As-Built & Startup Report

D&S Oil & Propane
Ewing, Nebraska

UG #030303-DB-1415
IIS #26423

Prepared for

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AS-BUILT AND START-UP REPORT

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RDG Geoscience & Engineering, Inc. has prepared the following narrative which provides a description of the recent site activities and as-built plans for the construction of the groundwater remediation system at the D&S Oil and Propane (Battle Creek Farmers Pride) in Ewing, Nebraska.

SUMMARY OF SITE ACTIVITIES

RDG prepared and submitted a Remedial Action Plan dated May 13, 2011. The RAP proposed installing an air sparge/soil vapor extraction (AS/SVE) system to complete the dissolved phase remedial actions, with initial remedial efforts targeting the source area.

An AS/SVE system operates by injecting air into the saturated zone below the level of groundwater contamination, which volatilizes the dissolved contaminants into the unsaturated zone. The volatilized contaminants are then captured by SVE recovery wells, and are discharged to the atmosphere. NDEQ approved the design and costs of the proposed system in June 2011.

The remediation system consists of a remediation equipment trailer housing the air sparge compressor and soil vapor extraction blower, and is located on the D&S Oil and Propane property. SVE and AS conveyance piping was installed by trenching from the remediation wells to the nearby equipment trailer.

Construction of the AS/SVE system was initiated on August 22, 2011. In addition to the standard utility locate, RDG contracted O'Neill Electric Motor Service to locate private electric service lines. Air sparge wells AS-1 through AS-15 and SVE recovery wells RW-2 through RW-6 were installed from October 22 through 24, 2011. Recovery well RW-1 was installed on March 23, 2011 for the pilot study. RDG contracted O'Malley Drilling to perform the well drilling and installation in areas accessible to a standard drill rig, and Environmental Priority Service was contracted to install remediation system wells within the AST containment berm utilizing a compact track mounted drill rig. Trenching for the installation of air sparge and SVE conveyance piping was completed by FDF Construction of O'Neill, Nebraska during the week of September 26. The remediation system trailer was purchased by RDG from the State of Iowa from a completed remediation site, and was delivered to the site on December 22. The electrical power supply was provided by Elkhorn Rural Public Power, and was installed in October, 2011.

Electrical hook-up and wiring service was provided by O'Neill Electric Motor Service. Wiring and electrical inspections were completed the week of January 9, 2012.

RDG personnel completed the piping hook-ups to the remediation trailer on January 4 and 5, 2012. System start-up was initiated on January 17.

The following paragraphs provide a description of the AS/SVE system construction. As-built drawings of the system are attached. The AS/SVE system operations and maintenance and hydrocarbon recovery information is provided immediately following the construction section.

CONSTRUCTION OF AS/SVE REMEDIATION SYSTEM

VAPOR EXTRACTION WELLS

A total of four soil vapor extraction wells (RW-2 through RW-5) were installed on August 22 and 23 by O'Malley Drilling utilizing a standard drill rig. Recovery well RW-6 was installed within the AST containment berm by Environmental Priority Service on August 24 utilizing a compact track mounted drill rig. Recovery well RW-1 was installed on March 23, 2011 by O'Malley Drilling for the pilot study. Vapor extraction wells RW-1 through RW-6 were installed to a depth of 14-feet below grade using 6.25-inch inside diameter hollow stem augers. Vapor extraction wells consisted of 4-inch diameter schedule 40 PVC, with a 10-foot section 0.01-inch slot high-flow screen. The filter pack consisted of 16-30 grade silica sand which extended from the bottom of the well screen to 1-foot above the top of the screened portion of the wells. Each well was sealed with hydrated bentonite chips to within 1-foot of the ground surface. The remainder of the annulus was backfilled with compacted native soil during the installation of the conveyance piping. The locations of the soil vapor wells are depicted on the System Layout Map included in **APPENDIX A**. The Soil Vacuum Extraction Well/Wellhead Construction Diagram is included in **APPENDIX A,** and boring logs and well construction diagrams are included in **APPENDIX B**.

During drilling of recovery well RW-3 on August 22, the private water line was damaged. The plastic water line was installed without a tracer wire and was not able to be located. Hurtig Well Service completed repairs to the water line on August 22.

AIR SPARGE INJECTION WELLS

A total of fifteen air sparge wells (AS-1 through AS-15) were installed on August 23 and 24, 2011. Air sparge wells AS-3 through AS-15 were installed by O'Malley Drilling utilizing a conventional drill rig. Air sparge wells AS-1 and AS-2 were installed within the AST containment berm by Environmental Priority Service utilizing a compact track mounted drill rig. The AS wells were drilled to depths of 20-feet below grade

(approximately 12-feet below the water table) using 4.25-inch inside diameter hollow stem augers. Each AS well was constructed of two-inch diameter Schedule 40 PVC with a 2-foot section 0.01-inch slot high flow screen. The filter pack consisted of 16-30 grade silica sand which extended from the bottom of the well screen to approximately 2-feet above the top of the screened portion of the wells. Each well was sealed with 2-feet of treated bentonite pellets on top of the filter pack, followed by neat cement grout to 3-feet below ground level. The remainder of the annulus was backfilled to grade with compacted native soil during the installation of the conveyance piping. The locations of the air sparge wells are depicted on the System Layout Map included in **APPENDIX A**. The Air Sparge Well/Wellhead Construction Diagram is included in **APPENDIX A**. Boring logs and well construction diagrams are included in **APPENDIX B**.

RDG applied for, and was granted, an Underground Injection Authorization (Authorization Number NE0211140) for operation of the air sparge injection wells.

TRENCHING AND PIPING DETAIL

FDF Construction of O'Neill, Nebraska completed the trenching for installation of the conveyance piping from the remediation system location to each of the AS and SVE wells. Trenching and pipe installation was completed on September 27 and 28. The conveyance piping trenches were excavated with a backhoe to a depth of 3-feet below grade, and were excavated to widths of 24-inches to accommodate the system piping. In order to prevent undermining of the ASTs, connections to air sparge wells AS-1 and AS-2 and recovery well RW-8, located within the AST containment berm, were completed with above grade piping.

During trenching on September 28, a shallow electric line and the phone line were damaged. O'Neill Electric Motor Service completed repairs to the electric line, and Great Plains Communications completed repairs to the phone line.

Following grading of the bottom of the trenches, the 4-inch Schedule 40 PVC vapor extraction lines and 2-inch Schedule 40 PVC air sparge lines were installed, and connections were made to each of the SVE and AS well heads. Air flow to each SVE and AS well is controlled through a ball valve installed at each well head. SVE well heads were protected with 18-inch diameter flush mounted steel covers with drop-in lids, and AS wells were protected with 12-inch diameter flush mounted steel covers with drop-in lids.

The system piping joints and fittings were solvent cemented and the piping was bedded with clean sand, compacted in lifts with a plate compactor. Surface coverings consisted of a 4-foot square by 8-inch thick concrete pad at each well head, and gravel surface cover over the remainder of the trenches.

After pouring the concrete pads, it was determined that several of the pads were at too high an elevation to accommodate the site truck traffic. Due to the soft and irregular nature of the trench area, determining the original surface grade was difficult while setting the covers and forms and the incorrect setting of the pads was not discovered until final grading was completed. On October 11, FDF Construction removed the pads, and the covers were re-set and the pads were re-poured.

During pressure testing of the 2-inch air sparge lines, two separate air leaks were detected. On October 10, FDF Construction exposed the leaking sections of pipe, and repairs were completed.

The System Layout Map is included in **APPENDIX A**.

AS/SVE SYSTEM EQUIPMENT TRAILER

The remediation equipment for the system was supplied by EPG Companies, Inc. of Maple Grove, Minnesota, and was first used at a remediation site in Iowa. RDG purchased the remediation trailer from the State of Iowa upon completion of the remediation project. The AS/SVE remediation equipment trailer is an 6-foot x 10.5-foot mobile trailer, and is located at the northeast corner of the property. The mobile trailer is composed of a single operations room, which houses the AS air compressor and the SVE blower. The system control panel is located on the outside of the trailer. A photocopy of the Operations & Maintenance Manual is included in **APPENDIX D**. The manual includes a list of the AS/SVE remediation equipment within the trailer, cut sheets for the equipment and electrical schematics.

A 100-amp electrical service was connected to the AS/SVE system equipment trailer by O'Neill Electric Motor Service, and Elkhorn Rural Public Power provides electricity to the site.

AS/SVE SYSTEM OPERATION & MAINTENANCE

The following AS/SVE System operation sections describe remediation system operation and maintenance activities for the start-up period of the system.

OPERATION & MAINTENANCE SUMMARY

Start up of the system was initiated on January 17, 2012. Since free product had not been detected at the site since September 2008, operation of both the SVE and AS components of the system was initiated at start-up. The SVE blower and air sparge compressor were temporarily turned on to verify proper motor rotation and air flow.

Due to the aerial extent of the contaminant plume and the limitations of the remediation system, remedial efforts will target the source area during the first phase of operation. Air sparge wells AS-1 through AS-9, along with all of the recovery wells, were activated for the start-up procedure. The air sparge pressure registered 12 pounds per square inch (psi) at a flow rate of 7 standard cubic feet per minute (scfm). The vapor extraction blower was set to operate at a vacuum pressure of 36 inches of water ("H_20) and a flow rate of 150 scfm. The vacuum relief valve for the SVE blower is partially open to prevent mounding of the water table and excessive condensate collection. The start-up vacuum pressure is based on the results of the pilot study which showed loss of vacuum and air flow at vacuum pressures exceeding 40 "H_20.

In order to achieve optimum performance and maintain HAP emissions within discharge limits, periodic fine-tuning of the system vacuum pressure and flow rate was conducted throughout the start-up period. SVE exhaust sampling was conducted in accordance with NDEQ Air Emissions Guidance for Petroleum Remediation Sites (November 2003) and is detailed in the Hazardous Air Pollutant Emissions section of this report.

HAZARDOUS AIR POLLUTANT EMISSIONS

Petroleum vapors recovered through the vapor extraction line and discharged through the vapor extraction exhaust have been measured with Gastech colorimetric tubes, with data collection completed on January 17, 18, 24, and 31, and February 14, 2012. Vapor readings as gasoline, along with the corresponding air flow data and gasoline recovery calculations are summarized in Gasoline Removal table **Appendix C**. As of February 14, after approximately 30-days of operation, an estimated 72-gallons of gasoline have been volatilized by the air sparge system and recovered by the SVE system.

For air emissions calculation purposes, emission samples were collected in charcoal tubes from the SVE system exhaust on January 18 (12-hour sample), January 24 (7-day sample), January 31 (14-day sample), and February 14 (30-day sample) for laboratory analysis of hazardous air pollutant (HAP) constituents. These samples were collected to calculate cumulative benzene cancer risks and to quantify HAP discharges for post-system implementation. Samples were submitted to TestAmerica Inc. of Cedar Falls, Iowa for analysis of BTEX, MTBE, and n-Hexane by EPA Method 18.

HAP emission calculations during the initial start up period are based on an exhaust flow rates of 150 to 170 scfm. SVE exhaust sampling conducted approximately 12-hours after the system start-up indicate projected total HAP concentrations of 2.28 tons per year, which would be within the discharge limit of not more than 2.5 tons per year of any constituent, and less than 10 tons per year of total HAPs. Calculations based on the January 24 air sample shows a reduction in projected total HAP emissions to a rate of 1.43 tons per year. Calculations based on the January 31 exhaust air sample show a

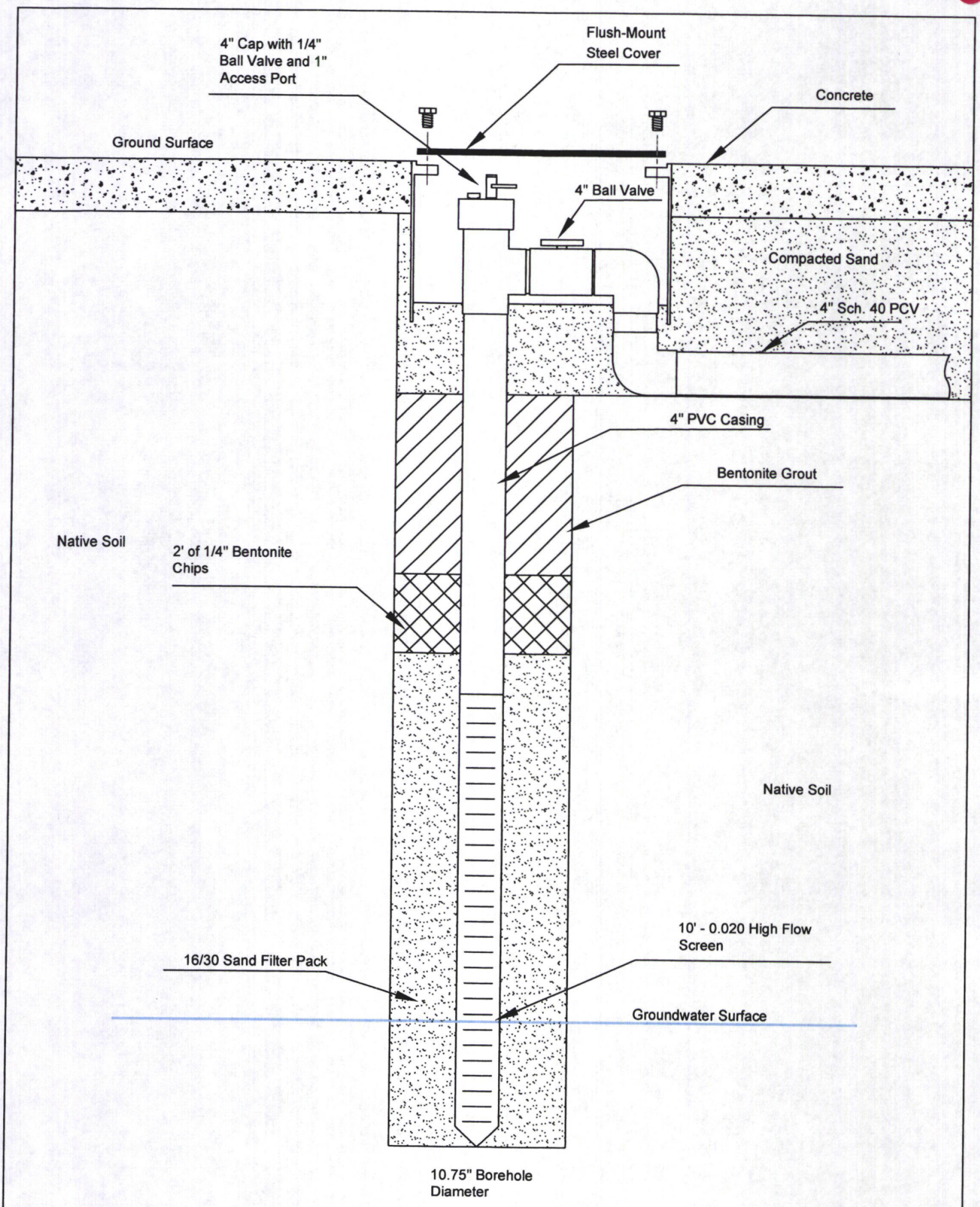
reduction in projected HAP emissions to a rate of 0.99 tons per year, and the February 14 sampling results show a reduction in projected HAP emissions to 0.89 tons per year. As of February 14, a cumulative total of 0.088-tons of HAPs have been discharged since the system start up on January 17, 2012. Since HAP discharge rates typically decline rapidly after system start up, RDG will continue SVE exhaust air sampling in accordance with NDEQ Air Emissions Guidance to evaluate the ongoing HAP discharge emission rates and operate the system within the 2.5 tons per year of the individual constituents and 10 tons per year discharge limit. Analytical results and emission calculations are shown in the Air Emissions Calculations table in **Appendix C**. The laboratory reports for the start-up sampling events are included in **Appendix E**.

Cumulative benzene cancer risks for the SVE exhaust emissions were calculated for the system start up and for the entire system operational period. Calculated cumulative benzene cancer risks show the system air emissions are below the $1x10^{-6}$ cancer exposure risk outlined in the NDEQ Air Emissions Guidance for Petroleum Remediation Sites (November 2003). Calculated cumulative benzene cancer risks for the SVE are included in the Cancer Risk Calculations table **Appendix C**. Laboratory reports for the air samples are included in **Appendix E**.

RDG will submit the first quarterly operating report for the first quarter of 2012 in April 2012. Quarterly reporting will include hazardous air pollutant emissions calculations, gasoline recovery calculations, the system operations and maintenance summary, and groundwater monitoring results from the site monitoring wells.

Appendix A

Soil Vacuum Extraction Well/Wellhead Construction Diagram
Air Sparge Well/Wellhead Construction Diagram
System Layout Map



Soil Vapor Extraction Well Construction Diagram
Standard Construction - Not to Scale

Date:	Prepared by:
08/24/11	DB
UG# 02279-BHI-1130	Reviewed by:

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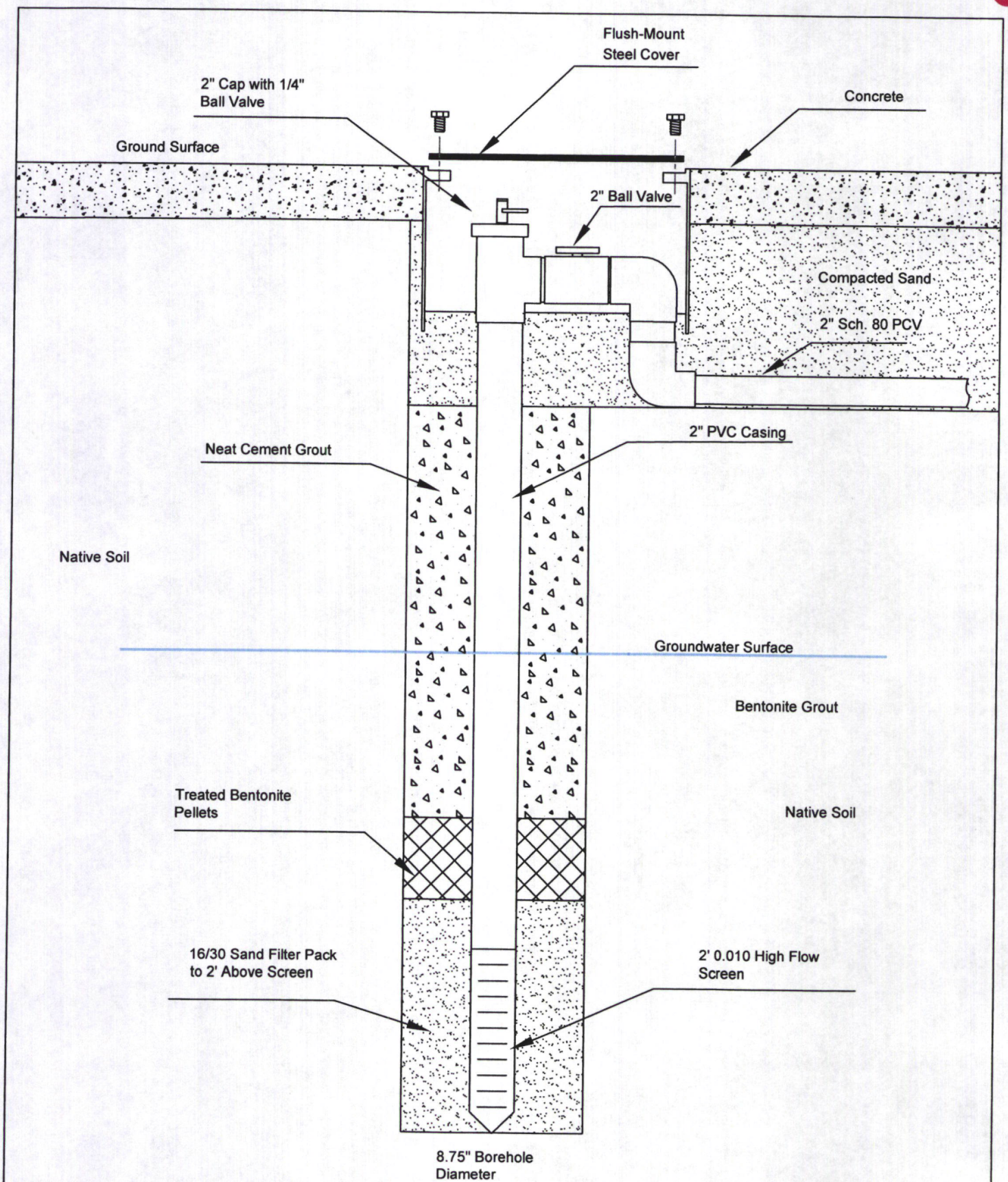
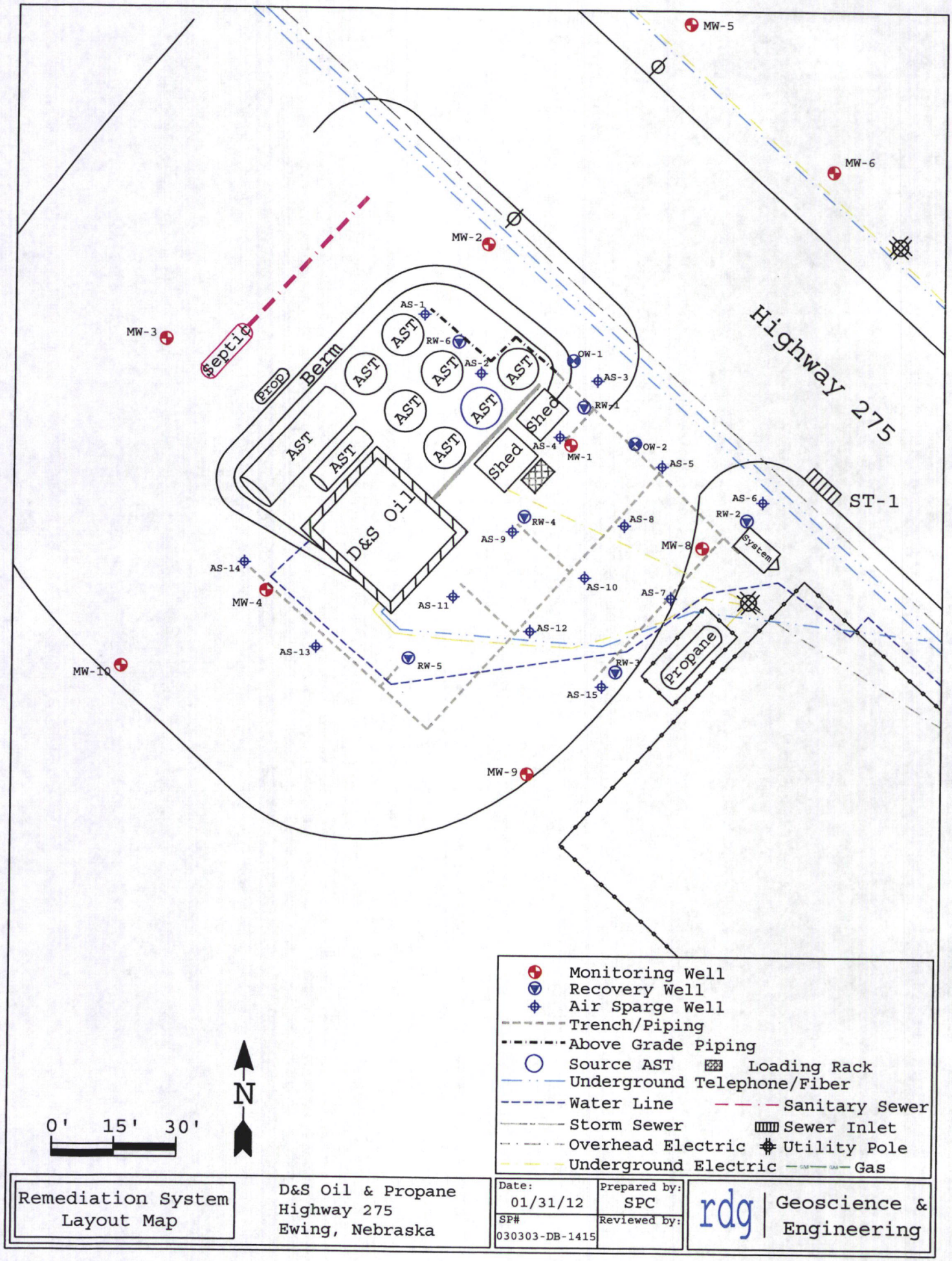


Air Sparge Well Construction Diagram Standard Construction - Not to Scale	Date: 08/24/11	Prepared by: DB	rdg | Geoscience & Engineering
	UG# 142998-GW-1552	Reviewed by:	



Remediation System Layout Map	D&S Oil & Propane Highway 275 Ewing, Nebraska	Date: 01/31/12 SP# 030303-DB-1415	Prepared by: SPC Reviewed by:

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