product bail-down tests, a limited pump test, and submittal of the RAP. The NDEQ approved the work plan in a letter dated August 24, 2004. The RAP field activities were conducted between September and November 2004 and submitted in the RAP dated December 29, 2004. The RAP proposed free product recovery using free product skimmer pumps designed to recover free product only. During a telephone conversation between the NDEQ project manager and RDG on March 1, 2005, it was decided to use vacuum enhanced pump and treat, also known as a dual pump dual phase extraction (DPE), to recover free product. This technology utilizes submersible total fluids pumps and a soil vapor extraction (SVE) blower to recover free product. RDG submitted a letter dated March 16, 2005 describing the proposed revisions. The NDEQ approved the revised RAP and provided notification to proceed with the remedial system installation in a letter dated March 23, 2005.

Installation of the free product recovery system was initiated on April 5-6, 2005 beginning with the installation of the six recovery wells. Trenching the conveyance piping from the remediation trailer location to the recovery wells and the discharge line to the storm sewer was completed in May 2005. The remediation system trailer was delivered to the site by H2Oil Recovery Oil Equipment, Inc. on August 4, 2005. Electrical hook-up and wiring service was provided by Baxter Kenworthy Electric, and was completed in September 2005.

RDG started the remediation system on September 27, 2005. The following paragraphs provide a description of the free product recovery system construction while as-built drawings are attached.

CONSTRUCTION OF MPE REMEDIATION SYSTEM

EXTRACTION WELLS

A total of six recovery wells (RW-1 through RW-6) were drilled on April 5-6 and April 15, 2005 by O'Malley Drilling of Omaha, Nebraska. The recovery wells were drilled to various depths using 6.25-inch hollow stem augers. Each recovery well is constructed of 15 feet of four-inch diameter Schedule 40 PVC, 0.02-inch slot screen with a 5-foot PVC sump at the bottom. The filter pack consists of 16-30 grade silica sand and extends from the bottom of the boring to a depth of approximately two foot above the top of each screen. Each well is sealed with approximately two feet of hydrated bentonite chips above the filter pack, and the remainder of the annulus above the seal is constructed of bentonite grout extending from the seal to approximately 3.5 feet below grade. The recovery well construction diagrams are included in **APPENDIX C**. The recovery wells locations are depicted on the RAP Site Map included in **APPENDIX A**.

TRENCHING AND PIPING DETAIL

Trenching and backfilling of the conveyance lines and discharge line was performed by Charlie's Excavating of Omaha from May 2-4, 2005. The trenches were excavated with a backhoe to a depth of four feet below grade and were two feet wide. Following grading of the bottom of the trench, the following horizontal conveyance piping was installed: ¾-inch Schedule 80 PVC pneumatic pump air supply line, two-inch Schedule 40 PVC pneumatic pump discharge line, and three-inch Schedule 40 PVC soil vapor extraction line. The treatment system piping joints and fittings were solvent cemented and the trench was bedded with compacted sand backfill to a depth of approximately three feet below grade. The remainder of the trench was backfilled with native soil.

The trench locations are depicted on the RAP Site Map in **APPENDIX A**. The trenching detail is provided on the Process and Construction Diagram included as **APPENDIX A**. Well heads are protected with 24-inch diameter traffic rated steel access vaults flush mounted and set in concrete.

WELLHEAD CONSTRUCTION

The top of casing on each recovery well is equipped with a four inch air tight Schedule 40 PVC well clincher adapted to accept the pneumatic pump air supply and discharge lines. SVE lines are attached to the well through a "tee" coupler located below the well head. The well head detail is illustrated on the Process and Construction Diagram included as **APPENDIX A**.

REMEDIATION SYSTEM TRAILER AND EQUIPMENT

The remediation equipment was supplied by H2 Oil Recovery Equipment, Inc. of Bend, Oregon. The remediation equipment is housed in an 8-feet x 20-feet mobile trailer located west of the Immanuel Medical Center Energy Plant building. The trailer houses the air compressor, oil/water separator, transfer and discharge pumps, shallow tray air stripper and soil vapor extraction blower. A 300-gallon free-product tank is located directly north of the trailer. A photocopy of the Operations & Maintenance Manual is included in **APPENDIX D**. The manual includes a list of the remediation equipment within the trailer, a floor plan layout, cut sheets for the equipment, electrical schematics, and photographs of the remediation system trailer.

Soil Vapor Extraction Blower

The surface pump/blower or the soil vapor extraction (SVE) blower is used to extract soil vapor from the subsurface and enhance free product recovery. The SVE blower for this site consists of a 7.5 horsepower (HP) Rotron regenerative blower with a 230 volt, three-phase explosion proof motor. The SVE package includes a 30-gallon carbon steel moisture separator with tank full sensor, manual drain, vacuum relief valve, vacuum gauge, and air bleed valves.

Total Fluids Pneumatic Pumps

The submersible pneumatic pumps at this site are Clean Environment AP4T total-fluids, controller-less pneumatic pumps. These pumps are capable of nine gallons per minute (gpm) for a maximum total flow rate of approximately 54 gallon per minute (gpm), however based on flow rates calculated from the first month of system operation, the total pumping rate from all six total fluids pumps is 0.19 gpm. A recovery well and pump detail is depicted in the Remediation System Process and Construction Diagram included. A 5.0-hp Curtis-Toledo air compressor provides air to the pneumatic pumps. Air to the pneumatic pumps is controlled by a 1/2" discharge solenoid valve.

Oil/Water Separator

The oil/water separator consists of a 350 gallon separator constructed of carbon steel. The oil/water separator is equipped with a high level sensor and site tube. The separate free product gravity feeds from the oil/water separator to the 300-gallon free product tank that is located outside the remediation trailer. The free product tank is double wall steel and equipped with a high level sensor that upon activating closes the above mentioned solenoid valve which stops the discharge from the submersible pneumatic pumps.

Air Stripper

Groundwater is treated with a two-tray stainless steel, low-profile tray air stripper located within the remediation system trailer. The air stripper is stainless steel construction and is equipped with a 3.0 hp Rotron blower. The air stripper sump is equipped with level switches which control the discharge pump used to pump the treated water from the remediation trailer. The air stripper pump consists of a ½ hp Goulds centrifugal discharge pump. The City of Omaha allowed connection to the storm sewer for discharge of treated groundwater. The Nebraska Department

of Environmental Quality Wastewater Section authorized discharge of the treated groundwater to the storm sewer (Authorization# NEG080143) in June 2005. Water samples will be collected from the influent and effluent of the remediation system on a monthly frequency and submitted for laboratory analysis in order to monitor contaminant concentrations within the effluent discharge and estimate the hydrocarbon mass removal. The water samples will be collected within laboratory supplied containers and laboratory analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) and pH in accordance with the applicable laboratory methods. The influent and effluent sampling ports are depicted on the Process and Construction Diagram.

The following effluent limitations shall be maintained.

Benzene limitation: 0.04 mg/L, monthly average

Total Xylenes: 0.04 mg/L, monthly average

pH limitation: 6.5 to 9 standard units

Control Panel

The control system consists of NEMA 4 enclosure and includes the motor starters for all blower and pump motors, intrinsic relays for level sensors, on/off delay timers and status indicator lights. The controller is 230 volt, 3-phase, NEMA 4 enclosure with main disconnect. A 100 amp electrical service was connected to the equipment trailer by Baxter Kenworthy Electric of Omaha, Nebraska. The electric service is provided by Omaha Public Power District.

MPE SYSTEM OPERATION & MAINTENANCE

The following free product recovery system operation section describes start-up operation and maintenance activities. The free product recovery system was started on September 27, 2005.

OPERATION & MAINTENANCE SUMMARY

In accordance with the remediation action plan, free product recovery system performance data shall be submitted semi-annually to the NDEQ. The progress summaries shall include remedial system operation summary, the volume of product removed and disposed, and a discussion of equipment problems and down times. Further, the progress summary shall include a discussion of the remediation system effectiveness. Graphs will be included illustrating the cumulative volume of product and groundwater removed from the site. All effluent results and groundwater and free product level fluctuations will be tabulated. Photocopies of laboratory reports and chain of custodies shall be included. Additionally, the progress summary shall include any recommendations for modifications to the remediation system.

The free product recovery system has operated continuously since September 27, 2005. Three site visits have been performed since September 27, 2005. No shut-downs have occurred since startup. An influent and effluent sample was collected on September 28, 2005 and laboratory analyzed. The influent sample was analyzed for BTEX using method OA-1. The effluent sample was laboratory analyzed for BTEX and total toxic organics (TTO) using method EPA 624. The laboratory results of the effluent sample revealed benzene and total xylenes were below the respective NPDES discharge limitations. The laboratory analytical report for the influent and effluent samples is provided in Attachment E.

Based on the site visit conducted on October 25, 2005, 41 gallons of free product have been recovered since startup. The free product recovery rate is approximately 0.06 gallons per hour. A total of 9,860 gallons of treated groundwater have been discharged to the storm sewer. The SVE exhaust emissions were monitored using a colorimetric detector tubes calibrated for gasoline to determine hydrocarbon removal. The detector tube readings ranged from 100 to 110 parts per million as gasoline. Generally, hydrocarbon concentrations are higher at startup, however, since the contaminant is fuel oil, the hydrocarbon emissions are expected to be lower. The SVE air flow rate is approximately 42 cubic feet per minute.

Groundwater and free product levels were measured in five monitoring wells on October 20, 2005 in order compare to initial product levels measured prior to start-up of the remediation system. The first semi-annual monitoring report will be submitted in January 2006. The free product and groundwater data is summarized in Table 1 included in **APPENDIX B**. It should be noted that MW-12 still exists, it but was damaged during demolition of the concrete storage tank. RDG intends to repair MW-12 (trim top of casing, re-survey, and install a new flush-mount cover) so that it can be used to monitor depth to groundwater/free product.

A free product thickness of 0.73 feet was measured in MW-16 on October 20, 2005. The free product was manually bailed. Less than a tenth of a gallon of product was removed from MW-16.