UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7
11201 Renner Boulevard
Lenexa, Kansas 66219

CON 12-15
Doc #30765

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
Article Number: 7014 1200 0000 6125 5798

Ms. Barbara Nielsen
Freeport-McMoRan Copper & Gold Incorporated
333 North Central Avenue
Phoenix, Arizona 85004

Mr. William J. Gibson
Environmental Department Manager
Roquette America, Inc.
1003 South 5th Street
Keokuk, Iowa 52632

Mr. Mark Bousselot
Public Works Director
City of Keokuk
415 Blondeau Street
Keokuk, Iowa 52632

RE: Transmittal of Corrective Action Framework Document
Cyprus Specialty Metals Company
Keokuk, Iowa
EPA ID No. IAD041391772

Dear Ms. Nielsen, Mr. Gibson and Mr. Bousselot:

The above identified parties and the U.S. Environmental Protection Agency collaborated to develop the attached document that describes the Corrective Action Framework for the Resource Conservation and Recovery Act Facility Investigation.

Please provide to the EPA a written response either by mail or email to confirm your agreement and understanding of the attached CAF document. If you have any questions regarding the information in this letter, please contact me at (913) 551-7657 or by email at grisolano.mary@epa.gov.

19605 MAR31'15 PM 4:16

Sincerely,

Mary Grisolano, P.E.
Project Manager
Waste Remediation and Permitting Branch
Air and Waste Management Division

Enclosure

cc: Cal Lundberg, IDNR
James Huff, Huff & Huff
Kevin Armstrong, MWH
Gary Witkovski, EPA, Des Moines Field Office

CORRECTIVE ACTION FRAMEWORK (CAF)
FOR THE ROQUETTE AMERICA, CYPRUS, KEOKUK FERRO-SIL SITE, KEOKUK, IOWA
MARCH 26, 2015

This CAF documents and summarizes the CAF meeting held on April 17, 2014 between EPA, Cyprus Specialty Metals Company, Roquette America, Inc. and the City of Keokuk, Iowa in regards to the investigation at the Cyprus/Roquette/Keokuk site. Specifically, it documents agreements reached during the CAF meeting and other relevant subsequent discussions and material exchanged after the meeting that are necessary for the investigation to commence. Note that this CAF is a "living document," and is subject to change, pending new information or data.

I. CAF MEETING PARTICIPANTS

EPA PM Mary Grisolano
EPA Supervisor Don Lininger
EPA Technical Support, Hydrogeologist Bill Ferguson, USACE
Facility Representatives:
- Barb Nielsen, Cyprus Specialty Metals Company (Freeport McMoran Copper and Gold)
- Bill Gibson, Roquette America, Inc.
- Mark Bousselot, City of Keokuk

Facility Technical Support,
- Kevin Armstrong, MWH for Cyprus Specialty Metals Company
- Jim Huff, Huff & Huff for Roquette America, Inc.

Facility Legal, Martin Jones and Chris Leason for Cyprus Specialty Metals Company

II. SITE CHARACTERIZATION

The information in this section is taken directly from the draft Current Conditions Report, dated February 2010, refer to this document for additional information and references.

a. Overview of Facility/Surrounding Properties

Site Location

The facility is approximately 70 acres located at 2301 Twin Rivers Drive in Keokuk, Iowa, at the confluence of the Mississippi and Des Moines Rivers and at the base of a steep limestone bluff along the north property boundary. Roquette America Railway, Inc. (RARI) owns the majority of the property. Cyprus Specialty Metals Company (Cyprus) owns the two closed hazardous waste landfills on the western portion of the facility. The City of Keokuk owns the building and five feet of property around the building located at 2311 Commercial, in the footprint of the RARI property.

The area surrounding the facility is used for commercial, industrial, and residential purpose. Further development is limited by topography, specifically a steep limestone bluff that bounds the facility to the north and the major rivers to the south.

Access to the facility is via Twin Rivers Drive, which parallels the northern border of the facility. The Mississippi and Des Moines Rivers run along the southern property boundary and Fulton Creek serves as the western property boundary. Parcels west of Fulton Creek are vacant. No property ownership information was available for the parcel due west of Fulton Creek from a Lee County property search website. Most of the parcels to the north (at the top of the steep bluff) are zoned for residential; however, some of the parcels to the north and parcels to the east are owned by RARI and are zoned for industrial use. The only area currently used near the facility is to the east, where several industrial and commercial buildings are located.

Prior to 2009, the property to the east of the facility was leased by the Southeast Iowa Port Terminal (SEIPT), who used several abandoned buildings located on the property for offices and storage. The SEIPT was an active coal and salt storage and distribution facility. RARI purchased this property in April 2009 and continues to operate the coal and salt storage and distribution facility. This property is zoned for commercial use.

Site History

Historically, the facility produced ferrosilicon alloys used in the cast iron and steel manufacturing industry to improve strength, hardness, heat, and corrosion resistance. Industrial water supply used by facilty operations was provided by the Mississippi River. Wastewater was discharged to the Mississippi River via NPDES outfalls. Past operations generated non-hazardous and hazardous waste streams including spent 1,1,1-trichloroethane (TCA), drum filter sludge (D008 lead), emission control dust, and slag (non hazardous). Raw materials (scrap metal, coal, metallurgical coke, quartzite, and manganese ore) were combined in electric arc furnaces at temperatures of 3,000 degrees Fahrenheit, and periodically tapped to obtain molten ferrosilicon. Prior to 1976, all waste gasses and airborne particulates generated were discharged to the atmosphere. In 1976, an air pollution control system and wastewater treatment plant were installed.

After 1976, the two electric arc furnaces each had a water-cooled cover which contained reaction gasses and unreacted raw materials that were passed through venturi scrubbers and separated. The cleaned furnace gasses were then either burned off at the plant flares or processed at the Off Gas Plant for sale. From 1976 to early 1987, waste gasses destined for sale were cleaned again, compressed, cooled, and transported to a nearby facility for sale. During the cooling process, naphthalene condensed in the gas cooling refrigeration tube pack. TCA was used to clean this naphthalene from the tube packs. The spent solvent and naphthalene were temporarily stored in 55-gallon drums and later shipped to an off-site treatment and disposal facility. After 1987, the waste gasses were no longer cooled prior to compression, which eliminated the need for TCA to clean naphthalene deposits off the chiller tubes.

From 1976 to 1987, the venturi scrubber effluent containing unreacted raw materials was dropped into a tar trap, and pumped to the on-site wastewater treatment plant. Lead was periodically introduced into certain ferrosilicon alloy refining processes from scrap metal used as raw material. This lead volatilized during the smelting process and was captured in the venturi scrubber effluent. The effluent was mixed with polymers and the mixture was allowed to settle in a sedimentation tank. Effluent from the sedimentation tank was recirculated to the venturi scrubbers. Solids were pumped to a vacuum drum filter for water removal. The dewatered sludge (containing elevated concentrations of lead) was discharged to a bin and disposed in the East and West Sludge Disposal Areas. After 1987, the sludge was chemically treated with calcium phosphate to bind lead in the sludge. Following this treatment, the sludge passed EP toxicity testing.

During the refining process, slag was generated on the top of the molten product and periodically raked off. After installation of the air pollution control system, emission control dust was used to cover the top of the molten product to control cooling. The slag and dust mixture was crushed, and the metals were magnetically separated for recycling into the furnaces. The resultant byproduct was referred to as kish. Kish was disposed in both sludge disposal areas and stockpiled on site. Historical characterization of the kish indicated it was not a hazardous waste based on EP toxicity testing.

Two hazardous waste landfill units (East and West) received waste consisting of the venturi scrubber sludge/emission control furnace dust that was generated in the on-site production of ferrosilicon alloy during the period from 1976 to 1988. The East Sludge Disposal Area operated from 1976 to 1991, the West Sludge Disposal Area operated from 1984 to 1991. The venturi scrubber waste met the definition of hazardous waste by exhibiting the characteristic of toxicity for lead, identified by the waste code D008 (lead). Approximately 91,000 cubic yards of mixed material are in the West Sludge Disposal Area, and approximately 87,000 cubic yards of mixed material are in the East Sludge Disposal Area. Both areas are capped and under post-closure care.

In April 1987, the facility began a chemical treatment process that reduced the leachability of lead in the sludge rendering the sludge nonhazardous between 1987 to 2001. This non hazardous sludge was disposed on site until 1991. In 1991, the facility began transporting the non hazardous sludge to an off-site Subtitle D solid waste disposal facility, permitted by the Iowa Department of Natural Resources. In 2004, the nonhazardous sludge was removed from the western portion of the West Sludge Disposal Area.

Little is known about waste management practices prior to 1976.

Prior to the installation of air pollution control equipment in 1976, electric arc furnace emissions were discharged directly to the atmosphere. Thus, the generation of emission control dust and spent TCA did not begin until the installation of this equipment in 1976. Little information was available regarding the handling and ultimate fate of the slag prior to 1976. Historically, slag piles have been observed throughout the site during various inspections and investigations. Historical information indicates that slag piles were typically present temporarily while awaiting crushing and magnetic separation prior to being recycled.

b. Environmental Characteristics

Surface topography of the facility slopes generally to the south-southwest towards the Mississippi River with an approximate elevation of 500 feet above mean sea level (msl). A steep limestone bluff bounds the facility to the north. The Mississippi and Des Moines Rivers form the boundary of the facility on the southwest, south, and southeast. Other than the East and West Sludge Disposal Areas, the facility lies within the 100-year flood plain. Fulton Creek forms the western boundary of the property; this creek extends from the railroad tracks to the Des Moines River.

Alluvial sediments deposited by the Mississippi River blanket the area surrounding the facility. The thickness of the alluvial deposits beneath the facility ranges from 15 feet on the north to 50 feet on the south, reflecting entrenchment into the carbonate bedrock by the river channels. Because of the geometric form of the paleochannel associated with the river system, the alluvial aquifer can best be described as a wedge which thickens southward toward the river channels. Unconsolidated alluvium overlies bedrock of Mississippian, Silurian-Devonian, and Cambrian-Ordovician age.

Depth to groundwater at and near the two landfill cells was about 9 feet below ground surface (bgs) near the river and 30 feet bgs at the northern edge of the facility. Shallow groundwater flow is generally to the south towards the rivers, with some movement to the southwest and southeast, dependent on river flow.

In borings completed around the two historical landfills, bedrock was generally encountered from 23.3 to 48 feet bgs. The general soil lithologies encountered during sample collection associated with the 2009 Phase II ESA were: 0-2 feet bgs dark brown, sandy lean clay; 2-11 feet bgs dark brown, fine-grained sand; 11-25 feet bgs dark brown/gray sandy lean clay; 25-36 feet bgs gray, fine-grained sand.

In both Phase II ESAs, cinders and metallic fines were encountered at relatively shallow intervals at locations throughout the facility.

The cinders are likely remnants of past operations at the facility. Further, in the 2006 ESA, there is reference to "made land" present at the facility. This refers to land that is man-made and consist of fill materials.

c. AOCs/SWMUs descriptions

The following solid waste management units (SWMUs) and areas of concern (AOCs) were identified in the 2009 post closure permit:

- SWMU 1 – East Sludge Disposal Area;
- SWMU 2 – West Sludge Disposal Area;
- SWMU 3 – TCA Storage Area;
- SWMU 4 – Former Settling Ponds and Slag Line;
- SWMU 5 – Wastewater Treatment Plant;
- SWMU 6 – Baghouse (EC) Dust Collector;
- SWMU 7 – Off-gas Plant;
- SWMU 8 – Not otherwise specified disposal areas;
- SWMU 9 – Miscellaneous slag piles;
- SWMU 10 – Arc Furnace Emissions;
- AOC A – Miscellaneous Scrap Steel Piles;
- AOC B – Fuel Storage Tank Areas;
- AOC C – PCB Transformer and Capacitors;
- AOC D – NPDES permitted outfall no. 6;
- AOC E – Miscellaneous Junk Areas;
- AOC F – Staining or discoloration of concrete and soil/gravel around two batteries SE corner of Ball Mill Building;
- AOC G – Greasy residues and oil staining in Oil Storage and Lube Shop;
- AOC H – Black staining from drums in Plunger Shop;
- AOC I – Staining on floor of Diesel Shop;
- AOC J – Staining on floor in Compressor Room;
- AOC K – A maintenance pit in the Lube Shop and at the Diesel Shop;
- AOC L – A spill of white emulsion from 3 drums in the southeast corner of the main ferro-alloy plant;
- AOC M – 10,000-20,000 gallon diesel above ground storage tank;
- AOC N – Household waste dumping on west side of site,;
- AOC O – Large area lacking vegetation on west-central portion of site;
- AOC P – Truck washing operations allowing wash waters to flow to storm drains;
- AOC Q – Two PVC pipes protruding from the ground near the Oil Storage Shop;
- AOC R – Yellow residue near Number 1 dry shed;
- AOC S – 30,000 to 40,000-ton coal pile;
- AOC T – Unlabeled electrical transformers;
- AOC U – Stained soil adjacent to current and former above ground storage tanks; and
- AOC V – Approximately 15,000 cubic yards of imported fill composed of dirt, clay, limestone, shale, brick, and concrete.

The following additional environmental concerns were identified following permit issuance in 2009: rock salt storage pile, poly tote storage container staging area, miscellaneous drums in No. 1 dry shed, subsurface structures, and kish piles on western portion of facility.

SWMUs 1 and 2, the East and West Sludge Disposal Areas, are under the post-closure care as specified in the Permit, except that the groundwater monitoring program is being conducted as an interim measure under the corrective action portion of the Permit. Because SWMUs 1 and 2 are regulated units that have previously achieved closure, these units will not be included in the RFI. The remaining SWMUs and AOCs are regulated for cleanup under corrective action as specified in the Permit.

d. Previous releases

During the 1989 RFA, evidence for release was identified for the Arc Furnace Emissions; miscellaneous scrap steel piles, fuel storage tank, and NPDES outfall number 6. The 2005 Phase I ESA identified additional areas of release that were designated as AOCs (see Section c): AOC F, AOC L, AOC G, AOC K, AOC H, AOC I, AOC J, AOC N, and AOC P. Various materials, such as kish, fly ash, and scrap metal, have been staged throughout the property. Prior to 1976, air emissions were released directly to the atmosphere and may have deposited at and near the property.

e. RCRA Regulatory History

1976: The East Sludge Disposal Area was constructed for receipt of venturi scrubber sludge.
Prior to 1976: This area was used as a settling pond for fly ash generated by coal-fired power plant located in Building No. 7.
August 1980: Foote filed a Notification of Hazardous Waste Activity form.
January 1981: EPA requested information on the types and amounts of hazardous wastes treated, stored, or disposed of and why a Part A had not been submitted.
February 1981: Foote maintained exemption of venturi scrubber sludge from RCRA regulation under 40 CFR 261.4(b)7.
1981: Foote developed groundwater monitoring program.
November 1983: Foote submits Notification of Hazardous Waste Activity Form for generation of TCA as degreaser.
October 1984: West Sludge Disposal Area constructed.
January 1986: Inspection found RCRA violations. Consent Agreement/Consent Order was issued.
October 1986: Foote tests sludge and finds no free liquids, leading to regulation of disposal areas as landfills.
March 1987: EPA notifies Foote that 40 CFR 261.4 exemption does not apply.
April 1987: Foote installs venturi scrubber sludge treatment system. Analytical data confirm that sludge is nonhazardous, based on lead toxicity.

April 1987: Foote indicated desire to close two landfill cells, per post-closure rules.
July 1987: EPA notifies Foote that the drum filter unit is an on-site treatment unit, subject to 40 CFR 262.
December 1987: Foote sold the facility to Keokuk Ferro-Sil, Inc. Foote retained post closure obligations.
May 1989: RCRA Facility Assessment completed.
October 1989: The East and West Sludge Disposal Areas were closed with closure certification submitted to EPA.
September 1991: A post-closure permit was issued to the facility.
August 2001: Manufacturing ceased and the plant closed.
November 2005: A Phase I Environmental Site Assessment (ESA) was conducted.
November 2006: A Phase II ESA was conducted.
December 2006: A Phase I ESA update and Limited Phase II Environmental Sampling were conducted.
July to October 2008: Several buildings were demolished.
March 2009: The Final Phase I ESA and final Phase II ESA were conducted.
April 2009: The City of Keokuk certified the RCRA Subtitle C Site Identification Form.
April 2009: A Part A application was submitted by RARI.
May 2009: A Part A application was submitted by Cyprus
September 2009: A post-closure permit was issued.

f. Other permitted activities

The facility historically discharged stormwater and process water via permitted NPDES outfalls. Currently, stormwater discharges through a general state permit.

g. Access or physical constraints

The facility is located in a low lying area directly bounded by major rivers on two sides of the property. The access road is the north boundary of the facility, with a steep bluff north of this road. The access road leads to this property and additional industrial properties further down the access road that restrict traffic. While site access is not readily available to the public, there are signs of transient human occupation on the bank of the southern rivers, i.e., signs of campfires. The property is currently unoccupied on a regular basis, but is owned by the adjacent property owner, RARI. RARI uses the property for some storage/materials management activity. During the CAF meeting site visit, bulldozers were moving a cattle feed component.

h. Other potential areas of investigation based on site history

The investigation and other RCRA work at the property is regulated under the post-closure permit as discussed in Section c.

i. Other

The majority of the property is owned by two parties, RARI and Cyprus. The City of Keokuk owns one building and the property immediately surrounding this building. The post-closure permit was issued to all three parties. In general, the obligations associated with the two hazardous waste landfill cells (East and West Sludge Disposal Areas) are addressed by Cyprus. The remaining corrective action (for all other SWMUs and AOCs) is generally addressed by RARI.

III. CONCEPTUAL SITE MODEL (CSM)

The following sections document the RARI/Cyprus/City of Keokuk facility's conceptual site model (CSM). The CSM is based on information currently available for the site and surrounding areas and may be updated based on new data or information that is generated during the investigation.

a. Sources and Extent of Known Contamination

The draft Current Conditions Report, dated February 2010, provides a summary of site-wide information available to date. In addition, groundwater data have been collected since February 1981 around the two landfill cell units subject to post closure, the East and West Sludge Disposal Areas. The most recent reports of post-closure work are the 2014 Annual Groundwater Monitoring Report, dated December 2, 2014 and the Semiannual Inspection Report for the Former Waste Disposal Areas, dated May 5, 2014.

The majority of the property has been impacted to some degree by past facility operations. Site contaminants include heavy metals and PAHs. The chemical and physical characteristics of these contaminants affect the types of transport mechanisms that convey these site contaminants. When the site investigation is completed, the chemicals of concern will be identified. Historical air emissions (prior to pollution control device installation in 1976) were released to the atmosphere and likely deposited at and near the property. Materials, such as kish, coal, slag, and scrap metal, have been stored at various locations throughout the property. The two landfill cells were used for disposal of operations waste material, both hazardous (for lead based on EP Toxicity testing) and non-hazardous. Random excavation and soil/material movement at the property have moved, buried, and uncovered a variety of fill material throughout the property, including a cinder material.

b. Contamination Transport/Migration Pathways

Based on information available to date, the primary site contamination is metals and PAHs in soil. Routine groundwater sampling has been conducted from the monitoring well network associated with the two landfill cells. Limited groundwater sampling has been conducted at areas beyond that of the two hazardous waste landfill cells. The potential for migration of contamination in groundwater cannot be determined until additional data are collected. The groundwater flow is generally to the south towards the Mississippi and Des Moines Rivers.

If there is groundwater contamination, it could move into the river. At this time, because the contaminants are not volatile, vapor intrusion is not anticipated to be a concern. The site experiences periodic flooding as it is located within the 100-year floodplain. With rainfall and periodic flooding, surface soil could leave the facility and enter surface water bodies.

Soil contamination is the primary transport media at this site as the primary site contaminants are solids with low or no vapor pressure. The PAHs would also be attached to soils due to the high Koc values. Soil can be transported via air as fugitive dust, via surface runoff as sediment, or via leaching to groundwater. Soil concentrations have been characterized in the four risk areas; however, additional investigations are continuing. Only where VOCs occur would volatilization from the soil be an exposure route.

c. Exposure Pathways

i. Exposure Receptors

Groundwater: The RFI groundwater investigation will determine if there is groundwater contamination and, if so, whether or not, the contamination is confined to the facility. The groundwater flows generally to the south towards the Mississippi and Des Moines rivers.

There are no water supply wells at the facility; therefore, there is no current exposure to contamination in groundwater at the property. City water is supplied to the property; however, because there are no property specific restrictions on groundwater use, future exposure to contaminated groundwater via a water supply well is possible.

As part of the CAF meeting/site visit and based on information from the facility record, a survey was conducted to identify water supply wells in the immediate area surrounding the facility, primarily through the City's efforts. An existing well was identified at the Rairden Auto Salvage business east of the facility. The business owner said the well has not been used in twenty years, there is no pump in the well, and there were no plans to use it. Water used by the Rairden business is supplied by the City. A second well was located at an adjacent residence (likely the Bryant residence). This home was razed, with the slab present during the site walk through. An abandoned hand pump well is present on this property. A cistern was observed at a property behind the church at the top of the bluff north of the subject property. A well was located at a home on the top of the bluff north of the facility. The City is working on getting additional information on this property. No other wells are known to exist near the facility. At this time, exposure to contamination in groundwater via residential wells is unknown, but under investigation.

Soil: Currently, the property is used for materials management (coal, coke, and salt) for an adjacent industrial facility and other customers. In addition, Kish, a by-product from the former Ferro-sil operation is stockpiled on the central part of the property. There is no current continual human occupation at the facility, only transitory occupation by workers moving materials. These workers are on heavy equipment and do not have direct contact with soil, except for fugitive dust emissions.

The site is fairly isolated, with a single industrial access road that runs along the north side of the facility. A steep bluff and rivers limit access from three sides of the facility, north, south, and west. Roquette America, Inc. (RAI) owns the property east of the facility, which limits access from the east. The property other than the landfill cells is owned and used by RAI for storage/materials management, and not continuous human occupation. Periodic use by RAI, that might include construction or material/soil movement of some type, is possible.

The City of Keokuk owns one building and surrounding 5 feet of property, used for miscellaneous equipment storage and not continuous human occupancy.

While the two hazardous waste landfill cells are fenced, no other physical restriction to access the facility is in place. As such, while site access is limited, it is not prohibited. There is evidence of transient human occupation (most likely fishing parties) along the river, not anticipated to be significant occupation of the facility property.

Surface soil might move from the facility into the river from rainfall and periodic flood water. The two adjacent rivers are very high flow volume.

Flooding affects the facility and could cause materials movement into and from surface water bodies. Eight storm sewer outfalls are associated with the property; however, none of the storm sewers are functioning efficiently due to sewer collapses and blockages over the years. The shoreline is slightly elevated, so direct non-point source surface runoff from the property is limited to flood-stage conditions.

ii. Exposure Point and Exposure Medium

The exposure point for soil is at the point of contact with either a construction worker or trespasser, site workers during maintenance of the two landfill cells, and future workers if site use changes.

Another exposure point to soil is to ecological receptors at the facility and if contamination enters the river via runoff or flood waters.

The exposure point for groundwater is at the point of contact during construction or if a water supply well is installed/used. For ecological receptors, the exposure point for groundwater is at the point of contact where the groundwater enters the rivers.

iii. Exposure Routes

Current facility use is for industrial purposes/material storage and movement. The future use of the facility will remain industrial.

Potential exposure routes for soil include dermal, incidental ingestion of soil, and inhalation of fugitive dust during construction/soil movement and cap maintenance.

Potential exposure routes for groundwater are dermal and incidental ingestion/inhalation during construction and water supply well use. At this time, because the primary site contaminants are PAHs/metals, vapor intrusion is not anticipated to be significant.

d. Ecological Risk Evaluation

The Mississippi River, the Des Moines River, and Fulton Creek are adjacent to the facility. All receive surface water runoff and sediment from the site. Aquatic species would be the primary focus of the screening. Vegetation is limited on site as potential habitat for terrestrial animals; however, there is potential for small mammals to be present on site. Therefore, the exposure pathways for terrestrial animals are limited to areas with vegetation. The eastern portion of the site consists of buildings and areas razed and material storage (coal, coke, and salt) and is highly disturbed. Table 4-1 depicts the site conceptual model to be used for screening potential ecological risk.

Potential ingestion of contaminated soils will be reviewed for plants, invertebrates, and wildlife. River water samples collected as part of the post closure sampling, did not indicate the presence of site related contaminants, and as such, additional sampling of the Des Moines/Mississippi Rivers was discontinued in 2002 and is not proposed as part of the RFI. Surface water samples will be collected from Fulton Creek and the Settling Pond west of the East Sludge disposal area. Sediment samples will be collected from Fulton Creek and facility outfalls. Soil, groundwater, sediment, and surface water sample results will be used to evaluate the ecological risk at the facility.

IV. RFI Work Plan

a. Scope and Objectives of the Investigation

The analytical detection limits will be sufficiently low to detect all suspected site-related contaminants at their individual health-based screening levels. Those levels can be found at: http://www.epa.gov/region9/superfund/prg/. Unfiltered metals groundwater data will be used for risk assessment calculations.

It is anticipated that the remedy for this site will include an institutional control that limits property use to industrial or commercial. In addition, it is anticipated that another control will be developed to describe safety measures and management procedures in the case that subsurface soil exposure will occur. The sampling scope for the RFI is provided below.

GROUNDWATER:

Eight monitoring wells will be installed at the site (MW-101 through MW-108), see Figure 1. In addition, the entire suite of existing landfill wells (MW-1, MW-5, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, and MW-15) will be sampled at the same time as the RFI wells. Groundwater samples will be analyzed for SVOCs, 8 RCRA total metals, VOCs, and 1,4-dioxane.

SOIL

Soil sampling will focus on surface sampling for the purposes of evaluating risk and determing where to focus remedial action at the site. EPA guidance typically considers surface soil to be the top 2 centimeters of soil. (EPA, 1996b, p. 12). For semivolatile organics and metals, samples will be collected from the top 2 centimeters. For volatile contaminants, soil samples will be collected at depths of 6 inches to 2 feet.

PROPOSED ADDITIONAL SOIL BORINGS

Soil Borings	Location	Rationale	Parameters
SB-101 thru SB-104	Immediately west of & within the Refractory & Diesel Shop	Elevated BaP reported 2009 B24 at 0-2 ft, 6-8 ft and 8-10 ft	**SVOCs** **RCRA Metals** 0-1 inch **VOCs** 0.5 to 2 ft bgs
SB-105 thru SB-108	West of Ball Mill/Plunge Shop & Furnace 1-6	Elevated BaP reported 2009 B24 at 0-2 ft	**SVOCs** **RCRA Metals** 0-1 inch, **VOCs** 0.5 to 2 ft bgs
SB-109 thru SB-112	City of Keokuk Bldg	Former ASTs	**SVOCs** **RCRA Metals** 0-1 inch, **VOCs** 0.5 to 2 ft,
SB-113 & SB-114	Compressor Off-Gas Bldg	Location of TCA use	**SVOCs,** **RCRA Metals** 0-1 inch, **VOCs, including 1,4-dioxane** 0.5 to 2 ft
SB-115 thru SB-118	9 & 10 Furnace Bldg	PAHs found in 2006 B-18 at 0-2 and dup. PAHs also in 2006 B-19 @ 0-2 ft bgs	**SVOCs** **RCRA Metals** 0-1 inch, **VOCs** 0.5 to 2 ft
SB-119	Wastewater Trmt Bldg	PAHs detected in surficial samples from nearby 2006 B-15 and B-18 and B(a)P in B-15 at 4-6 ft above RSL.	**SVOCs** **RCRA Metals** 0-1 inch **VOCs** 0.5 to 2 ft

SB-120 & SB-121	Dry Shed #2	Dry Shed #2 where TCA may have been stored.	**SVOCs** **RCRA Metals** 0-1 inch **VOCs AND 1,4-dioxane** 0.5 to 2 ft,
SB-122 thru SB-125	Kish Storage	2009 B-15 elevated B(a)P at 6 to 8 ft bgs (0.88 mg/kg).	**SVOCs** **RCRA Metals** 0-1 inch, 0.5-2 ft **VOCs** 0.5 to 2 ft
SB-126 & SB-127	Misc Slag Piles	SB-8 Pb in groundwater	**SVOCs,** **RCRA Metals** 0-1 inch, 0.5-2 ft **VOCs** 0.5 to 2 ft
SB-128 & SB-129	Misc Disposal Area	2006 B-13 surficial elevated As (130 mg/kg)	**SVOCs,** **RCRA Metals** 0-1 inch **VOCs** 0.5 to 2 ft
SB-130	North of Southern Settling Pond	2006 B-6 surficial As	**SVOCs** **RCRA Metals** 0-1 inch **VOCs** 0.5 to 2 ft
SB-131, 132 & SB-133	Kish Pile Area	2006 B-11 As (160 mg/kg) in surficial sample, detects of other pollutants; 2007 LSA SB-11 2 ft As (31.2) mg/kg; and 2007 LSA SB-13 2 ft As (31.9 duplicate sample)	**SVOCs** **RCRA Metals** 0-1 inch **VOCs** 0.5 to 2 ft
SB-134	Southern part of western portion	2009 B-14 at 0-2 ft and 4-6 ft cumulative risk	**SVOCs** **RCRA Metals** 0-1 inch **VOCs** 0.5 to 2 ft
SB-135 & SSB-136	West of West Disposal Area	2007 LSA SB-2 elevated As (27.2 mg/kg) and Lead (1,440 mg/kg) at 2-4 ft bgs. Plus benzene in groundwater	**SVOCs** **RCRA Metals** 0-1 inch **VOCs** 0.5 to 2 ft

SB-137 thru SB-144	SWMU 8 and Kish Storage	Need to fully characterize	**SVOCs** **RCRA Metals** 0-1 inch **VOCs** 0.5 to 2 ft
SB-145-147	North east of City's building. AST	2006 SB-25: B(a)P 0.460 mg/kg at 0 to2 ft	**SVOCs** **RCRA Metals** 0-1 inch **VOCs** 0.5 to 2 ft
SB-148	South of City's Building, where diesel tank located	To characterize AST Location 2006 B-21 at 0–2 ft and 2-4 ft elevated PAH	**SVOCs** **RCRA Metals** 0-1 inch **VOCs** 0.5 to 2 ft

SURFACE WATER

Based on the work completed on the site historically, no additional water samples from the Mississippi River or the Des Moines River are proposed. However, Fulton Creek and the Settling Pond to the west of the East Disposal Cell retain water some of the year. Surface water samples are proposed as listed below:

Surface Water	Location	Rationale	Parameters
SP-1	North end of Settling Pond	Entrance for runoff from historical storage area	Total & Dissolved RCRA metals SVOCs VOCs
SP-2	South end of Settling Pond	Near overflow to Mississippi River	Total & Dissolved RCRA metals SVOCs VOCs
FC-Up	Fulton Creek Upstream of RARI	Determine changes in water quality from runoff from property	Total & Dissolved RCRA metals SVOCs VOCs
FC-Down	Fulton Creek near mouth	Determine changes in water quality from runoff from property	Total & Dissolved RCRA metals SVOCs VOCs

SEDIMENT

From historic drawings, the local surveyor identified eight storm sewers on the subject property, which are labeled RASI 1 through RASI 8 in the facility's NPDES Permit. Seven storm sewer outfalls were to the Mississippi River, and the eighth one was to Fulton Creek, near the mouth of the creek. Over the years some of these sewers have collapsed, and outfalls to the Mississippi River are not apparent in all cases. For each outfall that remains visible **and** sediment is present in the outfall, it will be sampled. In addition, at each location where the outfall remains visible, a stream sediment sample from approximately 50 feet upstream and 10 feet downstream will be collected at each location, independent of whether the outfall remains visible. Sampling will depend upon the Mississippi River flow being low enough that the storm sewer are exposed.

In addition, drainage to Fulton Creek north of the outfall historically is not known, so additional sampling along Fulton Creek is also appropriate. Along Fulton Creek, the same protocol will also occur, but eight additional upstream samples will be collected running all the way to the railroad tracks north of the property line. A total of 10 sediment samples will be collected in Fulton Creek. The sample designations are listed below:

Sediment Sample	Location	Rationale	Parameters
RASI 1up, 1down & RASI 1	Outfall 001	First outfall	RCRA Metals & SVOCs, dry wt basis
RASI 2up, 2down & RASI 2	Outfall 002	Second outfall	RCRA Metals & SVOCs, dry wt basis
RASI 3up, 3down & RASI 3	Outfall 003	Third outfall	RCRA Metals & SVOCs, dry wt basis
RASI 4up, 4down & RASI 4	Outfall 004	Fourth outfall	RCRA Metals & SVOCs, dry wt basis
RASI 5up, 5down & RASI 5	Outfall 005	Fifth outfall	RCRA Metals & SVOCs, dry wt basis
RASI 6up, 6down & RASI 6	Outfall 006	Sixth outfall	RCRA Metals & SVOCs, dry wt basis
RASI 7up, 7down & RASI 7	Outfall 007	Seventh outfall	RCRA Metals & SVOCs, dry wt basis
RASI 8up, 8down & RASI 8	Outfall 008	Eighth outfall	RCRA Metals & SVOCs, dry wt basis
Fulton 1 thru 7, RASI 8 UP and RASI 8 Down	Above Outfall 008, Fulton 1 at RR Bridge	To determine if Fulton Creek displays legacy impacts	RCRA Metals & SVOCs, dry wt basis

b. Screening Levels

For screening of risk to human health, EPA's Regional Screening Levels (i.e., RSLs) for industrial use for soil and tapwater for groundwater will be used, dependent on development of an institutional control limiting site use to industrial/commercial.

Those levels can be found at: http://www.epa.gov/region9/superfund/prg/ A risk assessment will be conducted following completion of RFI data collection, in accordance with EPA guidance.

Screening of historical data to determine locations requiring additional work began with a 10-5 cancer risk for arsenic. The 10-6 cancer risk level will be used to screen out arsenic during the risk assessment process, which will determine if cumulative risk falls into a range acceptable to EPA, generally 10-4 to 10-6. For non-carcinogenic risk, a THQ=0.1 will be used for screening purposes.

EPA Region 7 uses the following ecological screening levels:

Surface water ecological screening levels:

- National Ambient Water Quality Criteria (U.S. EPA, 2009).
- Iowa Department of Natural Resources Chapter 61 Water Quality Standards (IDNR, 2010).
- Region 5 Ecological Screening Levels, (U.S. EPA, 2003).

Sediment probable effect concentration ecological screening levels:

- MacDonald DD, Ingersoll CG, Berger T. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Arch Environ Contam Toxicol 39:20-31.
- Region 5 Ecological Screening Levels, (U.S. EPA, 2003).

Soil ecological screening levels: Ecological Soil Screening Levels (http://www.epa.gov/ecotox/ecossl/index.html)

The media-specific RSLs, ecological screening levels, and background concentrations (where established) are used as an initial basis for comparison and are not corrective action levels. These screening levels will assist in identifying areas, COPCs, and conditions that may require further review, but not necessarily cleanup. Generally, at sites where COPC concentrations fall below the project screening levels, no further action or study is warranted. Concentrations above the screening levels do not automatically designate a site as requiring a response action or cleanup; rather, exceeding the screening levels suggests that further evaluation of the potential risks posed by COPCs may be appropriate.

c. Adaptive Approach

Groundwater data will be collected first. This data will be used to determine if additional soil and/or groundwater data are required beyond the current scope of work.

d. QAPP

i. Data Quality Objectives

The QAPP was developed in accordance with "EPA Requirements for Quality Assurance Plans," EPA QA/R-5, EPA/240/B-01/003 (March 2001, reissued May 2006). The QAPP was reviewed for EPA ENST approval.

ii. Standard Operating Procedures

The RFI Work Plan includes standard operating procedures as applicable and necessary to complete the RFI field work, including SOPs for soil and groundwater sampling, monitoring well installation, and laboratory procedures.

e. Modeling

At this time, the use of modeling is not anticipated to be part of the RFI scope for this facility.

f. Sampling Approach/Design

Groundwater samples will be used to determine if facility wide groundwater contamination is present. If so, additional wells and sampling may be required. Soil samples will be collected at SWMUs and AOCs to evaluate the level of contamination at the site. Sampling will focus on surface soil as the primary exposure point. A soil management plan will likely be necessary for construction/excavation projects. Historical soil results are being used to identify locations above industrial risk-based levels where removal or remediation might occur. If RFI results indicate the need, additional sampling will be required.

g. Sample Analysis

Samples will be analyzed for SVOCs, VOCs, and the 8 RCRA metals. In addition, 1,4-dioxane analysis will be conducted at areas where 1,1,1-TCA was used at the site. The sensitivity of analysis shall be sufficient to allow results to be compared to current EPA RSLs and other screening levels.

h. Use of Historical Data

Data used to determine the scope of the RFI as presented in this framework were collected under the review and approval of the EPA, i.e., results used to locate where soil concentrations exceed industrial risk-based levels and where wells need to be installed to characterize site groundwater.

i. Background

At this time, a background study is not considered to be necessary. Contaminants will be compared to RSLs to determine if they are within a range acceptable to EPA. If metals exceed an acceptable risk level, a background study may be developed to further address the issue.

j. Health and Safety Plan

The Permittees that are conducting field work will develop, maintain, and adhere to a health and safety plan to protect workers from unacceptable exposure relating to the facility. EPA will not be involved in development, review, approval or implementation of this plan.

k. Community Involvement and Environmental Justice

Nearby residences and businesses are not known to be impacted by facility contamination. Contamination in soil is anticipated to be limited to the facility property. If groundwater contamination is determined to be moving off site, appropriate action will be taken at that time in the direction of groundwater contamination. We believe that all water supply wells in the immediate vicinity of the facility have been located. Exposure via these wells to facility related contamination will be evaluated (i.e., whether the wells are being used and/or can be abandoned, or a sample taken for chemical analysis) and appropriate action taken, if necessary.

Public notice will be provided upon selection of a final remedy for the facility, as required by the permit and associated regulations and guidance. At that time, the public will have the opportunity to comment on the corrective action taken at the property.

l. Work Plan Implementation Schedule

A schedule will be included in the RFI work plan. We anticipate RFI field work to begin in the second quarter 2015.

IV. INTERIM MEASURES

a. Identified Interim Measures

The post closure groundwater sampling around the landfill cells is being conducted as an interim measure under the Permit and will continue while the RFI occurs. Post closure sampling planned for 2015 includes a full Appendix IX parameter list, rather than the typical list of four parameters. EPA has provided a letter allowing the expanded Appendix IX analysis planned for 2015 to be conducted concurrently with the RFI sampling in early 2015.

b. Future Potential Interim Measures

Other interim measures are not known at this time. If necessary, interim documents can be provided to EPA for review and approval while conducting the RFI work.

IV. CRITICAL DECISIONS

The EPA and Permittees have identified the following critical decisions. Each critical decision and resolution, or agreed path toward future agreement, is summarized below.

a. Land Use/Reasonably Expected Future Use in Relation to Characterization and Remediation
The corrective action work assumes the facility will continue to be used for industrial/commercial purposes. As such, an environmental covenant will be developed to limit the property to such use. Any change to residential or similar use will require reevaluation of risk due to exposure to environmental contamination and modification of the environmental covenant.

b. Existing Background Conditions and Consideration in RFI Process
The facility operated for over one hundred years for ferro-silicon production. In the early production years, there was no air pollution control and emissions were released directly to the air. As such, the property has likely had some impact from these emissions. In addition, production related materials (such as kish, scrap metal, etc.) have been disposed, managed, stored, and mixed into the soil randomly throughout the property. Industrial properties are located to the east of the property, and rail lines to the west. The property is located in a narrow strip at the bottom of a steep bluff, between the bluff and the Des Moines and Mississippi rivers to the south. Based on this information, it may be difficult to find a location to represent background that has not been impacted to some degree.

Chemical concentrations will be compared to RSLs for industrial use for soil and tapwater for groundwater. Locations with chemicals that are present at concentrations above these risk-based levels will be reviewed further to determine the need for a background study. The primary contaminant that might require a background study is arsenic. Arsenic is present in soil above the RSL associated with a 10-6 cancer risk. Locations where arsenic exceeds the 10-6 cancer risk will be evaluated further for cumulative risk from all chemicals. Locations exceeding the range acceptable to EPA will be evaluated for the need for additional work. The facility may opt to use a background study to address the presence of arsenic and other chemicals.

c. Use of Historical Data
Data collected under EPA review and approval of site plans will be considered usable for this project and has been used to determine the scope of the RFI work.

d. Use of Presumptive Remedies
There are no known presumptive remedies being considered at this site at this time.

e. Groundwater Use/Process for Addressing Groundwater Contamination, including State, Federal, and local requirements
City water lines reach the property to provide city water for reasonably anticipated future use. It is anticipated that the final remedy for this facility will include an environmental covenant that will prohibit the installation of a water supply well at the facility.

Wells in the immediate area of the facility have been located and the use of these wells will be evaluated to determine if any unacceptable exposure is occurring.

f. Coordination with Other Programs

At this time, coordination with other programs is not necessary.

g. Potential Facility Process/Land Use/Owner Changes

At this time, the facility property is owned by three parties, Cyprus, Roquette, and the city of Keokuk. Cyprus owns and manages the post closure care of the two landfill cells. Roquette owns the majority of the remaining property (except for one building/land owned by the city of Keokuk). It is anticipated that the current ownership will continue for the near future, except that the city of Keokuk may sell their building. Land owned by Roquette is currently used for materials storage and management.

h. Toxicity/Criteria Changes

When screening is conducted, EPA RSLs will be used; industrial use for soil and tapwater for groundwater. When the risk assessment is conducted, the most recent toxicity data and input parameters will be used. The Permittees plan to discuss input parameters with EPA risk assessors during the risk assessment process.

i. Risk Range Issues (Target Cancer Risk and Non-Cancer Hazard Index)

The Permittees will establish an appropriate risk range and hazard index during discussion with EPA risk assessors as part of the corrective action process.

j. Process for addressing remediation

i. Unknown Sources (if source cannot be found). Soil is impacted throughout the facility. Where concentrations exceed industrial RSLs, sources will be removed/remediated. It is likely that a soil management plan will be necessary as part of the permit. If signs of 1,1,1-TCA release are evident in groundwater, an effort will be made to determine the potential source of this contamination for removal.

ii. Source Removal vs. Source Control (Containment). The Permittees will establish the method to address sources in soil and/or groundwater during development the RFI process.

iii. Use of Risk Based or Pathway Elimination Approach. The RFI process will include an assessment of risk, including preliminary determination of cumulative risk at some soil locations with multiple contaminants. These results will be used to determine what source removal/remediation/control work needs to be done at the facility.

iv. Use of TI waiver. There is no anticipated need for a TI waiver at this facility at this time.

v. Where do we really have Corrective Action Obligations? The obligation is to protect against unacceptable exposure to environmental contamination, where that might result from site-related contamination.

vi. Use of Institutional Controls and Engineering Controls. An institutional control (environmental covenant) will likely be used to provide notice to future owners of potential site impact, limit site use to industrial/commercial, and prohibit installation of a water supply well.

V. OTHER KEY ISSUES

a. Format for Data/Information Exchange/Submittals

EPA requests submittal of RFI project documents as both a hard copy (two copies of draft documents and one copy of final EPA-approved document) and in electronic format.

b. Interim Submittals

Any change of the scope in this CAF document must be approved by the EPA project manager and be documented in writing, either via email or letter. Any discussion between EPA personnel and the Permittees that will affect the scope must be documented in writing and provided to the EPA Project Manager, especially those involving other than the EPA Project Manager, such as risk assessors or hydrogeologists.

c. Schedule for CAF Process

RFI field work is anticipated to occur in early 2015. The RFI work will be conducted in accordance with permit requirements.

d. Elements of RFI

The required elements of the RFI are provided in the facility permit.

e. Risk Assessment

Following collection of RFI data, a risk assessment will be conducted. The risk assessment results will be used to determine if additional work must be conducted at the facility, either additional investigation or corrective action. The Permittees will discuss the risk assessment input parameters and details with EPA's risk assessors prior to and during the process of developing the risk assessment.