



{In Archive} KNC-DC Background Work Plan

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11/23/2005 04:07 PM

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1 Attachment



KNC Background Assessment WP 11-23-05.pdf

Hello, Andrea,

Thank you for your input in the conference call on Monday. As promised in that call, here is an advance copy of the Background Assessment WorkPlan for your review. We would appreciate your comments, and will then finalize the document for submittal. The EPA guidance documents that are referenced in this WorkPlan, and the revised responses to comments, are being sent in two additional e-mail transmittals due to the size of the files.

Please contact me if you have questions.

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RCRA



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Prepared for

Koch Nitrogen Company
Dodge City, Kansas

BACKGROUND ASSESSMENT WORK PLAN

DODGE CITY, KANSAS

EPA ID NO.: KSD044625010

Prepared by

GeoSyntec Consultants

GeoSyntec Consultants Project Number FR0760

October November 2005

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ABBREVIATIONS AND ACRONYMS

GeoSyntec	GeoSyntec Consultants
KNC	Koch Nitrogen Company
FSP	Field Sampling Plan
ft	feet
bls	below land surface
EPA	Environmental Protection Agency
HA	hand auger
KDHE	Kansas Department of Health and Environment
DPT	direct push technology
SOPs	Standard Operating Procedures
IDW	investigation derived waste

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1. INTRODUCTION

1.1 Terms of Reference

This Background Assessment Work Plan has been prepared by GeoSyntec Consultants (GeoSyntec) on behalf of Koch Nitrogen Company (KNC) for the KNC facility located near Dodge City, Kansas. The objective of the background assessment activities detailed in this work plan are to collect sufficient data to determine the background concentrations of total chromium and nitrate plus nitrite as nitrogen, referred to as $\text{NO}_3+\text{NO}_2\text{-N}$, in soils and groundwater in the vicinity of the KNC Facility.

1.2 Facility Location

The KNC Facility is located three miles east of Dodge City in Ford County, Kansas, and consists of two separate parcels of land. The southern parcel houses the Facility's main production area and consists of more than 300 acres situated south of Highway 50 in Sections 22 and 15, Township 26 South, Range 24 West. The Facility's main production area consists of approximately 30 acres located in the northeastern quarter of Section 22. Highway 50 borders the southern parcel of the Facility property on the north, and the Burlington North Santa Fe Railroad comprises its southern boundary.

The northern portion of the Facility, consisting of approximately 54 acres, is located north of Highway 50 in the southeastern quarter of the southeastern quarter of Section 15 and most of the southern half of the northeastern quarter of the southeastern quarter of Section 15.

1.3 Work Plan Organization

The organization of the remainder of the Background Study Work Plan is described below.

- Section 2, *Assessment Strategy*. This section provides a rationale for the type and number

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of samples proposed to complete the background assessment.

- Section 3, *Soil Background Assessment Procedures*. This section provides a summary of the proposed sampling locations, analytical methods, and procedures that will be used to analyze collected data and calculate background chromium and $\text{NO}_3+\text{NO}_2\text{-N}$ in soil.
- Section 4, *Groundwater Background Determination*. This section provides a determination of background chromium and $\text{NO}_3+\text{NO}_2\text{-N}$ in groundwater using historic data from existing monitoring wells.

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2. ASSESSMENT STRATEGY

2.1 Work Plan Overview

This work plan has been designed to collect the soils and groundwater data necessary to establish the background concentration threshold of nitrate plus nitrite as nitrogen ($\text{NO}_3+\text{NO}_2\text{-N}$), and chromium in soils and groundwater from the vicinity of the KNC Facility. Nitrate and nitrite analysis will be performed and reported as $\text{NO}_3+\text{NO}_2\text{-N}$. The objectives of the study are to develop constituent and media-specific background concentrations present in the vicinity of the KNC Facility that will be used during the delineation of chromium and nitrate/nitrite in soil and groundwater.

2.2 Background Soil Sampling Strategy

The Background Assessment will initially consist of collecting soil samples from the two soil depths identified in the Field Sampling Plan (FSP), and summarized as follows:

- Surface soils (0 to 6 inches) and
- Subsurface soils (6 to 2 feet [ft] below land surface [bls]).

These depths intervals are consistent with the depths of the site-specific soil samples proposed in the FSP, and allow appropriate comparisons between Facility-related and background concentrations. Samples from these depths will be submitted to a laboratory for total chromium and $\text{NO}_3+\text{NO}_2\text{-N}$ analysis. The total chromium and $\text{NO}_3+\text{NO}_2\text{-N}$ concentration reported in these background samples will be compared to the reported concentrations of these constituents in samples collected during the forthcoming RFI activities.

It is inherently difficult to determine the number of soil samples required from a particular depth to characterize background. This can be attributed to a number of factors including:

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- the wide, and oftentimes skewed, distribution of naturally occurring constituents like chromium in soil ;
- the widespread use of nitrogen-based fertilizers for agricultural within the vicinity of the area; and
- the intrinsic heterogeneity of soil samples

For example, Table 1 provides a summary of background chromium levels in soil at the country, region, and state level which demonstrates the wide variability that may be expected from background soil sampling of inorganics. The Kansas Department of Health and Environment (KDHE) accounts for the variability in soil $\text{NO}_3+\text{NO}_2\text{-N}$ levels by establishing risk standards based on soil depth, presence or absence of vegetation, and vegetation type (KDHE, 2003). KNC has reviewed the before-mentioned KDHE document and EPA documents (EPA, 1989, EPA, 2002a; and EPA, 2002b) and proposes to collect soil samples from 0 to 6" and 6" to 24" at fifteen locations (30 samples total) for background soil characterization of total chromium and $\text{NO}_3+\text{NO}_2\text{-N}$ levels.

Sample results from each depth interval will be evaluated separately. If the results of the initial RFI sampling activities indicate that sampling from additional depth intervals is required to complete delineation activities, KNC may submit an addendum to this plan for USEPA and KDHE approval to characterize background concentrations from other depth intervals.

2.3 Groundwater Strategy

KNC monitors chromium and $\text{NO}_3+\text{NO}_2\text{-N}$ levels in groundwater at the site and adjacent areas on a quarterly and semi-annual basis. An initial assessment of background groundwater chromium and $\text{NO}_3+\text{NO}_2\text{-N}$ levels present in the unconsolidated deposits was undertaken using historic data from existing monitoring wells located north of the facility identified as representative of background by the KDHE in the draft EPA comments letter of September 29th

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2005. Table 2 identifies these wells. Historic analytical data for chromium and $\text{NO}_3+\text{NO}_2\text{-N}$ from these wells are summarized in Appendix A and B, respectively. The following subsections provide a preliminary evaluation of background chromium and $\text{NO}_3+\text{NO}_2\text{-N}$ in the unconsolidated deposits. It is believed that the analytical data collected to date is sufficient for a determination of background levels of these constituents. The methodology for calculation of a site-specific background value for chromium and $\text{NO}_3+\text{NO}_2\text{-N}$ is provided in Section 4.0.

2.3.1 Chromium Preliminary Evaluation

Chromium has previously been detected only once (April of 1993 in TW-25) during previous sampling of the background wells identified in Table 2 (Appendix A). This sample was collected prior to KNC's ownership of the Facility and the method and quality of that sample is unknown. Analytical results for chromium in subsequent sampling events were below the laboratory detection limit. KNC proposes to use the the detection limit (0.010 milligrams per liter [mg/L]) or the practical quantitation limit (POL) reported by the laboratory for a specific sampling event as the background chromium concentration in unconsolidated groundwater.

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What does this mean.

2.3.2 Nitrate Preliminary Background Evaluation

Nitrate has been detected in the wells identified by the KDHE as representative of background (Appendix B). The presence of nitrate in groundwater is not surprising. The Kansas Geological Survey (KGS), documents that over half of the wells sampled from wells screened in the Ogallala formation in Ford County had nitrate concentrations greater than 10 mg/L (http://www.kgs.ku.edu/General/Geology/Ford/05_gw8.html). Major sources of groundwater nitrate in the area may include agricultural practices, feed lots, and septic systems. Nitrate has also previously been detected at a concentration greater than the Safe Drinking Water Act Maximum Contaminant Level (MCL) in the Dodge City water supply (<http://www.epa.gov/safewater/dwinfo/index.html>). Furthermore, to assist with addressing widespread groundwater nitrate issues within the state of Kansas, the KDHE Bureau of Environmental Remediation (BER) has developed a "Nitrate Presumptive Remedy Plan" to

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streamline the remedial design phase and emphasize beneficial use of this groundwater (<http://www.kdhe.state.ks.us/remedial/npr.htm>).

KNC proposed to develop a site-specific $\text{NO}_3+\text{NO}_2\text{-N}$ background value using $\text{NO}_3+\text{NO}_2\text{-N}$ data from the wells identified in Table 2. Additional discussion of the historical data from these wells and the calculation of a site-specific $\text{NO}_3+\text{NO}_2\text{-N}$ background value for the unconsolidated deposits are provided in Section 4.0.

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3. SOIL BACKGROUND ASSESSMENT PROCEDURES

3.1 Sample Location Identification

Background samples locations will be taken from the area surrounding the KNC Facility. A grid was established for this area to ensure background samples were identified from random locations. The adjacent property was divided into grids approximately 700 foot by 700 foot in size. Grid sections located near roads or commercial properties were eliminated from consideration as background sampling locations. The grid sections were established in areas that are located well away from the facility in areas believed to be unimpacted by facility activities. The grid was established in the active agricultural areas since the land on which the Koch facility is located was used for agriculture prior to the construction of the facility. It is believed that the proposed background data set will be representative of the ongoing agricultural land use in the area. A total of 40 potential sampling grids were identified as sampling locations for the 15 background soil samples. Proposed samples were randomly assigned to the sample grids using a built-in random number generator (RANDBETWEEN) in an Excel spreadsheet.

show name

The pattern and area covered by the grid system described above is graphically depicted in Figure 1. The sample locations posted on Figure 1 represents the proposed sampling location in each grid. Sampling locations will be sited, to the extent possible, in the center of the grid. Background soil sampling locations will be located in the field using a global positioning system (GPS) and will be documented on field forms.

If background conditions need to be established for additional depth intervals in the future, these future background samples will be collected from the same sample locations.

3.2 Sample Collection and Analysis

Table 3 summarizes the sampling locations, methodology, sample name, and analysis type. Samples collected for the background assessment will have the designation "BG" in the sample

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name. Soil samples for the initial background determination will be collected using hand augers according to the procedures outlined in Appendix I-B of the FSP. If future background sampling is required from deeper depth intervals, these soil samples will be collected using either a hand auger (for samples from 4 feet or shallower) or a Geoprobe® direct push technology (DPT)(samples collected from depth greater than 4 feet bls) following the procedures provided in Appendix I-B Standard Operating Procedures (SOPs), FS 3000. The Geoprobe® will be used to collect discrete samples from the target depth interval and will likely result in less dragging down of soil from other intervals, as may be the case with hand augers. Sample handling and analysis for all background samples will be performed using the procedures described in Section I-4 of the FSP, equipment decontamination will be completed between borings and investigation derived waste (IDW) will be managed using the procedures described in Section I-5 of the FSP. Samples will be documented using the procedures described in Section I-6 of the FSP. The location of each background sampling point will be surveyed using a GPS to document its location to enable future sampling (if needed) from the same location.

Samples submitted for chromium analysis will be digested using EPA Method 3051 and will be analyzed using EPA Method 6020. Samples submitted for nitrate/nitrite analysis will be digested using a 1:1 ratio of soil to distilled water, with the decanted water analyzed using EPA Method 353.2. Analytical results will be reported as $\text{NO}_3 + \text{NO}_2\text{-N}$.

3.3 Data Evaluation

A preliminary statistical analysis will be conducted on the analytical results of the background samples in accordance with EPA Guidance (EPA 2002a, 2002b). The distribution type for the soil analytical results will be graphed to determine if the data are distributed normally, log normally, or non-normally, and identify outliers. As necessary, formal statistical outlier tests will be performed using the methods identified in the EPA Guidance (EPA 2002a, 2002b). As applicable, outliers will be evaluated to determine if QA/QC problems exist or if there are reasons for the variation in concentration. If the data is of sufficient quality for use and no reason can be identified for the variable concentration, the outlier will be eliminated from

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consideration as representative of background. The mean concentration at each depth interval will be computed for each constituent. The results of these preliminary statistical tests will be used to guide the selection of the appropriate methods to compare site and background concentrations.

The methodology described above provides a simple and straight forward approach for comparing the analytical results generated during RFI activities to background conditions. The approach described above has been used extensively in EPA Region IV at RCRA facilities ranging from NASA's Kennedy Space Center located in Florida to Arnold AFB which is located in Tennessee and Robins AFB located in Georgia.

3.4 Comparison of Background to Site Data

Site samples from each depth will be compared to a threshold level developed from the background dataset for $\text{NO}_3+\text{NO}_2\text{-N}$ and chromium. Threshold values are usually interpreted as representative of typical extreme concentrations from the distribution of background concentrations. EPA guidance specifies the threshold value as twice the mean background concentration but no greater than the highest detected background sample (EPA 2000b). This approach has been used as the basis of background determination at a number of Resource Conservation and Recovery Act (RCRA) sites (EPA, 1997; EPA 1999; EPA 2000a, etc.).

For each constituent in each media, a background threshold value will be established. The threshold value for chromium and $\text{NO}_3+\text{NO}_2\text{-N}$ will be one of the following:

- If the mean background concentration multiplied by 2 is greater than the maximum reported concentration in the background sample set, the background threshold concentration will be the maximum reported concentration; or
- If the mean background concentration multiplied by 2 is less than the maximum reported concentration in the background sample set, the background threshold concentration will

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be the mean multiplied by 2.

Analytical results from samples collected during RFI activities will be compared to the applicable threshold values. If the reported concentration of a constituent during the RFI investigation is less than the applicable threshold value, no additional lateral or vertical delineation will be required.

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4. BACKGROUND GROUNDWATER DETERMINATION

As discussed previously, KNC proposed to use the laboratory detection limit reported in the recent chromium database for the background wells (0.010 mg/L) as the background value for the delineating groundwater chromium in the unconsolidated deposits.

The background concentration of $\text{NO}_3+\text{NO}_2\text{-N}$ in groundwater was determined by calculating the mean concentration $\text{NO}_3+\text{NO}_2\text{-N}$ in existing background monitoring wells (Table 4). Only data identified as measuring both nitrate and nitrite as nitrogen were used for this analysis. The background concentration proposed for delineation of $\text{NO}_3+\text{NO}_2\text{-N}$ in the unconsolidated deposits was calculated using the methodology described for soil in Section 3.4 where the mean concentration is multiplied by 2. KNC proposes to delineate $\text{NO}_3+\text{NO}_2\text{-N}$ in unconsolidated deposit groundwater to a $\text{NO}_3+\text{NO}_2\text{-N}$ concentration of 2.8 mg/L.

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TABLES

Table 1
Summary of Published Soil Background Chromium Concentrations

Description	Number of Samples	Range		Arithmetic Mean (mg/kg)	Reference
		Minimum Reported Value (mg/kg)	Maximum Reported Value (mg/kg)		
Continental USA	NR	10	100	55	Kabata-Pendias, A. and H. Pendias. 2000. <i>Trace Elements in Soils and Plants</i> . CRC Press, Boca Raton, FL.
Continental USA	1318	1	2000	54	Shacklette, H.T. and J.G. Boerngen. 1984. <i>Element concentrations in soils and other surficial materials of the conterminous United States</i> . United States Geological Survey professional Paper 1270.
Continental USA	NR	20	85	NR	McBride, M.B. 1994. <i>Environmental Chemistry of Soils</i> . Oxford University Press. New York, NY.
Western USA	778	3	2000	56	Adriano, D.C. <i>Trace Elements in the Terrestrial Environment</i> . Springer-Verlag, New York, 1986.
Kansas	33	7	100	49	Boerngen, J.G. and H.T. Shacklette. 1981. <i>Chemical analysis of soils and other surficial materials of the conterminous United States</i> . United State Geological Survey Open File Report 81-197.

Notes:
NR - Not reported

Table 2
Summary of Proposed Background Groundwater Sampling Locations

Well ID	Current Function	Notes:
TW-24	Supplemental monitoring well	Located northeast of Facility
TW-25	Supplemental monitoring well	Located northeast of Facility
TW-56	Background Well in current quarterly monitoring network	Located north of the Facility
TW-59	Supplemental monitoring well	Located north of Facility
TW-60	Supplemental monitoring well	Located north of Facility
TW-61	Supplemental monitoring well	Located north of Facility
TW-62	Supplemental monitoring well	Located north of Facility

Table 3
Proposed Sample Identification, Location, Depth Intervals, and Analytes for Soil Background Assessment

Location	Sample ID	Estimated Sample Interval (ft BLS)	Sample Collection Method	Description	Sample Digestion (EPA 3051) Chromium Analysis (EPA 6020)	Nitrate-Nitrite (EPA 353.2)
BG01	BG01-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG01-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG02	BG02-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG02-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG03	BG03-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG03-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG04	BG04-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG04-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG05	BG05-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG05-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG06	BG06-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG06-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG07	BG07-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG07-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG08	BG08-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG08-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG09	BG09-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG09-SB01-002	0.5-2 ft	HA	subsurface sample	X	X

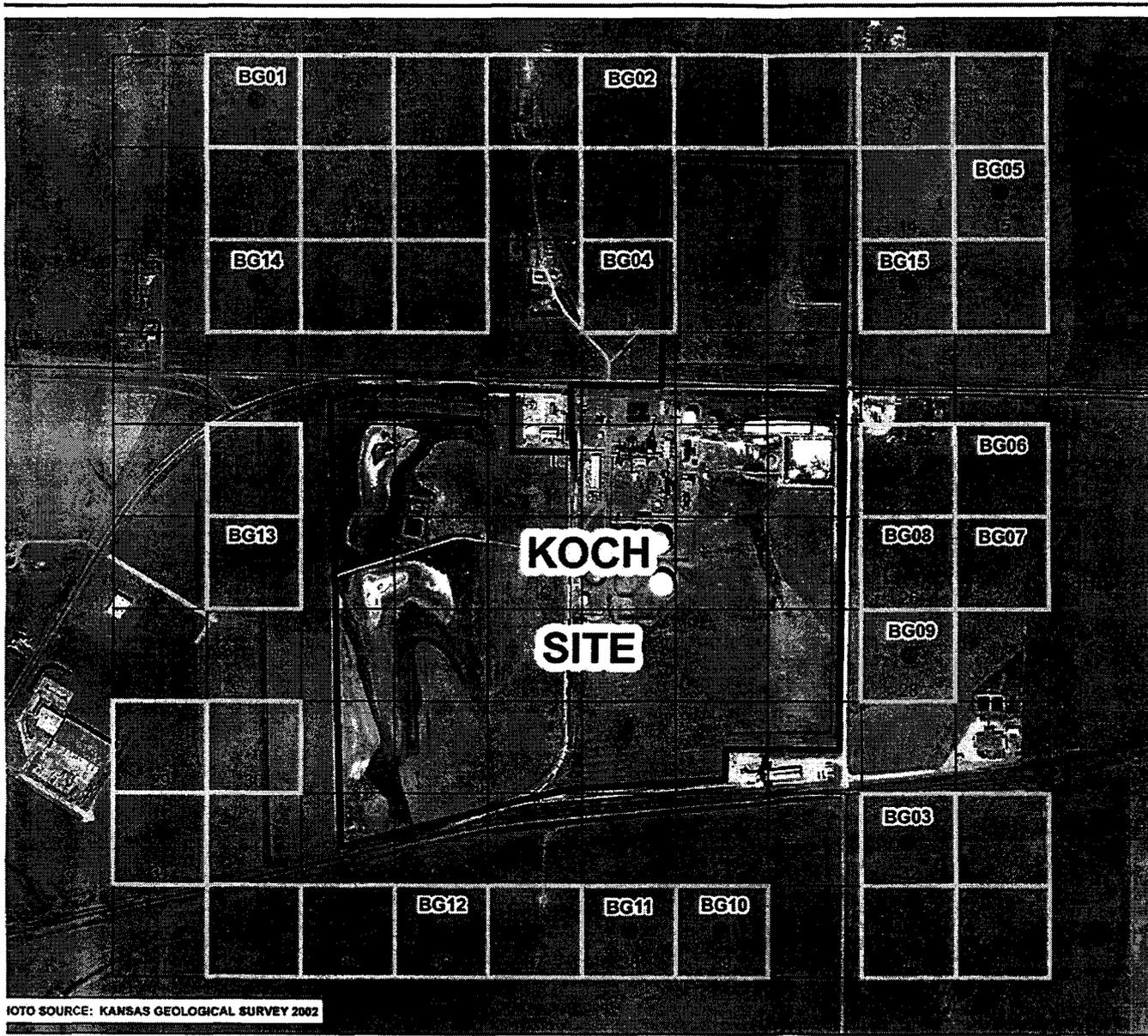
Table 3
Proposed Sample Identification, Location, Depth Intervals, and Analytes for Soil Background Assessment

Location	Sample ID	Estimated Sample Interval (ft BLS)	Sample Collection Method	Description	Sample Digestion (EPA 3051) Chromium Analysis (EPA 6020)	Nitrate-Nitrite (EPA 353.2)
BG10	BG10-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG10-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG11	BG11-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG11-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG12	BG12-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG12-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG13	BG13-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG13-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG14	BG14-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG14-SB01-002	0.5-2 ft	HA	subsurface sample	X	X
BG15	BG15-SS01-0.5	0-0.5 ft	HA	surface soil	X	X
	BG15-SB01-002	0.5-2 ft	HA	subsurface sample	X	X

Table 4
Summary Statistics for NO₃+NO₂-N in Background Groundwater

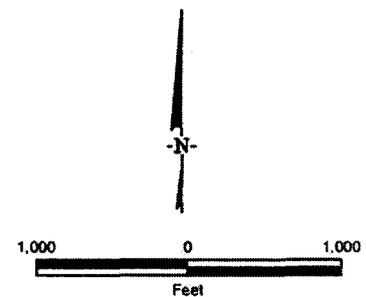
Well ID	Number of Samples	Average NO ₃ +NO ₂ -N (mg/L)	Maximum NO ₃ +NO ₂ -N (mg/L)	Minimum NO ₃ +NO ₂ -N (mg/L)
TW-24	20	0.6	1.1	0.1
TW-25	20	0.7	1.1	0.4
TW-56	38	1.5	12.2	0.6
TW-59	22	0.9	1.4	0.5
TW-60	21	0.8	1.4	0.4
TW-61	20	1.0	3.5	0.5
TW-62	22	3.3	12.1	0.5
All Wells	163	1.4	12.2	0.1

FIGURES



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- BG01**
● SAMPLE LOCATION FOR BACKGROUND SOIL ASSESSMENT
- 1**
□ SAMPLE BLOCK FOR BACKGROUND SOIL ASSESSMENT
- SAMPLE GRID LINE FOR BACKGROUND SOIL ASSESSMENT
- APPROXIMATE SITE BOUNDARY



**BACKGROUND SOIL ASSESSMENT
WORK PLAN**

PREPARED FOR: **KOCH**
KOCH NITROGEN COMPANY
11996 US HIGHWAY 56 - P.O. BOX 1337
DOOGUE CITY, KS 67801

PREPARED BY:
GEOSYNTEC CONSULTANTS

PROJECT NO. FR0780	FIGURE NO. 1
DATE. OCTOBER 2005	FILE NO.

PHOTO SOURCE: KANSAS GEOLOGICAL SURVEY 2002

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SCALE IN FEET

LEGEND

- PROPERTY LINE
- SECTION LINE
- RAILROAD
- + RECOVERY WELL
- ◇ MONITORING WELL
- PRIVATE WELL
- WELLS IDENTIFIED AS BACKGROUND



BACKGROUND MONITORING WELL LOCATION MAP

PREPARED FOR:			
KOCH KOCH NITROGEN COMPANY 11669 US HIGHWAY 50 - P.O. BOX 1337 DOODGE CITY, KS 67801			
PREPARED BY			
GeoSYNTEC CONSULTANTS			
PROJECT NO.	FR0760.03	FIGURE NO.	2
DATE.	OCTOBER 2005	FILE NO.	FR0760.03-0002

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APPENDIX A

HISTORICAL CHORMIUM DATA FROM PROPOSED
BACKGROUND WELLS

APPENDIX A
HISTORICAL CHROMIUM DATA FROM PROPOSED BACKGROUND WELLS

Well ID	Sampling Date	Analysis	Analytical Method	Chromium Concentration (mg/L)
TW-24	1/7/1993	Chromium	HIST	<0.024
TW-24	4/6/1993	Chromium	HIST	<0.024
TW-24	7/3/1993	Chromium	HIST	<0.024
TW-24	9/10/1993	Chromium	HIST	<0.024
TW-24	1/12/1994	Chromium	HIST	<0.024
TW-24	4/6/1994	Chromium	HIST	<0.024
TW-24	6/29/1994	Chromium	HIST	<0.024
TW-24	9/22/1994	Chromium	HIST	<0.024
TW-24	12/22/1994	Chromium	HIST	<0.024
TW-24	4/5/1995	Chromium	HIST	<0.024
TW-24	7/11/1995	Chromium	HIST	<0.024
TW-24	1/11/1996	Chromium	HIST	<0.024
TW-24	7/5/1996	Chromium	HIST	<0.024
TW-24	10/8/1996	Chromium	HIST	<0.024
TW-24	1/17/1997	Chromium	HIST	<0.024
TW-24	4/9/1997	Chromium	HIST	<0.024
TW-24	7/8/1997	Chromium	HIST	<0.024
TW-24	6/24/1998	Chromium	HIST	<0.024
TW-24	7/29/1999	Chromium	HIST	<0.024
TW-24	8/1/2000	Chromium	HIST	<0.024
TW-25	1/7/1993	Chromium	HIST	<0.024
TW-25	4/6/1993	Chromium	HIST	0.03
TW-25	7/3/1993	Chromium	HIST	<0.024
TW-25	9/10/1993	Chromium	HIST	<0.024
TW-25	1/12/1994	Chromium	HIST	<0.024
TW-25	4/6/1994	Chromium	HIST	<0.024
TW-25	6/29/1994	Chromium	HIST	<0.024
TW-25	9/22/1994	Chromium	HIST	<0.024
TW-25	12/22/1994	Chromium	HIST	<0.024
TW-25	4/5/1995	Chromium	HIST	<0.024
TW-25	7/11/1995	Chromium	HIST	<0.024
TW-25	1/11/1996	Chromium	HIST	<0.024
TW-25	7/5/1996	Chromium	HIST	<0.024
TW-25	10/8/1996	Chromium	HIST	<0.024
TW-25	1/17/1997	Chromium	HIST	<0.024
TW-25	4/9/1997	Chromium	HIST	<0.024
TW-25	7/8/1997	Chromium	HIST	<0.024
TW-25	6/24/1998	Chromium	HIST	<0.024
TW-25	7/29/1999	Chromium	HIST	<0.024
TW-25	8/1/2000	Chromium	HIST	<0.024
TW-56	1/7/1993	Chromium	HIST	<0.024
TW-56	7/3/1993	Chromium	HIST	<0.024
TW-56	9/10/1993	Chromium	HIST	<0.024

APPENDIX A
HISTORICAL CHROMIUM DATA FROM PROPOSED BACKGROUND WELLS

Well ID	Sampling Date	Analysis	Analytical Method	Chromium Concentration (mg/L)
TW-56	1/12/1994	Chromium	HIST	<0.024
TW-56	4/6/1994	Chromium	HIST	<0.024
TW-56	6/29/1994	Chromium	HIST	<0.024
TW-56	9/22/1994	Chromium	HIST	<0.024
TW-56	12/22/1994	Chromium	HIST	<0.024
TW-56	4/5/1995	Chromium	HIST	<0.024
TW-56	7/11/1995	Chromium	HIST	<0.024
TW-56	10/10/1995	Chromium	HIST	<0.024
TW-56	1/11/1996	Chromium	HIST	<0.024
TW-56	4/11/1996	Chromium	HIST	<0.024
TW-56	7/5/1996	Chromium	HIST	<0.024
TW-56	10/8/1996	Chromium	HIST	<0.024
TW-56	1/17/1997	Chromium	HIST	<0.024
TW-56	4/9/1997	Chromium	HIST	<0.024
TW-56	7/8/1997	Chromium	HIST	<0.024
TW-56	10/13/1997	Chromium	HIST	<0.024
TW-56	1/14/1998	Chromium	HIST	<0.024
TW-56	4/15/1998	Chromium	HIST	<0.024
TW-56	10/7/1998	Chromium	HIST	<0.024
TW-56	1/20/1999	Chromium	HIST	<0.024
TW-56	4/30/1999	Chromium	HIST	<0.024
TW-56	7/29/1999	Chromium	HIST	<0.024
TW-56	10/13/1999	Chromium	HIST	<0.024
TW-56	2/3/2000	Chromium	HIST	<0.024
TW-56	4/6/2000	Chromium	HIST	<0.024
TW-56	10/10/2000	Chromium	HIST	<0.024
TW-56	7/23/2003	Chromium	6010	<0.00700
TW-56	1/27/2004	Chromium	6010	<0.00700
TW-56	4/14/2004	Chromium	6010	<0.00500
TW-56	7/20/2004	Chromium	6010	<0.0050
TW-56	10/27/2004	Chromium	6010	<0.010
TW-56	1/18/2005	Chromium	6010	<0.010
TW-56	4/12/2005	Chromium	6010	<0.010
TW-56	7/15/2005	Chromium	6010	<0.010
TW-59	1/7/1993	Chromium	HIST	<0.024
TW-59	4/6/1993	Chromium	HIST	<0.024
TW-59	7/3/1993	Chromium	HIST	<0.024
TW-59	9/10/1993	Chromium	HIST	<0.024
TW-59	1/12/1994	Chromium	HIST	<0.024
TW-59	4/6/1994	Chromium	HIST	<0.024
TW-59	6/29/1994	Chromium	HIST	<0.024
TW-59	9/22/1994	Chromium	HIST	<0.024
TW-59	12/22/1994	Chromium	HIST	<0.024

APPENDIX A
HISTORICAL CHROMIUM DATA FROM PROPOSED BACKGROUND WELLS

Well ID	Sampling Date	Analysis	Analytical Method	Chromium Concentration (mg/L)
TW-59	4/5/1995	Chromium	HIST	<0.024
TW-59	7/11/1995	Chromium	HIST	<0.024
TW-59	10/10/1995	Chromium	HIST	<0.024
TW-59	1/11/1996	Chromium	HIST	<0.024
TW-59	4/11/1996	Chromium	HIST	<0.024
TW-59	7/5/1996	Chromium	HIST	<0.024
TW-59	10/8/1996	Chromium	HIST	<0.024
TW-59	1/17/1997	Chromium	HIST	<0.024
TW-59	4/9/1997	Chromium	HIST	<0.024
TW-59	7/8/1997	Chromium	HIST	<0.024
TW-59	6/24/1998	Chromium	HIST	<0.024
TW-59	7/29/1999	Chromium	HIST	<0.024
TW-59	8/1/2000	Chromium	HIST	<0.024
TW-60	1/7/1993	Chromium	HIST	<0.024
TW-60	4/6/1993	Chromium	HIST	<0.024
TW-60	7/3/1993	Chromium	HIST	<0.024
TW-60	9/10/1993	Chromium	HIST	<0.024
TW-60	1/12/1994	Chromium	HIST	<0.024
TW-60	4/6/1994	Chromium	HIST	<0.024
TW-60	6/29/1994	Chromium	HIST	<0.024
TW-60	9/22/1994	Chromium	HIST	<0.024
TW-60	12/22/1994	Chromium	HIST	<0.024
TW-60	4/5/1995	Chromium	HIST	<0.024
TW-60	7/11/1995	Chromium	HIST	<0.024
TW-60	10/10/1995	Chromium	HIST	<0.024
TW-60	1/11/1996	Chromium	HIST	<0.024
TW-60	4/11/1996	Chromium	HIST	<0.024
TW-60	7/5/1996	Chromium	HIST	<0.024
TW-60	10/8/1996	Chromium	HIST	<0.024
TW-60	1/17/1997	Chromium	HIST	<0.024
TW-60	4/9/1997	Chromium	HIST	<0.024
TW-60	7/8/1997	Chromium	HIST	<0.024
TW-60	7/29/1999	Chromium	HIST	<0.024
TW-60	8/1/2000	Chromium	HIST	<0.024
TW-61	1/7/1993	Chromium	HIST	<0.024
TW-61	4/6/1993	Chromium	HIST	<0.024
TW-61	7/3/1993	Chromium	HIST	<0.024
TW-61	9/10/1993	Chromium	HIST	<0.024
TW-61	1/12/1994	Chromium	HIST	<0.024
TW-61	4/6/1994	Chromium	HIST	<0.024
TW-61	6/29/1994	Chromium	HIST	<0.024
TW-61	9/22/1994	Chromium	HIST	<0.024
TW-61	12/22/1994	Chromium	HIST	<0.024

APPENDIX A
HISTORICAL CHROMIUM DATA FROM PROPOSED BACKGROUND WELLS

Well ID	Sampling Date	Analysis	Analytical Method	Chromium Concentration (mg/L)
TW-61	4/5/1995	Chromium	HIST	<0.024
TW-61	7/11/1995	Chromium	HIST	<0.024
TW-61	10/10/1995	Chromium	HIST	<0.024
TW-61	1/11/1996	Chromium	HIST	<0.024
TW-61	4/11/1996	Chromium	HIST	<0.024
TW-61	7/5/1996	Chromium	HIST	<0.024
TW-61	10/8/1996	Chromium	HIST	<0.024
TW-61	1/17/1997	Chromium	HIST	<0.024
TW-61	4/9/1997	Chromium	HIST	<0.024
TW-61	7/8/1997	Chromium	HIST	<0.024
TW-61	7/29/1999	Chromium	HIST	<0.024
TW-62	1/7/1993	Chromium	HIST	<0.024
TW-62	4/6/1993	Chromium	HIST	<0.024
TW-62	7/3/1993	Chromium	HIST	<0.024
TW-62	9/10/1993	Chromium	HIST	<0.024
TW-62	1/12/1994	Chromium	HIST	<0.024
TW-62	4/6/1994	Chromium	HIST	<0.024
TW-62	6/29/1994	Chromium	HIST	<0.024
TW-62	9/22/1994	Chromium	HIST	<0.024
TW-62	12/22/1994	Chromium	HIST	<0.024
TW-62	4/5/1995	Chromium	HIST	<0.024
TW-62	7/11/1995	Chromium	HIST	<0.024
TW-62	10/10/1995	Chromium	HIST	<0.024
TW-62	1/11/1996	Chromium	HIST	<0.024
TW-62	4/11/1996	Chromium	HIST	<0.024
TW-62	7/5/1996	Chromium	HIST	<0.024
TW-62	10/8/1996	Chromium	HIST	<0.024
TW-62	1/17/1997	Chromium	HIST	<0.024
TW-62	4/9/1997	Chromium	HIST	<0.024
TW-62	7/8/1997	Chromium	HIST	<0.024
TW-62	6/24/1998	Chromium	HIST	<0.024
TW-62	10/13/1999	Chromium	HIST	<0.024
TW-62	8/1/2000	Chromium	HIST	<0.024

Notes:

HIST - Historical data collected by the former Facility owner, analytical method not quantified.

6010 - EPA Method 6010

APPENDIX B

HISTORICAL NITRATE DATA FROM PROPOSED
BACKGROUND WELLS

APPENDIX B
HISTORICAL NITRATE DATA FROM PROPOSED BACKGROUND WELLS

Well ID	Sampling Date	Analysis	Analytical Method	Reported Concentration (mg/L)
TW-24	1/7/1993	NitrateplusNitrite (as N)	HIST	0.6
TW-24	4/6/1993	NitrateplusNitrite (as N)	HIST	0.5
TW-24	7/3/1993	NitrateplusNitrite (as N)	HIST	0.7
TW-24	9/10/1993	NitrateplusNitrite (as N)	HIST	0.8
TW-24	1/12/1994	NitrateplusNitrite (as N)	HIST	0.6
TW-24	4/6/1994	NitrateplusNitrite (as N)	HIST	0.5
TW-24	6/29/1994	NitrateplusNitrite (as N)	HIST	0.7
TW-24	9/22/1994	NitrateplusNitrite (as N)	HIST	0.8
TW-24	12/22/1994	NitrateplusNitrite (as N)	HIST	1.1
TW-24	4/5/1995	NitrateplusNitrite (as N)	HIST	1
TW-24	7/11/1995	NitrateplusNitrite (as N)	HIST	0.4
TW-24	1/11/1996	NitrateplusNitrite (as N)	HIST	0.7
TW-24	7/5/1996	NitrateplusNitrite (as N)	HIST	0.4
TW-24	10/8/1996	NitrateplusNitrite (as N)	HIST	0.7
TW-24	1/17/1997	NitrateplusNitrite (as N)	HIST	0.7
TW-24	4/9/1997	NitrateplusNitrite (as N)	HIST	0.4
TW-24	7/8/1997	NitrateplusNitrite (as N)	HIST	0.4
TW-24	6/24/1998	NitrateplusNitrite (as N)	HIST	0.7
TW-24	7/29/1999	NitrateplusNitrite (as N)	HIST	0.9
TW-24	8/1/2000	NitrateplusNitrite (as N)	HIST	1.1
TW-25	1/7/1993	NitrateplusNitrite (as N)	HIST	0.6
TW-25	4/6/1993	NitrateplusNitrite (as N)	HIST	0.3
TW-25	7/3/1993	NitrateplusNitrite (as N)	HIST	0.7
TW-25	9/10/1993	NitrateplusNitrite (as N)	HIST	0.08
TW-25	1/12/1994	NitrateplusNitrite (as N)	HIST	0.6
TW-25	4/6/1994	NitrateplusNitrite (as N)	HIST	0.6
TW-25	6/29/1994	NitrateplusNitrite (as N)	HIST	0.6
TW-25	9/22/1994	NitrateplusNitrite (as N)	HIST	0.9
TW-25	12/22/1994	NitrateplusNitrite (as N)	HIST	1.1
TW-25	4/5/1995	NitrateplusNitrite (as N)	HIST	0.6
TW-25	7/11/1995	NitrateplusNitrite (as N)	HIST	0.5
TW-25	1/11/1996	NitrateplusNitrite (as N)	HIST	0.8
TW-25	7/5/1996	NitrateplusNitrite (as N)	HIST	0.5
TW-25	10/8/1996	NitrateplusNitrite (as N)	HIST	0.8
TW-25	1/17/1997	NitrateplusNitrite (as N)	HIST	0.7
TW-25	4/9/1997	NitrateplusNitrite (as N)	HIST	0.4
TW-25	7/8/1997	NitrateplusNitrite (as N)	HIST	0.5
TW-25	6/24/1998	NitrateplusNitrite (as N)	HIST	0.7
TW-25	7/29/1999	NitrateplusNitrite (as N)	HIST	0.9
TW-25	8/1/2000	NitrateplusNitrite (as N)	HIST	0.5
TW-56	1/7/1993	NitrateplusNitrite (as N)	HIST	0.9
TW-56	4/6/1993	NitrateplusNitrite (as N)	HIST	0.8
TW-56	7/3/1993	NitrateplusNitrite (as N)	HIST	0.9
TW-56	9/10/1993	NitrateplusNitrite (as N)	HIST	1.1

APPENDIX B
HISTORICAL NITRATE DATA FROM PROPOSED BACKGROUND WELLS

Well ID	Sampling Date	Analysis	Analytical Method	Reported Concentration (mg/L)
TW-56	1/12/1994	NitrateplusNitrite (as N)	HIST	0.9
TW-56	4/6/1994	NitrateplusNitrite (as N)	HIST	0.6
TW-56	6/29/1994	NitrateplusNitrite (as N)	HIST	1
TW-56	9/22/1994	NitrateplusNitrite (as N)	HIST	1.1
TW-56	12/22/1994	NitrateplusNitrite (as N)	HIST	1.4
TW-56	4/5/1995	NitrateplusNitrite (as N)	HIST	1.5
TW-56	7/11/1995	NitrateplusNitrite (as N)	HIST	0.9
TW-56	10/10/1995	NitrateplusNitrite (as N)	HIST	1.1
TW-56	1/11/1996	NitrateplusNitrite (as N)	HIST	1.1
TW-56	4/11/1996	NitrateplusNitrite (as N)	HIST	1.1
TW-56	7/5/1996	NitrateplusNitrite (as N)	HIST	0.9
TW-56	10/8/1996	NitrateplusNitrite (as N)	HIST	1.1
TW-56	1/17/1997	NitrateplusNitrite (as N)	HIST	1
TW-56	4/9/1997	NitrateplusNitrite (as N)	HIST	0.7
TW-56	7/8/1997	NitrateplusNitrite (as N)	HIST	0.7
TW-56	10/13/1997	NitrateplusNitrite (as N)	HIST	1
TW-56	1/14/1998	NitrateplusNitrite (as N)	HIST	1.4
TW-56	4/15/1998	NitrateplusNitrite (as N)	HIST	1.2
TW-56	10/7/1998	NitrateplusNitrite (as N)	HIST	12.2
TW-56	1/20/1999	NitrateplusNitrite (as N)	HIST	1.4
TW-56	4/30/1999	NitrateplusNitrite (as N)	HIST	1.5
TW-56	7/29/1999	NitrateplusNitrite (as N)	HIST	1.8
TW-56	10/13/1999	NitrateplusNitrite (as N)	HIST	1.9
TW-56	2/3/2000	NitrateplusNitrite (as N)	HIST	1.6
TW-56	4/6/2000	NitrateplusNitrite (as N)	HIST	1.5
TW-56	10/10/2000	NitrateplusNitrite (as N)	HIST	1.6
TW-56	7/23/2003	NitrateplusNitrite (as N)	353.2	1.39
TW-56	1/27/2004	NitrateplusNitrite (as N)	353.2	1.22
TW-56	4/14/2004	NitrateplusNitrite (as N)	353.2	1.36
TW-56	7/20/2004	NitrateplusNitrite (as N)	353.2	1.31
TW-56	10/27/2004	NitrateplusNitrite (as N)	300.0	1.19
TW-56	1/18/2005	NitrateplusNitrite (as N)	300.0	1.11
TW-56	4/12/2005	NitrateplusNitrite (as N)	300.0	1.1
TW-56	7/15/2005	NitrateplusNitrite (as N)	300.0	1.21
TW-59	1/7/1993	NitrateplusNitrite (as N)	HIST	0.7
TW-59	4/6/1993	NitrateplusNitrite (as N)	HIST	0.6
TW-59	7/3/1993	NitrateplusNitrite (as N)	HIST	0.9
TW-59	9/10/1993	NitrateplusNitrite (as N)	HIST	0.9
TW-59	1/12/1994	NitrateplusNitrite (as N)	HIST	0.6
TW-59	4/6/1994	NitrateplusNitrite (as N)	HIST	0.6
TW-59	6/29/1994	NitrateplusNitrite (as N)	HIST	0.6
TW-59	9/22/1994	NitrateplusNitrite (as N)	HIST	1
TW-59	12/22/1994	NitrateplusNitrite (as N)	HIST	0.9
TW-59	4/5/1995	NitrateplusNitrite (as N)	HIST	1.1

APPENDIX B
HISTORICAL NITRATE DATA FROM PROPOSED BACKGROUND WELLS

Well ID	Sampling Date	Analysis	Analytical Method	Reported Concentration (mg/L)
TW-59	7/11/1995	NitrateplusNitrite (as N)	HIST	0.7
TW-59	10/10/1995	NitrateplusNitrite (as N)	HIST	0.9
TW-59	1/11/1996	NitrateplusNitrite (as N)	HIST	0.9
TW-59	4/11/1996	NitrateplusNitrite (as N)	HIST	0.9
TW-59	7/5/1996	NitrateplusNitrite (as N)	HIST	0.5
TW-59	10/8/1996	NitrateplusNitrite (as N)	HIST	0.8
TW-59	1/17/1997	NitrateplusNitrite (as N)	HIST	0.7
TW-59	4/9/1997	NitrateplusNitrite (as N)	HIST	0.5
TW-59	7/8/1997	NitrateplusNitrite (as N)	HIST	0.4
TW-59	6/24/1998	NitrateplusNitrite (as N)	HIST	0.7
TW-59	7/29/1999	NitrateplusNitrite (as N)	HIST	1.35
TW-59	8/1/2000	NitrateplusNitrite (as N)	HIST	1.1
TW-60	1/7/1993	NitrateplusNitrite (as N)	HIST	0.8
TW-60	4/6/1993	NitrateplusNitrite (as N)	HIST	0.7
TW-60	7/3/1993	NitrateplusNitrite (as N)	HIST	0.9
TW-60	9/10/1993	NitrateplusNitrite (as N)	HIST	1
TW-60	1/12/1994	NitrateplusNitrite (as N)	HIST	0.7
TW-60	4/6/1994	NitrateplusNitrite (as N)	HIST	0.7
TW-60	6/29/1994	NitrateplusNitrite (as N)	HIST	0.7
TW-60	9/22/1994	NitrateplusNitrite (as N)	HIST	1.1
TW-60	12/22/1994	NitrateplusNitrite (as N)	HIST	0.8
TW-60	4/5/1995	NitrateplusNitrite (as N)	HIST	1.2
TW-60	7/11/1995	NitrateplusNitrite (as N)	HIST	0.8
TW-60	10/10/1995	NitrateplusNitrite (as N)	HIST	1
TW-60	1/11/1996	NitrateplusNitrite (as N)	HIST	0.9
TW-60	4/11/1996	NitrateplusNitrite (as N)	HIST	0.9
TW-60	7/5/1996	NitrateplusNitrite (as N)	HIST	0.6
TW-60	10/8/1996	NitrateplusNitrite (as N)	HIST	0.9
TW-60	1/17/1997	NitrateplusNitrite (as N)	HIST	0.7
TW-60	4/9/1997	NitrateplusNitrite (as N)	HIST	0.5
TW-60	7/8/1997	NitrateplusNitrite (as N)	HIST	0.5
TW-60	7/29/1999	NitrateplusNitrite (as N)	HIST	3.5
TW-60	8/1/2000	NitrateplusNitrite (as N)	HIST	1.2
TW-61	1/7/1993	NitrateplusNitrite (as N)	HIST	0.8
TW-61	4/6/1993	NitrateplusNitrite (as N)	HIST	1.1
TW-61	7/3/1993	NitrateplusNitrite (as N)	HIST	0.9
TW-61	9/10/1993	NitrateplusNitrite (as N)	HIST	1
TW-61	1/12/1994	NitrateplusNitrite (as N)	HIST	0.7
TW-61	4/6/1994	NitrateplusNitrite (as N)	HIST	0.7
TW-61	6/29/1994	NitrateplusNitrite (as N)	HIST	0.7
TW-61	9/22/1994	NitrateplusNitrite (as N)	HIST	1.1
TW-61	12/22/1994	NitrateplusNitrite (as N)	HIST	0.9
TW-61	4/5/1995	NitrateplusNitrite (as N)	HIST	1.3
TW-61	7/11/1995	NitrateplusNitrite (as N)	HIST	0.9

APPENDIX B
HISTORICAL NITRATE DATA FROM PROPOSED BACKGROUND WELLS

Well ID	Sampling Date	Analysis	Analytical Method	Reported Concentration (mg/L)
TW-61	10/10/1995	NitrateplusNitrite (as N)	HIST	1.1
TW-61	1/11/1996	NitrateplusNitrite (as N)	HIST	1
TW-61	4/11/1996	NitrateplusNitrite (as N)	HIST	1
TW-61	7/5/1996	NitrateplusNitrite (as N)	HIST	0.7
TW-61	10/8/1996	NitrateplusNitrite (as N)	HIST	1.1
TW-61	1/17/1997	NitrateplusNitrite (as N)	HIST	0.9
TW-61	4/9/1997	NitrateplusNitrite (as N)	HIST	0.5
TW-61	7/8/1997	NitrateplusNitrite (as N)	HIST	0.6
TW-61	7/29/1999	NitrateplusNitrite (as N)	HIST	1.3
TW-62	1/7/1993	NitrateplusNitrite (as N)	HIST	2.4
TW-62	4/6/1993	NitrateplusNitrite (as N)	HIST	2.9
TW-62	7/3/1993	NitrateplusNitrite (as N)	HIST	3.2
TW-62	9/10/1993	NitrateplusNitrite (as N)	HIST	8
TW-62	1/12/1994	NitrateplusNitrite (as N)	HIST	7.6
TW-62	4/6/1994	NitrateplusNitrite (as N)	HIST	2.7
TW-62	6/29/1994	NitrateplusNitrite (as N)	HIST	3.1
TW-62	9/22/1994	NitrateplusNitrite (as N)	HIST	3.6
TW-62	12/22/1994	NitrateplusNitrite (as N)	HIST	3.3
TW-62	4/5/1995	NitrateplusNitrite (as N)	HIST	3.4
TW-62	7/11/1995	NitrateplusNitrite (as N)	HIST	2.7
TW-62	10/10/1995	NitrateplusNitrite (as N)	HIST	3.3
TW-62	1/11/1996	NitrateplusNitrite (as N)	HIST	12.1
TW-62	4/11/1996	NitrateplusNitrite (as N)	HIST	3.2
TW-62	7/5/1996	NitrateplusNitrite (as N)	HIST	2.5
TW-62	10/8/1996	NitrateplusNitrite (as N)	HIST	3.2
TW-62	1/17/1997	NitrateplusNitrite (as N)	HIST	2.9
TW-62	4/9/1997	NitrateplusNitrite (as N)	HIST	2.6
TW-62	7/8/1997	NitrateplusNitrite (as N)	HIST	2.5
TW-62	6/24/1998	NitrateplusNitrite (as N)	HIST	3.8
TW-62	10/13/1999	NitrateplusNitrite (as N)	HIST	4.6
TW-62	8/1/2000	NitrateplusNitrite (as N)	HIST	3.8

Notes:

HIST - Historical data collected by the former Facility owner, analytical method not quantified.
353.2 - EPA Method 353.2
300.0 - EPA Method 300.0