



**CITY OF  
TUCSON**

## MEMORANDUM

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**DATE:** November 4, 2010

**TO:** Ryan Airfield Landfill File

**FROM:** Molly Collins, R.G.  
Project Coordinator  
Environmental Services Dept. *MC*

**SUBJECT:** Ryan Airfield Closed Landfill  
Groundwater and Soil Gas Monitoring Report 2009

The City of Tucson-Environmental Services (COT-ES) conducts annual soil gas and groundwater monitoring of the Ryan Airfield closed landfill (RAF) to determine if wastes disposed of in the landfill have impacted adjacent soil vapor or groundwater. This memorandum documents the 2009 results, and provides recommendations for changes to monitoring of groundwater and soil vapor.

### Introduction

The RAF is located on the west side of Tucson Mountains, approximately 12 miles southwest of the City of Tucson in southeastern Avra Valley. The landfill is situated at the southeast end of the airfield's runway system (Figure 2). According to research compiled by Camp Dresser and McKee (CDM) for the COT in 1995<sup>1</sup>, the landfill was operated by the COT from 1973 through 1977 and received residential and commercial refuse from homes, farms, businesses and the airfield located in the surrounding Avra Valley area. The property is still owned by the City of Tucson and is leased to Tucson Airport Authority. The landfill meets the definition of closed solid waste facility under A.R.S. 49-701 and is exempt from the state rules covering solid waste facilities.

Four soil vapor probes were installed in 2003 to monitor soil vapor concentrations of volatile organic compounds (VOCs) which could migrate from the waste and impact the water table. Three groundwater monitoring wells were installed in 2006 to monitor water quality upgradient and downgradient of the landfill. Shallow soil vapor probes to monitor methane concentrations have not been installed around the perimeter of the waste as there are no structures within 500 feet of the waste footprint which could be impacted by methane migration. Methane monitoring for City-owned landfills was directed by Mayor and Council in August 1995 as part of a directive to the Solid Waste Management Department to manage and control methane gas which may pose a threat to nearby structures. Mayor and Council placed evaluation of methane hazards as the highest priority, but also directed staff to subsequently evaluate and establish protocols for other

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<sup>1</sup> CDM, Ryan Field, Landfill Gas Characteristics. 1995

environmental concerns, specifically the groundwater conditions at City-owned landfills.<sup>2, 3</sup>

The groundwater monitoring at the RAF is a non-regulatory discretionary program conducted by COT-ES in response to the Mayor and Council directive. This discretionary program began in 1999 with an inventory of all wells near City owned landfills. There are no regulatory agencies requiring monitoring at the RAF for groundwater or deep soil vapor. The soil vapor probes and ground water monitoring wells at RAF were sampled on a semi-annual schedule through 2006. In 2007 an annual sampling schedule for Volatile Organic Compounds (VOCs) and triennial schedule for inorganic compounds was adopted.

### **Scope of Work**

COT - ES conducted the following scope of work during 2009:

- Depths to groundwater were measured in monitoring wells RAM-503A, RAM-504A and RAM-505A. See Table 1 for monitor well information, and Figure 3 for water table elevations (WTEs). Measurements were collected to the nearest 0.01-foot with a calibrated electronic measuring device.
- In December 2009, vapor samples were collected from vapor probes installed in R-114A, R-115A, R-116A and R-117A (Figure 2). Each well has three probes installed at varying depths (45, 95, 145 feet below land surface (ft BLS)). Vapor samples were submitted to Columbia Analytical Services for analysis for volatile organic compounds (VOCs) by Method TO-15.
- Groundwater samples were collected in December 2009 from monitoring wells RAM-503A, RAM-504A, and RAM-505A (Figure 2 & Table 1). Samples were analyzed by the Tucson Water Quality Laboratory for VOCs and twenty-six inorganics.

### **Results**

#### Hydrogeology

Groundwater surface elevations in December 2009 ranged from 1947.60 feet above mean sea level (ft AMSL) to 1949.57 ft AMSL. Groundwater flow was to the west northwest with a horizontal gradient of 0.0022 feet/linear foot (Figure 3). Based on the water table elevations, RAM-505A is upgradient of the landfill. RAM-503 and RAM-504 are downgradient.

The closest groundwater wells to the west northwest (downgradient) of the site are active, domestic and municipal supply wells. Attachment 1 contains a map showing the locations of nearby registered wells, and a well information table from the Arizona Department of Water Resources web site. The table shows distances to the nearest downgradient wells.

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<sup>2</sup> Solid Waste Management Department: Memorandum to Mayor and Council. Closed Landfill Investigation Summary, February 18, 1998

<sup>3</sup> Mayor and Council: Memorandum: Update on Landfill Methane Monitoring and Compliance, March 15, 1999

Groundwater elevations have generally fallen an average of 5.23 feet since monitoring began at the site in June 2006, but elevations at two wells (RAM-503A and RAM-504A) increased approximately 6-inches between December 2008 and December 2009 (Figure 4). RAM-505A water level measurements for 2008 are not available because the water level meter was not operative due to battery failure.

### Soil Vapor Quality

The deep nested soil-vapor wells R-114A, R-115A, R-116A, and R-117A were monitored for VOCs in December of 2009. Prior to sampling, the probes in each well were purged and landfill gas concentrations were measured using the Landtec GEM 2000 Gas Analyzer and Extraction Monitor (Table 3 and Attachment 2). Methane was not detected in any deep soil vapor probe during the December 2009 event.

Tabulated summaries of soil vapor data for selected VOCs are provided on Table 4 for probes at R-114A, R-115A, R-116A, and R-117A. Trichloroethene (TCE) was detected at 0.0026 ug/L in well R-115A at the 145 foot depth in December 2009. Figure 5 shows historical concentrations of TCE detected at all wells and probes. The concentration detected at R-115-145' in December 2009 is consistent with historical trends since 2006. In the past, the most commonly occurring chemical found in the soil vapor samples collected from the closed RAF landfill was tetrachloroethene (PCE), which was not detected in any probe in December 2009. Figure 6 provides a graph showing the concentrations of vapor phase PCE detected in past sample events at the site. The trends indicate that PCE concentrations have been declining in the probes since 2006. The lab results for all samples collected in 2009 were reported as not detect for PCE. To verify this result, COT-ES will conduct a verification sampling event for soil vapor in the fall of 2010 and document the results in a memorandum to this report.

Although PCE and TCE have been detected in the vadose zone during past sample events, these concentrations are low in comparison to the estimated Groundwater Protection Levels (GPLs) established for Ryan Landfill by Hargis+Associates in 2008 for VOC levels at the soil-groundwater level interface<sup>4</sup>. The estimated site specific GPLs for the RAF Landfill are shown below. The maximum values observed at that site are also shown below. The maximum detected concentrations are significantly below the estimated GPLs which indicate there is little risk at this time of vapor phase VOC impacts to groundwater above Aquifer Water Quality Standards (AWQSS).

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<sup>4</sup> *Soil Vapor Assessment at Los Reales, Prudence, Vincent Mullins, Irvington, Cottonwood, and Ryan Landfills*, EEC and Hargis + Associates, Inc, April 10, 2008

Compound	Ryan Landfill Maximum Detected Concentrations (µg/L) and Year Detected	Well ID and Depth of Screen (ft)	Ryan Landfill GPLs (µg/L)
PCE	2.4 (2006)	R-114A-145'	37
TCE	0.94 (2003)	R-114A-95'	15
Vinyl chloride	0.11 (2005)	R-117A-145'	454
Cis-1,2 dichloroethene	0.015 (2003)	R-116A-95'	172

ND = not detected

There are no soil vapor probes constructed in the vadose zone between 145 ft BLS and the top of the soil-groundwater interface at approximately 455 ft BLS. This leaves approximately 300 ft of vadose zone where soil vapors are not being monitored. Based on the maximum detected concentrations of VOCs in soil vapor, and the groundwater quality data (discussed in next section) from the three on-site wells, the lack of data from the lower-most 300 ft of vadose zone does not pose a significant data gap.

#### Groundwater Quality

For data collected in December 2009, no VOCs were detected above the laboratory's reporting detection limit (RDL) in any groundwater sample (see Attachments 4 and 5 for groundwater field sampling forms and groundwater analytical sheets). In June 2006, toluene was detected at 5.0 µg/L, just above the RDL (3.0 µg/l), in the development sample collected from RAM-504A. This was believed to be an artifact from the well installation process, and has not been observed in any subsequent groundwater samples. Because VOCs other than toluene have not been detected in groundwater, the results are not tabulated or charted.

Of the twenty-six inorganic constituents analyzed in October 2006 and December 2009, none have exceeded their respective aquifer water quality standard (AWQS). All detected values were graphed and indicate relatively stable concentration levels (Attachment 6). Some of the charted data (aluminum and chloride) visually appear to have increasing trends, but considering the shortened concentration scales which are appropriate for the narrow ranged data set, and the change in concentration per year, these increases are negligible (example: an increase of 1.1 mg/L per year for chloride at well RAM-503A).

Based on four years of groundwater VOC data and the inorganic data collected in 2006 and 2009, the waste within the RAF Landfill has not impacted groundwater quality beneath the site.

#### **Proposed Changes to Monitoring.**

Currently, groundwater at the Landfills is monitored and sampled annually for VOCs and triennially for 26 inorganic parameters listed in Attachment 5. Deep soil vapor is monitored and sampled annually for VOCs. As described in the preceding sections, there are no detected water quality issues due to the impact of leachate or the migration of soil vapor VOCs from the waste. Based on a



review of the trends for the previous 7 years of vapor phase data, and 3 years of groundwater VOC data, the probability of impacts to the groundwater from waste buried at the landfill is low. Therefore, COT-ES will no longer monitor groundwater at the landfill as long as it remains undisturbed (i.e. the soil cover remains intact and there are no plans for redevelopment). COT-ES will perform a verification sample event in the fall of 2010 to assess the soil vapor concentrations. If the VOC levels in the soil vapor data are below the soil vapor GPLs and consistent with past levels, COT-ES will not collect further soil vapor samples at the landfill. COT-ES will reevaluate conditions at the landfill annually to determine if groundwater or deep soil vapor monitoring is necessary.

In 2010, COT-ES will initiate a program to inspect and maintain the landfill annually to correct problems such as wildcat dumping, erosion of soil cover, and vandalism of the wells. All groundwater and deep vapor monitoring wells will be inspected and repaired as needed to insure they are secure and remain in proper working order. The details of this program will be discussed in a separate document.

### **Conclusions**

- As part of the City-wide landfill assessment, the COT has monitored soil vapor and groundwater at the Ryan Landfill since 2003 and 2006 respectively. There have been no VOCs detected in groundwater except for a one-time detection of toluene, which is suspected to be an artifact of well installation.
- Concentrations of PCE, TCE and inorganic data collected to date indicate that there are no impacts to the groundwater due to leachate or soil vapor migration from the waste.
- COT-ES will perform a soil vapor sample event in the fall of 2010 to verify the 2009 laboratory analysis of the vapor samples. If the VOC levels in the soil vapor data are below their respective soil vapor GPLs and consistent with past levels, COT-ES will discontinue soil vapor sampling at the site.
- COT-ES will discontinue groundwater monitoring at the RAF as long as conditions remain unchanged. COT-ES will reevaluate the landfill conditions annually to determine if additional soil vapor and groundwater monitoring is necessary.
- In 2010, COT-ES will initiate a program to inspect and maintain the landfill to correct problems such as wildcat dumping, erosion of soil cover, and vandalism of the wells. All groundwater and deep vapor monitoring wells at the two landfills will be inspected and repaired as needed to insure they are secure and in proper working order. Details of this program will be outlined in a separate document. The results of the inspections will be reported annually for the file.

If you have any questions concerning this memorandum, please contact me at (520) 837-3703.

## Enclosures and Attachments

### ENCLOSURES

#### Figures

- 1: Ryan Airfield Landfill – Vicinity Location Map
- 2: Ryan Airfield Landfill – Site Map
- 3: Potentiometric Surface Map—December 2007/2008
- 4: Groundwater Monitor Well Hydrograph
- 5: Soil Vapor TCE Concentration by Probe Depths
- 6: Soil Vapor TCE Concentration by Probe Depths

#### Tables

- 1: Groundwater Monitor Well Information
- 2: Groundwater Table Elevation
- 3: Field Measurements for Landfill Gas
- 4: Vapor Probe Results – Selected VOCs Probes

### ATTACHMENTS

- Attachment 1: Downgradient Well Map and Table
- Attachment 2: Soil Gas Sample Form
- Attachment 3: Soil Vapor Analytical Sheets
- Attachment 4: Groundwater Field Sampling Forms
- Attachment 5: Groundwater Analytical Sheets
- Attachment 6: Inorganic Trend Analysis

cc: File copy—with all attachments

(With Figures only)

Fred Brinker, Tucson Airport Authority (Full Report)

(Full Report Email Link)

Ralph Marra, Tucson Water

Patrick Kelly, Fire Department

Andrew Quigley, Environmental Services

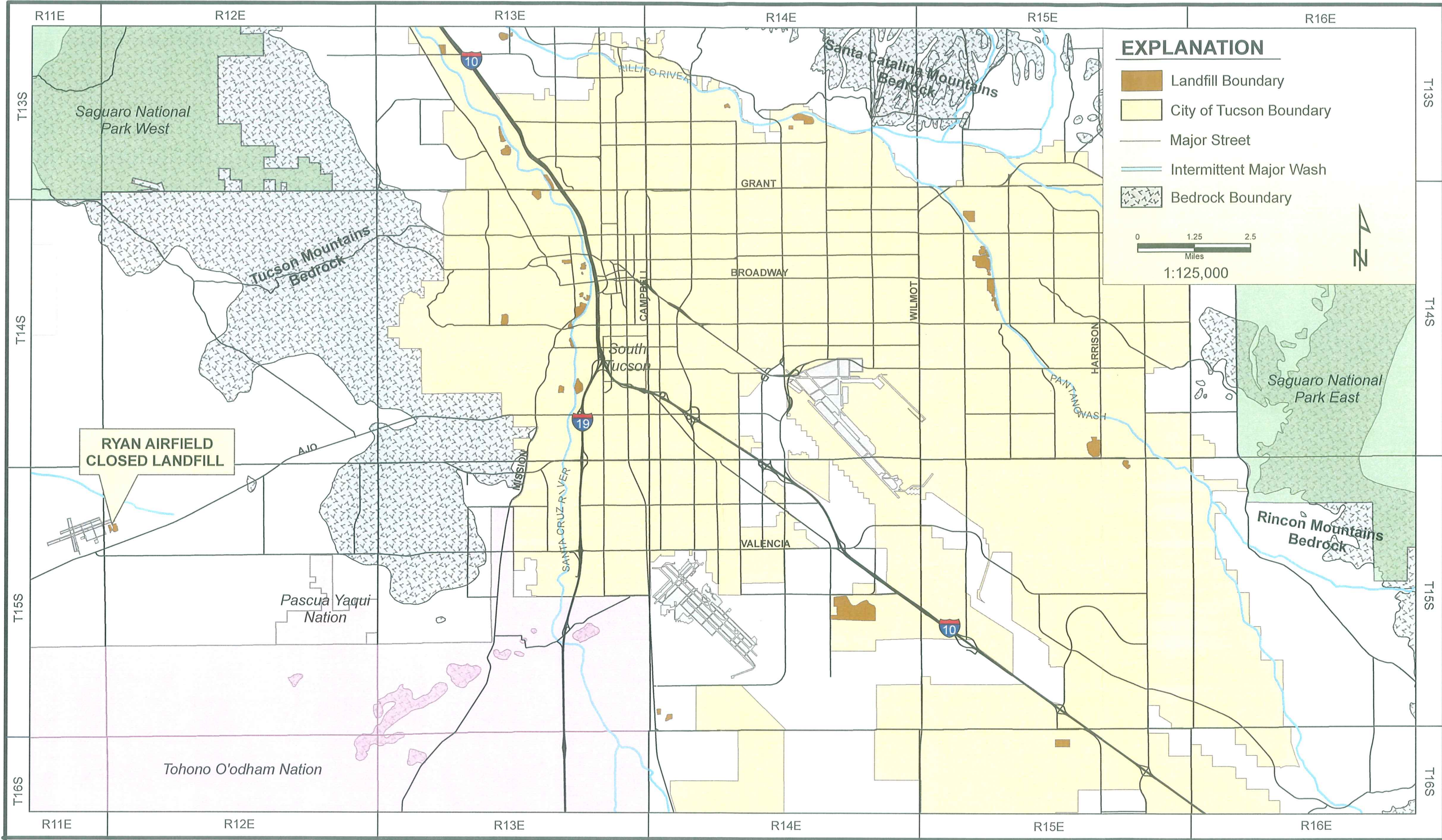
Nancy Petersen, Environmental Services

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## FIGURES





**EXPLANATION**

- Landfill Boundary
- City of Tucson Boundary
- Major Street
- Intermittent Major Wash
- Bedrock Boundary

0 1.25 2.5  
Miles  
1:125,000

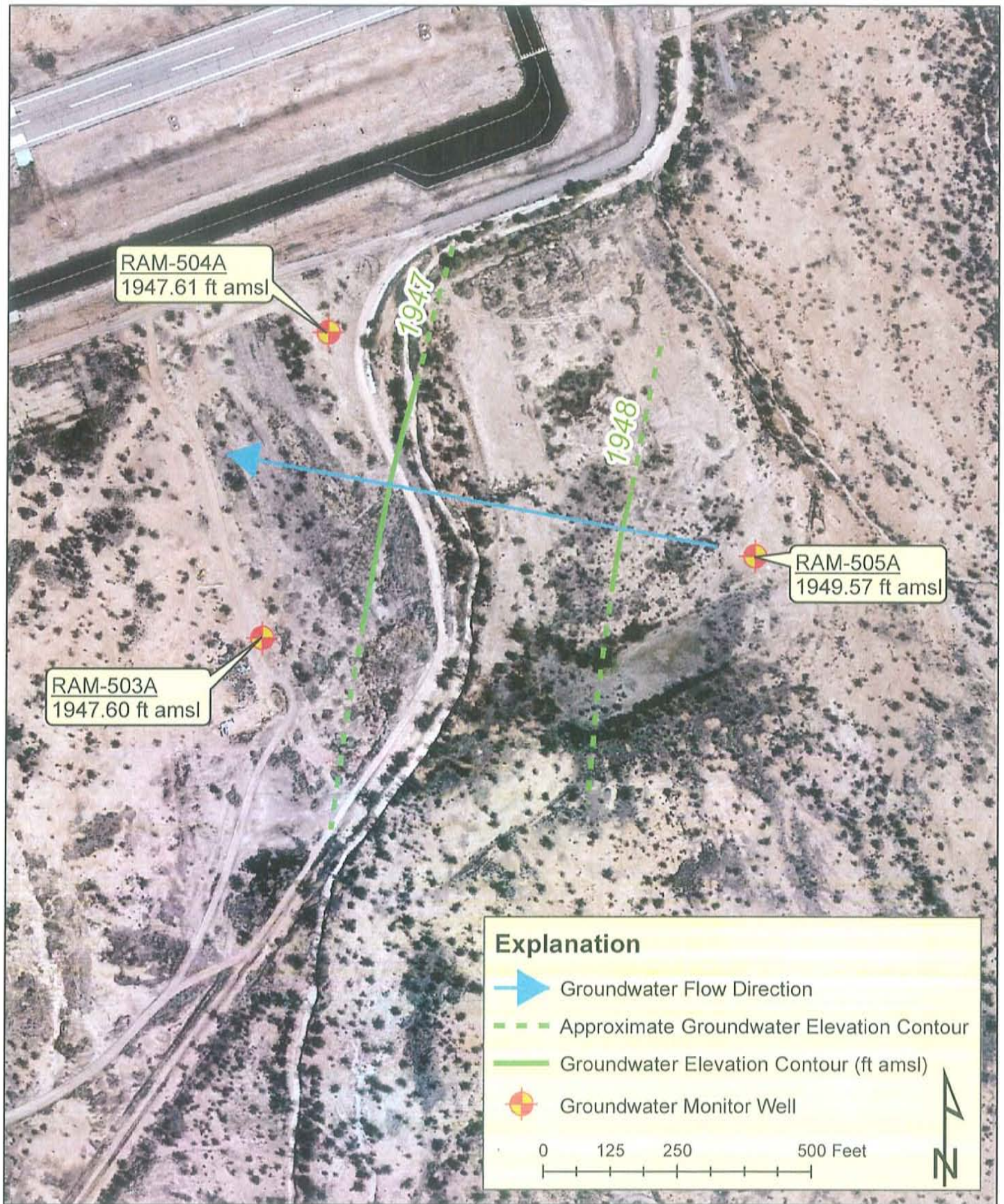
**Figure 1**  
Location Map  
Ryan Airfield Closed Landfill









**Figure 2**  
 Site Map  
 Ryan Airfield Closed Landfill





**Explanation**

-  Groundwater Flow Direction
-  Approximate Groundwater Elevation Contour
-  Groundwater Elevation Contour (ft amsl)
-  Groundwater Monitor Well

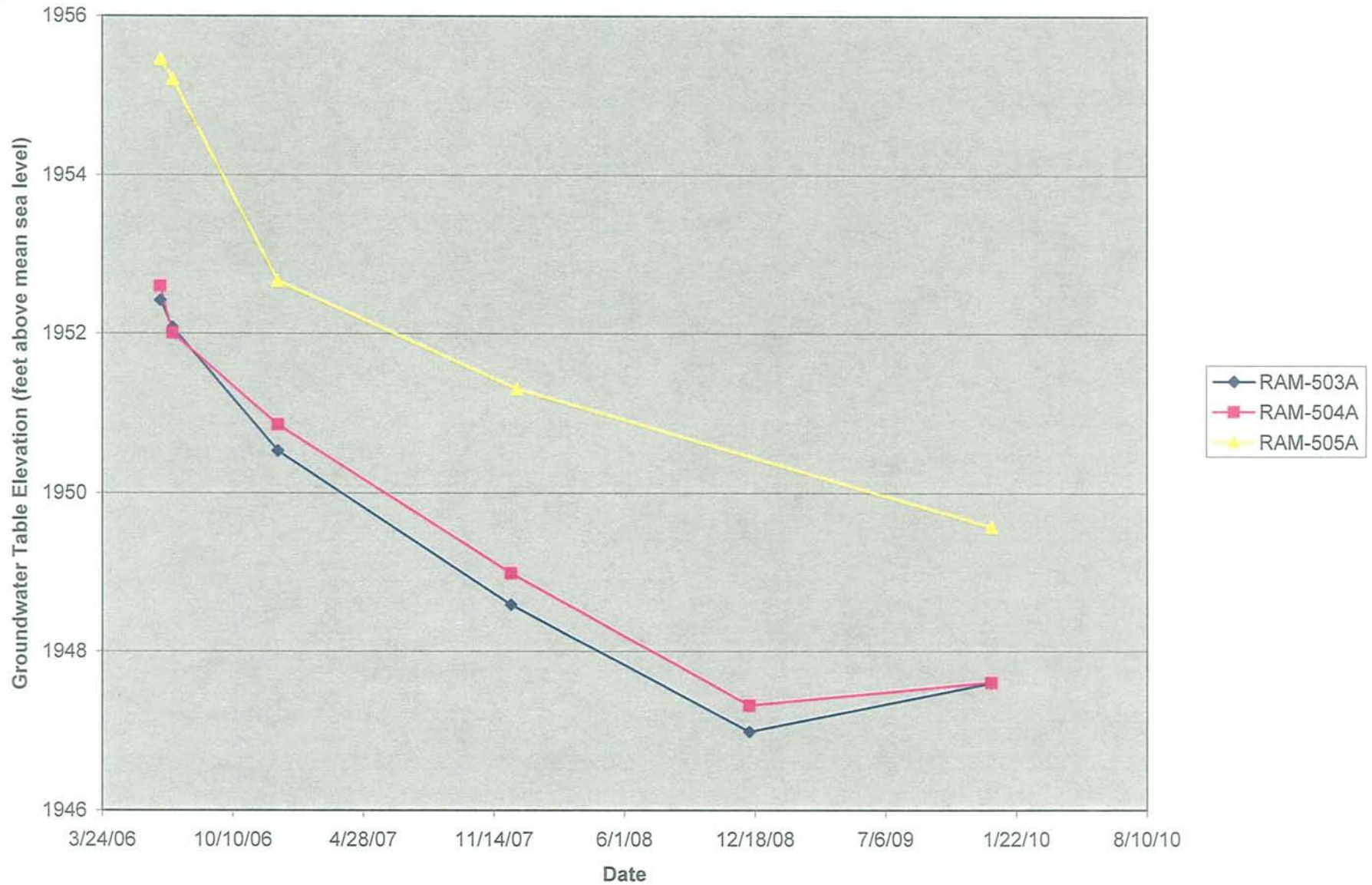
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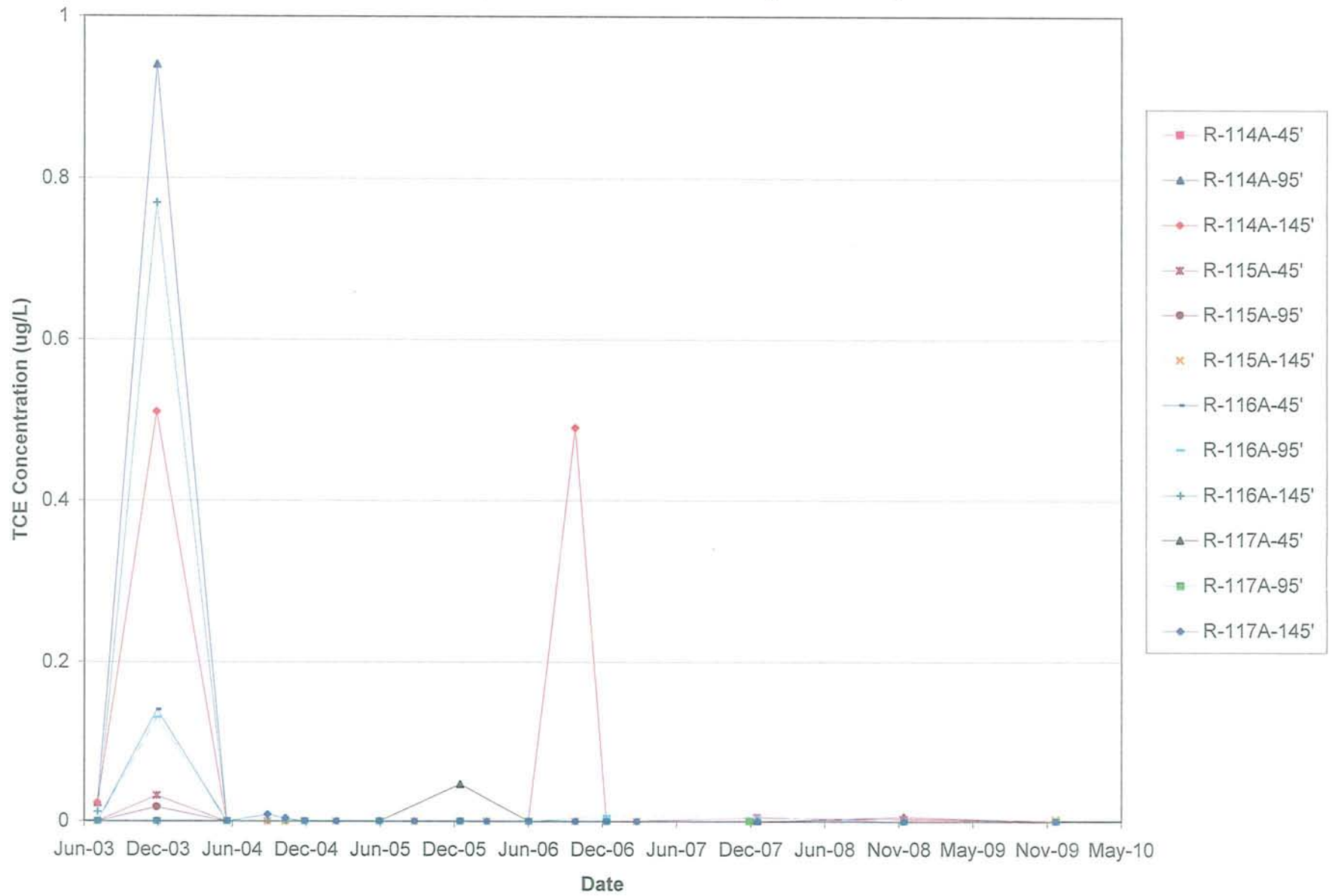
**Figure 3**  
 Groundwater Elevation Map  
 December 2009  
 Ryan Airfield Closed Landfill



Figure 4  
Groundwater Monitor Well Hydrograph  
Ryan Airfield Landfill

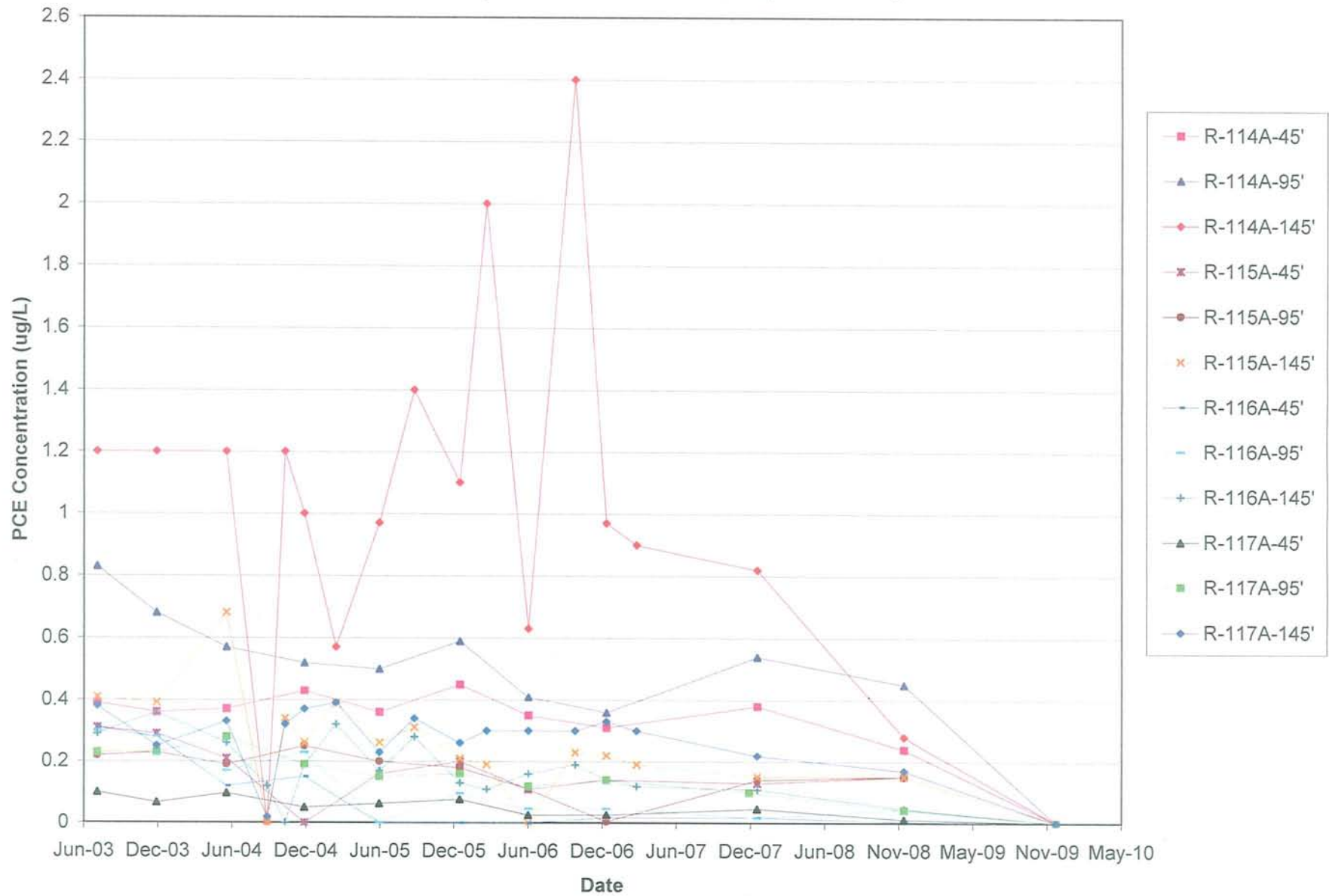


**Figure 5**  
**Ryan Airfield**  
**Soil Vapor TCE Concentration by Probe Depth**





**Figure 6**  
**Ryan Airfield**  
**Soil Vapor PCE Concentration by Probe Depth**



## TABLES

**TABLE 1  
Groundwater Monitor Well Information  
Ryan Airfield**

Well Name	Date Installed	Total Depth (ft bls)	Casing Diameter (inches)	Casing Material	Screened-Interval (ft bls)	Pump Info	Northing	Easting	Benchmark Elevation (ft amsl) concrete pad	Benchmark Elevation (ft amsl) casing	Benchmark Elevation (ft amsl) sounding tube
RAM-503A	5/31/2006	553	5	Schedule 80 PVC	459 to 549	Grundfos MS4000	416077.23	932888.02	2408.49	2408.65	2409.34
RAM-504A	6/6/2006	555	5	Schedule 80 PVC	461 to 550	Grundfos MS4000	416649.34	933011.22	2406.48	2406.70	2407.02
RAM-505A	6/7/2006	560	5	Schedule 80 PVC	461 to 550	Grundfos MS4000	416230.39	933810.34	2412.57	2412.73	2413.21

ft bls = feet below land surface

Geographic coordinate system information in Arizona Central State Plane, NAD 83, NAVD 88

ft amsl = feet above mean sea level

**TABLE 2**  
**Groundwater Table Elevation**  
**Ryan Airfield**

Well ID	Date	DTW (ft)	CF (in.)	Benchmark Elv. (ft. amsl)	WTE (ft)
RAM-503A	6/21/06	456.88	-0.81	2408.49	1952.42
	7/10/06	457.22	-0.81	2408.49	1952.08
	12/18/06	458.77	-0.81	2408.49	1950.53
	12/10/07	460.71	-0.81	2408.49	1948.59
	12/9/08	462.31	-0.81	2408.49	1946.99
	12/15/09	461.70	-0.81	2408.49	1947.60
RAM-504A	6/21/06	454.41	-0.53	2406.48	1952.60
	7/10/06	455.00	-0.53	2406.48	1952.01
	12/18/06	456.15	-0.53	2406.48	1950.86
	12/10/07	458.02	-0.53	2406.48	1948.99
	12/9/08	459.69	-0.53	2406.48	1947.32
	12/15/09	459.40	-0.53	2406.48	1947.61
RAM-505A	6/21/06	457.75	-0.64	2412.57	1955.46
	7/10/06	458.00	-0.64	2412.57	1955.21
	12/18/06	460.55	-0.64	2412.57	1952.66
	12/19/07	461.90	-0.64	2412.57	1951.31
	12/9/08			<i>Measurements lost.</i>	
	12/15/09	463.64	-0.64	2412.57	1949.57

DTW (ft) = depth to water in feet

CF (in.) = correction factor in inches

Benchmark Elv. (ft. amsl) = benchmark elevation in feet above mean sea level at concrete pad.

WTE (ft) = water table elevation in feet

TABLE 3  
Soil Vapor Monitor Wells  
Field Measurements for Landfill Gas  
Ryan Airfield

Well ID	Depth (ft)	Date	CH <sub>4</sub> (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)
R-114A	45	3/3/2006	0	6.3	14.4
	95		0	9.2	10.8
	145		0	11.4	8.4
	45	6/12/2006	0	5.3	14.7
	95		0	6.5	13.2
	145		0	11.1	8.4
	45	10/4/2006	0	5.7	14.2
	95		0	8.4	11
	145		0	11.5	7.6
	45	12/19/2006	0	5.9	15.1
	95		0	7.3	13.3
	145		0	11.1	8.6
	45	3/2/2007	0	6.2	14.3
	95		0	7.8	12.5
	145		0	11.6	8.1
	45	12/20/2007	0	7.4	13
	95		0	9.9	10.5
	145		0	12.2	8.1
	45	12/10/2008	0	6	14.7
	95		0	6.8	13.7
	145		0	9.4	10.6
	45	12/14/2009	0	7.1	15.1
	95		0	7.3	12.8
	145		0	8.7	11.1

TABLE 3  
Soil Vapor Monitor Wells  
Field Measurements for Landfill Gas  
Ryan Airfield

Well ID	Depth (ft)	Date	CH <sub>4</sub> (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)
R-115A	45	3/3/2006	0	9.2	12.3
	95		0	10.4	11.2
	145		0	10.1	11.4
	45	6/12/2006	0	8.3	12.7
	95		0	8.7	12.3
	145		0	10.4	10.9
	45	10/4/2006	0	8.9	12
	95		0	9.6	11.6
	145		0	11.1	10
	45	12/9/2006	0	9.1	12.6
	95		0	9.3	12.3
	145		0	10.7	11
	45	3/2/2007	0	8.9	12.4
	95		0	9.4	12.1
	145		0	11	10.4
	45	12/20/2007	0	10.4	11.7
	95		0	10.8	11.2
	145		0	11.4	10.8
	45	12/10/2008	0	9.4	12
	95		0	9.5	11.5
	145		0	10.6	10.9
	45	12/14/2009	0	8.1	11.9
	95		0	8.8	12.1
	145		0	9.7	19.9

TABLE 3  
Soil Vapor Monitor Wells  
Field Measurements for Landfill Gas  
Ryan Airfield

Well ID	Depth (ft)	Date	CH <sub>4</sub> (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)
R-116A	45	3/3/2006	0	4.6	16.9
	95		0	10.4	11.4
	145		0	13.6	8.2
	45	6/12/2006	0	1.2	19.7
	95		0	2.4	18.9
	145		0	9.9	13.8
	45	10/4/2006	0	3.6	16.8
	95		0	7.4	14.6
	145		0	13.7	6.8
	45	12/19/2006	0	2.9	19
	95		0	3.8	18.5
	145		0	9.6	12.3
	45	3/2/2007	0	4.6	17.5
	95		0	4.6	17.5
	145		0	9.5	10.6
	45	12/20/2007	0	5.3	15.2
	95		0	10.2	11.2
	145		0	12.6	8.6
	45	12/10/2008	0	1.2	19.8
	95		0	1.7	18.7
	145		0	3.8	17.6
	45	12/17/2009	0	2.2	18.3
	95		0	3.2	17.4
	145		0	4.3	16.2

TABLE 3  
Soil Vapor Monitor Wells  
Field Measurements for Landfill Gas  
Ryan Airfield

Well ID	Depth (ft)	Date	CH <sub>4</sub> (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)
R-117A	45	3/3/2006	0	6.1	15.7
	95		0	9.7	11.4
	145		0	12.2	8.5
	45	6/12/2006	0	3.2	17.8
	95		0	7.5	13.5
	145		0	11.7	9.3
	45	10/4/2006	0	5.1	16
	95		0	9.1	11.6
	145		0	12.1	8.8
	45	12/19/2006	0	3.4	18
	95		0	7.4	13.5
	145		0	11.4	9.8
	45	3/2/2007	0	4.1	17.1
	95		0	8	12.7
	145		0	11.8	9.3
	45	12/20/2007	0	6.7	14.1
	95		0	9.3	11.6
	145		0	12.2	9.8
	45	12/10/2008	0	2.6	18
	95		0	5.2	14.9
	145		0	10.3	10.9
	45	12/14/2009	0	1.9	17.6
	95		0	6.3	13.7
	145		0	11.7	9.8

All measurements collected by COT-ES with Landtec Gas Analyzer



**TABLE 4**  
**Vapor Probe Results - Selected VOCs**  
**Ryan Airfield**

Well	Date	Depth	PCE	TCE	cis-1,2-DCE	VC	TCFM
R-114A-45'	7/31/2003	45'	0.39	ND	ND	ND	0.54
R-114A-45'	12/22/2003	45'	0.36	ND	ND	ND	0.46
R-114A-45'	6/9/2004	45'	0.37	ND	ND	ND	0.55
R-114A-45'	12/15/2004	45'	0.43	ND	ND	ND	0.57
R-114A-45'	6/15/2005	45'	0.4	ND	ND	ND	0.4
R-114A-45'	12/28/2005	45'	0.45	ND	ND	ND	0.63
R-114A-45'	6/12/2006	45'	0.35	ND	ND	ND	0.47
R-114A-45'	12/19/2006	45'	0.31	ND	ND	ND	0.43
R-114A-45'	12/20/2007	45'	0.38	0.0047	ND	ND	0.49
R-114A-45'	12/10/2008	45'	0.24	0.003	ND	ND	0.34
R-114A-45'	12/14/2009	45'	ND	ND	ND	ND	ND
R-114A-95'	7/31/2003	95'	0.83	0.023	ND	ND	1.1
R-114A-95'	12/22/2003	95'	0.68	0.94	ND	ND	0.8
R-114A-95'	6/9/2004	95'	0.57	ND	ND	ND	0.8
R-114A-95'	12/15/2004	95'	0.52	ND	ND	ND	0.63
R-114A-95'	6/15/2005	95'	0.5	ND	ND	ND	0.6
R-114A-95'	12/28/2005	95'	0.59	ND	ND	ND	0.68
R-114A-95'	6/12/2006	95'	0.41	ND	ND	ND	0.49
R-114A-95'	12/19/2006	95'	0.36	ND	ND	ND	0.39
R-114A-95'	12/20/2007	95'	0.54	ND	ND	ND	0.75
R-114A-95'	12/10/2008	95'	0.45	0.006	ND	ND	0.47
R-114A-95'	12/14/2009	95'	ND	ND	ND	ND	ND
R-114A-145'	7/31/2003	145'	1.2	0.023	ND	ND	1.0
R-114A-145'	12/22/2003	145'	1.2	0.51	ND	ND	1.3
R-114A-145'	6/9/2004	145'	1.2	ND	ND	ND	1.4
R-114A-145'	9/16/2004	145'	ND	ND	ND	ND	ND
R-114A-145'	10/29/2004	145'	1.2	ND	ND	ND	1.8
R-114A-145'	12/15/2004	145'	1.0	ND	ND	ND	1.1
R-114A-145'	3/2/2005	145'	0.57	ND	ND	ND	0.63
R-114A-145'	6/15/2005	145'	0.97	ND	ND	ND	0.86
R-114A-145'	9/8/2005	145'	1.40	ND	ND	ND	1.10
R-114A-145'	12/28/2005	145'	1.10	ND	ND	ND	1.10
R-114A-145'	3/3/2006	145'	2.00	ND	ND	ND	1.50
R-114A-145'	6/12/2006	145'	0.63	ND	ND	ND	0.57
R-114A-145'	10/4/2006	145'	2.40	0.49	ND	ND	1.10
R-114A-145'	12/19/2006	145'	0.97	ND	ND	ND	1.00
R-114A-145'	3/2/2007	145'	0.90	ND	ND	ND	0.97
R-114A-145'	12/20/2007	145'	0.82	ND	ND	ND	0.90
R-114A-145'	12/10/2008	145'	0.28	0.0039	ND	ND	0.40
R-114A-145'	12/14/2009	145'	ND	ND	ND	ND	ND

**TABLE 4**  
**Vapor Probe Results - Selected VOCs**  
**Ryan Airfield**

Well	Date	Depth	PCE	TCE	cis-1,2-DCE	VC	TCFM
R-115A-45'	7/31/2003	45'	0.31	ND	ND	ND	0.048
R-115A-45'	12/22/2003	45'	0.29	0.032	ND	ND	0.05
R-115A-45'	6/9/2004	45'	0.21	ND	ND	ND	0.049
R-115A-45'	12/15/2004	45'	ND	ND	ND	ND	ND
R-115A-45'	6/15/2005	45'	0.16	ND	ND	ND	0.032
R-115A-45'	12/28/2005	45'	0.2	ND	ND	ND	0.05
R-115A-45'	6/12/2006	45'	0.11	ND	ND	ND	0.033
R-115A-45'	12/19/2006	45'	0.14	ND	ND	ND	0.051
R-115A-45'	12/20/2007	45'	0.13	ND	ND	ND	0.034
R-115A-45'	12/10/2008	45'	0.15	ND	ND	ND	0.026
R-115A-45'	12/14/2009	45'	ND	ND	ND	ND	ND
R-115A-95'	7/31/2003	95'	0.22	ND	ND	ND	0.030
R-115A-95'	12/22/2003	95'	0.23	0.018	ND	ND	0.042
R-115A-95'	6/9/2004	95'	0.19	ND	ND	ND	ND
R-115A-95'	12/15/2004	95'	0.25	ND	ND	ND	0.074
R-115A-95'	6/15/2005	95'	0.2	ND	ND	ND	ND
R-115A-95'	12/28/2005	95'	0.18	ND	ND	ND	0.049
R-115A-95'	6/12/2006	95'	0.11	ND	ND	ND	0.034
R-115A-95'	12/19/2006	95'	0.0046	ND	ND	ND	0.003
R-115A-95'	12/20/2007	95'	0.14	ND	ND	ND	0.046
R-115A-95'	12/10/2008	95'	0.15	ND	ND	ND	0.027
R-115A-95'	12/14/2009	95'	ND	ND	ND	ND	ND
R-115A-145'	7/31/2003	145'	0.41	ND	ND	ND	0.086
R-115A-145'	12/22/2003	145'	0.39	ND	ND	ND	0.074
R-115A-145'	6/9/2004	145'	0.68	ND	ND	ND	0.08
R-115A-145'	9/16/2004	145'	ND	ND	ND	ND	ND
R-115A-145'	10/29/2004	145'	0.34	ND	ND	ND	0.074
R-115A-145'	12/15/2004	145'	0.26	ND	ND	ND	0.080
R-115A-145'	3/2/2005	145'	0.39	ND	ND	ND	0.13
R-115A-145'	6/15/2005	145'	0.26	ND	ND	ND	0.074
R-115A-145'	9/8/2005	145'	0.31	ND	ND	ND	0.08
R-115A-145'	12/28/2005	145'	0.21	ND	ND	ND	0.068
R-115A-145'	3/3/2006	145'	0.19	ND	ND	ND	0.068
R-115A-145'	6/12/2006	145'	ND	ND	ND	ND	ND
R-115A-145'	10/4/2006	145'	0.23	ND	ND	ND	0.097
R-115A-145'	12/19/2006	145'	0.22	ND	ND	ND	0.074
R-115A-145'	3/2/2007	145'	0.19	ND	ND	ND	0.074
R-115A-145'	12/20/2007	145'	0.15	ND	ND	ND	0.062
R-115A-145'	12/10/2008	145'	0.15	ND	ND	ND	0.046
R-115A-145'	12/14/2009	145'	ND	0.0026	ND	ND	ND

**TABLE 4**  
**Vapor Probe Results - Selected VOCs**  
**Ryan Airfield**

Well	Date	Depth	PCE	TCE	cis-1,2-DCE	VC	TCFM
R-116A-45'	7/31/2003	45'	0.31	ND	ND	ND	0.10
R-116A-45'	12/22/2003	45'	0.28	0.14	ND	ND	0.12
R-116A-45'	6/9/2004	45'	0.12	ND	ND	ND	0.08
R-116A-45'	12/15/2004	45'	0.15	ND	ND	ND	0.074
R-116A-45'	6/15/2005	45'	ND	ND	ND	ND	ND
R-116A-45'	12/28/2005	45'	ND	ND	ND	ND	0.063
R-116A-45'	6/12/2006	45'	ND	ND	ND	ND	ND
R-116A-45'	12/19/2006	45'	0.018	ND	ND	ND	0.015
R-116A-45'	12/20/2007	45'	0.018	ND	ND	ND	0.051
R-116A-45'	12/10/2008	45'	0.005	ND	ND	ND	0.0065
R-116A-45'	12/14/2009	45'	ND	ND	ND	ND	ND
R-116A-95'	7/31/2003	95'	0.30	ND	0.15	ND	0.13
R-116A-95'	12/22/2003	95'	0.28	0.13	ND	ND	0.13
R-116A-95'	6/9/2004	95'	0.17	ND	ND	ND	0.097
R-116A-95'	12/15/2004	95'	0.23	ND	ND	ND	0.13
R-116A-95'	6/15/2005	95'	ND	ND	ND	ND	ND
R-116A-95'	12/28/2005	95'	0.097	ND	ND	ND	0.08
R-116A-95'	6/12/2006	95'	0.046	ND	ND	ND	0.015
R-116A-95'	12/19/2006	95'	0.047	0.0072	ND	ND	0.019
R-116A-95'	12/20/2007	95'	0.016	0.006	ND	ND	0.078
R-116A-95'	12/10/2008	95'	0.045	ND	ND	ND	0.014
R-116A-95'	12/14/2009	95'	ND	ND	ND	ND	ND
R-116A-145'	7/31/2003	145'	0.29	0.012	ND	ND	0.17
R-116A-145'	12/22/2003	145'	0.36	0.77	ND	ND	0.18
R-116A-145'	6/9/2004	145'	0.26	ND	ND	ND	0.13
R-116A-145'	9/16/2004	145'	0.12	ND	ND	0.07	0.086
R-116A-145'	10/29/2004	145'	ND	ND	ND	0.078	ND
R-116A-145'	12/15/2004	145'	0.19	ND	ND	ND	0.097
R-116A-145'	3/2/2005	145'	0.32	ND	ND	ND	0.18
R-116A-145'	6/15/2005	145'	0.17	ND	ND	ND	ND
R-116A-145'	9/8/2005	145'	0.28	ND	ND	ND	0.14
R-116A-145'	12/28/2005	145'	0.13	ND	ND	0.075	0.091
R-116A-145'	3/3/2006	145'	0.11	ND	ND	ND	0.091
R-116A-145'	6/12/2006	145'	0.16	ND	ND	ND	0.039
R-116A-145'	10/4/2006	145'	0.19	ND	ND	ND	0.17
R-116A-145'	12/19/2006	145'	0.14	ND	ND	ND	0.063
R-116A-145'	3/2/2007	145'	0.12	ND	ND	ND	0.08
R-116A-145'	12/20/2007	145'	0.11	ND	ND	ND	0.11
R-116A-145'	12/10/2008	145'	0.047	ND	ND	ND	0.014
R-116A-145'	12/14/2009	145'	ND	ND	ND	ND	ND

**TABLE 4**  
**Vapor Probe Results - Selected VOCs**  
**Ryan Airfield**

Well	Date	Depth	PCE	TCE	cis-1,2-DCE	VC	TCFM
R-117A-45'	7/31/2003	45'	0.1	ND	ND	ND	0.18
R-117A-45'	12/22/2003	45'	0.066	ND	ND	ND	0.11
R-117A-45'	6/9/2004	45'	0.097	ND	ND	ND	0.14
R-117A-45'	12/15/2004	45'	0.05	ND	ND	ND	0.091
R-117A-45'	6/15/2005	45'	0.062	ND	ND	ND	0.055
R-117A-45'	12/28/2005	45'	0.076	0.046	ND	ND	ND
R-117A-45'	6/12/2006	45'	0.025	ND	ND	ND	0.027
R-117A-45'	12/19/2006	45'	0.026	ND	ND	ND	0.028
R-117A-45'	12/20/2007	45'	0.046	ND	ND	ND	0.11
R-117A-45'	12/10/2008	45'	0.011	ND	ND	ND	0.017
R-117A-45'	12/14/2009	45'	ND	ND	ND	ND	ND
R-117A-95'	7/31/2003	95'	0.23	ND	ND	ND	0.44
R-117A-95'	12/22/2003	95'	0.23	ND	ND	ND	0.36
R-117A-95'	6/9/2004	95'	0.28	ND	ND	ND	0.38
R-117A-95'	12/15/2004	95'	0.19	ND	ND	ND	0.30
R-117A-95'	6/15/2005	95'	0.15	ND	ND	ND	0.22
R-117A-95'	12/28/2005	95'	0.16	ND	ND	ND	0.21
R-117A-95'	6/12/2006	95'	0.12	ND	ND	ND	0.12
R-117A-95'	12/19/2006	95'	0.14	ND	ND	ND	0.13
R-117A-95'	12/1/2007	95'	0.1	ND	ND	ND	0.18
R-117A-95'	12/10/2008	95'	0.042	ND	ND	ND	0.05
R-117A-95'	12/14/2009	95'	ND	ND	ND	ND	ND
R-117A-145'	7/31/2003	145'	0.38	ND	ND	ND	0.50
R-117A-145'	12/22/2003	145'	0.25	ND	ND	ND	0.32
R-117A-145'	6/9/2004	145'	0.33	ND	ND	ND	0.44
R-117A-145'	9/16/2004	145'	0.019	0.0083	ND	ND	ND
R-117A-145'	10/29/2004	145'	0.32	0.0039	ND	ND	0.51
R-117A-145'	12/15/2004	145'	0.37	ND	ND	ND	0.43
R-117A-145'	3/2/2005	145'	0.39	ND	ND	ND	0.44
R-117A-145'	6/15/2005	145'	0.23	ND	ND	ND	0.28
R-117A-145'	9/8/2005	145'	0.34	ND	ND	ND	0.3
R-117A-145'	12/28/2005	145'	0.26	ND	ND	0.11	0.35
R-117A-145'	3/3/2006	145'	0.3	ND	ND	ND	0.35
R-117A-145'	6/12/2006	145'	0.3	ND	ND	ND	0.34
R-117A-145'	10/4/2006	145'	0.3	ND	ND	ND	0.36
R-117A-145'	12/19/2006	145'	0.33	ND	ND	ND	0.30
R-117A-145'	3/2/2007	145'	0.3	ND	ND	ND	0.32
R-117A-145'	12/20/2007	145'	0.22	ND	ND	ND	0.27
R-117A-145'	12/10/2008	145'	0.17	ND	ND	ND	0.20
R-117A-145'	12/14/2009	145'	ND	ND	ND	ND	ND

NA = Not Analyzed  
 ND = Non-Detect  
 PCE = Tetrachloroethene  
 TCE = Trichloroethene  
 cis-1,2-DCE = cis-1,2-Dichloroethene  
 VC = Vinyl Chloride  
 TCFM = Trichlorofluoromethane  
 All concentrations reported in ug/L  
 Only selected compounds are shown.  
 All samples analyzed using Method TO-15