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#5320296

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RE: Stage I Abatement Proposal
R-Qubed Mesquite Methanogenesis Facility
Mesquite, New Mexico

Dear Mr. Smith:

On behalf of our client R-Cubed Energy, Souder, Miller & Associates (SMA) is submitting this proposal for a Stage I Abatement Proposal for your consideration. This proposal addresses the site history, conceptual site model, purpose of the scope of services, and workplan tasks.

Please feel free to call me at 575-647-0799 or to email me at the address below if you have any questions about this document or other issues.

Sincerely,

MILLER ENGINEERS, INC. D/B/A

SOUDER, MILLER & ASSOCIATES

A handwritten signature in blue ink, appearing to read 'R. Jay Vanlandingham', is written over a faint, larger version of the same signature.

R. Jay Vanlandingham, R.G.
Senior Geoscientist / Environmental Services Manager
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INTRODUCTION

Souder, Miller & Associates (SMA) has been contracted by R-Qubed Energy, Inc. to assist with developing this Stage 1 Abatement Plan for New Mexico Environment Department (NMED) Ground Water Quality Bureau (GWQB) and completing specified tasks. The subject property is the former Buena Vista Dairies located at 13085 Stern Drive in Mesquite, New Mexico within Township 25 South, Range 3 East, Sections 5 and 6. The approximate center of the subject property is located at latitude 32° 09' 35" and longitude 106° 39' 49". The subject property was purchased by R-Qubed Energy, Inc. circa 2010 as the future location of the R-Qubed Energy Mesquite composting facility and methanogenesis plant.

As is previously known, groundwater contamination at the subject property is a result of cow manure waste and associated wastewater accumulation from prior use of the subject property and surrounding dairies and the subsequent leaching of contaminants of concern from the accumulated waste to the groundwater; this proposed Stage I Abatement plan is intended to mitigate the groundwater impacts described herein.

1. SITE HISTORY

The subject property was an operational dairy since at least 1979 and ceased general operations prior to 2010. The wastewater and stormwater collection ponds have been located on the western portion of the subject property since inception although the ponds have been upgraded and moved from the original design and location throughout the operation of the dairy. When originally constructed the wastewater ponds were historically manure-lined or clay lined and located under what is now the westernmost feed lot. In 2008 the ponds were reconstructed further west using a synthetically liner. The subject property operated under a Discharge Permit (DP-86) until dairy operations ceased.

In early 2006, NMED required a Stage 1 Abatement Plan for thirteen (13) dairies in Doña Ana County including the subject property. The Abatement Plan was required due to analytical results from sampling of dairy monitoring wells that revealed concentrations of chloride and total dissolved solids (TDS) in excess of applicable New Mexico Water Quality Control Commission Regulations (NMWQCCR) standards. In late 2006 the dairies notified NMED that they had reached an agreement to work together as a consortium (Doña Ana Dairies) to respond to NMED requirements. As required for Stage 1 Abatement, a Site Investigation Report was prepared by EA Engineering, Science, and Technology, Inc. (EA) in July 2009. The report included information on groundwater contamination concentrations and extents for the subject property as well as all other dairies within the consortium.

In December 2009, SMA performed a Phase I Environmental Site Assessment (ESA) and Phase II ESA of the subject property on behalf of R-Qubed Energy, Inc. as part of the planned transfer of the subject property from Buena Vista Dairies to R-Qubed Energy, Inc. R-Qubed Energy, Inc. purchased the subject property for the future construction of a methanogenesis facility that will beneficially utilize the waste manure generated from area dairies.

1.1. Completed Sampling & Analysis Activities

1.1.1. Site Investigation Report (July 16, 2009)

As part of an on-going assessment of the Doña Ana Dairies consortium, a Stage 1 Abatement Plan was performed by EA (Site Investigation Report, July 2009). The Site Investigation Report details the extent of groundwater contamination associated with the subject property as well as surrounding dairies that are part of the consortium. The Site Investigation Report indicated that concentrations of nitrate, chloride and TDS exceeded applicable NMWQQR standards in groundwater samples collected from two (2) on-site monitoring wells associated with DP-86. During the investigation, an additional up-gradient monitoring well DAD-01 was installed in the northeast corner of the subject property. Groundwater samples collected from DAD-01 indicated concentrations of chloride and TDS above applicable NMWQQR standards. Based on the conclusions of the Site Investigation Report, it appears that chloride & TDS concentrations are regionally above applicable standards.

1.1.2. Phase I Environmental Site Assessment (December 4, 2009)

The Phase I ESA performed by SMA on behalf of R-Qubed Energy, Inc. identified eight (8) recognized environmental conditions (RECs) associated with the subject property. The RECs identified during the Phase I ESA included the following:

- Presence of four (4) state registered environmental institutional controls / engineering controls (IC/EC) sites located within ½-mile of the subject property, including the subject property itself. The subject property and the surrounding IC/EC sites are all dairies associated with the Doña Ana Dairies consortium.
- Presence of soil staining from petroleum hydrocarbons associated with the storage of used lubricants and a diesel AST on the subject property.
- Presence of soil staining associated with the emergency generator system located south of the milking barn on the subject property.
- Possible presence of asbestos containing material due to the age of structures on the subject property.
- Possible presence of lead-based paint due to age of the structures on the subject property.

1.1.3. Phase II Environmental Site Assessment (December 21, 2009)

Based on the results of the Phase I ESA, SMA on behalf of R-Qubed Energy, Inc. performed a Phase II ESA to further investigate the previously identified RECs previously identified. The RECs investigated included the soil staining observed near the used lubricant storage area, emergency generator and diesel AST as well as the possibility of lead-based paint (LBP) and asbestos containing material (ACM) in structures located on the subject property. A summary of the results of the Phase II ESA are as follows:

- During the Phase II ESA, SMA determined that suspect ACM was present in the structures located on the subject property and collected representative bulk samples for laboratory analysis. Analytical laboratory results of the bulk samples revealed no asbestos present in any of the samples.
- During the site visit SMA determined that no LBP was present in the structures located on the premises.

- Analytical results of the composite soil samples collected from the immediate vicinity of the diesel aboveground storage tank (AST) and used lubricant AST and the emergency generator and associated diesel AST reveal significant reportable contamination near ground surface. However, analytical results of the soil boring samples collected from within each area of stained soil at approximately five feet below ground surface reveal no reportable soil contamination in any of the three (3) samples.

A further investigation of the groundwater contamination at the subject property and from surrounding dairies was not conducted during the Phase II ESA as the contamination of nitrate, chloride and TDS was well known at the subject property and in the surrounding area and had been thoroughly been investigated previously with details of the groundwater contamination included in the Site Investigation Report (EA, July 2009).

1.1.4. Soil Metals Sampling Results – Phase II ESA Addendum (December 1331, 2009)

Results for metals testing of soil samples collected during the Phase II investigation were not available prior to issuance of the Phase II ESA Report. As such, a brief addendum to the Phase II ESA Report containing results of the metals analysis was subsequently submitted.

Laboratory results of the two samples submitted for analysis for RCRA 8 metals content did not indicate that the concentration of any analyzed metal met or exceeded the guidelines established for residential soil (the most conservative) by NMED. As such, the results did not alter the recommendations presented in the Phase II ESA Report.

1.1.5. Geotechnical Soil Boring Investigation – Figure 1 (May 14, 2010)

An investigation of geotechnical properties of soil at the subject property as well as a profile of waste material thickness was conducted by SMA on behalf of R-Qubed Energy, Inc. As part of the abatement process, R-Qubed Energy, Inc. proposed to remove existing waste material on site that posed a threat to groundwater. The waste thickness observed during installation of geotechnical soil borings is illustrated in Figure 1 and is included as part of the VRP application.

1.1.6. Near Surface/Construction Zone Soil Sampling & Analyses

Souder, Miller & Associates (SMA), on behalf R-Qubed Energy, Inc., completed the first phase of characterization activities for the former Buena Vista I Dairy located in Mesquite, New Mexico as described in the report titled *Site Characterization Report, R-Qubed Energy, Inc. Mesquite Digester Facility (former Buena Vista I Dairy) 13085 Stern Drive, Mesquite, New Mexico* dated and submitted to NMED on December 20, 2010. These activities were completed in accordance with an outline included in the application to the New Mexico Environment Department (NMED) Voluntary Remediation Program (VRP) dated June 3, 2010. In accordance with that application and the subsequent voluntary remediation agreement, R-Qubed Energy, Inc. monitored vadose zone and groundwater to evaluate subject property contaminant levels and define background levels of groundwater contamination coming onto the property from offsite.

On site activities included installing 14 soil borings to first groundwater. Borings were installed between July 19, 2010 and August 2, 2010 using a hollow stem auger drilling rig. Soil samples were collected from each of the borings from approximately five feet below the existing manure, near the capillary fringe (of the groundwater table) and from a mid-point between these two depths. A grab groundwater sample was also collected from the annulus of the hollow stem auger at the total depth of each boring. All samples were analyzed for typical contaminants of concern associated with the prior dairy activities.

The results from this site characterization event revealed elevated concentrations of chloride, nitrate, sulfate and total Kjeldahl nitrogen (TKN) in the subsurface soils. Results also illustrated chloride, sulfate, nitrate and total dissolved solids (TDS) concentrations in excess of New Mexico Water Quality Control Commission (NMWQCC) Standards in each sampled location. The groundwater sampling results generally indicated: chloride, nitrate, sulfate and TDS plume migration onto the subject property from the dairy to the north; a small possible source area for chloride, sulfate and nitrate located near the center of the subject property, and; a second possible source area for chloride, nitrate, sulfate and TDS near the southwest corner of the subject property in association with a former stormwater lagoon.

An additional vadose zone investigation was completed in November 2011 in response to concerns expressed by NMED personnel regarding the potential leaching of accumulated contaminants in the subsurface in the proposed stormwater management area. Two additional borings, SWB-1 and SWB-2, were advanced during on November 7, 2011 to evaluate the subsurface conditions in the southwest corner of the subject property

Each of the new borings was logged during advancement using a split-spoon sampling device at 18" intervals for the first five feet in depth followed by five-foot intervals to the total depth of the boring. Three soil samples were collected from each new boring for analysis of nitrate, nitrite, chloride and sulfate levels using EPA test method 300.0, and total Kjeldahl nitrogen (TKN) using test method 4500-N Org C. These samples were collected from 5, 15 and 25 feet below ground surface (bgs); the final sample was collected near the capillary fringe.

Consistent with prior sampling, near surface soil samples showed detectible concentrations of chloride, nitrate, TKN and sulfate. One sample, SWB-1 at 5 feet bgs, showed a detectible concentration of nitrite while the other sample did not. Near surface and vadose zone soil sampling results suggest that concentrations of the contaminants of concern underlying the proposed stormwater pond area are generally below levels that are likely to further contaminate groundwater (based upon the NMED Soil Screening Levels, Revision 5.0 published August 2009 and a dilution attenuation factor of 20). Based upon these results, the currently proposed plan to utilize the southwestern corner of the subject property for stormwater management is unlikely to result in substantial future contaminant transport to the groundwater.

2. SITE CONCEPTUAL MODEL

2.1. Site Setting

The subject property is a former dairy with one (1) one-story office building and one (1) two-story single-family dwelling. Each of the buildings was built prior to 1984 however the office building is a single-family dwelling that was remodeled into an office in 1999.

2.2. Geologic & Hydrogeologic Setting

According to the New Mexico Bureau of Mines and Mineral Resources' Geology and Ground-Water Resources of Central and Western Doña Ana County (1971), the subject property is located in valley-fill alluvium. The valley-fill is Late Quaternary in age and is composed of clay to gravel that is less than 80 feet thick. No major recent faults with surface expressions are mapped in the immediate vicinity of the subject property. Depth to groundwater in the vicinity of the subject property is approximately 55 feet below ground surface and the anticipated groundwater flow direction is toward the south-southeast based on water level data from the discharge plan (DP-86) associated with the subject property. The surface elevation on the subject property is approximately 3,900 feet above mean sea level.

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey website (updated July 14, 2009), the subject property is comprised of several soil types including Bluepoint loamy sand, 1 to 5 percent slopes, Bluepoint loamy sand, 5 to 15 percent slopes, and Pajarito fine sandy loam.

2.3. Nature and Extent of Contamination

Near surface contamination has essentially been removed from the subject property although a former stormwater management pond may have some residual manure. Nitrates, chloride, and dissolved solids will continue to leach from any remaining material into the vadose zone and may eventually enter the groundwater. Elevated levels of nitrate, chloride and TDS have been positively identified in the groundwater at the boundaries of the subject property. However, elevated levels of these same constituents have also been identified in association with currently operating dairies immediately north and south of the subject property. The recalcitrant nature of these constituents in groundwater infers that only dilution will positively impact the plume. The impact of contributions from neighboring properties is difficult to define although the potential for additional release of constituents from the subject property has been substantially mitigated and vadose zone sampling indicates minimal residual contamination in the subsurface soils.

2.3.1. Organic Contaminants of Concern

Analytical results of composite soil samples collected during the Phase II ESA from visibly stained areas in the vicinity of the emergency generator, diesel AST and used lubricant AST revealed reportable diesel range organics (DRO) and motor oil range organics (MRO) concentrations ranging between 5,600 milligrams per kilogram (mg/Kg) and 16,000 mg/Kg. Concentrations for gasoline range organics (GRO) in both composite samples were below laboratory practical quantitation limits (PQL) and are therefore below reportable limits. The analytical results of soil samples collected from the hand auger soil boring revealed GRO, DRO, or MRO concentrations to be below laboratory PQL in samples from both areas of stained soil. Based on the laboratory data from the composite soil samples and soil boring soil samples, the hydrocarbon contamination associated with the visible soil staining in each area does exceed the limits established by the NMED VRP; however, the contamination did not extend to a depth greater than five feet below ground surface in each area. Laboratory analysis of the soil boring soil samples collected from five feet below ground surface revealed no reportable total petroleum hydrocarbon (TPH) concentrations above laboratory PQL and therefore will not impact groundwater.

2.3.2. Inorganic Contaminants of Concern

Inorganic contaminants of concern at the subject property are related to dairy cattle waste remaining on the subject property and from surrounding dairies. These contaminants of concern include nitrate, chloride and TDS. A detailed discussion on the extent of contamination as well as soil and groundwater analytical results obtained at the subject property and from surrounding dairies can be found in the Site Investigation Report (EA, July 2009) included as in part as Appendix A. The Site Investigation Report indicated that concentrations of nitrate, chloride and TDS in groundwater samples collected from two (2) on-site monitoring wells associated with DP-86 exceeded applicable NMWQCCR standards. The groundwater sample from monitoring well 86-01 contained concentrations of nitrate at 42 milligrams per liter (mg/L), chloride at 1,659 mg/L and TDS at 4,850 mg/L. The groundwater sample from monitoring well 86-02 contained concentrations of nitrate at 16.4 mg/L, chloride at 625 mg/L and TDS at 2,666 mg/L.

In addition, the groundwater sample collected from the one (1) newly installed Abatement Plan well DAD-01 located in the up-gradient portion of the subject property contained concentrations of chloride (540 mg/L) and TDS (1,800 mg/L) above applicable NMWQCCR standards.

2.4. Potential Migration Pathways

The potential pathway for contaminants of concern begins with the surface storage of dairy waste and manure, continues with leaching into the vadose zone, and eventually dissolution into groundwater. Once in groundwater the elevated concentrations migrate with the groundwater gradient in a generally south-southeast direction.

Use of groundwater within the plume of elevated concentrations is currently limited, serving primarily as a non-potable water source for the subject property, the neighboring dairies and irrigatable agricultural properties. This use is not expected to change in the immediate future. In addition, the potential use of the on-site supply well for the methanogenesis process will provide some measure of containment for the elevated concentrations.

2.5. Fate and Transport of Contaminants

As noted above, flushing and transport of the contaminants through the vadose zone will be limited by both the removal of surface waste and engineering controls (asphalt and buildings). Once reaching the groundwater, transport of the constituents is influenced solely by the groundwater gradient. Locally this gradient may in turn be impacted by the use of nearby water supply wells. The recalcitrant nature of the contaminants of concern in groundwater suggests that dilution is the only mechanism other than pumping and treatment that might impact the fate of the contaminants.

2.6. Potential Risk to Human Health, Safety and the Environment

Concentrations of contaminants of concern at this time are such that they would require ingestion in order to represent a risk to human health. The subject property, as well as the neighboring dairies, has separate potable water systems supplied by the Mesquite Mutual Domestic Water Consumers Association. Hence the ingestion pathway has already been mitigated.

There are no immediate safety concerns associated with the contaminants of concern; they are non-volatile/non-flammable. Handling of or immersion in tainted groundwater, while not a cause for immediate concern, should be minimized.

The elevated constituent concentrations found in the groundwater in association with the subject property currently do not transect surface water and therefore are not exposed to the environment. Incidental exposure, as relates to groundwater monitoring activities or use of the on-site supply well, is unlikely to represent a significant threat to the environment. Should a release of a small quantity of groundwater with elevated concentrations occur within the subject property, the portion of the release that did not evaporate would likely infiltrate into the subsurface hence eliminating further exposure.

3. PURPOSE AND SCOPE OF SERVICES

Abatement activities, as initially proposed, include residual source area removal and engineering controls (asphalt and structures) to reduce the potential of future leaching. These activities will be followed by monitored natural attenuation for a proposed period of three years to determine the effectiveness of abatement. Should further abatement activities then be considered necessary (i.e. sufficient demonstration of the reduction of concentrations of contaminants of concern does not take place), groundwater recovery and treatment could be employed using the proposed on-site wastewater treatment plant.

4. WORKPLAN TASKS

4.1. Near Surface/Construction Zone Abatement

With the cessation of the use of the property as a dairy the discharge of cow manure and other wastes on to the surface of the property ceased. However, the continued leaching of already existing near surface waste material on the subject property may have represented a further threat to groundwater. Areas containing manure, including several stock pens and a former unlined containment pond, have been excavated down to native soil and the resultant material has been largely removed to be land farmed/thin spread in an agricultural area off of the subject property.

4.2. Contingency Vadose Zone Abatement

The results of the vadose zone soil sampling did not indicate contaminant concentrations in excess of NMED Soil Screening Levels (August 2009). However, where appropriate, engineering controls will be employed including the containment of future dairy waste used in the ongoing operation of the new facility, if received as slurry, within mixing tanks prior to introduction to the anaerobic digesters. Future receipt of manure solids will be handled on an impervious (asphalt or concrete) surface and composted within an HDPE lined area or on an impervious surface. In addition, much of the surface area of the former dairy will be covered by structures and/or paved as part of the site redevelopment, further minimizing the potential for leaching of contaminants that may exist in the vadose zone at the site.

4.3. Contingency Groundwater Abatement

Should groundwater contaminant concentrations associated with the subject property not show sufficient reduction within the first three years after assuming operational control, R-Qubed Energy, Inc. would propose to install and operate a conventional pump and treat groundwater containment system. The

discharge from the system would be added to the liquid generated from the anaerobic digester process and treated in the on-site wastewater treatment plant. Effluent from this wastewater treatment plant would be treated to a level to allow surface discharge in compliance with NMED requirements.

The specific configuration and design elements of the pump and treat system are not at this time available, however, R-Qubed would propose to complete this design as necessary in the future in consultation with NMED. The objective of the system would be to 1) prevent further distribution of contaminants from the subject property (achieve containment), 2) maximize treatment effectiveness with respect to targeting the areas of the most substantially elevated contaminant concentrations, and 3) minimize a perpetual clean-up cycle resulting from commingling of contaminants released from neighboring properties.