Engeman, Diana

From: Kevin Armstrong [Kevin.G.Armstrong@us.mwhglobal.com]
Sent: Tuesday, May 28, 2013 4:40 PM
To: Engeman, Diana
Subject: RE: PNG alternatives table
Attachments: PNG Alternatives Summary Table revised 052813.docx

Diana,
Attached is a revised alternatives table for PNG. I added a "project duration" category under the "Cost" criteria. Let me know if that provides the information you need or if you need something else.

Thanks,
Kevin

From: Engeman, Diana [mailto:Engeman.Diana@epa.gov]
Sent: Thursday, May 16, 2013 10:43 AM
To: Kevin Armstrong
Subject: PNG alternatives table

TABLE 1

SUMMARY OF DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES FOR GROUNDWATER
MIDAMERICAN ENERGY COMPANY
PEOPLES NATURAL GAS SITE
DUBUQUE, IOWA

Criteria	Alternative 2 Institutional Controls and Additional Excavation	Alternative 3 Institutional Controls and In Situ Solidification	Alternative 4 Institutional Controls and In Situ Thermal Treatment	Alternative 5 Institutional Controls and Monitored Natural Attenuation	Alternative 6 Institutional Controls, Hydraulic Containment System, and Monitored Natural Attenuation
OVERALL PROTECTIVENESS					
Groundwater Ingestion for Existing Users	High because no existing users to protect.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Groundwater Ingestion for Future Users	High because institutional controls prohibit use of groundwater.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Environmental Protection	Moderate. DNAPL and groundwater plume contained by site geology. Low to moderate if the LCU is damaged.	Moderate. DNAPL and groundwater plume contained by site geology. Low to moderate if the LCU is damaged and/or created area of low permeability changes flow paths.	Same as Alternative 2.	Moderate. DNAPL and groundwater plume contained by site geology.	Moderate. DNAPL contained by site geology. Downgradient plume migration controlled by hydraulic containment system.
COMPLIANCE WITH ARARs					
Chemical-Specific	ARARs for accessible soil could be achieved. ARARs for groundwater would take in excess of a thousand years.	Same as Alternative 2.	Same as Alternative 2.	ARARs not likely achieved in a reasonable timeframe. Natural attenuation processes will reduce the overall contaminant mass over time.	Same as Alternative 5.
Action-Specific	None identified.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Location-Specific	None identified.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Other	None identified.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
LONG-TERM EFFECTIVENESS					
Magnitude of Residual Risk	The low potential for future use of groundwater near the site remains. Restrictions on accessing contaminated groundwater will remove exposure risk.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Adequacy and Reliability of Control	Multiple layers of protection: existing IDNR rules and Environmental Covenants. Contaminant mass removed through excavation.	Multiple layers of protection: existing IDNR rules and Environmental Covenants. Contaminant mass immobilized by in situ solidification.	Multiple layers of protection: existing IDNR rules and Environmental Covenants. Contaminant mass volatilized and/or mobilized for extraction by in situ thermal treatment.	Multiple layers of protection: existing IDNR rules and Environmental Covenants. MNA increases reliability of predicting future plume concentrations, assessment of plume size and applicability of institutional controls.	Multiple layers of protection: existing IDNR rules and Environmental Covenants. MNA increases reliability of predicting future plume concentrations, assessment of plume size and applicability of institutional controls. Hydraulic containment system reduces potential for off-site migration of groundwater plume.
Need for 5-Year Review	Review required to ensure adequate protection of human health and environment.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
REDUCTION IN TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT					
Treatment Process and Materials Treated	Excavation of accessible soil contaminant mass.	Solidification of accessible soil and groundwater contaminant mass.	Extraction and volatilization of accessible contaminant mass.	None.	Extracted groundwater would be treated at the WRRC by screening, grit removal, primary treatment, secondary treatment by the oxygen activated sludge process, final clarification and ultraviolet disinfection.
Amount of Hazardous Materials Destroyed or Treated	65% of the total remaining contaminant mass will be removed. 206,230 pounds of contaminant mass remains. DNAPL will remain and mobilization is possible.	65% of the total remaining contaminant mass will be immobilized but not destroyed. 206,230 pounds of contaminant mass remains mobile. DNAPL will remain and mobilization is possible.	59% of the total remaining contaminant mass will be removed. 252,620 pounds of contaminant mass remains. DNAPL will remain and mobilization is possible.	None.	A relatively small mass of dissolved compounds would be extracted by the hydraulic containment system, with subsequent treatment at the WRRC. In addition, natural attenuation processes would gradually reduce contaminant concentrations.

TABLE 1 (CONTINUED)

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REDUCTION IN TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT (CONTINUED)					
Degrees of Expected Reduction	Untreated source material would remain in the inaccessible area beneath the city maintenance garage, along the 30-inch sanitary sewer force main, and within the Highway Corridor area, leaving an on-going source for groundwater contamination.	None.	Temperatures are limited to 212°F. Approximately 41% of the estimated 614,290 pounds of contaminant mass remaining at the site is present under Highway 61 or remains east of the City maintenance garage as residual DNAPL or adsorbed material.	None.	Although some contaminant mass will be removed by the hydraulic containment system, the overall reduction is expected to be small.
Degree to which Treatment is Reversible	Mass removal is irreversible but may mobilize DNAPL. DNAPL will remain as an on-going source for groundwater contamination.	Immobilization is irreversible. Low permeability may encourage mobilization of DNAPL. DNAPL will remain as an on-going source for groundwater contamination.	Thermal treatment of contaminant mass is irreversible. The DNAPL may be mobilized. DNAPL will remain as an on-going source for groundwater contamination.	None.	The small amount of contaminant mass removed by the hydraulic containment system is irreversible. However, continued downgradient migration would be expected if the system were to be shut off.
Type/Quantity of Residuals	206,230 pounds of untreated source material would remain in the inaccessible area beneath the city maintenance garage, along the 30-inch sanitary sewer force main, and within the highway corridor area.	Same as Altemative 2.	225,620 pounds of untreated source material would remain present under Highway 61 and east of the city maintenance garage as residual DNAPL or adsorbed material. This untreated source material is either inaccessible to in situ thermal treatment and/or not susceptible to treatment due to the temperature limitation of 212°F.	Current conditions persist with natural degradation.	Current conditions persist with natural degradation.
Statutory Preference for Treatment	Does not satisfy for inaccessible areas of the site. Alternative 3 would satisfy the preference by reducing the contaminant mass in the accessible soil by 66% of the total site contaminant mass.	Does not satisfy for inaccessible areas of the site. Alternative 4 would satisfy the preference by irreversibly reducing contaminant mobility in accessible soil and groundwater by 66% of the total site contaminant mass.	Does not satisfy for inaccessible areas of the site. Alternative 5 would satisfy the preference by destroying and reducing the contaminant mass in accessible soil by 59% of the total site contaminant mass.	Does not satisfy.	Satisfies preference for treatment for the small amount of contaminant mass removed by the hydraulic containment system. Does not satisfy for remainder of site contaminants.
SHORT-TERM EFFECTIVENESS					
Protection of Community During Remedial Actions	Minor, controllable exposure risks from excavated soil and vapor migration.	Minor, controllable exposure risks from soil cuttings and vapor migration.	Minor, controllable exposure risks from soil cuttings, extracted groundwater and vapor migration.	Risk to community by remedy is not increased.	Minor, controllable risks during construction outside of the fenced portion of the site. Minor, controllable exposure risks from extracted groundwater.
Protection of Workers During Remedial Actions	Risks controlled through use of PPE and Standard Operating Procedures.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Environmental Impacts	LCU may be damaged allowing DNAPL to migrate into the alluvial aquifer. Excavation may facilitate DNAPL migration.	LCU may be damaged allowing DNAPL to migrate into the alluvial aquifer. Low permeability area may alter groundwater flow direction locally.	LCU may be damaged allowing DNAPL to migrate into the alluvial aquifer. Heated soil may facilitate DNAPL migration.	No short-term environmental impact.	LCU may be damaged during well installation allowing DNAPL to migrate into the alluvial aquifer. Groundwater extraction may induce DNAPL migration by increasing hydraulic gradient.
Time until RAOs Achieved	As soon as restrictions are in place.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
IMPLEMENTABILITY					
Ability to Construct and Operate the Technology	Difficult. Equipment and process is common but there is a large volume of overburden to remove and excavators must protect LCU.	Difficult. Equipment and process is specialized. The treatment process is relatively complex.	Difficult. Equipment and process is uncommon for FMGP sites. The treatment process is relatively complex.	Easy. Monitoring wells already installed and groundwater sampling previously conducted at the site.	Moderate. Monitoring wells already installed and groundwater sampling previously conducted at the site. Hydraulic containment system equipment and process is common.
Ability to Construct and Operate the Technology	Difficult. Equipment and process is common but there is a large volume of overburden to remove and excavators must protect LCU.	Difficult. Equipment and process is specialized. The treatment process is relatively complex.	Difficult. Equipment and process is uncommon for FMGP sites. The treatment process is relatively complex.	Easy. Monitoring wells already installed and groundwater sampling previously conducted at the site.	Moderate. Monitoring wells already installed and groundwater sampling previously conducted at the site. Hydraulic containment system equipment and process is common.

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IMPLEMENTABILITY (CONTINUED)					
Reliability	High. Multiple layers of protection and appropriate authorities notified. Excavation equipment is reliable.	Moderate. Multiple layers of protection and appropriate authorities notified. Equipment reliable.	Moderate. Multiple layers of protection and appropriate authorities notified. Equipment is reliable, but untested at an FMGP site.	High. Multiple layers of protection and appropriate authorities notified. Monitoring ensures current plume conditions are known.	High. Multiple layers of protection and appropriate authorities notified. Operation of hydraulic containment system is mature technology. Poor water quality will require on-going maintenance to control scaling and biofouling of system. Monitoring provides current data on plume conditions.
Ease of Undertaking Additional Remedial Action if Necessary	Difficult. Access to the remaining contamination limited by the LCU, maintenance garage and highway corridor.	Difficult. Solidified areas of the site not easily penetrated. Access to the remaining contamination limited by the LCU, maintenance garage and highway corridor.	Possible, but restricted by conveyance piping and well layout during implementation. Access to the remaining contamination limited by the LCU, maintenance garage and highway corridor.	High.	High.
Ability to Monitor Effectiveness	New well permits could easily be verified to be outside of known area of contamination. Groundwater monitoring used to ensure impacted areas are addressed.	New well permits could easily be verified to be outside of known area of contamination. Groundwater monitoring used to ensure impacted areas are addressed.	New well permits could easily be verified to be outside of known area of contamination. Groundwater monitoring used to ensure impacted areas are addressed.	New well permits could easily be verified to be outside of known area of contamination. MNA increases predictability of future concentrations.	New well permits could easily be verified to be outside of known area of contamination. MNA increases predictability of future concentrations. Effectiveness of the hydraulic containment system monitored by groundwater extraction rates.
Ability to Obtain Approvals from other Agencies	High.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Coordination with Other Agencies	Required coordination with city, county and IDNR for implementation of institutional controls plus excavation permits.	Same as Alternative 2 plus groundwater discharge permits and building permits.	Same as Alternative 3 plus air discharge permits.	Required coordination with city, county and IDNR for implementation of institutional controls.	Required coordination with city, county and IDNR for implementation of institutional controls; and the WRRC for POTW Industrial Wastewater Discharge Permit.
Availability of Off-Site Treatment/Disposal	Required coordination for off-site treatment/disposal of impacted soil.	Not applicable.	Same as Alternative 2.	Not applicable.	Treatment available at WRRC.
Availability of Necessary Equipment/Specialists	Readily available.	Potential for low availability as it is not a common technology.	Potential for low availability as there is only one licensed contractor.	Same as Alternative 2.	Same as Alternative 2.
Availability of Prospective Technologies	Commonly utilized.	Available technology, but will require bench-scale testing.	Same as Alternative 2, but not specifically for FMGP contaminants. Pilot scale testing may be required.	Same as Alternative 2.	Same as Alternative 2.
COST					
Project Duration	Moderate construction duration.	Moderate construction duration.	Long construction duration.	Short construction duration; ongoing operation and maintenance.	Moderate construction duration; ongoing operation and maintenance.
Capital, Operation & Maintenance, Present Worth Cost (7% discount rate)	$2,394,000	$3,711,000	$3,416,000	$523,000	$1,706,000

Notes:

% = Percent
°F = Degrees Fahrenheit
ARAR = Applicable or Relevant and Appropriate Requirements
City = City of Dubuque
DNAPL = Dense nonaqueous phase liquid
FMGP = Former Manufactured Gas Plant
IDNR = Iowa Department of Natural Resources
LCU = Lower Confining Unit
MNA = Monitored natural attenuation
POTW = Publically Owned Treatment Works
PPE = Personal protective equipment
RAOs = Remedial action objectives
U.S. = United States
WRRC = Water and Resource Recovery Center