SITEWIDE GROUNDWATER (OU1)
BASIS OF DESIGN

CONTINENTAL STEEL SUPERFUND SITE
Kokomo, Indiana

Remedial Design

WA No. 122-RDRD-05BW/ Contract No. 68-W6-0025

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Abbreviations and Acronyms

ACM	asbestos-containing material
ARAR	Applicable or Relevant and Appropriate Requirements
ALR	action leakage rate
BOD	Basis of Design
CAA	Clean Air Act
CAMU	Corrective Action Management Unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	contaminant of concern
CQAP	Construction Quality Assurance Plan
CSSS	Continental Steel Superfund Site
CWA	Clean Water Act
DCR	Design Criteria Report
DOT	Department of Transportation
FML	flexible membrane liner
GCL	geosynthetic clay liner
HDPE	high-density polyethylene
HMTA	Hazardous Materials Transportation Act
HSWA	Hazardous and Solid Waste Amendments of 1984
HZE	Hub-Zone Enterprise
IAC	Indiana Administrative Code
IDEM	Indiana Department of Environmental Management
LBP	lead-based paint
LCL	leachate collection layer
LCS	leachate collection system
LDL	leak detection layer
LDR	Land Disposal Restriction
LDS	Leak Detection System
MW	monitoring well
NCP	National Contingency Plan
NOI	Notice of Intent
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
OVA	organic vapor analyzer

PAH	polyaromatic hydrocarbon
PCB	polychlorinated biphenyl
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act of 1976
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act of 1986
SBE	Small Business Enterprise
SDBE	Small Disadvantaged Business Enterprise
SDWA	Safe Drinking Water Act
SMP	Site Management Plan
SOW	Statement of Work
START	Superfund Technical Assistance Response Team
SVE	soil vapor extraction
SVOC	semivolatile organic compound
TBC	to be considered
TCL	target compound list
TCLP	Toxicity Characteristic Leaching Procedure
TI	Technical Impracticality (waiver)
TSCA	Toxic Substances Control Act
UCL	upper confidence limit
USC	United States Code
USEPA	United States Environmental Protection Agency
UST	underground (storage) tank
UTS	Universal Treatment Standard
VFD	variable frequency drive
VOC	volatile organic compound
WOB	Women-Owned Business
WWTP	wastewater treatment plant

Introduction

CH2M HILL has prepared this Basis of Design (BOD) Report for the Continental Steel Superfund Site (CSSS) Sitewide Groundwater (OU1) for the United States Environmental Protection Agency (USEPA) under Contract No. 68-W6-0025. This is in accordance with the Statement of Work (SOW) in the Record of Decision[1] (ROD), issued September 1998, and the Remedial Design/Remedial Action (RD/RA) Handbook, issued June 1995.[2] This BOD Report is divided into the following sections:

- Introduction
- Project Delivery Strategy
- Design Approach, Assumptions, and Parameters
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
- Construction Schedule
- Cost Estimate
- Biddability, Constructibility, and Operability Review
- Tables
- Figures
- Appendixes

The appendixes included in this BOD Report provide supplemental information integral to the design of the selected remedy. They consist of:

- Appendix A: Monitoring Well and Piezometer Installation—Technical memorandums discussing the installation of wells during the predesign investigation.
- Appendix B: Aquifer Pump Test—Technical memorandums discussing the aquifer pump tests conducted during the predesign investigation.
- Appendix C: Groundwater Sampling—Technical memorandums discussing groundwater sampling during the predesign investigation and evaluation of the analytical results.
- Appendix D: Well Spacing Calculations—Technical memorandums discussing well spacing and groundwater modeling performed for engineering purposes only.
- Appendix E: M-CACES Cost Estimate—A cost estimate with an accuracy of +15 to -5 percent in M-CACES format.

This report discusses the RA for the shallow, intermediate, and lower water-bearing zones; however, the RD contract documents (i.e., design specifications and drawings) are only for the shallow water-bearing zone. The design specifications and drawings that accompany this report have been included as separate submittals. A Construction Quality Assurance

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[1] USEPA/IDEM. *Record of Decision: Continental Steel Corporation Superfund Site.* Kokomo, Howard County, Indiana. September 1998.

[2] USEPA: *Remedial Design/Remedial Action Handbook (EPA 540/R-95/059).* June 1995.

Plan (CQAP) and a Draft Operations and Maintenance (O&M) Manual will be submitted at a later date. The separate design specification and drawing submittal includes all of the drawings cited in this report.

Site History

A detailed history of Continental Steel can be found in the RI/FS[3] and the ROD.[4] Throughout its history, the facility produced nails, wire, and wire fence from scrap metal. Operations included reheating, casting, rolling, drawing, pickling, annealing, hot-dip galvanizing, tinning, and oil tempering. The steel manufacturing operations included the use, handling, storage, and disposal of hazardous materials. For purposes of the RI/FS and the RD/RA, the site was divided into six operable units (OUs):

- OU1—Sitewide Groundwater
- OU2—Lagoon Area
- OU3—Kokomo and Wildcat Creeks
- OU4—Markland Avenue Quarry
- OU5—Main Plant
- OU6—Slag Processing Area

Site Description

The CSSS (Figure 1) is on West Markland Avenue in the City of Kokomo (Township 23 North, Range 3 East and Township 24 North, Range 3 East), Howard County, Indiana. The site covers 183 acres and includes an abandoned steel manufacturing facility (Main Plant), pickle-liquor treatment lagoons (Lagoon Area), a former waste disposal area (Markland Avenue Quarry), and a former waste disposal and slag processing area (Slag Processing Area). It is within a mixed residential, commercial, and industrial area zoned mainly for general use. Residential properties lie predominantly east and southeast of the site; mixed residential and industrial areas, north and west; and industrial properties, south. The closest residences to the plant are within 100 ft east of the site, near the property fence line along South Leeds Street, and south of the Main Plant across Kokomo Creek. Highland Park, a public recreation area for local residents, is south of the Main Plant just across Kokomo Creek and immediately adjacent to the CSSS property south of Kokomo Creek.

The three aquifers under the site are differentiated by their water-bearing capacity, which is directly determined by their geologic structure or stratigraphy. They have been classified as the shallow, intermediate, and lower aquifers or water-bearing zones. These aquifers have been further separated into two categories: (1) those underlying source contaminant areas and (2) those NOT underlying source contaminant areas. Sitewide Groundwater (Figure 1) includes a large area and quantity of affected groundwater from all three water-bearing zones. Groundwater appears to have also received contaminants from the Main Plant, the

[3] Camp Dresser & McKee Inc. *Feasibility Study: Continental Steel Corporation Superfund Site.* Kokomo, Howard County, Indiana. February 28, 1997.

[4] USEPA/IDEM. *Record of Decision: Continental Steel Corporation Superfund Site.* Kokomo, Howard County, Indiana. September 1998.

Markland Avenue Quarry, the Lagoon Area, and/or other areas related to the site, and disposal of hazardous materials.

Groundwater generally flows to the west; however, groundwater flow within each zone may vary according to localized and regional influences, particularly in the shallow zone. The intermediate and lower water-bearing zones are largely influenced by preferential flow through the fractures in the limestone bedrock underlying the site. These fractures serve as conduits through which groundwater can easily flow. The shallow water-bearing zone is influenced mostly by the surface waters, which mostly consist of the Wildcat and Kokomo Creeks. Groundwater flow in the intermediate water-bearing zone on the site's eastern two-thirds is due west with a horizontal gradient of 0.01. Hydraulic influence from large-quantity groundwater pumping operations at the Martin Marietta Quarry, west of the Slag Processing Area (OU6; Figure 1), is first observed near the Slag Processing Area (OU6), where the hydraulic gradient increases to 0.02.

Selected Remedy—Sitewide Groundwater (OU1)

Record of Decision

The purpose of USEPA's ROD[5] was to select the final RA for the CSSS. The final remedy will control the sources of contamination and prevent further migration of the contaminants. The selected remedy for sitewide groundwater (OU1) includes:

- Collecting intermediate and lower groundwater at Martin-Marietta Quarry to contain contaminants within current boundaries
- Disposing of groundwater collected from the Martin-Marietta Quarry offsite
- Collecting shallow groundwater and offsite disposal at the Kokomo Wastewater Treatment Plant (WWTP)
- Allowing natural attenuation
- Invoking a TI waiver
- Imposing groundwater use restrictions

Description of the ROD—Selected RA

According to the ROD, the RA will include collection of the shallow groundwater using extraction wells installed along the creeks or within the groundwater contamination plumes. Extracted groundwater will be discharged through underground piping directly to the City's sanitary sewer system for offsite treatment and disposal at the Kokomo WWTP. This report documents the details of this portion of the RA. The intermediate and lower water-bearing zones will be addressed through continued operation of the Martin-Marietta Quarry, instead of installing up to 300 separate extraction wells to address the deeper parts of the plumes.

The intermediate and lower groundwater discharges directly to Wildcat Creek under a regulated discharge permit. The purpose of collecting the intermediate and lower groundwater is to dewater the quarry for production operations. The RA will take

[5] USEPA/IDEM. *Record of Decision: Continental Steel Corporation Superfund Site.* Kokomo, Howard County, Indiana. September 1998.

advantage of the dewatering pumping to prevent groundwater contaminant migration outside its current boundaries.

A technical impracticality (TI) waiver for the intermediate and lower water-bearing zones will be invoked as part of the proposed RA, since active remediation will not be part of the remedy. Section 6.5 of the FS[6] presents the justification for the TI waiver. Based on modeling predictions, it would be no more effective to collect and treat the intermediate and lower water-bearing zone groundwater than to allow nature to take its course. Therefore, contamination in the intermediate and lower aquifers will be allowed to naturally attenuate. Collection of the intermediate and lower groundwater by the Martin-Marietta Quarry pump station will continue in order to keep the contaminants within their current boundaries (containment only). The predicted operational life of the Martin-Marietta Quarry is 35 years, beyond which, IDEM will assume operation of the pumping station until the ARARs are achieved.

The remedies for both the shallow and intermediate/lower water-bearing zones will continue until contamination is below the remediation goals. The groundwater model used in the FS[7] predicts that the area of contaminated groundwater exceeding drinking water standards will stay within existing boundaries, thus controlling and containing contaminant migration. As part of addressing the shallow zone, groundwater use restrictions will be required for the source areas and offsite areas where groundwater contamination extends downgradient of treatment/containment system capture zones established by the source control groundwater alternatives.

Based on modeling results, the groundwater use restrictions for the downgradient contaminated groundwater areas will be required for about 40 years, until the offsite and downgradient groundwater contamination will have naturally attenuated. It is important to note that the predicted time for the intermediate and lower groundwater to achieve ARARs is more than 200 years, whether the groundwater contamination is allowed to naturally attenuate, migrate to the quarry for collection, or active collection is proposed. DNAPL recovery from porous, fractured bedrock historically has been poor (National Research Council, 1994).

Groundwater will be monitored quarterly for 2 years, semiannually for the following 2, and annually thereafter for an indefinite period or until compliance with ARARs is attained. Thirty new monitoring wells were installed as part of the predesign activities to complement the sitewide groundwater monitoring well network. Additional domestic drinking water well sampling may be performed during the RD to evaluate continued monitoring during the RA.

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[6] Camp Dresser & McKee Inc. *Feasibility Study: Continental Steel Corporation Superfund Site.* Kokomo, Howard County, Indiana. February 28, 1997.

[7] Ibid

CH2M HILL RD/RA Implementation Strategy

In 2000, CH2M HILL reviewed the proposed RA activities at the six OUs and formulated an RA strategy that aggregates similar types of activities proposed for the various OUs into manageable contracts,[8] namely:

- Contract 1—Lagoon Solids Excavation and Consolidation
- Contract 2—Wildcat and Kokomo Creeks Sediment Removal
- Contract 3—Markland Avenue Quarry Sediment Excavation
- Contract 4—Backfill and Capping/Covers
- Contract 5—Groundwater

Contract 5—Groundwater

The RA presented in the Technical Assistance document[9] is being slightly revised after CH2M HILL proposed to USEPA and IDEM to modify the areas targeted for shallow groundwater extraction and treatment based on the information collected as part of the 2001 predesign investigation activities and the proposed RAs for individual OUs that result in the removal of source areas.

Predesign Investigation Activities

Predesign field investigation activities were performed in August and November 2001 to gather additional data for the groundwater preliminary design. These included:

- Monitoring well and piezometer installation
- Groundwater sampling
- Aquifer pump tests
- Groundwater modeling

The procedures, analyses, data, and data evaluation of the samples collected during the predesign investigation for sitewide groundwater are discussed in the following appendixes:

- Appendix A—Monitoring Well and Piezometer Installation Documentation
- Appendix B—Aquifer Pump Test Documentation
  - Attachment B-1—Aquifer Pumping Tests
  - Attachment B-2—Aquifer Test Analysis
- Appendix C—Groundwater Sampling Documentation
  - Attachment C-1—Groundwater Sampling Activities
  - Attachment C-2—Groundwater Flow and Quality Conditions
  - Attachment C-3—Analytical Data

[8] CH2M HILL. *Technical Assistance Document—RD/RA Implementation Strategy: Continental Steel Corporation Superfund Site.* September 19, 2000.

[9] CH2M HILL. *Technical Assistance Document—RD/RA Implementation Strategy: Continental Steel Corporation Superfund Site.* September 19, 2000.

Groundwater Modeling

The groundwater collection system modeling goal was to demonstrate horizontal containment of the contaminant plume in the shallow water-bearing zone. However, the modeling was revised after CH2M HILL proposed to modify the areas targeted for groundwater extraction based on the information collected as part of the 2001 predesign investigation activities. CH2M HILL discussed and received concurrence on the modifications with USEPA and IDEM. The procedures and results of the revised groundwater modeling task are contained in Appendix D.

Proposed RA

Intermediate/ Lower Water-Bearing Zones

The long-term RA for the intermediate and lower water-bearing zones will be addressed through continued operation of the Martin-Marietta Quarry dewatering system. The TI waiver will be invoked as part of the proposed remedial action, since active remediation will not be part of the remedy. Based on modeling predictions, it will be no more effective to collect and treat the intermediate and lower water-bearing zone groundwater than to allow nature to take its course. Therefore, contamination in the intermediate and lower groundwater will be allowed to attenuate naturally.

The intermediate and lower groundwater currently discharges directly to Wildcat Creek under a regulated discharge permit. The purpose of collecting the intermediate and lower groundwater is to dewater the quarry for production operations. The long-term RA for the intermediate and deep water-bearing zones will take advantage of the dewatering pumping to prevent groundwater contamination migration outside its current boundaries. If quarry operations cease, IDEM may need to continue pumping.

Shallow Water-Bearing Zone

Areas targeted for groundwater extraction, based on the information collected as part of the 2001 predesign investigation activities and the revised groundwater modeling effort for the shallow water-bearing zone, are proposed at the four sites listed below.

Markland Avenue Quarry

The proposed extraction system for the Markland Avenue Quarry (Figure 2) includes a single well constructed after the quarry pond is backfilled to contain shallow groundwater in the immediate vicinity of the quarry. The expected flow rate is 42 gpm.

East Bank Wildcat Creek, Northwest of Markland Avenue Quarry

The proposed extraction system for this area consists of six wells in a line, parallel to Wildcat Creek's eastern bank, approximately 1,500 ft northwest of the Markland Avenue Quarry (Figure 3). This system is designed to intercept contaminants prior to their entering the hydraulically connected creek. Each well is expected to pump at 6 gpm, and the entire system would extract 36 gpm.

Millbrook Lane Area

The proposed Millbrook Lane extraction system (Figure 4) is a line of five wells situated parallel to Millbrook Lane. These wells are to extract contaminated groundwater between Wildcat Creek and Millbrook Lane. Each is expected to pump at a rate of 12 gpm, and the entire system would extract 60 gpm.

West Markland Avenue

The proposed West Markland Avenue extraction system (Figure 5) is a line of four wells situated parallel to Markland Avenue, just west of South Berkley Road. These wells are designed to extract contaminated groundwater downgradient from the Millbrook Lane Area extraction system. Each is expected to pump at a rate of 10.3 gpm, and the entire system would extract 42 gpm.

Summary

The estimated groundwater flow rate from the shallow aquifer only and discharged to the Kokomo WWTP is approximately 160 gpm. The WWTP has just completed a major capacity expansion and previously agreed to accept up to 300 gpm. The overall configuration of the proposed collection systems across the site is set up for a gradual reduction in the total discharge to the Kokomo WWTP over time, as specific areas are shut off or their pumping rates are reduced.

Details of the design for the shallow water-bearing zone only are described under the following components of the remedy:

- Extraction well installation
- Instrumentation and piping installation
- Institutional controls
- Environmental monitoring and maintenance
- 5-year site reviews

The rest of this document focuses on the shallow water-bearing zone RD. The intermediate and deep water-bearing zones will be addressed through a TI waiver and operation of the Martin-Marietta Quarry dewatering system, since active remediation for intermediate and deep water-bearing zones will not be part of the RA.

Project Delivery Strategy

This section presents the project delivery strategy for the Sitewide Groundwater (OU1) RA. The contracting strategy and the RA's primary components are summarized below. Key project delivery strategies, linked to a specific RA component, are noted below in their respective sections.

Contracting Strategy

The contract documents for the Sitewide Groundwater (OU1) are being prepared based on the understanding that the State of Indiana (State) is the Owner. CH2M HILL will prepare the specifications and drawings for the State to use as part of its Request for Bid documents. The State will provide the bidding process instructions and contract terms.

Final Design

USEPA and IDEM have reviewed the preliminary design and their comments have been incorporated into the final design documents. Detailed design drawings and specifications are provided for the RA components. The draft CQAP and draft O&M Manual will be submitted separately.

The final design package will consist of the:

- BOD Report, which will include a cost estimate and the biddability, operability, and constructibility reviews
- Specifications and Drawings
- CQAP
- O&M Manual

Detailed design drawings and specifications have been prepared for the RA components. However, the choice of most construction methods and the selection of some materials will be based on performance specifications, which will allow the contractor flexibility during implementation while ensuring conformance with the specification requirements.

Remedial Action—Sitewide Groundwater (OU1)

Descriptions of the primary RA components are presented below in their expected construction sequence. The design details and construction methods for each component are presented in the following section.

The State of Indiana will execute the Sitewide Groundwater RA using the RD prepared by CH2M HILL. The primary RA components, as discussed in the preceding sections, are presented below in their expected construction sequence. Key project delivery strategies, relative to a specific RD component, are noted below in each respective section.

- **Extraction Well Installation**—Well locations will be field located and surveyed. The wellhead areas will be cleared to allow drilling equipment to access the area. Sixteen 6-in. extraction wells will be installed to reach 50 ft below ground surface (bgs) and equipped with small electric submersible pumps.
- **Instrumentation and Piping Installation**—High-density polyethylene (HDPE) piping will transport extracted water to a small pump house. Instrumentation to control the pumps and measure and control flow rates will be located in the pump houses.
- **Institutional Controls**—IDEM will implement institutional controls consisting of groundwater use restrictions for the CSSS site. It is not anticipated that activities necessary to secure institutional controls will be performed as part of the remedial design.
- **Environmental Monitoring/Maintenance**—Environmental monitoring will be performed to determine the effectiveness of the remedy. The site O&M Manual will establish environmental monitoring details for the site. The groundwater monitoring program will include evaluation of the groundwater collection system's effectiveness.
- **5-Year Site Reviews**—Data collected during the monitoring program will be reviewed at 5-year intervals to determine whether human health and the environment continue to be protected and whether additional remedial action is warranted. Alternative remedial technologies will be considered if it is determined that remedial objectives are not being achieved.

Design Approach, Assumptions, and Parameters

This section presents the technical details of the Main Plant Area RA design. Methods of construction for each RA component are described in this section, as are performance standards that must be met during construction. As described previously, the components of the Main Plant Area (OU5) RA consist of the following, presented in their expected project delivery sequence:

- Extraction well installation
- Instrumentation and piping installation
- Institutional controls
- Environmental monitoring and maintenance
- 5-year site reviews

Extraction Well Installation

Description of Extraction Well Installation

Sixteen 6-in. wells will be installed with an air-rotary drill rig reaching 50 ft bgs.

Areas Requiring Extraction Well Installation

As previously described, the four areas targeted for groundwater extraction are:

- **Markland Avenue Quarry**—The proposed extraction system for the Markland Avenue Quarry includes a single well constructed after the quarry pond is backfilled to contain shallow groundwater in the quarry's immediate vicinity (Figure 2).
- **East Bank Wildcat Creek, NW of Markland Avenue Quarry**—The proposed extraction system for this area consists of six wells in a line, parallel to the Wildcat Creek's eastern bank, approximately 1,500 ft northwest of the Markland Avenue Quarry (Figure 3).
- **Millbrook Lane Area**—The proposed Millbrook Lane extraction system is a line of five wells situated parallel to Millbrook Lane (Figure 4).
- **West Markland Avenue**—The proposed West Markland Avenue extraction system is a line of four wells situated parallel to Markland Avenue, just west of South Berkley Road (Figure 5).

As noted, the areas targeted for groundwater extraction in the ROD have been revised based on the information collected as part of the 2001 predesign investigation activities. CH2M HILL discussed the modifications with USEPA and IDEM, both of which concurred. Attachment C-2 of Appendix C contains figures showing the location and extent of the groundwater plume that the four groundwater extraction systems address. The well spacing

shown on the figures and the design drawings is discussed in a technical memorandum in Appendix D.

Construction Details Including Design and Construction Technical Factors

Before the start of construction, IDEM staff will complete a Notice of Intent (NOI) form for construction site activities and obtain any easements. IDEM shall select the order in which wells are installed at each location. Initially, two will be installed at each location (excluding the Markland Avenue Quarry location) and capacity and performance testing performed on each well, with both wells monitored during each test. IDEM will evaluate the data collected from these tests and determine the placement of the remaining wells at each location, such that the long-term, steady-state drawdown achieved between the well, during pumping, is approximately 2 ft.

The extraction wells will be installed by an air-rotary drill rig capable of drilling a 12-inch-(in.) diameter borehole to 50 ft bgs. After the borehole is drilled, the 6-in. well will be constructed by installing a stainless steel screen across the entire depth of the shallow aquifer (i.e., approximately 15–50 ft bgs). Core samples and geophysical logging will not be performed during the installation of the wells.

The extraction wells will be developed by alternately surging and purging the well for at least 30 minutes to remove fine-grained solids from the filter pack and screen using a solid-type surge block, bailer, sand pump, and all appurtenant equipment necessary for developing extraction wells. After surging, a volume of water equivalent to 10 times the well volume plus any water added during drilling will be removed from the well. Development will continue until clear, sediment-free formation water is produced from the wells, or as IDEM approves.

Sediment introduced into the wells during the purge and surge process will be removed by using a bottom-filling bailer or other IDEM-approved method. Anticipated pumping rates during development are 10–25 gpm. The pump and driver shall be capable of pumping up to 25 gpm and a total head of 75 ft. At the end of purge and surge process, the wells will be sampled and analyzed for volatile organic compounds (VOCs) and metals.

Each well will be equipped with a pitless adapter and an electric submersible pump capable of pumping 2–13 gpm, except for the Markland Avenue Quarry well, which will have a single pump capable of pumping 42 gpm. The wells will be completed with a 24-by-24-in. traffic-rated steel well vault surrounding the wellhead and flush to the completed surface with a concrete pad.

Instrumentation and Piping Installation

Description of Instrumentation and Piping

The required electrical service and instrumentation will be housed in a small pump house for each groundwater target area. Groundwater extraction will be controlled and monitored by a variable frequency drive (VFD) control unit. The VFD control unit will be used to adjust the flow rate and monitor system operation. An autodialer will notify the personnel

in charge of operation of a malfunction or system shutdown. Other instrumentation will be installed to measure the flow rates from each well and log the total flow discharged from each extraction system.

Construction Details Including Design and Construction Technical Factors

The well pumps will be attached to the discharge lines using a pitless adapter. Piping will be HDPE pipe installed in a trench below the frost line and brought into the pump house through the floor. The individual lines from each well will be equipped with a flowmeter, check valve, and sample tap prior to connecting to a manifold inside the pump house. Piping inside the pump house will be polyvinyl chloride (PVC) pipe.

The electric submersible pump motors will be equipped with VFD control units to control the pump motor speed and consequently, the flow rate from each well. The flow rates will be adjusted using the local speed control on the VFD control unit and will not be capable of remote control.

At the manifold, water from each well within a target groundwater area will be combined into a single stream and discharged to the Kokomo WWTP via the nearest sanitary sewer. A totalizing flowmeter will be installed to measure the flow rate and volume of water discharged. The discharge piping after the flowmeter will be oversized (4-in. HDPE pipe) to accommodate increased flow rates or additional wells, if needed.

Each extraction system will be equipped with an autodialer to notify the personnel in charge of operation of a malfunction or system shutdown. The autodialer is also capable of remote access to start and stop each groundwater extraction system.

Groundwater Quality

Groundwater data within the target extraction areas was reviewed as part of the revised groundwater modeling task. There is limited groundwater quality data for each area; in most cases only one well nest and round of sample data are currently available. A conservative estimate of the groundwater quality can be found in Table 1, which presents the expected maximum concentrations of contaminants from each groundwater target area.

Table 1 shows that only iron and manganese concentrations in two groundwater target areas exceed the Kokomo WWTP pretreatment standards. As previously mentioned, Table 1 provides maximum concentrations from a single well. These maximum concentrations are not expected to be typical of those present in the groundwater across the entire groundwater target area or in the combined groundwater stream discharged to the sanitary sewer system. The groundwater quality of each extraction well will be verified during startup activities for each groundwater collection area by collecting and analyzing samples for VOCs and metals from each well.

Groundwater in all four groundwater target areas contains low levels of VOC compounds (i.e., total toxic organics [TTO]). The TTO concentration is very low and not expected to require any pretreatment prior to discharge to the sanitary sewer. Preliminary discussions with the Kokomo WWTP indicate pretreatment for metals or TTO will not be required for any of the four groundwater target areas.

Postconstruction Activities

Postconstruction activities associated with Contract 5 include:

- Institutional control development
- Environmental monitoring and maintenance (i.e., implementation of the O&M Plan)
- 5-year site reviews

Institutional Controls

IDEM will implement institutional controls consisting of groundwater use restrictions for the CSSS. Deed restrictions in the form of an enforceable restrictive covenant will be used to specify that no groundwater withdrawal, other than that necessary to perform remediation and monitoring activities, will be permitted until the cleanup objectives are met.

Environmental Monitoring/Maintenance

Environmental monitoring will be performed to determine the remedy's effectiveness. The site O&M Manual will establish the environmental monitoring details.

Groundwater will be monitored quarterly for 2 years, semiannually for the following 2, and annually thereafter for an indefinite period or until compliance with ARARs is attained. Wells included in the long-term monitoring of the sitewide groundwater are shown on Figure 6. Piezometers shown on Figure 6 are not part of the long-term monitoring plan. An additional monitoring well will be installed downgradient of each of extraction systems to monitor performance, except the Markland Avenue Quarry extraction system, which is surrounded by numerous existing monitoring wells.

5-Year Site Reviews

Data collected during the monitoring program will be reviewed at 5-year intervals to determine whether human health and the environment continue to be protected and whether additional remedial action is warranted. Alternative remedial technologies will be considered if it is determined that remedial objectives are not being achieved.

The performance of each groundwater extraction target area will be evaluated using the performance of the total extraction system and the individual wells, since performance may vary between individual wells within a given extraction system and between entire systems.

Compliance with ARARs

The CSSS ROD summarized the following federal and state ARARs in Appendix G:

- CERCLA, including the Superfund Amendments and Reauthorization Act (SARA) of 1986 and subsequent amendments
- RCRA, including the Hazardous and Solid Waste Act Amendments of 1984 (HSWA)
- The Toxic Substances Control Act (TSCA)
- The Clean Water Act (CWA) and Amendments
- The Safe Drinking Water Act (SDWA)
- The Clean Air Act (CAA)
- The Protection of Wetlands/Floodplains Management Executive Order
- The Hazardous Materials Transportation Act (HMTA)
- Indiana Water Quality Standards (Indiana Administrative Code [IAC] Title 327)
- Indiana Solid Waste Management Board Rules (IAC Title 329)
- Indiana Air Pollution Control Regulations (IAC Title 326)

Many of these laws and regulations were discussed within the Lagoon (OU2) Basis of Design Report,[10] the Main Plant (OU5) Basis of Design Report,[11] the Markland Avenue Quarry Design Criteria Report,[12] and the Wildcat and Kokomo Creeks Design Criteria Report.[13] Laws and regulations with unique aspects related to the design of the groundwater remediation are discussed below. Table 4 presents the specific requirements, the design components that address them, and whether an ARAR waiver is necessary.

The Comprehensive Environmental Response, Compensation, and Liability Act

CERCLA requires the selected remedy to meet the substantive requirements of all environmental rules and regulations that are ARARs unless a specific waiver of the requirement is granted. Waiver of ARARs may be requested (per the NCP [National Contingency Plan] 300.430[f][1][ii][C]) based on any one of six circumstances. It is not anticipated that any ARAR waivers under CERCLA will be necessary.

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[10] CH2M HILL. *Lagoon Area (OU2) Basis of Design Report: Continental Steel Corporation Superfund Site.* September 2002.

[11] CH2M HILL. *Main Plant Area (OU5) Basis of Design Report: Continental Steel Corporation Superfund Site.* June 2003.

[12] CH2M HILL. *Markland Avenue Quarry (OU4) Design Criteria Report: Markland Avenue Quarry Pond Sediment Removal Design: Continental Steel Corporation Superfund Site.* October 2002.

[13] CH2M HILL. *Wildcat and Kokomo Creeks (OU3) Design Criteria Report: Continental Steel Corporation Superfund Site.* November 2002.

The Resource Conservation and Recovery Act

The applicability or relevancy and appropriateness of RCRA are discussed first by summarizing the classification of wastes present in the groundwater.

Classification of Wastes

The first part of the RCRA applicability determination is to analyze whether or not the contaminated groundwater is a RCRA hazardous waste. The mixture rule within RCRA states that mixtures of hazardous waste and solid waste are to be considered hazardous waste. However, the mixture rule cannot apply to contaminated media, such as groundwater, because the media has not been "discarded" and is, therefore, not solid waste. To clarify how the mixture rule applies to contaminated environmental media, USEPA developed a "contained-in" policy which specifies that environmental media that "contain" hazardous waste must be managed as hazardous waste. This policy applies to contaminated environmental media that exhibit a characteristic of a hazardous waste, such as toxicity, and to environmental media contaminated with a listed hazardous waste, such as F-listed solvents. To determine whether a contaminated environmental medium at a CERCLA site contains a listed hazardous waste, the origin of the waste that contaminated the medium must be known. If the origin of the waste is not known or there is no documentation of it, the medium can be assumed not to contain a listed hazardous waste. The specific hazardous waste classification of the sources of the chlorinated solvent groundwater contamination is not known and, therefore, the groundwater is assumed to not contain a listed waste.

To determine if a contaminated environmental medium at a CERCLA site is a characteristic waste, the medium can be tested or professional judgment may be used to determine whether testing is necessary. Groundwater that exceeds the Toxicity Characteristic Leaching Procedure (TCLP) limits is a characteristic hazardous waste. The groundwater at CSSS has been extensively sampled and the contaminants of concern (COCs) that have TCLP limits, along with their maximum concentrations, are as follows:

- PCE—570 μg/L P limit = 700 μg/L
- TCE—380 μg/L TCLP limit = 500 μg/L
- VC—1,800 μg/L TCLP limit = 200 μg/L
- Chloroform—9 μg/L TCLP limit = 6,000 μg/L
- Benzene—2 μg/L TCLP limit = 500 μg/L

Vinyl chloride is the only COC for which the maximum observed concentration exceeds the TCLP limit. Further review of groundwater data shows, however, that only two of the 75 monitoring wells (LA-04 and UA-111) sampled during the predesign investigations had VC concentrations exceeding the TCLP limit of 200 μg/L. As a result, the combined groundwater in the collection system is unlikely to have VC in excess of the TCLP limit.

In summary, the groundwater is not considered to be hazardous waste. Even if the groundwater was a characteristic hazardous waste or it contained a listed hazardous waste, RCRA would not impose additional requirements for treatment of the groundwater, because it provides an exclusion for wastes that are discharged to publicly owned wastewater treatment systems or treated in wastewater treatment units permitted under the Clean Water Act (i.e., they have a NPDES permit).

Clean Air Act

Requirements of the CAA are potentially applicable to remedial actions that result in air emissions, such as groundwater treatment. The groundwater, however, will be discharged to the WWTP, where it will be treated. Air emissions are therefore regulated by the air permit for the WWTP.

Clean Water Act

The CWA provides regulations for discharges of pollutants into the waters of the United States. It requires USEPA to set water quality standards for all contaminants in surface waters and permits to be obtained for discharge of pollutants from a point source into navigable waters. The WWTP will be responsible for meeting its NPDES permit levels.

Indiana Water Pollution Control Board Rules (IAC Title 327)

IAC rules specify requirements for surface and groundwater quality and include pretreatment requirements for discharges to WWTPs and surface water (NPDES program). Rules generally parallel the federal CWA.

Collected groundwater will be discharged to the Kokomo WWTP. As a result, it must meet the pretreatment requirements designated by the WWTP. These requirements specify individual limits for metals, cyanide, phenol, and sulfide. In addition a TTO limit will be provided. The estimated concentrations of metals for the combined discharge are all below the pretreatment requirements, with the possible exception of manganese. This will be evaluated further and treatment to remove manganese will be added if necessary. It is anticipated that the TTO limit will be greater than the concentration in the combined discharge, thus allowing the groundwater to be discharged directly to the WWTP without pretreatment. None of the COCs in the discharge is expected to pass through the WWTP without treatment or interfere with the treatment system. Also the estimated VOC concentrations in the discharge are too low to pose an acute risk to workers at the WWTP.

IAC 327 2- 11-5 *Criteria for all Groundwater* specifies that surface water standards found in 327 IAC 2-1-6 must be met at the groundwater surface water interface. In a practical sense it implies that contaminant concentrations in upper aquifer monitoring wells adjacent to a surface water discharge zone must meet the surface water standards. Groundwater data were compared against the surface water standards and three site contaminants were found that exceed surface water standards in at least one upper aquifer monitoring well. These are PCE (UA 28), PCBs (MWs UAs 12, 108, and 117), and heptachlor (UA 12). Of these, UAs 28 and 108 are not located near the groundwater surface water interface of a groundwater discharge zone. UA 12 is about 40 ft from Wildcat Creek at a location within the groundwater collection system capture area. UA 117 is near Wildcat Creek but in an area that may be downgradient of the creek. As a result it is anticipated that groundwater will meet surface water standards at the groundwater surface water interface once the collection system is operable.

IAC 327 2- 11-4 Groundwater Classification Plan specifies how groundwater is to be classified. At CSSS, the groundwater contaminated above groundwater quality criteria would be classified as "impaired drinking water." The area of contamination must have either a restrictive covenant prohibiting the use of untreated groundwater or an institutional

control, such as a local ordinance, in place until groundwater standards are met. The ROD specifies that an Environmental Notice would be placed on the deeds of the properties within the boundary of the contamination. It is anticipated that either USEPA or IDEM will lead the effort in obtaining the groundwater restrictions.

IAC 327 2- 11-6 Criteria for Drinking Water Class Groundwater specifies criteria for groundwater used as drinking water. These criteria are the remedial goals that define the area to be collected and used to evaluate when remediation is complete. They generally parallel the SDWA MCLs.

OSHA Requirements

A health and safety plan for construction activities in accordance with the OSHA requirements listed in 20 CFR 1910 and 20 CFR 1926 will be required.

Minimizing Environmental and Public Impacts

Environmental and public health and welfare impacts will be minimized through:

- Site access control
- Groundwater Pollution Control

Site Access Control

Areas where extraction wells will be located will likely not be fenced to prevent public access. Instead, extraction wells will be flush mounted and completed with concrete pads and locking-well caps and instrumentation housed in small, prefabricated pump houses.

Groundwater Pollution Control

Groundwater pollution is minimized through the installation and operation of the groundwater extraction systems, direct discharge of the groundwater to the Kokomo sanitary sewers, and treatment at the Kokomo WWTP.

Compliance with Permitting Requirements

CERCLA response actions do not need to comply with the administrative requirements, such as permitting, of applicable or relevant and appropriate environmental laws and regulations. Substantive requirements, however, must be met.

Construction Schedule

A draft construction schedule follows this page.

Cost Estimate

The cost of the RA was estimated to be $1.2 million. This estimate is based in the well locations shown on the drawings. The actual cost of the RA may change if easements cannot be obtained for any of the well locations. The estimated cost includes services during construction (SDC), the Contractor's general and administrative costs, and the Contractor's estimated fee. Items not included in the cost estimate include taxes and any permit fees required for construction.

The cost estimate in M-CACES Gold format is attached (Appendix E).

Biddability, Constructibility, and Operability Review

CH2M HILL's affiliate, CH2M HILL Constructors, Inc. (CCI), has reviewed the draft BOD and plans and specifications with an emphasis on biddability and constructibility. Comments from the review have been incorporated into this document and the accompanying plans and specifications.

In addition, the project review team reviewed the draft BOD report and draft plans and specifications, and their comments were incorporated as appropriate.

Tables

TABLE 1

Maximum Expected Concentrations at Collection System Locations

CSSS Sitewide Groundwater (OU1) Basis of Design Report

Parameter	Markland Ave. Quarry[a]	East Bank Wildcat Creek[a]	Millbrook Lane Area[a]	West Markland Ave.[a]	Kokomo WWTP Pretreatment Standards: Maximum Daily Concentration[b]	Kokomo WWTP Pretreatment Standards: Maximum Concentration[c]
1,1-Dichloroethene[d]	0.002	0.001	-	0.002		
2-Methylnaphthalene[d]	-	-	0.001	-		
Acetone[d]	0.007	-	0.02	-		
Aluminum	0.78	0.24	-	0.112		
Aroclor-1248[d]	0.001	-	-	-		
Arsenic	-	-	-	0.011	0.03	0.10
Barium	0.45	0.21	0.14	0.075		2.00
bis(2-Ethylhexyl)phthalate[d]	0.009	-	-	-		
Calcium	213	172	128	484		
Caprolactam[d]	0.006	0.15	-	-		
Chloroform[d]	0.009	0.009	-	-		
Chromium	0.009	-	-	0.004	2.00	2.50
cis-1,2-Dichloroethene[d]	2.70	0.24	0.36	0.35		
Cobalt	-	-	-	0.003		
Iron	0.039	0.467	1.01	12.2		5.00
Magnesium	14.3	56.6	44.5	45.3		
Manganese	0.067	1.01	0.099	0.646		0.10
Methylene Chloride[d]	-	0.025	0.006	0.015		
Nickel	0.004	0.016	0.002	0.062	0.80	2.00
Potassium	71.0	5.72	3.51	11.3		
Sodium	58.2	266	46.3	111		
Tetrachloroethene[d]	-	0.57	0.015	-		
Toluene	-	-	0.001	-		
trans-1,2-Dichloroethene[d]	0.011	0.002	-	0.005		
Trichloroethene[d]	0.44	0.44	0.041	0.004		
Vanadium	0.007	-	-	-		
Vinyl Chloride[d]	1.8	0.036	0.011	0.021		
Zinc	0.026	0.010	0.004	0.014	1.25	5.00

Note:

[a] All units are mg/L.

[b] [Sewer Ordinance #6064] Maximum allowable discharge based upon a 24 hour flow composite sample. No single sample portion of the 24 hour flow composite sample or instantaneous sample shall be in excess of four (4) times the daily maximum concentration.

[c] Kokomo City Code Ch. 50 §50.51(O).

[d] [Sewer Ordinance #6064] Limits for parameters on the total toxic organics list will be considered on an individual case by case basis.

TABLE 2
Evaluation of ARARs
CSSS Sitewide Groundwater (OU1) Basis of Design Report

ARARs and TBCs	Design Components Addressing Requirement	Waivers Needed?
Identification and Listing of Hazardous Waste 40 CFR Part 261 Defines those solid wastes which are subject to regulation as hazardous wastes under 40 CFR Parts 262-265 and Parts 270, 271, 124.	The groundwater does not have to be managed as containing listed waste because specific documentation of the release of a listed waste is not available. The groundwater is also not a characteristic waste. In addition, RCRA does not apply to treatment of groundwater discharged to a POTW or treated in a wastewater treatment system regulated under the Clean Water Act.	No
Clean Air Act 40 CFR 50-99 Specifies requirements for air emissions such as particulates, sulfur dioxide, VOCs, hazardous air pollutants, and asbestos.	Onsite treatment of groundwater is not planned. Air emission requirements will be met by the Kokomo WWTP.	No
Clean Water Act 33 USC Sec. 1251-1376 Water Quality Criteria 40 CFR Part 131 Sets criteria for developing water quality standards based on toxicity to aquatic organisms and human health.	The Kokomo WWTP will continue to meet its NPDES discharge limits.	No
National Pretreatment Standards 40 CFR Part 403 Sets standards to control pollutants which pass through or interfere with treatment processes in publicly owned treatment works or which may contaminate sewage sludge.	Discharges to the Kokomo WWTP will meet pretreatment standards.	No
Safe Drinking Water Act 42 USC Sec. 300g 40 CFR Part 141 National Primary Drinking Water Standards	Establishes health-based standards for public water systems (maximum contaminant levels[MCLs]). MCLs will be the remedial goal for groundwater (e.g., TCE = 5 μg/L, Vinyl chloride = 2 μg/L).	No

TABLE 2
Evaluation of ARARs
CSSS Sitewide Groundwater (OU1) Basis of Design Report

ARARs and TBCs	Design Components Addressing Requirement	Waivers Needed?
National Secondary Drinking Water Standards 40 CFR Part 143	Establishes welfare-based standards for public water systems (secondary maximum contaminant levels [SMCLs]). The SMCLs provide guidance only; they are not enforceable. As a result, they are TBCs and will be considered for inorganics, such as iron.	No
Executive Order 11990 Requires actions to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.	Collection of groundwater is not anticipated to effect wetland water levels because extraction flow rates are very low.	No
Indiana Water Pollution Control Board Rules 327 Indiana rules specify requirements for surface water and groundwater quality and include pretreatment requirements for discharges to POTWs and discharges to surface water (NPDES program). Rules generally parallel federal Clean Water Act.	See below and federal CWA ARARs.	No
Indiana Surface Water Quality Standards 327 IAC 2 Water Quality Standards Specifies use designations for surface waters of the state, mixing zone guidelines, minimum water quality conditions and water quality criteria for specific substances. Used by state in setting discharge limits for NPDES permits.	Collected groundwater will be discharged to Kokomo WWTP. As a result, a NPDES permit will not be needed. The WWTP has NPDES discharge limits based on meeting the Indiana Water Quality Standards.	No
Minimum Surface Water Quality Standards 327 IAC 2-1-6 Specifies minimum surface water quality standards. These standards must be met at the groundwater– surface water interface for groundwater plumes discharging to surface water (see below, 327 IAC 2-11-5). The following groundwater COCs exceed the surface water standard in at least one upper aquifer monitoring well: PCE- 88.5 ug/l SW standard PCBs- 0.00079 ug/l SW standard Heptachlor- 0.0028 ug/l SW standard	Groundwater at the groundwater-surface water interface exceeding the surface water standards will be captured in the groundwater collection systems prior to discharge to surface water.	No

TABLE 2
Evaluation of ARARs
CSSS Sitewide Groundwater (OU1) Basis of Design Report

ARARs and TBCs	Design Components Addressing Requirement	Waivers Needed?
Indiana Groundwater Quality Standards 327 IAC 2-11 Specifies use designations for groundwaters of the state, and water quality criteria for specific substances for each use designation.	Remediation of groundwater is expected to result in meeting the groundwater quality standards. Restoration of groundwater to MCLs within a reasonable time frame is expected.	No
Groundwater Classification Plan 327 IAC 2-11-4 Requires groundwater to be classified as "drinking water class" unless it meets specific requirements. Use designation may be "impaired drinking water class" if 1) contaminant concentrations exceed the groundwater standards, 2) a remediation plan has been approved, and 3) either a restrictive covenant has been placed on the property prohibiting the use of untreated groundwater or an alternate institutional control such as a local ordinance is in place.	Groundwater will be considered "impaired drinking water" until remediation has returned the groundwater to concentrations below the groundwater quality standards. At that time, it would return to "drinking water class."	No
Criteria for All Groundwater 327 IAC 2-11-5 Requires surface water quality standards to be met at the groundwater-surface water interface.	Groundwater at the groundwater-surface water interface exceeding the surface water standards will be captured in the groundwater collection systems prior to discharge to surface water.	No
Criteria for Drinking Water Class Groundwater 327 IAC 2-11-6 Specifies criteria for untreated groundwater used as drinking water. Criteria for site COCs (ug/l) are: PCBs- 0.5 1,1-Dichloroethene- 7 cis-1,2-Dichloroethene- 70 trans-1,2-Dichloroethene- 100 PCE- 5 TCE- 5 Vinyl Chloride- 2 Benzene- 5.	The groundwater will be remediated to the Indiana drinking water class groundwater criteria.	No

TABLE 2
Evaluation of ARARs
CSSS Sitewide Groundwater (OU1) Basis of Design Report

ARARs and TBCs	Design Components Addressing Requirement	Waivers Needed?
Groundwater Management Zones 327 IAC 2-11-9 Allows a three dimensional groundwater management zone (GMZ) to be established beyond which groundwater quality criteria must be met. If none is established, the default zone must be in accordance with one of the following (note this is summarized– see rule for details): 1) at each drinking water well within 300 feet of a contaminant source, 2) at the property boundary if the property boundary is within 300 feet of the source, or 3) 300 feet from a source when the property boundary and drinking water wells are greater than 300 feet from the source.	A groundwater management zone has not been formally established, but it would include the entire area of groundwater in the upper, intermediate, and lower aquifers that exceed groundwater quality criteria.	No
Indiana Industrial Wastewater Pretreatment Programs 327 IAC 5 Prescribes policies, procedures, and technical criteria for the issuance of permits for pretreatment of industrial wastewater to be discharged into municipal sewage treatment facilities.	Water discharged to the Kokomo WWTP will meet the substantive requirements of the pretreatment program.	No
Pretreatment Standards 327 IAC 5-18-2 Prohibits discharge of pollutants that could pass through or cause interference with the POTW. Also specifically prohibits pollutants that could result in the presence of toxic vapors or gasses within the POTW in a quantity that may pose acute health and safety problems.	Discharges to the Kokomo WWTP will meet these requirements. Discharges of groundwater contaminants will be below the Kokomo WWTP pretreatment standards.	No
Pretreatment Standards Code of the City of Kokomo Title V, Chapters 50 and 52 Prohibits discharge of pollutants that could pass through or cause interference with the POTW. Also provides specific limits for wastewater discharged to the city sewer system.	Discharges to the Kokomo WWTP will meet these requirements. Discharges of groundwater contaminants will be below the Kokomo WWTP pretreatment standards.	No

ARAR – Applicable or Relevant and Appropriate Requirements
TBC – To be considered

Figures