DOE/OR/01-2735&D2/A1

Addendum to the Remedial Design Report/Remedial Action Work Plan for Water Treatment at Outfall 200 in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee

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Peter Kortman	11-21-2019
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Addendum to the Remedial Design Report/Remedial Action Work Plan for Water Treatment at Outfall 200 in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee

Date Issued—November 2019

Prepared for the
U.S. Department of Energy
Oak Ridge Office of Environmental Management

URS | CH2M Oak Ridge LLC
under contract DE-SC-0004645

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ACRONYMS

ANW	APTIM-North Wind Construction JV, LLC
ARAP	aquatic resource alteration permit
ARAR	applicable or relevant and appropriate requirement
BMP	best management practice
BSWTS	Big Spring Water Treatment System
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	*Code of Federal Regulations*
CNS	Consolidated Nuclear Security, LLC
CS	condition score
DOE	U.S. Department of Energy
DWR	Division of Water Resources
FF	functional foot/feet
FIBC	flexible intermediate bulk container
HUC	Hydrologic Unit Code
LF	linear feet
MTF	Mercury Treatment Facility
NWP	nationwide permit
OF	Outfall
OREM	Oak Ridge Office of Environmental Management
RDR/RAWP	Remedial Design Report/ Remedial Action Work Plan
SQT	Stream Quantification Tool
TDEC	Tennessee Department of Environment and Conservation
TN	Tennessee
UCOR	URS | CH2M Oak Ridge LLC
UEFPC	Upper East Fork Poplar Creek
USACE	U.S. Army Corps of Engineers
Y-12	Y-12 Nuclear Security Complex

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EXECUTIVE SUMMARY

This addendum to the Remedial Design Report/Remedial Action Work Plan (RDR/RAWP), describes the approaches for complying with applicable or relevant and appropriate requirements (ARARs) related to construction of Outfall (OF) 200 Mercury Treatment Facility (MTF) intake and outfall structures in Upper East Fork Poplar Creek (UEFPC), and to the permanent loss of net resource value in UEFPC requiring mitigation. The specific ARARs considered in this addendum are: 1) construction or modification of intake and outfall structures for effluents, 2) loss of net resource value of state waters, and 3) mitigation of state waters other than wetlands.

Construction of the OF200 MTF includes the installation of an intake structure in UEFPC in the Headworks area, and the installation of an outfall structure in UEFPC at the Treatment Plant. Because this in-stream construction activity will be conducted under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the substantive requirements of applicable aquatic resource alteration permits (ARAPs) must be met. Temporary stream diversion around the work sites is described in this addendum.

When the OF200 MTF begins operations, there will be a permanent loss of resource value of 2500 ft of stream length in UEFPC between OF200 and the Big Spring Water Treatment System OF51. The Tennessee Stream Quantification Tool (TN SQT) was utilized to evaluate the length of UEFPC being impacted, and the existing condition score (CS) was determined to be 0.43. This results in a debit of 1075 functional feet (FF) (0.43 × 2500 ft).

Compensatory mitigation of at least 1075 FF will be required to offset the debit of 1075 FF. It is preferred that the mitigation occur on an impacted stream in the same watershed, and on the same site or as close to the impacted stream as possible. The proposed mitigation site is still being determined. Mitigation measures that will be considered include, but are not limited to: restoration of degraded stream reaches and/or riparian zones; new (relocated) stream channels; removal of pollutants from and hydrologic buffering of storm water runoff, and other measures, which would have a reasonable likelihood of increasing the resource value of a state water.

The mitigation plan may consist of a combination of measures. For example, the OF200 MTF will provide hydrologic buffering of storm water runoff, which may provide mitigation offsetting some of the loss of resource value. This mitigation may be considered in combination with other measures, such as restoration of downstream degraded stream reaches and/or riparian zones. One impacted downstream reach under consideration on the Oak Ridge Reservation (ORR) is the length of Poplar Creek within the East Tennessee Technology Park (ETTP). For the chosen mitigation measures, the TN SQT will be used to evaluate functional lift between the existing and proposed stream condition, with the objective of obtaining a lift of at least 1075 FF. A mitigation plan will be prepared consistent with the substantive requirements for an individual ARAP, and the plan will then be submitted for review under CERCLA.

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1. INTRODUCTION AND PURPOSE

This addendum to the Remedial Design Report/Remedial Action Work Plan (RDR/RAWP) describes the approaches for complying with certain applicable or relevant and appropriate requirements (ARARs) contained in the RDR/RAWP related to construction and operation of the Outfall (OF) 200 Mercury Treatment Facility (MTF). The specific ARARs considered in this addendum are: 1) construction or modification of intake and outfall structures for effluents, 2) loss of net resource value of state waters, and 3) mitigation of state waters other than wetlands. Construction of the OF200 MTF intake and outfall structures will occur in Upper East Fork Poplar Creek (UEFPC), necessitating a temporary stream diversion at each construction site. After OF200 MTF operations begin, there will be a permanent loss of net resource value of the length of UEFPC between OF200 and the Big Spring Water Treatment System (BSWTS) OF51. This permanent loss of net resource value requires compensatory mitigation.

The UEFPC watershed includes approximately 1170 acres that encompass the industrialized area of the Y-12 National Security Complex (Y-12). The boundary extends along the top of Pine Ridge to the north, the top of Chestnut Ridge to the south, the eastern boundary of the Bear Creek Valley watershed to the west, and the U.S. Department of Energy (DOE) property line to the east (Fig. 1).

The OF200 MTF will capture and remove mercury-contaminated water entering UEFPC from OF200 and OF135. A water diversion system intake structure will be constructed just downstream of these two outfalls. Due to site constraints near OF200, the OF200 MTF will be constructed in two different areas, the Headworks site adjacent to OF200 on the south side of UEFPC at the diversion system intake structure, and the Treatment Plant site near B Road and Third Street, joined by a transfer pipeline corridor. The Treatment Plant outfall structure will be constructed on the north bank of UEFPC south of where B Road and Third Street intersect. Key locations on UEFPC related to OF200 MTF construction and operation are shown in Fig. 2.

After OF200 MTF operations begin, there will be a permanent loss of net resource value for 2500 ft of UEFPC between OF200 and BSWTS OF51. The location of BSWTS OF51 is upstream of the Treatment Plant effluent outfall structure (Fig. 2). There will remain sufficient flow between BSWTS OF51 and the Treatment Plant outfall structure to not impact this length of stream.

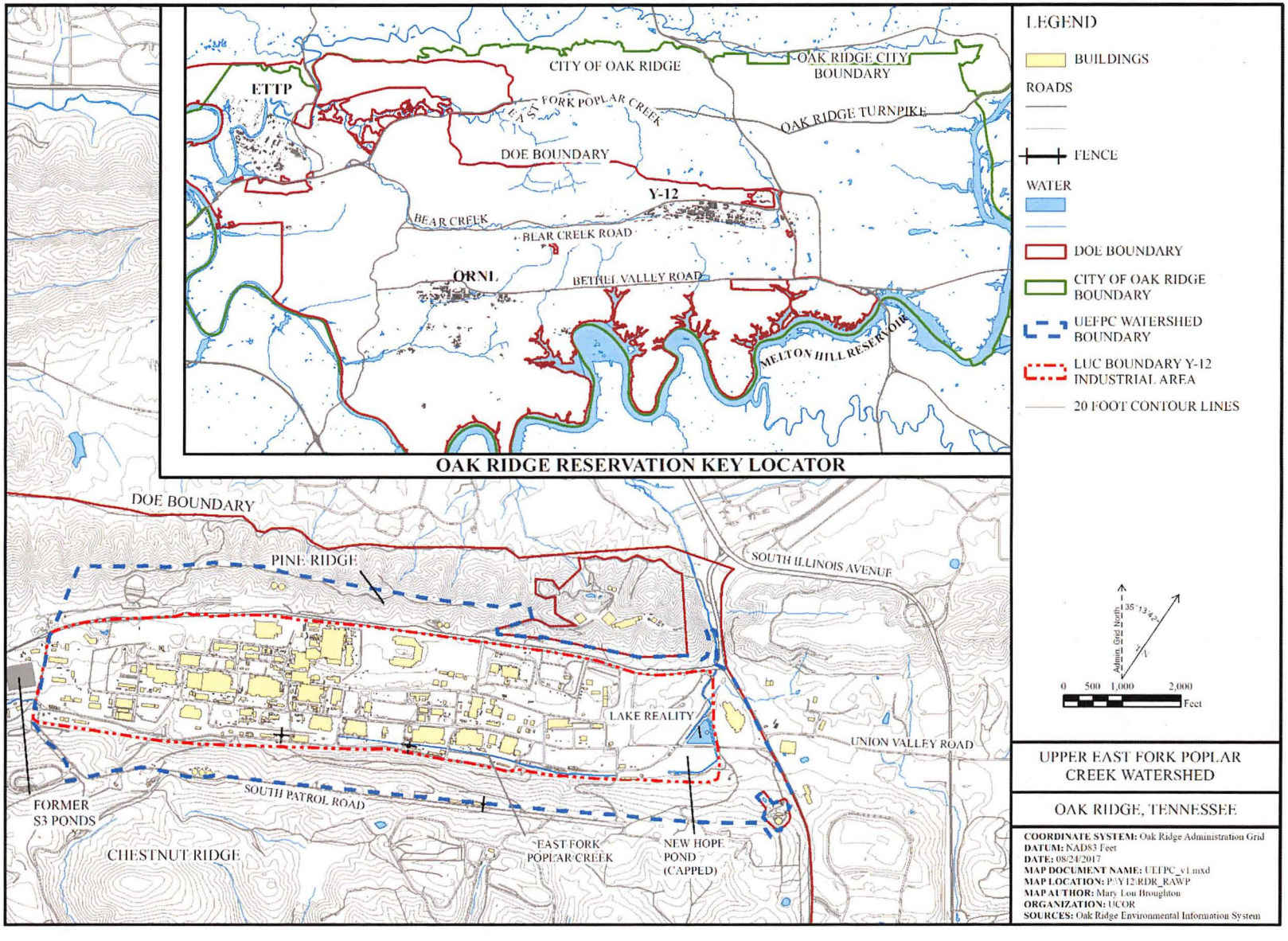

Fig. 1. Location of the UEFPC watershed.

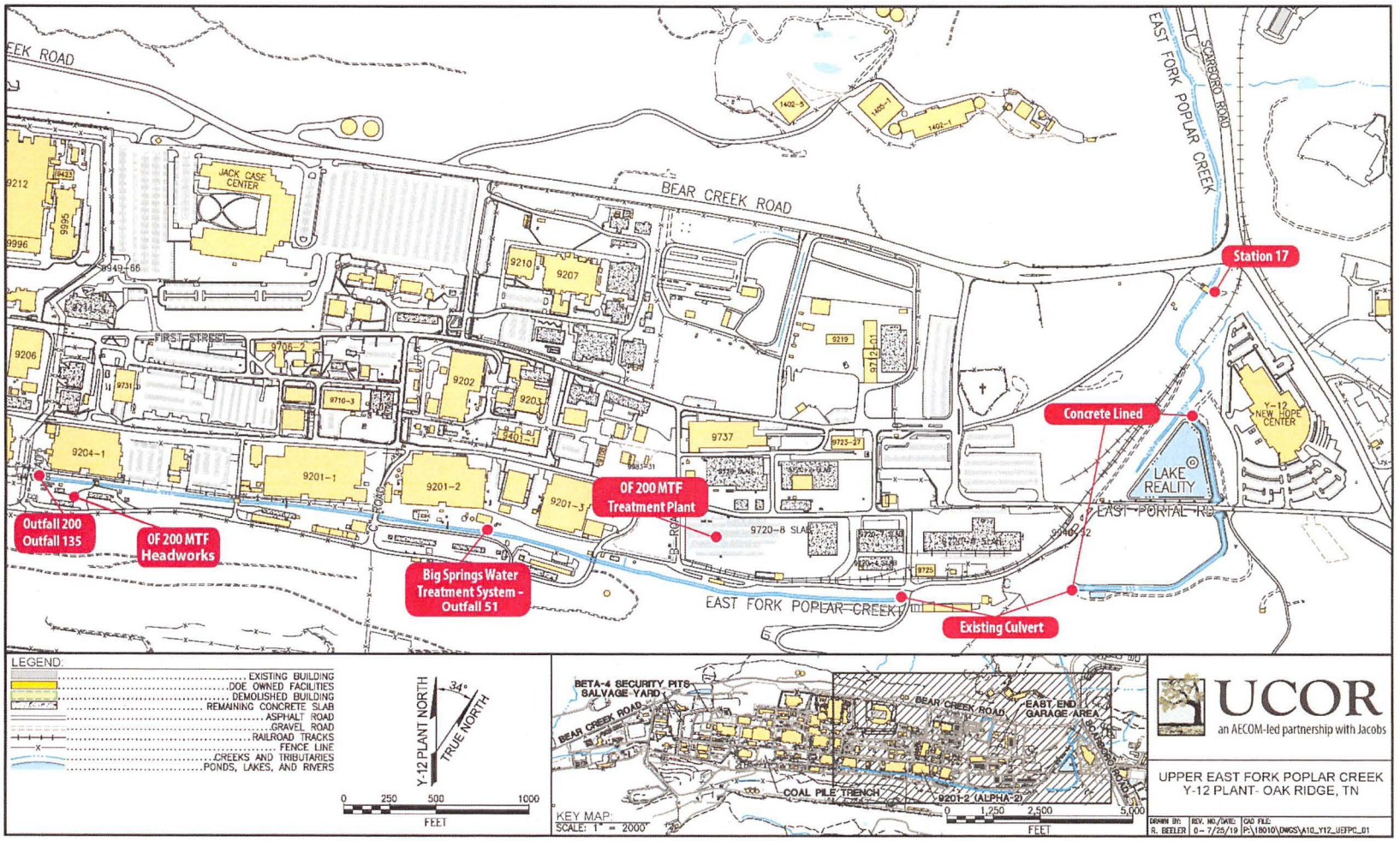

Fig. 2. Key locations on UEFPC within Y-12.

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2. SITE DESCRIPTION

The Headworks site—including the intake diversion structure, grit removal, and storm water storage facilities—is located on approximately 1 acre adjacent to OF200 and just south of UEFPC. This footprint is bounded by E Road to the west, UEFPC to the north, and Third Street to the south. The site provides the space necessary for water intake diversion, grit processing, pumping, and storm water storage (Fig. 3).

The Headworks and Treatment Plant sites are joined by an interconnecting transfer pipeline and fiber optic data cable. This pipeline and fiber optic connection is generally located along a narrow corridor on the south side of UEFPC, north of Third Street. The pipeline and fiber optic cable cross to the east side of Third Street via an underground road crossing and to the north side of UEFPC via an above-grade pipe bridge near the Treatment Plant site (Fig. 3).

The Treatment Plant site is bounded by Second Street to the north, Third Street to the south, B Road to the west, and A Road to the east (Fig. 3). This site provides the space necessary for the OF200 water treatment facilities (about 2.3 acres) and can accommodate future expansion. The outfall for the OF200 MTF will be constructed on the north bank of UEFPC near the intersection of B Road and Third Street (Fig. 3).

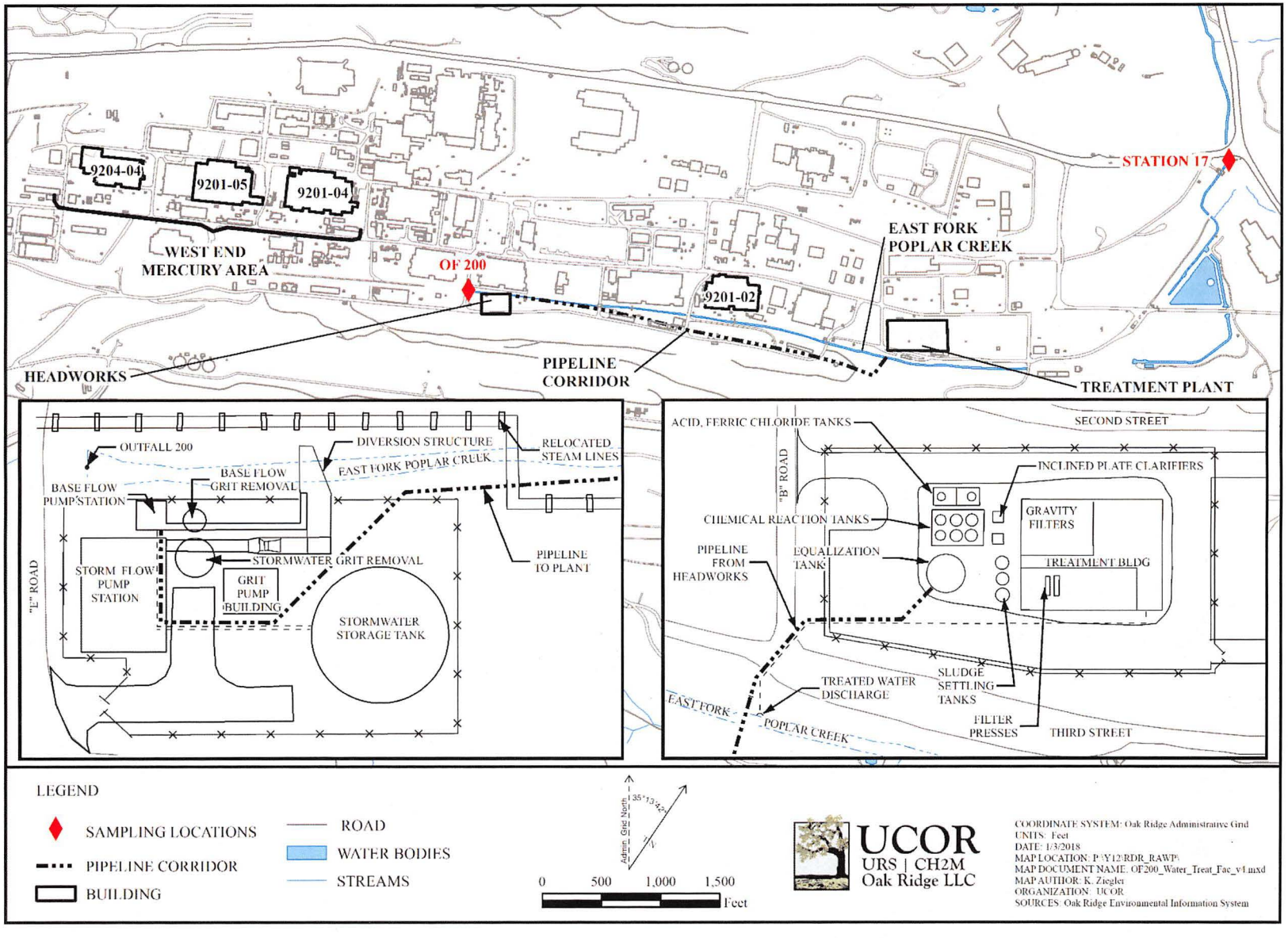

Fig. 3. OF200 MTF site location.

3. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR AQUATIC RESOURCES

ARARs from the RDR/RAWP that are most relevant to this addendum are listed in Table 1. Compliance with these ARARs is described in Sects. 4 and 5.

Table 1. ARARs from RDR/RAWP relevant to this addendum

Construction or modification of intake and outfall structures for effluents
Requirement: Construction, maintenance, repair, rehabilitation, or replacement of intake or outfall structures shall be carried out in such a way that work: • Does not violate water quality criteria as stated in TDEC 0400-40-03-.03, including, but not limited to, prevention of discharges that cause a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of waters of the state for any of the designated uses for that water body by TDEC 0400-40-04. • Activities in non-navigable streams shall be conducted in the dry; in navigable streams, where impracticable to work in the dry, work may be conducted within the water column. • Shall be located and oriented to avoid permanent alteration or damage to the integrity of the stream channel, including the opposite stream bank. Alignment of the structure (except for diffusers) should be as parallel to the stream flow as is practicable, with the discharge pointed downstream. Diffusers may be placed perpendicular to stream flow for more complex mixing. • Intake and outfall structures shall be designed to minimize harm and prevent impoundment of normal or base flows. • Velocity dissipation devices shall be placed as needed at discharge locations to provide a non-erosive velocity from the structure. • Activity may not be conducted in a manner that would permanently disrupt the movement of fish and aquatic life. • Material may not be placed in a location or manner so as to impair surface water flow into or out of any wetland area. • Backfill activities must be accomplished in a manner that stabilizes the streambed and banks to prevent erosion. All contours must be returned to pre-project conditions to the extent practicable and completed activities may not disrupt or impound stream flow. • Streambeds must not be used as transportation routes for construction equipment. • Temporary stream crossings shall be limited to one point in the construction area and erosion control measures shall be utilized where stream banks are disturbed. Crossing shall be constructed so that stream flow is not obstructed. Following work, all materials used for temporary crossing must be removed and disturbed stream banks restored and stabilized. • Materials used in intake and outfall structures must be free of contaminants and wastes as defined by TCA 69-3-103(18). • Clearing, grubbing, and other disturbances to riparian vegetation shall be kept to a minimum necessary for slope construction and equipment operations. Unnecessary tree removal is prohibited.

Table 1. ARARs from RDR/RAWP relevant to this addendum (cont.)

Construction or modification of intake and outfall structures for effluents
• Sediment shall be prevented from entering waters of the state. Erosion and sediment control measures shall be properly selected, installed, and maintained, and must be in place and functional before earth-moving operations begin. • Litter, construction debris, and construction chemicals exposed to storm water shall be picked up prior to anticipated storm events or otherwise prevented from becoming a pollutant source during storms. • Excavated materials, removed vegetation, construction debris, and other wastes shall be removed to an upland location and properly stabilized or disposed of to prevent reentry into the waterway. • Take appropriate steps to ensure petroleum products or other chemical pollutants are prevented from entering waters of the state. In the event of a spill, take immediate measures to prevent pollution of waters of the state.
Prerequisite: Construction of intake and outfall structures in waters of the state—applicable.
Citation: TCA 69-3-108(1), TDEC 0400-40-07-.01, TDEC General Permit for Construction of Intake and Outfall Structures (effective April 7, 2015)
Loss of net resource value of state waters (ARAP program)
Requirement: No activity can be authorized by the Commissioner unless any lost resource value associated with the proposed impact is offset by mitigation sufficient to result in no net loss of resource value.
Prerequisite: Activity that would result in an appreciable permanent loss of resource value of a state water—applicable.
Citation: TDEC Rule 0400-40-07-.04(6)(c)
Mitigation of state waters other than wetlands (ARAP program)
Requirement: Must provide mitigation that results in no overall net loss of resource values for any activity that would result in appreciable permanent loss of resource value of a state water. For any mitigation involving relocation or re-creation of a stream segment, to extent practicable must complete mitigation before any impact occurs to existing state waters. Mitigation measures include but are not limited to: restoration of degraded stream reaches and/or riparian zones; new (relocated) stream channels; removal of pollutants from and hydrologic buffering of storm water runoff; and other measures that have a reasonable likelihood of increasing the resource value of a state water. Mitigation measures or actions should be prioritized in the following order: restoration, enhancement, re-creation, and protection.
Prerequisite: Activity that would result in an appreciable permanent loss of resource value of a state water—applicable.
Citation: TDEC 0400-40-07-.04(7)(a)

ARAP = Aquatic Resource Alteration Permit
TCA = Tennessee Code Annotated
TDEC = Tennessee Department of Environment and Conservation

4. CONSTRUCTION OF OUTFALL 200 MTF INTAKE STRUCTURE AND OUTFALL STRUCTURE IN UEFPC

4.1 IN-STREAM CONSTRUCTION ACTIVITIES

The in-stream construction activities for the OF200 MTF consist of installing the intake structure at the Headworks and the outfall structure at the Treatment Plant. Because the OF200 MTF construction is being performed under Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), an individual aquatic resource alteration permit (ARAP) will not be issued for these in-stream construction activities. The contractor is responsible however for meeting the substantive requirements of applicable ARAPs during the in-stream construction in UEFPC.

4.1.1 Intake Structure at Headworks

The intake structure at the Headworks will be constructed with a reinforced concrete floor as an overflow/diversion weir to divert water by gravity flow from UEFPC just downstream of OF200 into wet wells through a concrete channel fitted with a manual bar rack to protect from any oversize debris. Control gates will separate the base flow and storm flow to divert the water into their respective grit chambers.

Clearing or other disturbance of areas immediately adjacent to UEFPC will be minimized during installation of the intake structure, and disturbed areas will be stabilized and revegetated as specified in the design. No dredged or fill material will be discharged to UEFPC during construction.

The Headworks control system operates in three stages. Stage 1 is for flows of less than 3000 gpm, with water only flowing to the base flow wet well side. Stage 2 is for flows between 3000 and 40,500 gpm, with water flowing to both the base and storm flow wet well sides. Weir gates are used to control the flow rates into the base and storm sides. During times of high flow, where the UEFPC flow is greater than the total Headworks flow capacity of approximately 40,500 gpm, the level in UEFPC will increase to the point where excess water will overflow the weir and flow down the existing creek channel. The control system then enters Stage 3 to limit flow to 3000–37,500 gpm for the base and storm sides, respectively. Both weir gates operate to control these flow rates, with any excess flow from OF200 bypassing the facility and continuing downstream in UEFPC. If the storm water storage tank reaches capacity, the storm side flow is stopped and any flow in excess of 3000 gpm is bypassed downstream.

4.1.2 Outfall Structure at Treatment Plant

The MTF outfall structure will be constructed with a lined, ductile iron pipe with a flap gate valve discharging to an effluent outfall structure. The outfall will include a reinforced concrete slab and walls with access stairs. The slab will include reinforced concrete baffles for energy dissipation.

Clearing or other disturbance of areas immediately adjacent to UEFPC will be minimized during installation of the treated water discharge line, and disturbed areas will be stabilized and revegetated as specified in the design. No dredged or fill material will be discharged to UEFPC during construction.

4.2 STREAM DIVERSION DURING IN-STREAM CONSTRUCTION

Construction of the intake structure at the Headworks and the outfall structure, riprap, and crushed rock base bedding at the Treatment Plant requires adequate conveyance of water around the construction footprint during certain portions of the construction. The APTIM-North Wind Construction JV, LLC

(ANW) *Water Control Plan—Outfall 200 MTF Y-12* (WCP-501249-001, Rev. 4) provides details for planned stream diversions for the Headworks intake structure (Figs. 4 and 5) and the Treatment Plant outfall structure (Fig. 6). The stream diversions will be conducted separately and in dry periods. In-stream construction work requiring stream diversion will be kept to as short a time period as possible, to minimize the chance of flooding from rain events. Excavation and fill activities will be kept to a minimum, and all excess material will be managed to prevent runoff.

The contractor's conceptual approach for creek bypass is the same at both locations in UEFPC. A dam will be constructed utilizing sand-filled flexible intermediate bulk containers (FIBCs) upstream of the intake structure or outfall structure. The impounded water will then be pumped around the work area to a downstream location by a 6-in., diesel-powered pump. A riprap discharge pad will be placed into the downstream creek bed to reduce the discharge velocity and minimize disturbance of the creek bed. An 8-in. diesel-powered pump will be utilized as a backup and to provide surge capability if needed. The 8-in. pump will discharge to the same riprap apron.

Two dams will be constructed utilizing sand-filled FIBCs downstream of the intake or outfall structure work area. The diverted stream water will be pumped back into the pool created between these two dams. The upper dam will prevent water from flowing back into the work area. The lower dam will allow the discharged water some residence time in the impounded area to settle any sediment prior to the water overtopping the dam.

The 6-in. and 8-in. pumps will be connected to float switches that activate the starting of the pumps. The float switch for the 6-in. primary pump will be set lower than the float switch for the 8-in. secondary pump. Should water levels continue to rise after operation of the primary pump, the secondary pump float switch will activate the 8-in. pump. It is anticipated that this will only occur during significant rain events. During off-shift hours, personnel will be onsite to monitor and refuel the pumps.

For additional stream diversion at the Headworks, prime contractor ANW, with approval by Y-12 Consolidated Nuclear Security, LLC (CNS), may elect to add a boot and piping to the existing pipes at OF135 and OF200 to provide additional surge capacity in the event of a significant rain event. Approval from Y-12 CNS will be obtained and the applicable National Pollutant Discharge Elimination System (NPDES) permit may require modification to allow boot installation at either OF135 or OF200. The piping will be routed to a downstream discharge point. The request to boot either or both of the outfall pipes will be made based on actual and forecasted weather conditions during the construction of the Headworks intake structure and information received from the DOE Oak Ridge Office of Environmental Management (OREM) regarding discharge data and connection points for OF135 and OF200. The temporary storm water retention basin, pumps, boot, and piping are designed based on historic UEFPC flow data provided by DOE OREM via RFI-0001 on February 4, 2019.

Stream diversion for the outfall structure at the Treatment Plant may also be accomplished by utilizing sand-filled FIBCs in a semicircle in the streambed around the construction area and parallel to the stream flow, if space allows. The stream flow would be diverted around the work area to the south bank of UEFPC. Depending on the space available for this in-stream diversion and how much water can be diverted, the pumps may still have to be utilized to pump additional stream water around the work area.

During the construction of the intake and outfall structures the contractor will implement erosion and sedimentation control throughout construction to prevent the discharge of visible solids, bottom deposits, or turbidity to impair the usefulness of UEFPC. These best management practices (BMPs) will be in accordance with the *Tennessee Erosion and Sediment Control Handbook* (TDEC 2012) and the *Water Management Requirements for the Outfall 200 Mercury Treatment Facility* (UCOR-5172). The BMPs to be implemented include installation of a sandbag berm, installation of outfall stabilization structures

(aprons) for outlet protection, stream diversion, and discharge of accumulated water. Additionally, the contractor will deploy oil and debris booms in the creek downstream of the construction sites prior to any creek disturbance activities, in accordance with the BMP in UCOR-5172 for installation of an oil and debris boom.

Excavation materials are expected to be disposed at the Oak Ridge Reservation Landfills (ORRLF). Any needed backfill will be clean imported backfill as specified in the design technical specifications. Excavation and fill activities will be kept to a minimum, and all excess material will be handled to prevent runoff.

If any waste is to be disposed at the Environmental Management Waste Management Facility (EMWMF), a waste handling plan (WHP) will be prepared and approved prior to disposal. These wastes will be characterized and disposed in accordance with regulatory requirements.

If free mercury is encountered during construction or following excavation, then the mercury—along with the soil and debris in the surrounding area—will be collected, packaged, and sent to an approved commercial facility for treatment and disposal. Mercury will be managed in accordance with applicable and appropriate regulations.

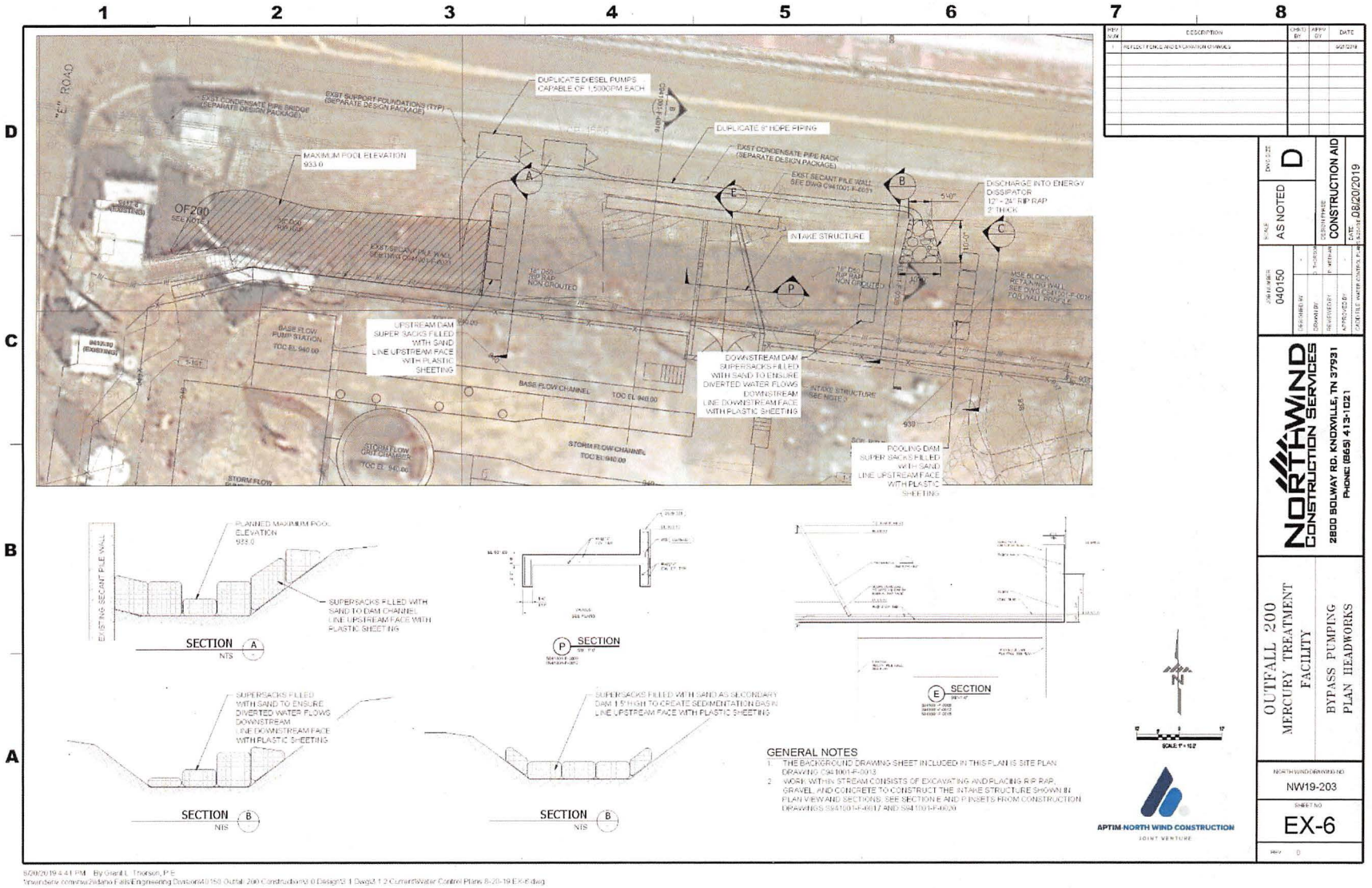

Fig. 4. Stream diversion plan for Headworks intake structure.

Fig. 5. UEFPC at Headworks intake structure site location looking east from OF200.

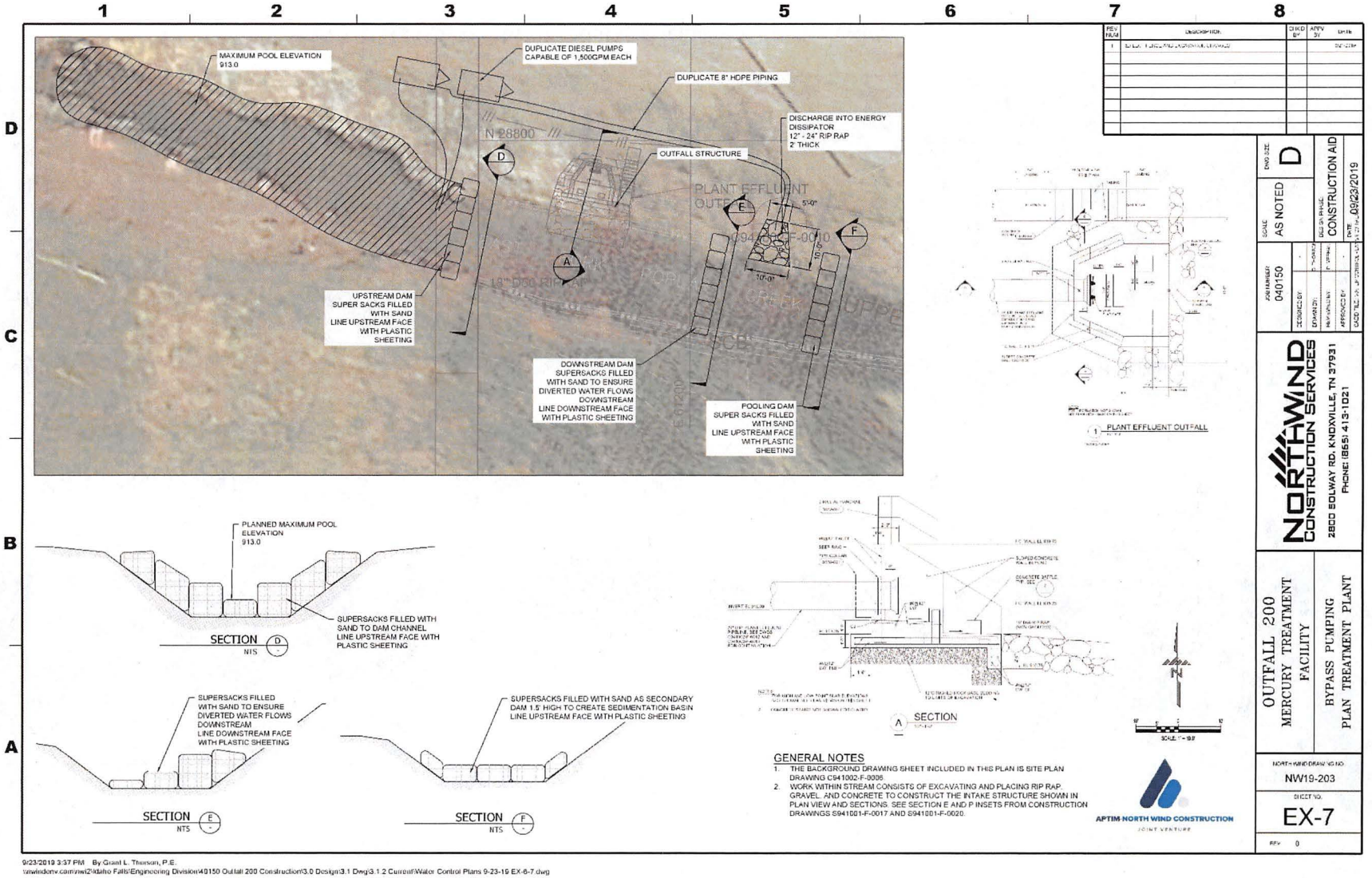

Fig. 6. Stream diversion plan for Treatment Plant outfall structure.

5. LOSS OF NET RESOURCE VALUE IN UEFPC AND COMPENSATORY MITIGATION DUE TO OUTFALL 200 MTF OPERATION

The U.S. Army Corps of Engineers (USACE) and Tennessee Department of Environment and Conservation (TDEC) Division of Water Resources (DWR) currently require compensatory mitigation for certain permitted impacts to Tennessee's streams. TDEC may require compensatory mitigation to offset unavoidable adverse impacts resulting in an appreciable permanent loss of aquatic resource value.

Resource values are the benefits provided by the water resource that help maintain classified uses. These benefits, including, but not limited to sufficient quality and adequate quantity of water and habitat for fish, other aquatic life, and wildlife can be evaluated, in part, through quantitative analysis of stream function. Stream functions are defined as the physical, biological, and chemical processes that occur in lotic ecosystems. Therefore resource value losses can be quantified by measuring the chemical, physical, and biological stream functions.

Tennessee's ARAP rules establish TDEC's mandatory requirements for mitigation. Rule 0400-40-07-.04(7), modified in 2018, requires mitigation sufficient to compensate for the loss of resource values from existing conditions. The rule prioritizes mitigation methods as follows: restoration, enhancement, preservation, creation, or other effective measures. The rule further prioritizes mitigation as close to the impact location as practicable, but does not express a preference for the type of mitigation provided.

TDEC's preference is to evaluate mitigation in terms of FF of stream; this term is discussed in detail in the remainder of this section. The Tennessee Stream Quantification Tool (TN SQT) and the Tennessee Debit Tool were created to assist applicants with these calculations. Permit applicants may apply alternative methodologies only if they demonstrate to the Division that these methodologies are scientifically defensible and comply with all applicable legal requirements.

Stream compensatory mitigation projects provide functional lift to offset permitted impacts. Functional lift is the numerical difference between an existing (degraded) stream condition and the proposed (restored) stream condition. These projects should be designed to improve the resource value and function in streams that are currently not supporting their designated uses, or otherwise demonstrated to be significantly degraded. Restoring a stream's ability to support its designated uses provides the maximum benefit and value to the citizens of Tennessee. Stream compensatory mitigation projects should have goals to re-establish and improve stream resource values and functions to their natural, best attainable condition.

The May 2019 TDEC DWR Natural Resources Unit guidance document, *DWR-NR-G-01-Stream Mitigation Guidelines-05202019* (TDEC 2019), was utilized throughout this section. This quantitative assessment method uses two primary tools: (1) the TN Debit Tool, which focuses on stream functional loss; and (2) the TN SQT, which focuses on stream functional lift of stream restoration projects. These quantitative assessment methodologies calculate loss and lift of stream function, and therefore resource value, in terms of FF. Therefore, credits and debits are described as an amount of functional foot (FF) lift (credits) or FF loss (debits). It is the intent of the DWR to use the same quantitative methodology to calculate credits and debits to ensure impacts to water resource values are sufficiently offset by compensatory mitigation.

5.1 LOSS OF NET RESOURCE VALUE IN UEFPC

Loss of stream length in UEFPC between OF200 and BSWTS OF51 results in an appreciable permanent loss of resource values. Activities that involve permanent degradation and functional loss of water resources

in excess of a general permit limit typically require compensatory mitigation to ensure no net loss. The nature and scale of the required mitigation is informed by a list of considerations, including existing conditions of the impacted resource, an evaluation of cumulative and secondary effects of associated impacts, and the guidance on debit determination.

USACE compensatory mitigation requirements will be implemented in accordance with 33 *Code of Federal Regulations* (*CFR*) Part 320.4(r), *Navigation and Navigable Waters, General policies for evaluating permit applications, Mitigation*; and 33 *CFR* Part 332, *Compensatory Mitigation for Losses of Aquatic Resources*; and 40 *CFR* Part 230.70-77, *Subpart H—Actions To Minimize Adverse Effects*; 40 *CFR* Part 1508.20, *Terminology and Index, Mitigation*; and 40 *CFR* Part 1502.14, *Environmental Impact Statement, Alternatives including the proposed action.* In overall terms, the objective of compensatory mitigation is to offset environmental losses resulting from unavoidable impacts to waters of the United States authorized by Department of the Army permits. In particular it should be noted that the evaluation of impacts to resource functions and requirements for compensatory mitigation is significantly different in the USACE Nationwide Permits (NWP), as compared to TDEC General ARAPs. Mitigation may in fact be required under a NWP in order to ensure an activity will result in no more than minimal individual and cumulative adverse environmental effects, which is the standard for an activity to be authorized under the NWPs.

5.1.1 Tennessee Debit Tool (TN Debit Tool)

The TN Debit Tool contains an array of spreadsheets that are used to assist a permit applicant to determine the debits for their proposed impact activities. Contained within the TN Debit Tool is a Debit Calculator, which is used to estimate the proposed stream condition resulting from an impact activity (this condition is called the Proposed Condition). In addition, the tool contains Existing Condition worksheets (similar to SQT worksheets) if an applicant chooses to individually measure the existing site condition when determining functional loss. The Debit Calculator uses an existing condition score (CS) coupled with an Impact Factor (based on impact type) and a modeled proposed CS to determine the FF loss and resulting debits. These three variables, existing CS, Impact Factor, and proposed CS, along with the length of the impact will determine the amount of base debits required to compensate for aquatic resource losses.

The TDEC DWR will base debits on the amount of FF loss projected to occur due to the proposed activities. This will require applicants to do one of the following:

1. Determine the existing condition of their site with the Rapid Assessment Method in the TN SQT.
2. Estimate the site existing condition by measuring specific metrics of the TN SQT while unmeasured metrics remain at a standard (functioning) value.
3. Use a standard existing CS.

These options for establishing an existing CS will allow an applicant flexibility to best fit the needs of a particular project.

Existing CS, FF calculations, and proposed CS in the debit tool follow the same form of quantitative evaluation of functional change as functional-lift determinations in the TN SQT. This provides a direct comparison of functional loss and lift, helping ensure that the credits provided by mitigation projects adequately offset debits caused by permitted impacts.

5.1.2 Functional Loss Calculations

Functional loss and lift are measured in units of FF, where the stream length and the stream reach CS multiplied together equal stream FF.

$$\textbf{\textit{Existing Stream FF}} = \textit{Existing CS} \times \textit{Existing Stream Length}$$

$$\textbf{\textit{Proposed Stream FF}} = \textit{Proposed CS} \times \textit{Proposed Stream Length}$$

$$\textbf{\textit{Change in FF}} = \textit{Proposed FF} - \textit{Existing FF}$$

Functional loss is generated when the proposed CS is less than the existing CS, yielding a negative value—a debit.

The ARAP rules require that the determination of existing conditions shall ensure at least minimal protection for all streams notwithstanding prior degradation. Therefore, for activities that propose impacts to highly degraded streams, the existing CS will not be assessed as less than 0.40. This lower limit CS does not apply to degraded streams proposed for compensatory mitigation and aimed at providing functional lift. This lower limit for impacted streams recognizes that even degraded streams have values outside of the functional quantification evaluation that must be offset if lost. Resource values are the benefits provided by a water resource that help maintain the classified uses established under Tennessee's water quality standards regulations. The TN Debit Tool and the TN SQT measure functions of streams such as the physical, chemical, and biological processes that are primarily associated with ecosystem functions. However, a stream's current condition may provide little to no ecosystem function while still providing other resource values that help maintain additional classified uses such as irrigation, recreation, wildlife and livestock watering. In this regard, a permanent loss of stream length or significant loss of resource values must be balanced by compensatory mitigation to ensure an overall "no net loss" of resource values for Tennesseans.

5.1.3 Existing Stream Length

The length of UEFPC that will be directly impacted by the permitted activity has been determined to be 2500 linear feet (LF). This length was measured from OF200 to BSWTS OF51.

5.1.4 Proposed Stream Length

The length of UEFPC after the permitted activity will be zero LF from OF200 to BSWTS OF51, meaning this length of stream will be evaluated as being eliminated.

The existing CS for the length of UEFPC being eliminated has been determined to be 0.43. This results in an Existing Stream FF value of 1075 FF (0.43 × 2500 ft). Because the Proposed Stream FF value will be zero, the Change in FF would be a debit of 1075 FF.

5.2 COMPENSATORY MITIGATION

The preliminary functional loss calculations detailed in Sect. 5.1 for the length of UEFPC from OF200 to BSWTS OF51 resulted in a debit of 1075 FF. Because this length of UEFPC will be assumed to be eliminated after the OF200 MTF is in operation, the compensatory mitigation credits to offset this debit must be obtained by performing mitigation on a different length of stream or by other approved methods for obtaining mitigation credits.

TDEC, along with agency partners, including the USACE, U.S. Environmental Protection Agency (EPA), Natural Resources Conservation Service (NRCS), Tennessee Wildlife Resources Agency (TWRA), Tennessee Valley Authority (TVA), and U.S. Fish and Wildlife Service (USFWS) have worked with consultants, academics, and statewide stakeholders to develop and regionalize a tool for site evaluation and determination of compensatory mitigation credits (FF). TDEC and the USACE have determined that the TN SQT is the preferred quantitative assessment method to calculate credits (FF). The primary purpose of the TN SQT and associated documents are to evaluate the functional change between an existing and proposed stream condition. The agencies intend to use the TN SQT as a component of the project review process and to award credits through determination of functional lift.

As noted, the TN SQT calculates credits in FF. The existing site conditions and the proposed site conditions along the stream are established, then input into the TN SQT worksheet, which then automatically calculates the FF. An FF score is produced by multiplying a CS by the stream length. Because the CS must be 1.00 or less, the FF score is always less than or equal to the actual stream length.

TDEC rules state that compensatory mitigation for impacts to streams must occur in Tennessee, provided that the Division will use a watershed prioritization approach to evaluate proposed mitigation sites. Mitigation should occur as close to the impact location as practicable. The Division prioritizes project locations as follows:

- Projects providing an increase in resource values to degraded streams onsite or within the immediate impact area.
- Projects providing an increase in resource values to degraded streams or wetlands within the Hydrologic Unit Code (HUC)-12, in which the impact is located.
- Projects providing an increase in resource values to degraded streams or wetlands within the HUC-8, in which the impact is located.
- Projects providing an increase in resource values to degraded streams or wetlands outside the HUC-8, in which the impact is located.
- Any combination of the above activities.

Stream compensatory mitigation may be accomplished through the restoration, reestablishment, enhancement, or preservation (in conjunction with other mitigation activities) of the water resource values, functions, and designated uses of currently degraded streams. The DWR Rules outline a preference for mitigation to occur as close to the impacts as is feasible. Tennessee statute and the Division's overarching mission to abate existing pollution and restore polluted waters, establishes priority should be given to significantly degraded stream reaches near the impact site and within waterbodies assessed as impaired by TDEC (i.e., "303(d)-listed"). This provides a means to alleviate the causes or sources of water quality and/or habitat impairment.

One potential length of stream being considered for compensatory mitigation is the length of Poplar Creek within the East Tennessee Technology Park (ETTP). It is within the same watershed as UEFPC and is a degraded stream on the Oak Ridge Reservation (ORR). Mitigation, including bank stabilization, for this length of Poplar Creek would provide an increase in resource value, including recreational opportunities.

All mitigation projects must provide a mitigation plan commensurate with the scale and complexity of the project. Mitigation plans are intended to fully illustrate the measures proposed to create, restore, enhance, or preserve a stream. A mitigation plan meeting these requirements will be prepared in accordance with the substantive requirements for an individual ARAP, and the plan will then be submitted for review, under CERCLA, on the scope and location of the mitigation.

6. REFERENCES

33 *CFR* Part 320. *Navigation and Navigable Waters,* 320.4(r), "Mitigation," Washington, D.C.

———33 *CFR* Part 332. *Compensatory Mitigation for Losses of Aquatic Resources.*

40 *CFR* Part 230, Subpart H (Sects.70–77). *Actions to Minimize Adverse Effects*, Washington, D.C.

———40 *CFR* Sect. 1502.14, "Alternatives including the proposed action."

———40 *CFR* Sect. 1508.20. "Mitigation."

TDEC. Rules of the Tennessee Department of Environment and Conservation, Division of Water Resources, Water Pollution Control, Chap. 0400-40-07, *Aquatic Resource Alteration.* URL: https://sharetngov.tnsosfiles.com/sos/rules/0400/0400-40/0400-40-07.20131216.pdf. Last accessed: 11/20/2019.

TDEC 2012. *Tennessee Erosion and Sediment Control Handbook*, 2012, Tennessee Department of Environment and Conservation, Division of Water Resources, Nashville, TN.

TDEC 2019. *DWR-NR-G-01-Stream Mitigation Guidelines—05202019*, May 20, 2019, Tennessee Department of Environment and Conservation, Division of Water Resources, Nashville, TN. URL https://www.tn.gov/content/dam/tn/environment/water/policy-and-guidance/dwr-nr-g-01-stream-mitigation-guidelines-052019.pdf. Last accessed: 11/19/2019.

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