMEC Quality Assurance Manager	Signature	Date

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- Chain-of-custody form
- Custody seals
- Soil boring log
- Instrument calibration log

1.0 INTRODUCTION

AMEC Earth and Environmental (AMEC) was retained by the City of Avondale (City) to perform a Phase II Environmental Site Assessment (Phase II) of the property located at 901 to 905 North Avondale Boulevard in Avondale, Arizona (Site) (Figure 1). The Site is 13.7 acres and consists of one parcel with the Maricopa County Assessors Parcel Number 102-57-006C. The eastern half of the Site currently consists of agricultural land while the western half contains an airstrip, an aircraft hanger/storage structure, a separate storage/office structure, old farm equipment, chemicals and supplies, a concrete water basin, and asphalt surface pad (Figure 2).

The objective of the requested services is to obtain current due diligence information for the Site, and to complete the characterization of the extent of contamination identified by previous investigations both on the Site and adjacent to the Site. Based on the findings of previous investigations and the Phase I Environmental Site Assessment (ESA) (Phase I), dated October 2, 2007 AMEC identified the following recognized environmental conditions (RECs) in connection with the Site:

- The former presence of a crop dusting operation is a REC for the Site. Operations associated with the crop dusting facility included chemical storage, aircraft and equipment maintenance and chemical mixing. In addition, previous soil sampling and remediation that occurred on the Salt River Project well site that previously was part of the Site indicated that toxaphene, dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethylene (DDE), and dichlorodiphenyldichloroethane (DDD) were present in concentrations exceeding their respective Arizona Residential Soil Remediation Levels (RSRLs). It is likely that the Site has similar contamination based on its historical use as a crop dusting facility.
- Surface staining on soil and asphalt was observed in and around the aircraft hanger/storage structure and on the air strip. An oil drum with a dispenser pump was observed on the western portion of the Site off the northeast corner of the storage/office structure. Visible staining was observed down the side of the steel drum and onto the soil below.

To evaluate the potential significance of these RECs, AMEC will perform the following:

- Evaluate the potential impacts from the crop dusting facilities' operations that included chemical storage, aircraft and agriculture equipment maintenance, mixing of chemicals, and the airstrip. Assessment techniques will include soil sampling for pesticides, herbicides, metals, semi-volatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs).

This Sampling and Analysis Plan (SAP) was prepared in accordance with the United States Environmental Protection Agency (EPA) document *Sampling and Analysis Plan Guidance and*

Template, Version 3, Brownfields Projects, R9QA/006, dated June 2004. The Site is part of a roadway expansion to facilitate proposed and future development in the area. The Site will be used as a roadway and for potential future commercial development.

1.1 Site Name or Sampling Area

The Site is referred to as a 13.7-acre parcel located at 901 to 905 North Avondale Boulevard, and is occupied by an airstrip, an aircraft hanger/storage structure, a separate storage/office structure, old farm equipment, chemicals and supplies, a concrete water basin, asphalt surface pad and agricultural fields (Figure 2).

1.2 Site or Sampling Area Location

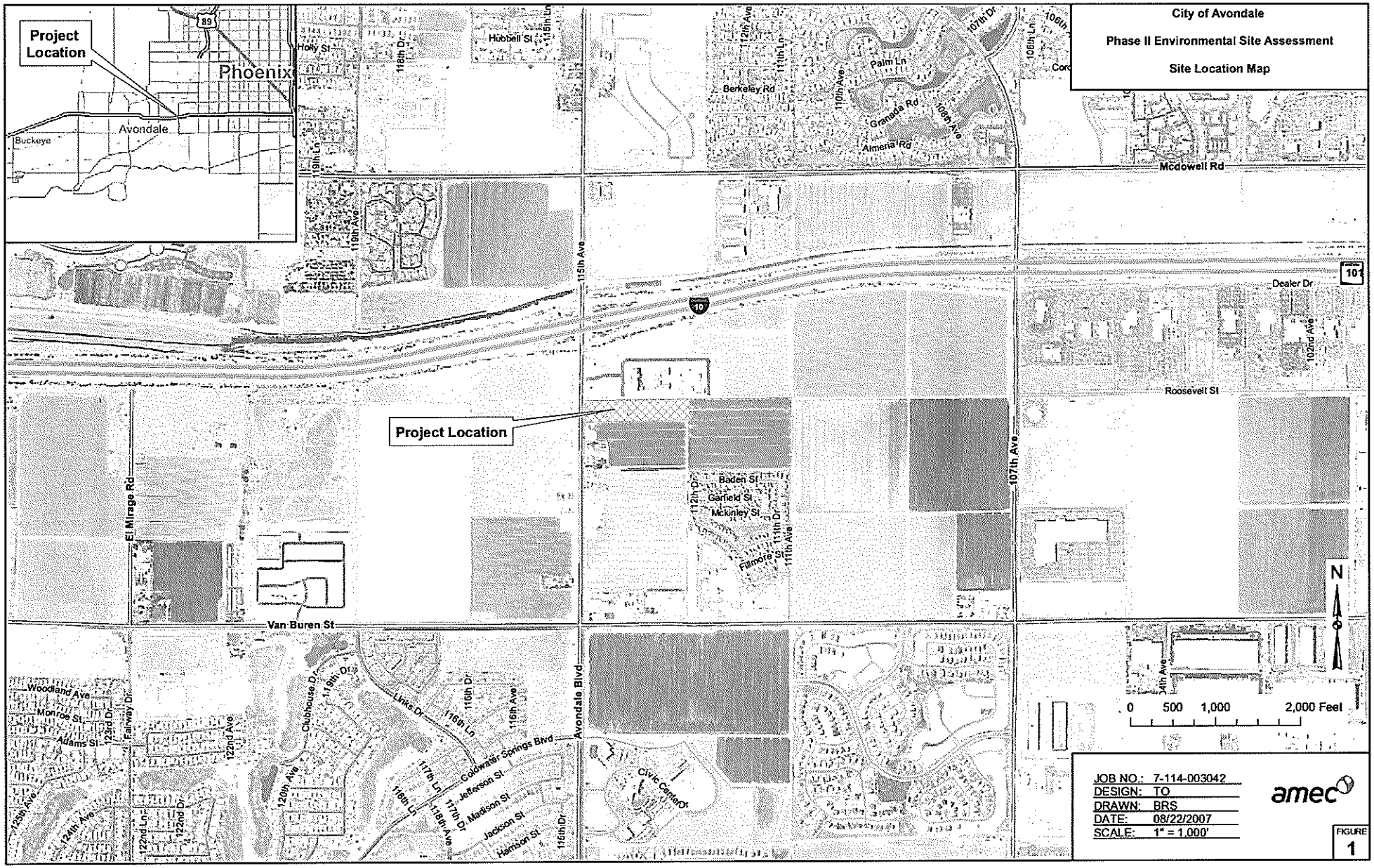
The Site covers 13.7 acres and the associated parcel number 102-57-006 C in Maricopa County, Arizona. The Site Section 6, Township 1 North, Range 1 East of the United States Geological Survey (USGS) 7.5-minute series topographic map entitled, "Tolleson, Arizona", in Avondale, Maricopa County, Arizona. The Site address is 901 to 905 North Avondale Boulevard in Avondale, Arizona. A Site Location Map is included as Figure 1.

1.3 Responsible Agency

AMEC is contracted by the City of Avondale. AMEC is an environmental engineering firm registered with the Arizona Board of Technical Registration. Services provided for this project will be performed by or under the direction of a registered professional geologist.

1.4 Project Organization

Title/Responsibility	Name	Phone Number
EPA Project Manager	Nuria Muniz	415-972-3811
EPA QA Project Manager	Gail Jones	415-972-3807
EPA QA Manager	Eugenia E. McNaughton, PhD	415-972-3411
ADEQ Project Manager	Debi Goodwin, Brownfields Project Manager	602-771-4453
AMEC Earth and Environmental		
Project Manager	Julianne Hamilton, R.G.	480-940-2320
Field Manager	Tim Ostapuk	480-940-2320
QA/QC Manager	Marilyn Hoyt	978-692-9090
AMEC – Subcontractors		
Laboratory	Test America (Phoenix, AZ)	480-785-0043
Drilling	To Be Determined	



City of Avondale

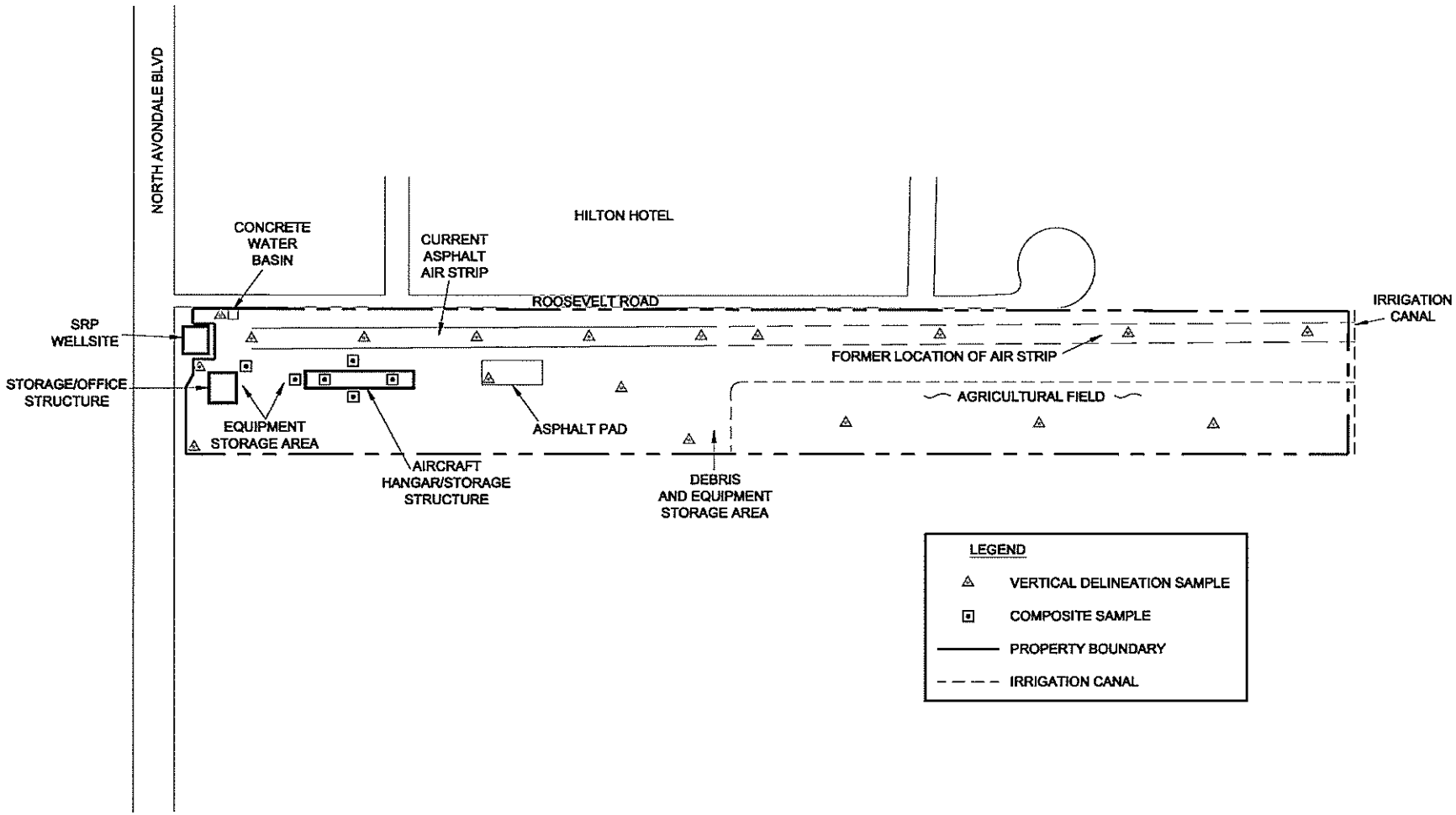
Phase II Environmental Site Assessment

Site Location Map

JOB NO.:	7-114-003042
DESIGN:	TO
DRAWN:	BRS
DATE:	08/22/2007
SCALE:	1" = 1,000'

amec

FIGURE 1



0 100' 200' 400'

SCALE IN FEET

JOB NO. 7-114-003042 DESIGN: AS DRAWN: SRH DATE: 10/2007 SCALE: 1"=200'	SITE PLAN PHASE II ESA SAMPLING AVONDALE, AZ	FIGURE 2

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2.0 BACKGROUND

The Site is currently owned by a private entity and the City of Avondale is currently in the process of negotiating purchase of the Site for redevelopment.

Recently, a portion of the Site was transferred to the City of Avondale for the development of water well. This portion was located on the northwest corner of the Site, currently located on the southeast corner of Avondale Boulevard and Roosevelt Street. During the development of the well site in 2002, soil investigations revealed that the upper 18 inches of the soil contained residual pesticide concentrations exceeding RSRLs. As a result, the soil at the well site was excavated to a depth of approximately 18 inches and disposed of as non-hazardous waste in 2003. Verification samples collected from the base of the excavated well site were reported with levels of pesticides below the RSRLs. It is likely that the Site has similar contamination to the well site based on its historical use as a crop dusting facility and because of this, soil sampling was recommended.

2.1 Sampling Area Description

The Site is located at 901 to 905 North Avondale Boulevard in Avondale, Arizona. The Site is located in Section 6, Township 1 North, Range 1 East of the United States Geological Survey (USGS) 7.5-minute series topographic map entitled, "Tolleson, Arizona". The Site is a 13.7-acre parcel with a Maricopa County Assessors Parcel Number 102-57-006 C. A Site Location Map is presented as Figure 1.

The Site, a former crop dusting facility, is currently used for agricultural purposes. At the time of AMEC's assessment, the eastern half of the Site consisted of agricultural land and the western half of the Site contained; two structures, an asphalt air strip, an asphalt pad, a concrete pad, a concrete water basin, an exterior debris and equipment storage area, and various pieces of farming equipment. A Site Plan is presented as Figure 2.

An aircraft hanger/storage structure, and was located on the western portion of the Site. General construction of the structure consisted of block walls, corrugated roof, wood trusses and concrete and bare soil floors. The structure housed many pieces of old farming equipment.

A storage/office structure is located on the southwest portion of the Site. General construction of the structure consisted of metal corrugated walls and roofing, concrete floors, finished gypsum wallboard interior office and living spaces, and vinyl floor tile floors. The structure housed tools, maintenance equipment, and vehicles.

A concrete pad is located on the northwest corner of the Site. Adjacent to the pad is a concrete water basin. The basin was empty at the time of the Phase I site visit.

General property use within a 0.5 mile radius consists of agricultural, residential and some commercial uses. AMEC viewed the 0.5 mile project area from public roadways and did not observe any visual evidence of significant chemical storage, improper waste disposal, or other indications of adverse environmental conditions. Due to the agricultural, residential, and small commercial nature of the area, the chemicals stored nearby are likely to include pesticides, herbicides and household cleaners.

As part of AMEC's Phase I, a visual reconnaissance of the properties adjoining the Site was conducted. Roadways/properties which adjoin the Site are as follows:

Adjacent Property Use
North – Roosevelt Street, Hilton Garden Inn and Homewood Suites with Interstate 10 further north.
East – 111th Avenue Alignment and agricultural Land.
South – Residential houses on agricultural land with a single-family residential development further south.
West – Avondale Boulevard followed by agricultural land.

2.2 Operational History

The Site was utilized as crop dusting facility, known as Country Boy Crop Dusting, from approximately 1955 to 1990. An airstrip extended through the north portion of the Site in an east-west alignment. The western half of the Site was utilized for pesticide loading, aircraft wash out, aircraft turn around and routine maintenance.

2.3 Previous Investigations/Regulatory Involvement

In addition to the Phase I ESA performed by AMEC, previous environmental investigations on the Site performed by others have included a Phase I ESA, soil sampling investigations, and well site remediation. Reports from these previous investigations are summarized below.

Previous Phase I ESA Report (SCS, 2002)

The Phase I ESA report was prepared by SCS Engineers (SCS) dated October 31, 2002. The report was for Right of Ways (ROWs) on and adjacent to 115th Avenue between Interstate 10 and Buckeye Road in Avondale, Arizona.

The SCS Phase I ESA report refers to a target site along the western boundary of the Site which was formerly part of the Leverton property. Similar contamination is anticipated as part of the Phase II investigation proposed in this SAP. The report states "the odor of agricultural chemicals was observed on the ROWs in the vicinity of the west portion of the former Country Boy Crop Dusting Facility. This facility operated from the 1950s to the 1990s. A wash pad, containment structure, and west terminus of the runway are located topographically upgradient and adjacent to the ROWs. It is possible that pesticides/herbicides utilized by this facility have migrated onto the ROWs."

The SCS Phase I Report also states the Country Boy Crop Dusters previously maintained four USTs ranging in capacity from 500 to 10,000 gallons. The tanks, which had been removed, were previously located east of the administrative/storage building, an estimated 200 feet east of the ROW. Soil contamination extending to a depth of 10 feet below ground surface was identified. Contaminated soil was subsequently excavated and the Leaking Underground Storage Tank (LUST) file was closed by ADEQ on December 12, 2000. Based upon existing information, the release at this adjoining facility has not adversely impacted the ROW.

The SCS Phase I Report also states Country Boy Crop Dusting was listed at 901 to 905 North 115th Avenue in City Directories from 1952 to 1978. Also according to the report, SCS contacted the State Fire Marshals Office for UST records for 901 and 905 North 115th Avenue. According to the previous report there is record for two removed USTs (Permit No. 97-020) issued to 901 North 115th Avenue on August 24, 1997. The Fire Marshall's Office stated the facility is listed as the Country Boy Crop Dusting and Freeway Gas.

Soil Sampling Investigation (SCS, 2002)

The Soil Sampling Investigation report was prepared by SCS, dated November 12, 2002. It was developed for a New Salt River Project (SRP) well site located east of 115th Avenue and South of Interstate 10. Soil samples were collected west of the crop dusting facility and analyzed for organochlorine pesticides, organophosphate pesticides, and organochlorine herbicides. Based on the results, SCS recommended the excavation and proper disposal of soils containing pesticides and herbicides above their respective RSRLs.

Site Remediation Report (SCS, 2003)

The Site Remediation Report was prepared by SCS, dated January 8, 2003. The report stated that SCS performed soil sampling within the existing ROWs and the new well site area to evaluate the potential presence of pesticides in the soils. Several locations were sampled and found to contain levels of toxaphene, DDD, DDE, or DDT in surface soils. The detected contamination appeared to be associated with former agricultural use of land and the proximity of a former crop dusting strip that may have been the source of overspray. Based on the results, SCS excavated the soil at the new well site to a depth of one and half feet. SCS also excavated three areas along the ROW to a depth of one foot.

SRP Well Site Remediation Report (SCS, 2003)

SRP Well Site Remediation Report was prepared by SCS, dated April 17, 2003. SCS excavated soil within the SRP well site at depths ranging from two to three feet in 2002 and 2003. Verification and waste characterization samples were collected. Sample results indicated that soils contain organochlorine pesticides above the RSRLs had been removed from the well site. The excavated soil was disposed of as non-hazardous waste at Waste Management's Regional Landfill in Surprise, Arizona.

ADEQ LUST File

The Country Boy Crop Dusting LUST is the target property for this Phase II. A review of the ADEQ LUST files during the Phase I determined that the file was closed. According to the records, five (5) USTs were located on the Site. Two 10,000-gallon gasoline tanks were excavated and removed from the Site on March 12, 1997. After removal activities and soil sampling, ADEQ issued a UST Closure Report on March 13, 1997, for the two 10,000-gallon USTs. The three other tanks were removed from the Site in December 1990. After removal activities and soil sampling, it was determined that a release had occurred due to elevated levels of common gasoline constituents in the soil samples. Soil sampling in September, 2000, revealed that the elevated levels of gasoline constituents were no longer present. ADEQ issued a Case Closure letter for the three (3) USTs on November 28, 2000. According to the letter, based on laboratory analysis ADEQ determined that the extent of soil contamination and vertical extent of contamination was adequately defined at approximately ten (10) feet below ground surface (bgs). The horizontal extent of contamination has been defined to be approximately 15 feet radius around the release locations, according to the report. The depth to groundwater is estimated to be 140 bgs and the highest levels of soil contamination identified to date were below the laboratory reporting limits.

2.4 Geologic Information

Based on the USGS 7.5-minute topographic map, "Tolleson, Arizona," the Site is approximately 997 feet above mean sea level (amsl). The surface topography of the Site is essentially flat and gently slopes west-southwest.

2.4.1 Regional

The following geological information was obtained for the Site.

Rock Stratigraphic Unit		Geologic Age Identification	
Geologic Code:	Q	Category:	Stratified Sequence
Era:	Cenozoic		
System:	Quaternary		
Series:	Quaternary		

The Site is located within the west portion of the West Salt River Valley subbasin of the Phoenix Active Management Area (Brown & Pool, 1989). The Salt River Valley is a broad alluvial basin within the Basin and Range physiographic province of the United States (Wilson, 1962). The basin is almost completely surrounded by mountains composed primarily of granitic, metamorphic and volcanic rocks. The valley floor is underlain by unconsolidated to semi-consolidated basin-fill sediments that are more than 15,000 feet thick in the central part of the basin (Hammett and Herther, 1995).

3.0 PROJECT DATA QUALITY OBJECTIVES

3.1 Project Task and Problem Definition

The City wishes to determine whether remediation of areas of concern will be necessary, and if so, the scope of work necessary to complete this remediation. The goal of this project is to determine the extent of media requiring remediation for proposed and future development activities at the Site. The objective is to complete the characterization of the extent of contamination identified by this SAP and previous investigations both on Site and adjacent to the Site. Based on the findings of previous investigations and the Phase I, dated October 2, 2007, the following areas of concern have been identified for additional investigation on the Site:

- The former presence of a crop dusting operation is a REC for the Site. Operations associated with the crop dusting facility included chemical storage, aircraft and equipment maintenance and chemical mixing. In addition, previous soil sampling and remediation that occurred on the Salt River Project well site that previously was part of the Site indicated that toxaphene, DDT, DDE, and DDD were present in concentrations exceeding their respective RSRLs. It is likely that the Site has similar contamination based on its historical use as a crop dusting facility.
- Surface staining on soil and asphalt was observed in and around the aircraft hanger/storage structure and on the air strip. An oil drum with a dispenser pump was observed on the western portion of the Site off the northeast corner of the storage/office structure. Visible staining was observed down the side of the steel drum and onto the soil below.

The areas of concern identified above will be completed by performing shallow soil sampling at three (3) different depths utilizing direct-push techniques and composite samples. The surface staining areas of concern will be physically characterized by visual inspection prior to collecting composite samples. AMEC assumes stained soil will need to be excavated and properly disposed, so the surface staining areas of concern samples will be used to perform waste characterization only.

3.2 Data Quality Objectives

3.2.1 Identify the Information Requirements

The following questions posed by this Phase II Investigation and planned actions are:

3.2.1.1 Airstrip and General Operation Areas

1. *What is the nature of contamination at the airstrip and general operation areas?*

   Determine what pesticides or herbicides are present in previously-identified soil contamination near this location.

2. *What is the extent of contamination at the airstrip and general operation areas?*

   Determine the vertical and horizontal extent of detected pesticides and herbicides identified by #1 above) in soil at concentrations exceeding RSRLs.

3. *Does contamination at the airstrip and general operation areas exceed regulatory thresholds or levels that could pose a threat to human health or the environment?*

   Determine if pesticides and herbicides are present in soil at concentrations exceeding RSRLs that would require remediation.

3.2.1.2 Aircraft Hangar and Equipment Storage Area

1. *Is soil contamination associated with the aircraft hangar and equipment storage area on the western portion of the property?*

   Determine if pesticides, herbicides, VOCs, metals, SVOCs, or PAHS are present in soil near this location.

2. *If soil contamination is identified at the aircraft hangar and equipment storage area, what is the extent of such contamination?*

   Determine the concentration of chemicals (as identified by #1 above) in soil and at concentrations exceeding RSRLs for waste characterization and future disposal.

3. *If soil contamination is identified at the aircraft hangar and equipment storage area, does it exceed regulatory thresholds or levels that could pose a threat to human health or the environment?*

   Determine if chemicals are present in soil at concentrations exceeding RSRLs that would require remediation.

3.2.2 Identify the Inputs to the Decision

The following tasks and information are needed to resolve the decision statements listed in Section 3.2.1: (information sources, basis for Action Level [RSRLs], sampling/analysis method).

- Two (2) different types of sampling will be utilized during this SAP; (1) vertical delineation sampling and (2) composite sampling. The vertical delineation sampling will be used to determine the depth of potential chemicals from surface to three (3) bgs. Composite samples will be utilized for waste characterization and disposal profiles; and
- Obtain laboratory analytical results for selected chemicals of potential concern.

Compare detected chemicals with Action Levels, which will be RSRLs. Table 1 shows the RSRLs for chemicals included in the analytical methods that will be used.

3.2.3 Define the Boundaries of the Study

The Site is located at 901 to 905 North Avondale Boulevard in Avondale, Arizona. The Site is located in Section 6, Township 1 North, Range 1 East of the United States Geological Survey (USGS) 7.5-minute series topographic map entitled, "Tolleson, Arizona". The Site is 13.7 acres and the associated parcel number 102-57-006 C in Maricopa County. A Site Plan is presented as Figure 2.

3.2.4 Develop a Decision Rule

Action Levels and decision rules that will be used to choose among alternative actions with regard to the results of sampling activities are discussed below.

Soil samples will be analyzed by the following methods:

Airstrip and general property:

- Pesticides (EPA Method 8081); and
- Herbicides (EPA Method 8151).

Aircraft hangar and equipment storage area:

- Pesticides (EPA Method 8081);
- Herbicides (EPA Method 8151);
- Volatile organic compounds (VOCs, EPA Method 8260B);
- Total 8 RCRA metals (EPA Method SW7471A and SW6010B);
- Polynuclear aromatic hydrocarbons (PAHs, EPA Method 8310); and
- Semivolatile organic compounds (SVOCs; EPA Method 8270C).

Because the exact nature of the source and distribution are not known at this time, the detection of any pesticides and herbicides above their respective RSRLs will trigger additional sample analysis (deeper soil samples) for the identified chemicals. All other analytical methods and associated chemicals will be used for waste characterization purposes only.

ADEQ RSRLs (Arizona Administrative Code [AAC] Title 18, Chapter 7, Article 2) will be used as the primary Action Levels to determine whether soil remediation will be required. Table 1 shows the RSRLs for chemicals included in the analytical methods proposed.

The decision rules for vertical delineation sampling are summarized below:

1. If pesticides and herbicides are not detected above their respective RSRLs in the upper samples (0.5-1.0 feet), then no further action is required and remaining samples will be properly discarded.
2. If any analyte is detected above RSRLs in the upper samples (0.5-1.0 feet), the next lower sample (1.5-2.0 feet) will be analyzed using same analytical methods. This process will continue for the final sample (2.5-3.0 feet).

If one or more chemicals are detected in a soil sample that equal or exceed the RSRLs then recommendations for further action, such as additional assessment, remediation, or special disposal will be provided by AMEC.

3.2.5 Specify Tolerable Limits on Decision Errors

Decision error analysis for field decisions is limited to soil sampling protocol. The defined error limit for the soil sampling protocol will be the laboratory reporting limit for each sample.

Additional laboratory limits and methods to minimize decision errors include:

- Decision errors (defined as rejecting data [sampling or measurement], when the data are actually correct) will be minimized in the field by following the established sampling protocols;
- Decision errors will be minimized by using all data, except that rejected in data validation for quality control (QC) considerations;
- Decision errors will be minimized during sample collection, shipping and transportation by utilizing the preservation, sample bottle specifications and holding times;
- Decision errors will be minimized during analysis by following the extraction and analysis methods;
- Decision errors will be minimized by the laboratories by following the quality assurance/quality control (QA/QC) criteria dictated by the methods, the laboratory Quality Assurance Manual (QAM), and QA/QC criteria specified in this SAP; and
- Decision errors (defined as accepting data [sampling or measurement] when the data are actually incorrect) will be minimized by thoroughly documenting the field and laboratory conditions under which the sample was collected and analyzed and by following the QA/QC requirements specified in this SAP.

TABLE 1. SOIL REMEDIATION LEVELS

Contaminant	Residential (mg/kg)			Non-residential (mg/kg)
	Carcinogen		Non-carcinogen	
	10^6 Risk	10^5 Risk		
Pesticides (EPA Method 8081A)				
Aldrin	0.032	0.32		1
α BHC				
β BHC				
γ BHC				
δ BHC				
Chlorobenzilate	2	20		64
α Chlordane				
γ Chlordane				
Chlordane - not otherwise specified	1.9	19		65
DBCP				
4,4'-DDD	2.8	28		100
4,4'-DDE	2	20		70
4,4'-DDT	2	20		70
Diallate	9	90		280
Dieldrin	0.034	0.34		1.1
Endosulfan I			370	3,700
Endosulfan II				
Endosulfan sulfate				
Endrin			18	180
Endrin aldehyde				
Endrin ketone				
Heptachlor	0.12	1.2		3.8
Heptachlor epoxide	0.06	0.6		1.9
Hexachlorobenzene	0.34	3.4		11
Hexachlorocyclopentadiene			370	3,700
Isodrin				
Methoxychlor			310	3100
Toxaphene	0.5	5		16
Herbicides (EPA Method 8151)				
2,4-D			690	7,700
2,4-DB				
2,4,5-TP (Silvex)				
2,4,5-T				
Dalapon			1800	18000
Dicamba			1800	18000
Dichloroprop				
Dinoseb			61	620

TABLE 1. SOIL REMEDIATION LEVELS (Cont.)

Contaminant	Residential (mg/kg)			Non-residential (mg/kg)
	Carcinogen		Non-carcinogen	
	10^6 Risk	10^5 Risk		
Herbicides (EPA Method 8151)				
MCPA				
MCPP			61	620
4-Nitrophenol				
Pentachlorophenol	3.2	32		90
Volatile organic compounds (VOCs; EPA Method 8260B)				
Acetone			14,000	54,000
Acetonitrile			420	1,800
Acrolein (Propenal)			0.1	0.34
Acrylonitrile	0.21	2.1		4.9
Allyl alcohol			310	3,100
Allyl chloride			18	180
Benzene	0.65	NA		1.4
Benzyl chloride	0.92	9.2		22
Bis (2-chloroethyl) sulfide				
Bromoacetone				
Bromochloromethane				
Bromodichloromethane				
4-Bromofluorobenzene (surr)				
Bromoform	69	690		2,200
Bromomethane			3.9	13
n-Butanol			6100	61000
2-Butanone (MEK)			23,000	34,000 *
t-Butyl alcohol				
Carbon disulfide			360	720 *
Carbon tetrachloride	0.25	2.5	2.2	5.5
Chloral hydrate			6,100	62,000
Chlorobenzene			150	530
Chlorobenzene-d_5 (IS)				
Chlorodibromomethane				
Chloroethane	3	30		65
2-Chloroethanol				
2-Chloroethyl vinyl ether				
Chloroform	0.94	9.4		20
Chloromethane			48	160
Chloroprene				
3-Chloropropionitrile				

TABLE 1. SOIL REMEDIATION LEVELS (Cont.)

Contaminant	Residential (mg/kg)			Non-residential (mg/kg)
	Carcinogen		Non-carcinogen	
	10^6 Risk	10^5 Risk		
Volatile organic compounds (VOCs; EPA Method 8260B)				
Crotonaldehyde	0.0053	0.053		0.11
1,2-Dibromo-3-chloropropane	0.53	5.3	1.5	6.5
1,2-Dibromoethane	0.029	0.29		0.63
Dibromomethane				
1,2-Dichlorobenzene			600 *	600 *
1,3-Dichlorobenzene			530	600 *
1,4-Dichlorobenzene	3.5	35		79
1,4-Dichlorobenzene-d_4 (IS)				
cis-1,4-Dichloro-2-butene	0.008	0.08		0.18
trans-1,4-Dichloro-2-butene				
Dichlorodifluoromethane			94	310
1,1-Dichloroethane			510	1,700 *
1,2-Dichloroethane	0.28	2.8		6
1,2-Dichloroethane-d_4 (surr)				
1,1-Dichloroethene			120	410
trans-1,2-Dichloroethene			69	230
1,2-Dichloropropane	0.34	3.4		7.4
1,3-Dichloro-2-propanol				
cis-1,3-Dichloropropene				
trans-1,3-Dichloropropene				
1,2,3,4-Diepoxybutane				
Diethyl ether				
1,4-Difluorobenzene (IS)				
1,4-Dioxane	50	500		1,600
Epichlorohydrin			7.6	26
Ethanol				
Ethyl acetate			19,000	37,000 *
Ethylbenzene			400 *	400 *
Ethylene oxide	0.14	1.4		3.4
Ethyl methacrylate			140 *	140 *
Fluorobenzene (IS)				
Hexachlorobutadiene				
Hexachloroethane	39	390	61	620
2-Hexanone				
2-Hydroxypropionitrile				
Iodomethane				

TABLE 1. SOIL REMEDIATION LEVELS (Cont.)

Contaminant	Residential (mg/kg)			Non-residential (mg/kg)
	Carcinogen		Non-carcinogen	
	10^6 Risk	10^5 Risk		
Volatile organic compounds (VOCs; EPA Method 8260B)				
Isobutyl alcohol			13,000	40,000 *
Isopropylbenzene				
Malononitrile			6.1	62
Methacrylonitrile			2.1	8.4
Methanol			31,000	310,000
Methylene chloride	9.3	93		210
Methyl methacrylate			2,200	2,700 *
4-Methyl-2-pentanone (MIBK)			5,300	17,000 *
Naphthalene				
Nitrobenzene			20	100
2-Nitropropane	0.0028	0.028		0.061
N-Nitroso-di-n-butylamine	0.025	0.25		0.58
Paraldehyde				
Pentachloroethane				
2-Pentanone				
2-Picoline				
1-Propanol				
2-Propanol				
Propargyl alcohol				
β-Propiolactone				
Propionitrile (ethyl cyanide)				
n-Propylamine				
Pyridine			61	620
Styrene			1,500 *	1,500 *
1,1,1,2-Tetrachloroethane	3.2	32		73
1,1,2,2-Tetrachloroethane	0.42	4.2		9.3
Tetrachloroethene	0.51	5.1		13
Toluene			650 *	650 *
Toluene-d_8 (surr)				
o-Toluidine	2.9	29		91
1,2,4-Trichlorobenzene			62	220
1,1,1-Trichloroethane			1,200 *	1,200 *
1,1,2-Trichloroethane	0.74	7.4		16
Trichloroethene	3	30	17	65
Trichlorofluoromethane			390	1,300
1,2,3-Trichloropropane	0.005	0.05		0.11

TABLE 1. SOIL REMEDIATION LEVELS (Cont.)

Contaminant	Residential (mg/kg)			Non-residential (mg/kg)
	Carcinogen		Non-carcinogen	
	10^6 Risk	10^5 Risk		
Volatile organic compounds (VOCs; EPA Method 8260B)				
Vinyl acetate			430	1,400
Vinyl chloride	0.085	NA		0.75
o-Xylene			270	420 *
m-Xylene			270	420 *
p-Xylene			270	420 *
Total 8 RCRA Metals (EPA Method SW7471A and SW6010B)				
Arsenic	10	10	10	10
Barium			15,000	170,000
Cadmium			39	510
Chromium III			120,000	1,000,000 **
Chromium IV	30	NA		65
Lead			400	800
Mercury			23	310
Selenium			390	5,100
Silver			390	5,100
Polynuclear aromatic hydrocarbons (PAHs; EPA Method 8310)				
Acenaphthene			3,700	29,000
Acenaphthylene				
Anthracene			22,000	240,000
Benzo (a) anthracene	0.69	6.9		21
Benzo (a) pyrene	0.069	0.69		2.1
Benzo (b) fluoranthene	0.69	6.9		21
Benzo (ghi) perylene				
Benzo (k) fluoranthene	6.9	69		210
Chrysene	68	680		2,000
Dibenzo (a,h) anthracene	0.069	0.69		2.1
Fluoranthene			2,300	22,000
Fluorene			2,700	26,000
Indeno (1,2,3-cd) pyrene	0.69	6.9		21
Naphthalene			56	190
Pyrene			2,300	29,000
Semivolatile organic compounds (SVOCs; EPA Method 8270C)				
Acenaphthene				
Acenaphthene-d_{10} (IS)				
Acenaphthylene				
Acetophenone				

TABLE 1. SOIL REMEDIATION LEVELS (Cont.)

Contaminant	Residential (mg/kg)			Non-residential (mg/kg)
	Carcinogen		Non-carcinogen	
	10^6 Risk	10^5 Risk		
Semivolatile organic compounds (SVOCs; EPA Method 8270C)				
2-Acetylaminofluorene				
1-Acetyl-2-thiourea				
Aldrin				
2-Aminoanthraquinone				
Aminoazobenzene				
4-Aminobiphenyl				
3-Amino-9-ethylcarbazole				
Anilazine				
Aniline	96	960	430	3,000
o-Anisidine				
Anthracene			22,000	240,000
Aramite	22	220		690
Aroclor 1016				
Aroclor 1221				
Aroclor 1232				
Aroclor 1242				
Aroclor 1248				
Aroclor 1254				
Aroclor 1260				
Azinphos-methyl				
Barban				
Benzidine	0.0024	NA		0.0075
Benzoic acid			240,000	1,000,000 **
Benzo (a) anthracene	0.69	6.9		21
Benzo (b) fluoranthene	0.69	6.9		21
Benzo (k) fluoranthene	6.9	69		210
Benzo (ghi) perylene				
Benzo (a) pyrene	0.069	0.69		2.1
p-Benzoquinone				
Benzyl alcohol			18,000	180,000
α BHC				
β BHC				
γ BHC (Lindane)				
δ BHC				
Bis (2-chloroethoxy) methane				
Bis (2-chloroethyl) ether	0.23	2.3		5.8
Bis (2-chloroisopropyl) ether			790 *	790 *

TABLE 1. SOIL REMEDIATION LEVELS (Cont.)

Contaminant	Residential (mg/kg)			Non-residential (mg/kg)
	Carcinogen		Non-carcinogen	
	10^6 Risk	10^5 Risk		
Semivolatile organic compounds (SVOCs; EPA Method 8270C)				
Bis (2-ethylhexyl) phthalate	39	390		1200
4-Bromophenyl phenyl ether				
Bromoxynil			1,200	12,000
Butyl benzyl phthalate			12,000	120,000
Captafol	64	640	120	1,200
Captan	160	1,600		4,900
Carbaryl			6,100	62,000
Carbofuran			310	3,100
Carbophenothion				
Chlordane - not otherwise specified	1.9	19		65
Chlorfenvinphos				
4-Chloroaniline			240	2,500
Chlorobenzilate	2	20		64
5-Chloro-2-methylaniline	0.94	9.4		30
4-Chloro-3-methylphenol				
3-(Chloromethyl) pyridine hydrochloride				
1-Chloronaphthalene				
2-Chloronaphthalene			110 *	110 *
2-Chlorophenol			63	240
4-Chloro-1,2-phenylenediamine				
4-Chloro-1,3-phenylenediamine				
4-Chlorophenyl phenyl ether				
Chrysene	68	680		2,000
Chrysene-d_{12} (IS)				
Coumaphos				
p-Cresidine				
Crotoxyphos				
2-Cyclohexyl-4,6-dinitro-phenol				
4-4'-DDD	2.8	28		100
4-4'-DDE	2	20		70
4,4'-DDT	2	20		70
Demeton-O			2.4	25
Demeton-S			2.4	25
Diallate (cis or trans)	9	90		280
2,4-Diaminotoluene				
Dibenz (a,j) acridine				
Dibenz (a,h) anthracene				

TABLE 1. SOIL REMEDIATION LEVELS (Cont.)

Contaminant	Residential (mg/kg)			Non-residential (mg/kg)
	Carcinogen		Non-carcinogen	
	10^6 Risk	10^5 Risk		
Semivolatile organic compounds (SVOCs; EPA Method 8270C)				
Dibenzofuran				
Dibenzo (a,e) pyrene				
1,2-Dibromo-3-chloropropane	0.53	5.3	1.5	6.5
Di-n-butyl phthalate				
Dichlone				
1,2-Dichlorobenzene			600 *	600 *
1,3-Dichlorobenzene			530	600 *
1,4-Dichlorobenzene	3.5	35		79
1,4-Dichlorobenzene-d_4 (IS)				
3,3'-Dichlorobenzidine	1.2	12		38
2,4-Dichlorophenol			180	1,800
2,6-Dichlorophenol				
Dichlorovos	1.9	19		59
Dicrotophos				
Dieldrin	0.034	0.34		1.1
Diethyl phthalate			49,000	490,000
Diethylstilbestrol	0.00012	NA		0.0037
Diethyl sulfate				
Dihydrosaffrole				
Dimethoate			12	120
3,3'-Dimethoxybenzidine	39	390		1,200
Dimethylaminoazobenzene				
7,12-Dimethylbenz (a)-anthracene				
3,3'-Dimethylbenzidine	0.24	2.4		7.5
α,α-Dimethylphenethylamine			61	620
2,4-Dimethylphenol			1,200	12,000
Dimethyl phthalate			610,000	1,000,000 **
1,2-Dinitrobenzene			6.1	62
1,3-Dinitrobenzene			6.1	62
1,4-Dinitrobenzene			6.1	62
4,6-Dinitro-2-methylphenol				
2,4-Dinitrophenol			120	1,200
2,4-Dinitrotoluene			120	1,200
2,6-Dinitrotoluene			61	620
Dinocap				
Dinoseb			61	620
Dioxathion				

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TABLE 1. SOIL REMEDIATION LEVELS (Cont.)

Contaminant	Residential (mg/kg)			Non-residential (mg/kg)
	Carcinogen		Non-carcinogen	
	10^6 Risk	10^5 Risk		
Semivolatile organic compounds (SVOCs; EPA Method 8270C)				
Diphenylamine			1,500	15,000
5,5-Diphenylhydantoin				
1,2-Diphenylhydrazine	0.68	6.8		22
Di-n-octyl phthalate				
Disulfoton				
Endosulfan I			370	3,700
Endosulfan II				
Endosulfan sulfate				
Endrin			18	180
Endrin aldehyde				
Endrin ketone				
EPN				
Ethion			31	310
Ethyl carbamate				
Ethyl methanesulfonate				
Famphur				
Fensulfothion				
Fenthion				
Fluchloralin				
Fluoranthene				
Fluorene				
2-Fluorobiphenyl (surr)				
2-Fluorophenol (surr)				
Heptachlor	0.12	1.2		3.8
Heptachlor epoxide	0.06	0.6		1.9
Hexachlorobenzene	0.34	3.4		11
Hexachlorobutadiene	7	70	18	180
Hexachlorocyclopentadiene			370	3,700
Hexachloroethane	39	390	61	620
Hexachlorophene			18	180
Hexachloropropane				
Hexamethylphosphoramide				
Hydroquinone	9.8	98		310
Indeno (1,2,3-cd) pyrene				
Isodrin				
Isophorone	580	5,800		18,000
Isosafrole				

TABLE 1. SOIL REMEDIATION LEVELS (Cont.)

Contaminant	Residential (mg/kg)			Non-residential (mg/kg)
	Carcinogen		Non-carcinogen	
	10^6 Risk	10^5 Risk		
Semivolatile organic compounds (SVOCs; EPA Method 8270C)				
Kepone	0.068	0.68		2.2
Leptophos				
Malathion			1,200	12,000
Maleic anhydride			6,100	62,000
Mestranol				
Methapyrilene				
Methoxychlor			310	3,100
3-Methylcholanthrene				
4,4'-Methylenebis (2-chloroaniline)	4.2	42		130
4,4'-Methylenebis (N,N-dimethylaniline)			120	1,200
Methyl methanesulfonate				
2-Methylnaphthalene				
Methyl parathion				
2-Methylphenol			3,100	31,000
3-Methylphenol			3,100	31,000
4-Methylphenol			310	3,100
Mevinphos				
Mexacarbate				
Mirex	0.3	3		9.6
Monocrotophos				
Naled			120	1,200
Naphthalene			56	190
Naphthalene-d_8 (IS)				
1,4-Naphthoquinone				
1-Naphthylamine				
2-Naphthylamine				
Nicotine				
5-Nitroacenaphthene				
2-Nitroaniline			180	1,800
3-Nitroaniline			18	180
4-Nitroaniline	26	260	180	820
5-Nitro-o-anisidine				
Nitrobenzene			20	100
Nitrobenzene-d_5 (surr)				
4-Nitrobiphenyl				
Nitrofen				
2-Nitrophenol				

TABLE 1. SOIL REMEDIATION LEVELS (Cont.)

Contaminant	Residential (mg/kg)			Non-residential (mg/kg)
	Carcinogen		Non-carcinogen	
	10^6 Risk	10^5 Risk		
Semivolatile organic compounds (SVOCs; EPA Method 8270C)				
4-Nitrophenol				
5-Nitro-o-toluidine				
Nitroquinoline-1-oxide				
N-Nitrosodi-n-butylamine	0.025	0.25		0.58
N-Nitrosodiethylamine	0.0037	0.037		0.11
N-Nitrosodimethylamine	0.011	0.11		0.34
N-Nitrosodimethylethylamine	0.025	0.25		0.78
N-Nitrosodiphenylamine	110	1,100		3,500
N-Nitrosodi-n-propylamine	0.078	0.78		2.5
N-Nitrosomorpholine				
N-Nitrosopiperidine				
N-Nitrosopyrrolidine	0.26	2.6		8.2
Octamethyl pyrophosphoramide			120	1,200
4,4'-Oxydianiline				
Parathion			370	3,700
Pentachlorobenzene			49	490
Pentachloronitrobenzene	2.1	21		66
Pentachlorophenol	3.2	32		90
Perylene-d_{12} (IS)				
Phenacetin				
Phenanthrene				
Phenanthrene-d_{10} (IS)				
Phenobarbital				
Phenol				
Phenol-d_6 (surr)				
1,4-Phenylenediamine				
Phorate			12	120
Phosalone				
Phosmet			1,200	12,000
Phosphamidon				
Phthalic anhydride			120,000	1,000,000 **
2-Picoline (2-Methylpyridine)				
Piperonyl sulfoxide				
Pronamide			4,600	46,000
Propylthiouracil				
Pyrene				
Pyridine			61	620

TABLE 1. SOIL REMEDIATION LEVELS (Cont.)

Contaminant	Residential (mg/kg)			Non-residential (mg/kg)
	Carcinogen		Non-carcinogen	
	10^6 Risk	10^5 Risk		
Semivolatile organic compounds (SVOCs; EPA Method 8270C)				
Resorcinol				
Safrole				
Strychnine			18	180
Sulfallate				
Terbufos			1.5	15
Terphenyl-d_{14} (surr)				
1,2,4,5-Tetrachlorobenzene			18	180
2,3,4,6-Tetrachlorophenol			1,800	18,000
Tetrachlorovinphos	23	230		720
Tetraethyl dithiopyrophosphate			31	310
Tetraethyl pyrophosphate				
Thionazine				
Thiophenol (Benzenethiol)				
Toluene diisocyanate				
o-Toluidine	2.9	29		
Toxaphene	0.5	5		16
2,4,6-Tribromophenol (surr)				
1,2,4-Trichlorobenzene			62	220
2,4,5-Trichlorophenol			6,100	62,000
2,4,6-Trichlorophenol			6.1	62
Trifluralin	71	710	460	2,200
2,4,5-Trimethylaniline				
Trimethyl phosphate	15	150		470
1,3,5-Trinitrobenzene			1,800	18,000
Tris (2,3-dibromopropyl) phosphate				
Tri-p-tolyl phosphate				
O,O,O-Triethyl phosphorothioate				

Notes:

* Indicates SRL is based on the chemical-specific saturation level in soil for volatile organic chemicals only.

** Indicates SRL is based on a 100% saturation ceiling limit for non-volatile organic chemicals.

surr - Surrogate

IS - Internal Standard

3.3 Data Quality Indicators

Data quality indicators (DQIs), which include; precision, accuracy, completeness, sensitivity, representativeness, and comparability refer to QC criteria established for various aspects of data gathering, sampling, or analysis activity. In defining DQIs specifically for the project, the level of uncertainty associated with each measurement is defined.

Soil samples will be analyzed by laboratories certified by the Arizona Department of Health Services (ADHS) for each chemical of concern. Appendix A includes the QAM for Test America, Inc. to be used during this investigation. The QAM includes information on the QA/QC program and DQIs for the following soil and water sample analyses:

- Pesticides (EPA Method 8081);
- Herbicides (EPA Method 8151);
- Volatile organic compounds (VOCs, EPA Method 8260B);
- Total 8 RCRA metals (EPA Method SW7471A and SW6010B);
- Polynuclear aromatic hydrocarbons (PAHs, EPA Method 8310); and
- Semivolatile organic compounds (SVOCs; EPA Method 8270C).

The measurement quality objectives as evaluated by precision, accuracy, completeness, sensitivity, representativeness, and comparability are summarized in the following paragraphs. Precision refers to the agreement or reproducibility of a set of duplicate or replicate results obtained from independent analyses completed under identical conditions. Both sampling and laboratory precision will be evaluated by the performance of field duplicates, matrix spike/matrix spike duplicates (MS/MSDs), laboratory duplicates, and Laboratory Control Samples/Laboratory Control Sample Duplicates (LCS/LCSDs).

Precision is expressed as the relative percent difference (RPD) in concentration between the original and duplicate analyses, as determined in the formula:

$$RPD = \frac{|S - D|}{\frac{1}{2} \times (S + D)} \times 100$$

Where:
RPD = Relative percent difference
S = Concentration of analyte in the original sample
D = Concentration of analyte in duplicate sample
For data validation (see Section 3.5), the most stringent criteria will be used - either the laboratory-specific criteria or the method specific criteria.

Accuracy, or measurement bias, is a measure of the agreement between an experimental or observed value and the true value of the parameter being measured. A measurement is evaluated for accuracy by comparing a given observed value to a true value and against an established range specifying a lower limit and an upper limit of acceptability. LCS/LCSDs, surrogate spikes, and MS/MSDs will be used to evaluate the accuracy and bias for the project samples.

Accuracy is expressed as percent recovery (%R), as determined from the formula:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

Where:
%R = Percent recovery (percent)
SSR = Spike sample result (concentration units)
SR = Original sample result (concentration units)
SA = Spike added (concentration units)

For data validation (see Section 3.5), the most stringent criteria will be used - either the laboratory-specific criteria or the method specific criteria.

Completeness is a measure of the adequacy of the amount of usable data resulting from the sampling and analysis program. It is evaluated for each method, matrix and analyte combination in order to prevent misinterpretation of the data and to meet the needs of the sampling program. Another aspect of completeness involves the adequacy of the data package in documenting the associated QC data for the project samples. The validated data will provide a measure of completeness, but the usability of the validated data will be determined by AMEC, the City of Avondale and ADEQ. The completeness goal for this project is 90 percent; however, for critical samples the completeness goal will be 100 percent. Critical samples include those used to define the boundaries of areas requiring remediation or to demonstrate compliance with applicable federal or state criteria.

Percent completeness is expressed as %PC, as determined from the formula:

$$\%PC = \frac{N_A}{N_1} \times 100$$

Where:
N_A = actual number of valid analytical results obtained
N_1 = theoretical number of results obtainable under ideal conditions

The method detection limit (MDL) is defined as the minimum concentration at which a given target analyte can be measured and reported with 99% confidence that the analyte concentration is greater than zero. Laboratory practical quantitation limits (PQLs), contract required quantitation limits (CRQLs) or reporting limits (RLs) are defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. Laboratory MDLs and RLs will be used to evaluate the method sensitivity and/or applicability. To assess the respective method capability, the project criteria listed in Table 1 for each chemical of concern have been screened against the CRQLs and RLs for each analytical method, for the laboratory.

The sample-specific MDL and RL will be reported by the laboratory and will take into account any factors relating to the sample analysis that might decrease or increase the reporting limit (e.g. dilution factor, percent moisture, sample volume, sparge volume). In the event that the MDL and RL are elevated due to a matrix limitation and subsequent dilution or reduction in the sample aliquot, the data will be evaluated by AMEC and the laboratory to determine if an alternative course of action is required. Should elevated RLs and MDLs continue to reoccur, the AMEC project manager (PM) shall consult with the ADEQ prior to any corrective action.

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Rationale for the sampling effort is discussed in the Section 4.0. The sampling plans and laboratory standard operating procedures (SOPs) will be followed to ensure that the requirements of the program design, sampling techniques, sample holding times, and analytical procedures are satisfied.

Comparability represents the extent to which comparisons among different measurements of the same quantity or quality will yield valid conclusions. Comparability among measurements in these investigations will be achieved through the use of standard procedures for sample collection, handling, analysis, and reporting, as described in Section 3.0 of this SAP and the procedures documented in the laboratory QAM.

3.4 Data Review and Validation

The data review and validation process will evaluate the analytical data for method quality control and laboratory quality control compliance, and will determine the validity and applicability of the data. Tier 1A Laboratory data validation will be performed, which will consist of verification of 100 percent of the analytical data. The validated project data, including qualifiers and reason codes, will be entered into the project database, thus enabling this information to be retained or retrieved, as needed. A summary of the data qualifiers shall be written for each sampling activity and shall be included in the report to the City.

The laboratory will supply a data deliverable that supports sufficient traceability and QC for legally defensible data. This data package will include all relevant QC sample data, calibration

data, method QC data, laboratory case narratives, custody information, standards traceability data, and any information pertaining to the sample analysis excluding raw instrument data, unless equivalent information is not available in summary form. Inconsistencies or errors contained in the data package will be noted by the AMEC QA Manager and discussed with the laboratory PM. The laboratory PM is responsible for resolving any inconsistencies or errors in a timely manner.

3.4.1 Completeness Check

Data will be verified for completeness against the chain-of-custody (COC) forms to ensure that the analyses requested were performed and reported. The percentage of usable data shall also be determined by comparing the total number of data planned against the number of usable data. This number shall be reported in the Phase II Report. Compilation of sufficient data is necessary for meeting the project data quality objectives (DQOs).

3.4.2 Data Verification Criteria

Field data shall be checked in the field prior to submittal of the samples to the laboratory. This review is designed to identify field documentation errors prior to sample submittal. Field measurement data will also be verified using procedures that include routine checks during the recording and processing of data, e.g. looking for errors in identification codes, and looking for outliers that may be the result of transcription errors or field instrumentation breakdown. Obvious mistakes in identifiers or field data will be corrected when possible. Since outliers may indicate a greater degree of spatial or temporal variability than expected rather than an error, results will be reviewed carefully before a decision to include or exclude a suspect field measurement is made.

3.4.3 Data Qualifier Flags

The guidance used for data verification is taken from the EPA Contract Laboratory Program National Function Guidelines for Organic Data Review, as revised, and EPA Contract Laboratory Program National Function Guidelines for Inorganic Data Review, as revised. The data qualification scheme is the basis for determining whether sample results should be qualified, but the reviewer's judgment is also critical in determining whether data quality and usability have been systematically influenced and whether data points require qualification. The staff performing the assessment must understand the analytical procedures being reviewed and understand how the data will be used. If QC results are out of criteria, the data will be qualified using the standard Contract Laboratory Program data flags (i.e., B, J, UJ, NJ, and R).

Problems or questions about analytical data quality that may require corrective action will be brought to the attention of the laboratory in writing from AMEC QA Manager. The request may be initiated if QC results exceed method or project criteria, if reporting or flagging errors are identified, or to request information that has not been reported. The laboratory's response shall include a written explanation of the problem, a plan and a schedule for corrective action, and/or a

re-issuance of laboratory reports or electronic data files. If significant data quality problems have occurred and the data are critical to decision making, samples maybe required to be reanalyzed, or recollected and reanalyzed at the discretion of AMEC.

The ADEQ has published standardized data qualifier flags that will be used by the laboratory in qualifying analytical results. Any data that is associated with a QC exceedance will be designated by the laboratory using the Arizona Data Qualifier flags to identify the sample results associated with the exceedance.

3.5 Data Management

The analytical electronic and hardcopy data will be managed and maintained by AMEC. Any requests for these data by third parties must be first approved by the City and subsequently communicated by the City to AMEC. Data management for the project has the following objectives:

- Establish a controlled, functional, and efficiently-operated data management system and accompanying procedures to manage, analyze, document, and transfer the environmental data that are collected and generated;
- Maintain a usable and accurate database throughout the life of the project;
- Process specific data requests from project and City personnel;
- Transfer specific data components to other parties, as appropriate; and
- Archive the database and related documentation upon closure of the project.

Additional data fields may be added to accommodate the requirements of the project. All changes and additions must be reviewed and approved by the AMEC PM and/or AMEC QA/QC Manager.

3.6 Assessment Oversight

Prior to the beginning of fieldwork, the AMEC field staff will review the project SAP and Health and Safety Plan (HASP) and will assemble the necessary field gear, including the field notebook and logs, copies of the project SAP and HASP, sampling and decontamination equipment, sample containers and labels, COC forms and seals, sample shipping coolers and materials, and any other equipment and materials necessary for the fieldwork. The AMEC PM or field staff will contact the analytical laboratories in advance to schedule sample analyses and will arrange for transportation of samples to the laboratories.

The AMEC field staff will be responsible for performing fieldwork in accordance with the SAP, including sampling activities; documentation accuracy, completeness, and consistency; and packaging and transportation of samples to the laboratories.

The AMEC field staff will communicate daily to the AMEC PM regarding field activities, and any changes or corrections will be implemented. During and following the fieldwork, the AMEC PM will review field documentation and laboratory data for accuracy and completeness and will provide the information to the AMEC QA Manager for additional review.

4.0 SAMPLING RATIONALE

This section of the SAP describes the rationale and frequency for the soil sampling program. The information will allow field personnel to obtain data of sufficient quantity and quality to fulfill the SAP DQOs. The Site has been divided into two (2) large areas based on historic use and current conditions. Soil will be sampled in accordance with the applicable guidance and regulations.

4.1 Airstrip and General Property

The airstrip and general property area includes; the current airstrip alignment on the west side, historic airstrip alignment on east side, and other general areas of the Site based on Phase I. The general areas will include the detached asphalt pad south of the current airstrip alignment, an area in the middle of the Site where historic photos show equipment storage and the concrete water basin in the northwest corner of the Site.

For sampling purposes, the Site has been divided into reference areas of agricultural (east) and non-agricultural (west). Sample locations on the agricultural portion of the Site will be spaced across the current airstrip and historic airstrip at approximately 300-foot centers. Sample locations on the non-agricultural portion of the Site will be focused on areas of environmental concern identified in the Phase I environmental site assessment. At each location, three (3) samples will be collected. The shallow sample will be collected from 0.5-1.0 feet bgs, the middle sample will be collected from 1.5-2.0 feet bgs, and the deep sample will be collected from 2.5-3.0 feet bgs. With the exception of the concrete water basin sample each of the shallow samples will be analyzed immediately upon delivery to the fixed laboratory. However, the middle and deep samples will remain on hold at the laboratory pending shallow sample analysis. If the shallow sample analytical results are above the RSRLs for specific pesticide or herbicide constituents then the middle sample will be analyzed. If the middle sample results are above the RSRLs for specific pesticides or herbicides constituents then the deep sample will be analyzed. If the deep sample results are above RSRLs then further investigation activities will be evaluated. Due to the possibility of leakage and downward vertical migration of potential chemicals, all sample depths collected at the concrete water basin will be analyzed for pesticides and herbicides regardless of analytical results. The table in Section 5.1.1 lists the proposed soil sampling protocol for the airstrip and general property area.

4.2 Aircraft Hangar and Equipment Storage Area

The aircraft hangar and equipment storage area includes three (3) specific sections of the Site including; the interior aircraft hangar, the exterior aircraft hangar and the equipment storage area on the west side of the aircraft hangar adjacent to the office/storage building.

Throughout the aircraft hangar and surrounding area multiple soil staining areas are present. Sampling the interior aircraft hangar, exterior aircraft hangar and the equipment storage area will be for waste characterization only (i.e., the chemical identification for hazardous/nonhazardous media disposal). Two composite soil samples will be submitted for an array of analytical analysis by collecting discrete surface samples from stained areas; surface samples will be collected approximately from the top six (6) inches of the soil (0.5 feet) at ground surface. Each composite sample will comprise of soil from five (5) discrete surface locales taken at biased stained soil locations. Two (2) composite samples from the interior aircraft hangar, two (2) composite samples from the exterior aircraft hangar, and two (2) composite samples from the equipment storage area between the aircraft hangar and office storage building. The table in Section 5.1.2 lists the proposed soil sampling protocol for the aircraft hangar and equipment storage area.

5.0 REQUEST FOR ANALYSIS

5.1 Analyses Narrative

Soil samples will be collected from current and historical airstrip, general property locations, aircraft hangar (interior and exterior), and concrete water basin. In addition, field duplicate samples and equipment rinse blanks will be collected for QA/QC requirements. The location for the field duplicate samples will be selected by AMEC in the field; if possible, AMEC will select locations that appear to have been impacted by chemicals of concern.

The samples (including QC samples) will be analyzed by a fixed-base laboratory (Test America, Inc., Phoenix, AZ). All soil samples collected will be analyzed on a normal turnaround basis (10-day) unless weather or other factors delay field work, in which case five-day turnaround may be used if necessary to maintain the project schedule. Table 2 is the Request for Analyses (RFA) for soil to be sampled at the Site. The table includes the specifics related to chemical analyses, container types, sample volumes, preservatives, special designation, and analytical holding times for each parameter. Quality Control (QC) samples, such as blanks and duplicates are indicated as "Special Designation".

5.1.1 Soil Samples from Airstrip and General Property

The airstrip and general property area includes; the current airstrip alignment on the west side, historic airstrip alignment on east side, and other general areas of the Site based on Phase I. The general areas will include 1) the detached asphalt pad south of the current airstrip alignment, 2) an area in the middle of the Site where historic photos show equipment storage and 3) the concrete water basin in the northwest corner of the Site.

Table 2
Request for Analysis
Summary of Samples, Containers, and Analytical Methods for Soil

				Organic						Inorganic	
Specific Analyses Requested				VOCs 8260B		SVOCs 8270C	PAHs 8310	Herbicides 8151	Pesticides 8081A	[1]Metals 6010B/7471A	Approximate Containers Per Sample
Preservatives				Stored at 4ºC±2ºC		Stored at 4ºC±2ºC	Stored at 4ºC±2ºC	Stored at 4ºC±2ºC	Stored at 4ºC±2ºC	Stored at 4ºC±2ºC	
Analytical Holding Time(s)				14 days		14 days	14 days	14 days	14 days	28 days	
Sample Number	Matrix	Sample Type	Depth (in feet)	[2]En Core®	MeOH 40 mL VOA	4 oz CWM	4 oz CWM	4 oz CWM	4 oz CWM	4 oz CWM	
AHI-1	Soil	Soil Composite	0-0.5	1*	1*	1	1	1	1	1	4 to 6
AHI-2	Soil	Soil Composite	0-0.5	1*	1*	1	1	1	1	1	4 to 6
AHE-1	Soil	Soil Composite	0-0.5	1*	1*	1	1	1	1	1	4 to 6
AHE-2	Soil	Soil Composite	0-0.5	1*	1*	1	1	1	1	1	4 to 6
ESA-1	Soil	Soil Composite	0-0.5	1*	1*	1	1	1	1	1	4 to 6
ESA-2	Soil	Soil Composite	0-0.5	1*	1*	1	1	1	1	1	4 to 6
ASC-1a	Soil	Soil Boring	0.5-1.0					1	1		1
ASC-1b	Soil	Soil Boring	1.5-2.0					(1)	(1)		1
ASC-1c	Soil	Soil Boring	2.5-3.0					(1)	(1)		1
ASC-2a/QC	Soil	Soil Boring	0.5-1.0					1/1	1/1		1
ASC-2b	Soil	Soil Boring	1.5-2.0					(1)	(1)		1
ASC-2c	Soil	Soil Boring	2.5-3.0					(1)	(1)		1
ASC-3a	Soil	Soil Boring	0.5-1.0					1	1		1
ASC-3b	Soil	Soil Boring	1.5-2.0					(1)	(1)		1
ASC-3c	Soil	Soil Boring	2.5-3.0					(1)	(1)		1
ASC-4a	Soil	Soil Boring	0.5-1.0					1	1		1
ASC-4b	Soil	Soil Boring	1.5-2.0					(1)	(1)		1
ASC-4c	Soil	Soil Boring	2.5-3.0					(1)	(1)		1
ASC-5a/QC	Soil	Soil Boring	0.5-1.0					1/1	1/1		1
ASC-5b	Soil	Soil Boring	1.5-2.0					(1)	(1)		1
ASC-5c	Soil	Soil Boring	2.5-3.0					(1)	(1)		1
ASH-1a	Soil	Soil Boring	0.5-1.0					1	1		1
ASH-1b	Soil	Soil Boring	1.5-2.0					(1)	(1)		1
ASH-1c	Soil	Soil Boring	2.5-3.0					(1)	(1)		1
ASH-2a	Soil	Soil Boring	0.5-1.0					1	1		1
ASH-2b	Soil	Soil Boring	1.5-2.0					(1)	(1)		1
ASH-2c	Soil	Soil Boring	2.5-3.0					(1)	(1)		1
ASH-3a	Soil	Soil Boring	0.5-1.0					1	1		1
ASH-3b	Soil	Soil Boring	1.5-2.0					(1)	(1)		1
ASH-3c	Soil	Soil Boring	2.5-3.0					(1)	(1)		1
ASH-4a/QC	Soil	Soil Boring	0.5-1.0					1/1	1/1		1
ASH-4b	Soil	Soil Boring	1.5-2.0					(1)	(1)		1
ASH-4c	Soil	Soil Boring	2.5-3.0					(1)	(1)		1
ASH-5a	Soil	Soil Boring	0.5-1.0					1	1		1
ASH-5b	Soil	Soil Boring	1.5-2.0					(1)	(1)		1
ASH-5c	Soil	Soil Boring	2.5-3.0					(1)	(1)		1
ASH-6a	Soil	Soil Boring	0.5-1.0					1	1		1
ASH-6b	Soil	Soil Boring	1.5-2.0					(1)	(1)		1
ASH-6c	Soil	Soil Boring	2.5-3.0					(1)	(1)		1
ASH-7a	Soil	Soil Boring	0.5-1.0					1	1		1
ASH-7b	Soil	Soil Boring	1.5-2.0					(1)	(1)		1
ASH-7c	Soil	Soil Boring	2.5-3.0					(1)	(1)		1

5.1.2 Soil Samples from Aircraft Hangar and Equipment Storage Area

The aircraft hangar and equipment storage area includes four (4) specific sections of the Site including; the interior aircraft hangar, the exterior aircraft hangar and the equipment storage area on the west side of the aircraft hangar.

5.2 Analytical Laboratory

Soil samples collected during this project will be analyzed by an ADHS-certified laboratory, Test America in Phoenix, Arizona, Arizona Environmental Laboratory License number AZ0426 (fixed-base laboratory). The Laboratory Quality Assurance Manual for Test America is included in Appendix A.

6.0 FIELD METHODS AND PROCEDURES

6.1 Field Equipment

The following general list of equipment will be utilized during the soil sample activities detailed in this SAP.

6.1.1 List of Equipment Needed

1. Personnel protective equipment (PPE);
   a. Nitrile gloves;
   b. Hard hat;
   c. Steel-toe boots;
   d. Leather gloves; and,
   e. If necessary, a respirator with appropriate cartridges.
2. Field logbook;
3. Hand trowel (disposable or stainless steel);
4. Shovel and digging bar;
5. Digital camera;
6. Unified Soil Classification System (USCS) soil identification field chart;
7. Handheld Global Positioning System (GPS);
8. Folding table and chair;
9. Methanol sample containers (lab certified) and laboratory spoons, if applicable;
10. Scale (methanol extraction only);
11. En Core® preservation sample kits, if applicable;
12. Plastic re-sealable storage bags;
13. Teflon squares;
14. Waterproof self-adhesive sample labels;

15. Custody seals;
16. Chain-of-custody forms;
17. Ice chests/coolers with ice;
18. Permanent markers;
19. Paper towels; and
20. Decontamination Equipment.
    a. Alconox® (or equivalent);
    b. Scrub brushes;
    c. Distilled water; and
    d. Clean 5-gallon buckets (three or more);

6.1.2 Calibration of Field Equipment

Field equipment will be calibrated prior to each sampling event according to manufacturer's recommendations using manufacturer's standards. The equipment, calibration, and maintenance information will be documented in the instrument calibration log (Appendix B). The frequency of calibration is dependent on the type and stability of the equipment, the methods used, the intended use of the equipment, and the recommendations of the manufacturer. Detailed information regarding the calibration and frequency of equipment calibration is provided in specific manufacturer's instruction manuals. Field equipment requiring repair, replacement, or recalibration will be removed from service if the condition cannot be repaired following the manufacturer's procedures that will be provided at the Facility.

6.2 Field Screening

Field screening will only apply to the surface composite soil sampling activities outlined in Section 6.3.1. The field screening will consist of visually screening the soil staining area within the aircraft hangar (interior and exterior) and the equipment storage area between the office storage and aircraft hangar. AMEC field representatives will locate typical soil staining throughout the aircraft hangar and mark them with flagging. AMEC will choose a total of ten (10) locations for discrete specimen sampling which will be used to produce two (2) composite soil samples. The composite soil sampling protocol is outlined in Section 6.3.1.

6.3 Soil Sampling

6.3.1 Surface Soil Sampling (Composite)

Surface composite soil sampling will occur in the aircraft hangar (interior and exterior) and equipment storage area. Composite soil samples in each area will be collected from discrete specimen sample locations as described in the steps below:

9.2 Photographs

Photographs will be taken at areas of interest during the Site activities. They will serve to verify information entered in the field logbook. When a photograph is taken, the following information will be written in the logbook or will be recorded in a separate field photography book:

- Time, date, location, and, if appropriate, weather conditions;
- Type of camera;
- Description of the subject photographed (including the photograph direction); and
- Name of person taking the photograph.

All photographs will be subject to the City security review.

9.3 Labeling

Sample identification and labeling is important for maintaining the integrity of analytical data collected during the field investigation activities. The sample identification is an integral part of the data management for future analysis of data and further investigation responsibilities, if warranted.

Each sample will have an adhesive plastic or waterproof paper label affixed to the container and will be labeled at the time of collection. The following information will be recorded on the container label with a permanent marker at the time of collection:

- Project name;
- Sample identification;
- Date and time of sample collection;
- Preservative type (if applicable);
- Initials of sampler; and
- Laboratory analysis requested.

Along with the proposed soil samples, QC samples will be collected to measure precision and effectiveness of laboratory, decontamination and transportation procedures.

9.4 Chain-Of-Custody Procedures

COC records are use to document sample collection and shipment to a laboratory for analysis. The COC form is an integral component of the sampling process, and represents the permanent record of sample holding and shipment. Forms will be completed and sent with the samples for each laboratory and each shipment. If multiple coolers are sent to a single laboratory on a

single day, forms will be completed and sent with each cooler. An example COC form is presented in Appendix B.

The COC record will identify the contents of each shipment and maintain the custodial integrity of the samples. A sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are delivered, the custody of the samples will be the responsibility of the AMEC field representative. The COC form will be crosschecked for errors and signed. Corrections on paperwork will be made by placing a single line through the mistake, initialing and dating the change. The correct information will be entered above, below, or after the mistake.

When releasing samples from their custody, the AMEC field representative will sign the COC form on "relinquished by" box and note the date, time, and air bill number (if applicable). A laboratory representative will check samples with their respective COC form(s) into the laboratory, and the form will be signed and dated appropriately. The AMEC field representative or staff member will retain one copy of the signed COC form for the project files. The original COC form will be returned to the AMEC project manager with the analytical results to go into the project files.

9.5 Packaging and Shipment

Analytical methods for soil samples collected within each area at the Site, are referenced in the SAP. The SAP will detail the analytical requirements for each area based upon the historical investigations at the Site and the media being sampled. Soil samples will be submitted to fixed-based laboratories. The responsible field representative will hand deliver samples to the fixed-based laboratory, or the laboratory's courier service will pick up the samples at the Site.

10.0 FIELD QUALITY CONTROL SAMPLES

QC procedures will be implemented using methods that will ensure the project's data needs for completeness, comparability, representativeness, accuracy, and precision are achieved. As such, the soil sample analyses will be completed in accordance with the EPA methodologies. Field sampling precision and data quality will be evaluated through the use of duplicate samples, field blanks, and equipment rinsate blanks. Sample integrity during shipment is monitored with temperature blanks.

10.1 Duplicate Sample

Soil sample duplicates will be collected during the investigation approximately every ten (10) samples or at least one per day; locations will be determined based on field observation and photoionization detector (PID) readings. Duplicate samples will be collected from areas of concern by the following procedures:

A. Duplicate samples will be collected in separate sample containers, at the same location and depth; and
B. Duplicate samples will be collected immediately after the original sample.

10.2 Field Blank

Because equipment blanks are being collected, field blanks are not proposed.

10.3 Equipment Rinsate Blank

The equipment rinsate blank is a sample of reagent grade, analyte free, water poured into, over, or pumped through the sampling device, collected in a sample container, and transported to the laboratory for analysis in the same manner as environmental samples. These blanks are used to assess the effectiveness of equipment decontamination procedures. Equipment rinsate blanks are prepared in accordance with American Standard Testing Method (ASTM) D 5088-90, Practice for Decontamination of Field Equipment Used at Non-Radioactive Waste Sites protocol and are used to monitor the effectiveness of the decontamination process. One equipment rinsate blank sample per type of sampling equipment utilized will be collected at the initiation of each sampling event where samples are submitted for COC analysis. The equipment rinsate blank will be analyzed by the same methods as the environmental samples collected at the sampling location.

10.4 Temperature Blank

The temperature blank is a blank water sample provided by the laboratory. The temperature blank is used to verify the temperature of the sample set submitted to the laboratory. At the time of sample receipt, the laboratory measures the temperature of the water blank as a measure of the sample preservation conditions. If the temperature falls outside the required range of 4°C +/-2°C, preservation has not been within method requirements and data may need to be qualified during validation. One temperature blank will be placed in each sample cooler to be submitted to the laboratory.

10.5 Laboratory Quality Control Samples

The laboratory QAM lists the SOP format and both the QAM and SOP discuss the laboratory quality control samples that will be evaluated to meet the data quality requirements of the analytical methods. The laboratory shall be responsible for assuring that the precision and accuracy criteria are met and maintained in accordance with method specifications, followed by the appropriate corrective action, when necessary. In the event corrective action is warranted, the laboratory will provide the appropriate documentation, such as a nonconformance report (NCR) or data qualifiers, and report the problem in the laboratory case narrative. In general, should there be a disagreement between the SAP and the laboratory QAM, the project SAP will take precedence, and every attempt will be made to resolve such differences, as needed. The laboratory control limits for the QC samples and method QC indicators are cited in Appendix A.

11.0 FIELD VARIANCES

As conditions in the field may vary, it may become necessary to implement minor modifications to sampling as presented in this plan. When appropriate, the ADEQ Project Manager will be notified and a verbal approval will be obtained before implementing the changes. Modifications to the approved SAP will be documented in the field logbook and sampling project report.

12.0 FIELD HEALTH AND SAFETY PROCEDURES

AMEC will prepare a Site-specific Health and Safety Plan (HASP) under separate cover for this project. Level D personal protective equipment (PPE) is anticipated during soil sample collection for this project, including work boots, gloves, hard hat, and if necessary, Tyvek overalls. A copy of the HASP will be available for review prior to initiating the project fieldwork.

APPENDIX A

LABORATORY CERTIFICATION AND QUALITY ASSURANCE MANUAL, TEST AMERICA, INC.

CD COPY ONLY

APPENDIX B

FIELD FORMS

SOIL SAMPLE FORM

SAMPLE IDENTIFICATION	SAMPLED		SAMPLER	DEPTH (U, M, L)	PHYSICAL CHARACTERISTICS		FIELD SCREENING (PID/FID)	ANALYSIS PERFORMED
	DATE	TIME			APPEARANCE	ODOR		

Aerotech Environmental Laboratory, Inc.

[X] Main Lab- 4645 E.Cotton Center Blvd. Bld.3 Ste.189, Phoenix, AZ 85040 (602) 437-3340 FAX (623) 445-6192 rwoods@aerotechlabs.com
[ ] **North Phoenix** 1501 W. Knudsen Drive, Phoenix, AZ 85027 (623) 780-4800 FAX (623) 780-7695 dfelveit@palabs.com
[ ] **Tucson** 4455 S. Park Ave, Suite 110, Tucson, AZ 85714 (520) 807-3801 FAX (520) 807-3803 jchavez@palabs.com

Lab Number

Client
Address
City, State, Zip
Contact
Phone
Fax

Project Name:
Project Number:
Sampler:
P.O. Number:

Page_____of_____
Fax Results Y N
email Results Y N
email Address

ANALYSES REQUESTED

Sample Type Code	Sample Receipt	Turn Around Time Request
DW - Drinking Water	Temperature _____ ° C	_____ 24 Hours
WW - Waste Water	Custody Seals Yes _____ No _____	_____ 48 Hours
HW - HazWaste	Custody Seals Intact Y ___ N ___ NA ___	_____ 72 Hours
S - Soil	Preserved Yes _____ / No _____	_____ 5 Day
A - Air	Total # of Containers _____	_____ Standard 10 Day
Other_____		

Sample Information

#	Sample Identification	Date	Time	Type															# of sample containers

Instructions/Special Requirements:

Date/Time	Samples Relinquished By: Printed Name:	Signature	Samples Received By Printed Name	Signature	Date/Time

CUSTODY SEAL

DATE _____

SIGNATURE _____

QEC
Quality Environmental Containers
800-255-3950 • 304-255-3900

CUSTODY SEAL

DATE _____

SIGNATURE _____

QEC
Quality Environmental Containers
800-255-3950 • 304-255-3900

CUSTODY SEAL

DATE _____

SIGNATURE _____

QEC
Quality Environmental Containers
800-255-3950 • 304-255-3900

CUSTODY SEAL

DATE _____

SIGNATURE _____

QEC
Quality Environmental Containers
800-255-3950 • 304-255-3900

CUSTODY SEAL

DATE _____

SIGNATURE _____

QEC
Quality Environmental Containers
800-255-3950 • 304-255-3900

CUSTODY SEAL

DATE _____

SIGNATURE _____

QEC
Quality Environmental Containers
800-255-3950 • 304-255-3900

PROJECT _____

JOB NO. _____ DATE _____

LOCATION _____

RIG TYPE _____

BORING TYPE _____

SURFACE ELEV. _____

DATUM _____

Depth in Feet	Drill Rate Min/ft.	Graphical Log	Sample	Sample Type	Blow Count (S) Per 6-inches (U) Per 12-inches	Dry Density lbs per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										
5										
10										
15										
20										
25										

GROUNDWATER

	DEPTH(ft)	HOUR	DATE

SAMPLE TYPE

A - Drill cuttings
S - 2" O.D. 1.38" I.D. tube sample
U - 3" O.D. 2.42" I.D. tube sample
C - 3" O.D. CME tube sample
NR - No Recovery

LOG OF TEST BORING NO. 1

INSTRUMENT CALIBRATION LOG

DATE	TIME	METER MODEL TYPE/NUMBER	METER READINGS FOR STANDARDS			INITIALS	COMMENTS
			STD 1	STD 2	STD 3		