



The City of
OKLAHOMA CITY
UTILITIES DEPARTMENT

May 22, 2024

Project Title: Hefner Water Treatment Plant Clarifier Rehabilitation

Project Location: Hefner Water Treatment Plant

Project Number: WT-0261

Estimated Project Cost: To Be Determined.

1.0 Project Description:

OCWUT is evaluating the rehabilitation of clarifiers at the Hefner Water Treatment Plant (WTP). This project will provide preliminary engineering services for the plant expansion.

2.0 Project Intent:

The Engineer will provide all preliminary engineering services required to develop a clarifier rehabilitation plan for Hefner WTP. Final design, bidding, construction administration and management, inspection, and as-built services may be completed under a future amendment.

3.0 Background:

OCWUT funds, operates, and maintains the Hefner WTP to provide water services to its citizens and wholesale customers. The WTP is a conventional softening plant located in the northwest part of Oklahoma City immediately north of Lake Hefner. The components of the solids contact reactor clarifiers (clarifiers) are approaching the end of their service life and need to be replaced. The rehabilitation plan is anticipated to occur in two separate construction packages. The 1st phase will rehabilitate Clarifiers 1, 2, and 3. The 2nd phase will rehabilitate Clarifiers 4 and 5. Preliminary design services will be completed for all five clarifiers and will recommend a final phasing plan approach for the improvements.

The construction contract for Phase 1 will be funded with a Drinking Water State Revolving Fund Loan.

3.1 Plant Overview

The Hefner WTP is rated to treat 100 million gallons per day (mgd). The facility currently treats water from Lake Hefner using a combination of pre-ozonation, lime softening, and biologically activated carbon filters. Ozone currently provides primary disinfection inactivation for viruses and Giardia Lamblia, while chloramines provide secondary disinfection for the distribution system.



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Hefner WTP obtains raw water from Hefner Lake, which includes a watershed area surrounding the North Canadian River and a primary water source from Canton Lake, located in Northwest Oklahoma. Water from Canton Lake and the North Canadian is diverted, as needed, to Hefner and Overholser Lakes in OKC. Raw water in Hefner Lake is generally considered good, with low turbidity, moderate pH, and high hardness and alkalinity. The raw water data indicates the tendency of water quality to fluctuate based on environmental factors such as temperature and sunlight.

The treatment processes for the plant are outlined below:

- Preliminary Treatment
 - Low Lift (Raw Water) Pump Stations
 - Raw Water Flow Measurement
 - Ozone Contact Basins
- Finished Water Treatment
 - Lime Softening Solids Contact Reactor Clarifiers
 - Clarifier Effluent Channels
 - Recarbonation Basins
 - Filtration
 - Filter Backwash and Air Scour
- Storage and Distribution
 - Clearwells
 - High Service Pump Station
- Solids Treatment
 - Solids Pump Station
 - Gravity Thickeners
 - Balancing Tanks
 - Solids Dewatering (Belt Filter Presses)
 - Recovery Pump Station
- Chemical Treatment
 - Ozone
 - Ferric Sulfate
 - Lime
 - Fluoride
 - Phosphate
 - Carbon Dioxide
 - Chlorine Gas
 - Liquid Ammonium Sulfate



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4.0 Clarifiers

Hefner WTP utilizes lime-softening solids contact reactor clarifiers (“clarifiers”).

4.1 Background

The Hefner WTP has five (5) clarifiers.

Parameter	Clarifiers 1, 2, 3	Clarifiers 4 and 5
Diameter (feet)	130	130
Center Cone at Surface (feet)	52	52
Hydraulic Loading @ 25 mgd (gpm/ft ²)	1.56	1.56
Volume, each (MG)	2.14	2.14
Detention Time @ 25mgd with center cone (minute)	123	123
Detention Time @ 25 mgd without center cone (minute)	93	93
Weir Length, each (feet)	1508.5	1692
Weir Loading @ 25 mgd	16,573	14,775
Clarifier mechanism manufacturer	Eimco (Ovivo)	Westech

4.2 Clarifiers 1, 2, and 3 Rehabilitation

OCWUT staff completed an initial assessment of Clarifiers 1, 2, and 3 and identified the following possible items for rehabilitation and/or replacement. The provided list is not intended to be exhaustive but provides the minimum scope for the rehabilitation of Clarifiers 1, 2, and 3. The Engineer is responsible for completing an assessment and providing final recommendations.

4.2.1 Clarifier 1

- Center Structure
 - Replace Center Column, Recirculation Drum, Rotating Drum, Reaction Cone, Upper Cylinder, Lower Baffles, Upper Baffles, Vertical Tie-Rods, Inner Tie-Rods, Lower Tie-Rods, Upper Cylinder Hangers, and all mounting hardware with 316L stainless steel.
- Rake Assembly
 - Replace Inner Rake Arms, Outer Rake Arms, Trench Scrapers, Cage, Cage Bracing, Blade Support Frames, and all mounting hardware with 316L stainless steel.
 - Replace Trench Scraper Bracing and mounting hardware with 316 stainless steel.



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- Replace Squeegees and mounting hardware with 304 stainless steel.
- Turbine Assembly
 - Replace Turbine, Turbine Bracing, Turbine Drive Drum, Turbine Mounts, and all mounting hardware with 316L stainless steel.
- Launderers
 - Replace Annular Launder (including Launder Drain Assemblies), Radial Launderers, Effluent Launder, Annular Launder Braces, Radial Launder Inner and Outer Supports, and all mounting hardware with 316L stainless steel.
- Rake Drive
 - Replaced entire C60P Rake Drive Assembly including Main Gear Drive Assembly, Secondary Drive Assembly, Worm Gear Drive Assembly, Motor Drive Package, Torque Drive Control Unit, and all associated hardware.
- Walkways
 - Replace all grating and all mounting hardware with 304L stainless steel.
 - Replace Lower Support Beam and all mounting hardware for main walkway stair stringers with 316L stainless steel.
 - Inspect and repair or replace (with matching) any existing damaged handrail.
 - Widen primary walkway (including stairs if possible) to the northwest edge of the super structure platform and install 304L stainless steel grating on it with appropriate toe board and matching handrail.
 - Add matching handrail to southeast auxiliary walkway and pour concrete stairs to top of tank wall to meet stairs coming off of walkway.
- Super Structure
 - Abrasive blast all upper non-submerged metal (including Super Structure Beams, Beam Bracing, Walkway Stringers, Stair Stringers) to remove existing coating, corrosion, scale, and debris.
 - All non-submerged metal to receive appropriate coating system with the exception of stainless steel parts, Rake Drive Mechanism, and Turbine Drive Mechanism.
- Concrete Structure
 - Abrasive blast interior walls and repair any damage found.
 - Coat interior of concrete structure.
- Desludge System
 - Install 10" non-rising stem gate valve with handwheel and position indication on reactor side of desludge line for system isolation.
 - Abrasive blast piping and apply appropriate coating system approved by Utilities Engineering Division.



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- Abrasive blast concrete floor and lower walls of Desludge Room to remove scale and debris. Re-seal concrete floor and lower walls.
- Remove any abandoned wall penetrations and grout fill.
- Replace grating support angle brackets and mounting hardware with 316L stainless steel.
- Replace grating and mounting hardware with 304L stainless steel.
- Lime Feed System
 - Change lime feed point from being surface fed to being fed inside the Recirculation Drum, in the center, close to the Influent Ports.

4.2.2 Clarifier 2

- Center Structure
 - Replace Center Column, Recirculation Drum, Rotating Drum, Reaction Cone, Upper Cylinder, Lower Baffles, Upper Baffles, Vertical Tie-Rods, Inner Tie-Rods, Lower Tie-Rods, Upper Cylinder Hangers, and all mounting hardware with 316L stainless steel.
- Rake Assembly
 - Replace Inner Rake Arms, Outer Rake Arms, Trench Scrapers, Cage, Cage Bracing, Blade Support Frames, and all mounting hardware with 316L stainless steel.
 - Replace Trench Scraper Bracing and mounting hardware with 316 stainless steel.
 - Replace Squeegees and mounting hardware with 304 stainless steel.
- Turbine Assembly
 - Replace Turbine, Turbine Bracing, Turbine Drive Drum, Turbine Mounts, and all mounting hardware with 316L stainless steel.
- Launderers
 - Replace Annular Launder (including Launder Drain Assemblies), Radial Launderers, Effluent Launder, Annular Launder Braces, Radial Launder Inner and Outer Supports, and all mounting hardware with 316L stainless steel.
- Rake Drive
 - Replaced entire C60P Rake Drive Assembly including Main Gear Drive Assembly, Secondary Drive Assembly, Worm Gear Drive Assembly, Motor Drive Package, Torque Drive Control Unit, and all associated hardware.
- Walkways
 - Replace all grating and all mounting hardware with 304L stainless steel.
 - Replace Lower Support Beam and all mounting hardware for main walkway stair stringers with 316L stainless steel.
 - Inspect and repair or replace (with matching) any existing damaged handrail.



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- Widen primary walkway (including stairs if possible) to the north edge of the super structure platform and install 304L stainless steel grating on it with appropriate toe board and matching handrail.
- Add matching handrail to south auxiliary walkway and pour concrete stairs to top of tank wall to meet stairs coming off of walkway.
- Super Structure
 - Abrasive blast all upper non-submerged metal (including Super Structure Beams, Beam Bracing, Walkway Stringers, Stair Stringers) to remove existing coating, corrosion, scale, and debris. All non-submerged metal to receive appropriate coating system with the exception of stainless steel parts, Rake Drive Mechanism, and Turbine Drive Mechanism.
- Concrete Structure
 - Abrasive blast interior walls and repair any damage found.
 - Re-coat the interior of the concrete structure.
- Desludge System
 - Install 10" non-rising stem gate valve with handwheel and position indication on reactor side of desludge line for system isolation.
 - Abrasive blast piping and apply appropriate coating system.
 - Abrasive blast concrete floor and lower walls of Desludge Room to remove scale and debris. Re-seal concrete floor and lower walls.
 - Remove any abandoned wall penetrations and grout fill.
 - Replace grating support angle brackets and mounting hardware with 316L stainless steel.
 - Replace grating and mounting hardware with 304L stainless steel.
- Lime Feed System
 - Change lime feed point from being surface fed to being fed inside the Recirculation Drum, in the center, close to the Influent Ports.

4.2.3 Clarifier 3

- Center Structure
 - Replace Center Column, Recirculation Drum, Rotating Drum, Reaction Cone, Upper Cylinder, Lower Baffles, Upper Baffles, Vertical Tie-Rods, Inner Tie-Rods, Lower Tie-Rods, Upper Cylinder Hangers, and all mounting hardware with 316L stainless steel.
- Rake Assembly
 - Replace Inner Rake Arms, Outer Rake Arms, Trench Scrapers, Cage, Cage Bracing, Blade Support Frames, and all mounting hardware with 316L stainless steel.



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- Replace Trench Scraper Bracing and mounting hardware with 316 stainless steel.
- Replace Squeegees and mounting hardware with 304 stainless steel.
- Turbine Assembly
 - Replace Turbine, Turbine Bracing, Turbine Drive Drum, Turbine Mounts, and all mounting hardware with 316L stainless steel.
- Launderers
 - Replace Annular Launder (including Launder Drain Assemblies), Radial Launderers, Effluent Launder, Annular Launder Braces, Radial Launder Inner and Outer Supports, and all mounting hardware with 316L stainless steel.
- Rake Drive
 - Replaced entire C60P Rake Drive Assembly including Main Gear Drive Assembly, Secondary Drive Assembly, Worm Gear Drive Assembly, Motor Drive Package, Torque Drive Control Unit, and all associated hardware.
- Walkways
 - Replace all grating and all mounting hardware with 304L stainless steel.
 - Replace Lower Support Beam and all mounting hardware for main walkway stair stringers with 316L stainless steel.
 - Inspect and repair or replace (with matching) any existing damaged handrail.
 - Widen primary walkway (including stairs if possible) to the south edge of the super structure platform and install 304L stainless steel grating on it with appropriate toe board and matching handrail.
 - Widen primary walkway (including stairs if possible) to the east edge of the super structure platform and install 304L stainless steel grating on it with appropriate toe board and matching handrail.
 - Add matching handrail to north auxiliary walkway and pour concrete stairs to top of tank wall to meet stairs coming off of walkway.
- Super Structure
 - Abrasive blast all upper non-submerged metal (including Super Structure Beams, Beam Bracing, Walkway Stringers, Stair Stringers) to remove existing coating, corrosion, scale, and debris. All non-submerged metal to receive appropriate coating system with the exception of stainless steel parts, Rake Drive Mechanism, and Turbine Drive Mechanism.
- Concrete Structure
 - Abrasive blast interior walls and repair any damage found.
 - Re-coat the interior of the concrete structure.
- Desludge System
 - Install 10" non-rising stem gate valve with handwheel and position indication on reactor side of desludge line for system isolation.



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- Abrasive blast piping and apply appropriate coating system approved by Utilities Engineering Division.
- Abrasive blast concrete floor and lower walls of Desludge Room to remove scale and debris. Re-seal concrete floor and lower walls.
- Remove any abandoned wall penetrations and grout fill.
- Replace grating support angle brackets and mounting hardware with 316L stainless steel.
- Replace grating and mounting hardware with 304L stainless steel.
- Lime Feed System
 - Change lime feed point from being surface fed to being fed inside the Recirculation Drum, in the center, close to the Influent Ports.

4.3 Clarifiers 4 and 5 Operational Challenges

Suspected operation issues with Clarifiers 4 and 5 (Westech) are as follows:

- Clarifiers 4 and 5 treat water significantly worse than Clarifiers 1, 2, and 3 (Eimco) with the same coagulant dose.
- Effluent turbidity on the Westech reactors averages over 200% higher than the Eimco reactors; Westech reactors also do not produce a “sludge blanket,” and cone slurry settleability is consistently below the 5% needed to keep the blanket. This may have something to do with the turbine impeller that is responsible for mixing and recirculating water in the reaction flocculation zone.
- The Eimco units have a much different design, Eimco impellers have smaller and a greater number of impeller vanes, while Westech has larger and fewer vanes. The larger and fewer vanes on Westech units may be causing incomplete mixing and large areas of clear water in the cones, if you attempt to alleviate this by speeding up the turbine it creates too much lift and disturbs what little sludge blanket has developed while at the same time causing shearing of Floc particles. The Eimco impellers achieve excellent mixing in the reaction zone while also maintaining proper lift in the slurry return zone.

5.0 Current Projects:

The following projects are currently either in design, construction, or planned for Hefner WTP.

5.1 WT-0201 – Hefner WTP Lime System Improvements

- Status: Construction.
- Estimated completion: Summer 2024.

5.2 WT-0151 – Hefner WTP Ozone System Improvements

- Status: Construction.
- Estimated completion: Summer 2025.



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5.3 WT-0221 – Hefner WTP Various Improvements – Phase 1

- Status: Final design.
- Estimated completion: 2026

5.4 WT-0229 – Hefner WTP Emergency Power & Electrical Substation Improvements – Phase 1

- Status: Engineering contract negotiations.
- Estimated completion: TBD

5.5 WT-0271 – Hefner WTP Foundation Dewatering Improvements (Design)

- Status: Detailed Design.
- Estimated completion: 2026

6.0 Draft Project Scope:

The initial contract will include Task 1A - Preliminary Report services. The following subtasks are proposed. This list is not exhaustive and it is expected the selected engineer will review and make additional recommendations.

6.1 Primary Subtasks

- Project Management and Progress Reporting.
- Kickoff Meeting.
- Data collection and analysis.
- Field Investigations.
- Condition Assessment of Clarifiers.
- Performance Evaluation and Optimization of Clarifiers 4 and 5.
- Preliminary Engineering Report with phasing plan.
- SRF formatted Engineering Report for Phase 1 Improvements constituting a 15% design deliverable.

7.0 Available Information:

Upon execution of a non-disclosure agreement, the following information will be made available for review in preparation of Letter of Interest submissions. The executed form must be submitted to Andrew Mishler (Andrew.mishler@okc.gov) and Patty Pool (patty.butenhoff@okc.gov) via e-mail.

- Relevant plant operational data.
- Available as-built drawings for the clarifiers.
- Available construction shop drawing submittals for the clarifiers.
- Available operation & maintenance manuals for the clarifiers.



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8.0 Optional Pre-Submittal Meeting & Site Visit

An optional meeting and site visit will be held on June 5, 2024, at 1:30 PM. The meeting will be held at Hefner Water Treatment Plant (3827 W Hefner Road, Oklahoma City, OK 73120). Participants must have personal protective equipment (steel-toed boots, safety vest, and hard hat) to participate in the site walk-through of the clarifiers, as portions of the plant are under construction. This will be the only opportunity to visit the site during the solicitation process. Participants must enter through the main administration building.

The meeting and site visit are OPTIONAL.

9.0 Proposal Schedule:

- Advertisement: 05/29/2024
- Optional Pre-Submittal Meeting and Site Visit: 06/05/2024
- Deadline for Submitting Questions: 06/10/2024
- Answers Published: 06/13/2024
- Letter of Interest Submission Deadline: 06/20/2024
- Notification of Short-Listed Firms: 07/23/2024
- Interviews: 08/06/2024