KOCH

KOCH NITROGEN COMPANY LLC

July 9, 2013

UPS Tracking # *1Z 693 661 03 9450 6269*

Chief - RCRA Corrective Action & Permits Branch
Air, RCRA and Toxic Division
U.S. Environmental Protection Agency – Region VII
11201 Renner Boulevard
Lenexa, Kansas 66219

UPS Tracking # *1Z 693 661 03 9453 4270*

Andrea R. Stone
Environmental Scientist
RCRA Corrective Action & Permits Branch
Air, RCRA and Toxics Division
U.S. Environmental Protection Agency Region VII
11201 Renner Boulevard
Lenexa, Kansas 66219

UPS Tracking # *1Z 693 661 03 9493 3486*

Chief of the Hazardous Waste Permits Section
Bureau of Waste Management
Kansas Department of Health and Environment
1000 SW Jackson, Suite 320
Topeka, Kansas 66612-1366

RE **Response to EPA May 22, 2013 Comments to the RCRA Post-Closure Permit Renewal Application – Groundwater Recovery System Upgrades Supplement**
Koch Nitrogen Company, LLC
Dodge City, Kansas
EPA RCRA ID No. KSD044625010

Dear Regulatory Officials:

620.227.8631 Tel
620.227.6016 Fax

11559 U.S. Highway 50
P.O. Box 1337
Dodge City, Kansas 67801-1337

This letter and associated attachments are provided to address comments on Koch Nitrogen Company, LLC's (KNC's) RCRA Post-Closure Permit Application – Groundwater Recovery System Upgrades Supplement (Supplement), dated February 28, 2013, which were provided by the Kansas Department of Health and Environment (KDHE) and the U.S. Environmental Protection Agency (EPA), in a letter dated June 6, 2013.

Per KDHE instruction, KNC has responded to these comments in two submittals. Our first submittal was provided by letter of June 20, 2013. The purpose of this letter is to transmit the remainder of our responses. Specifically, this submittal provides KNC's response to additional EPA comments.

Comments from EPA's May 22, 2013 submittal and KNC's responses to these comments are provided in Attachment A. Text revision replacement pages are provided in Attachment B. Table and figure revisions and additions are provided in Attachment C. Supporting tables are provided in Attachment D.

We trust that the information we have provided will address the corresponding comments. Please call Cory Zellers at (620) 371-7914 if you have any questions or would like to discuss any of these items further.

In accordance with Section I.F of the Part I Permit and Section B.22 of the Part II permit, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or other persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Very Truly Yours,

Michael J. Sherbak II
Plant Manager
Koch Nitrogen Company, LLC

Cc w/Attachments:

Cory Zellers, KNC, Dodge City, Kansas
Tom Siegrist, KF, Wichita, Kansas (electronic)
Warren Brady, Geosyntec, Baton Rouge, Louisiana

ATTACHMENT A

EPA 22 MAY 2013
COMMENTS AND KNC RESPONSES

EPA Project Manager General Comment 1 - It is premature to revise the groundwater recovery system before the soil and groundwater delineation of the vertical and horizontal extent of contamination is defined. The groundwater recovery system needs to be designed to capture the groundwater contamination efficiently and effectively. Making changes at this point before all the data has been collected and evaluated could potentially miss areas where the contamination is more concentrated. For example, once we have all of the soil data, there may be an area with high levels of contamination, but there is no recovery well near that location. Based on that data, a recovery well could be placed near that high level of soil contamination to capture any contamination that is migrating from the soil to the groundwater.

KNC Response: We understand and respect EPA's position. However, it is KNC's belief that upgrades to the groundwater recovery system should not be postponed until the RFI is complete but rather that the operation of the system should be modified over time, as necessary, to reflect knowledge gained from new data. We believe incremental changes would significantly improve the usefulness of the recovery system, allowing more efficient and better capture of impacted groundwater, reductions in energy usage, reductions in unnecessary withdrawals of groundwater from the Ogallala aquifer, and improvements in system performance.

As documented in Section 8 of the Supplement document, KNC is proposing a phased approach to upgrades and operation of the recovery system so that the configuration of the recovery system has the flexibility to evolve as conditions change and new information is obtained. As noted in Section 8.2, "it is anticipated that the groundwater model will be updated after the upgrades in Section 8.1 are complete and will be further revisited as site conditions change to provide an iterative approach for: 1) expansion and/or reduction in the recovery system layout; and/or 2) increases or decreases in the individual pumping rates for the site."

EPA PM Specific Comment 1 - Section 1.1 Overview, Last Sentence, Page 1: This sentence reads, "By prior agreement with the Agencies, KNC has prepared this supplement as a proposal to amend the current corrective action program to incorporate newly obtained groundwater information and improvements to the groundwater recovery and treatment system to better meet project objectives." The EPA, KDHE and KNC discussed permit renewal changes last year; however, we do not specifically recall agreeing to the submission of this supplement. As stated above, the EPA thinks that it is premature to make changes to the groundwater recovery system before all of the soil and groundwater data has been collected and analyzed.

KNC Response: Comment noted. In the cover letter for KNC's Permit Renewal submission dated 19 October 2012, KNC requested an extension to February 28, 2013 to develop and submit the Supplement. As stated in KNC's response above, KNC views optimizing the groundwater recovery system as part of the evolution of the remedy and a logical next step in the collaborative process already underway. The proposed approach provides a mechanism for changes to the recovery system layout as new data suggest

changes to optimize efficiency. Furthermore, we believe that promptly initiating the proposed changes will enable us to better capture COCs in groundwater at the Site as soon as possible.

EPA PM Specific Comment 2 - Section 2.6.1.2 South, North and East Ponds, Second Paragraph, Page 5&6: In the second sentence it states, "Total and hexavalent chromium analyses performed as part of the RFI Work Plan implementation only identified detectable hexavalent chromium in six samples (shallower than 6 ft bgs) in the South Pond and 1 sample in the East Pond (also shallower than six feet) with the total chromium concentrations generally delineated to background levels with depth (KNC, 2012a). It further states, "Hexavalent chromium was not detected above the detection limit of 20 milligrams per kilogram (mg/kg) in the north pond. As mentioned to KNC previously, the Regional Screening Levels for Hexavalent Chromium have changed from 20 mg/kg to 5.6 mg/kg for industrial soil. Most of the sampling for hexavalent chromium occurred when the RSL was at the higher level of 20 mg/kg; therefore, additional sampling for hexavalent chromium needs to be conducted and analyzed at the RSL of 5.6 mg/kg for Hexavalent Chromium. This additional sampling should be completed in the current phase of the RFI.

KNC Response: Comment noted. The first phase of the data collection noted above was performed in April and May. KNC is the process of receiving and reviewing these analytical data.

EPA PM Specific Comment 3 - Section 2.6.2.1 30,000-Ton UAN Tank Leak, Page 6: This paragraph discusses the leak from this tank in 1992; however, the quantity of the leak was not specified. Please provide the amount, if known, of the leak; otherwise, provide an explanation in the responses to these comments.

KNC Response: Please note that the leak at the UAN Tank was identified and assessed by the previous Facility owner (Farmland), as documented in the RFI Work Plan. KNC acquired the site in 2003 and has not identified information in the previous owner's records that defines the quantity of UAN associated with this historic release.

EPA PM Specific Comment 4 - Section 7 Groundwater Recovery System Upgrades Configuration, Page 18: The second sentence of the first paragraph on this page states, "Three additional pumping wells (RW-1, RW-2 and RW-3) are proposed to be constructed along the southern edge of the site (Figure 18) with conversion of TW-80 from monitoring to groundwater recovery."

On Figure 18, it shows proposed RW-1 as being on the southwest part of KNC's property; proposed RW-2, RW-3 and TW-80 are shown as being located south of the railroad tracks and the KNC property. In the past, pumping wells were installed north of the KNC property and caused the contaminant plume to migrate north of the property. The EPA is concerned that the proposed locations of the new recovery wells and converting monitoring well TW-80 to a recovery well will cause the contamination to be pulled south of the KNC property; and, potentially impact the private residence's drinking water well and irrigation well also located south of the KNC property.

KNC Response: As described in Section 2.5 of the Supplement, KNC has taken steps to prevent groundwater use south of the Facility through imposition of restrictive covenants and/or paying for property owners to connect to the Dodge City public water supply to insure these potential downgradient receptors are protected. The intent of additional groundwater recovery wells in this area is to improve capture of nitrate and chromium along the southern boundary to further prevent migration.

EPA PM Specific Comment 5 - Section 7.3 Equipment Decontamination and Investigation Derived Waste Management, Page 19: The last sentence in this section states that, "All waste and debris generated during drilling activities will be drummed, labeled, and stored on site for management under KNC plant protocols." Describe KNC plant protocols or attach the KNC Plant protocols as an appendix to this document.

KNC Response: Protocols for IDW management for soil and groundwater collected as part of RCRA activities at the KNC facility are performed in accordance with Section I-5.5 of the RFI Sampling and Analysis Plan (Volume 1 Field Sampling Plan). The reference to KNC plant protocols on page 19 has been revised to directly reference this document (Attachment B).

EPA PM Specific Comment 6 - Section 7.4 Well Vault Installation, Page 19: The first sentence of the second paragraph states, "The horizontal force main will connect to the pitless adapter in the well casing and run though the well vault." There is a typographical error in this sentence. Please change "though" to "through" in this sentence. Also, please include a diagram(s) of the horizontal force main and the pitless adapter and provide a reference in this section to that diagram(s).

KNC Response: Comment noted. A replacement page reflecting this change is provided in Attachment B. A new figure has been created (Figure 20), which provides a diagram of the horizontal force main and the pitless adaptor. The new Figure is provided in Attachment C. A replacement page that includes a text reference is provided in Attachment B.

EPA PM Specific Comment 7 - Section 7.6 Pumping Well/Permanent Pump Assessment, #2 bullet item, Page 21: This bulleted item states, "swab the pumping well between the bottom to the top of the screened section;" There are several different methods of swabbing a well. Please describe the specific techniques/methods that will be used to "swab" a well or attach the information as an appendix to this document.

KNC Response: The intent of the proposed swabbing for the rehabilitation of recovery wells is to liberate scale, entrained fine grained formation materials and/or biofilm from the well screen surface and within the filter pack to induce additional flow from recovery wells. A more detailed description of the swabbing process is provided below.

1) **Perform drawdown test of well by monitoring sustained drawdown with constant pumping rate. Record drawdown and flow rate for later comparison.**
2) **Place plastic sheeting on ground near the recovery well.**
3) **Remove permanent pump from recovery well and place on plastic sheeting.**
4) **Tag bottom of recovery well and compare to well installation records.**
5) **Bail the accumulated sediment from the bottom of the well if there is more than 0.5 feet of accumulated sediment on the bottom of well and properly manage sediment in accordance with Section 7.3 of the Supplement.**
6) **Swab borehole with a tight fitting polyethylene swab designed for the diameter of the recovery well for a period of at least 1 hour (or until accumulated material in bottom of well is noted by shortening of swab stroke) to mechanically agitate and loosen biofilm, scale, and material entrained in filter pack. The swab shall be moved up and down within the screened section of the borehole using drill stem and winch line.**
7) **Tag bottom of recovery well and compare to initial reading.**
8) **If accumulated sediment is noted on the bottom of well, bail the well to remove and properly manage sediment in accordance with Section 7.3 of the Supplement.**
9) **Perform drawdown test of well by monitoring sustained drawdown with constant pumping rate. Compare to earlier readings to determine change in well productivity.**
10) **If it is deemed necessary (i.e. well yield does not increase), apply biocide and/or viscosifiers per manufactures instructions to well and repeat process between Steps #6 and #9 to evaluate effectiveness.**

EPA PM Specific Comment 8 - Section 7.6 Pumping Well/Permanent Pump Assessment, 1st Paragraph, Page 22: KNC will need prior approval from the EPA and KDHE if KNC decides to use biocides and/or viscosifiers. Change the last sentence in this paragraph to read, "In the event that biocides and/or mud viscosifiers are required, KNC will contact KDHE and EPA, and obtain approval prior to use."

KNC Response: Comment noted. A replacement page reflecting this change is provided in Attachment B.

EPA PM Specific Comment 9 - Section 8.3 Regulatory Implementation, Page 24: The last sentence in this section states, "KNC welcomes the opportunity to discuss the type(s) of data, in addition to those proposed in Section 8.2, that KDHE would require to make operational changes more fluid through Annual Groundwater Corrective Action or other reports (e.g., quarterly RCRA progress reports) as conditions dictate." Please revise and add, "and EPA" after "KDHE" in this sentence.

KNC Response: Comment noted. A replacement page reflecting this change is provided in Attachment B.

EPA PM Specific Comment 10 - Table 1 Flow Meter Data Collection Summary: Some of the calculations do not add up. For example: average gpm (flow rate) and time change (min) in the calculations area of the table. Please revise as appropriate.

KNC Response: Table 1 has been revised and provided in Attachment C. A total of six errors associated with the time interval between flow meter readings resulted in the following changes:

1) **9 November 2012: F-8 flow changed from 7.8 to 7.6 GPM**
2) **9 November 2012: F-9 flow changed from 7.8 to 7.6 GPM**
3) **9 November 2012: Equalization Basin flow changed from 224 to 217 GPM**
4) **10 November 2012: F-3 flow remained at 0 however time interval read changed from 971 minutes to 969 minutes.**
5) **29 January 2013: F-5 flow changed from 35.4 to 36.9 GPM**
6) **30 January 2013: F-2 flow changed from 46.1 to 47.7 GPM**

The data from 10 November 2012 used for the groundwater model input was accurate as originally provided; therefore changes to the model were not required.

EPA PM Specific Comment 11 - Figure Number 12: There appears to be a typographical error on this figure. It lists 548 inches per year in one small area, and the other areas are listed as 0.5 inches per year and one other area is listed as 3.65 inches per year. Please revise or explain in the response to the comments.

KNC Response: Section 6.1 of the Supplement provides a description of why recharge boundary conditions were varied in Figure 12 as follows, "The specified recharge rate was zero inches per year across the model domain except in a few low lying areas and unlined sewage ponds on and adjacent to the Site where a specified flux was assigned." The 548 inches represents potential infiltration from an existing unlined pond (sewage lagoon).

EPA Geologist Comment 1: The EPA is concerned that an incomplete evaluation of hydraulic capture of the groundwater contaminant plumes at the Koch Nitrogen Company Dodge City, Kansas facility (Facility) will result in continued ineffectual and inefficient control and remediation of the plumes.

A great deal of effort during the RFI was geared toward characterizing the three-dimensional extent and concentration distributions of the chromium, nitrate, nitrite, and volatile organic compound (VOC) plumes with the intention that this information would be used in assessing the current level of recovery system effectiveness, and in the course of so doing identify ways to improve the recovery system effectiveness and efficiency. This effort of characterizing the three-dimensional extent of groundwater contamination and relating it to the optimization of the recovery system is not reflected in the Supplement, and must be done so in order to result in the improved effectiveness and efficiency of the recovery system.

The EPA would like to recommend to Koch an EPA guidance document which may prove helpful, titled *"A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems"* (EPA/600/R-08/003, January 2008) (Guidance). The Supplement in its current form

considers only two dimensional (horizontal) captures, and provides no assessment of vertical capture. Absence of consideration of vertical capture has been identified as one of the primary causes of failure of many pump and treat systems. In the Guidance cited above, Figure 1 illustrates both horizontal and vertical capture zones and is useful in pointing out the importance of assessing vertical capture. Of particular relevance to the conditions at the Facility is that the illustration of vertical capture in Figure 1 is based on a partially penetrating recovery well, as are the current recovery wells at the Facility. Assessment of groundwater contamination during the RFI focused on evaluating the vertical as well as the horizontal extent of contamination with the idea of providing this information for a detailed assessment of the current recovery system. In Figure 6 of the Supplement, several plumes are presented in horizontal aspect only, and need to be considered vertically as well. This may be accomplished by transecting the plumes in several directions with cross sections similar to the one shown in Figure 1 of the Guidance. Once illustration of the plumes has been done at a considerably larger scale than that used in Figure 6 of the Supplement, the next step would be to add or superimpose selected recovery wells onto the plume maps and appropriately scaled cross sections in order to complete a depiction of the current plumes with the current recovery system.

Another factor that needs to be considered is whether there are particular zones that may contain high concentrations of contaminants. If extraction is focused on such areas then much more effective and efficient remediation may be achieved by removing higher concentrations of contaminants.

Finally, once it has been determined where extraction would be most beneficial to successful containment and remediation of groundwater contamination, configuration and operation of an ideal extraction system might be considered and evaluated. For example, effective containment of the plumes might be achieved with a much smaller number of wells pumping at higher rates in strategic locations, and such a system might prove to be more cost effective with a much smaller number of wells to operate, maintain, and plumb into a collection system. Evaluation of a wide variety of different combinations of numbers, locations and arrays, screened intervals, and pumping rates of wells could be evaluated using carefully calibrated groundwater models.

The EPA believes the level of effort described in this comment is essential in order to begin an analysis of the performance of the current groundwater recovery system and how it might be improved upon.

KNC Response: KNC shares EPA's concern of "continued ineffectual control and remediation of the plumes." Please see our response to EPA Project Manager General Comment 1 above. KNC has proposed changes to optimize system performance and believes that agency approval of those changes would resolve a good part of this concern. KNC has proposed in the Supplement a first step to improving the capture of COCs. To support this proposal, existing data were reviewed and a significant additional data collection effort was undertaken: an aquifer testing program was implemented that included single well permeability testing on 53 recovery and monitoring wells and single well aquifer performance tests on 5 recovery wells. Additionally, KNC installed pressure gauges and flow meters throughout the well network to better understand how the current system operates. These data were utilized to populate a groundwater model, to KNC's

knowledge the first for this site, which can now be utilized to improve the groundwater recovery system. As noted in the Supplement (Section 8), KNC proposes to evaluate capture and modify the system, as applicable, to implement the best possible remedy for groundwater.

KNC provided cross-sections in the June 20, 2013 submittal that included the lithology, distribution of chromium and Nitrate + Nitrite as N during the 4th quarter 2013 monitoring event, and the water table under non-pumping conditions during September 2012. The cross-sections demonstrate that:

i) most of the recovery well screens are long and extend through the entire saturated portion of the unconsolidated deposits;
ii) in most areas the water table under non-pumping conditions does not extend to the top of the well screen; and
iii) little variability in COC levels was identified based on lithology.

These data are supported by aquifer testing results that further demonstrate a small range of measured hydraulic conductivity values (Table 2 of the Supplement). EPA notes that "Absence of consideration of vertical capture has been identified as one of the primary causes of failure of many pump and treat systems." For this reason, KNC proposed to install long (50 foot) well screens to capture groundwater throughout the saturated deposits (Section 7.2 of the Supplement).

Please note that the Supplement includes many if not all of the elements in the "Six Steps for Systematic Evaluation of Capture Zone" discussed in the EPA Reference Document (EPA, 2008), as summarized below.

- ***"Step 1: Review Site data, site conceptual model and remedy objectives"* – Much of this information was provided in Section 2 and 6.1 of the Supplement. Based on data needs identified in the Site Conceptual Model (SCM), additional data collection was performed (Section 4 of the Supplement) to update the SCM. The remedial objectives were established in Section 5 of the Supplement.**
- ***"Step 2: Define site-specific Target Capture Zone(s)"* – The remedial and optimization objectives are contained in Section 5 of the Supplement.**
- ***"Step 3: Interpret water levels"* – Potentiometric maps and a discussion of groundwater flow are provided in Sections 2.4 and 6.2 of the Supplement.**
- ***"Step 4: Perform Calculations"* – The EPA guidance document specifically identifies the use of modeling (analytical or numerical) to simulate water levels in conjunction with particle tracking, which was provided in Section 6.3 of the Supplement. It was important that a groundwater model was utilized for the KNC Site because it allows for the superposition of one or more drawdown cones.**
- ***"Step 5: Evaluate Concentration Trends"* – Section 2.6 of the Supplement provides the conceptual model for COC release scenarios and distribution in groundwater.**
- ***"Step 6: Interpret actual capture based on steps 1-5, compare to Target Capture Zone(s), assess uncertainties and data gaps"* – Section 8.2 of the Supplement indicates that the groundwater model will be updated after the upgrades are complete. This**

and other new site data while the system is operational would be utilized to complete step 6. The iterative approach proposed in Section 8.2 of the Supplement is consistent with the approach prescribed in the EPA Reference Document.

KNC agrees with EPA that the system could be optimized to improve performance through different arrays and pumping rates. At this time, KNC believes the priorities should be focused on protection of potential off-site receptors. To accomplish this, KNC has obtained agreements to restrict groundwater use and/or paid for the provision of water to property owners in the area. The addition of recovery wells to the south is proposed to provide additional protections to capture nitrate and chromium. It is KNC's belief that the proposed upgrades and iterative model updates are critical to optimizing the groundwater system over time (different arrays and pumping rates) as described by the EPA. It is our contention that the "ideal" groundwater recovery system alluded to by the EPA is one that changes over time as new data is collected and the conceptual site model is updated.

EPA Geologist Comment 2 - Page 4, Section 2.6, First Paragraph. In discussing the distribution of the contaminants of concern (COCs) at the facility, there is no discussion or illustration of vertical distribution. A discussion of vertical distribution of the COCs must be included, and sufficient cross sections must be prepared in order to illustrate the vertical distribution and concentrations of the COCs.

KNC Response: Cross-sections that depict the concentration of chromium and Nitrate + Nitrite as N were provided as part of KNC's June 20, 2013 submittal. In addition to the well clusters installed in 2011 KNC has performed analytical testing on discrete vertical intervals within long-screened wells and has performed additional hydraulic testing of the material present at select long-screened monitoring wells. Under the direction of the EPA, KNC has installed depth discrete monitoring well clusters with five foot screens to investigate the vertical distribution of COCs. Monitoring well clusters MW-18, MW-19, MW-22 and MW-23 were installed in 2011 and have been monitored quarterly for water table elevations and COC concentrations.

Table 1 of Attachment D summarizes total chromium and nitrate plus nitrite concentrations in monitoring well clusters MW-18, MW-19, MW-22 and MW-23. The presence and magnitude of COC concentrations in general are similar at deep and shallow screened locations. Differences that are noted (e.g. Q3-2012 in well cluster MW-19) may be due to variability in sampling equipment used for some clusters. Bailers have been employed for low yield locations (MW-19S), while low flow sampling has been employed in more productive screened intervals (MW-19D). The use of bailers may bias the concentration of total chromium high due to turbidity.

In March 2012, depth discrete samplers (Hydrasleeves ®) were deployed in monitoring wells TW-05 (20 foot screen), TW-15 (20 foot screen) and TW-80 (60 foot screen) to assess, as applicable, zones of higher concentration vertically within these longer screened intervals. The results of this vertical profiling are summarized in Table 2 of Attachment D. Appreciable differences in the presence or magnitude of chromium or nitrate plus nitrite

concentrations were not observed at discrete locations along each well's screened interval with the exception of total chromium in monitoring well TW-15. At the shallowest depth of TW-15, total chromium was not detected, while total chromium was detected in both of the deeper intervals.

Discrete vertical profiling based on sampling of well clusters and depth discrete sampling in longer well screens indicate that COCs are present throughout the saturated thickness of the unconsolidated deposits, rather than concentrated in vertically discrete zones. Proposed system modifications conservatively have addressed the potential for vertically discrete zones through the utilization of long screens (50 feet) to insure groundwater is collected through the entire saturated thickness of the unconsolidated deposits.

EPA Geologist Comment 3 - Page 7, Section 3, Current Groundwater Recovery System. The Supplement needs to present more information regarding the current recovery system relative to the current configuration of the COC plumes. It should present figures at a suitable scale such as that used for Figure 3 (approximately 1" = 800'). These figures should show (1) the locations of the recovery wells, (2) the most recent water level elevation contours produced from water level data collected during the most recent groundwater sampling event, and (3) illustration of the plume of one of the COCs showing isoconcentration contours from the fourth quarter 2012 data (a figure should be produced for each of the COCs). Next, from each of these figures, an appropriate number of cross sections should be prepared to show views through the contaminant plume which depict it in several directions. Each cross section should show (1) the entire thickness of the unconsolidated zone from ground surface down to the Graneros Shale, (2) the groundwater surface, (3) the recovery wells through which the section was prepared including the screened intervals, (4) the monitoring wells through which the section was prepared including the screened intervals, and (5) the plume of the COC showing isoconcentration contours. Completion of these figures and cross sections will provide a clear three-dimensional depiction of the current groundwater COC plumes along with the configuration of the monitoring and recovery wells.

If not done previously, the following information should be put into a table both to assist in the preparation of the cross sections and to provide for future reference: for each well, (1) designate whether it is for monitoring or recovery purposes, (2) present elevations of the top and bottom of the screened interval, (3) present the elevation of the base of the unconsolidated aquifer at the well location, and (4) present static water level elevations of the water table collected during September 2012.

KNC Response: The information requested in this comment was recently provided to KDHE and EPA in a submittal dated June 20, 2013.

EPA Geologist Comment 4 - Page 9, Section 4.2.1. The text states that the "pumping wells have a local effect on the Ogallala Aquifer where the recovery in each individual pumping well is as much as 30 feet, however the overall flow direction did not noticeably change the resulting groundwater flow field with a northwest to southeast flow direction." The EPA is not entirely

clear on what this statement means. Does it mean that water levels within certain wells drop as much as 30 feet while influence on water levels outside the well are minimal or undetectable? If so, this probably indicates a large loss in well efficiency or specific capacity, indicating intake problems such as a clogging well screen.

KNC Response: Based on previous studies, groundwater flow during pumping operations at the Site is generally to the southeast with an area of groundwater capture centered on the main processing area of the Site. The statement in Section 4.2.1 was intended to explain that groundwater flow when the pumping wells at the Site had been shut down was also generally toward the southeast with an area of apparent groundwater capture centered on the main processing area of the Site. There have been isolated instances of water levels in wells recovering by up to 30 feet which may be attributed to isolated occurrences of well inefficiency, however this is the exception rather than the rule. Overall, site-wide recovery following recovery system shutdown does not indicate a drastic site-wide water level recovery. The limited aquifer recovery can be attributed to:

- **i) the relatively short duration of the recovery system shutdown,**
- ii) **the extended time period in which the recovery wells have been pumped, and**
- iii) **the relatively low mean hydraulic conductivity of 1.0 ft/day,**

The infrastructure installed (e.g. flow meters) and testing activities (slug and APT tests) performed in 2012 provide a baseline of well performance and system operation that may be utilized to assess changes in recovery well efficiency and system performance over time. In addition, these baseline data can be used to gauge the effectiveness of rehabilitation efforts that are attempted at the site.

<u>EPA Geologist Comment 5 - Page 10, Section 4.3.</u> The Supplement should discuss whether there has been any aquifer parameter testing previously done during the Facility history that may provide valuable information.

KNC Response: The information requested in this comment was recently provided as KNC's response to EPA Geologist Comment 8 in a submittal dated June 20, 2013. Our response stated: "The range of horizontal hydraulic conductivity results ranged from 0.1 and 19.5 ft/day (excluding MW-19S which had a result of 0.0012 feet per day [ft/day]) and a geometric mean of 1.0 ft/day. … previous slug testing and aquifer performance testing completed by Woodward Clyde Consultants (WCC) at the site in 1988 indicated a range of horizontal hydraulic conductivity between 0.9 and 13 ft/day. Both the 1988 and 2012 results are similar to the range of horizontal hydraulic conductivity reported by the Kansas Geologic Survey Open File Report 2010-18, as noted in the Permit Renewal Submission."

<u>EPA Geologist Comment 6 - Pages 10 and 11, Section 4.3.1.</u> The accuracy of the data resulting from a rising head slug test in which a submersible pump was used to "instantaneously" remove a volume of water over a 10-20 second period of time is very questionable.

KNC Response: As noted below in EPA Geologist Comment 7, the Hvorslev solution method was used to evaluate slug test results. The Hvorslev method does not require that the slug be introduced in a near-instantaneous manner relative to aquifer response. As a

quasi-steady state representation of slug induced flow, there is no assumption about the relative speed of slug introduction in the underlying mathematical model. The only assumption in this regard is that the slug introduction has been completed prior to the collection of response data. Under the circumstances this was the most accurate method afforded to assess the hydraulic conductivity at the recovery well locations. To evaluate the results between testing methods employed at the monitoring and recovery wells the slug testing results of the monitoring well and recovery wells were compared. The geometric mean of hydraulic conductivity determined at the monitoring wells (excluding MW-19S) which were tested using conventional slug testing methods was 0.4 ft/day. The geometric mean of hydraulic conductivity determined at the recovery wells was 1.4 ft/day. The slightly elevated result from the recovery well is not surprising due to the constant pumping and development occurring at the recovery wells.

EPA Geologist Comment 7 - Page 11, Section 4.3.1. The Hvorslev solution method was initially developed for confined aquifers, although it may be modified for use with unconfined aquifers. Was consideration given to using other methods for analyzing slug test data, such as Bouwer and Rice and other methods, given the various assumptions for the methods such as confined or unconfined conditions, partially or fully penetrating wells, etc.?

KNC Response: While the Bouwer and Rice Method [Bouwer, H. and R.C. Rice, 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, vol. 12, no. 3, pp. 423-428.] can be used in situations where slugs are not introduced instantaneously, error can be introduced into the hydraulic conductivity estimates using this method. Therefore it is best to use a near instantaneous slug when analysis is to be performed via the Bouwer and Rice method to reduce potential error and the need for simplification of the underlying mathematical model of other methods (e.g. Cooper et al, 1967[1], Hyder et al., 1994[2], etc). In our opinion, the basic nature of the Hvorslev method allowed for the most accurate results in this situation.

EPA Geologist Comment 8 - Page 11, Section 4.3.3. There is no indication that consideration was given to the interval of the unconsolidated aquifer that was tested, since hydraulic conductivity can vary with depth. The screened interval of the well being tested should be matched up with its drilling log, and only wells that are screened across approximately the same zones should be averaged together. This process of ensuring that similarly screened wells are grouped together for averaging may be useful in locating zones of higher permeability, if present, in the unconsolidated aquifer.

[1] Cooper, H.H., J.D. Bredehoeft and S.S. Papadopulos, 1967. Response of a finite-diameter well to an instantaneous charge of water, Water Resources Research, vol. 3, no. 1, pp. 263-269.
[2] Hyder, Z., J.J. Butler, Jr., C.D. McElwee and W. Liu, 1994. Slug tests in partially penetrating wells, Water Resources Research, vol. 30, no. 11, pp. 2945-2957

KNC Response: The information requested in this comment was recently provided to KDHE and EPA in a submittal dated June 20, 2013.

EPA Geologist Comment 9 - Pages 16 and 17, Section 6.3. The EPA is in general agreement that discontinuing pumping of the wells north of Highway 50 is a productive measure, since the natural groundwater flow direction is to the south-southeast. Before this is done, Koch should contact the surrounding property owners and ensure there have been no irrigation wells installed since the last well survey that could influence the contaminant plumes upon shutdown of the proposed wells. Also, in order to have a better understanding of what effects it may have on the plumes, Koch needs to prepare the plume maps and cross sections described in the previous comment on Section 3 so this information may be considered before the proposed shutdown. Also, shutdown of the wells will affect the flow regime at and around the Facility, so water levels need to be collected before shutdown, and afterward until the levels equilibrate. If after evaluating the data after the shutdown Koch, KDHE, and the EPA are in agreement to leave the wells off, the effects of the shutdown will need to be considered insofar as capture zone analysis for the Facility is concerned.

KNC Response: Comment noted. Prior to turning off wells to the north of Highway 50 KNC will contact the surrounding property owners with whom KNC does not currently have an agreement that restricts groundwater use to determine if there are any new irrigation wells. The plume maps and cross sections were submitted to address EPA Geologist Comment 3 in a submittal dated June 20, 2013. KNC is prepared to develop potentiometric maps for the unconsolidated deposits using the procedures described in the Phase II RFI Work Plan Addendum: Groundwater Characterization prior to long-term shut down of these wells. These potentiometric maps will be provided to KDHE and EPA for review prior to shut-down of these wells for an extended time period.

EPA Geologist Comment 10 - Pages 18 - 22, Section 7. The EPA believes that the proposal of changes to the recovery system insofar as the installation of additional wells and piping is premature in light of the considerations that should be made that the EPA has pointed out in these comments. These proposed changes should be deferred until a more thorough assessment of the three-dimensional extent of contamination and other considerations as detailed in these comments has been performed.

KNC Response: Please see our response to Project Manager General Comment 1 above. The proposed approach provides a mechanism for changes to the layout as new data suggest the need for modification. We believe that initiating these proposed changes now will result in an earlier, more efficient capture of impacted groundwater containing site COCs.

ATTACHMENT B

SUPPLEMENT REPLACEMENT PAGES

List of Tables

Table 1 Flow Meter Data Collection Summary
Table 2 Summary of Slug Test Results
Table 3 Summary of Single Well Aquifer Performance Test Results
Table 4 Model Assigned Hydraulic Parameters
Table 5 Summary of Recovery Well Input Parameters

List of Figures

Figure 1 Site Location Map
Figure 2 Groundwater Potentiometric Surface Contour Maps - 2011
Figure 3 Unconfined Aquifer Thickness - August 2011
Figure 4 Monitoring and Recovery Well Location Map
Figure 5 Private Property Owners and Private Well Locations
Figure 6 Laboratory Results for Groundwater Sampling - Fourth Quarter 2012
Figure 7 Groundwater Volatile Organic Compounds Concentration Map
Figure 8 Groundwater Recovery Well Network
Figure 9 September 2012 Static Water Level Elevations
Figure 10 Model Grid Layout
Figure 11 Optimized Groundwater Recovery System Elevation Map
Figure 12 Model Recharge Parameter Layout
Figure 13 Groundwater Recovery System Flow Schematic
Figure 14 Optimized Groundwater Recovery System Groundwater Elevation Map
Figure 15 Optimized Groundwater Recovery System - Nitrate Particle Path Results
Figure 16 Optimized Groundwater Recovery System - Total Chromium Particle Path Results
Figure 17 Optimized Groundwater Recovery System - Hexavalent Chromium Particle Path Results
Figure 18 Optimized Groundwater Recovery System Layout
Figure 19 Typical Recovery Well Construction Summary
Figure 20 Well Head Typical Detail

List of Appendices

Appendix A Slug Test Analytical Solutions
Appendix B Single Well Pumping Test Solutions

A minimum 3 foot thick bentonite seal will be installed over the filter pack. The seal will be constructed with compressed and coated bentonite pellets specifically designed for groundwater wells. Bentonite will be hydrated with potable water if placed above the water table and allowed to hydrate according to manufacturer specifications. A cement/bentonite grout will be placed above the bentonite seal and will extend to the surface. The cement/bentonite grout will be mixed in the following proportions: 94 pounds of Type I or II Portland cement, not more than four pounds of 100 percent sodium bentonite powder, and 6.5 to 7 gallons of potable water. A side discharge tremie pipe will be used to place the grout, and the end of the tremie pipe shall be kept submerged in the grout at all times. No tools can be inserted into the well until the grout has cured for 24 hours. Figure 19 provides a typical pumping well construction summary with temporary surface completion.

The surface completion of the pumping wells will include the installation of a pitless adapter and transition to the force main installed to a minimum of 30 inches below grade. See Section 7.4 for additional surface completion details. The pumping wells will be further developed following surface completion using the procedures discussed previously.

A submersible well pump with a minimum 0.5 horse power will be installed in each new pumping well. A one-inch Schedule 40 PVC or equivalent piping will be used as a "pipe string" to install the well pump near the bottom of the screen. The pipe string will be connected to the force main via the pitless adapter.

7.3 Equipment Decontamination and Investigation Derived Waste Management

Drilling equipment and tooling will be pressure washed prior to initial use, between boreholes, and at the completion of drilling activities. Decontamination activities will take place on a temporary decontamination pad at the well site, to be constructed by the drilling contractor. The pad will be constructed to capture all fluids generated during the cleaning process. All waste and debris generated during drilling activities will be drummed, labeled, and stored on site for management in accordance with Section I-5.5 of the RFI (Volume 1 Field Sampling Plan).

7.4 Well Vault Installation

A well vault will be installed immediately adjacent to each new pumping well to house instruments and process fittings. The well vault will be constructed of 48 inch diameter corrugated metal pipe (CMP) and will be located approximately 6 to 10 feet from the wellhead. The CMP will be buried approximately 42 inches below ground with an above-ground stickup of approximately 8 inches above ground. The CMP vault will be set on a bed of sand approximately 4 inches thick and then filled with concrete in the bottom of the vault.

The horizontal force main will connect to the pitless adapter in the well casing and run though the well vault (Figure 20). In the vault the following will be installed in the force main in the following sequence; sample port, flow meter, check valve, shutoff valve, and pressure indicator. The instruments and fittings will be equipped as follows:

Additional steps may be needed if biological growth is noted which may include the introduction of water well rehabilitation chemicals including biocides and/or mud viscosifiers. Any chemicals used will be approved for potable water well use and approved by the National Safety Foundation (NSF). In the event that biocides or mud viscosifiers are required, KNC will contact KDHE and EPA, and obtain approval prior to use.

Once the pumping well has been verified to produce the amount of groundwater specified, the existing permanent pump (or test pump at the new well locations) will be plumbed into the production pipeline which runs to the equalization basin. The pumping well will then be test pumped to ensure the pipeline losses do not impede the flow from the pumping well below the flow rate observed during specific capacity testing. If the flow rate is below the specified flow rate, the pump size must be increased to attain the specified flow rate. If the specified flow rate cannot be achieved, the flow rates which can be achieved will be simulated in the model and additional pumping configurations will be evaluated.

7.7 Remediation System Telemetry

In an effort to enhance the monitoring capabilities of the groundwater recovery system, the recently installed flow meters will be integrated into a real-time monitoring system which utilizes radio frequency data transfer to a central cellular data uplink station. The data will be catalogued and displayed via a cloud based computing platform in order to maintain groundwater recovery system control. This system will be designed to provide an alert for deviations to system performance according to tolerances to be established (i.e. target flow rates).

system upgrades will allow KNC to more actively manage the system with a clear identification of major system changes (e.g., pump outages and/or larger scale flow changes in areas monitored by multiple flow meters).

KNC proposes to operate the groundwater recovery system for a period of one year after the upgrades are complete to evaluate system capture with respect to seasonal variation, system-wide variation, and individual well variation. The groundwater model would be utilized to evaluate the effectiveness of the system to meet the remedial objective and identify, as applicable, the necessity for system modifications. The results of this modeling would be provided in the Annual Groundwater Corrective Action Report for the Facility, which will be provided as set forth in the RCRA Permit. The Annual Groundwater Corrective Action Report modeling section would include: 1) a summary of model inputs; 2) model results; 3) proposed modification, as applicable, to the groundwater recovery system; and 4) a plan and schedule for implementation.

8.3 Regulatory Implementation

KNC's recent work and proposed upgrades are anticipated to allow for more active management and evaluation of the groundwater recovery system. As currently written and discussed in Section 5, the permit identifies a specific set of wells that are designated as monitoring or recovery. Any changes to these well designations require a major permit modification. Consequently, the ability to change the recovery strategy to address changing conditions and meet Permit Objectives provides little flexibility. The approach outlined in Section 8.2 provides KNC's proposed methodology to add flexibility on at least an annual basis through the submittal of information justifying system changes in a report (Annual Groundwater Corrective Action) already required by the Permit. KNC welcomes the opportunity to discuss the type(s) of data, in addition to those proposed in Section 8.2, that KDHE and EPA would require to make operational changes more fluid through Annual Groundwater Corrective Action or other reports (e.g., quarterly RCRA progress reports) as conditions dictate.

ATTACHMENT C

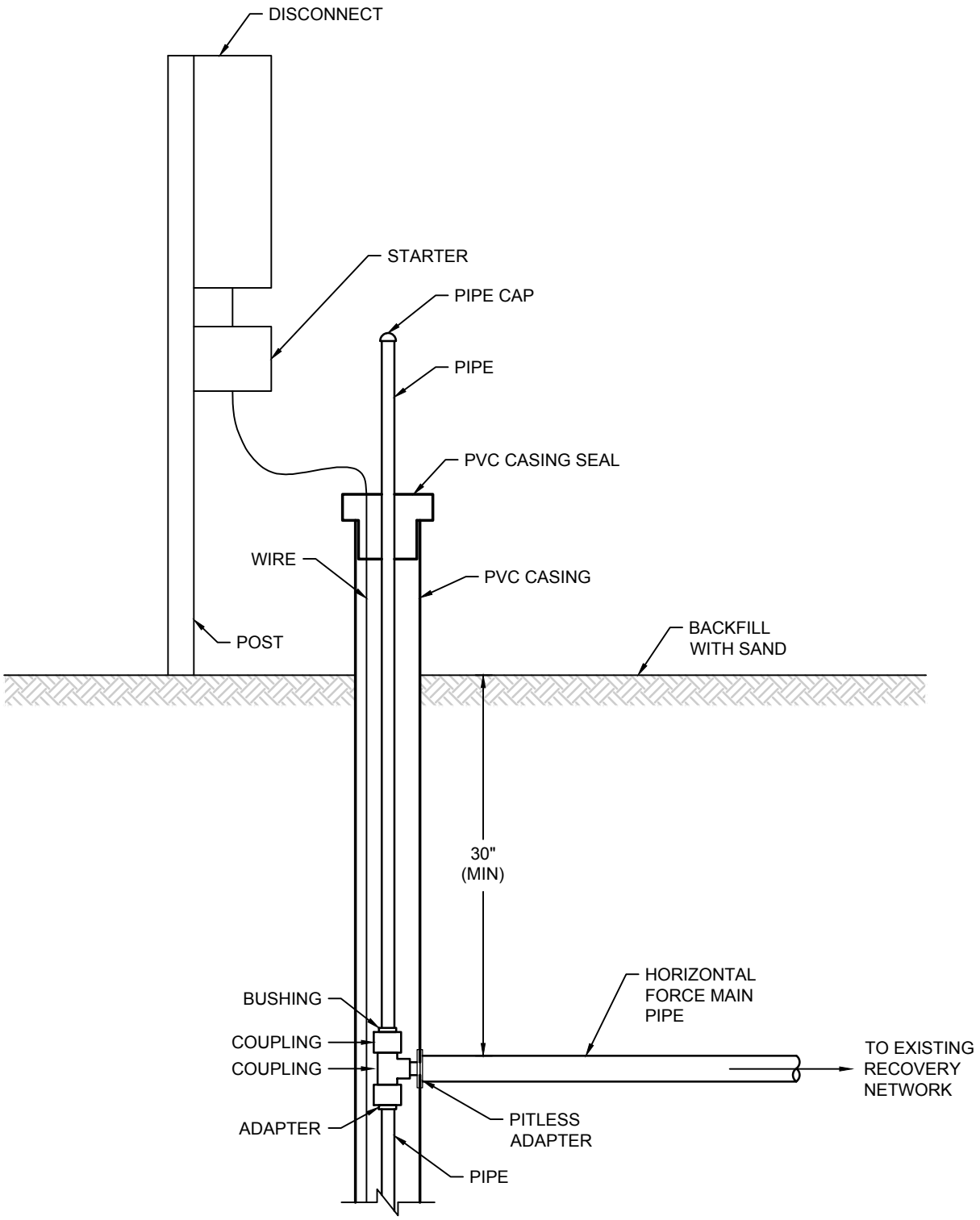
REVISED TABLE 1

NEW FIGURE 20

Table 1
Flow Meter Data Collection Summary
Koch Nitrogen Company LLC, Dodge City, Kansas

		Flow Meter									
Date		**F-1**	**F-2**	**F-3**	**F-4**	**F-5**	**F-6**	**F-7**	**F-8**	**F-9**	**Equilization Basin**
Nov 9-12	Time	818	757	755	800	814	842	857	851	854	750
	Flow rate (gpm)	39.2	47.5	0	38.5	22.6	112.5	26.5	11.0	8.4	222
	Pressure (psi)	25	17	27	25	-	18	22	23	21	-
	Totalizer (gal)	1700283	5620905	4049	2057752	28805	6315150	1201578	397175	486254	2441778
	Time	1702	1713	1716	1740	1655	1718	1730	1725	1728	1718
	Flow rate (gpm)	37.8	49.2	0	43.6	32.2	114.4	27.4	8.0	9.5	230
	Pressure (psi)	26	17	29	30	34	20	22	21	23	-
	Totalizer (gal)	1720484	5647894	4049	2073586	44126	6381194	1215094	401162	491769	2567400
Calculations	Time Change (min)	524	556	561	580	521	516	513	514	514	560
	Change in Totalizer	20201	26989	0	15834	15321	66044	13516	3987	5515	125622
	Average gpm	38.6	48.5	0	27.3	29.4	128.0	26.3	7.8	10.7	224
Nov 10-12	Time	941	929	927	932	948	924	916	921	919	936
	Flow rate (gpm)	38.3	47.5	0	44.2	34.5	114.2	29.4	10.4	8.1	226
	Pressure (psi)	24	17	30	29	30	18	23	21	22	-
	Totalizer (gal)	1758841	5694893	4049	2115554	79432	6494036	1240797	408410	501742	2789126
Calculations	Time Change (min)	999	976	971	952	1013	966	946	956	951	978
	Change in Totalizer	38357	46999	0	41968	35306	112842	25703	7248	9973	221726
	Average gpm	38.4	48.2	0	44.1	34.9	116.8	27.2	7.6	10.5	227
	Time	1307	1334	1336	1327	1301	1323	1314	1317	1319	1341
	Flow rate (gpm)	38.5	47.1	0	43.6	31.9	112.6	30.3	10.5	7.5	229
	Pressure (psi)	25	17	30	30	32	20	24	22	20	-
	Totalizer (gal)	1766707	5706688	4049	2125565	86128	6521813	1247211	410201	504273	2844210
Calculations	Time Change (min)	206	245	249	235	193	239	238	236	240	245
	Change in Totalizer	7866	11795	0	10011	6696	27777	6414	1791	2531	55084
	Average gpm	38.2	48.1	0	42.6	34.7	116.2	26.9	7.6	10.5	225
Jan 27-13	Time	1141	1210	1212	1204	1149	1216	1113	1105	1108	1219
	Flow rate (gpm)	37.8	46.2	0	47.2	36.6	83.3	25.5	6.1	11.4	210
	Pressure (psi)	24	17	29	27	36	16	19	18	19	-
	Totalizer (gal)	6023306	11002150	4049	6864874	3738154	17444165	4241401	1140682	1467930	7895137
	Time	1550	1615	1617	1601	1554	1619	1535	1530	1532	1620
	Flow rate (gpm)	37.7	46.5	0	45.1	27.9	90.7	27.6	9.2	9.9	209
	Pressure (psi)	24	17	28	28	38	17	20	20	19	-
	Totalizer (gal)	6032756	11013684	4049	6875774	3746359	17465774	4247867	1142351	1469946	7945754
Calculations	Time Change (min)	249	245	245	237	245	243	262	265	264	241
	Change in Totalizer	9450	11534	0	10900	8205	21609	6466	1669	2016	50617
	Average gpm	38.0	47.1	0	46.0	33.5	88.9	24.7	6.3	7.6	210
Jan 28-13	Time	1004	941	943	937	958	945	928	922	924	948
	Flow rate (gpm)	37.6	47.0	0	46.3	30.1	96.3	23.5	9.1	5.5	209
	Pressure (psi)	25	17	30	27	35	18	20	19	15	-
	Totalizer (gal)	6074236	11062765	4049	6924238	3782755	17559201	4274374	1149042	1478239	8165828
Calculations	Time Change (min)	1094	1046	1046	1056	1084	1046	1073	1072	1072	1048
	Change in Totalizer	41480	49081	0	48464	36396	93427	26507	6691	8293	220074
	Average gpm	37.9	46.9	0	45.9	33.6	89.3	24.7	6.2	7.7	210
Jan 29-13	Time	857	839	840	835	930	841	826	831	829	844
	Flow rate (gpm)	37.9	48.4	0	46.0	29.4	86.7	24.2	4.7	12.2	214
	Pressure (psi)	25	16	28	29	35	17	20	16	20	-
	Totalizer (gal)	6126284	11127405	4049	6987415	3832686	17682263	4308302	1157581	1489547	8451573
Calculations	Time Change (min)	1373	1378	1377	1378	1412	1376	1378	1389	1385	1376
	Change in Totalizer	52048	64640	0	63177	49931	123062	33928	8539	11308	285745
	Average gpm	37.9	46.9	0	45.8	35.4	89.4	24.6	6.1	8.2	208
Jan 30-13	Time	935	915	917	911	938	919	905	909	907	925
	Flow rate (gpm)	37.1	45.6	0	44.2	34.3	89.5	27.2	3.1	8	204
	Pressure (psi)	25	16	28	27		15	20	17	18	-
	Totalizer (gal)	6182209	11195495	4049	7054997	3878279	17815379	4344821	1166589	1501548	8737329
Calculations	Time Change (min)	1478	1476	1477	1476	1448	1478	1479	1478	1478	1481
	Change in Totalizer	55925	68090	0	67582	45593	133116	36519	9008	12001	285756
	Average gpm	37.8	46.1	0	45.8	31.5	90.1	24.7	6.1	8.1	193

Notes:
- = no data available
gpm = gallons per minute
psi = pounds per square inch
gal = gallon
min = minute



WELL HEAD TYPICAL DETAIL
KOCH NITROGEN COMPANY
DODGE CITY, KS

NOT TO SCALE

KOCH

KOCH NITROGEN COMPANY, LLC

DATE:	JUNE 2013	FILE NO.	TXR0325F02
PROJECT NO.	TXR0325	FIGURE NO.	20

I:_CADD (PROJECTS)\KKOCH NITROGEN\FIGURES\TXR0325\TXR0325F02.DWG (21 June 2013) cvickers

ATTACHMENT D

SUPPLEMENTAL TABLES

Table 1
Monitoring Well Cluster COC Concentrations Q42011 to Q22013
Koch Nitrogen Company LLC, Dodge City, Kansas

Well	Total Chromium (mg/L)							Nitrate + Nitrite as N (mg/L)						
	Q42012	Q12012	Q22012	Q32012	Q42011	Q12013	Q22013	Q42011	Q12012	Q22012	Q32012	Q42012	Q12013	Q22013
MW-18D	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	6.6	4.8	7.2	7.5	6.2	9.0	10.5
MW-18S	0.007	0.008	0.036	< 0.005	0.023	0.005	0.005	35.8	45	47.6	52.1	53	52	58
MW-19D	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	30.4	51.1	52.2	59.2	64.5	18.4	70.6
MW-19S	< 0.005	< 0.005	0.019	0.013	< 0.005	0.005	< 0.005	7.5	71.3	80.2	92.5	86.6	97	103
MW-22D	0.008	0.005	< 0.005	< 0.005	< 0.005	0.007	0.008	1.4	2.4	2.5	2.4	2.5	2.4	2.7
MW-22S	0.021	0.006	< 0.005	< 0.005	0.019	0.013	0.009	1.4	3.2	5.4	6.9	7.8	8.6	8.5
MW-23D	0.010	< 0.005	< 0.005	< 0.005	0.006	< 0.005	< 0.005	0.2	< 0.1	0.3	0.5	< 0.1	< 0.1	< 0.1
MW-23S	< 0.005	< 0.005	< 0.005	< 0.005	0.016	0.006	< 0.005	1.6	0.8	0.8	1.0	1.0	0.3	< 0.1

Table 2
Vertical Profiling Results - March 2012
Koch Nitrogen Company LLC, Dodge City, Kansas

Well	Depth (ft)	Total Chromium	Nitrate + Nitrite as N
		mg/L	
TW05	127	0.051	88.8
	135	0.052	83.7
	143	0.055	112
TW80	145	0.111	134
	155	0.094	131
	165	0.111	129
TW15	123	<0.005	1.0
	130	0.012	0.9
	137	0.031	0.8