

SOLIDS HANDLING STUDY

~ REQUEST FOR QUALIFICATIONS ~

The Metropolitan Sewerage District of Buncombe County, North Carolina (MSD) is soliciting Statements of Qualifications for Professional Engineering Services associated with the Solids Handling Study. The project includes the assessment of critical solids handling processes at MSD's Water Reclamation Facility (WRF), and recommendations for improvements to said processes. Areas of focus will include sludge thickening and pumping system, sludge dewatering, and solids disposal.

General Background of Project

MSD owns and operates a 1,140-mile collection system, 40 pump stations, and a 40 mgd WRF located along the French Broad River in Asheville, North Carolina. The plant's liquid treatment consists of coarse (1/2") and fine (1/4") screening, grit removal via forced vortex, high-rate chemically-enhanced primary clarification, biological treatment via rotating biological contactors (RBCs), secondary clarification, cloth media disk filtration, and disinfection. Solids are collected from the primary and secondary clarifiers as well as disk filters and are pumped to gravity thickeners. Thickened sludge is then conveyed to the plant's incinerator building where it is dewatered with belt presses and pumped into MSD's fluidizing bed incinerator (FBI).

In 2018, the FBI failed to demonstrate the ability to process 40 dry tons per day (design capacity) during an annual stack test and was subsequently derated to 32 dry tons per day (2,651 dry pounds per hour) on the air quality Title V Operating Permit. The reduced capacity was not immediately detrimental to plant operations but has recently become a limiting factor in the solids handling process following the startup of the high-rate primary treatment (HRPT) facility in late 2021. Operation of the HRPT facility remains sporadic due to unanticipated difficulties and inefficient treatment. However, when the process is running, sludge production outpaces the permitted burn rate of the FBI and the HRPT system must be shut down to effectively manage sludge inventory. The District is optimistic that the FBI's original design capacity can be reestablished following successful stack testing later this year.

The FBI was originally placed into service in 1992 and has undergone one major rebuild in 2004. Various solids handling components were replaced during that project including the belt press sludge dewatering system. The belt presses continue to perform well despite their age due to

routine scheduled maintenance, but capacity and service life are of concern and shall be evaluated as part of the study. Likewise, the FBI and all ancillary equipment shall be evaluated for future capacity, regulatory and permitting requirements, and compatibility with existing and future treatment systems.

Existing Solids Handling Facilities

The WRF processes approximately 22mgd of domestic wastewater daily with an average influent TSS of 230mg/L. Grit and coarse solids (1/4" and greater) are disposed of at the Buncombe County landfill. Suspended solids continue through the treatment train and are collected at three locations in the WRF including the primary and secondary clarifiers, and cloth media disk filters. Due to the low solids concentration in the disk filter backwash, backwash flow is conveyed to the head of the HRPT facility where it combines with effluent from the plant headworks facility. All sludge generated at the HRPT is conveyed to a blending tank located at the north end of the process where settled sludge from the secondary clarifier is also received. Sludge is blended via a submersible mixer to create a homogenous mixture and ensure a consistent burn inside the FBI.

Sludge from the HRPT blending tank is pumped to one of two gravity thickeners. The thickeners were installed in 1984 and each have a diameter of 100 ft. and storage capacity of approximately 900,000 gallons. Influent flow averages 2,800gpm and influent solids concentrations are <1.0%. Sludge is thickened to a consistency of 2-6% solids. Normal operating procedure is to maintain one thickener in the duty position and the second in standby, providing flexibility for scheduled maintenance and fluctuations in plant flow and sludge quality. The plant experiences seasonal variations in sludge quality which reduces settleability and has in the past required the use of polymer addition. To date, a second thickener has not been required to help mitigate the changes in sludge quality (by reducing total hydraulic overflow rate); however, future flow projections suggest that both thickeners may be required for effective thickening. The Solids Handling Study shall evaluate this need and the potential for capacity expansion.

Thickened solids are conveyed to the incinerator building through a single 8-inch pipe via three progressing cavity sludge pumps, each rated at 150 gpm. Operation at average daily flow and average solids loading requires the use of one pump. Capacity of the pumping station and piping shall be evaluated for future needs. Solids are delivered to two (2) 2.5m BDP belt filter presses which dewater the sludge to 19-20% solids on average, and occasionally over 22% solids. Normal operating procedure is to run one press at a time; however, the ability to continue in that

manner is unlikely once the HRPT is consistently online since solids production has increased due to improved solids capture and production of chemical sludge. The Solids Handling Study shall evaluate the remaining service life of the existing belt presses, recommend timing of capacity upgrades, and recommended approach for providing redundancy in the system (e.g. three smaller units vs. two large units). Recommendations for the upgraded dewatering system shall consider changes being proposed to the FBI system. For example, if a second FBI is constructed for expanded capacity and/or redundancy, is it practical to maintain two separate dewatering systems, or one central system?

Upstream of the belt presses, polymer is added to the sludge to improve dewaterability. MSD recently replaced its old system with a new UGSI dry polymer feed system. The new system is capable of feeding 9.2 lb/hr and was designed to provide sufficient chemical dose at full FBI design capacity, 40 dry tons/day. It is understood that the polymer system is appropriately sized for near-term and mid-term solids loading; however, the system shall be evaluated for compatibility with the future FBI system(s).

Dewatered sludge exits the belt press (units are located on the second floor of the incinerator building) and drops through an inlet chute to the sludge cake pumps below. Each of the two cake pumps has a dedicated belt press (e.g. Belt Press No. 1 can only feed solids to Cake Pump No. 1). The cake pumps and their associated hydraulic units, as well as all sludge piping was replaced in 2020 as part of the HRPT project. Max cake pump output is 42gpm making the units appropriately sized for near-term and mid-term growth. Each pump can convey dewatered sludge to either of two FBI feed ports, or to a truck loading station if the incinerator is offline. The Study shall evaluate the most efficient use of the new dewatered cake pumps and piping.

MSD's FBI was originally placed into service in 1992 and was designed to process 40 dry tons of sludge per day. The facility includes two (2) fluidizing air blowers (one duty, one standby), one (1) fluidizing bed incinerator, one (1) primary heat exchanger for waste heat recovery, one (1) quencher vessel, one (1) multi-venturi scrubber with integrated mercury removal scrubber system, one (1) booster pump skid for water supply to the venturi throats, and two (2) purge air blowers for temperature control at gas lances, internal instrumentation, and duct expansion joints. Ash from the multi-venturi scrubber is conveyed to an ash thickener via two (2) ash slurry pumps. The thickened ash slurry is then pumped to a 9-acre storage lagoon for ultimate

disposal via two (2) ash transfer pumps and a 4-inch CPVC and stainless steel force main. Supernatant from the lagoon is sent back to the head of the WRF. The FBI is regulated under Asheville-Buncombe Air Quality Agency (ABAQA), Title V Permit #11-772-18 and the ash storage lagoon is permitted through NCDEQ.

Since 1992, the FBI has undergone numerous upgrades and repairs due to the extreme environment under which it operates (i.e. temperatures up to 1,800 °F, internal corrosion and erosion). Below is a list of projects that have occurred since the original installation.

- 2004 – Sludge Handling Improvements (refractory replacement, venturi rehab, new heat exchanger, fluidizing air blower modifications, new belt presses)
- 2015 – Incinerator Emissions Upgrade (new heat exchanger, refractory-lined ductwork, quench, new venturi scrubber, mercury scrubber)
- 2020 – Purge Air Blower Replacement
- 2020 – Incinerator Birdhouse (“Cupola”) and Expansion Joint Replacement
- 2020 – Ash Pump Line Replacement (approx. 700LF)
- 2020 – Cake Pump and Piping Replacement (part of HRPT project)
- 2020 – Pumpable refractory grout installation between FBI shell and refractory lining
- 2022 – Incinerator Polymer System Replacement
- Future (2024) – Incinerator refractory and heat exchanger replacement

As mentioned previously, the FBI was derated to 32 dry tons per day in 2018 and remains permitted as such. The derating was due to a combination of inadequate sludge piping (one of two sludge feed ports into the FBI was inoperable at the time) and sludge quality of approximately $\leq 2\%$ solids exiting the gravity thickeners. Having completed upgrades to the sludge pumps and piping in 2020, and producing a thickened sludge of 4-6% solids with the HRPT process, MSD hopes to regain the unit’s design capacity prior to the 2022 Title V operating permit renewal. In June 2022, MSD performed a stack test and successfully demonstrated its ability to physically process 40 dry tons per day; however, elevated SO₂ levels at the increased burn rate kept the unit from being rerated. MSD believes the elevated SO₂ is the result of thermal decomposition of aluminum sulfate, the primary coagulant being used in the

HRPT process. MSD will trial a polyaluminum chloride (PACl) coagulant to reduce SO₂ emissions and retest by the end of 2022.

In FY21/22, the FBI processed approximately 22.1 dry tons per day of residuals at a rate of approximately 1,840 lb/hr on average. When the HRPT is online, sludge generation outpaces processing ability, requiring the FBI unit to remain in operation 24hr per day and burn at the maximum permitted rate. This is not only stressful on the aging facility, but furthermore allows no downtime for repairs and maintenance. It is unclear whether this trend will continue once the FBI is rerated and the HRPT is running consistently; however, requiring a single-unit process of this criticality to run constantly is a primary concern of MSD. The Solids Handling Study shall evaluate the remaining useful life of the FBI, the feasibility of providing additional capacity and/or redundancy, and alternative disposal options if deemed necessary. Below are additional topics and concerns that should be addressed in the study related to the FBI system.

- ***Age and condition of the existing FBI.*** The FBI is approximately 30 yrs old and MSD personnel has observed hot spots, thinning, and holes in the steel shell. Repairs have been made via welded patches and pumpable refractory grout. The vessel's interior refractory lining was replaced in 2004 and is budgeted to occur again in 2024.
- ***Capacity of existing FBI and sludge production from HRPT.*** Rerating the FBI to 40 dry tons per day and gaining additional run time of the HRPT process will clarify criticality of capacity upgrades and help define daily operating demand on FBI system. Ultimately, additional capacity will be necessary, and the Study shall recommend sizing of the new unit.
- ***Lack of redundancy and no sustainable alternative disposal option.*** The FBI is a single-unit process with no redundancy. When the system is taken offline for maintenance and repairs, MSD's only disposal option is the Buncombe County landfill. MSD has a no-cost arrangement to take the landfill's leachate in return for periodic wastewater solids disposal. MSD has no other readily available disposal option and no alternative for long-term management of solids.

- ***Permitting a new sewage sludge incineration unit.*** The process of permitting a new, or second incineration unit will be complicated, time consuming, and potentially controversial. The Study shall evaluate the steps for permitting a new unit, anticipated timeline, and likelihood of approval.
- ***Process redundancy vs. difficulties of running two incinerator systems.*** Redundancy is ideal for critical infrastructure; however, difficulties will emerge with the operation of redundant incinerator units. The Solids Handling Study shall evaluate the challenges of operating two incineration units and advise whether redundancy is a feasible option for MSD. If a second unit is recommended for capacity upgrades and/or redundancy, the Study shall evaluate how the two systems will operate (e.g. in parallel or in duty/standby), the complexities of doing so, and regulatory implications. The existing incinerator is subject to limitations contained in 40 CFR Part 60 Subpart Mmmm while a new sewage sludge incinerator will be regulated under the more stringent Subpart LLLL. If it is recommended that two incinerator systems be operated, the plan shall also include recommendations for ancillary equipment critical to the incinerator system (e.g. dewatering equipment, polymer system, dewatered cake pumps, electrical systems and controls, etc.). Recommendations may include consolidating certain equipment into one, central location for use at both incinerators, or maintaining entirely separate processes with individual and dedicated components.
- ***Limited footprint to construct new facility.*** The existing FBI facility is constrained by MSD's Filter Building to the northwest, a hillside of rock to the north and south, and ash lagoon emergency spillway to the east. Without extensive grading efforts involving rock removal (and blasting likely), or partially blocking access around the WRF, siting the new facility will be difficult.

Consideration of Future Impacts on Solids Handling

The District's NPDES permit includes a compliance schedule for the reduction of ammonia (a constituent not currently regulated at MSD) which is to be implemented by 2030. This regulatory requirement, coupled with the age and condition of the existing RBCs is driving the

replacement of MSD's biological treatment system. A biological treatment alternatives evaluation is scheduled to begin in early 2023. While it is unclear what treatment process will be selected, the Solids Handling Study shall consider the impacts on solids volume and quality as MSD moves away from RBC technology.

General Scope of Work

The firm selected shall generate a preliminary engineering report with phased recommendations of plant upgrades necessary for the management of solids over a 30-yr planning horizon. The study shall include planning level cost estimates for each phase of the work which will be incorporated into MSD's Capital Improvement Program. Preliminary estimates shall be provided by February 2024 for inclusion into the FY24/25 10-yr CIP budget document. The study shall be complete in its entirety by July 2024.

The selected firm shall take the following items into consideration when evaluating and recommending new solids handling processes, upgrades and expansions:

- Maintenance of Plant Operations is critical and must be a consideration in all recommended process improvements. Incinerator shutdowns (and hauling to Buncombe County landfill) must be no longer than 8 weeks at a time.
- Costs and benefits of any given layout must be carefully weighed. The firm will work closely with MSD staff in evaluating options and layout of any new unit processes within the facility.

Additional Resources Being Provided:

- 1984 Gravity Thickener Record Drawings – Proj. No. 1984001 (Hendon & Assoc.)
- 1988 Original FBI Record Drawings – Proj. No. 1987001 (Hendon Engineering Assoc.)
- 2004 Sludge Handling Improvements Record Drawings (Hazen & Sawyer)
- 2004 Hankin Record Drawings
- 2015 Facility Plan Update (HDR)
- 2015 Incinerator Emissions Upgrade (CDM Smith)
- 2018 ABRAQA (formerly WNCRAQA) Air Quality Title V Operation Permit
- 2018 HRPT Conformed Construction Drawings – select drawings only (CDM Smith)

- 2020 Incinerator and Equipment Assessment (IFCO)
- 2020 HRPT Waste Sludge Pump O&M (Egger Turo)
- 2020 Dewatered Cake Pump and Auger O&M (Schwing)
- 2022 Incinerator Polymer System O&M (UGSI)

Submittal Requirements

NOTE: Qualifications shall not exceed ten (10) pages in length. Brevity, clarity, and conciseness are strongly encouraged.

1. Transmittal cover letter. The cover letter will designate the firm's contact person with phone number, mailing address, fax number and email address.
2. Project Manager. Identify the project manager and describe their experience related to this project. Provide references of other clients (including contact name, phone number and address) for other projects similar in scope. Discuss the experience of the project manager with the other members of the project team.
3. Project team and sub-consultants. Identify other project team members and sub-consultants and their relative experience. Discuss the role of key team members. Specify the location of the offices and the percentage and type of work that will be performed at each location.
4. Firm Qualifications. Discuss the firm's work on projects similar studies and complexity. Firm must have extensive knowledge and expertise in wastewater treatment, solids handling processes, and sewage sludge incineration. Firm must have completed **no less than 10** similar solids handling studies. The firm must also have experience in permitting sewage sludge incinerator systems within the past 10 years. Indicate firm's history of meeting established schedules and budgets.

Evaluation of Statement of Qualifications

The selection committee will develop a short list of firms for the project. Short listed firms may be asked to participate in a presentation/interview process.

The selection committee will choose a firm for the proposed project based in part on the following criteria:

1. Experience on projects of similar type and magnitude, and the firm's ability to adequately address and evaluate the items described above, within the specified timeframe.
2. Qualifications and experience of the proposed team and location of team members.
3. Completeness of the submittal.
4. Any other experience or criteria deemed applicable to the project.

To Respond

If your firm is interested in this project and qualified based on the requirements above, please submit an electronic copy of the Statement of Qualification to Hunter Carson, P.E. before 2:00 P.M on Thursday, December 1, 2022 to:

MSD of Buncombe County, N.C.
Mull Building
2028 Riverside Drive
Asheville, N.C. 28804

For questions regarding the process or to review information, please contact Hunter Carson directly at (828) 225-8241, or e-mail hcarson@msdbc.org.

The anticipated selection process timeline will be as follows:

- SOQ Submittal Deadline – December 1, 2022
- SOQ Review and Shortlisting – December 2-16, 2022
- Consultant Interviews – January 3-13, 2023
- MSD Board Approval – February 15, 2023

The Metropolitan Sewerage District reserves the right to reject any and all Statements of Qualifications.