APPENDIX B - INVESTIGATION PHOTOGRAPHS

Photo 1

Photo 2

CPT and LIF Equipment

Photo 1 – Specialized track-mounted CPT probe rig (remotely operated). Photo looking west with petroleum recovery trench in foreground (berm with bolted well covers). **Photo 2 –** Typical set-up of CPT probe rig and LIF support truck for investigative borings. Photo at LIF-1 looking east.

Photo 3

Photo 4

CPT and LIF Equipment

Photo 3 – Inside of CPT probe rig. **Photo 4 –** CPT and LIF devices. The CPT tool was equipped with electronic devices that continuously measure cone tip resistance, sleeve/skin (local) friction, and pore water pressure with depth to determine geotechnical properties of soils and provide an interpretation of subsurface stratigraphy. The LIF device (UltraViolet Optical Screening Tool [UVOST®] developed by Dakota Technologies) was equipped in-line with the CPT probe tooling (LIF device is pictured at bottom of CPT tooling) to measure and record wavelengths and relative intensity of the LNAPL fluorescence in soil. Due to the configuration of the tooling, there is an off-set from CPT data to UVOST LIF data of 2.7 feet, measured from the tip of the cone to the center of the sapphire window.

Photo 5

Photo 6

Photo 7

CPT and LIF Equipment

Photo 5 – Close-up photo of LIF device (in-line with CPT tool) where pulsed UV light produced from a laser is sent through the sapphire window (hole in tooling) to stimulate the fluorescence of aromatic hydrocarbons found in LNAPLs in soil. **Photo 6 –** Typical CPT operations showing CPT threaded piping (with CPT/LIF data cables strung inside) loaded into hydraulic press to advance CPT/LIF devices into the subsurface. **Photo 7 –** Typical LIF UVOST® system that sends UV light through a fiber optic cable strung through CPT probe rods that exit through the sapphire window in the side of the probe (see Photo 5). The fluorescence emitted from soils (the "signal" light) is transmitted through a second fiber optic cable, back up hole to be analyzed. Responses are graphed in real-time log (signal vs. depth) that can be viewed on a field laptop and printed.

Photo 8

Photo 9

CPT/LIF Borehole Abandonment

Photo 8 – Typical CPT/LIF borehole abandonment in grass performed by backfilling with granular bentonite to ground surface. Photo taken at LIF-18. **Photo 9** – Typical CPT/LIF borehole abandonment in asphalt road performed by backfilling with granular bentonite to near ground surface (within approximately 6-inches bgs) and placing asphalt patch as surface cap/seal. Photo taken at LIF-44. Yellow and Blue "OK" in foreground of photo represents marked utility clearance by City of Neodesha for gas and water, respectively.

Photo 10

Photo 11

Direct-Push Soil Probe Borings

Photo 10 – Typical continuous soil sampling using direct-push probing, adjacent to LIF-3 (photo looking south), for subsurface logging purposes to compare select CPT lithologic interpretations.
Photo 11 – Typical continuous soil sampling using direct-push probing, at Monitoring Well MW-169 (photo looking north-northeast), for lithologic logging purposes prior to well installation activities.

Photo 12

Photo 13

Hollow-Stem Auger Boring and Well Installation

Photo 12 – Typical hollow-stem auger (HSA) drilling for well installation activities (following continuous soil sampling for logging purposes). Photo taken at Monitoring Well MW-164 looking west-northwest. **Photo 13** – Typical well installation/construction through HSAs; pouring filter pack sand through HSAs. Photo taken at Monitoring Well MW-152 looking south. Soil cutting generated during continuous sampling and HSA drilling were containerized in 55-gallon drums and staged in a gravel lot behind the remediation building.

Photo 14

Photo 15

Groundwater Monitoring Well Surface Completions

Photo 14 – Typical surface completion for above ground monitoring wells. Photo taken at Monitoring Well MW-146 looking north-northwest. **Photo 15** – Typical surface completion for flush-mounted ground monitoring wells. Photo taken at Monitoring Well MW-168 looking west. Investigative-derived waste (IDW) drum with soil cuttings shown in left of photo with "Non-Classified Waste Material – Laboratory Analysis in Progress" label (all IDW drums relocated to gravel lot behind remediation building).

Photo 16

Photo 17

Investigative-Derived Waste (IDW) Drums

Photo 16 – Staging area for IDW drums during investigation behind remediation building on gravel lot. Photo looking north-northeast; not all IDW drums pictured (photo taken at start of investigation). **Photo 15** – Typical IDW drum label.

Photo 18

Photo 19

Monitoring Well MW-40 Abandonment

Photos 18 and 19 – Monitoring Well MW-40 prior to abandonment. Well consisted of 2-inch diameter PVC well casing. Photo looking south-southwest.

Photo 20

Photo 21

Monitoring Well MW-40 Abandonment

Photos 20 – Abandonment activities at Monitoring Well MW-40. Protective well casing, bollards (3), and concrete pad removed. Attempts of pulling well casing out of ground were unsuccessful. The top five (5) feet of the well casing was removed and bentonite chips were poured into well to approximately three (3) feet bgs. Photo looking north. **Photos 21 –** Completion of abandonment activities.