SITE CONCEPTUAL MODEL

for the

FORMER TROOP BOILER PLANT, BUILDING 8481
Operable Unit 2, FGGM-05

FORT MEADE, MARYLAND
MDE PROJECT #: 92-0026AA
KEMRON PROJECT #: VA0032

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Data contained on this sheet shall not be disclosed without prior approval from KEMRON Environmental Services, Inc. (Proprietary)

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Data contained on this sheet shall not be disclosed without prior approval from KEMRON Environmental Services, Inc. (Proprietary)

1.0 INTRODUCTION

On January 1, 2006, under U.S. Army Environmental Center Contract No. W91ZLK-05-R-0004, KEMRON Environmental Services Inc., of Vienna, Virginia assumed responsibility of all remediation activities from URS Corporation at the Troop Housing Boiler Plant. This contract is known as the Fort Meade Performance Based Contract (PBC) and the Troop Housing Boiler Plant is one of 11 sites under the Fort Meade PBC. The Troop Housing Boiler Plant is known as FGGM-05; however KEMRON will refer to this site as Operational Unit (OU) 2 under the Fort Meade PBC project.

KEMRON, MDE-OCP, and Fort Meade EMO held a transition meeting for OU-2 on January 5, 2006. The project goals, current operation and maintenance (O&M) activities, and site history were discussed. All 3 parties agreed to continue current O&M activities with Liquid Phase Hydrocarbon (LPH) recovery starting in March 2006.

The purpose of the Site Conceptual Model is to present comprehensive information of all known data collected at the site. KEMRON has also proposed a work plan to remove the remaining LPH as well as collect a current round of groundwater samples from selected monitoring wells at OU-2. Refer to Appendix C of this document for a copy of the proposed work plan.

1.1. Tank History Background

According to the 1991 U.S. Army Environmental Hygiene Agency's site investigation, the Troop Housing Area Boiler Plant, Building 8481, had five aboveground storage tanks (ASTs) and four underground storage tanks (USTs) containing Number 2 fuel oil and waste oil (See Figure 1). There are documented spills at this site occurring as far back as the early 1980s. Refer to Table 1-1 for specifics on the tanks that were in operation at OU-2.

Table 1-1. OU-2 Tank Chart

Tank #	Size (gallons)	AST/UST	Status	Storage
1	142,000	AST	Removed	No. 2 Fuel
2	1,500	UST	Removed	Waste oil
3	20,000	UST	Removed	No. 2 Fuel
4	550	AST	Removed	Waste oil
5	20,000	UST	Abandoned in place	No. 2 Fuel
6	1,000	AST	Removed	Waste oil
7	1,000	AST	Removed	Waste oil
8	275	AST	Removed	Waste oil
9	20,000	UST	Removed	No. 2 Fuel

Documented Spill Events

There were two fuel spills of No. 2 fuel during deliveries totaling 2,400 gallons circa 1981.

On July 31, 1991, The Maryland Department of the Environment (MDE) received a report of a precision test failure of the site's 1,500 gallon UST (Tank 2) for waste oil. The rate of fuel being lost was too fast to be measured. Further investigation revealed the piping associated with the tank was the cause of the spill.

On August 6, 1991, the MDE received a report of a precision test failure for the 20,000 gallon (Tank 5) UST of Number 2 fuel oil. The tank, which had been in operation since 1963, had a leak of 0.167 gallons per hour. Tank 5 was abandoned in place on September 17, 1991 and filled with an inert solid.

As a result of the leaks and spills from Tank 2 and Tank 5, the MDE opened a case, #92-0226-AA, on the site in October 1991. The MDE regional inspector gauged 12 on-site monitoring wells and 7 monitoring wells contained varying amounts of LPH. In an October 24, 1991 MDE observation report, the MDE requested the installation of an automatic recovery system.

AST/UST Closures at OU-2

KEMRON has reviewed the available UST/AST information from previous investigation reports and the Fort Meade Installation Action Plan (IAP). KEMRON has prepared a brief summary of the UST/AST closures at OU-2. Some of this information was not consistent. In an effort to rectify the inconsistencies, KEMRON contacted the MDE-OCP for additional information related to the AST/UST closures at OU-2. KEMRON has filed a Freedom of Information Act (FOIA) request and is scheduling a visit to the MDE-OCP office to review the documents associated with OU-2. After reviewing the MDE-OCP information, KEMRON will, if needed, revise this section and re-submit the SCM.

KEMRON has obtained the following information from the previous investigations by the Army and a telephone conversation with the MDE-OCP. A total of nine tanks were closed out or removed at OU-2 from 1991 through 2000. A summary of these nine tank closures follows:

- Tank 8, a 275 gallon AST, was removed and closed in August 1991;
- Tank 9, a 20,000 gallon UST, was removed and closed in August 1991;
- Tank 5, a 20,000 gallon UST, was abandoned in place with an inert solid in September 1991;
- Tank 4, a 550 gallon AST was removed and closed in May 1998;
- Tank 2, a 1,500 gallon UST was removed and closed in May 1998;
- Tank 3, a 20,000 gallon UST was removed and closed in October 2000;
- Tank 1, a 142,000 gallon AST was removed and closed, however the exact date of this closure cannot be located in the Army records;
- Tank 6, a 1,000 gallon AST was removed and closed, however, the exact date of this closure cannot be located in the Army records; and
- Tank 7, a 1,000 gallon AST was removed and closed, however, the exact date of this closure cannot be located in the Army records.

2.0 HISTORICAL INVESTIGATIONS

There were eight major investigations at this site since 1991. A site investigation was initiated late summer 1991 to determine the extent of the contamination of LPH in the soil and groundwater. Refer to Section 4 for a summary of the major findings of these investigations.

2.1. U.S. Army Environmental Hygiene Agency (1991)

Nineteen groundwater wells were installed between August 14, 1991 and December 5, 1991. There was a measurable thickness of LPH detected in six of the nineteen wells (USAEHA, January 1992).

In November 1991, an LPH plume approximately 150 feet wide by 250 feet long existed at OU-2. It was also noted that LPH in W-12 (now MW-12) fluctuated from less than 0.083 feet in thickness to 1.33 feet. This well is located in the vicinity where two former USTs and three former ASTs were located. Benzene, toluene, ethylbenzene, and xylenes (BTEX), and naphthalene concentrations were detected in the groundwater.

2.2. Spotts, Stevens, and McCoy, Incorporated (1992)

On July 14, 1992, Spotts, Stevens, and McCoy, Inc. (SSM) installed nine temporary wells (HP-1 through HP-9). SSM then sampled and analyzed groundwater from the 9 wells. SSM returned on January 7, 1993 and installed four more temporary wells (HP-10 through HP-13) and collected groundwater samples for analysis. All groundwater samples collected by SSM were analyzed for BTEX, MTBE, and TPH. Refer to Figure 1 for the locations of the temporary wells. Refer to Table 4-2 for the groundwater results.

2.3. Kamber Engineering (1992)

In 1992, Kamber Engineering (Kamber) performed slug tests on nine monitoring wells to determine the hydraulic conductivity of the site's aquifer, the lower Patapsco. Besides the hydraulic conductivity, Kamber calculated the LPH thickness.

2.4. CH2M Hill (1993)

CH2M Hill was contracted to construct a treatment system at OU-2. The treatment system was constructed and operational in 1993. The treatment system was designed to recover the LPH as well as treat the dissolved phase LPH in the groundwater. In September 1997, the MDE instructed CH2M Hill to cease the operations at the treatment system. The treatment system was shut down in December 1997. The treatment system shed and equipment remain as the only structure at OU-2.

2.5. EA Engineering, Science, and Technology (1996)

EA Engineering evaluated the site in August 1996 in an attempt to approximate the amount of recoverable LPH at OU-2. The EA assessment also provided a status check on the progress being made by the on-site pump and treat system. EA determined that the site contained approximately 5100 gallons of free phase LPH.

2.6. U.S. Army Corps of Engineers (1999)

From December 1999 through early 2000, the U.S. Army Corps of Engineers (USACE) abandoned 14 monitoring wells (MW-2, MW-4 through MW-7, MW-10, MW-11, MW-17, MW-21, and MW-23 through MW-27) and replaced them with 11 new monitoring wells ((MW-102, MW-104, MW-105, MW-110, MW-111, MW-121, and MW-123 through MW-127). USACE installed two additional wells, MW-200 and MW-201. The purpose of installing the 13 new wells was to intersect the seasonal high and low water levels. The USACE performed a bail down test to determine the LPH thickness at the site. Figure 1 shows the locations of monitoring wells MW-2, MW-4, and MW-7 as MW-02, MW-04 and MW-07 respectively.

2.7. URS Corporation (1999)

From 1999-2001, URS conducted quarterly groundwater sample collection and analysis. The MDE granted URS permission to halt the groundwater sample collection activities in November 2001. URS completed a geophysical survey in November 2004 as a part of the remediation investigation. In October 2005, per MDE request, seven monitoring wells (MW-301 through MW-307) were installed down gradient of the LPH plume as part of their investigation. URS conducted the operations and maintenance of the pump and treat system and the site.

2.8. KEMRON Environmental Services (2006)

Beginning in March 2006, wells containing a thickness of more than 0.1 ft (0.12 inches) of LPH are bailed until all LPH is removed from the respective well. Bailed LPH is stored in a labeled 15 gallon drum that is located on the south side of the remediation shed. Proposed work activities to eliminate the LPH at OU-2 are provided in Appendix C of this document.

3.0 REGIONAL/SITE GEOLOGY AND HYDROGEOLOGY

3.1. Site Geology

Fort Meade is located in the Atlantic Coastal Plain physiographic province and is underlain by a thick wedge of unconsolidated sediments that dip and thicken to the southeast. The sediments beneath the installation are Early Cretaceous in age and belong to the Potomac Group (formations are Patapsco, youngest; Arundel; Patuxent, oldest). The formations are more than 600 feet in thickness and are characterized as fluvial lacustrine deposits consisting of interbedded sand, silt, and clay that are limited in extent.

At OU-2, the Patapsco Formation is prevalent. This formation can be subdivided into lower, middle and upper unit. The site-specific unit is the lower Patapsco, where the site's monitoring wells are screened. Previous investigations indicate that the lower Patapsco unit is approximately 200 feet thick and ends abruptly with the Arundel Clay Formation. Further investigation of the site's geology revealed that it primarily consists of fine to medium sand with a gravel layer of coarse sand and gravel. The gravel layers were encountered throughout the site. Some clay and silt lenses were also present, ranging in thickness from two inches to six feet. Clays logged at MW-121 and MW-127 indicated that the lens thickens at the south end of the site. Refer to Appendix A for all available well logs at this site.

3.2. Site Hydrogeology

The groundwater at this site flows to the west and southwest, however the clay lens at the southeast corner of the site have occasionally caused a southeast flow. Groundwater in the shallow unconfined aquifer of the Patapsco Formation was modeled in 1996 for containment of LPH.

The water table ranges from 20-30 feet below the surface and fluctuates up to five feet. The fluctuations are caused by variations in recharge to the aquifer and possibly to a perched water table on portions of the site. The perched water table is caused by a clay layer of variable thickness (0.3-5 feet) that exists near the top of the water table. This clay layer also impedes downward recharge in certain areas on site.

4.0 INVESTIGATIVE RESULTS

4.1. Groundwater

This section provides the outcome of the investigations listed in Section 2. The results are stated to show the progress of the site since the case was initiated by the Maryland Department of the Environment.

4.1.1. U.S. Army Environmental Hygiene Agency (1991)

Initial groundwater sample collection and analysis at OU-2 as well as LPH gauging activities were conducted by the USAEHA per instructions of the Maryland Department of the Environment.

LPH Thickness Results

Below are the monitoring well locations and the LPH thicknesses measured November 13, 1991:

W-1 0.24 inches
W-4 5.16 inches (referred to as MW-04/6716 on Figure 1)
W-7 0.72 inches (referred to as MW-07/6886 on Figure 1)
W-11 6.48 inches (referred to as MW-11/6884 on Figure 1)
W-12 16.92 inches
W-14 5.4 inches

Below are the monitoring well locations and the LPH thicknesses measured in January 8-9, 1992:

W-1 0.12 inches
W-4 4.08 inches (referred to as MW-04/6716 on Figure 1)
W-7 0.60 inches (referred to as MW-07/6886 on Figure 1)
W-11 5.76 inches (referred to as MW-11/6884 on Figure 1)
W-12 6.72 inches
W-14 2.04 inches

Initial Groundwater Sample Results

Table 4-1 lists the wells and concentrations from the November 1, 1991 sampling event (W series wells) and January 8, 1992 (7000 series wells). Refer to Figure 1 for the monitoring well locations:

Table 4-1. USAEHA Groundwater Sampling Results

Monitoring Well	TPH µg/L	Benzene µg/L	Ethylbenzene µg/L	Toluene µg/L	Xylene µg/L	Naphthalene µg/L
W-2	0.89	14.4	47.4	1.3	65.9	90.2
W-3	<0.5	3.4	22.2	2.5	65.4	97.1
W-5	<0.5	ND	ND	3.6	ND	ND
W-13	<0.5	ND	7.9	ND	49.2	13.9
W-15	<0.5	9.9	31.0	70.6	97.1	64.7

Table 4-1. USAEHA Groundwater Sampling Results						
Monitoring Well	**TPH µg/L**	**Benzene µg/L**	**Ethylbenzene µg/L**	**Toluene µg/L**	**Xylene µg/L**	**Naphthalene µg/L**
7238	<0.5	ND	1.1	ND	3.9	1.7*
7239	<0.5	8.8	85.2	58.7	299.0	303.0
7241	0.62	ND	6.2	ND	18.4	22.0

Notes to Table 4-1: 1. * means estimated concentration
2. 7238 is referred to as W-16/MW-16 on Figure 1 and 7241 is referred to as W-19/MW-19 on Figure 1

4.1.2. Spotts, Stevens, and McCoy, Incorporated (1992)

Spotts, Stevens, and McCoy groundwater sampling events occurred July 14, 1992 (HP-1 through HP-9) and January 6, 1993 (HP-10 through HP-13). The samples were analyzed for BTEX (Method 602 M) and TPH-GRO (Method 418.1 (July 92) and API (January 93)). Table 4-2 lists the wells and the concentrations from these groundwater sampling events:

Table 4-2. SSM Groundwater Sampling Results						
Monitoring Well	**TPH mg/L**	**Benzene µg/L**	**Ethylbenzene µg/L**	**Toluene µg/L**	**Xylene µg/L**	**Naphthalene µg/L**
HP-1	12550	80	230	57	610	850
HP-2	17.6	<1	<1	<1	<1	<1
HP-3	24.1	<1	<1	<1	<1	<1
HP-4	53	<1	3	<1	4	22
HP-5	<10	<1	<1	<1	<1	2
HP-6	<10	7	46	2	180	360
HP-7	12.6	<1	<1	<1	<1	15
HP-8	<10	<1	<1	<1	<1	1
HP-9	<10	4	26	<1	89	150
HP-10	180000	<1000	19000	<1000	37000	150000
HP-11	750	2	1	<1	2	25
HP-12	600000	63	150	59	440	400
HP-13	>990000	<5000	89000	280000	310000	280000

Refer to Figure 1 for location of temporary monitoring wells installed by SSM.

4.1.3. Kamber Engineering

In 1992, Kamber Engineering performed slug tests on nine monitoring wells to determine the hydraulic conductivity of the aquifer on site (Lower Patapsco). Kamber calculated a hydraulic conductivity of 6.4 ft/day; however, Kamber's report indicates a hydraulic conductivity of 39.0 ft/day is representative for the predominant lithology of the aquifer, a moderately silty, and fine to medium-grained sand. Slug tests tend to provide results lower than the actual results.

The drainable porosity of the aquifer (specific yield) is assumed to range between 15% and 24%. These values are typical for sandy aquifers.

4.1.4. URS Corporation

Groundwater samples were collected and analyzed for BTEX and MTBE from September 1999 through November 2001 by URS (Figure 2) approximately every three months. The November 2001 sample results were all below the MDE cleanup concentration standards. As a result, the MDE permitted URS to discontinue sampling. Table 4-3 lists the results from URS sampling events. The samples collected on November 1, 2001 were also analyzed for naphthalene which was present in MW-110 (2.4 µg/L) and MW-200 (4.8 µg/L). Figure 1 and Figure 2 show the monitoring well locations that correspond to the results.

4.2. Soil

There are minimal issues related to the soils on site, however, with the fluctuation of the water table, residual petroleum may have created smear zones within the soil matrix.

4.2.1. U.S. Army Corps of Engineers

During a pilot study in 2002 conducted by the Army, 13 boreholes were evaluated for potential well installation. Five of the thirteen boreholes (102, 104, 111, 124, and 127) contained LPH and these boreholes were converted to monitoring well locations (see Figure 2, those monitoring wells were given MW nomenclature). Refer to Appendix A for the monitoring well construction logs as well as the soil boring logs.

During split spoon sampling of the five boreholes, stained soils were encountered. Borehole 102 had LPH present in its wet, fine to coarse sands at depths of 30.0-31.5 feet and 35-36.5 feet below ground surface (bgs). MW-102, converted from Borehole 102, is screened from 14 to 39 feet bgs and its depth to bottom is 40 feet bgs.

Borehole 104 had LPH present in its wet, fine to coarse sands at depths of 30.0-31.5 feet bgs, 35.0-36.5 feet bgs, and 40.0-41.0 feet bgs. No clay layer was encountered and the water level at completion was 31.6 feet bgs. MW-104, converted from Borehole 104, is screened from 14 to 39 feet bgs and its depth to bottom is 40 feet bgs. The monitoring well construction log for MW-104 is not included in Appendix A; however both the drilling record and the development record are available for MW-104 in Appendix A.

Borehole 111 had LPH present in its wet, fine to medium sands at depths of 26.1-26.5 feet bgs, 30.0-31.5 feet bgs, and 35.0-36.5 feet bgs. No clay layer was encountered and the water level at completion was 31.35 feet bgs. MW-111, converted from Borehole 111, is screened from 17 to 42 feet bgs and its depth to bottom is 42.5 feet bgs.

Borehole 124 had LPH present in its wet, coarse sands at depths of 40.0-41.5 feet bgs and 45.0-46.5 feet bgs. A five foot thick clay layer was encountered from 35.0-40.0 feet bgs and the water level at completion was 35.8 feet bgs. MW-124, converted from Borehole 124, is screened from 20 to 45 feet bgs and its depth to bottom is 46.5 feet bgs.

Borehole 127 had LPH present in its wet, medium sands at depths of 30.0-31.5 feet bgs, 35.0-36.5 feet bgs, and 40.0-41.0 feet bgs. A five foot thick clay layer was encountered from 25.0-30.0 feet bgs and the water level at completion was 26.6 feet bgs. MW-127, converted from Borehole 127, is screened from 10 to 35.0 feet bgs and its depth to bottom is 35.5 feet bgs.

Table 4-3. URS Groundwater Sampling Results

Monitoring Well	Date	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylenes µg/L	MTBE µg/L
MW-1	09/03/99	485	1560	1130	4360	150
MW-2		11000	38000	2900	11000	64000
MW-3		23	360	2200	410	220
MW-4		<5	<5	<5	<5	<5
MW-5		<5	<5	<5	<5	<5
MW-1	11/02/99	650	2410	1720	6580	<5
MW-2		2400	4100	830	2700	13000
MW-3		43	140	960	320	180
MW-4		Not Sampled – no reason indicated				
MW-5		<5	<5	<5	<5	<5
MW-1	3/24/00	167	2050	1440	6690	18
MW-2		14000	53000	3500	11000	22800
MW-3		LPH Present				
MW-4		<5	<5	<5	<5	<5
MW-5		<5	<5	<5	<5	<5
MW-1	05/15/00	759	2630	1560	7360	22
MW-2		6500	26000	1800	7500	18050
MW-3		<10	1300	7900	1100	200
MW-4		<5	<5	<5	<5	<5
MW-5		Not Sampled – no reason indicated				
MW-1	08/15/00	1140	1600	2110	7160	<5
MW-2		4600	27000	2100	9300	983
MW-3		300	4200	1900	5600	400
MW-4		<1	<1	<1	<1	<1
MW-5		Not Sampled – no reason indicated				
MW-1	11/27/00	900	1610	1880	5240	3
MW-2		6140	40600	4270	17900	1780
MW-3		37	170	300	380	40
MW-4		Not Sampled – no reason indicated				
MW-5		<1	<1	<1	<1	<1
MW-1	03/06/01	3030	4630	3340	14000	98
MW-2		1560	15700	1800	8780	2900
MW-3		8	30	45	100	9
MW-4		<1	<1	<1	<1	<1
MW-5		<1	<1	<1	<1	<1
MW-1	06/19/01	2890	4860	3550	15400	93
MW-2		3000	24800	3120	14600	5730
MW-3		<5	1.9	<5	<5	<1
MW-4		<1	<1	<1	<1	<1
MW-5		<1	<1	<1	<1	<1
MW-110	11/01/01	<1	<1	<1	<3	<10
MW-121		<1	<1	<1	<3	<10
MW-123		<1	<1	<1	<3	<10
MW-125		<1	<1	<1	<3	<10
MW-200		<1	<1	<1	<3	<10
MW-201		<1	<1	<1	<3	<10

4.3. LPH Characterization

The LPH present at this site is heating oil or Fuel Oil Number 2 or "red diesel". Fuel Oil Number 2 is a middle distillate petroleum hydrocarbon product of intermediate volatility and mobility. As an intermediate product, it has a combination of lighter, less persistent and more mobile compounds as well as heavier, less mobile compounds. In groundwater, many of these compounds are readily partition on an equilibrium basis back and forth between water and solids, soil and sediment (Roy Irwin, 1995). Since KEMRON assumed the O&M duties at the site, fuel oil has been detected in MW-12, MW-15, MW-104, MW-111, MW-124, and MW-127.

Every petroleum product has unique characteristics or "fingerprint" that can distinguish it from the others. Listed below are characteristics of the LPH found on site:

- API Gravity @ 60 degrees Fahrenheit: 32.1 (unit less number)
- Density @ 20 degrees Celsius: 0.8774 grams/milliliter
- Aqueous Solubility @ 22 degrees Celsius: 55.97 milligrams/liter (Fresh water)
- Dynamic Viscosity @ 21.1 degrees Celsius: 1.965 millipascal-second or centipoise
- Interfacial Tension @ 20 degrees Celsius: Oil-Water: 50 Newton meters or dynes/centimeters

4.4. LPH Recovery

The recovery of LPH at OU-2 has been accomplished using three methods: 1) Pump and Treat system from 1993 to 1996; 2) Solar Powered Skimmer from 2000 to 2003; and 3) hand bailing from 2006 to present. A description of these methods as well as the amount of LPH recovered is described below.

Pump and Treat System (1993 to 1996)

CH2M Hill installed and operated a pump and treat recovery system in 1993. The system ran until approximately June 1996. Approximately 2,727 gallons of LPH had been recovered; 2,549 gallons of LPH and 178 gallons of dissolved phase LPH.

Solar Powered Skimmer (2000 to 2003)

A significant amount of LPH recovery came from MW-127 (refer to Figure 3 for the location of MW-127). In March 2000, 56 gallons of LPH was recovered from MW-127 via hand bailing methods. An April 2000 bail down test at MW-127 measured a LPH thickness of 1.14 feet. In April/May 2000, 112 gallons of LPH was recovered from MW-127 via hand bailing methods. From June 2000 to August 2001 a small pump was installed at MW-127 and recovered approximately 494 gallons.

Beginning in September 2001, a solar paneled skimmer was installed in MW-127. The skimmer was in operation until March 2003 and recovered an additional 1,042 gallons of LPH. The water surface elevation within MW-127 at the time the system was shut down was 130.21 feet mean sea level (msl). Since 2005, the water elevation has fluctuated from 133 feet msl to 125 feet msl. Since March 2003, only 0.30 gallons of LPH has been recovered from MW-127. At the end of 2003, a total of 4,310 gallons of LPH had been removed from the site.

Hand Bailing Recovery (2006 to Present)

Beginning in March 2006, monitoring wells containing a thickness of 0.1 feet or greater of LPH are manually hand bailed until all LPH is removed from the respective well. The recovered LPH is stored in a labeled 15 gallon drum that is located on the south side of the on-site CH2M Hill remediation shed. A total of 14 gallons of LPH has been recovered using hand bailing recovery methods.

Total LPH Recovered

Currently, LPH thickness varies from 0.01 feet (MW-104, MW-111) to 0.1 feet (MW-124). Wells containing LPH historically are MW-12, MW-15, MW-104, MW-111, MW-127, MW-200, and RW-4. No LPH has been found in any down gradient wells. Since 1993 to the present, a total of 4,324 gallons from estimated 5,100 gallons (EA, 1996) of LPH had been recovered from OU-2. Refer to the LPH recovery data and gauging data found in the Tables Section of this report for additional information.

5.0 INVESTIGATIVE ANALYSIS OF RISK FACTORS

This section provides an analysis of the risks associated with OU-2. The initial section discusses the current and future land uses for OU-2 as well as potentially exposed populations and completed pathways. The second section discusses the seven risk factors that must be considered when evaluating a site for closure in accordance with the Maryland Environmental Assessment Technology (MEAT) document.

5.1. Exposure Pathways

The current land use for OU-2 is classified as military/industrial. The Army uses OU-2 to train the police dogs and conduct other drills. The current potentially exposed populations would be the soldiers, police dogs, and any groundskeepers. The anticipated future land use for OU-2 is classified as military/industrial. The Army might use the land for some commercial enterprise or continue to use OU-2 as a training ground. The future potentially exposed populations could include soldiers, police dogs, construction workers, groundskeepers, and/or commercial workers.

Groundwater Exposure

The OU-2 site has access to public water which means the OU-2 site groundwater would not be used for any potable use. Additionally, the most recent round of groundwater sample results do not show any concentrations of volatile organic constituents (VOCs) in the OU-2 groundwater. There is no completed exposure pathway to groundwater.

Soil Exposure

Since the LPH is not mobile and is located at 35 feet bgs, the soldiers, police dogs, groundskeepers and the potential commercial workers are not exposed to the LPH or any LPH containing subsurface soils. There are no LPH containing surface soils at OU-2. Typical construction methods do not require building or footer excavations of 35 feet bgs; therefore, the construction worker would not be exposed to the LPH or LPH containing subsurface soils. There is no completed exposure pathway to surface or subsurface soils at OU-2.

5.2. MEAT Risk Factors

This sub-section discusses the seven risk factors in accordance with the MEAT guidance.

5.2.1. LPH Removal

A total of 4,324 gallons of LPH has been recovered through hand bailing methods, pump and treat system, and solar paneled skimmer. Based on water fluctuation and lack of LPH in down gradient wells, KEMRON concludes there is stagnant LPH in four of the wells on site. These wells are MW-15, MW-104, MW-111, and MW-124. The LPH amounts range from a sheen to 0.1 feet (MW-124 February 22, 2007, see Table 2 in the Tables section of this report).

5.2.2. Groundwater Usage

No current uses for the groundwater at this site exist and no future uses are anticipated. Fort Meade has a public water supply; therefore future plans for this site will not use the groundwater. No potable well source is located within a half mile radius and water supply is

received from the Patuxent aquifer (see Appendix B). The downgradient potable well is screened at three intervals: 1) from 434 to 443 feet bgs; 2) from 458 to 482 feet bgs; and 3) 491 to 496 feet bgs. The LPH contaminated area is located at 35 feet bgs at OU-2; therefore, the LPH will not reach the downgradient potable well.

5.2.3. Migration

The LNAPL/LPH has not been found in any of the wells downgradient (MW-125, MW-304, MW-300, and MW-305) from the area of LPH contamination at OU-2. Therefore, the LPH is not migrating from the site.

5.2.4. Human Exposure

Human exposure is unlikely due to no exposure to groundwater. No possibilities of inhalation, ingestion, or dermal contact are present. According to 2001 data, no concentrations of VOCs (BTEX and MTBE) are found in the OU-2 groundwater; therefore no reason exists to evaluate vapor intrusion exposure pathway. Refer to Section 5.1 above for a more complete discussion of the human exposure pathways.

5.2.5. Environmental Exposure

The LPH will not impact the natural resources at the site due to the depth of the LPH found in the site groundwater and the immobile nature of the LPH.

5.2.6. Impact to Buried Services

Fort Meade has installed electric and communication trenches at OU-2 as recently as the spring of 2007. There was no reported LPH that surfaced during the trenching and installation of utility lines at OU-2.

5.2.7. Other Sensitive Receptors

There are no ecological entities or components exposed to LPH at OU-2. The current land use for this site is Military/Industrial. Occasionally, there are training drills and exercises for the Military Police held on site. Historically, OU-2 has been used for industrial purposes, and in the future the site will also be used for industrial purposes. There is potential for commercial use, but OU-2 will not be functioning as a residential location.

6.0 CONCLUSION

Evaluation of historical field data indicates that LPH exists in a centralized plume at OU-2. The data also indicate that the LPH present at the site has a high specific gravity and does not migrate through the OU-2 fine sand and silt aquifer. The initial plume has decreased in area and thickness (refer to Figure 4 for a 2002 LPH plume map). The initial site thickness was 1.33 feet of LPH. The current LPH plume can be found in Figure 5. The current site conditions show LPH thicknesses ranging from 0.01 to 0.1 feet of LPH in three wells located on site. A comparison of Figure 4 and Figure 5 reveals that LPH recovery has occurred.

As evidenced by the reduced LPH plume size and the reduced LPH thicknesses, LPH recovery has been conducted to the maximum extent practicable using a variety of methods including: 1) Pump and Treat system from 1993 to 1996; 2) Solar Powered Skimmer from 2000 to 2003; and 3) hand bailing from 2006 to present. KEMRON currently conducts weekly gauging of wells that contain LPH.

Please refer to Appendix C of this document for the work activities that KEMRON proposes to implement. KEMRON believes that by implementing these tasks, the remaining LPH thicknesses will be removed from OU-2. Additionally, KEMRON proposes to collect a current round of groundwater samples for laboratory analysis in accordance with the current MDE-OCP guidance.

7.0 REFERENCES

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FIGURES

Data contained on this sheet shall not be disclosed without prior approval from KEMRON Environmental Services, Inc. (Proprietary)

TABLES

Data contained on this sheet shall not be disclosed without prior approval from KEMRON Environmental Services, Inc. (Proprietary)

APPENDIX A

WELL LOGS AND SURVEY DATA

Data contained on this sheet shall not be disclosed without prior approval from KEMRON Environmental Services, Inc. (Proprietary)

APPENDIX B

WELL SEARCH DATA

Data contained on this sheet shall not be disclosed without prior approval from KEMRON Environmental Services, Inc. (Proprietary)

APPENDIX C

Proposed 2007 Work Plan

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