Remedial Objectives Report
Former Manufactured Gas Plant
Champaign, Illinois
State ID 0190100008

December 5, 2008

Prepared for:

AMEREN SERVICES

St. Louis, Missouri

Columbia, Illinois

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Executive Summary

AmerenIP is submitting this Remediation Objectives Report (ROR) for the Former Champaign Manufactured Gas Plant (MGP) site located at 308 North 5th Street in Champaign, Illinois. Site investigation activities have been performed and the results presented in the *Comprehensive Site Investigation Report, For AmerenIP Champaign, Illinois Former Manufactured Gas Plant, State ID 0190100008* (CSIR) dated December 2007 and the *Off-Site Investigation Report, Former Manufactured Gas Plant, Champaign Illinois, State ID 0190100008* (OSIR) dated August 22, 2008. Subsurface impact indicative of MGP operations was identified encompassing the entire remediation site. The subsurface impact has been delineated for the constituents of concern listed on Table ES-1.

Twenty-six constituents of concern (COC) in soil and twenty COC in groundwater have been identified. This ROR presents an evaluation of the COCs and describes the proposed exposure pathway exclusions. Ameren has elected to use a combination of soil excavation and disposal, in-situ chemical oxidation, and institutional controls to address the site impact. The remedial approach will be presented in the Remedial Action Plan (RAP). Additionally, AmerenIP has established project remediation objectives (ROs) that reflect the use of the most stringent Tier 1 ROs outlined in Illinois Administrative Code (IAC) Section 742. Tier 2 or Tier 3 evaluations may be performed following the above mentioned remediation activities as a method to address site residuals.

Upon implementation of the methods for pathway exclusion that are outlined in this ROR and in an accompanying RAP, Ameren intends to meet the requirements for a NFR letter for the remediation site.

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1 INTRODUCTION

PSC Industrial Outsourcing, LP has prepared this Remedial Objectives Report (ROR) on behalf of AmerenIP, for the former Manufactured Gas Plant (MGP) located in Champaign, Illinois (Figure 1-1). This ROR is being submitted in accordance with Title 35 of the Illinois Administrative Code (IAC) Section 740.445 to establish the remedial objectives for the remediation site and illustrate how the recognized environmental conditions (RECs) will be addressed for the former MGP site. The RECs and subsurface impact exceeding Tier 1 Remediation Objectives (ROs) identified during site investigation activities and were presented in the *Comprehensive Site Investigation Report, For AmerenIP Champaign, Illinois Former Manufactured Gas Plant, State ID 0190100008* (CSIR) dated December 2007 and the *Off-Site Investigation Report, Former Manufactured Gas Plant, Champaign Illinois, State ID 0190100008* (OSIR) dated August 22, 2008.

The former MGP facility was located at 308 North Fifth Street (formerly 502 East Hill Street), Champaign, Illinois. The remediation site is currently owned by AmerenIP and is enrolled in the Illinois Environmental Protection Agency's (IEPA) Site Remediation Program (SRP) under state ID 0190100008. During the investigation activities limited impact was identified on some neighboring properties as well as portions of Fifth and Sixth Streets and an active railroad right of way. Investigation activities and approaches for addressing the impact on the properties not owned by AmerenIP are addressed in separate RORs and RAPs. Figure 1-2 identifies the extent of the remediation site covered by this report, and the area for which AmerenIP will request a No Further Remediation (NFR) letter.

Impact was identified during the site investigation activities that exceed Tier 1 ROs. All soil impact above the most stringent Tier 1 ROs located within the top 10 feet of ground surface will be addressed through soil removal and disposal. AmerenIP will then perform in-situ chemical oxidation to remediate impact greater than the site remediation objectives. The methods and approaches to be used for meeting requirements for a NFR letter are discussed in this document as well as the accompanying RAP.

2 SITE DESCRIPTION

The following sections provide a brief description of the remediation site. A full description of the remediation site, the regional setting, and the operational history and historical use of the properties as required under Section 740.435(b)(2) is in the CSIR dated December 2007.

2.1 Site Information

The Site is located within the city limits of Champaign, Illinois in Champaign County in the northeast quarter of the southwest quarter of Section 7, Township 19 North, Range 9 East of the Third Principal Meridian. The Site address is 308 North Fifth Street (formerly 502 East Hill Street), Champaign, Illinois. The property is currently vacant, secured by a chain-link fence, and owned by AmerenIP. Figure 1-1 illustrates the approximate location of the Site. The general area around the Site consists of both residential and commercial properties. Figure 1-2 depicts the remediation site boundaries and the layout of the surrounding properties.

A single active track railroad right-of-way (Norfolk-Southern) borders the Site to the north and several residential properties are located north of the railroad right-of-way. The Sixth Street right-of-way is adjacent to the east of the Site; however, Sixth Street is closed between the railroad right-of-way and the alley south of the Site. Other property east of the vacated Sixth Street right-of-way is commercial. Residential properties to the south are separated from the Site by the chain link fence and an active alley. North Fifth Street borders the Site to the west and separates the Site from residential properties to the west. At one time, Hill Street approximately bisected the Site in the east-west direction; but the street has been vacated and is now part of the Site owned by AmerenIP.

2.2 Site History

The following information relative to MGP history is summarized from Sanborn Fire Insurance Maps (Sanborn Maps), Brown's Directory of American Gas Companies (Brown's Directories), AmerenIP files, and other historical documents.

Historical information relative to the Site indicates that gas was manufactured on the Site as early as 1869 and continued through 1933 (i.e. at least 64 years). Gas was produced by coal carbonization, oil gasification, and carbureted water gas methods during various periods of operation. After operations ceased in 1932 or 1933, the plant was maintained for stand-by production purposes until about 1955. Plant facilities were demolished, with the exception of the booster house, between 1955 and 1960. Although the property remained vacant, Illinois Power, a predecessor of AmerenIP, maintained ownership of the property until 1979 when it was sold to the American Legion. Illinois Power repurchased the property from the American Legion in 1991 after preliminary environmental investigations indicated the presence of MGP related impacts at the Site.

Past site features identified through historical documents are depicted on Figure 2-1. The former gas plant and associated buildings, three tar wells, two gas holders (GH-1 and GH-2),

and two oil tanks were located on the northern portion of the site. The former booster house, a third gas holder (GH-3), three purifiers, and seven oil tanks were located on the southern portion of the site.

2.3 Subsurface Geology

The subsurface geology has been characterized using the methods described in Section 2 of the CSIR. The general subsurface geology for the remediation site consists of:

- Surficial fill material;
- Weathered till unit;
- Unweathered till unit; and
- Lower silty sand unit of the Glasford Formation.

A brief description of the geologic units are provided below. More detailed geologic descriptions for each of the properties of the remediation site are presented in Section 2.6 of the CSIR.

2.3.1 Surficial Fill Layer

The surficial fill layer is typically 3 to 4 feet thick and covers the entire Site. The fill consists of gravelly silt and sand, with cinders, bricks and debris. Much of the fill was placed on the Site after demolition of the MGP facilities was completed. Some topsoil encountered may have been classified as fill material based on a dark organic appearance which resembles the known fill on Site. Topsoil was also placed over portions of the Site where CSI test pits were excavated. The fill is thickest in an isolated area along the northern portion of the Site near the railroad tracks.

2.3.2 Weathered Till Unit

The first natural subsurface material encountered is a weathered till unit. The unit is continuous beneath the study area and is believed to be part of the Batestown Till Member of the Wisconsinan Wedron Formation. The Weathered Till Unit was contacted at various depths beneath the study area. The unit averages 10 to 15 feet thick beneath the Site.

The Weathered Till Unit is comprised of brown to gray silty clay with some oxidation evident along clay fractures. MGP residual staining is present along some of these fractures. Numerous minor sand and silty sand layers were encountered; however, the sand layers are laterally discontinuous. Residual impacts are frequently associated with sandy and silty layers. The distinction between the weathered and unweathered till units was often difficult to distinguish.

2.3.3 Unweathered Till Unit

The Unweathered Till Unit is also believed to be part of the Batestown Till Member of the Wisconsinan Wedron Formation. The unit is generally differentiated from the Weathered Till Unit by the gray color and lack of weathering along fractures. The Unweathered Till

was encountered at depths ranging from 9 to 20.5 feet bgs. Sand and gravel layers were also encountered within the Unweathered Till Unit; however, these layers were not laterally continuous beneath the Site.

2.3.4 Lower Silty Sand Unit

Three deep boreholes drilled during the Phase II investigation encountered thick sand, silty sand, and gravel units at depths below 100 feet. These deeper deposits are believed to be the upper units of the Illinoisan Glasford Formation. The actual contact between Wedron and Glasford was not delineated due to the similarities between the units and the rotary wash drilling method used in the deeper boreholes.

2.4 Hydrogeologic Conditions

The following sections provide a brief description of the groundwater bearing units and the groundwater flow conditions at the remediation site.

2.4.1 Shallow Groundwater System

The shallow groundwater system at the Site is an unconfined water-bearing zone with the saturation depth (water table) found in the surficial fill layer or the uppermost till unit and is currently monitored by eighteen wells. Groundwater in the shallow system beneath most of the study area generally flows in a north/northwest direction with a somewhat radial pattern from the site. The configuration of the shallow water table in September 2008 is shown on Figure 2-2. Depth to the shallow groundwater system typically ranges from 3 to 10 feet bgs. Additional groundwater data from previous events is presented in the CSIR dated December 2007.

Groundwater flow gradients differ considerably between the southern and northern parts of the Site. The shallow groundwater system near the southern edge of the Site has a hydraulic gradient of about 0.08 foot per foot. The groundwater flow rate is about 7.5 feet/year based on an averaged observed hydraulic conductivity of 9.1×10^{-5} cm/sec from the slug tests performed in wells UMW-104 and UMW-106. Groundwater velocity could be as high as 30 feet/year using an effective porosity of 25 percent. The shallow groundwater system for the remainder of the Site has a hydraulic gradient of about 0.01 foot per foot. The resulting groundwater flow rate is about 0.33 foot/year based on an average hydraulic conductivity of 3.2×10^{-5} cm/sec from the slug tests performed in wells UMW-102 and UMW-108. Groundwater velocity could be as high as 1.3 feet/year using an effective porosity of 25 percent. Calculation methods were presented in the RI report (Burlington, 1994).

2.4.2 Intermediate Groundwater System

Eight groundwater monitoring wells were installed at a depth of forty-five feet bgs during the 2008 off-site investigation to encounter an intermediate sand unit. Wells were cased to a depth of approximately 29.5 feet bgs with a screened interval of 35.0 to 45.0 feet bgs. One well was installed off-site to the north and west; three wells were installed off-site to the south, one well was installed off-site to the southeast, and one well was installed off-site to

the east. An additional well was installed on-site in the former Hill Street right-of-way. Water levels taken in September 2008 ranged from 26.0 to 28.0 feet bgs. The configuration of the intermediate water table in September 2008 is shown on Figure 2-3. Groundwater generally flows in a southeast direction.

Slug testing was performed in four of the eight intermediate wells (UMW-301, UMW-302, UMW-303, and UMW-304) during the off-site investigations. The horizontal hydraulic conductivity values ranged from 2.80×10^{-2} centimeters per second to 8.63×10^{-2} centimeters per second. The mean hydraulic conductivity calculated using data from the four wells was 4.85×10^{-2} centimeters per second, or 137.5 feet per day. Hydraulic conductivity calculations were presented in the OSIR.

2.4.3 Deep Groundwater System

The deepest groundwater system that has been monitored at the Site is a sand and gravel zone within the Lower Glasford Formation beginning at a depth of about 151 feet bgs to a depth greater than 177 feet bgs. The sand and gravel layers encountered in this zone were much thicker and laterally continuous than the silty sand and sand units encountered in the weathered and unweathered till units. The water levels for the three wells screened in this zone stabilized at depths of approximately 120 feet bgs. The regional gradient is to the west-southwest.

The three deep wells installed during the Phase II Site Investigation were plugged and abandoned in 1999. During the period between 1992 and 1998 when these wells were being monitored, no impacts were detected. Since there is a downward gradient from the shallow groundwater unit to the deeper aquifer, these wells were plugged to prevent them from acting as a potential conduit from shallow impacted soils to the deeper aquifer.

2.5 Recognized Environmental Conditions

Historical information relative to the Site indicates that gas was manufactured on the Site as early as 1869 and continued through 1933 (i.e. at least 64 years). Gas was produced by coal carbonization, oil gasification, and carbureted water gas methods during various periods of operation. After operations ceased in 1932 or 1933, the plant was maintained for stand-by production purposes until about 1955. Plant facilities were demolished, with the exception of the booster house, between 1955 and 1960. Although the property remained vacant, AmerenIP maintained ownership of the property until 1979 when it was sold to the American Legion. AmerenIP repurchased the property from the American Legion in 1991 after preliminary environmental investigations indicated the presence of MGP related impacts at the Site. Additional historical information for the former MGP was presented in the CSIR dated December 2007.

Based on historical data and observations during previous activities, RECs were identified and the 2004 CSI activities were completed to define those conditions. Figure 2-1 illustrates approximate locations of historical MGP structures on the Site. The following sections discuss environmental conditions that exist at the Site as determined during CSI activities.

2.5.1 Former Tar Wells

Three tar wells (TW1, TW2, and TW3) have been identified at the Site. TW1 and TW2 had diameters measuring approximately 10.7 feet. TW1 was covered with a brick and concrete lid approximately 8-inches thick that was supported by rails. Above the lid was a concrete foundation 12-inches thick containing metal rebar. The tops of TW1 and TW2 were located approximately 2 feet bgs, and their bottoms were located at approximately 10 feet bgs. The walls and floors were constructed of brick and mortar. Tar well TW3 had a diameter measuring 19.3 feet wide, and a depth measuring 10 feet bgs. The walls were constructed of brick and mortar and the bottom was constructed of 6-inches of concrete. The environmental impacts from these tar wells would have been from releases through the sides and bottom. The material from each of the three tar wells was removed in 1997; therefore, these structures no longer serve as a source for continued release.

2.5.2 Former Tar Separator

One tar separator was previously identified at the Site. The dimensions of the separator were approximately 10 feet in diameter with depths of 6 to 10.5 feet bgs. The walls and base were constructed of concrete with interior wooden baffles. The upper 2 feet contained clean fill material with the remainder of the backfill saturated with fluid tar. The valve box was located east of the separator and was approximately 9 feet wide on each side with brick walls extending to 5 feet bgs. The floor of the separator consisted of only native clay till material. Environmental impacts related to this structure could have been from releases of source material through the base of the separator, the valve box, or from piping. The contents of the separator were removed in 1997; therefore, this structure no longer serves as a source for further releases.

2.5.3 Former Purifiers

Three concrete purifier pads were previously identified at the Site. Purifier waste consisted mainly of wood shavings, coal, and cinders. Releases from purifiers would primarily have been cyanide and other inorganic constituents. The contents and pad structures have been removed; therefore, they no longer serve as a source for further release.

2.5.4 Former Gas Holder Tank GH-1

Gas holder tank GH-1 was constructed prior to 1869 and was converted to a tar well in 1924. This below ground structure contained a significant quantity of source material and was the primary focus of the IRM removal actions in 1997. The prior release of MGP related material could have occurred through the base or sidewalls of the structure or from underground piping going into the structure. The contents of GH-1 were removed in 1997; thus mitigating further releases to the subsurface.

2.5.5 Former Gas Holder Tank GH-2

Gas holder tank GH-2 was constructed prior to 1902 and was the focus of CSI test pit and boring activity. Based on the Site history and the period of operation, this gas holder tank

may have been used as a relief holder during part of the operation. Evidence from the 2004 CSI appears to indicate that this former gas holder was a belowground structure, with confirmed presence of the structures including walls, valve pit, and piping. No solid bottom was encountered. CSI soil sample analytical results indicate significant levels of MGP impacts within the GH-2 gas holder tank. This structure will be a primary focus during remedial activities.

2.5.6 Former Gas Holder Tank GH-3

Gas holder tank GH-3 was constructed between 1909 and 1915. Historical photographs indicate that the tank was constructed above grade on a concrete slab. The foundation slab and both inlet and outlet valve pits were located during CSI activities. The bottom of the valve pits are about 8.5 feet bgs and both pits contained some tar-like liquid.

2.5.7 Former Oil And Diesel Storage Tanks

Seven above grade oil and diesel storage tanks were located along the southwest property line from the early 1920s until plant demolition in the 1950s. In addition, other oil storage tanks on the northern portion of the property were used at various times during the operation of the MGP. Environmental impacts from these structures could be related to piping and accidental spillage and would most likely have been either surface or shallow subsurface releases. The decommissioning and removal of these structures in the late 1950s has served to eliminate any continued releases from the former aboveground tanks. The CSI analytical results confirmed the presence of some minor impacts near the southwest property fence-line.

2.5.8 North Property Line

The northern AmerenIP property line extends from Sixth Street just north of vacated Hill Street northeast along the railway to the alley, and continues west along the alley to Fifth Street. No MGP activities occurred north of the railroad tracks; however, impact appears to have migrated to that area. CSI test pit and boring activities focused on locating an environmental pathway from the Site MGP operations to the north side of the railroad tracks. Impact was observed north of the railroad right-of-way during the 2008 off-site investigation activities; however, no potential point source was identified. Impact along the northern property line within the remediation site boundary will be addressed through excavation and disposal.

2.5.9 East Property Line and Former Gas Experiment Station

The eastern property line extends from the railway south along the western right-of-way of Sixth Street to the active alley. MGP-related impact was identified in a monitoring well located in the vacated Sixth Street right-of-way east of the AmerenIP property. Historical MGP activities did not occur in this area; however, the “Gas Experiment Station of the University of Illinois” was located near the northeast corner of the AmerenIP property and MGP impact appears to have migrated into the vacated Sixth Street right-of-way. In addition, a sixteen-inch diameter gas main is known to exist within the vacated Sixth Street

right-of-way. The gas main was used for the distribution of gas and is not believed to contain tar, but it will be further investigated during the Remedial Action.

2.5.10 Vacated Hill Street Right-of-Way

Although no actual MGP operations activities occurred in the Hill Street right-of-way, gas mains were located within the right-of-way and piping between various operations was buried under the street. Due to impacts identified during CSI activities in borings and test pits located within the right-of-way, Hill Street is identified as a REC. Impacts observed within the right-of-way could be from piping, incidental spillage, or migration from other MGP structures and operations.

3 IDENTIFICATION OF CONSTITUENTS OF CONCERN

This section presents the Tier 1 screening results for the site. An evaluation was performed by comparing the analytical soil and groundwater results from the CSI and the Off-Site Investigation to the Tier 1 ROs set forth in IAC Section 742. From the comparison, a site-specific list of constituents of concern (COCs) was identified. Table 3-1 presents a list of COCs identified at the remediation site. Any constituent that exceeded the Tier 1 ROs in any sample was defined as a site-specific COC. The following sections discuss the COCs in detail.

3.1 Tier 1 Evaluation

The analytical results from soil and groundwater samples were compared to the Tier 1 ROs set forth in IAC Section 742 for all potential exposure pathways and all property use scenarios. Table 3-2 provides a summary of all COCs for the remediation site by pathways, property use scenarios, and soil horizons. There are thirty-one COCs that have been identified for the remediation site.

Figure 3-1 illustrates the locations of soil borings and test pits that are included in this report.

3.2 Screening Results Summary

Results of the Tier 1 screening are discussed in the following subsections based on compound or compound group. All laboratory analytical results for soil and groundwater samples are summarized in Tables 3-3 through 3-18.

3.2.1 Volatile Organic Compounds

A total of one hundred fifty (150) soil samples collected on site were analyzed for the four BTEX constituents (benzene, toluene, ethylbenzene, and xylene) as these constituents are typically associated with MGP-related impact. Analytical results for BTEX from the CSIR and OSIR are presented in Tables 3-3 through 3-5. Seventeen soil samples were also analyzed for a full list of volatile organic compounds (VOCs). Analytical results for VOCs are presented in Tables 3-6 through 3-8. Through a Tier 1 comparison, all four BTEX constituents, acetone, methylene chloride, and styrene were identified as COCs. All four BTEX constituents are COCs for the soil inhalation and soil component to groundwater ingestion exposure pathways. Benzene is the only BTEX constituent identified as a COC for the soil ingestion pathway. Acetone, methylene chloride, and styrene are COCs for the soil component to groundwater ingestion pathway. Styrene is a COC for the indoor and outdoor inhalation exposure pathway from one location, B-507. Although acetone and methylene chloride have been identified, these constituents are not typically associated with MGP operations.

Figures 3-2 through 3-4 illustrate Tier 1 Exceedances of BTEX constituents in soil by depth interval.

Benzene, ethylbenzene, and toluene were also identified as COC for groundwater. Samples collected from wells UMW-107, UMW-110, and UMW-114, and UMW-115 have contained benzene concentrations exceeding Class I groundwater standards in quarterly sampling events since 2004. Ethylbenzene has also been identified in well UMW-114 in quarterly sampling events. Toluene concentrations exceeding the Class I groundwater standard were identified in well UMW-101 during Phase II activities; however, UMW-101 has since been abandoned. Toluene has been detected in monitoring wells UMW-107, UMW-110, UMW-114, and UMW-115 in previous sampling events; however the concentrations did not exceed the Class I groundwater standard. Groundwater analytical results for VOCs from the September 2008 sampling event are shown on Table 3-9. Analytical results from previous sampling events were presented in the CSIR.

3.2.2 Semivolatile Organic Compounds and Polycyclic Aromatic Hydrocarbons

One hundred fifty (150) soil samples were analyzed for polycyclic aromatic hydrocarbons (PAHs), and twenty-one soil samples were analyzed for a full list of semivolatile organic compounds (SVOCs). Twelve PAH constituents were identified as COCs. The twelve constituents are: acenaphthene, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluorene, indeno(1,2,3,cd)pyrene, naphthalene, and phenanthrene. Soil analytical results for PAHs are presented on Tables 3-3 through 3-5.

Two SVOCs, dibenzofuran and 2-methylnaphthalene, were also identified as COCs onsite. Dibenzofuran is a COC for the soil ingestion and soil component to groundwater ingestion exposure pathways and 2-methylnaphthalene is a COC for the indoor inhalation and soil component to groundwater ingestion exposure pathways. Analytical results for SVOCs are presented in Tables 3-10 through 3-12. Although dibenzofuran has been identified, this constituent is not typically associated with MGP operations.

Thirteen SVOCs have been identified as COC for groundwater. The July 2004 groundwater sampling event identified acenaphthylene, acenaphthene, and fluorene in four samples; naphthalene in three samples; anthracene, flouranthene, phenanthrene and pyrene in two samples; and benzo(a)anthracene in one sample. The 2008 sampling events (May, September) identified only benzo(a)anthracene, naphthalene and 2-methylnaphthalene above Class I groundwater standards. Groundwater analytical results for SVOCs for the September 2008 sampling event are presented on Table 3-13.

3.2.3 Inorganic Constituents

Soil samples were analyzed for thirteen metals and cyanide. The following subsections present a summary of the inorganic COCs that were identified for the Site. Inorganic COC were identified only in the 0 to 3 foot depth interval at the locations illustrated on Figure 3-5.

3.2.3.1 Metals

Arsenic, chromium, and lead were identified as COCs in surface soils. Arsenic and lead are COCs for the soil ingestion and soil component to groundwater ingestion exposure pathways.

Chromium is a COC for the soil component to groundwater ingestion exposure pathway only. Analytical results for metals and cyanide are presented in Tables 3-14 through 3-16. Exceedances of Tier 1 ROs for metals were only identified in the 0 to 3 foot depth interval.

Four metals (iron, lead, manganese, and nickel) have been identified to exceed the Class I groundwater standard. The groundwater sampling results for metals and cyanide for the September 2008 sampling event are included in Table 3-17.

3.2.3.2 Cyanide

Cyanide concentrations were identified in surface soil that exceed Tier 1 ROs for the soil to groundwater exposure pathway and the soil ingestion exposure pathway. Cyanide was only identified as a COC for the 0 to 3 foot depth interval. The Tier 1 ROs are based upon the potential for exposure to amenable cyanide.

Cyanide was also identified as a COC in groundwater. Concentrations in eight monitoring wells exceed the Class I Groundwater Standard for cyanide. The eight wells are UMW-104, UMW-106, UMW-107, UMW-110, UMW-113, UMW-114, UMW-115, and UMW-121.

3.2.3.3 Polychlorinated Biphenyls

Table 3-17 presents the analytical results for groundwater samples analyzed for PCBs during the September 2008 sampling event. No PCBs were identified above method detection limits.

3.2.3.4 Pesticides

Groundwater samples were also analyzed for pesticides during the September 2008 sampling event, as presented in Table 3-18. No pesticides were identified above Class I Groundwater Standards.

3.3 Criteria for Contaminant Source and Free Product

IAC Sections 742.215, 742.220, and 742.305 require an evaluation of the potential contaminant sources and free product in soil. The following sections provide a summary of the evaluation.

3.3.1 Soil Saturation Limits

The COCs that have melting points less than 30° C were compared to the tabulated soil saturation limits listed in IAC Section 742; Appendix A; Table A. The only COCs with a melting point less than 30° C are the four BTEX compounds. All detected BTEX results were compared to the soil saturation limits. Table 3-19 presents a summary of the results for COCs that exceed the soil saturation limits. Ethylbenzene concentrations at boring B-514 exceed the soil saturation limit of 400 mg/kg. Two locations, B-506 and B-507, had toluene concentrations that exceed the soil saturation limit of 650 mg/kg. Xylene concentrations exceed the soil saturation limit of 320 mg/kg at three locations: B-506, B-507, and B-514.

3.3.2 Soil Attenuation Capacity

IAC Section 742.215 requires determination of soil attenuation capacity by evaluation of natural organic carbon fraction data, TPH data and/or total organic carbon concentration (OCC). During 1996 twelve soil samples were collected from four probeholes completed onsite and were analyzed for total organic carbon using Method 415.1. Probeholes were located near the four corners of the AmerenIP property. Three samples were collected from each location; one sample from the surface soil, one from the 3 to 10 foot interval, and one from below 10 feet. Table 3-20 presents analytical results for total organic carbon (TOC) adjusted as per IAC Section 742.215(b).

Table 3-20 also presents information on soil type for the various depth intervals. All samples collected from the one foot interval were described as fill material containing coal, cinders, etc.; therefore the default value of 6,000 mg/kg was used to evaluate potential source materials from the surface soil interval (i.e. 0-3'). The default value of 2,000 mg/kg was used to evaluate potential source materials below one meter.

TPH results and total organic carbon concentration for CSI samples were compared to these TOC values. Table 3-21 presents a summary of those samples and includes location, depth, and TPH results. Based on the results presented in Table 3-21, potential source materials are present on the site at depths ranging from 4 feet to 24 feet bgs. These samples tend to represent the central and north central area of the AmerenIP property. Potential source material was identified at ten locations.

3.3.3 Reactivity

Selected soil samples collected from locations within the impacted area were analyzed for reactive cyanide and sulfide. The soil samples results were compared to the requirements set within IAC Section 721.123. No exceedances were identified.

3.3.4 Soil pH

Soil pH analyses were performed at boring locations representative of Site conditions. The calculated average site pH level is 7.5 as reported in the CSIR. The soil sample results were compared to the range in IAC Section 742.305(d). The reported pH levels are within the requirements specified in IAC Section 742.305(d).

3.3.5 Characteristics of Toxicity for Hazardous Waste

Pursuant to 40 CFR Part 261 and the Federal Register (Volume 67, Number 49 for Wednesday, March 13, 2002) and IAC Section 721.124(a), toxicity characteristic leaching procedure (TCLP) does not apply for characterizing former MGP waste as hazardous; therefore, no TCLP analyses were completed during the CSI.

3.3.6 Polychlorinated Biphenyls in Soil

No historical evidence suggests or indicates that an electrical substation was present or that equipment or materials were stored at this site that would potentially contain polychlorinated biphenyls (PCBs). Additionally, groundwater samples collected and analyzed during 2008 did not detect PCBs in groundwater beneath the site.

4 DETAILED PATHWAY EVALUATION FOR REMEDIATION OBJECTIVES

This section discusses each of the exposure pathways presented in IAC Section 742 and corresponding property use scenarios. A summary is provided discussing which soil pathways and property use scenarios have potential exposure concerns. A concern applies to any constituent that exceeds a Tier 1 RO for any potential exposure pathway and property use scenario.

4.1 Soil Ingestion Exposure Pathway

Exceedances for the soil ingestion exposure pathway were identified at locations covering the extent of the remediation Site. The most significant levels of impact are present within the former Hill Street right-of-way in areas of underground piping and on the northern portion of the Site in the proximity of the former gas holders and tar structures. Exceedances of the soil ingestion exposure pathway are present in surface soils (0 to 3 ft bgs), shallow subsurface soils (3 to 10 ft bgs), and deep subsurface soils (greater than 10 ft bgs).

Table 3-2 presents the COCs by constituent type, depth, and potential exposure pathway. Figures 6-2 through 6-10 of the CSIR illustrate the constituents, concentrations, and depth intervals of Tier 1 Exceedances by potential exposure pathway.

4.1.1 Residential Property Use Scenarios

Eleven SVOCs (nine PAHs, dibenzofuran, 2-methylnaphthalene), and benzene have been identified as COC that exceed the Tier 1 ROs for the soil ingestion exposure pathway for residential property use scenarios. All eleven SVOCs and benzene were detected above the Tier 1 RO for deep subsurface soils. Benzene, the only BTEX constituent identified as a COC for the soil ingestion pathway for residential property use, was identified at eighteen locations.

Arsenic, cyanide, and lead have also been identified as COC for the soil ingestion pathway. Exceedances are present in surface soils. Arsenic exceedances were identified at five locations on the northern portion of the Site (Hill Street north to Site boundary) and five locations in the southwestern portion of the Site. Lead was identified in one location on the northern portion of the property in the vicinity of gas holder GH-2, and in four locations in the southwest corner of the Site in the former oil tank area. Cyanide was identified at only two locations in the southwest corner of the Site.

4.1.2 Industrial/Commercial Property Use Scenarios

Six PAH constituents and benzene have been identified as COCs that exceed the Tier 1 RO for the soil ingestion exposure pathway for industrial/commercial property use scenarios. Exceedances of all six PAH constituents are present in shallow subsurface soils. Exceedanaces of five of the six PAH constituents are present in deep subsurface soils.

Benzene, the only VOC that exceeds the Tier 1 RO for soil ingestion, is present at three locations: B-506, B-507, and B-514. The exceedances are all located in deep subsurface soils (greater than 10 feet bgs). B-506 is located in the central portion of the site within the former Hill Street right-of-way. B-507 is located just east of two former tar structures in the center portion of the Site. B-514 is located in an area north of the booster house that contained underground piping.

Arsenic and lead were also identified as COC for the soil ingestion exposure pathway in surface soils. Arsenic Tier 1 RO exceedances were detected in soil samples from ten locations; eight on the northern portion of the site near the former gas holders and tar wells, and two in the southwestern corner of the Site near the former oil tanks. Lead exceedances were identified at only two locations in the southwest corner of the Site.

4.1.3 Construction Worker Scenarios

Six PAHs have been identified as COC that exceed the Tier 1 RO for the soil ingestion pathway for construction worker exposure. The six PAHs are benzo(a)anthracene, benzo(a)pyrene, benzo(b)flouranthene, dibenzo(a,h)anthracene, dibenzofuran, and naphthalene. Exceedances of all six PAH constituents are present in deep subsurface soils. Two constituents (benzo(a)pyrene and dibenzo(a,h)anthracene) are present in shallow subsurface soils, and one constituent (benzo(a)pyrene) is present in surface soils.

Lead was also identified as a COC for the soil ingestion pathway for construction worker scenarios. Exceedances of the Tier 1 RO for lead were found in two locations in the southwest corner of the Site in surface soils.

4.2 Soil Inhalation Exposure Pathway

The following sections briefly discuss the inhalation exposure pathways by property use scenario for the AmerenIP property.

4.2.1 Residential Property Use Scenarios

Benzene, ethylbenzene, toluene, naphthalene, and xylene have been identified to exceed the Tier 1 ROs for the soil inhalation exposure pathway for residential property use in deep subsurface soils. Benzene and naphthalene are the only two COC present in surface and shallow subsurface soils. Exceedances are present on the northern portion of the property in the former main area of operations, and on the southern portion of the property adjacent to former gas holder GH-3.

No other constituents were identified as COC for the inhalation exposure pathway for residential property use.

4.2.2 Industrial/Commercial Property Use Scenarios

All four BTEX constituents and naphthalene have been identified to exceed the Tier 1 RO for the soil inhalation exposure pathway for industrial/commercial property use scenarios.

BTEX and naphthalene exceedances are present in deep subsurface soils. Benzene and naphthalene are the only two COC identified in surface and shallow subsurface soils. Exceedances are present mainly on the northern portion of the Site and in one location (B-513) in the southwest corner of the site. The exceedance at B-513 was present in surface soils only.

No other constituents were identified as COC for inhalation for industrial/commercial property use scenarios.

4.2.3 Construction Worker Scenarios

All four BTEX constituents, naphthalene, and styrene have been identified as COC for the soil inhalation pathway for construction worker exposure. Tier 1 RO exceedances are present in all three depth intervals, with all six COC present in deep subsurface soils. Exceedances are located mainly on the northern portion of the Site, with two locations (UTB-21 and B-818) to the south of gas holder GH-3 on the southern Site boundary. Mercury was also identified as a COC in surface soils in multiple boring locations; however, it is not typically associated with MGP operations.

4.3 Indoor Inhalation Exposure Pathway

All four BTEX constituents, naphthalene, styrene, and 2-methylnaphthalene were identified as COC for the indoor inhalation exposure pathway for residential and industrial/commercial property use scenarios. Exceedances were identified at multiple locations across the remediation site.

4.4 Soil Component to Groundwater Ingestion Exposure Pathway

Eight VOCs, fourteen SVOCs, and four inorganic constituents have been identified as COC that exceed the Tier 1 ROs for the soil component to groundwater ingestion pathway. The impact extends across the entire remediation site in all depth intervals, with the most significant impact in deep subsurface soils. Constituents are identified in Table 3-2.

4.5 Groundwater Ingestion Pathway

Groundwater samples were collected from twenty-six monitoring wells on and around the Site in September, 2008. Samples were analyzed for VOCs, SVOCs, metals, PCBs, and pesticides. The analytical results are presented in Tables 3-9, 3-13, 3-17, and 3-18.

Benzene and ethylbenzene were the only VOCs to exceed Class I groundwater standards. Benzene exceedances were identified at six well locations: UMW-107, UMW-110, UMW-114, UMW-115, UMW-302, and UMW-304. Ethylbenzene exceedances were identified only in well UMW-114. Toluene concentrations exceeding the Class I groundwater standard were identified in well UMW-101 during Phase II activities; however, UMW-101 has since been abandoned. Toluene has been detected in monitoring wells UMW-107, UMW-110, UMW-114, and UMW-115 in previous sampling events; however the concentrations did not

exceed the Class I groundwater standard. Groundwater analytical results for VOCs are presented on Table 3-9.

Thirteen SVOCs have been identified as COC for groundwater. The 2008 sampling events (May, September) identified only benzo(a)anthracene, naphthalene and 2-methylnaphthalene above Class I groundwater standards. The July 2004 sampling event identified acenaphthylene, acenaphthene, and fluorene in four samples; naphthalene in three samples; anthracene, flouranthene, phenanthrene and pyrene in two samples; and benzo(a)anthracene in one sample. Groundwater analytical results for SVOCs for the September 2008 sampling event are presented on Table 3-13.

Four metals (iron, lead, manganese, nickel) and cyanide were identified as COC for groundwater. Iron concentrations exceed Class I groundwater standards in samples collected from five wells (UMW-107, UMW-110, UMW-113, UMW-114, and UMW-115). Nickel was identified at two locations, UMW-109 and UMW-116. Manganese exceedances were identified in samples from eleven wells, and cyanide exceedances were identified in samples from eight well locations. Groundwater analytical results for metals are presented on Table 3-17.

No PCBs or pesticides were identified as COC for groundwater. Groundwater analytical results for PCBs are presented on Table 3-17, and analytical results for pesticides are on Table 3-18.

Figure 4-1 illustrates the locations of the groundwater monitoring wells and the constituents that exceeded Tier 1 ROs for the most recent sampling event.

5 TIER 2 AND TIER 3 EVALUATIONS

Any soil impact greater than 10 feet below ground surface that exceeds project ROs following remedial actions will be evaluated using Tier 2 ROs. As permitted in IAC Sections 742.600 and 742.900, site-specific input parameters will be used to establish Tier 2 ROs. The Tier 2 evaluation will be utilized to estimate the potential downgradient migration of impact. If downgradient migration is determined, the potentially affected property owners will be notified.

6 PROPOSED PATHWAY EXCLUSIONS

Impact is present on the AmerenIP property that exceeds Tier 1 ROs for the soil ingestion, the soil inhalation, indoor inhalation, the soil component to groundwater ingestion, and the groundwater ingestion exposure pathways. The impact exceeds the ROs for residential property use, industrial/commercial property use, and construction worker scenarios. The following section provides a description of how the COCs for each exposure route will be addressed in order to meet the requirements for a NFR letter.

6.1 Soil Ingestion Exposure Pathway

All soil impact above the most stringent Tier 1 ROs discussed in Section 7.1 within the top 10 feet of ground surface will be addressed through soil removal and disposal. AmerenIP will then perform in-situ chemical oxidation to remediate impact deeper than 10 feet bgs that also exceeds the site remediation objectives. A Class V Injection Well Inventory Form will be submitted to the IEPA prior to the in-situ chemical oxidation activities. It is anticipated that the in-situ chemical oxidation will either completely address the impact or significantly reduce impact levels. If impact above the project ROs remains after completion of removal activities and in-situ chemical oxidation, AmerenIP will use the 10 feet of clean back fill material as an engineered barrier to exclude this pathway. A full description and discussion of the excavation areas and the in-situ chemical oxidation method will be provided in the RAP.

6.2 Soil Inhalation Exposure Pathway

All soil impact above the most stringent Tier 1 ROs discussed in Section 7.1 within the top 10 feet of ground surface will be addressed through soil removal and disposal. AmerenIP will then perform in-situ chemical oxidation to remediate impact deeper than 10 feet bgs that also exceeds the site remediation objectives. A Class V Injection Well Inventory Form will be submitted to the IEPA prior to the in-situ chemical oxidation activities. It is anticipated that the in-situ chemical oxidation will either completely address the impact or significantly reduce impact levels. If impact above the project ROs remains after completion of removal activities and in-situ chemical oxidation, AmerenIP will use the 10 feet of clean back fill material as an engineered barrier to exclude this pathway. A full description and discussion of the excavation areas and the in-situ chemical oxidation method will be provided in the RAP.

6.3 Indoor Inhalation Exposure Pathway

All soil impact above the most stringent Tier 1 ROs discussed in Section 7.1 within the top 10 feet of ground surface will be addressed through soil removal and disposal. AmerenIP will then perform in-situ chemical oxidation to remediate impact deeper than 10 feet bgs that also exceeds the site remediation objectives. A Class V Injection Well Inventory Form will be submitted to the IEPA prior to the in-situ chemical oxidation activities. It is anticipated that the in-situ chemical oxidation will either completely address the impact or significantly

reduce impact levels. If impact above the project ROs remains after completion of removal activities and in-situ chemical oxidation, AmerenIP will use the 10 feet of clean back fill material as an engineered barrier to exclude this pathway. A full description and discussion of the excavation areas and the in-situ chemical oxidation method will be provided in the RAP.

6.4 Soil Component to Groundwater Exposure Pathway

All impacted soil present at the remediation site that remains (following remedial actions) at concentrations above the Tier 1 RO for the soil component to groundwater ingestion will be addressed through Tier 2 evaluations, the use of an institutional control in the form of the groundwater ordinance, and notification(s) to the downgradient property owners.

6.5 Groundwater Ingestion Exposure Pathway

All impacted groundwater above the Tier 1 ROs will be addressed through Tier 2 evaluations, the use of an institutional control in the form of the groundwater ordinance, and notification(s) to the downgradient property owners.

6.6 Addressing Source Material

In areas where source material is present, the soil will be addressed using excavation and disposal or by in-situ chemical treatment. A Class V Injection Well Inventory Form will be submitted to the IEPA prior to the in-situ chemical oxidation activities. No source material will remain on the remediation site.

7 PROJECT REMEDIATION OBJECTIVES AND REMEDIAL MEASURES

AmerenIP has elected to remove or treat impacted soil on the remediation site to the most stringent Tier 1 ROs outlined in IAC Section 742 for any property use scenario or to the IEPA accepted background levels for metropolitan statistical areas except as follows:

- The City of Champaign is currently working on a groundwater use prohibition ordinance that will be acceptable to the IEPA. AmerenIP will not remediate any soil that exceeds a Tier 1 RO for the soil component to groundwater ingestion but is also less than a Tier 1 RO for all remaining exposure pathways and property use scenarios.

- Groundwater impact will not be addressed. The City of Champaign is currently working on a groundwater ordinance that prohibits the use of groundwater and will be acceptable to the IEPA. AmerenIP will use the ordinance as an institutional control that prevents the exposure to groundwater. AmerenIP will provide notification to potentially affected downgradient property owners. This will be based on Tier 2 ROs calculated after remedial actions have been completed utilizing post-remedial groundwater data.

7.1 Project Remediation Objectives for Soil

AmerenIP intends to perform remedial actions to address all soil impact that exceeds a Tier 1 RO for soil ingestion or soil inhalation for any property use scenario. AmerenIP will also incorporate the accepted background values for selected PAHs as permitted in IAC Section 742. To establish site remediation objectives, all Tier 1 ROs for soil inhalation and ingestion for all property use scenarios were tabulated. The more stringent of the ROs were selected as the project ROs. The project ROs are summarized in Table 7-1. These project ROs will be used as the objectives for the remedial actions.

7.2 Project Remediation Objectives for Source Material

Potential source material is present on site as discussed in Sections 3.3.2 and 6.6 of this document. AmerenIP intends to remove the material to the maximum extent practicable as stated in IAC 742.320(b). As previously stated in this report, all impact within the top 10 feet of ground surface will be addressed through soil removal and disposal; however, if source material is present below ten feet it will be excavated to the extent achievable by the excavation equipment. If source material remains after the maximum excavation depth is reached, in-situ chemical oxidation will be performed.

7.3 Project Remediation Objectives for Groundwater

Constituents are present in soil at concentrations that exceed the Tier 1 ROs for the soil component to groundwater ingestion. Constituents are also present in groundwater at

concentration exceeding Tier 1 ROs and groundwater quality standards. This potential exposure pathway will be excluded through the use of the Champaign groundwater use ordinance that prohibits the use of groundwater and the installation of potable water wells within the city limits. Tier 2 evaluations will be performed (following remedial actions) that estimate the potential downgradient migration of impact. If off-site migration is determined, the potentially affected property owners will then be identified. After receipt of the Comprehensive NFR letter, AmerenIP will notify the potentially affected parties of the possible presence or future presence of groundwater impact to their properties. The use of the Champaign ordinance should effectively exclude soil component to groundwater ingestion and the groundwater ingestion exposure pathways.

7.4 Soil Removal

All impacted soil above project ROs within the top 10 feet of ground surface will be removed, transported to a licensed disposal facility, and properly disposed. The excavated areas will be backfilled with clean fill from an off-site source. The details of the removal depths and areas are outlined in the RAP presented in conjunction with this ROR.

7.5 In-Situ Chemical Oxidation

Impacted soil above project ROs below 10 feet of ground surface will be addressed through chemical oxidation. Soil will be remediated to project ROs outlined in Section 7.1. A Class V Injection Well Inventory Form will be submitted to the IEPA prior to the in-situ chemical oxidation activities. The details of the in-situ chemical oxidation process are outlined in the RAP.

7.6 Engineered Barriers

Subsurface impact will be remediated to the project ROs outlined in Section 7.1 and listed in Table 7-1. Any soil impact greater than 10 feet bgs that remains in place and exceeds a site RO will be excluded through the use of an engineered barrier. The barrier will consist of at least 10 feet of clean soil from an off-site source.

7.7 On-Site Institutional Controls

Subsurface impact will be remediated to the project ROs outlined in Section 7.1 and listed in Table 7-1. Remediation to these ROs will require the use of institutional controls that restrict use of the property and prohibit use of the groundwater underlying the property. Any soil that remains in place that is excluded through the use of the engineered barrier will require an institutional control stating that the barrier must be maintained.

7.8 Groundwater Prohibition Ordinance

Constituents are present in soil at concentrations that exceed the Tier 1 ROs for the soil component to groundwater ingestion. Constituents are also present in groundwater at

concentrations exceeding Tier 1 ROs and groundwater quality standards. This potential exposure pathway will be excluded through the use of the Champaign groundwater use ordinance that prohibits the use of groundwater and the installation of potable water wells within the city limits. Tier 2 evaluations will be performed following remedial actions that estimate the potential downgradient migration of impact. After off-site migration is estimated, the potentially affected property owners will then be identified. After receipt of the Comprehensive NFR letter, AmerenIP will notify the potentially affected parties of the possible presence or future presence of groundwater impact to their properties. The use of the Champaign ordinance should effectively exclude soil component to groundwater ingestion and the groundwater ingestion exposure pathways.

7.9 Highway Authority Agreements

Subsurface impact will be remediated to the project ROs outlined in Section 7.1. Remediation to these ROs will not require the use of HAAs.

7.10 Technical and Practical Feasibility

The selected approaches for addressing the soil and groundwater impact at the remediation site are both technically and practically feasible. Soil remediation through excavation/disposal and in-situ chemical oxidation are accepted methods and can readily achieve the remediation objectives of addressing impact to the most stringent ROs.

8 SUMMARY AND CONCLUSIONS

Subsurface soil and groundwater impact is present on the AmerenIP property located at 308 North 5th Street in Champaign, Illinois. The remediation site is depicted in Figure 1-2.

Subsurface soil and groundwater impact will be addressed to meet the requirements for No Further Remediation as outlined in IAC Section 742. The project ROs established are the most stringent Tier 1 ROs for any property use scenario or IEPA accepted background levels for metropolitan statistical areas as outlined in IAC Section 742. All impact within the top 10 feet of ground surface that exceeds project ROs will be removed and properly disposed. Areas containing source material will be excavated to the maximum extent achievable by the excavation equipment. In-situ chemical oxidation will be used to address impact deeper than 10 feet. If required, an engineered barrier in the form of 10 feet of clean soil will be used to exclude the ingestion and/or inhalation pathways. Tier 2 evaluations will be calculated for the soil and compared to groundwater and groundwater ingestion pathways following remedial actions. The Tier 2 evaluations will be performed to identify the projected downgradient migration in groundwater and potentially affected property owners. An IEPA approved groundwater ordinance will be used to exclude the groundwater ingestion pathway.

The implementation of the proposed remedial actions in conjunction with necessary barriers and controls will exclude all potential exposure pathways. AmerenIP will have met the requirements for a comprehensive NFR letter for this remediation site.

9 ILLINOIS LICENSED PROFESSIONAL ENGINEER REVIEW

For those portions of the work performed before my involvement:

I have reviewed documentation of the prior investigation activities and believe the documentation is suitable for compliance with 35 Ill. Adm. Code 740.

For those portions of the work performed during my involvement:

I attest that all site investigation activities performed during my involvement were performed with my input and direction and that this document and all attachments were prepared under my direction or reviewed by me; and, to the best of my knowledge and belief, the work described in this report has been completed in accordance with 35 Ill. Adm. Code 740, developed in conjunction with the use of accepted engineering standards, and the information presented is accurate and complete.

Signature: _____

Derek D. Ingram, P.E.
Licensed Professional Engineer

Date: _____

License No.: _____

License Expiration Date: _____

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