THIRD FIVE-YEAR REVIEW REPORT FOR MACALLOY CORPORATION SUPERFUND SITE NORTH CHARLESTON, CHARLESTON COUNTY, SOUTH CAROLINA

August 2020

Prepared by

Superfund & Emergency Management Division
U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

CAROL MONELL

Digitally signed by CAROL MONELL
Date: 2020.08.20 13:34:44 -04'00'

Carol J. Monell, Director
Superfund & Emergency Management Division

Date

This Page
Is Left
Intentionally
Blank

Table of Contents

Tables

Figures

LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
BGS	Below Ground Surface
BSA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
CPS	Calcium Polysulfide
Cr(VI)	Hexavalent Chromium
CY	Cubic Yard
EPA	U.S. Environmental Protection Agency
ESP	Electrostatic Precipitator
FYR	Five-Year Review
ICs	Institutional Controls
MCL	Maximum Contaminant Level
µg/L	Micrograms Per Liter
mg/kg	Milligrams per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OCRM	Ocean and Coastal Resource Management
OU	Operable Unit
ORP	Oxidation Reduction Potential
O&M	Operation and Maintenance
PRB	Permeable Reactive Barrier
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
REDOX	Reduction/Oxidation
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SCA	Shipyard Creek Associates
SCDHEC	South Carolina Department of Health and Environmental Control
TBC	To be considered
USI	Unlined Surface Impoundment

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 CFR Section 300.430(f)(4)(ii)) and considering EPA policy.

This is the third FYR for the Macalloy Corporation Superfund Site. The triggering action for this statutory review is the signature date of the previous FYR. The FYR has been prepared because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE). The Site consists of one operable unit (OU). The sitewide OU addresses the soil, groundwater, surface water and sediment remedies.

The FYR was led by EPA remedial project manager (RPM), Craig Zeller. Participants included South Carolina Department of Health and Environmental Control (SCDHEC) environmental health manager Evan Ethridge and SCDHEC project manager Joel Padgett. The review began on 1/8/2020.

Site Background

The Macalloy Corporation National Priorities List (NPL) Site is located at 1800 Pittsburgh Avenue in North Charleston, Charleston County, South Carolina. Ferrochromium alloy was manufactured at the Site by the Macalloy Corporation from 1941 to 1998 when operations ceased. The Site consists of approximately 140 acres fronting Shipyard Creek in a highly industrialized and commercial section of the Charleston Peninsula. The peninsula is formed by the confluence of the Ashley and Cooper Rivers. The Site is directly adjacent to a tidal creek and marsh along Shipyard Creek. The nearest residential neighborhood, Union Heights, is located approximately 0.5 miles to the west.

Two roads (Sewanee Rd. and Talluah Rd.) built in 2007 divide the Site into approximately 110 acre and 30-acre portions. The northern portion consists of approximately 110 acres of undeveloped land vegetated with grass and shrubs. The southern portion is approximately 30 acres in size and is currently occupied by several light industrial/commercial businesses. The topography of the Site is relatively flat with elevations ranging between 10 to 15 feet above mean sea level. Earthen ditches channel on-site storm water runoff to two engineered settling basins. Permitted discharge primarily occurs through one National Pollutant Discharge Elimination System (NPDES) outfall with limited areas flowing directly to Shipyard Creek. Shallow groundwater beneath the Site generally flows from west to east and toward Shipyard Creek. Figure 1 displays the Site location.

The ferrochromium alloy manufacturing process involved the conversion of chromium-bearing ore (chromite) to ferrochromium in a single submerged arc electric furnace. The alloy was then shipped offsite for production of high-quality stainless steel. During operation, smelting was conducted in both submerged and open arc furnaces. Open arc (low carbon) furnaces were operated from approximately 1946 to 1967. Submerged arc furnaces were used in subsequent years. Open arc furnaces generally

produce more hexavalent chromium by-product than submerged arc furnaces. The submerged arc furnace yielded approximately 180 tons of finished ferrochromium per day. Waste materials generated during furnace operations included wastewater, airborne waste gases, and particulate matter. Water was used for cooling the furnace and as the contact cooling medium for airborne discharges from the furnace. Air emissions control equipment at the facility included three baghouses, two gas conditioning towers, and two electrostatic precipitators (ESPs). These systems generated various solid wastes, including dust collected in the ESPs and baghouses, sludge from the gas conditioning towers, and bottom sludge from an on-site NPDES permitted settling pond (former Outfall 001). From 1988 until 1997, Macalloy operated an unlined surface impoundment (USI) for treated ESP dust just north of the ferrochromium process area. Figure 2 presents a detailed map of the Site.

Figure 1: Site Location Map

Figure 2: Detailed Site Map

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Macalloy Corporation		
EPA ID: SCD003360476		
Region:4	**State:** SC	**City/County:** North Charleston/Charleston

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency:EPA
Author name: Craig Zeller
Author affiliation: EPA with support of SCDHEC
Review period:1/8/2020 - 7/1/2020
Date of site inspection:2/11/2020
Type of review: Policy
Review number:3
Triggering action date:9/1/2015
Due date *(five years after triggering action date)*:9/1/2020

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

During its final years of operation, the plant was regulated by several federal environmental statutes, primarily the Clean Water Act, the Clean Air Act, and the Resource Conservation and Recovery Act (RCRA). In 1992, the SCDHEC Bureau of Water Pollution Control issued Administrative Order 92-64-W requiring the Macalloy Corporation to remediate contaminated groundwater on the Macalloy property. Pursuant to this order, a groundwater remediation system was installed in 1994-1995 around the area of the USI. In 1996, Macalloy began the RCRA corrective action process. In January 1997, pursuant to the terms of a consent order with the SCDHEC (No. 96-38-HW), Macalloy initiated offsite disposal of treated

ESP dust from the USI. Macalloy also initiated a removal action in June 1998 under a CERCLA consent order with EPA (No. 98-18-C) to implement a surface water management system to mitigate transport of contaminants to Shipyard Creek while a final site remedy was being developed.

An initial draft RCRA Facility Investigation (RFI) Work Plan (October 14, 1998), was submitted to the EPA and the SCDHEC for review and comment. The draft RFI work plan was revised based on technical comments received from both agencies and then resubmitted on November 30, 1999. After production at the plant ceased in July 1998, Macalloy, the EPA and SCDHEC decided that CERCLA would be a more appropriate mechanism for this site. Subsequently, the site was proposed for inclusion on the National Priorities List (NPL) on October 22, 1999 and was listed as "final" the following February. On March 29, 2000, Macalloy entered into an agreement with the EPA to perform a CERCLA RI/FS. The revised November 30, 1999, RFI work plan formed the basis of the CERCLA Remedial Investigation/Feasibility Study work plan (RI/FS), which was converted to fulfill the requirements of the March 29, 2000, agreement with EPA; the RI/FS work plan was approved as final by the EPA on June 1, 2000.

In December 2000, the first phase of the RI was completed by Macalloy with oversight by the EPA and SCDHEC. The primary focus of Phase I was to assess the nature and extent of soil and groundwater contamination on the Macalloy property and to evaluate the risk to human health and the environment from site media. The Final Phase I RI Report was approved by the EPA on May 17, 2001. Several data gaps were identified in the Phase I RI that needed to be filled before an FS could begin. Therefore, a second phase of the RI was conducted in June 2001, primarily to assess risk to human and ecological receptors from potential contamination in Shipyard Creek. The Final Phase II RI Report was approved by the EPA on March 21, 2002.

Through the RI, it was determined that approximately 60,000 cubic yards of site soil was determined to be impacted by hexavalent chromium. Soil impacted by hexavalent chromium was observed from the ground surface to approximately 15 to 20 feet below ground surface (bgs) and determined to be concentrated in and around the Marsh Lake Fill Area, the former furnace buildings, the former concentrator area, and other isolated locations across the Site. These areas were filled with material from plant operations, including raw materials, slag, sludge, and treated and untreated dust from air pollution control equipment. An additional 55,000 cubic yards of on-site material used as berm material for surface impoundments also contained elevated concentrations of hexavalent chromium.

Approximately 110 cubic yards of soil and debris with gamma radiation levels greater than background levels were identified near the former concentrator area. The radionuclides detected were radium-226, thorium-232, potassium-40, and uranium-235. This material is believed to have been brought to the Site in railcars carrying feedstock for alloy production. The average depth of the radiological debris was determined to be 18 inches.

Five plumes of groundwater contaminated with hexavalent chromium were identified at the Site during the RI. The largest of the plumes, Plume I extended approximately from the former USI to Shipyard Creek. Hexavalent chromium concentrations of 10,000 micrograms per liter (µ/L) were measured in Plume I. Plumes II, III, and IV were smaller in size and located immediately adjacent to the eastern edge of Plume I. Plume V was identified at the plant's former concentrator area. Data collected during the RI, indicated that impacted groundwater at each of the plumes was confined to the shallow aquifer and did not penetrate a clay confining layer that exists across the Site, at approximately 20 feet bgs.

Surface water samples associated with the Site's storm water management system exceeded the hexavalent chromium limit at several sampling locations. Other metals including arsenic, copper, lead, and zinc were identified as being a concern due to offsite discharge to Shipyard Creek.

As part of the RI/FS, a Baseline Risk Assessment (BRA) was conducted to evaluate current and potential effects of contaminants to human health and the environment. Human health exposure pathways evaluated included ingestion, inhalation, and dermal contact with surface soils and groundwater, and ingestion of shellfish from Shipyard Creek. The EPA based its assessment on an expected future industrial land use exposure scenario for an on-site worker. Groundwater ingestion was not determined to be a likely exposure pathway at the Site, since shallow groundwater is not currently used for consumption, nor will it likely be in the future. Nonetheless, shallow groundwater beneath the Site was conservatively assumed to be a source of drinking water because South Carolina classifies all groundwater as a potential underground source of drinking water.

Response Actions

The results of the RI indicated that the primary impacts from the Macalloy Site were to vadose zone soil, shallow site groundwater, storm water, and sediment in the 001 tidal creek. The migration pathways are groundwater discharge and leaching of soil. The primary contaminant of concern (COC) in soil and groundwater is chromium (VI) (Cr(VI)); however, suspended solids and inorganic compounds (metals) with potential saltwater ecological toxicity have been identified as a concern in storm water discharges, and chromium, nickel, and zinc were identified as COCs in sediment. In addition, soil and debris in the concentrator area with radiation readings above background were also identified as a concern.

Therefore, the following remedial action objectives (RAOs) for the Macalloy Site were developed based on reasonably anticipated future land use, potential beneficial groundwater use, and legal requirements:

- Prevent future site worker exposure to unacceptable hazard levels in groundwater.
- Remediate shallow groundwater zones exhibiting the highest concentrations of Cr(VI) and limit its migration to Shipyard Creek to minimize long-term threats.
- Remediate soil that leaches Cr(VI) to groundwater and surface water at concentrations hazardous to human health and the environment.
- Mitigate offsite Cr(VI) discharges in storm water to Shipyard Creek through a combination of the aforementioned remediation measures and a comprehensive site-wide storm water management plan.
- Manage storm water discharges of toxic inorganic compounds in accordance with the comprehensive storm water management plan to protect ambient saltwater quality in Shipyard Creek.
- Remediate soil and debris that produce elevated levels of gamma radiation to mitigate current exposure pathways.
- Mitigate the exposure of benthic organisms to contaminated sediments in the tidal creek.

To accomplish these RAOs, the following remedial components were specified in the Record of Decision (ROD):

- Soil: On-site chemical reduction and stabilization/solidification via ex situ treatment with mechanical mixing.
- Groundwater: Enhanced in-situ chemical reduction via injection and trenching.
- Radiological Material: Excavation with offsite disposal.
- Sediment: Removal, upland disposal, installation of an engineered fabric/sand cap, and restoration of Zone A tidal creek; and monitoring of Zone C Shipyard Creek.
- Surface Water/Storm Water: Comprehensive storm water management system.
- Multi-media: Institutional controls and restrictive covenants to limit land use to commercial/industrial purposes and prohibit the use of groundwater underlying the property.
- Infrastructure: Decommission and demolish all site-wide buildings and infrastructure.

Table 1 includes the cleanup levels established in the 2002 ROD. The EPA based its cleanup goals on an expected future industrial land use exposure scenario for an on-site worker.

Table 1: Cleanup Goals Established in the 2002 RI/FS and ROD

Media	Chemical of Concern	Cleanup Level	Basis of Cleanup Level
Soil	Chromium (VI)	23 mg/kg	Calculated using leachability ratios and groundwater MCL
Debris	Gamma radiation	12 micro-Roentgens/hour	2 times background
Groundwater	Chromium (VI)	100 µg/L	ARAR compliance (MCL)
Sediment	Total chromium	219 to 258 mg/kg	Appendix A of 2002 ROD
	Nickel	33 to 35.7 mg/kg	Appendix A of 2002 ROD
	Zinc	132 to 163 mg/kg	Appendix A of 2002 ROD
Storm Water	Flow	Report	ARAR compliance (Clean Water Act)
	Lead	220 µg/L	ARAR compliance (Clean Water Act, Ambient Saltwater Criteria)
	Arsenic	69 µg/L	ARAR compliance (Clean Water Act, Ambient Saltwater Criteria)
	Chromium (VI)	1,100 µg/L	ARAR compliance (Clean Water Act, Ambient Saltwater Criteria)
	Copper	5.8 µg/L	ARAR compliance (Clean Water

			Act, Ambient Saltwater Criteria)
	Zinc	9.5 µg/L	ARAR compliance (Clean Water Act, Ambient Saltwater Criteria)
	Acute Whole Effluent Toxicity	Report	ARAR compliance (Clean Water Act)

Notes: mg/kg: milligrams per kilogram
micro-Roentgens/hour: micro-Roentgens per hour
µg/L: micrograms per liter

Status of Implementation

Radiological Material: Excavation and Offsite Disposal

Removal activities began on February 7, 2005 and were completed on February 9, 2005. ENTACT, the remedial construction contractor, performed the debris removal. The radiological debris area was in the southwestern portion of the Site and covered approximately 2,025 square feet. Erosion controls were placed on the downslope sides of the removal area before construction began. Initially, the entire area was excavated to a depth of 9 inches and then soil left in place was field screened using a pressurized ion chamber. Initial screening indicated that material exceeding 12 micro-Roentgens/hours remained, thus additional material was removed followed by screening until the cleanup goal was achieved. Final excavation depths ranged from 9 to 18 inches. In total, approximately 200 tons of debris and soil were excavated and transported to U.S. Ecology Idaho, Inc. in Grand View, Idaho for appropriate disposal. Upon completion of the removal activities, a confirmatory survey and inspection was performed by the EPA and SCDHEC on May 11, 2005.

Zone A Sediment Removal

Sediment removal began on December 6, 2004 and was completed on December 23, 2004. Specialty amphibious low-ground-pressure construction equipment was used to excavate sediment up to 24 inches bgs contaminated with chromium, nickel, and zinc from the Zone A tidal creek. Because these activities could only take place during low tide, work was conducted during two five-hour shifts during both daily low tides. To ensure that the excavation of sediment achieved the required 2-foot depth, ground personnel directed the excavator operator and used a surveyor's rod to continuously verify excavation depths. Geotextile installation and placement of clean sand backfill began on December 28, 2004 and was completed on January 29, 2005. Upon completion of sediment removal, geotextile fabric was placed across the excavated area and secured using 24-inch-long hooked steel reinforcing bars. Excavated sediment was staged in an earthen bermed, temporary holding area on the shore immediately north of the creek. Kiln dust was immediately added to the excavated sediment in the holding area to solidify it. The solidified sediment was then placed in approximate 500-cubic-yard (CY) stockpiles for use on-site during the soil remedy. During sediment removal and sand cap placement, a portion (less than an acre) of the adjacent tidal marsh was disturbed. The disturbed area was returned to approximate original grade at the completion of remediation activities in January 2005. As required by the Critical Area Permit, a Marsh Restoration Plan restoration was performed March 11 through

March 13, 2005. Restoration activities included planting 5,900 1-gallon *Spartina alternifiora* on 3-foot centers (approximately 120 plants per 1,000 square feet). In addition, 196 feet of shoreline were restored by planting 40 five-gallon *Baccharis halimifolia* on five-foot centers.

Groundwater: Enhanced in Situ Chemical Reduction

Groundwater remediation activities through 2009 included enhanced in-situ chemical reduction via injection and trenching. Shallow groundwater with Cr(VI) concentrations up to 38,600 µg/L (MCL = 100 µg/L) were identified during the remedial investigation. Following an EPA pilot study, chemical reduction zones in the form of permeable reactive barriers (PRBs) were installed by injection and trenching methods to treat groundwater downgradient of the soil source areas. Over 480,000 gallons of chemical reductant consisting of sodium dithionite/ferrous sulfate or sodium dithionite/potassium carbonate were injected into 203 injection wells located along eight PRB transects. Mechanical trenching techniques were used where injection wells did not meet injection volume objectives.

More than a decade of groundwater monitoring through July 2016 indicated total Cr concentrations at the majority of Site wells were less than the cleanup goal of 100 µg/L, with the exception of an area of shallow groundwater in the vicinity of MW041, MW043, MW047, MW060, and MW061. A supplemental site investigation was conducted in October/November 2016. During the 2016 supplemental investigation, ten temporary shallow monitoring wells (IW09-01 through IW09-10) were installed and sampled along with 11 permanent monitoring wells (MW040 through MW048, MW060, and MW061R) to further delineate the extent of chromium in groundwater and fill spatial data gaps associated with the northern edge of an plume at that time, with the objective of informing decisions regarding supplemental injections. The results of the investigation concluded that groundwater with chromium (VI) above the cleanup goal of 100 µg/L was only present at MW043 (730 µg/L) and IW09-06 (2600 µg/L). Therefore, it was recommended that Supplemental remedial injections of liquid calcium polysulfide (CPS) at various depth intervals around MW043 and IW09-06 were recommended to address the isolated pockets of residual Cr(VI) in shallow groundwater.

Supplemental injections of the chemical reductant CPS were completed in the vicinity of MW043 and IW09-06 in March and June 2017. The goal was to establish highly reducing conditions in the aquifer matrix to elicit conversion of Cr(VI) to Cr(III), which does not pose the same ecological and health threat as Cr(VI), as in previous remedial actions.

At MW043, 28 injection points were successfully completed over a 5,000-square foot treatment area from March 14 through 20, 2017. Each injection point received approximately 231 gallons of 4% by weight CPS solution. This volume was distributed over three injection intervals from 8 to 18 feet bgs (approximately 77 gallons per interval). In total, an estimated 6,468 gallons of 4% CPS solution were successfully injected into the shallow aquifer at the MW043 treatment area, with minimal daylighting.

Two rounds of injections were successfully completed at IW09-06, in March and June 2017. From March 14 through 20, 2017, injections were completed at 40 of the 42 proposed points over a 7,000-square foot treatment area; only two injection points (points 37 and 38) had immediate daylighting, which required abandonment before the targeted injection volume was delivered. On June 28 and June 29, 2017, injections were completed at all of the proposed 13 injection points at IW09-06 over an approximately 1,100-square foot area. Each injection point received either 240 or 266 gallons of 7% by weight CPS solution, distributed over three injection intervals from 8 to 18 feet bgs. In total, an estimated 13,334 gallons of 7% CPS solution were injected into the shallow aquifer at IW09-06

A map of the injection points from both 2017 events is pictured in Figure 3:

Figure 3: Injection Points from March and June 2017 Supplemental Injection


MW043
MW041
MW042
MW043
MW061R
MW044
MW045
MW047
IW09-08
MW046
FIGURE 5
INJECTION OF CALCIUM POLYSULFIDE IN MARCH AND JUNE 2017
FORMER MACALLOY CORPORATION SITE
NORTH CHARLESTON, SOUTH CAROLINA
LEGEND
TEMPORARY INJECTION POINT IN JUNE 2017
TEMPORARY INJECTION POINT IN MARCH 2017
NO AMENDMENT DELIVERED (#37 & 38)
LONG-TERM SHALLOW GROUNDWATER MONITORING WELL
0 25 50
SCALE IN FEET
COORDINATE SYSTEM: NAD 1983
STATE PLANE SOUTH CAROLINA FEET
REQUESTED BY: CT
DRAWN BY: KPB
DATE: 6/27/2018
PROJECT: 000001965
ENSAFE

Soil: On-site Chemical Reduction

Full-scale soil treatment in the primary soil remediation areas began on March 22, 2005 and was completed on October 13, 2005. Over 160,000 CY of soil was treated in these areas. In general, soil treatment consisted of excavating contaminated soil and mixing with the calcium sulfide reductant until the cleanup goal was attained. The soil cleanup goal for hexavalent chromium-impacted soil above the water table was 23 mg/kg. This value was a site-specific concentration calculated during the RI to minimize leaching of hexavalent chromium from soil to groundwater at concentrations above the drinking water MCL of 100 µg/l.

Soil excavation also occurred at isolated "hot spots" across the Site at depths ranging from one to seven feet bgs and as identified during the RI. Excavated soil from areas outside the soil remediation area was transported to the soil remediation area and stockpiled for treatment and placement. Samples of treated hot spot stockpiles were collected and analyzed for hexavalent chromium in the field laboratory. Ten percent of samples were sent to a laboratory for verification. Approximately 5,000 CY of soil was effectively treated from the "hot spot" areas on-site.

In December 2005, during site grading activities immediately east of the former concentrator area, ENTACT encountered a layer of dense white material suspected to be low carbon slag and furnace rubble from the earliest days of the ferrochromium plant's operation. The material ranged from about two feet to seven feet in thickness and ranged from one to four feet below existing grades. Initial hexavalent chromium analysis of the material conducted in the field laboratory indicated most of the material to be below the cleanup goal of 23 mg/kg. The low carbon slag/furnace rubble was excavated, placed in approximate 500-CY stockpiles, and sampled. Although only two piles had concentrations greater than the cleanup goal, all piles were treated with 3% calcium sulfide solution and placed within the soil remediation area. Approximately 22,500 CY of low carbon slag/furnace rubble was treated and backfilled on-site.

Comprehensive Stormwater Management:

Surface Water/Storm Water — Comprehensive storm water management system: The storm water remedy focused on mitigating pollutant discharge into Shipyard Creek by construction of a modern comprehensive storm water management system that met the requirements of the South Carolina Storm Water Management and Sediment Reduction Act of 1991. The selected storm water remedy, in conjunction with the selected soil and groundwater remedies, was developed to meet Cr(VI) cleanup goals in storm water discharges to Shipyard Creek, and to control sediment (total suspended solids) in discharge water, thereby reducing arsenic, copper, lead, zinc, and other metals. Key elements included detention basins and conveyances to reduce suspended sediment concentrations; modern peak flow designs; a consolidated outfall; regraded topography; site topography designed for no runoff from offsite watersheds; and sealed underground pipe sections and migration barriers to minimize potential groundwater infiltration and preferential groundwater flow along pipes.

Institutional Controls (ICs) Review

Charleston County identifier numbers for the parcels associated with the Site are: 4660000010, 4660000063, 4660000060, 4660000009, 4660000061, 4660000065, and 4660000066 which are owned by Shipyard Creek Associates; and parcel 4660000062, which is owned by Sonoco Recycling LLC. As a part of the site-wide remedy, institutional controls and restrictive covenants were executed for the Site that limit future use to commercial/industrial purposes and prohibit the use of groundwater underlying the property. These institutional controls were approved by the EPA and SCDHEC in May 2006, and have been officially recorded with the Charleston County Register of Deeds. A copy of the restrictive covenants is provided in Appendix H. Current and future land use for the Site is industrial and commercial use only. Table 2 lists the institutional controls associated with areas of interest at the Site. Figure 4 shows the location of the parcel boundaries associated with the Site.

Figure 4: Institutional Control Base Map

Parcel 4660000062 owned by Sonoco Recycling LLC. The rest are owned by Shipyard Creek Associates. All parcels shown are subject to limiting future use to commercial/industrial purposes, and prohibiting the use of groundwater underlying the property.

NORTH

Macalloy Corporation NPL Site

Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Table 2: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcels	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater	Yes	Yes	4660000010 4660000063 4660000060 4660000009 4660000062 4660000061 4660000065 4660000066	Limit future use to commercial/ industrial purposes and prohibit the use of groundwater underlying the property.	Declaration of Restrictive Covenants, May 2006

Systems Operations/Operation & Maintenance

EnSafe Inc., contracted by the former property owner Macalloy, performed remedial effectiveness monitoring through 2014 in accordance with the FRAR (EnSafe 2006) and the First FYR (EPA 2010). EnSafe Inc. is no longer contracted to perform this work.

There have been no costs associated with Operation & Maintenance over the last five years. Any future costs will pertain to groundwater monitoring of the 6-acre area where cleanup goals have not been met. These costs will be covered on a voluntary basis by the property owner.
.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the previous FYR (Table 3) as well as the recommendations from the previous five-year review and the current status of those recommendations (Table 4).

Table 3: Protectiveness Determinations/Statements from the 2015 FYR

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Short-term Protective	The remedy at the Site currently protects human health and the environment in the short-term because the following were completed to meet RAOs: • Radiological debris and soil were removed. • Contaminated sediment in Zone A was removed and a clean sand cap was constructed to isolate the minimal deeper contaminants. • Concentrations of hexavalent chromium in soil were reduced below 23 milligrams per kilogram. • A comprehensive storm water management system was constructed to mitigate offsite storm water discharges of toxic inorganic compounds.

		• Institutional controls and restrictive covenants were executed for the Site that limit future use to commercial/industrial purposes and prohibit the use of groundwater underlying the property. Cleanup goals established by the ROD for storm water, sediment, and marsh restoration have been met; therefore, monitoring for these components was discontinued, as recommended in the First Five-Year Review Report (U.S. EPA 2010). The First Five-Year Review Report also recommended thickness measurements of the engineered tidal creek cap be completed in 2011 and 2013. The additional measurements found negligible sand loss and parts of the former channel were indistinguishable from the surrounding tidal marsh. No additional tidal creek cap thickness monitoring events are planned. The soil and ongoing groundwater remedy have reduced the highest concentrations of hexavalent chromium in the shallow groundwater; however, in order for the remedy to be protective in the long-term, all site shallow groundwater must show sustained concentrations of hexavalent chromium below the cleanup goal of 100 µg/L. Based on the latest groundwater monitoring results, a small area of groundwater contaminated above the cleanup goal still exists.

Table 4: Status of Recommendations from the 2015 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	MW061 has been damaged and is inaccessible.	Abandon and replace MW-061	Completed	Damaged monitoring well MW061 was properly abandoned, and a replacement well, MW061R, was installed approximately 12 feet to the west.	11/2/2016
1	Total chromium concentrations at MW041, MW043, MW060, (and previously at MW061) remain elevated above the RAO of 100 µg/l.	Supplemental groundwater remediation similar to the in-situ chemical reduction completed in 2005 and 2008.	Ongoing	Supplemental injections of the chemical reductant CPS were completed in the vicinity of MW043 and IW09-06 in March and June 2017. The goal was to establish highly reducing conditions in the aquifer matrix to elicit conversion of Cr(VI) to Cr(III), which does not pose the same ecological and health	NA

				threat as Cr(VI), as in previous remedial actions.	
1	Current groundwater data suggests that the horizontal extent of the contaminant plume boundary above the RAO to the north, east, and west of MW060 is unknown.	Evaluate the need for additional monitoring locations (temporary or permanent) to delineate the remaining area of elevated chromium in groundwater. This should be done prior to any supplemental remediation.	Completed	Ten temporary shallow injection/monitoring wells (IW09-01 through IW09-10) were installed to further delineate the extent of Cr in groundwater, fill spatial data gaps associated with the northern edge of the apparent plume, and thereby inform decisions regarding supplemental injections.	11/1/2016
1	EnSafe is no longer contracted to perform the annual groundwater monitoring.	Identify an alternate mechanism to obtain annual groundwater monitoring.	Ongoing		

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement and Site Interviews

A public notice was made available by newspaper in *The Post and Courier* of Charleston, SC on 2/12/2020, stating that there was a five-year review and inviting the public to submit any comments to the U.S. EPA. The results of the review and the report will be made available at the Site information repository located at the Charleston County Main Library, 68 Calhoun Street, Charleston, SC 29401. A copy of the notice can be found in Appendix B.

The FYR process included interviews with regulatory agencies involved in or aware of Site activities. The purpose was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy implemented to date. All the interviews were completed via email after the Site inspection. The interviews are summarized below. Appendix C provides the complete interviews.

Joel Padgett is a Hydrogeologist in the Bureau of Land and Waste Management Federal Remediation Program at SCDHEC. Mr. Padgett's overall impression is that "the soil, sediment, and stormwater remedies continue to be effective and provide protectiveness for commercial/industrial reuse."

Data Review

As of the Second Five-Year Review Report for Macalloy Corporation, the cleanup goals and RAOs in the ROD for the storm water, sediment, marsh, tidal creek, and radiological debris have been met. Therefore, monitoring activity for these media has been discontinued.

More than a decade of groundwater monitoring from 2006 through July 2016 indicated total chromium concentrations were below the cleanup goal in Site monitoring wells, with the exception of a few acres of elevated total Cr at MW041, MW043, MW047, MW060, and MW061R. A 2016 Supplemental Investigation recommend additional injections of CPS in these areas where chromium (VI) contamination above cleanup goals persists. Supplemental injections were carried out in March and June of 2017 at two locations: MW043 and IW09-06. Groundwater monitoring results and sampling locations from the Supplemental Investigation can be found below in Table 5 and Figure 5, respectively.

Table 5: 2016 Supplemental Investigation Groundwater Monitoring Results

Well Identification	Sample Type	Sample ID	Sample Date	Analytical Results (µg/L)			Total Dissolved Solids (mg/L)	Geochemistry					
				Arsenic	Total Chromium	Hexavalent Chromium via Method 7199		Turbidity (NTU)	Raw ORP (mV)	Eh (ORP+ 200mV)	DO (mg/L)	Specific Conductivity (mS/cm)	pH
MW040	N	MACGMW0401016	10/31/2016	0.35 J	7.7 B	**6.1**	NA	2.95	138.9	338.9	1.73	0.66	6.48
MW041	N	MACGMW0411016	10/31/2016; 11/22/2016	**26.2**	**786**	1 U	**1,100**	9.6	-38.3	161.7	3.51	1.903	6.18
MW042	N	MACGMW0421016	10/31/2016	**2.1**	0.87 BJ	1 U	NA	2.17	185.2	385.2	0.95	2.96	6.70
MW043	N	MACGMW0431016	10/31/2016; 11/22/2016	**2.8**	**1,260**	**730**	**2,000**	8.72	-83.0	117	0.57	2.596	6.24
MW044	N	MACGMW0441116	11/1/2016	**6.8**	0.54 BJ	1 U	NA	5.1	76.5	276.5	0.33	9.72	6.59
MW045	N	MACGMW0451116	11/1/2016	**37.9**	0.6 BJ	1 U	NA	34.1	-118	82	0.19	10.07	6.91
MW046	N	MACGMW0461116	11/1/2016	**10.7**	4.4 J	1 U	NA	4.31	-139.1	60.9	0.38	14.16	6.44
MW047	N	MACGMW0471016	10/31/2016; 11/22/2016	**7.9**	**280**	1 U	**8,400**	4.17	10.3	210.3	0.26	12.54	6.05
MW048	N	MACGMW0481116	11/1/2016	**5.5**	0.64 BJ	1 U	NA	0.91	92.7	292.7	0.23	14.83	6.09
	FD	MACGHW0481117	11/1/2016	**5.6**	0.68 BJ	1 U	NA	0.91	92.7	292.7	0.23	14.83	6.09
MW060	N	MACGMW0601116	11/1/2016; 11/22/2016	**1.2**	**517**	1 U	**840**	9.63	-118.7	81.3	0.79	1.196	5.75
MW061R	N	MACGMW061R1116	11/4/2016	**11.9**	**11.6**	1 U	NA	9.05	-177.6	22.4	0.25	4.327	5.98
IW09-01	N	MACIW09011116	11/3/2016	NA	**95.6**	1 U	NA	29.7	-49.4	150.6	0.41	1.33	6.16
IW09-02	N	MACIW09021116	11/3/2016	NA	4.0 J	1 U	NA	2.69	8.2	208.2	0.37	1.81	5.83
IW09-03	N	MACIW09031116	11/3/2016	NA	4.2 J	1 U	NA	5.64	-43.7	156.3	0.24	2.49	6.43
IW09-04	N	MACIW09041116	11/4/2016	NA	**390**	1 U	NA	64.8	-17.1	182.9	0.98	2.83	6.04
IW09-05	N	MACIW09051116	11/4/2016	NA	**10**	1 U	NA	7.83	-65.9	134.1	0.55	5.89	6.55
IW09-06	N	MACIW09061116	11/4/2016; 11/22/2016	NA	**3,310**	**2,600**	**8,800**	13.4	-60.5	139.5	0.79	11.91	6.17
	N	MACIW09061216	12/2/2016	NA	**3,380**	**3,300**	**8,700**	2.51	153.6	353.6	0.36	10.26	6.28
IW09-07	N	MACIW09071116	11/4/2016	NA	**15.7**	1 U	NA	7.63	-101.3	98.7	0.39	8.023	5.26
IW09-08	N	MACIW09081116	11/4/2016	NA	6.5 J	1 U	NA	8.7	-150.4	49.6	0.21	5.412	5.66
IW09-09	N	MACIW09091116	11/4/2016	NA	3.7 J	1 U	NA	7.04	-54.5	145.5	0.29	7.26	6.09
IW09-10	N	MACIW090101116	11/4/2016	NA	2.8 J	1 U	NA	3.78	-1.0	199	0.49	4.22	5.92

Notes:

mg/L	=	Micrograms per liter
µg/L	=	Milligrams per liter
NTU	=	Nephelometric Turbidity Units
mV	=	Millivolts
mg/L	=	Milligrams per liter
N	=	Normal/Primary
FD	=	Field duplicate
NA	=	Not analyzed
U	=	Parameter not detected above reporting limit.
B	=	Analyte detected in method blank at estimated concentrations that did not significantly affect results.
J	=	Estimated concentration less than the reporting limit but greater than or equal to the method detection limit.

Bold values are detections above the reporting limit.

Yellow shading indicate Cr(VI) concentration is greater than the cleanup goal of 100 µg/L.

Green shading indicates arsenic or total chromium are above their MCL of 10 ug/L and 100 ug/L, respectively.

Figure 5: 2016 Supplemental Investigation Monitoring Locations

The pre-injection Cr(VI) concentration at IW09-06 in December 2016 was 3,300 µg/L, significantly above the cleanup goal of 100 µg/L. Subsequent to the March 2017 injection, Cr(VI) concentrations remained above the cleanup goal, ranging from 490 to 4,100 µg/L through May 2017. Additionally, positive oxidation reduction potential (ORP) levels indicated the injection did not establish optimum reducing conditions in the subsurface sufficient to convert Cr(VI) to Cr(III), or extend over a large enough area to be present at IW09-06. Following the second injection in June 2017, ORP reduced significantly indicating sufficient CPS was delivered to the subsurface, Cr(VI) concentrations in IW09- 06 immediately declined by an order of magnitude to 480 µg/L in July 2017, and then were non detect for eight monthly events from September 2017 through May 2018.

The pre-injection Cr(VI) concentration at MW043 in October 2016 was 730 µg/L. Subsequent to the March 2017 injections, Cr(VI) was not detected at MW043 for six months from March through August 2017; however, higher ORP and dissolved oxygen levels suggested insufficient CPS was delivered to the subsurface to establish optimum long-term reducing conditions. In September 2017, the sample collected from MW043 contained elevated Cr(VI) at 3,800 µg/L. A second sample collected later in the month confirmed the elevated Cr(VI), with a concentration of 8,200 µg/L. Both detections were historic highs at MW043 above the cleanup goal. Unusual hydrological conditions caused by tropical rainfall from Hurricane Irma (5.51 inches on September 11, 2017) likely contributed to the elevated Cr(VI) concentrations during the two September sampling events. Following the September hurricane rainfall event, Cr(VI) concentrations returned to non-detect at MW043 for four months, and then elevated Cr(VI) at 2,500 µg/L was reported in February 2018. Subsequently from March through June, 2018, Cr(VI) was non-detect. Eight consecutive monthly samples for Cr(VI) below the cleanup goal are necessary to document that groundwater restoration is complete and the Site can proceed with NPL deletion.

Attainment groundwater monitoring results from March 2017-June 2018 are summarized in Table 6.

Table 6: 2017-2018 Attainment Groundwater Monitoring Results

Well Identification	Days after Injection	Month Count Satisfying Attainment Requirement	Sample Date	Analytical Results (µg/L)	Depth to Water (feet btoc)	Depth to Water (approx feet bgs)	Geochemistry					
				Hexavalent Chromium via Method 7199			Turbidity (NTU)	Raw ORP (mV)	Eh (ORP+ 200mV)	DO (mg/L)	Specific Conductivity (mS/cm)	pH
MW043	Preinjection		10/31/2016	**730**	-	-	8.72	-83.0	117	0.57	2.596	6.24
	Injection		3/20/2017									
	2	1	3/22/2017	0.40 U	13.01	10.01	33.5	44.8	244.8	1.4	1.59	6.65
	21	2	4/10/2017	0.30 U	13.22	10.22	7.15	-71.0	129	0.87	2.667	6.05
	50	3	5/9/2017	0.30 U	13.28	10.28	1.93	-22.3	177.7	0.22	2.81	6.27
	86	4	6/14/2017	0.30 U	12.91	9.91	3	-10.9	189.1	7.31	2.999	5.84
	120	5	7/18/2017	0.30 U	13.15	10.15	9.71	-115.9	84.1	0.9	3.219	6.05
	155	6	8/22/2017	0.30 U	12.35	9.35	9.01	-35.3	164.7	6.59	1.917	6.23
	184	7	9/20/2017	**3,800**	11.95	8.95	5.92	60.1	260.1	0.91	1.394	6.49
	193	0	9/29/2017	**8,200**	12.04	9.04	1.02	57.3	257.3	0.57	0.981	6.59
	211	1	10/17/2017	30 U	12.39	9.39	37.5	-2.8	197.2	0.72	2.438	6.06
	240	2	11/15/2017	0.30 U	12.61	9.61	16.5	-102.3	97.7	1.66	3.512	5.92
	274	3	12/19/2017	0.30 U	12.79	9.79	4.1	-88.7	111.3	2.57	2.91	6.09
	311	4	1/25/2018	0.30 U	12.96	9.96	6.25	-126.8	73.2	0.51	4.357	5.86
	339	0	2/22/2018	**2,500**	12.58	9.58	4.03	106.3	306.3	1.25	2.41	6.18
	373	1	3/28/2018	0.30 U	12.89	9.89	27.3	62	262	1.37	2.638	5.93
	414	2	5/8/2018	0.30 U	13.02	10.02	14.6	82.3	282.3	0.82	3.201	6.05
	464	3	6/27/2018	0.30 U	12.63	9.63	8.61	-128.8	71.2	0.95	3.027	6.09
IW09-06	Preinjection		11/4/2016	**2,600**	-		13.4	-60.5	139.5	0.79	11.91	6.17
	Preinjection		12/2/2016	**3,300**	-		2.51	153.6	353.6	0.36	10.26	6.28
	Injection		3/17/2017									
	5		3/22/2017	**2,800**	13.05	10.05	31.0	131.2	331.2	1.40	12.90	6.26
	24		4/10/2017	**4,100**	13.21	10.21	4.0	216.8	416.8	0.23	10.11	6.25
	40		4/26/2017	**490**	13.22	10.22	48.3	-261.3	-61.3	1.17	11.06	6.59
	53		5/9/2017	**1100 (unfiltered)**	13.11	10.11	15.5	119.5	319.5	0.37	10.08	6.47
	53		5/9/2017	**1100 (filtered)**	13.11	10.11						
	89		6/14/2017	0.30 U	12.71	9.71	24.6	10.0	210	-	11.65	5.85
	Injection		6/29/2017									
	19		7/18/2017	**480**	13.05	10.05	9.8	-471.9	-271.9	0.18	10.68	10.06
	54	0	8/22/2017	**380**	12.01	9.01	710.0	-421.7	-221.7	2.19	10.98	8.82
	83	1	9/20/2017	0.30 U (field filtered and unfiltered)	11.38	8.38	587 (unfiltered)	-397.2	-197.2	0.04	11.01	8.17
	92	-	9/29/2017	0.30 U	11.66	8.66	270	-335.1	-135.1	0.13	10.64	7.81
	110	2	10/17/2017	30 U	12.13	9.13	184	-276.2	-76.2	3.09	5.151	6.91
	139	3	11/15/2017	1.5 U	12.43	9.43	64.3	-345.6	-145.6	1.23	10.34	6.91
	173	4	12/19/2017	0.30 U	12.62	9.62	58.3	-280.1	-80.1	0.88	9.812	6.88
	210	5	1/25/2018	0.30 U	12.92	9.92	8.13	-310.1	-110.1	0.30	9.63	6.72
	238	6	2/22/2018	0.30 U	12.41	9.41	9.02	-277.1	-77.1	0.45	10.71	6.7
	272	7	3/28/2018	1.5 U	12.72	9.72	9.49	-199.7	0.3	0.29	9.624	6.7
	313	8	5/8/2018	0.30 U	12.91	9.91	2.47	-192.9	7.1	0.26	10.32	6.83

Notes:

µg/L	=	Micrograms per liter
mg/L	=	Milligrams per liter
NTU	=	Nephelometric Turbidity Units
mV	=	Millivolts
U	=	Not detected above the laboratory reporting limit
ORP	=	Oxidation-Reduction Potential
DO	=	Dissolved oxygen
btoc	=	below top of casing
bgs	=	below ground surface

Bold values are detections above the laboratory reporting limit.

Yellow shading indicate hexavalent chromium concentration is greater than the cleanup goal of 100 µg/L.

Site Inspection

The inspection of the Site was conducted on 2/11/2020. In attendance were Craig Zeller of the EPA, Evan Ethridge, Tim Kadar, Sara MacDonald, and Joel Padgett of SCDHEC. The purpose of the inspection was to assess the protectiveness of the remedy.

Participants toured the Site and observed monitoring wells and adjacent properties. The Site is well maintained. The completed site inspection checklist is included in Appendix D.

SCDHEC staff visited the designated Site Repository, the Charleston County Main Library, located at 68 Calhoun Street in Charleston, South Carolina. Staff determined that the Site Documents were up to date through 2015.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

The cleanup goals and RAOs in the ROD for the storm water, sediment, marsh, tidal creek, and radiological debris have been met and continue to provide protectiveness for commercial/industrial reuse. Injections of chemical reductant and natural attenuation have been effective in reducing chromium groundwater concentrations at the Site. A total of 18 chemical reductant injections have been conducted at the Site from 2007 to 2018. The two most recent events conducted in 2017 and 2018 were funded by the Site property owners. The reductant and natural attenuation have reduced chromium groundwater contamination over the vast majority of the Site, however a 6-acre area surrounding MW043 still exceeds the remedial goal of 100 µg/L. This 6-acre area will remain on the NPL with groundwater restrictions in place and will continue to be monitored to ensure the remedy remains protective.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Question B Summary:

A review of the Applicable or Relevant and Appropriate Requirements (ARARs) was conducted as a part of this FYR. The only ARAR that remains applicable to the Macalloy Site is the groundwater cleanup level pertaining to Chromium (VI). The standard used is EPA's Maximum Contaminant Level (MCL) for Chromium (VI), which is 100 µg/L. The MCL for Chromium (VI) remains to be 100 µg/L. Therefore, the ARARs selected at the time of remedy selection are still valid.

QUESTION C: Has any **other** information come to light that could call into question the protectiveness of the remedy?

Question C Summary:

No other information has materialized that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
Sitewide

OTHER FINDINGS

The following recommendation was identified during the FYR. This recommendation does not affect current and/or future protectiveness:

The reductant and natural attenuation have reduced chromium groundwater contamination over the vast majority of the Site, however a six-acre area still exceeds the remedial goal of 100 μg/L.
In December 2019, the property owners, Shipyard Creek Associates, sent a request to the EPA for partial deletion of the Site from the NPL. The request entailed deletion of all but 6 acres of the Site where chromium groundwater concentrations exceed the remedial goal. This 6-acre area will retain the restrictive covenants in place and continue to be monitored. The owners plan to sell the deleted portion of the site for industrial redevelopment. It is recommended that EPA review and implement a partial NPL deletion. SCDHEC has reviewed the request and has prepared a letter of concurrence should the EPA choose to proceed. A map of the proposed 6-acre area to be excluded from NPL deletion can be found in Appendix E.

VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement	
Protectiveness Determination: Protective	*Planned Addendum Completion Date:* N/A

Protectiveness Statement:

The remedy at the Macalloy Corporation Superfund Site is protective of human health and the environment.

The cleanup goals and RAOs for storm water, sediment, marsh, tidal creek, and radiological debris have been met. Since the last FYR, two rounds of supplemental remedial injections were performed in order to reach groundwater cleanup goals. To date, only a 6-acre area remains where Chromium (VI) contamination exceeds cleanup goals. This area will remain on the NPL with restrictive covenants in place to prohibit the use of groundwater, thereby ensuring the remedy remains protective.

VIII. NEXT REVIEW

The next five-year review report for the Macalloy Corporation Superfund Site is required five years from the completion date of this review.

APPENDIX A – LIST OF DOCUMENTS REVIEWED

First Five-Year Review; Macalloy Corporation Site, Charleston, South Carolina, EnSafe, September 1, 2010.
Second Five-Year Review; Macalloy Corporation Site, Charleston, South Carolina, EPA, August 2015.

Groundwater

First Quarter Long-Term Groundwater Monitoring Report; Macalloy Corporation Site, Charleston, South Carolina, EnSafe, January 17, 2007.
Event 2 Long-Term Groundwater Monitoring Report; Macalloy Corporation Site, Charleston, South Carolina, EnSafe, March 27, 2007.
Event 3 Long-Term Groundwater Monitoring Report; Macalloy Corporation Site, Charleston, South Carolina, EnSafe, June 28, 2007.
Long-Term Groundwater Monitoring Report Event 4, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, September 2007.
Long-Term Groundwater Monitoring Report Event 5, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, December 21, 2007.
Optimized Remedial Groundwater Program Technical Memorandum, Macalloy Corporation NPL Site, Charleston, South Carolina, EnSafe, January 8, 2008.
Long-Term Groundwater Monitoring Report Interim Event 5A Macalloy Corporation Site, Charleston, South Carolina, EnSafe, March 4, 2008.
Long-Term Groundwater Monitoring Report Event 6, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, May 15, 2008.
Delineation of Potential Plume in the Vicinity of MW060 Technical Memorandum, Optimized Remedial Groundwater Program, Macalloy Corporation NPL Site, Charleston, South Carolina, EnSafe, June 20, 2008.
Supplemental Groundwater Treatment at MW041, MW047, MW060 and MW061 Technical Memorandum, Macalloy Corporation NPL Site, Charleston, South Carolina, EnSafe, September 29, 2008.
001 Tidal Creek- Work Plan to Repair Cap Near Transect 3 Technical Memorandum, Macalloy Corporation NPL Site, EnSafe, December 1, 2008.
001 Tidal Creek Cap Repair Completion Report Technical Memorandum, Macalloy Corporation NPL Site, EnSafe, February 9, 2009.
Supplemental Groundwater Treatment Completion Report, Macalloy Corporation NPLSite, EnSafe, February 9, 2009.
Long-Term Groundwater Monitoring Report - Event 7 Macalloy Corporation Site, Charleston, South Carolina, EnSafe, March 18, 2009.
Long-Term Groundwater Monitoring Report Event 8, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, August 24, 2009, EnSafe, (2007, November).
Long-Term Groundwater Monitoring Report Event 9, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, November 23, 2009.
Long-Term Groundwater Monitoring Report Event 10, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, June 18, 2010.
Long-Term Groundwater Monitoring Report Event 11, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, January 28, 2011.
Long-Term Groundwater Monitoring Report Event 12, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, August 16, 2011.

Long-Term Groundwater Monitoring Report Event 13, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, January 21, 2012.
Long-Term Groundwater Monitoring Report Event 14, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, October 2012.
Long-Term Groundwater Monitoring Report Event 15, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, October 2013.
Long-Term Groundwater Monitoring Report Event 16, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, October 2014.
Macalloy Supplemental Investigation and Injection in Support of Site Closeout, EnSafe, February 9, 2017.
Groundwater Restoration Attainment Monitoring Report, Recommendation for Partial NPL Deletion and Elimination of Residential Use Restriction Macalloy Corporation Superfund Site, North Charleston, South Carolina, Shipyard Creek Associates LLC, August 2018.
Macalloy Corporation NPL Site UPDATED REQUEST for Commencement of Partial NPL Deletion Process, Shipyard Creek Associates LLC, December 19, 2019.
Regional Screening Levels for Chemical Contaminants at Superfund Sites. EPA. Last accessed May 15, 2020.

Tidal Marsh

Year 2 Marsh Restoration Monitoring, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, July 27, 2007.
Year 3 Marsh Restoration Monitoring, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, July 30, 2008.
Zone A 001 Tidal Creek Tidal Creek Year 1 Annual Cap Monitoring Report, Macalloy Corporation Site, Charleston, EnSafe, June 29, 2006.
Year 2 Tidal Creek Cap Monitoring Report, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, July 27, 2007.
Year 3 Tidal Creek Cap Monitoring Report, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, June 30, 2008.
Year 4 Tidal Creek Cap Monitoring Report, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, September 10, 2009.
Year 5 Tidal Creek Cap Monitoring Report, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, 2010.
Year 6 Tidal Creek Cap Monitoring Report, Macalloy Corporation Site, Charleston, South Carolina, EnSafe, August 2011.
Tidal Creek Cap Monitoring Report (along with LTM Groundwater report), Macalloy Corporation Site, Charleston, South Carolina, EnSafe, March 2014.

Zone C sediment

Zone C Sediment Post-Construction Monitoring Report (Event 1); Macalloy Corporation Site, Charleston, South Carolina, EnSafe, December 8, 2006.
Zone C Sediment Post-Construction Monitoring Report (Event 2); Macalloy Corporation Site, Charleston, South Carolina, EnSafe, February 10, 2009.
Zone C Sediment Post-Construction Monitoring Report (Event 3); Macalloy Corporation Site, Charleston, South Carolina, EnSafe, December 8, 2009.

APPENDIX B: Public Notice

RECEIVED

FEB 19 2020

SITE ASSESSMENT, REMEDIATION, & REVITALIZATION

AFFIDAVIT OF PUBLICATION

The Post and Courier

State of South Carolina

County of Charleston

Personally appeared before me the undersigned advertising Clerk of the above indicated newspaper published in the City of Charleston, County and State aforesaid, who, being duly sworn, says that the advertisement of

copy attached

appeared in the issues of said newspaper

on the following day(s): 2/12/20

Subscribed and sworn to

before me this 17th day

of February

A.D. 20 20

Advertising Clerk

NOTARY PUBLIC, SC

My Commission expires Sept. 24, 2023

SHELLY DUBERRY NOTARY PUBLIC SOUTH CAROLINA My Comm. Exp. 09/24/2023

EPA

Macalloy Corporation Superfund Site
North Charleston, Charleston County, South Carolina

The U.S. Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (DHEC) are conducting a 5-Year Review of the Macalloy Corporation Superfund site located at 1800 Pittsburgh Avenue in North Charleston, SC. The facility manufactured ferrochromium alloy from 1941-1998. The site was placed on the National Priorities List (NPL) in February 2000. Clean up work started at the site in October 2004 and was completed in September 2006. The first 5-Year Review for the site was completed in September 2010. Activities conducted at the site since that time have primarily involved groundwater and sediment monitoring.

The purpose of the review is to evaluate remedial activities of the past five years and ensure that the cleanup continues to protect human health and the environment. During the review, EPA and DHEC staff will conduct interviews with local residents, officials, and others who are familiar with the site. We value input about site conditions and want to hear any concerns of the local community. **You are encouraged to participate in the review by contacting us with your comments or questions through May 1, 2020.**

The Five-Year Review process is expected to be complete in the Summer of 2020, at which time a report will be written on our findings. Any comments received about the site will be summarized in the report. The report will be available on EPA's website and at the Charleston County Main Library at 68 Calhoun Street in Charleston, South Carolina. For more information about the Macalloy Corporation site, please visit: http://www.epa.gov/region4/superfund/sites/npl/southcarolina/macalsc.html

For comments, questions, or to participate in an interview, please contact either of the following:

Technical Comments:

Craig Zeller, EPA Regional Project Manager, at (404) 562-8827, or by e-mail at Zeller.Craig@epa.gov

Community Involvement:

Donna Moye, DHEC Community Liaison, at (803) 898-1382, or by e-mail at moyedd@dhec.sc.gov.

Please share this with others you know who might be interested.

APPENDIX C: INTERVIEW FORMS

Macalloy Superfund Site (Charleston, Charleston, SC)
Five-Year Review Interview Form

Site Name:	**Macalloy Corporation Site**	**EPA ID No.:**	**SCD003360476**
Interviewer Name:	**Evan Ethridge**	**Affiliation:**	**SCDHEC**
Subject Name: Joel Padgett		**Affiliation:** **SCDHEC**	

Contact Information: padgetjp@dhec.sc.gov

Date: **2/20/20**

Interview Format: Email

Interview Category: **SCDHEC Remedial Project Manager**

1. What is your overall impression of the project; including cleanup, maintenance, and reuse activities (as appropriate)? *The soil, sediment, and stormwater remedies continue to be effective and provide protectiveness for commercial/industrial reuse. Chemical injections in conjunction with natural attenuation have reduced chromium concentrations over most of the Site. However, a 12 acre area of groundwater contamination on the east side of the Site exceeds the remedial goal of 100 µg/L set by the ROD.*

   In 2018, SCDOT acquired an easement by eminent domain on the west side of the Site for construction of the Port Access Road (PAR), a multi lane connector from Interstate 26 to the Port of Charleston facility under construction on the former Naval Base property. The easement is situated on an uncontaminated portion of the Site. A temporary construction office for the PAR was set up on another uncontaminated portion of the Site located on the east side of the Site across from Tallulah Road.

   In December 2019, the property owners for the site sent a request to EPA for partial deletion of the Site from the NPL. The request entailed deletion of all but 12 acres of the Site where chromium groundwater concentrations exceed the remedial goal. The owners plan to sell the deleted portion of the site for industrial redevelopment. SCDHEC has reviewed the request and has prepared a letter of concurrence for when and if EPA issues a request for State concurrence with the partial deletion.

2. What is your assessment of the current performance of the remedy in place at the Site? *The soil, sediment and stormwater remedies continue to provide protectiveness for*

commercial/industrial reuse. Injections of chemical reductant and natural attenuation have been partially effective in reducing chromium groundwater concentrations at the Site.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities since the implementation of the cleanup? *I am not aware of any complaints or inquiries regarding site-related environmental issues or remedial activities since implementation of the cleanup.*

4. Has your office conducted any site-related activities or communications in the past five years? *If so, please describe the purpose and results of these activities. SCDHEC has provided review and comments to EPA, the site contractor, and the site owners regarding reports submitted for Site. SCDHEC has also participated in telephone calls and site visits to monitor the status of Site. On February 11, 2020, SCDHEC and EPA conducted a site inspection for the 2020 5YR.*

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy? *I am not aware of any changes to state laws that might affect the protectiveness of the Sites's remedy.*

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues? *I am comfortable with the status of the institutional controls (ICs) at the site. All ICs specified by the ROD are in place.*

7. Are you aware of any changes in projected land use(s) at the Site? *I am not aware of any changes in projected land use(s) at the Site.*

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy? *A total of 18 chemical reductant injections have been conducted at the Site from 2007 to 2018. The two most recent events conducted in 2017 and 2018 were funded by the Site property owners. The reductant and natural attenuation have reduced chromium groundwater contamination over most of the Site, but a 12-acre area still exceeds the remedial goal of 100 mg/L. As mentioned in the answer to Question 1, this area will be excluded from deletion from the NPL when and if EPA issues a request for State concurrence with the partial deletion. When future remedial work is conducted on the chromium groundwater contamination within the 12-acre area, the Department recommends that a more effective remedy than chemical reductant injection be developed and utilized.*

APPENDIX D: SITE INSPECTION CHECKLIST

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Macalloy Corporation	**Date of inspection: February 11, 2020**
Location and Region: Charleston, SC, Region IV	**EPA ID: SCD003360476**
Agency, office, or company leading the five-year review: EPA Region IV	**Weather/temperature:**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- x Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐xOther_____

- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Chad Tripp (Name) EnSafe (Title) _____ (Date)
   Interviewed ☐ at site x by email ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____SCDHEC_____
Contact _____Joel Padgett_____ _____Project Manger___ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

4. **Other interviews** (optional) ☐ Report attached. Complete interview attached to FYR

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☐ O&M manual — ☐ Readily available — ☐ Up to date — x N/A
   - ☐ As-built drawings — ☐ Readily available — ☐ Up to date — x N/A
   - ☐ Maintenance logs — ☐ Readily available — ☐ Up to date — x N/A

   Remarks_____

2. **Site-Specific Health and Safety Plan** — ☐ Readily available — ☐ Up to date — x N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — x N/A

   Remarks_____

3. **O&M and OSHA Training Records** — ☐ Readily available — ☐ Up to date — x N/A

   Remarks_____

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — x N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — x N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Other permits_____ — ☐ Readily available — ☐ Up to date — x N/A

   Remarks_____

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — x N/A

   Remarks_____

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — x N/A

   Remarks_____

7. **Groundwater Monitoring Records** — x Readily available — x Up to date — ☐ N/A

   Remarks_____

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — x N/A

   Remarks_____

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — x N/A
   - ☐ Water (effluent) — ☐ Readily available — ☐ Up to date — x N/A

   Remarks_____

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — x N/A

    Remarks_____

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house x Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____
_____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____
_____
_____
_____
_____
_____

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured x N/A

Remarks_____
_____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks_____
_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No x N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☐ No x N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached

_____
_____
_____
_____

2. **Adequacy** x ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks_____
_____
_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map x No vandalism evident
Remarks_____
_____

2. **Land use changes on site** x N/A
Remarks_____
_____

3. **Land use changes off site** x N/A
Remarks_____
_____

VI. GENERAL SITE CONDITIONS

A. Roads x Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map x Roads adequate ☐ N/A
Remarks_____
_____

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS ☐ Applicable x N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks_____
   _____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent_____
   ☐ Ponding ☐ Location shown on site map Areal extent_____
   ☐ Seeps ☐ Location shown on site map Areal extent_____
   ☐ Soft subgrade ☐ Location shown on site map Areal extent_____
   Remarks_____
   _____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____
_____

B. Benches ☐ Applicable x N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

C. Letdown Channels ☐ Applicable x N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____
_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____
_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____
_____

D. Cover Penetrations ☐ Applicable x N/A

1. **Gas Vents** ☐ Active☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____
_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____
_____

E. Gas Collection and Treatment ☐ Applicable x N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____
   _____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____
   _____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____
   _____

F. Cover Drainage Layer ☐ Applicable x N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____
   _____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____
   _____

G. Detention/Sedimentation Ponds ☐ Applicable x N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____
   _____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____
   _____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____
   _____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____
   _____

H. Retaining Walls ☐ Applicable x N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____
   _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____
   _____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable x N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____
   _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____
   _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable x N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____
   _____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable x N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable x N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable x N/A

1. **Collection Structures, Pumps, and Electrical**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

C. Treatment System ☐ Applicable x N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☐ Carbon adsorbers
   ☐ Filters_____
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   ☐ Good condition ☐ Needs Maintenance
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☐ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☐ Quantity of surface water treated annually_____
   Remarks_____
   _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☐ Good condition☐ Needs Maintenance
   Remarks_____
   _____

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☐ Good condition☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____
   _____

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☐ Good condition☐ Needs Maintenance
   Remarks_____
   _____

5. **Treatment Building(s)**
   ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
   ☐ Chemicals and equipment properly stored
   Remarks_____
   _____

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks_____
   _____

D. Monitoring Data

1. Monitoring Data
   ☐ Is routinely submitted on time x Is of acceptable quality

2. Monitoring data suggests:
   x Groundwater plume is effectively contained x Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance x N/A
Remarks_____
_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy is effective and functioning as designed to remove contaminants from the groundwater.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

There are no known O&M issues.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

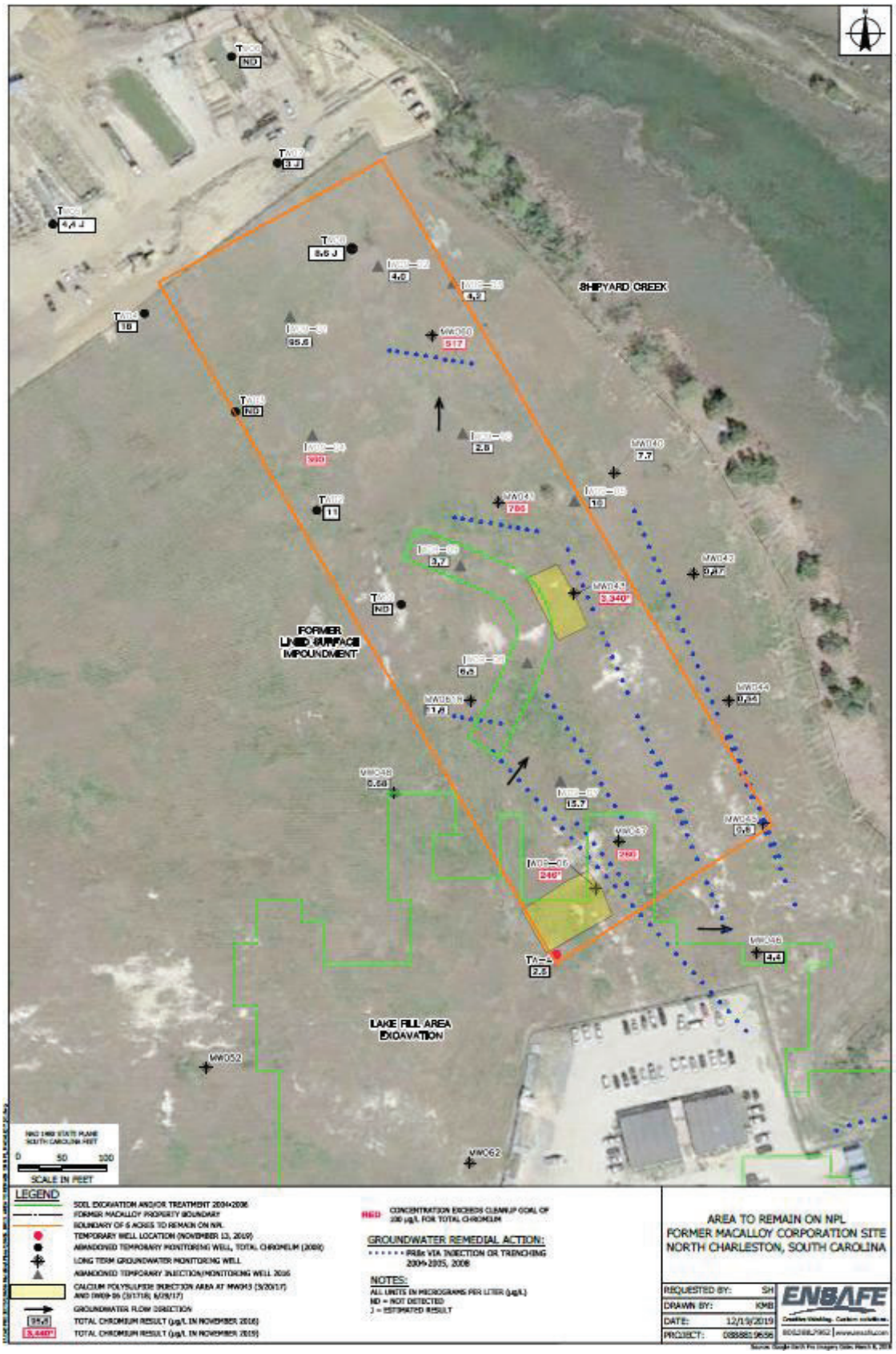
There are no known early indicators of potential remedy problems.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

There are no known opportunities for optimization.

APPENDIX E: MAP OF PROPOSED AREA TO REMAIN ON THE NPL



APPENDIX F: CHRONOLOGY OF EVENTS

Event	Date
Discovery	March 5, 1998
PRP Removal Action	June 6, 1998 to November 4, 1999
Administrative Order on Consent for Removal Action	June 13, 1998
Proposal to the NPL	October 22, 1999
Preliminary Assessment Completed	November 15, 1999
Final Listing on NPL	February 4, 2000
Administrative Order on Consent signed for Remedial Investigation/Feasibility Study (RI/FS)	March 29, 2000
PRP-lead RI/FS	March 29, 2000 to August 21, 2002
ROD	August 21, 2002
Final Pre-Design Sampling and Analysis report Submitted	January 10, 2003
Final Treatability Study Report submitted	January 13, 2003
Remedial Design submitted/approved	September 4, 2003
December 2003 Groundwater and Soil Sampling results Memorandum Submitted (presents the results of additional delineation and lithologic sampling required by the remedial design)	May 13, 2004
Remedial Action Consent Decree Entered	June 14, 2004
Remedial Action Kick-off Meeting	September 2, 2004
Final Sediment Remedial Action Work Plan Submitted	September 24, 2004
Final Soil Remedial Action Work Plan Submitted	October 4, 2004
Mobilization to Site	October 11, 2004
Injection Wells and Monitoring Wells Installation Began	October 12, 2004
Baseline Groundwater Sampling Conducted	November 4 to 16, 2004
Reductant Injections	November 14, 2004 to March 5, 2005
001 Tidal Creek Sediment Removal	December 6 to 23, 2004
001 Tidal Creek Geotextile Installation and Sand Cap Placement	December 27, 2004 to January 29, 2005
Storm Water Discharge Limitations Memorandum Submitted	January 20, 2005
Radiological Material Removal	February 1 to 12, 2005
Soil Remediation Starts	March 1, 2005
001 Tidal Creek Marsh Restoration	March 11 to 13, 2005
Site Clearing for Storm Water System Construction Began	September 10, 2005
Redox Trench Pilot Study	October 11 to 12, 2005
Complete Soil Remediation	October 31, 2005
Redox Trenches Installed	December 2 to 20, 2005
Low Carbon Slag Discovery	December 6, 2005
Low Carbon Slag Delineation	December 21, 2005 to January 17, 2006
Low Carbon Slag Removal and Stockpiling	January 28, 2006 to March 30, 2006
Low Carbon Slag Treatment	July 5, 2006
Pre-Final Walk-Through and Inspection	July 13, 2006
Punch List for Remedial Construction Complete	July 20, 2006
Interim Walk-Through and Inspection	August 7, 2006
August 7, 2006 Site Inspection Punch List	August 9, 2006
Installation of Long-Term Monitoring Wells	August 21 to 29, 2006
Final Walk-Through Inspection	September 18, 2006
Preliminary Close-Out Report signed	September 26, 2006
SCDHEC Terminated Storm Water Sampling Requirements	July 16, 2008
Repair of 001 Tidal Creek Cap	December 2008
Supplemental Groundwater Treatment	December 2008
Zone C Sediment Post-Construction Monitoring Event (Event 2)	February 2009
Long-Term Groundwater Monitoring Event 7 Report	March 2009
Long-Term Groundwater Monitoring Event 8 Report	August 2009
Year 4 Tidal Creek Cap Monitoring Report	September 2009

Long-Term Groundwater Monitoring Event 9 Report	November 2009
Zone C Sediment Post-Construction Monitoring Event 3 Report	December 2009
Long-Term Groundwater Monitoring Event 10 Report	August 2010
First Five-Year Review Report for Macalloy Corporation	September 2010
Long-Term Groundwater Monitoring Event 11 Report	March 2011
Long-Term Groundwater Monitoring Event 13 Report	January 2012
Year 1 Interim Progress Report South Carolina Department of Natural Resources (SCDNR)	February 2012
Year 2 Interim Progress Report SCDNR	January 2013
Long-Term Groundwater Monitoring Report (October 2013 Event)	May 2013
Year 3 Interim Progress Report SCDNR	February 2014
2013 Long-Term Groundwater and Tidal Creek Cap Monitoring	March 2014
2014 Annual Long-Term Groundwater Monitoring Report	January 2015
Publication of Second Five-Year Review	August 2015
Publication of Supplemental Investigation and Injection in Support of Site Closeout Report (Conducted October-December 2016)	February 9, 2017
Supplemental CPS injections conducted at MW-043	March 14-20, 2017
First round of supplemental CPS injections conducted at IW09-06	March 14-20, 2017
Second round of supplemental CPS injections conducted at IW09-06	June 28-29, 2017
Attainment monitoring phase at MW-043 and IW09-06	April 2017-May 2018
Publication of Groundwater Restoration Attainment and Monitoring Report Recommendation for Partial NPL Deletion & Elimination of Residential Use Restriction	August 2018
Groundwater sampling event in southwest corner to further delineate chromium contamination	November 2019
Updated Request for Commencement of Partial NPL Deletion	December 19, 2019

APPENDIX G – CURRENT SITE STATUS

Environmental Indicators
- Current human exposures at the Site are under control. - Current groundwater migration is under control.

Are Necessary Institutional Controls in Place?
☒ All ☐ Some ☐ None

Has EPA Designated the Site as Sitewide Ready for Anticipated Use?
☒ Yes ☐ No

Has the Site Been Put into Reuse?
☐ Yes ☒ No

APPENDIX H: RESTRIVTIVE COVENANTS

BK 0 585PG298

STATE OF SOUTH CAROLINA)
) DECLARATION OF COVENANTS
COUNTY OF CHARLESTON) AND RESTRICTIONS

THIS DECLARATION OF COVENANTS AND RESTRICTIONS (Declaration) is made and entered into this 22 day of May of 2006, by Ashley II of Charleston, LLC, a South Carolina limited liability company (hereinafter referred to as Ashley II) and the South Carolina Department of Health and Environmental Control (Department).

RECITALS

WHEREAS, this Declaration of Covenants and Restrictions is entered into pursuant to S.C. Code §44-56-200 et seq.; and

WHEREAS, Ashley II is the owner of certain real property in Charleston County, South Carolina, more particularly described in Exhibit A attached hereto and incorporated herein by reference ("Property"); and

WHEREAS, contaminants in excess of allowable concentrations for unrestricted use remain at the Property; and

WHEREAS, the Property was previously used as a ferrochromium alloy manufacturing plant and is currently designated as Superfund Site SCD003360476 pursuant to the Comprehensive Environmental Compensation and Liability Act ("CERCLA"), 42 U.S.C. Section 9601 et seq.; and

WHEREAS, the Property is the subject of Consent Agreement 05-06-HW (CA) entered into to by the Department and Ashley II, pursuant to the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), 42 U.S.C. §§ 9601, et seq. and the South Carolina Hazardous Waste Management Act (HWMA), S.C. Code Ann. § 44-56-200.

WHEREAS, the Property has undergone and is undergoing remediation pursuant to the United States Environmental Protection Agency ("EPA") Record of Decision relating to the Macalloy Corporation Site, signed August 21, 2002, by the Director of the Waste Management Division, EPA Region 4 ("ROD") and the Consent Decree between the United States of America and Macalloy Corporation and The BOC Group, Inc., Civil Action Number 2 04 1201 18 (the "Consent Decree");

WHEREAS, the remedial and other work required under the ROD and Consent Decree shall hereafter be referred to as the "Consent Decree Work"; and

restrictions under the Consent Decree and this Declaration, or to take samples as may be necessary to enforce the this Declaration.

4. The covenants and restrictions set forth herein shall run with the title to the Property and shall be binding upon Ashley II, its heirs, successors and assigns. It is expressly agreed that the Department shall have the right to enforce these covenants and restrictions upon Ashley II, its successors, and assigns. Ashley II and its heirs, successors, and assigns shall include the following notice on all deeds, mortgages, plats, or any legal instruments used to convey any interest in the Property (failure to comply with this paragraph does not impair the validity or enforceability of these covenants):

> NOTICE: This Property is Subject to Declaration of Covenants and Restrictions and any subsequent Amendments Recorded at Book _____, Page _____, Register of Mesne Conveyance Office for Charleston County, South Carolina.

5. Ashley II, its heirs, successors, assigns and any subsequent purchaser of the Property shall submit to the EPA and the Department a statement of maintenance of the covenants and restrictions as set forth above annually on May 31st of every year. This reporting requirement is the obligation of each owner of the Property, or portion of the Property, as of May 31 of each year. Once title to all or a portion of the Property has been conveyed by Ashley II or any subsequent owner, such predecessor in title shall no longer have any responsibility for submission of the Report with respect to the portion of the Property it previously owned.

6. This Declaration shall remain in place until such time as the Department has made a written determination that the covenants and restrictions set forth herein are no longer necessary. The Department shall not consent to any such termination unless the requirements of the ROD have been met. This Declaration shall not be amended without the written consent of the Department or its successor agency. The Department shall not consent to any such amendment or termination without the consent of EPA.

7. It is expressly agreed that EPA is not the recipient of a real property interest but is a third party beneficiary of the Declaration of Restrictive Covenants, and as such, has the right of enforcement.

8. This Declaration only applies to the Property expressly identified in Exhibit A and does not impair the Department's authority with respect to the Property or other real property under the control of Ashley II.

IN WITNESS WHEREOF, Ashley II of Charleston, LLC has caused this instrument to be executed as of the date first above written.

WITNESSES:

ASHLEY II OF CHARLESTON, LLC
A SOUTH CAROLINA LIMITED LIABILITY COMPANY

By: Robert L. Clement

Robert L. Clement, III
Authorized Member

STATE OF SOUTH CAROLINA)
COUNTY OF CHARLESTON) ACKNOWLEDGEMENT

I, Lauren Howell (Notary Public), do hereby certify that, Robert Clement, an authorized representative of the Ashley II of Charleston, LLC, personally appeared before me this day and acknowledged the due execution of the foregoing instrument, on behalf of the Ashley II of Charleston, LLC.

Witness my hand and official seal this 22 day of May, 2006.

Notary Public for South Carolina
My Commission Expires: 6/7/2014

IN WITNESS WHEREOF, the Department has caused this instrument to be executed as of the date first above written.

WITNESSES:

South Carolina Department of Health and Environmental Control

By: _____

Robert W. King, Jr., P.E., Deputy Commissioner, Environmental Quality Control

Kathy J. Rogers

South Carolina Department of Health and Environmental Control

STATE OF SOUTH CAROLINA)
) ACKNOWLEDGEMENT
COUNTY OF RICHLAND)

I, Barry B. Nelson (Notary Public), do hereby certify that, Robert W. King, Jr., P.E., Deputy Commissioner Environmental Quality Control of the South Carolina Department of Health and Environmental Control, personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal this 26 day of May, 2006

Notary Public for South Carolina

My Commission Expires: May 26, 2009

BK 0 585PG303

EXHIBIT A

EXHIBIT A

(Description of Real Estate)

(Attached to Contract of Sale between Macalloy Corporation, Seller, and Ashley II of Charleston, LLC, Purchaser)

PARCEL 1:

All that piece, parcel or tract of land, situate, lying and being in the County of Charleston, State of South Carolina, east of Meeting Street Road, and west of Shipyard Creek, and having such size, shape, dimensions, and buttings and boundings as are more clearly shown and delineated on a plat thereof bearing legend. "Boundary Plat as shown on existing Plats and Records of Property of Airco Alloys Division Airco, Inc.", dated July 12, 1977, by Cummings and McCrady, Inc., Engineers, and recorded in the R.M.C. Office for Charleston County in Plat Book AJ. at Page 67, which said plat is hereby made a part and parcel hereof, reference to which said plat is hereby made for a more full and complete description.

PARCEL 2:

All that certain piece, parcel or tract of land, situate, lying and being in the North Charleston Sewer District, formerly St. Philip's and St. Michael's Parish, in Charleston County, State of South Carolina, known and designated as Tract "C", measuring and containing 1.40 acres, all of which is more fully shown and delineated on a plat made by Davis & Floyd Engineers, Inc., dated March 13, 1979, entitled "Plat showing Tract C Property of Seaboard Coast Line Railroad Co., about to be conveyed to Airco, Inc., located off Meeting Street, Charleston County, recorded in Plat Book AN at Page 103, reference to which said plat is hereby made for a more full and complete description.

<u>Save and excepting</u>, however, from the above property the salt marsh which contains 17 acres more or less title to which shall remain in the name of Seller. If all or any portion of the salt marsh is not conveyed to NOAA by Seller, Seller shall convey at no cost to the Purchaser all or the remaining portion of the salt marsh to Purchaser by quit claim deed within 90 days following complete resolution of the claim by NOAA and others for alleged damages to natural resources.

Being the same property conveyed to Macalloy Corporation by deed of Airco, Inc. dated July 11, 1979 and recorded July 17, 1979 in book U 119 at Page 72.

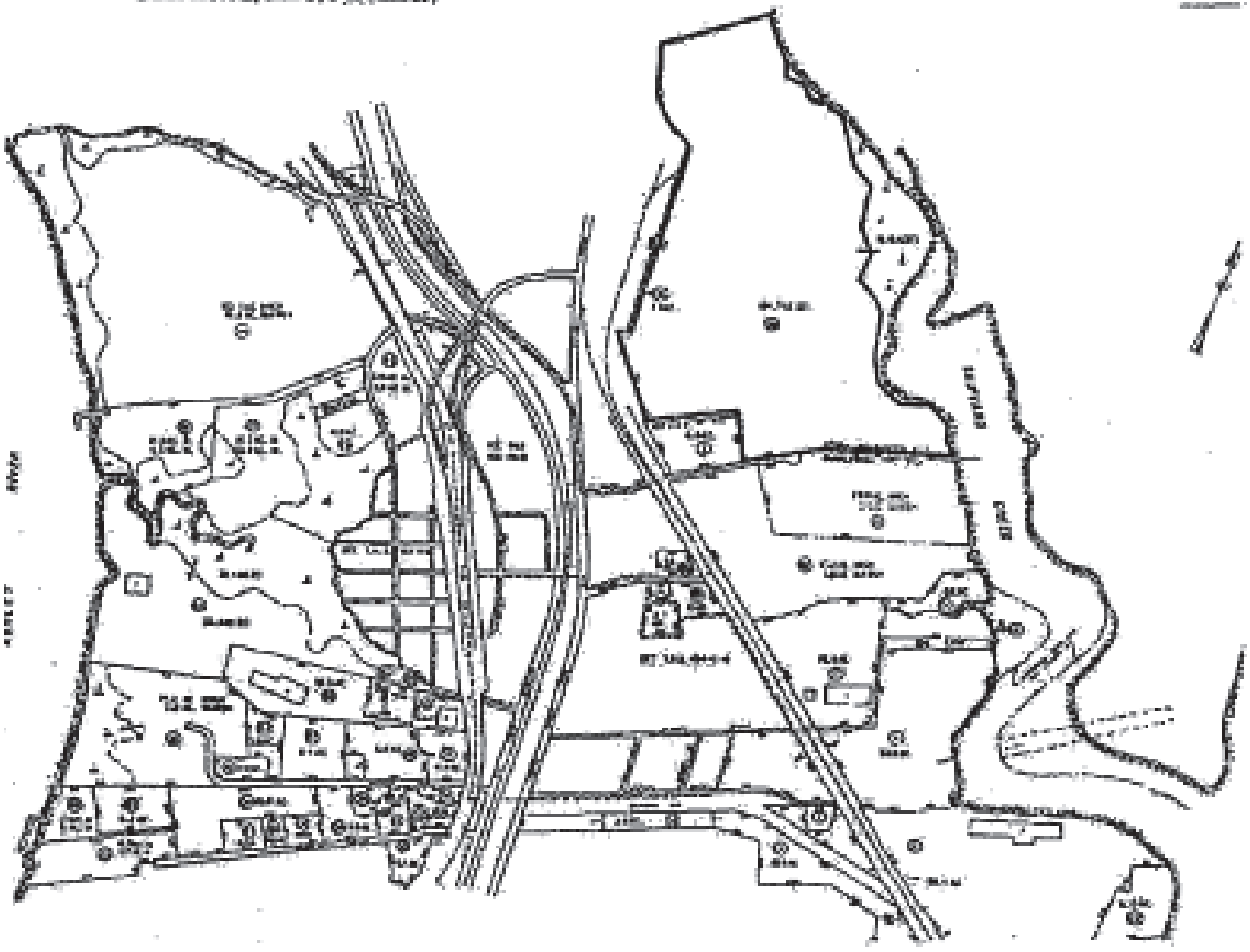
#2003-0186 | [illegible] | kl
COLUMBIA [illegible]
COLUMBIA [illegible]

[redacted]

SCHEDULE A-1

(Tax Map)

(Attached to Contract of Sale between Macalloy Corporation, Seller, and Ashley II of Charleston, L.L.C, Purchaser)



BK 0 585PG306

RECORDER'S PAGE

NOTE: This page MUST remain with the original document

FILED

May 31, 2006
3:19:44 PM

BK 0 585PG298

Charlie Lybrand, Register
Charleston County, SC

Filed By:

Young Clement Rivers, LLP

P.O. Box 993
Charleston SC 29402

DESCRIPTION	AMOUNT
DEC/COV/REST	$ 14.00
Postage	
TOTAL	$ 14.00

DRAWER:

	B - ECP

DO NOT STAMP BELOW THIS LINE