CORRECTIVE MEASURES STUDY (CMS)
WORK PLAN FOR
LOWER GENESEE RIVER (OU-5 of EBP)

Prepared For:

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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LIST OF ACRONYMS

bgs	below ground surface
CAO	Corrective Action Objective
CMA	corrective measures alternative
CMS	Corrective Measures Study
CPOI	chemical parameter of interest
EBP	Eastman Business Park
KLWWTP	King's Landing Wastewater Treatment Plant
NKPE	Northeast Kodak Park East
NYSDEC	New York State Department of Environmental Conservation
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
ppm	part per million
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SCO	Soil Cleanup Objective
SGV	Sediment Guidance Value
SWAC	Surface Weighted Average Concentrations
USEPA	United States Environmental Protection Agency

1.0 Purpose of the Corrective Measures Study

The riverbed and wetland/floodplain sediments of the Lower Genesee River have been impacted by several chemical parameters, including silver, from historical industrial activities adjacent to the river. The Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) identified that this contamination potentially presents risks both to human health and ecological resources. The results of previous investigations have indicated that conducting a Corrective Measures Study (CMS) at Operable Unit 5 (OU-5) of the Lower Genesee River is warranted. This work plan describes the processes for completing the CMS at the Lower Genesee River and evaluating possible remedial actions. The selected remedial action will reduce the further spread of silver, potential adverse risks to human health, and potential impacts to biota associated with silver.

1.1 SITE BACKGROUND

The Lower Genesee River in Rochester, New York, consists of the area from the mouth of the river at Lake Ontario upstream to the Lower Falls. This CMS will address OU-5 of the Eastman Business Park (EBP) RCRA Site (the Site). The Site includes about four miles of the Lower Genesee River from its mouth at Lake Ontario to the State Route 104 (Veteran's Memorial) Bridge near the Kodak's King's Landing Wastewater Treatment Plant (KLWWTP) and the adjoining wetland and floodplain areas (Figure 1). The EBP Environmental Trust was established as a result of Kodak's bankruptcy, with the New York State Department of Environmental Conservation (NYSDEC) designated as the primary beneficiary. The aim of the EBP Environmental Trust is to fund environmental response actions relating to pre-existing contamination associated with historical releases from the EBP. Kodak's former Rochester manufacturing operations and the KLWWTP are both located adjacent to the Lower Genesee River. The KLWWTP historically treated and continues to treat wastewater from multiple operations at the EBP and discharges treated effluent to the Lower Genesee River approximately one-half mile downstream of the State Route 104 Bridge.

Current land use along the Lower Genesee River is primarily park land and cemeteries; however, the area from the Colonel Patrick O'Rorke Bridge to the mouth of the river is dominated by commercial development. The Port of Rochester extends from slightly upstream of the Turning Basin to the river's mouth and includes a dredged navigation channel. The river is characterized by reinforced banks and bulkheads, boat docks, and small embayments from the Turning Basin to the river mouth. The NYSDEC site number associated with the EBP is 828177, and the United States Environmental Protection Agency (USEPA) RCRA ID number is NYD980592497.

1.2 SITE GEOLOGY AND HYDROGEOLOGY

The Lower Genesee River is located within the Rochester Gorge, which is composed of Upper Ordovician to Lower Silurian-aged sedimentary bedrock including shales (some interbedded with limestone), siltstones, and sandstones. The Genesee River watershed occupies about 2,500 square miles in Western New York and Northern Pennsylvania. The river itself is about 160 miles long. The river is dammed at Mt. Morris, resulting in attenuated peak flows downstream. The Erie Canal intersects the Genesee River about 12 miles upstream of the river mouth. Immediately downstream of the Lower Falls, the Lower Genesee River is narrow and high energy with a boulder and gravel substrate and relatively low sediment thickness. The river widens at Seth Green Island, resulting in a reduction in river energy and

velocity, decreasing sediment particle size, and increasing sediment thicknesses. Groundwater from surrounding uplands discharges to the river through bedrock and storm sewer outlets. A groundwater pumping and collection system has been implemented at the EBP. The system collects about 50 million gallons of groundwater per year, while an underdrain system at the Weiland Road Landfill collects about 30 million gallons of groundwater per year. Groundwater from both systems is treated at the KLWWTP. Hydrogeologic investigations at the EBP have found that contaminant plumes are shrinking over time. Groundwater from the EBP does discharge to the Lower Genesee River, but discharge volumes are very low compared to the discharge of the river, reducing the potential for significant contaminant fluxes to be transmitted to the river.

1.3 HISTORICAL AND RCRA FACILITIES INVESTIGATION SUMMARY

Two portions of the EBP, the KLWWTP and Northeast Kodak Park East (NKPE), are directly adjacent to the river and have been used for hazardous waste management operations. Both areas are subject to a RCRA permit and have received remedial action. An RFI for the Site was completed in late 2016 and included:

- Sampling and analysis of river surface water, suspended sediment, river sediment, wetland/floodplain sediments, benthic macroinvertebrates, fish, and groundwater (at the KLWWTP) to further assess the nature and extent of contamination
- Using analytical techniques to further assess environmental impacts on organisms from river sediment, including sediment chronic toxicity testing
- Assessing potential impacts to existing cultural resources (including archaeological and historical resources)
- Analyzing hydrodynamics and bed sediment transport to assess potential future movement of sediment within the river and floodplain
- Assessing potential impacts to human health and identifying pathways of exposure to contaminated media
- Assessing potential impacts to fish and wildlife in the river and adjacent wetland/floodplain habitats

Historical sampling and data from the RFI report (Parsons et al. 2017) have indicated that chemical parameters of interest (CPOIs) for the Lower Genesee River include silver and other metals, polycyclic aromatic hydrocarbons (PAHs), pesticides/herbicides, polychlorinated biphenyls (PCBs), and dioxins/furans. These contaminants were identified based on their exceeding NYSDEC standards or guidance values, although some may not be attributable to historical EBP operations. Key findings include:

- Silver has been identified as the primary CPOI for sediments within the Lower Genesee River. Silver concentrations exceeded the Class C Sediment Guidance Value (SGV) at all transects downstream of the KLWWTP. Peak silver concentrations were generally located at a depth of at least 2 feet.
- PAHs and other metals exceeded the Class A and Class C SGVs throughout the RFI study area (Figure 1). In addition, dioxins/furans exceeded the Class A SGV throughout the study area. However, it is unlikely that most of these constituents are associated with EBP operations.

Based on data collected, it is possible that the presence of cadmium and zinc in the Lower Genesee River are attributable to EBP.

- Results of the wetland/floodplain sediment investigation indicated similar conclusions as those made for river sediment.
- Although the sediment transport model shows that buried peak silver concentrations in sediment are unlikely to be resuspended even under high flow conditions, limited erosion and re-deposition of overlying surface sediments may occur.
- The potential for organism-level impacts to benthic macroinvertebrates and forage fish from exposure to silver in sediment has been identified.
- Population and community-level impacts to benthic macroinvertebrates, fish, plants, and sediment invertebrates from exposure to silver are not expected based on multiple lines of evidence.
- Ecosystem-level impacts, although not directly evaluated, are considered unlikely based on the probable absence of impacts at the population and community levels of biological organization.

As concluded in the RFI report, a CMS is warranted for the Lower Genesee River due to the presence of potential risks to human health and to fish and wildlife resources. The CMS should identify and evaluate corrective measure alternatives (CMAs) for river and wetland/floodplain sediments that have been impacted by silver, the primary constituent of concern in OU-5. After submittal of the RFI report, it was also determined that supplemental data were needed to further delineate and characterize silver concentrations in sediment that will support development of CMAs. This supplementary field work was performed from September through November 2017, and is discussed further in Section 2 and the attached CMS Data Summary Report (Appendix A).

2.0 Supplemental Field Data Acquisition

Additional field work was performed in accordance with the Scope of Work for CMS Field Investigation for the Lower Genesee River (Parsons and OBG 2017). Remedial alternatives for the CMS will focus on "Actionable Areas" that will be defined by documented Site conditions such as habitat characteristics, scour potential, media concentrations, biota concentrations, and by expected future Site use. The objectives of the CMS field investigation were to provide supplemental silver concentration data in the vicinity of previously sampled areas and to assist in the establishment of these "Actionable Areas." The scope of the supplemental field work consisted of:

- Riverbed sediment sample collection
- Wetland/floodplain characterization and sediment sample collection
- Geotechnical analysis and index testing of riverbed and wetland/floodplain sediments

The data summary of the field investigation and results is presented in the CMS Data Summary Report (Appendix A). Although not anticipated, the evaluation of the CMAs may reveal a need to conduct further data collection (e.g., sample collection, pilot- or bench-scale studies, etc.) to finalize the analysis. Any recommendations for further investigation will be presented and discussed to NYSDEC for consideration.

3.0 Updated Nature and Extent of Contamination

Site contamination in surface water, river sediments, wetland/floodplain sediments, biota, and groundwater were identified in the RFI report. Information was also provided on geochronology of river sediments, sediment toxicity, sediment transport, cultural resources, and the potential impact of Site contamination on both human health and fish and wildlife resources. This information was gained through data collection and evaluation including:

- Bathymetric, geophysical, magnetometry, and Acoustic Doppler Current Profiler surveying
- Continuous river gauging
- Sediment transport modeling
- Benthic macroinvertebrate community analysis
- Sampling and analysis of riverbed cores, wetland/floodplain sediments, benthic macroinvertebrate and fish tissues, and KLWWTP groundwater

Beyond the key findings described in Section 1.3, the RFI work generated valuable information about the nature and extent of Site contamination. This information was used in the development of remedial action objectives (RAOs). Silver, the primary CPOI in both river and wetland/floodplain sediments, was detected at all transects downstream of the KLWWTP at concentrations that may potentially pose a risk to aquatic life (values above the Class C SGV). The highest concentrations were observed at and immediately downstream of the KLWWTP. River sediment silver concentrations tended to be higher near the banks and in depositional areas, and the highest concentrations generally occurred at a sediment depth of greater than two feet. While limited erosion and re-deposition of surface sediments may occur, these buried peak silver concentrations are unlikely to be resuspended even at the flow conditions experienced during the largest flood event at the Lower Genesee River since the construction of the Mt. Morris dam. Higher concentrations of silver were identified in wetland/floodplain sediments downstream of the KLWWTP, with concentrations in the first two feet of sediment tending to be higher than those in deeper sediments. Other metals, PAHs, PCBs, and dioxins/furans were also noted at concentrations exceeding SGVs and/or Soil Cleanup Objectives (SCOs) (NYSDEC 2006) in wetland/floodplain sediment. However, except for cadmium and zinc, these were either observed at only limited locations or are not attributable to historical EBP operations.

The human health risk assessment completed during the RFI did not identify any unacceptable risks from silver concentrations in either river sediments or wetland/floodplain soils and sediments. Silver was identified as a CPOI in biota tissue because it was measured at concentrations exceeding tissue effect levels in mussels and forage fish. This confirmed the potential for organism-level impacts from exposure to silver for benthic macroinvertebrates and forage fish, although population, community, and ecosystem-level impacts to fish and wildlife resources are considered unlikely.

Results of the supplementary field work performed for the CMS tended to reaffirm the results of the RFI. Silver was found in excess of its NYSDEC Class C SGV along the length of the Lower Genesee River and its adjoining wetland/floodplain habitats, with silver concentrations in both the riverbed and wetland/floodplain sediments higher near the EBP than those further downstream. River sediments were found to exhibit higher silver concentrations near shallow, depositional point bar areas than at areas with deeper water depths. Additionally, higher concentrations were generally found at depths of

two feet below ground surface (bgs) or more. Wetland/floodplain sediments exhibited the highest silver concentrations between 0.5 and two feet bgs. Lower concentrations were observed at the surface and within deeper intervals.

4.0 Corrective Action Objectives

Corrective Action Objectives (CAOs) will be developed as part of the CMS. CAOs are Site-, medium-, and chemical-specific and established with the goal of protecting both the environment and human health. The CAOs will be employed in the development of CMAs that meet the remediation goals.

4.1 REMEDIAL ACTION OBJECTIVES

Preliminary RAOs were developed during the RFI and were subsequently updated based on recommendations from NYSDEC. These RAOs will aid in the development of CAOs during the CMS.

Updated RAOs are as follows:

- Reduce the potential for migration of silver contamination related to EBP operations that may result in adverse impacts to surface water, river sediment, and wetland/floodplain soil/sediment contamination.
- Reduce the potential for adverse risks from EBP operations to the health of current and future recreational users of the river and/or future construction workers due to exposure to silver in the Lower Genesee River wetland/floodplain soils/sediments.
- Reduce the potential for adverse impacts to biota from exposure to silver related to EBP operations in river surface water, river sediment and wetlands/floodplain soils/sediments.

4.2 TARGET MEDIA CLEANUP STANDARDS

All relevant standards and guidance values for silver will be considered in the development of CAOs in the CMS, including:

- NYSDEC freshwater SGVs (NYSDEC 2014)
- 6 NYCRR Part 375 SCOs (NYSDEC 2006)

The wetland/floodplain areas within OU-5 have been observed to exhibit two primary conditions: constant/near constant inundation by the river and no/infrequent inundation. For NYS criteria and guidance, sediment is defined as unconsolidated particulate material found at the bottom of lakes, rivers, streams and other water bodies at bed elevations equal to or lower than the mean high-water level (6 NYCRR Part 375-1.2), therefore, areas that exhibit constant or near constant inundation by the river are most appropriately defined as sediment and silver concentrations in these areas will be compared to SGVs in the CMS report.

In the areas outside of mean high water but still displaying wetland characteristics, the applicability of the sediment criteria or soil standard is determined based on the likely exposures encountered. The sediment criteria is based on exposures to aquatic organisms, namely fish and aquatic invertebrates. The ecological soil standard is based on exposure to terrestrial organisms including small mammals and earthworms. Based on site recon, there are sizeable areas of the wetland/floodplains that are not inundated and function more like upland soil than a true sediment (e.g., consolidated, horizons apparent) with the expected exposures likely to be more typical of those used in the calculation of the soil standard. Moreover, the flora and fauna of these areas are more closely associated with a soil matrix rather than sediment. For the wetland soils outside of mean high water, that are unlikely to have regular exposure to the aquatic species of the LGR (e.g., habitat for fish, mussels) and are unlikely to

become sediment, a human health or ecological soil standard will be used. The FWRIA Part II discussed the differences between soil and sediment relative to specific sample locations.

4.3 EVALUATION CRITERIA

The CMS report will include remediation areas where CAOs will be applicable. These remediation areas will be specific to each CMA and specific to silver contamination of sediment and/or soil. As noted previously, the RFI report, constituents in wetland/floodplain substrates were compared to both 6 NYCRR Part 375 SCOs and NYSDEC freshwater SGVs.

4.4 REMEDIATION TIME FRAME

The time frame of design, construction, and implementation of corrective measures will be evaluated and described in the CMS report.

4.5 INVESTIGATION DERIVED WASTE

Waste disposal technologies will be evaluated in the CMS, and will be managed in accordance with all applicable state and federal regulations.

5.0 Corrective Measures Technologies/Alternatives

5.1 TECHNOLOGIES TO BE EVALUATED

Multiple remedial technologies will be evaluated as part of the CMS, including institutional controls, monitored natural recovery, biological/chemical treatment and/or solidification/stabilization (in-situ technologies), sediment removal by excavation with conventional earthmoving equipment and/or dredging, and containment by addition of a thin layer or isolation cap or bed armoring/substrate enhancement, and/or combinations of these methods. Additional technologies may be evaluated based on the CAOs developed during the CMS.

5.2 ALTERNATIVES TO BE CONSIDERED

Multiple sediment-specific CMAs will be considered in the CMS and discussed in the CMS report. These CMAs will be developed after further screening of potential remedial technologies and consideration of Site-specific factors and will be evaluated based on the parameters discussed in Section 5.

Anticipated CMAs are described below.

No Action Alternative

A no action alternative will be evaluated, as required in the CMS process.

Monitored Natural Recovery (MNR)

A MNR remedy that uses ongoing naturally-occurring processes to contain, destroy, or reduce the bioavailability or toxicity of contaminants in sediment will be evaluated as a stand-alone alternative and/or as a component of other alternatives. As indicated in EPA's Technical Resource Document on Monitored Natural Recovery (USEPA 2014), natural physical, chemical, and biological processes such as sediment burial, sediment erosion, and containment sequestration will be considered.

Pre-Release Alternatives

This alternative will involve the removal, of all river and wetland/floodplain sediments that exceed the Class C SGV for silver of 2.2 parts per million (ppm) (NYSDEC 2014). In the wetland/floodplain areas defined as soil, this alternative will involve the excavation and backfill of all sediments and soils that exceed the unrestricted use SCO of 2.0 ppm.,

Potential Actionable Areas Alternatives

These alternatives will involve the development of multiple Actionable Areas within the Site at which remedial efforts will be evaluated. These areas will include riverbed sections and wetland/floodplain areas. Development of these Actionable Areas will involve the evaluation of multiple elements to determine specific areas for alternative development and evaluation. Riverbed and wetland/floodplain remedial areas will be considered separately, with various factors governing their evaluation, although they may be evaluated using the same numerical standards. Site characteristics that will be evaluated for development of Actionable Areas for riverbed sediments include scour potential, biotic factors, and silver concentrations. For wetland/floodplains, biotic factors (e.g., habitat characteristics), future human recreational uses and/or construction worker exposure, and silver concentrations will be assessed.

Different parameters will not necessarily be considered equally important, with silver concentrations and scour potential likely being the most crucial factors for riverbed sediments and with silver concentrations likely being the primary factor for wetland/floodplains sediments. It is anticipated that actionable areas in the river and/or floodplain/wetlands for which detailed alternatives will be evaluated will include:

- Silver hot spots
- Remedial areas which will allow achievement of silver criteria on a surface-weighted average (SWAC) basis
- Areas with the highest scour potential within the river

It is anticipated that remedial alternatives that will be evaluated for river and/or floodplain/wetland areas for actionable areas include:

- Capping
- Partial Removal/Capping
- Complete Removal/Backfilling

6.0 Investigating and Evaluating Potential Corrective Measures

USEPA performance standards (USEPA 2000) will be employed to evaluate the proposed corrective measures. These performance standards serve to protect human health and the environment and prevent further environmental degradation. The USEPA has established the following three performance standards for selecting corrective measures.

- Protect Human Health and the Environment. This standard requires protection for the environment and human health based on both present and future Site uses, including by construction workers and recreational users. Additionally, it requires any necessary protective activities that may not be needed for Site cleanup.
- Achieve Media Cleanup Objectives. Corrective measures must meet media cleanup objectives based on present and future uses of the Site as well as state and federal regulations and standards. Media cleanup levels, points of compliance, and remediation time frames should be addressed by the cleanup objectives, which may be influenced by technical aspects of the Site.
- Remediate the Sources of Releases. Remediation of release sources should be performed so that further release of hazardous wastes or constituents is eliminated or reduced. This includes both the original release location and any locations at which significant amounts of contaminant may have accumulated, such as sediments located within the more upstream portions of OU-5. Corrective measures meeting this criterion may include treatment technologies, containment technologies, removal, and institutional controls.

Proposed corrective measures that meet these performance standards will also be evaluated according to the following balancing criteria to select the most successful and practical corrective measure.

- Long-Term Effectiveness. Remedies will be evaluated based on the long-term effectiveness and reliability they provide, as well as the likelihood that they will retain protective capability for human health and the environment. This evaluation may also review how effective the corrective measures and techniques have been at similar sites and the potential risk from failure of any components of the corrective measures including from changes at the Site such as flooding or dam removal.
- Toxicity, Mobility, or Volume Reduction. Remedies will be evaluated based on the degree to which they reduce the toxicity, mobility, or volume of silver-contaminated sediment and soils. Remedies that eliminate or reduce the potential for future environmental releases or other risks are generally preferable.
- Short-Term Effectiveness. The short-term effectiveness and risk to both workers and the environment associated with remedies will be evaluated, as well as the time needed for design, construction, and implementation of the corrective measures.
- Implementability. Remedies will be evaluated based on the difficulty involved in implementing the remedy, considering construction, operation, monitoring, administrative coordination, and availability of materials and services.
- Cost. The capital, operation, and maintenance costs associated with proposed remedies will be evaluated. Cost estimates will be developed in the case that more than one corrective measure provides similar protection to human health and the environment.
- Community Acceptance. The potential acceptability of proposed remedies to the affected community will be considered through utilization of a Public Involvement Plan.

7.0 Outline for the CMS Report

The CMS report will follow the requirements in the RCRA Corrective Action Plan (Final) (USEPA 1994). The following general sections will be included in the CMS report:

- Introduction/Purpose
- Description of Current Conditions
- Corrective Action Objectives
- Evaluation of Remedial Technologies
- Identification, Screening, and Development of Corrective Measure Alternatives
- Evaluation of Corrective Measure Alternatives
- Recommended Corrective Measure Alternative and Rationale
- Public Involvement Plan

8.0 Project Management

The project management team will be structured upon approval of this CMS Work Plan. The tentative schedule for preparing the CMS report is prior to February 15, 2019.

9.0 References

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FIGURES

LAKE ONTARIO

TURNING BASIN

KING'S LANDING
WASTEWATER TREATMENT PLANT

SETH GREEN ISLAND

LOWER FALLS

MIDDLE FALLS

HIGH FALLS

STATE ROUTE 104 BRIDGE

BACKGROUND SAMPLING
LOCATION

0 2,000 4,000 6,000 8,000 Feet

Study Area For RFI

OU-5 Area (Site)

Extent of Navigational Dredging
(Based on 2015 Bathymetric Survey)

FIGURE 1

NEW YORK STATE OF OPPORTUNITY
Department of Environmental Conservation

CORRECTIVE MEASURES STUDY OF THE LOWER GENESEE RIVER
Rochester, NY

LOWER GENESEE RIVER
STUDY AREA

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APPENDIX A
CMS DATA SUMMARY REPORT