STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

REQUEST OF THE CITY OF EVANSVILLE, INDIANA TO ADDRESS THE ISSUES ASSOCIATED WITH ITS DEBT TRUE-UP REPORT AND THE POTENTIAL IMPACT OF CURRENT MARKET CONDITIONS ON OVERALL CAPITAL PROJECT COSTS AS WELL AS FOR ADDITIONAL FINANCING AUTHORITY.	)))))))	**CAUSE NO. 45545 S1**

PUBLIC'S EXHIBIT NO. 6

TESTIMONY OF JAMES T. PARKS

ON BEHALF OF

THE INDIANA OFFICE OF UTILITY CONSUMER COUNSELOR

May 2, 2024

Respectfully submitted,

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CERTIFICATE OF SERVICE

This is to certify that a copy of ***Public's Exhibit No. 6 - OUCC's Testimony of James Parks on behalf of the OUCC*** has been served upon the following counsel of record in the captioned proceeding by electronic service on May 2, 2024.

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TESTIMONY OF OUCC WITNESS JAMES T. PARKS
CAUSE NO. 45545 S1
CITY OF EVANSVILLE

I. INTRODUCTION

Q: Please state your name and business address.

A: My name is James T. Parks, P.E., and my business address is 115 W. Washington Street, Suite 1500 South, Indianapolis, IN 46204.

Q: By whom are you employed and in what capacity?

A: I am employed by the Office of Utility Consumer Counselor ("OUCC") as a Senior Utility Analyst in the Water/Wastewater Division. My qualifications and experience are described in Appendix A.

Q: What is the purpose of your testimony?

A: Initially in this subdocket, the City of Evansville ("Evansville" or "Petitioner") requested increased financing authority to permit it to construct a new water treatment plant on a new site. As shown in its latest testimony, Evansville has abandoned its plans to construct a new water treatment plant ("WTP") on a new site in favor of constructing a Hybrid Solution WTP that rehabilitates and reuses some treatment processes and structures of the existing WTP along with new facilities. To fund the Hybrid Solution, Evansville would divert financing authorized in Cause No. 45545 that were to fund Road Relocations ($44,391,000) and a Residuals Management facility ($30,000,000). My testimony evaluates aspects of the Hybrid Solution. I note that the Hybrid Solution does not provide the stated 50 MGD firm capacity for the rehabilitated and upgraded South Plant Sedimentation Basins and recommend Petitioner revisit adding the third set of South Plant clarifiers that were originally approved and funded in 2007. To maximize the reuse of the existing plant, recognizing the best and highest use of all real estate, I recommend Petitioner's filtration system be made up of 16 filters consisting of eight existing filters (recently rehabilitated Filters 21-28) and eight new filters.

Q: Please describe the review and analysis you conducted for your testimony.

A: I reviewed testimony, discovery responses, and Master Plans about Evansville's existing Water Treatment Plant ("WTP") and proposed new WTP five times in four proceedings since 2016. I reviewed Evansville's request for $10.65 million in financing, approved in Cause No. 44760, to prepare a Preliminary Engineering Report, engineering design, and land acquisition for water treatment plant options including switching from its current Ohio River surface water supply to new groundwater wells and a new groundwater treatment plant.[1]

I reviewed testimony Petitioner presented in 2018 in Cause No. 45073 about groundwater quantities and quality from test wells and the status of plans for a new water treatment plant. I reviewed Petitioner's testimony in Cause No. 45545 requesting financing authority for a new 50 MGD surface water treatment plant on a new site, including the March 2021 Advanced Facility Plan prepared by AECOM Engineers and the June 2021 Preliminary Engineering Report. The OUCC did not oppose Petitioner's proposal to build a new WTP, which was to be constructed from 2022 to 2025, but only opposed the proposed 50 MGD capacity and Petitioner's

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[1] Final Order, Cause No. 44760, October 5, 2016, p. 7. Petitioner agreed that it should analyze the costs and benefits of various options associated with replacing its existing treatment plant and present the analysis as part of its next rate case.

estimated $126,439,000 construction cost for the higher capacity WTP.

I reviewed the Cause 45545 S1 subdocket testimony filed from Evansville's witness, Douglas L. Baldessari, CPA, Baker Tilly Municipal Advisors, LLC ("BTMA") on September 23, 2022, seeking an additional $68.7 million for the new WTP. In December 2022, I reviewed rebuttal testimonies of Mr. Baldessari, Lane T. Young, Executive Director and Shawn R. Wright, Director of Planning for the Evansville Water and Sewer Utility ("EWSU").

On January 10, 2023, Petitioner filed a Motion to Stay Proceedings and Vacate the January 13, 2023, Evidentiary Hearing requesting a stay of the subdocket proceedings.[2] I reviewed Petitioner's Status Reports filed on February 1, 2023, March 1, 2023, and April 3, 2023. I reviewed the Commission's Docket Entry Staying the Subdocket on April 13, 2023, following the Attorneys' Conference held April 10, 2023. I participated in a teleconference meeting with Evansville regarding the status of the subdocket on October 25, 2023, and I attended an Attorneys' Conference with the IURC, Petitioner's legal counsel and the OUCC on November 21, 2023. I reviewed informal submittals requested at the Attorneys' Conference including: 1) AECOM's final cost estimate (90% design) submitted to Petitioner on May 16, 2023; 2) Kokosing's $353 million GMAX Price Revision dated July 12, 2023, with 24 pages of pricing information; 3) An explanation for repurposing $40

[2] Petitioner's Motion to Stay Proceedings and Vacate the January 13, 2023, Evidentiary Hearing requesting a stay of the subdocket proceedings until Petitioner either (1) filed the Guaranteed Energy Savings Contract, or (2) provided notification it would be seeking competitive bidding to construct its water treatment plant. Petitioner stated it would be beneficial to both the parties and the Commission to have additional information about the water treatment plant's estimated cost to address Petitioner's additional financing request.

million authorized for road relocation projects to the WTP project: and 4) Water Main Reports that were required under Cause No. 45545 to be submitted as part of Petitioner's IURC Annual Reports.

I reviewed a second round of subdocket testimony filed on January 25, 2024, by Mr. Baldessari, Mr. Wright, and Andrea W. Bretl, P.E. of Clark Dietz, Inc. I wrote discovery requests and reviewed Evansville's responses. I participated in a Tech-to-Tech teleconference on March 27, 2024, between the OUCC, Petitioner and its engineering team to discuss the proposed Hybrid Solution project. I completed my third site visit to Evansville's existing water treatment plant on April 30, 2024. Finally, I compiled and attached various documents, which I refer to in my testimony. These attachments are listed in Appendix B.

Q: In what order are you addressing your issues?

A: My testimony is arranged in the following order:

I. Introduction
II. Petitioner's Increased Financing Authority Request
III. Replacement of the Proposed New WTP with a Hybrid Solution
IV. Cost Estimates and GMAX Price
V. Water Treatment Plant Project Changes
VI. Reuse of Existing Water Treatment Plant Facilities
VII. Evansville's Maximum Day Design Flow
VIII. Life Cycle Cost-Benefit Analysis and IFA 20-Year Net Present Worth
IX. Build America Buy America ("BABA") Requirements
X. Per- and Poly-Fluoroalkyl Substances ("PFAS") Removal Facilities
XI. Master Plan
XII. Reuse Potential of Existing Treatment Plant Site
XIII. Property Acquisition and Relocation Costs
XIV. Other Matters
XV. Recommendations

Q: If you do not address a specific topic in your testimony, does that mean you agree with or endorse Petitioner's request or position?

A: No. It is neither practical nor reasonable for me or the OUCC's other witnesses to address every issue, item, or adjustment presented in Petitioner's testimony, exhibits, work papers, or discovery responses. Petitioner's case-in-chief addresses a broad and significant number of issues, while my testimony only addresses a subset of the issues. Its scope is strictly limited to the specific items I address. My silence in response to any actions, decisions, or positions stated or implied by Petitioner in its request should not be construed as an endorsement.

II. PETITIONER'S INCREASED FINANCING AUTHORITY REQUEST

Q: What Financing Authority did the Commission grant in Cause No. 45545 for the new Water Treatment Plant in 2022?

A: The Commission authorized total financing of $225,062,000. This amount included a construction cost estimate (with 30% contingency) for the new water treatment plant of $126,439,000.[3] It also included $6,199,000 for WTP Construction Engineering Services and Resident Project Representation ("CES/RPR") and separate amounts for Residuals – TSS/Mercury ($30 million), relocation of the City Garage ($3.5 million) and costs for non-WTP improvements and non-construction costs divided shown in Table 1.

[3] Cause No. 45545, Rebuttal Testimony of Simon M. Breese, September 24, 2021, pp. 16-17.

Table 1 - Cause No. 45545, Financing Authority March 2, 2022

Cost Component	Amount
Estimated Construction, Engineering, and Contingency Costs:	
Water Treatment Plant – SRF[4]	$ 132,638,000
Water Treatment Plant (TSS/Mercury) – SRF	30,000,000
Water Treatment Plant - Relocation of City Garage – Open Market	3,500,000
Road Relocations – OM	39,806,000
CES/RPR – Road Relocation Projects/Program Mgmt. Planning – OM	4,585,000
Total Estimated Construction, Engineering and Contingency Costs	210,529,000
Estimated Non-Construction Costs:	30,000,000
Underwriter's Discount (1%) [OM Bond * .01] – OM	534,470
Preliminary Engineering Report – SRF	-
Capitalized Interest – OM	4,318,199
Capitalized Interest – SRF	7,508,156
Legal, Financial, Contingencies, rounding	1,609,338
IURC Bond Fee (Total Funding * .0025)	562,655
Total Estimated Non-Construction Costs	14,532,818
Total Estimated Project Costs	$ 225,062,000

Q: How have the proposed WTP and Petitioner's estimated construction costs changed since Cause No. 45545 was filed on May 10, 2021?

A: Petitioner has dropped plans to build an entirely new WTP in favor of a Hybrid Solution that relies on rehabilitating and upgrading parts of the existing WTP and building fourteen new conventional filters, a new 5 MG clearwell (parallel 2.5 trains), and a new high service pump station. I limit my discussion about costs to water treatment plant construction cost estimates. These estimates have been prepared by Petitioner's engineers or Kokosing Industrial, Inc., selected by

[4] The $132,638,000 Water Treatment Plant – SRF cost is further divided to $126,439,000 for construction costs per Mr. Baldessari's Cause No. 45545 S1 subdocket testimony, p. 9 and $6,199,000 for Construction Engineering Services and Resident Project Representation ("CES/RPR") per Petitioner's responses to 45545 S1 DR 2-16, DR 2-19, and DR 8-2.

Evansville on June 29, 2022, as the Guaranteed Energy Savings Contract ("GESC") contractor, and do not address other capital projects or non-construction costs.[5]

Original $126,439,000 Financing: On March 2, 2022, in Cause No. 45545, the Commission approved Petitioner's full requested amount for the new 50 million gallons per day ("MGD") WTP at the new location (City Garage site) at an estimated construction cost of $126,439,000. This estimate included a 30% contingency including contingencies embedded in line items and an overall contingency.

Subdocket requested increase to $163,946,000: On September 23, 2022, in its subdocket testimony, Petitioner increased requested WTP funding to $163,946,000 for cost escalations and seven design changes for the new WTP on a larger site (City Garage and Levee Authority properties).[6] The 2021 original and 2022 subdocket construction cost estimates reflected a 30% design completion stage or less by the design engineer, AECOM.

Proceedings Stayed: On January 10, 2023, Petitioner filed a Motion to Stay the subdocket proceedings. In its Motion, Evansville opined that it recognized the best indicator of additional financing needed to build the WTP Project was the GESC that Evansville would enter into with Kokosing setting forth the Guaranteed Maximum Price ("GMAX price" or "GMP"). Petitioner stated additional cost information would benefit all parties for purposes of Petitioner's additional

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[5] *See* Attachment JTP-15 for the GESC Contractor selection letter and Attachment JTP-18 for the GMAX Price proposals by Kokosing Industrial, Inc.

[6] Cause No. 45545-S1, Attachment DLB-2 to the Case-in-Chief Testimony of Douglas L. Baldessari, September 23, 2022. Petitioner proposed increasing the construction cost by $19,838,000 for cost escalations to December 2023 and by $17,669,000 for seven project design changes which raised the total estimated construction cost to $163,946,000 from $126,439,000.

financing request.[7]

AECOM's $310,729,862 Construction Cost Estimate (75% Design): On May 4, 2023, Petitioner received AECOM's $310,729,862 construction cost estimate based on the 75% design drawings. It appears Petitioner began receiving indications that construction costs would exceed the financing authority first in the Spring of 2022 after the Cause No. 45545 Final Order was issued (which was later included in the subdocket) and later in the March to May 2023 timeframe when AECOM estimated construction costs on March 10, 2023, updated them on March 31, 2023 (reportedly at $350 million), updated them again on April 10, 2023, updated them again on May 4, 2023, at $310,729,862 (AACE Class 4 estimate based on 75% design), and again on May 16, 2023 at $299,938,948 (AACE Class 3 estimate based on 90% design).[8] I do not know whether Petitioner received AECOM's March 10, 2023 and April 10, 2023 cost estimates. In its April 3, 2023, Status Report and Request for Attorneys' Conference, Petitioner reported it was informed of higher construction costs.

> Petitioner received information from AECOM on March 31, 2023 indicating the final cost estimate for the Water Treatment Plant project is coming in significantly higher than what AECOM had previously communicated to Petitioner and significantly higher than the amount Petitioner was anticipating. Given this new information, Petitioner does not believe a May 15th filing date or an early August 2023 close on the proposed bonds can be accomplished in this proceeding.[9]

[7] Evansville Motion to Stay Proceedings and Vacate Hearing, January 10, 2023.

[8] *See* Attachment JTP-16 for AECOM's Engineer's Opinions of Probable Construction Cost ("EOPCC") based on the 75% Design ($310,729,862, May 4, 2023) and 90% Design ($299,938,948, May 16, 2023).

[9] Petitioner's Submission of Status Report and Request for an Attorneys Conference, April 3, 2023.

Mr. Wright testified that in its March 31, 2023, phone call to Evansville, AECOM indicated construction costs would be closer to $350 million.[10] I do not know if Petitioner received a final construction cost estimate based on the 100% design by AECOM that appears to have been completed in September 2023.[11]

Kokosing's $353 million GMAX Price: On June 28, 2023, Petitioner received Kokosing's $353 million GMAX Price (assumed but not confirmed to be based on AECOM's 90% design).[12] The GMAX Price was nearly triple the original $126,439,000 financing authority for the new WTP. Petitioner's Value Engineering team later raised the estimated construction cost to $401 million in July 2023 to account for flood elevation adjustments to address IDEM permitting concerns, engineering, electric utility, and permitting and then to $448 million for additional inflation, additional concrete per the 100% design, and demolition of abandoned water plant structures.[13] However, Petitioner delayed disclosing AECOM's high construction cost estimates (May 2023) and Kokosing's $353 million GMAX Price (June 28, 2023) to the OUCC and IURC. Monthly status reports to the OUCC and the IURC had been discontinued after April 2023 when the Commission granted

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[10] Petitioner's Exhibit No. 2, January 25, 2024, p. 3.

[11] Progress Meeting notes indicate AECOM's 100% Design Drawings were due to Petitioner on September 22, 2023. *See* Attachment JTP-17, p. 13 of 38.

[12] *See* Attachment JTP-18 for Kokosing Industrial, Inc.'s Guaranteed Saving Contract (GSC) – GMP Proposal, June 28, 2023, and GMP Proposal, Rev. 1, July 12, 2023, with cost information.

[13] *See* Table 2 - July 2023 Engineering Summary and Table 3 – Final Cost Analysis in Attachment AWB-3, VE Process Summary Technical Memorandum, Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting, Nov. 14, 2023, in the Case-in-Chief Testimony of Andrea W. Bretl, pp. 3 - 4 of 139. The Final Adjusted $448 million estimated construction cost is three and a half times the original $126,439,000 estimated construction cost.

Petitioner's request for an indefinite stay of the proceedings.[14]

Q: Did AECOM and Kokosing work together on the design?

A: Kokosing was selected on June 29, 2022, as the GESC provider.[15] My understanding is that Kokosing was to work at risk with AECOM to advance the design from 30% to the 100% design stage and after the 60% design was reached, Kokosing would submit its GMAX Price.[16] AECOM's design schedule indicated the 60% design would be completed by September 30, 2022. However, AECOM's 60% design was delayed. The schedule included with the mandatory Guaranteed Energy Savings Contract RFQ Pre-Response Meeting Agenda indicated Evansville would receive the Guaranteed Maximum price Proposal on October 3, 2022, and initiate the Guaranteed Savings Report and Contract on October 18, 2022.[17]

Q: Were AECOM's delays in meeting the design completion milestones (i.e., 60%, 90%, and 100%), along with timely updates of the construction cost estimates, a problem for securing the GMAX price for the project?

A: Yes. OUCC witness Scott Bell discussed the adverse impacts of the design delays in his subdocket testimony.[18] Petitioner witness Lane T. Young countered that the

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[14] Docket Entry - Approval of Evansville's Indefinite Stay Request April 13, 2023.

[15] Petitioner's response to DR 1-5, The Request for Qualifications (for GESC Providers) for New Water Treatment Plant, EWSU Project No. U1032, was advertised on April 25, 2022, and May 2, 2022, with GESC Providers' Statements of Qualifications submitted on June 1, 2022. Petitioner selected Kokosing Industrial, Inc. as the GESC provider on June 29, 2022, per Petitioner's response to DR 13-22.

[16] Cause No. 45545, Petitioner's Exhibit No. 3R, Rebuttal Testimony of Michael Labitzke, September 24, 2021, p. 8. "In a GSC approach, a contractor is selected and works with the designer to develop plans from 30% to complete final plans. At 60% completion a GMP is given based on the contractor's exposure to the plan development and their involvement and influence into the design that effects construction means and methods."

[17] Petitioner's response to DR 1-5, The Request for Qualifications (for GESC Providers) for New Water Treatment Plant, EWSU Project No. U1032, p. 5 of 124.

[18] Public's Exhibit No. 1, November 18, 2022, pp. 4, 19-21.

60% design was delayed due to Evansville's decision to expand the water treatment plant site to include the Levee Authority property to allow for expansion of the treatment plant's footprint for future requirements for per-and polyfluoroalkyl ("PFAS") regulations.[19]

AECOM's 60% design was due by September 30, 2022, and the GMAX Price was to be provided by December 19, 2022, per AECOM's project schedule.[20] Petitioner altered the schedule to receive GMAX pricing after 90% design in the Spring of 2023. In his 2022 Rebuttal testimony, Mr. Young explained that the rationale to wait on getting the GMAX pricing was the fear Kokosing would price in higher contingencies due to design uncertainties, inflation, and supply chain concerns.[21]

> We are going to wait until we receive 90% design in Spring 2023 and base the GMP and the size of the financing off of the 90% design instead. We made the decision to wait until 90% design because based on the current uncertainty in the construction and economic market, if we were to ask Kokosing to give us a GMP based off of the 60% design at this time, we expect they would provide a very conservative estimate to account for this uncertainty and unknown issues that could come to light as design progresses. Thus we expect Kokosing would reasonably include a much larger contingency if asked for a guaranteed price today as compared to later in the process. We believe waiting to secure the price until 90% design is available will help avoid this concern and also allow more time for the inflationary and supply chain constraints to level out.

Petitioner did not provide the GMAX Price or the additional cost information to the

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[19] Petitioner's Exhibit No. 2-R, Rebuttal Testimony of Lane T. Young, December 5, 2022, p.15.

[20] Petitioner's response to DR 1-1, AECOM's Professional Services Agreement, Amendment Number 1, Water Filter Plant Final Design ("Project"), April 19, 2022.

[21] Rebuttal Testimony of Lane T. Young, December 5, 2022, pp. 16-17.

OUCC and IURC until November 14, 2023, and January 25, 2024, respectively.[22]

Project Review and Value Engineering: Due to AECOM's higher estimates and Kokosing's $353 million GMAX Price later budgeted by Petitioner at $448 million, Petitioner did not execute a Guaranteed Energy Savings Contract with Kokosing. Instead, it began a project review and value engineering ("VE") effort with a new engineering team of Clark Dietz, Inc., Black & Veatch, and Arcadis that began June 6, 2023, with a July 7, 2023, report deliverable. The VE effort was contracted for approximately seven weeks, ending on July 31, 2023. Clark Dietz's task was determining Value Engineering cost savings associated with significant modifications to AECOM's new WTP design, the "VE Option." Remarkably, after only one month of effort, the VE team was able to identify significant savings and stated it was likely at least $105 million in VE savings could be found in AECOM's design to bring the construction cost for the new WTP down to $248 million from Kokosing's $353 GMAX Price.[23] Nevertheless, given its opinion that there was a strong likelihood that rehabilitation would be as costly as a new plant, Clark Dietz recommended Petitioner proceed with construction of the value engineered new WTP.[24]

[22] The OUCC informally received the estimated construction cost for the Hybrid Solution on November 14, 2023. The same information was filed on January 25, 2024, in Ms. Bretl's testimony as Attachment AWB-3, VE Process Summary Technical Memorandum, Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting, Clark Dietz, Inc. November 14, 2023. This Technical Memorandum also disclosed that Kokosing submitted a GMAX Price of $353 million on June 28, 2023, based on 90% Design.

[23] *See* Attachment AWB-1, Water Plant Value Engineering Report, Clark Dietz, Inc. and Benton Associates, July 7, 2023, in the Case-in-Chief Testimony of Andrea W. Bretl, p. 21 of 25.

[24] *Id.*, p. 20 of 25.

The VE team also developed and evaluated opportunities to maximize the existing plant and minimize new construction by developing high-level schematics, probable opinions of construction cost, and associated assumptions for cost savings alternatives. For this effort both Black & Veatch and Arcadis were tasked with determining the cost savings associated with extensive rehabilitation of the existing plant with all new treatment equipment, the "Rehab Option."

Q: Do you agree with the value engineering ideas the VE Team developed in July 2023?

A: Yes. Many value engineering ideas listed in the July 7, 2023, Water Plant Value Engineering Report by Clark Dietz, Inc. with Benton Associates, would reduce costs to ratepayers. These cost saving ideas included: 1) Defer ozonation; 2) Change pile type from 30" diameter drilled shaft piles to auger cast piles; 3) Reduce treatment capacity to 40 MGD; 4) Raise the hydraulic profile to bring all treatment structures above the design flood stage, balance cut and fill, reduce significant excavation, minimize construction dewatering, minimize soils handling and disposal; 5) Rehabilitate and reuse the 6.5 MG clearwell and high service pump station. Clark Dietz also presented the idea of modifying the design to either rehabilitate all or part of the existing water plant (such as the south plant) and build a New Water Plant with one-half of the 50 MGD firm capacity in the 90% design.[25]

Q: Was value engineering already part of AECOM's planning and design contracts?

A: Yes. AECOM's design team conducted value engineering sessions with Petitioner

[25] *See* Petitioner's Exhibit No. 3, Case-in-Chief Testimony of Andrea W. Bretl, Attachment AWB-1, Water Plant Value Engineering, July 7, 2023, p. 16 of 25.

through September and October 2021, which included multiple phases for project presentation, design review, and comment discussion.[26] Amendment No. 1 for design services to AECOM's contract included provisions for value engineering:

> 2. Address value engineering items
>
> a. The end of the phase 1 services included a value engineering (VE) workshop to identify strategies for cost savings. A subsequent meeting was held with EWSU and AECOM to identify key VE ideas to be considered for inclusion in the Phase 2 design. VE items that have been mutually agreed upon between OWNER and AECOM will be finalized in the Phase 2 design and included in the 60% deliverable. Major VE design concepts to be further considered for inclusion in this phase of design are as follows:
>
> 1) Raise the hydraulic profile of the treatment facility.
>
> 2) Utilize more common wall construction for treatment basins.
>
> 3) Switch locations of the pretreatment basin with the clearwell / filter building.
>
> 4) Switch from potassium permanganate to liquid sodium permanganate at the river intake onshore facility.
>
> 5) Replace pretreatment rapid mix equipment with side-stream injection of coagulant.
>
> 6) Consider increasing the loading rate of plate settlers and filters at the 50 MGD capacity.

Once the GESC contractor was on board in the summer of 2022, AECOM and the contractor were to advance the new WTP design from 30% to 60% and the contractor was to perform constructability reviews and offer value engineering ideas.[27] Task 3 of AECOM's Amendment No. 1 for design services reads in part:

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[26] Public's Exhibit No. 2, November 18, 2022, p. 35.

[27] Petitioner's response to DR 1-1, Attachment - AECOM Technical Services, Inc. Professional Services Agreement, Amendment No. 1, April 19, 2022.

> **Task 3 Contractor Procurement**
> 5. Contractor will be selected and retained during the 30-60% design phase to perform constructability reviews and offer value engineering ideas. AECOM will coordinate with the selected contractor to adjust the design to address constructability issues and Value Engineering ideas approved by EWSU.

Following 60% design completion on September 30, 2022, the GESC contractor, Kokosing Industrial, Inc. was to submit its GMAX price proposal by December 19, 2022. It is unfortunate that Evansville did not keep with the project schedule in AECOM's Contract Amendment No. 1 and receive AECOM's updated construction cost estimate at the 60% design stage in September 2022 followed by the GMAX price by December 19, 2022. Doing so would have alerted Petitioner to the project's apparent cost problems much earlier.

Q: What value engineering ideas and savings were identified by AECOM and Kokosing during design work between the 30% and 60% design completions?

A: That is unknown. In its subdocket Rebuttal testimony on December 5, 2022, Petitioner did not discuss the value engineering effort conducted by AECOM and Petitioner in 2021 and AECOM and Kokosing in 2022. In 2022, the OUCC submitted a discovery question in this subdocket (OUCC DR 4-6) inquiring about value engineering savings ideas from 2021, but Petitioner objected to the question and refused to provide the requested information.[28]

[28] *See* Attachment LTY-1R in Petitioner's Exhibit No. 2-R, Rebuttal Testimony of Lane T. Young, December 5, 2022, for Petitioner's response to DR 4-6, November 11, 2022, pp. 86 - 88 of 123.

III. REPLACEMENT OF PROPOSED NEW WTP WITH HYBRID SOLUTION

Q: How did Evansville proceed with the VE cost savings findings and new alternatives developed by the VE Team?

A: Petitioner tasked the VE Team to conduct further value engineering and develop the Hybrid Solution to rehabilitate and reuse existing treatment processes, equipment, and structures along with construction of new filters, clearwell and high service pump station. Starting in August 2023 the combined team of EWSU, Clark Dietz, Black & Veatch, Arcadis, Kokosing, and Sterling (Kokosing's major subcontractor) held weekly workshops to discuss Hybrid and VE options.[29, 30] The VE effort led to lower estimated construction costs for the Hybrid Solution because new facilities were deleted from the design.

Q: Is the estimated construction cost for the Hybrid Solution WTP higher than the financing authority Petitioner requested in the 2022 subdocket for the all new WTP?

A: Yes. In its January 25, 2024, filing in the subdocket, Petitioner listed a higher $226,845,000 estimated construction cost for the Hybrid Solution (compared to the original $126.439 million in May 2021 and the $163,946,000 requested in the subdocket in September 2022).[31, 32] (Again, these estimated construction costs are

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[29] *See* Attachment AWB-3, VE Process Summary Technical Memorandum, Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting, November 14, 2023, in the Case-in-Chief Testimony of Andrea W. Bretl, pp. 3-4 of 139.

[30] *See* Attachment JTP-17 for Petitioner's response to DR 10-1 which provided meeting minutes for the nine Progress Meetings examining value engineering and the Hybrid Solution that began on August 31, 2023 and ended on October 26, 2023.

[31] *Id.,* p. 6 of 139.

[32] The 45545 S1 subdocket resumed on February 20, 2024.

for the water treatment plant only and do not include other capital projects or non-construction costs.) The Hybrid Solution is also not comparable to the previously proposed new water plant because several major new components with high costs were deleted such as Sedimentation Basins, Ozonation, Administration and Maintenance buildings, new electrical systems and emergency generators. To reduce costs further, Petitioner also proposes to rehabilitate and reuse some existing South Plant structures and processes as well as the 1900 Pumping Plant building. The Hybrid Solution construction cost estimate reflects an unknown design completion stage.

IV. COST ESTIMATES AND GMAX PRICE

Q Who prepared the construction cost estimates?

A: AECOM prepared both the initial construction cost estimate in the March 2021 Advanced Facility Plan and the September 2022 subdocket estimate. The GESC contractor, Kokosing submitted the $353M GMAX price on June 28, 2023 (revised on July 12, 2023) and the Hybrid Solution construction cost estimate in Attachment AWB-3 to Ms. Bretl's testimony as a subconsultant to the Value Engineering consultants under a $48,000 contract.[33] Importantly, the Hybrid Solution construction cost was an estimate made by Kokosing but was not a GMAX Price.[34]

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[33] *See* Attachment JTP-18 for the GMAX Price proposals made by Kokosing Industrial, Inc. on June 28, 2023, and July 12, 2023. These GMAX Prices were based on the AECOM 90% design drawings. *See* also Attachment JTP-19 for Petitioner's responses to DRs 10-15 to 10-18 and DR 12-10 about the Hybrid estimate.

[34] In the September 14, 2023 Progress Meeting minutes, Clark Dietz noted "the pricing provided by Kokosing as part of the Value Engineering effort are estimates, not GMAX costs. *See* Attachment JTP-17, p. 10 of 38

Q: Will Black & Veatch prepare independent Engineer's Estimates of the construction cost?

A: No. At the Tech-to-Tech teleconference on March 27, 2024, EWSU's Director of Planning, Shawn Wright, indicated Evansville will get the GMAX Price at the 60% design stage and have the option to competitively bid the WTP project if Evansville can't reach an acceptable cost with Kokosing. Petitioner's witness Andrea Bretl confirmed that Black & Veatch's design contract does not include preparation of construction cost estimates as a scope of work item. This is unusual to not have a construction cost estimate prepared, especially for a project of this size. My experience is that design engineers always prepare construction cost estimates including estimates at the various design completion milestones (i.e., 60%, 75%, 90%, 100%) to show the project is on track and within the project budget. My experience is that owners always want cost updates. The Engineer's Estimate is used to set the budget and is needed when evaluating bid prices or the GMAX price to determine if they are prudent and reasonable.

Q: Did Petitioner indicate it would provide the GMAX price in this proceeding?

A: Yes. In its January 10, 2023 Motion to Stay Proceedings, Petitioner stated the best indicator of additional financing needed to build the WTP Project was the GESC that Evansville would enter into with Kokosing setting forth the Guaranteed Maximum Price ("GMAX price" or "GMP").[35] Petitioner stated additional cost

[35] Evansville Motion to Stay Proceedings and Vacate Evidentiary Hearing, January 10, 2023.

information would benefit all parties for purposes of Petitioner's additional financing request. *Id.*

Q: Will the parties and the Commission have the benefit of knowing the GMAX price in this proceeding?

A: No. On April 26, 2024, the OUCC received Evansville's updated project schedule, which shows that the 60% design is due May 17, 2024, the Preliminary Engineering Report approval is June 15, 2024, the 90% design is due July 12, 2024, and the GMAX Price is due on July 31, 2024. The 90% design and GMAX Price will not be provided until after the evidentiary hearing in this subdocket.[36] Thus, the OUCC will not have the benefit of that information in making its recommendation, and the Commission will not have the benefit of that information in making its decision.

V. WATER TREATMENT PLANT PROJECT CHANGES

Q: What new treatment units that were previously part of AECOM's new WTP design have been deleted from the Hybrid Solution?

A: Based on my review of the Black & Veatch's Basis of Design Memorandum, the following treatment units and structures are no longer part of the WTP project.[37]

- New sedimentation basins
- New liquid oxygen storage, ozonation, and ozone destruct facilities
- New biologically active filters
- New PFAS removal facilities using granular activated carbon (future)
- New residuals treatment facility (possible future)

[36] *See* Attachment JTP-20 for Petitioner's response to DR 13-20. The revised PER for the Hybrid Solution is to have been submitted to IFA on May 1, 2024, one day before the OUCC's testimony filing date.

[37] *See* Attachment JTP-21, Petitioner's supplemental response to DR 12-1 - Draft Basis of Design Memorandum, EWSU Water Treatment Plant Improvements, prepared by Black & Veatch, March 8, 2024.

- New chemical building
- New electrical systems
- New standby generators
- New maintenance building
- New administration building and laboratory

Q: What other changes have been made to the design?

A: Previously Petitioner proposed acquiring both the Street Maintenance Department (City Garage) and the Levee Authority properties for the new WTP on the new site east of Waterworks Road. However, neither property has been acquired and due to the revised Hybrid design, Petitioner no longer needs both properties.

Q: As Petitioner plans to acquire the City Garage and Levee Authority properties, will environmental hazards at those facilities (asbestos, lead based paint, underground storage tanks, etc.) need to be remediated?

A: Yes. However, these costs should be paid by the cost causers, in this case by either the Evansville Street Maintenance Department or the Evansville Vanderburgh County Levee Authority. In addition, the costs to build new facilities and relocate both the Street Maintenance Department and the Levee Authority should not be borne by water utility ratepayers. Petitioner included a $6 million allowance for testing and removal of contaminated soils in Mr. Baldessari's initial testimony in this subdocket. I discussed Petitioner's subdocket request for an additional $6 million for contaminated soil testing and disposal in my 2022 subdocket testimony, testifying that the requested $6 million was unsupported and recommending that clean-up costs should be allocated to the party that caused the contamination rather than to water utility ratepayers.[38] AECOM continued to include the $6 million

[38] Public's Exhibit No. 2, November 18, 2022, pp. 20-25.

allowance in its (May 16, 2023) 90% design construction cost estimate.

VI. REUSE OF EXISTING WATER TREATMENT PLANT FACILITIES

Q: What does Petitioner propose for the Raw Water Intake Structure?

A: Petitioner proposes a complete rebuild of the Intake facilities including replacement or rehabilitation of nearly all equipment, screens, pumps, piping, valves, fittings, electrical, and building systems. The original concrete intake structure was placed in service in 1980.

Q: What does Petitioner propose for the existing North Plant facilities?

A: Petitioner plans to retire and demolish all North Plant facilities including the North Flocculation basins, the North Primary and Secondary Sedimentation basins, Filters, 13-20 and 29-36, the 1.5 MG and 6.5 MG clearwells, High Service Pump Stations Nos. 2 and 3, and the Caustic/Ammonia building.[39] Demolition will also include the long decommissioned original 1912 filters (Nos. 1-12) and 1912 Filter building.[40] Filters 33 – 36 are Petitioner's newest filters. Filters 33 and 34 were installed in 1999 and Filters 35 and 36 were installed in 2009. Petitioner replaced the filter media in all four filters in 2021[41] Petitioner installed High Service Pump Station No. 3 in 1984. In Cause No. 45073 in 2018, Petitioner proposed constructing a new 6

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[39] Filters to be demolished include filters 13-16 (began service in 1923), filters 17-20 (added in 1938), filters 29-32 (added in 1949) and the newest filters placed in service in 1999 (filters 33-34), and 2009 (filters 35-36).

[40] Evansville added sedimentation and filtration in 1912 due to typhoid fever outbreaks. Evansville distributed untreated Ohio River water from 1872 through the original Riverside Dr. pumping plant (between Mulberry and Oak Streets) and from 1900 to 1912 through the replacement pumping plant at the current plant site.

[41] *See* Attachment JTP-22 for Petitioner's response to DR 3-20 regarding filter ages and media replacement.

MG redundant clearwell so that it could inspect and make repairs to the existing 6.5 MG clearwell.

Q: Has Petitioner prepared any evaluations or studies supporting its decision to demolish its newest Filters (Filters 33 – 36), High Service Pump Station No. 3 and the 6.5 MG clearwell?

A: No. Petitioner has not provided any evaluation documenting why these facilities should not continue in service nor any Life Cycle Cost Analysis or Net Present Worth analysis indicating the Hybrid Solution is the most cost-effective option.

1. South Plant Sedimentation Basins

Q: When were the South Plant's sedimentation basins and filter building (existing Filters 21-28) placed in service?

A: The South Plant facilities, consisting of the sedimentation basins and Filters 21-28, were designed by Black & Veatch in 1967 and were placed in service in 1970.[42, 43]

Q: What does Petitioner propose for the existing South Plant facilities?

A: Petitioner's engineers determined the South Plant primary and secondary sedimentation basins structural conditions are acceptable and can continue in service after rehabilitation with new mechanisms and capacity upgrades. Black & Veatch proposes installing tube settlers to triple the existing basins' firm capacity from the current 12 MGD to 36 MGD and more than double the 24 MGD rated capacity to

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[42] Petitioner's response to DR 12-10b Attachment 2, Design Drawings for Evansville Waterworks Improvements, Black & Veatch Project 4130, dated April 6, 1967.

[43] *See* Attachment JTP-22 for Petitioner's response to DR 3-20, Cause No. 45545.

54 MGD.[44, 45] Petitioner's planned South Sedimentation Basins reuse is contrary to AECOM's finding that the South Plant's basins were not a good retrofit and that reusing the North Plant basins instead would save costs and ongoing maintenance.[46] Petitioner also proposes to repurpose the South Filter building for a Chemical building.[47] I discuss continued use of the South Filter building later in my testimony.

Q: Does Petitioner's proposed capacity increase for the South Plant sedimentation basins meet the 51.5 MGD peak design flow?

A: No. Petitioner's plan falls short of meeting its stated 51.5 MGD maximum day design flow with the largest basin out of service.[48, 49] Relying solely on the South Plant once the North Plant basins are demolished, the Hybrid plant's firm capacity

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[44] The four existing South Plant sedimentation basins, configured as two trains operated in series (primary to secondary basins), have current firm and rated capacities of 12 MGD and 24 MGD, respectively. Rated capacity is determined with all treatment units in service. Firm capacity is with the largest treatment unit out of service (n-1). *See* Attachment JTP-23 for an aerial view of the existing WTP with all process units and structures labeled and for a listing of the current firm and rated capacities of the treatment processes. (Source: Petitioner's response to DR 3-11, Cause No. 45073, Water Master Plan, HNTB Corp. September 2016).

[45] Black & Veatch indicates that with installation of tube settlers in each basin and a switch to parallel operation, the two larger diameter primary sedimentation basins will each be able to treat 18 MGD and the two smaller diameter secondary sedimentation basins will each be able treat 9 MGD. *See* Attachment JTP-21 for the Draft Basis of Design Memorandum prepared by Black & Veatch, March 8, 2024.

[46] *See* Cause No. 45545, Attachment SMB-1, *Water Treatment Plant, Advanced Facility Plan, Alternatives Report*, Section 7.5.1 Pretreatment Alternative 1: Conventional with Rehabilitation, AECOM, March 2021 to the case-in-chief testimony of Simon M. Breese, May 10, 2021, pp. 56 – 60. AECOM evaluated reusing the existing south plant for conventional pretreatment with new plate settlers, but despite being newer, concluded it was not a good retrofit. AECOM listed other disadvantages including:

- The circular, single-stage flocculation basins had limited capacity (not quantified).
- The basins could not be retrofitted for multi-stage flocculation to enhance performance.
- If retrofitted with plate settlers, the circular basins would have limited capacity in a single basin because the sludge system restricted plate settler frame length, requiring cantilevered supports.

[47] Petitioner's response to DR 13-8.

[48] *See* Attachment JTP-21, Petitioner's supplemental response to DR 12-1 - Draft Basis of Design Memorandum, EWSU Water Treatment Plant Improvements, Black & Veatch, March 8, 2024, p. 51 of 153.

[49] Section 4.2 Clarification of the *Recommended Standards for Waterworks*, published by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, 2022 Edition, p. 35. "Where more than two units are provided, the units shall be capable when operating at the approved rate of treating the plant design capacity with the largest unit removed from service."

would be 36 MGD instead of Petitioner's proposed 51.5 MGD listed in the Draft Basis of Design Memorandum.[50]

Q: Did Black & Veatch initially assume higher capacity could be achieved in the existing South Sedimentation Basins retrofitted with tube settlers?

A: Yes. In its July 2023 Technical Memorandum, Black & Veatch stated that installing tube settlers could re-rate each primary basin to 25 MGD and each secondary basin to 11 MGD for a total (rated) settling capacity with all four basins in service of 72 MGD, that is triple the current 24 MGD rated capacity.[51] Black & Veatch's initial assumption that tube settlers could triple capacity appears overly optimistic but was recognized and moderated by the design team in the Basis of Design Memorandum.

Q: Would the initially assumed higher capacities have met the required maximum day demand?

A: No. Even at the highest assumed (and unsupported) capacity ratings, the firm rated capacity of the South Sedimentation Basins would only have been 47 MGD which is again short of the 51.5 MGD design capacity.[52]

Q: Has Petitioner conducted pilot studies or other testing to show it will be able to process the maximum day demand through the rehabilitated and upgraded South Sedimentation Basins?

A: No. Internally, the design team recommended pilot testing and site visits to other WTPs with tube settlers, but Petitioner chose not to do so.[53] Petitioner has not provided evidence that tube settler additions and reliance on the existing South Plant

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[50] Calculated as two primary basins times 18 MGD each plus two secondary basins (converted to primaries) times 9 MGD each minus the largest basin out of service (primary at 18 MGD) equals 2 x 18 MGD plus 2 x 9 MGD equals 54 MGD rated capacity minus the largest basin at 18 MGD equals 36 MGD firm capacity.

[51] *See* the Case-in-Chief testimony of Shawn Wright, Attachment SW-2 - Water Treatment Plant Alternatives Evaluation Technical Memorandum, Black & Veatch, July 14, 2023, p. 6 of 27.

[52] Calculated as one primary basin at 25 MGD plus two secondary basins at 11 MGD each equals 47 MGD.

[53] *See* Attachment JTP-17, p. 11.

Sedimentation Basins alone will achieve the design 51.5 MGD maximum day capacity.[54] Petitioner is eliminating more than half of its current pretreatment capacity for suspended solids and turbidity reduction with its plan to demolish North Plant facilities. It appears Petitioner has not yet vetted that its sedimentation basins design meets Ten States Standards or will garner IDEM permit approval.

Q: Did the current design team identify issues with relying only on the existing South Plant Sedimentation Basins?

A: Yes. During the Value Engineering review, the following concerns were raised.[55]

> Tube Settlers. We feel like the recommendation to install tube settlers in the existing basins needs to be more thoroughly vetted. At minimum, other Ohio River WTPs should be visited to discuss tube settler performance and maintenance with operators. Bench scale or pilot testing would be preferable, if time allows. p. 7.
>
> Clarification Layout. The B&V plan shows flow split four ways between the two existing primaries and the two secondaries converted to primaries. This will require re-piping the existing primaries and complexity splitting to multiple size/hydraulic profile clarifiers. We suggest that instead of this, a third primary clarifier of equal size be installed to the south of the existing primaries. This was planned for in the design of the existing clarifiers and will [sic] *make* operations and maintenance easier. Also, with only 3 or 4 clarifiers, when one clarifier is out of service there isn't a lot of redundancy. p. 8.
>
> Conclusions
> 6. Trying to get 50 mgd in the space that is just slightly bigger than the existing 24 mgd South Plant will potentially push the envelop [sic] for treatment and ease of operation. p. 10.

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[54] The inability to meet the maximum day design capacity applies to the assumed capacities in the Draft Basis of Design and July 2023 Technical Memorandums *See* the Case-in-Chief testimony of Shawn Wright, Attachment SW-2 - Water Treatment Plant Alternatives Evaluation Technical Memorandum, Black & Veatch, July 14, 2023, p. 6 of 27 and Attachment JTP-21, Petitioner's supplemental response to DR 12-1 - Draft Basis of Design Memorandum, EWSU Water Treatment Plant Improvements, prepared by Black & Veatch, March 8, 2024, p. 51 of 153.

[55] Cause No. 45545 S1, Case-in-Chief Testimony of Andrea W. Bretl, Attachment AWB-2, EWSU Water Plant VE Review, August 29, 2023, pp. 7, 8 and 10.

Q: Has Petitioner previously identified the sedimentation basins' limited capacity?

A: Yes. In Cause No. 43190 in 2007, Evansville requested Commission approval of its $36 million capital program which included $6.6 million for a 3rd set of South Plant Sedimentation Basins. Petitioner's witness, Christopher B. Gale of HNTB, testified sedimentation limited the plant's capacity rating and expansion was needed for future demand. He noted the sedimentation basins' firm capacity (combined North and South Plants) was only 42 MGD.[56] The OUCC also noted capacity limitations of the Flocculation Basins.[57] Mr. Gale testified design of the new basins would be in 2007 followed by start of construction in 2008.[58]

Q: Did the Commission previously approve financing for the third set of South Plant Sedimentation Basins in Cause No. 43190?

A: Yes. The OUCC agreed with Evansville's proposed capital program, and in 2007 the Commission granted financing authority for Petitioner's requested full amount.[59]

Q: Did Petitioner design and construct the third set of Sedimentation Basins?

A: Petitioner designed the third set of South Plant Sedimentation Basins in July 2009 ($500,000) but never installed the basins.[60] Petitioner did not explain why it did not

[56] Cause No. 43190, Case-in-Chief Testimony of Christopher B. Gale, February 20, 2007, p. 7.

[57] Cause No. 43190, Public's Exhibit No. 2, Roger A. Pettijohn Testimony, May 4, 2007, pp. 3-4. OUCC Witness Pettijohn noted Petitioner could not meet peak demand if a 15 MGD-rated flocculation basin was out of service, a situation that would be addressed with the proposed improvements.

[58] *Id.,* p. 14.

[59] Final Order, Cause No. 43190, June 4, 2007, p. 14.

[60] Cause No. 43190, Evansville Water Utility Annual Projects Report, December 29, 2010. Evansville reported it had completed design in July 2009 of four projects at the Water Treatment Plant (Addition of 3rd South Primary & Secondary Sedimentation basins, Rerouting South Plant Filtered Water, Preliminary design of Dechlorination facilities and Residual Collection and Pumping Facilities) at a cost of $711,490.

construct the approved and funded basins in its required Annual Project Status Reports in accordance with the Commission's Order in Cause No. 43190.

Q: Did Evansville later identify the same South Plant Sedimentation Basin project in its Master Plans?

A: Yes. HNTB again listed the Sedimentation Basins project in the 2009 and 2016 Water Master Plans for $5,600,000 and $5,700,000 (both costs recognized design was already completed) but showed construction pushed back to 2015 and then to 2022-2026.[61] The third set of South Plant Sedimentation Basins were proposed to be located immediately south of the two existing sets of Sedimentation Basins as shown in Figure W-3-3, WTP CIP Projects. *See* Attachment JTP-24.

Q: Did the current design team evaluate additional sedimentation basins?

A: Yes. As part of the Value Engineering effort in 2023, the design team evaluated adding a third large (primary) sedimentation basin with tube settlers rated at 18 MGD and demolishing both existing secondary basins.[62] Firm capacity would still fall short at only 36 MGD with three large (primary) sedimentation basins each rated at 18 MGD.

Q: What do you recommend for the Sedimentation Basins?

A: Petitioner cannot meet the 51.5 MGD design maximum day flow without additional sedimentation basin(s). In consultation with IDEM permit reviewers, Petitioner's engineer should revisit its decision to rely solely on the upgraded existing South Plant Sedimentation Basins and consider whether the Hybrid Option should include

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[61] *See* Attachment JTP-24 for excerpts about the 3rd Set of South Plant Sedimentation Basins project from the Water Master Plans prepared by HNTB, October 2009 and September 2016.

[62] *See* Attachment JTP-25 for the Water Plant Value Engineering and Conceptual Design/Budgeting, Workshop minutes (nine weekly meetings between August 31st and October 26th 2023).

construction of the long-planned third set of new Sedimentation Basins or reuse the North Plant primary sedimentation tanks.

2. South Plant Filter Building - Filters 21-28

Q: In the Hybrid option, Petitioner reuses South Plant sedimentation basins installed in the same project with Filters 21-28. Could the filters also continue in service to reduce construction costs?

A: Yes. Petitioner has already replaced many South Filter facilities such as the underdrains and media in all eight filters, building roof, valves, controls, and filter to waste piping. Petitioner's engineers concluded reusing filters 21-28 was viable. Doing so would reduce the number of new filters needed, lowering construction costs. Reuse dovetails with Petitioner's decision to keep the South Plant sedimentation basins as it preserves the hydraulic flow path and retains the current short piping runs between the basins and filters. I discuss in more detail below why reusing both the south Plant sedimentation basins and filters 21-28 should be pursued.

Q: Has Evansville rehabilitated all South Plant Filters (Filters 21-28)?

A: Yes. Previously, in response to discovery in Cause No. 45545, Petitioner reported it replaced the underdrains and filter media in all eight filters as follows: 2018 (Filters 21, 24), 2019 (Filters 23, 27-28), and 2021 (Filters 22, 25, and 26 – contracted and ongoing).[63] In response to DR 13-15, Petitioner confirmed it replaced the filter media and underdrains in all eight filters over a five-year period starting in 2017 and ending in 2021. But in response to DR 13-16 Petitioner indicated that a project in

[63] *See* Attachment JTP-22 for Petitioner's response to 44760 DR 8-5 from 2016, 45545 DR 3-20 from 2021 and responses to 45545 S1 DR 13-15, 13-16, and DR 13-17.

the South Filter building was still being evaluated to replace media and underdrains in some filters (unspecified which filters).[64, 65] During my April 30, 2024, site visit, Petitioner's witness Shawn Wright and Water Filtration Plant Superintendent Brenna Caudill, confirmed the underdrains and filter media were replaced in all eight filters. AECOM summarized pre-2021 replacements made to South Plant Filters 21-28 and the South Filter building prior to 2021:

> These south plant filters were commissioned in 1970 but have undergone improvements over the decades. Beds which have received new underdrains and media within the last 15 years include filters 21, 23, 24, 27, and 28. Nearly all valves, actuators, and controls were replaced in 2008 and are not considered at the end of their useful life. Filter to waste piping was also added in the late 1990s and is still in good condition.[66]

Petitioner also replaced the South Filter roof in 2018.[67]

Q: What are the treatment capacities and design filtration rates of existing South Filters 21-28?

A: The filters' rated capacity is 24 MGD or 3.0 MGD each at a 2.0 gpm/ft^2 filtration rate. In discovery, Petitioner did not give individual design filtration rates for South Filters 21-28, listing only a 2-4 gpm/ft^2 range per Ten States Standards for all 24 existing filters.[68] In Cause No. 45073, Petitioner listed the South Filters' rated

[64] *Id.*

[65] 2021 media replacement may have been delayed because Petitioner replaced Filter 22's media in 2012 and Filters 25 and 26's media in 2013 per Petitioner's response to DR 8-5 in Cause No. 44760, June 20, 2016.

[66] Cause No. 45545, Case-in-Chief Testimony of Simon M. Breese, Attachment SMB-1, *Water Treatment Plant, Advanced Facility Plan,* March 2021, p. 73 of 276. *See* Attachment JTP-26.

[67] Evansville 2018 IURC Annual Report, p. W-3(c). Evansville reported it replaced the South Filter Plant roof for $116,050.00 with an in-service date of 3/31/2018.

[68] *See* Attachment JTP-22 for Petitioner's response to 45545 DR 3-20 from 2021.

capacity at 24 MGD.[69] I calculated the eight filters, each at 1,036 ft^2, have a design filtration rate of 2.0 gpm/ft^2 which is at the most conservative, low end of the range allowed by Ten States Standards.[70, 71] IDEM typically permits 3.0 gpm/ft^2 loadings but allows up to 4.0 gpm/ft^2 if demonstrated by testing. AECOM confirmed the 24 MGD rated capacity is 2.0 gpm/ft^2 for Filters 21-28 and listed their upper capacity at 47.7 MGD for 4.0 gpm/ft^2.[72]

AECOM also reviewed reusing all existing filters, concluding reuse was viable, that flows far in excess of 50-60 MGD could be achieved with filter loadings above the 2.0 gpm/ft^2 minimum even with multiple beds offline, and that the 50 MGD design capacity could be easily met using only existing filters 21-36.[73]

Q: What is the current average filtration rate for Evansville's filters?

A: AECOM calculated the average loading rate was 0.85 gpm/ft^2 at an average flow of 26 MGD.[74] Updating for average 2019 to 2023 water production of 23.16 MGD, I calculate the average filtration rate across all 24 filters has been approximately 0.80

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[69] *See* Attachment JTP-23 for Table 3.1, Water Treatment Plant Firm Capacities, 2016 Water Master Plan.

[70] Calculated as 24 MGD divided by eight filters equals 3.0 MGD per filter divided by 1,036 ft^2 per filter divided by 1,440 minutes per day equals 2.0 gpm/ft^2. For discussion purposes, I calculated filter capacities without backwashing (and filter to waste time) when filters do not produce finished water. Subtracting backwashing downtime slightly increases the average filtration rate.

[71] Section 4.3.1.2 Rate of Filtration of the *Recommended Standards for Waterworks*, published by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, 2022 Edition, p. 43. "Typical filtration rates are from 2 to 4 gpm/ft^2."

[72] Cause No. 45545, Case-in-Chief Testimony of Simon M. Breese, Attachment SMB-1, *Water Treatment Plant, Advanced Facility Plan,* March 2021, pp. 72-76 of 276. *See* Attachment JTP-26.

[73] *Id.*, p. 72 of 276.

[74] *Id.*, p. 34 of 276. The 26 MGD appears to be the approximate 2016 to 2019 average water produced.

gpm/ft^2.[75] Evansville's actual average filter loadings are far below the 2.0 gpm/ft^2 design loadings and IDEM's typically allowed 3.0 gpm/ft^2.

Q: What filtration rate was AECOM's filter design based on?

A: Evansville currently has 24 active filters with an approximate filtration rate of 2.0 gpm/ft^2. AECOM's proposed number of new filters and filtration rate at the 50 MGD design flow with one filter offline changed several times. In the Advanced Facility Plan (March 2021), AECOM listed twelve filters (1,058 ft^2 each) at a 2.98 gpm/ft^2 filtration rate. In AECOM's August 2021 Basis of Design Report, provided to Guaranteed Energy Savings Contract ("GESC") firms, AECOM also showed twelve but smaller filters (968 ft^2 each) at a higher 3.26 gpm/ft^2 loading.[76] AECOM's 75% and 90% designs had only ten filters (968 ft^2 each) loaded at the maximum allowed 4.0 gpm/ft^2. AECOM's 100% design raised the number of filters (968 ft^2 each) to fourteen but reduced loadings to 2.76 gpm/ft^2.[77] The important point from this discussion is that Evansville needs less filters than it currently operates, and all proposed design filtration rates were above the conservative 2.0 gpm/ft^2 loading.

Q: What Value Engineering Options for filtration were identified and evaluated by Petitioner?

A: In July 2023, Clark Dietz and the Value Engineering ("VE") team identified $105 million in VE ideas for the new water treatment plant designed by AECOM

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[75] Calculated as 23.16 MGD average water production reported on the Monthly Reports of Operation for 2019 to 2023 divided by 19,870 ft^2 of filters (with the largest filter out of service) equals 0.8 gpm/ft^2 (23.16 MGD times 1,000,000 = 23,160,000 gallons per day / 19,870 ft^2/1,440 minutes per day = 0.8 gpm/ft^2). The average filtration rate with all filters in service (20,928 ft^2) is 0.81 gpm/ft^2.

[76] Petitioner's response to DR 1-5. The firm capacity of the twelve new filters (n-1) was 50 MGD calculated as 11 filters at 968 ft^2 each times 3.26 gpm/ft^2 times 1,440 minutes per day equals 50 MGD.

[77] The Basis of Design included on Sheet 0-G007 of AECOM's 100% design drawings.

(Alternative 2B) including reducing the design Maximum Day flow from 50 MGD to 40 MGD, rehabilitating and continuing to use part of the existing water plant (such as the South Plant sedimentation basins and filters), and constructing a new East Plant (filters) located near the South plant with an estimated 20 MGD capacity that would be laid out for future expansion.[78] The VE team evaluated cost saving ideas further and proposed rehabilitating Filters 21-28 for continued use as conventional filters.[79]

At the September 14, 2023, Progress Meeting, Black & Veatch presented a low-cost option to keep more of the existing plant in service and add fewer new elements. This low-cost option included demolishing most of the north plant, adding new primary clarification, keeping existing Filters 21-36 (16 existing filters but no new filters), and converting the high service pump stations to transfer pump stations. Evansville's design decision at the time was to move forward with the hybrid option (all new filters) but keep the low-cost option as a fallback option, if needed.[80]

Q: What is the South Filter building's condition?

A: Based on 2016 evaluations of all 24 filters, HNTB noted concrete concerns in the filter beds (13-20, 21-28, and 29-32) including surface efflorescence specifically in Filters 21-28 that HNTB reported is generally aesthetic. HNTB opined the "filters

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[78] *See* Petitioner's Exhibit No. 3, Case-in-Chief Testimony of Andrea W. Bretl, Attachment AWB-1, Water Plant Value Engineering, July 7, 2023, pp. 4, 16 17 and 20. Other major VE ideas included deferring ozonation, changing the type of pile foundation to auger cast piles, reducing treatment capacity to 40 MGD peak flow, raising the hydraulic capacity, and rehabilitating and reusing the 6.5 MG clearwell and high service pump station.

[79] Cause No. 45545 S1, Case-in-Chief Testimony of Andrea W. Bretl, Attachment AWB-2, EWSU Water Plant VE Review, August 29, 2023, p. 9 of 10.

[80] *See* Attachment JTP-25, September 14, 2023 Workshop minutes, pp. 10-11.

are beyond their intended useful life of the concrete" and noted a more serious concern of exposed rebar corrosion within the concrete wall. Nevertheless, HNTB recommended surface preparation / recoating to protect the reinforcing steel.[81]

Relying on condition assessments from the 2016 Water Master Plan, HNTB prepared the 2019 Immediate Needs Memorandum as a subconsultant to AECOM. HNTB did not note structural, concrete, or building issues but recommended dehumidification and filter gallery upgrades including sandblasting and recoating piping and equipment to extend service life and prevent possible failure.[82] In its 2021 review of treatment plant alternatives, AECOM concluded existing Filters 21-28 could be rehabilitated for continued service. including gallery concrete and crack repair, new waterproofing, coatings, and west wall repair by grout fill and anchoring. AECOM estimated the South Filter building concrete repairs would cost $81,000.[83]

The VE team reported on the existing condition of the existing 24 filters including Filters 21-28 at a September 7, 2023, Progress Meeting as follows:

> 3.3 Existing Conditions
> a. Filters 29-32: The concrete is not in good condition and is not currently being considered for reuse.
> b. Filters 29-36: These have trouble getting sufficient flow.
> c. Filters 21-28 (south plant): These were recently rehab'd, but the piping is in bad shape, bolts, valves, corrosion at pipe penetrations. The condition of the clearwell is unknown. The 48" raw water line goes through that

[81] Petitioner's response to DR 3-11, *Evansville Water & Sewer Utility Water Master Plan*, HNTB, September 2016, Cause No. 45073, p. 62 of 459.

[82] Cause No. 45545, Case-in-Chief Testimony of Simon M. Breese, Attachment SMB-1, *Water Treatment Plant, Advanced Facility Plan,* Appendix C. *Immediate Needs Memorandum: Treatment Equipment Infrastructure*, HNTB, December 2019.

[83] Cause No. 45545, Case-in-Chief Testimony of Simon M. Breese, Attachment SMB-1, *Water Treatment Plant, Advanced Facility Plan,* March 2021, pp. 72 -76 of 276. *See* Attachment JTP-26.

building and it has pinholes.

d. Existing chemical systems are not in bad shape, but they are spread all over the site.
   - Decision: Assume new chemical bldgs. for now.

Q: Have you viewed the South Plant including the Filter building and filters?

A: Yes. I conducted site visits to Evansville's water treatment plant three times: May 23, 2018, July 21, 2021, and April 30, 2024, and viewed the South Filter building each time. During my April 30, 2024, site visit, I toured the South Filter Building again to view the condition of the existing facilities and concrete walls.

Q: Can the South Filter building concrete walls be recoated?

A: Yes. The concrete conditions I saw during my site visits can be remedied thereby allowing continued service of the South Filter building and Filters 21-28. There were limited areas of efflorescence (aesthetics issue), but I did not see any exposed rebar in the concrete walls. The main thing Evansville needs to do is to recoat the existing piping as it did to the piping for Filters 13 – 20 in 2023.

When I worked for the Indianapolis Department of Public Works ("DPW") we completed several projects to rehabilitate concrete walls, tanks, and deck slabs exposed year-round to the elements which is a far more severe exposure than concrete in a below grade indoor filter gallery. Concrete repairs for the DPW projects involved removing deteriorated (spalling) concrete down to good concrete, routing out loose concrete in cracks and then filling in the cracks and holes in the concrete with patching compounds.

Repairing the South Filter building's interior concrete walls and removing efflorescence, and recoating/sealing the walls is less involved and less costly because there is less damage since the South Filter building interior walls have never been exposed to freeze thaw conditions.

Q: Can the South Filter building and Filters 21-28 continue in service following rehabilitation?

A: Yes. Petitioner's engineers over the years have identified filter buildings and filters rehabilitation needs in several Master Plans, studies, and analyses, including the 2009 and 2016 Water Master Plans by HNTB, the 2019 Immediate Needs Memorandum by HNTB, 2021 Advanced Facility Plan by AECOM, the 2021 Preliminary Engineering Report by VS Engineering (based on AECOM's Advanced Facility Plan), the 2023 Value Engineering effort by Clark Dietz, Black & Veatch, and Arcadis, and Black & Veatch's 2023 proposed low-cost option to reuse Filters 21-36. The rehabilitation options have always been viable options.

Q: What are Petitioner's current plans for the South Plant Filter building?

A: The plan for the South Plant Filter building may not be finalized yet. It is slated for demolition and is listed in the October 6, 2023, demolition budgetary cost proposal by Klenck Company. However, it is not shown on the demolition drawings included in Black & Veatch's 30% design drawings. It appears Petitioner has concluded the building is still serviceable and is investigating keeping the South Plant Filter building but possibly converting it into a Chemical Storage and Feed building.[84]

Q: Why should Petitioner reuse Filters 21-28 for continued filtration instead?

A: Filters 21-28 are in an optimal location for continued use with the South Plant Sedimentation Basins that are being reused for the Hybrid Solution. The Basins and Filters were designed together as a project by Black & Veatch. Reuse conforms to

[84] *See* Attachment JTP-27 for Black & Veatch's site layout drawing provided in response to DR 13-8.

Petitioner's directive to the VE team to "maximize the reuse of the existing plant" and "maximize the best and highest use of all real estate." The best and highest use of the South Plant filters is continued use as filters. Their configuration lends itself to continued service and they were designed with a provision to be expanded to the east. Given the likely installation of separate GAC contactors for PFAS removal in the future as recommended by Ten States Standards instead of adding GAC to the filters, the depth of the current filters is not an issue in their continued use as filters.[85] Existing Filters 21-28 can continue providing reliable service to ratepayers at less cost to rehabilitate/repaint the building, filter gallery concrete walls and filter piping than to construct all new filters, demolish filters 21 – 28, and reconstruct the South Filter building for use as a chemical building.

Q: What is your recommendation regarding reuse of existing Filters 21-28?

A: I recommend Petitioner reconsider its decision not to rehabilitate and reuse the existing South Plant Filter building and Filters 21-28 for continued filtration in the same configuration now in use. I recommend the number of new filters be reduced from the proposed fourteen filters to eight filters with a minimum filtration capacity of approximately 3.0 MGD per filter at a 2.0 gpm/ft^2 loading. The rated capacity for all 16 filters (existing Filters 21-28 plus eight new filters) would be 48 MGD and the firm capacity (with one filter out of service) would be 45 MGD.

[85] *See* Attachment JTP-21 for Petitioner's supplemental response to DR 12-1 - Draft Basis of Design Memorandum, EWSU Water Treatment Plant Improvements, prepared by Black & Veatch, March 8, 2024, p. 44 of 153.

VII. EVANSVILLE'S MAXIMUM DAY DESIGN FLOW

Q: What design flows are being used for the Hybrid Solution?

A: Black & Veatch retained the same design flows presented in the 2021 Preliminary Engineering Report, derived by AECOM in the 2021 Advanced Facility Plan.[86] The future peak design flow in 2050 is nominally 50 MGD. Design peak flows are slightly higher to account for residual streams, but for discussion purposes I will refer to 50 MGD as the maximum day flow.

Q: Did Black & Veatch update AECOM's population growth and water demand forecasts?

A: No. Black & Veatch did not independently update AECOM's forecasts and did not incorporate the latest 2020 U.S. Census data or the 2022-2023 population forecasts by the Indiana Business Research Center ("IBRC") for Evansville's population or Vanderburgh County's population, respectively.[87]

Q: Have Evansville's population and water demand declined?

A: Yes. Evansville's population continues to decrease. The population determined by the US Census has declined from the 1960 peak of 141,543 to 117,298 in 2020. The IBRC forecasts Evansville's 2023 population declined further to 115,749 people. Similarly, the IBRC forecasts Vanderburgh County's population declined from 180,136 people in 2020 to 179,810 people in 2023.

Evansville's water production over the last five years (2019-2023) has averaged 23.16 MGD, down slightly from the ten year (2014-2023) average flow of

[86] *See* Attachment JTP-21 for Petitioner's supplemental response to DR 12-1 - Draft Basis of Design Memorandum, EWSU Water Treatment Plant Improvements, prepared by Black & Veatch, March 8, 2024, pp. 50-51 of 153.

[87] Petitioner's response to DR 13-7. "The current growth and water demand forecasts remain unchanged from the June 2021 Preliminary Engineering Report."

24.07 MGD. Water sold averaged 17.1 MGD over the 2016 to 2022 period (latest data available) and non-revenue water averaged 7.63 MGD or 31% over the 2016 to 2022 period (latest data available). In Cause No. 45545, Mr. Baldessari showed that water produced has been declining at an annual rate of 1.9% over the 2011 to 2019 period.[88] I reviewed Petitioner's water withdrawals reported to the Indiana Department of Natural Resources for the years 2009 to 2023. The withdrawals show a similar average annual decline of 1.8%.[89]

Q: Did Petitioner's VE team agree that the design maximum day flow should be kept at 50 MGD?

A: No. Clark Dietz reviewed AECOM's population projections and water demand forecasts and concluded that the AECOM forecasts are overestimated. To correct AECOM's errors in population growth and future water demand, Clark Dietz recommended reducing the design peak flow to 40 MGD as a value engineering cost savings idea that should be implemented.

> 3.1.1 REDUCE TREATMENT CAPACITY
> As discussed in Section 2.2.3, it appears that both the population estimates, and the commercial and industrial flow estimates are too high. We recommend using the following modified flow projections shown in Table 5 and construct a plant with a 40 MGD peak flow. Doing this will allow the reduction in treatment capacity, especially in the sedimentation basins and filtration basins. Space should be preserved both in the hydraulic profile and on the site for future flows up to 50 MGD. The piping should also be sized for future flows.[90]

> 8. Reduce Treatment Capacity – The existing 50 MGD capacity is based on a misunderstanding of population growth projections and

[88] *See* Cause No. 45545, Petitioner's Exhibit No. 2, Case-in-Chief Testimony of Douglas L. Baldessari, May 10, 2021, pp. 31-37 for the discussion of Evansville's declining use.

[89] *See* Workpaper JTP-3 for Petitioner's annual water withdrawal data.

[90] *See* Petitioner's Exhibit No. 3, Case-in-Chief Testimony of Andrea W. Bretl, Attachment AWB-1, Water Plant Value Engineering, July 7, 2023, p. 12.

> overly optimistic projects for industrial and commercial water demand growth. Based on the data available for review, a 40 MGD New Water Plant capacity should be sufficient for the planning period with hydraulic and site space reserved for future expansion. If a new industrial user with a high water demand is expected, then a future expansion may be warranted earlier than the planning period.[91]

Q: Do you concur with Clark Dietz's recommendation to reduce the design peak flow to 40 MGD?

A: Yes. Clark Dietz's recommendation mirrors the recommendation I made in my 2021 testimony in Cause No. 45545. *See* Section III. Water Demand Forecasts and Design Capacities in Public's Exhibit No. 4, pp. 5 to 21.

> Petitioner's current plans to build a 50 MGD WTP are not warranted. Doing so will oversize the new surface water treatment plant ("SWTP") by 25% due to overestimated and unsupported water demand projections. I recommend that Petitioner re-evaluate AECOM's water demand forecasts, preferably using updated IBRC population forecasts based on 2020 Census data to confirm that the new treatment plant can be sized for an average day demand of 28.4 MGD in 2050 and a maximum day demand of 40 MGD instead of Evansville's proposed 50 MGD capacity. A 28.4 MGD design average day capacity is 26% higher than the 2020 average day flow, is sufficient to meet three times the IBRC forecasted population increase, and includes Petitioner's assumed higher growth rates for the industrial, wholesale, public authority classes and leaks and losses.[92]

Earlier in my testimony, I pointed out that the firm design capacity of the Sedimentation Basins at 36 MGD proposed by Black & Veatch does not meet the 50 MGD design maximum day flow. I also recommend implementing a cost savings idea identified by the VE team to retain Filters 21-28 so the number of new filters can be reduced from 14 (planned under the Hybrid Solution) to eight. The 16 filters (eight existing and eight new) would have a rated capacity of 48 MGD and a firm

[91] *Id.*, p. 20.

[92] Public's Exhibit No. 4, Cause No. 45545, p. 21.

capacity (largest unit offline) of 45 MGD based on a conservative 2.0 gpm/ft^2 filtration rate that is below the 3.0 gpm/ft^2 loading typically allowed by IDEM.

Q: Has Petitioner added any large water customers?

A: No. None of the 13 potential large water users that Petitioner listed in its response to the Commission's October 6, 2021 Docket Entry with water demands ranging from 550,000 gallons per day up to 9.4 MGD have connected to Evansville's system.[93] In response to discovery in Cause No. 45545, Petitioner reported it had not connected any large water users who use 250,000 gallons per day or more in the last ten years (2012 to 2021).[94] At the Tech-to-Tech teleconference on March 27, 2024, Petitioner's witness Shawn Wright confirmed there were no large customer connections after 2021 but did indicate that water use at Toyota's plant (Gibson Water Authority customer) is expected to grow.

VIII. LIFE CYCLE COST-BENEFIT ANALYSIS

Q: Has Petitioner conducted a Life Cycle Cost-Benefit Analysis ("LCCBA") for the Hybrid Solution project?

A: No. Petitioner did not provide a LCCBA in its Case-in-Chief testimony to determine which of the options the VE Team evaluated would have the lowest overall capital and operations cost. Typically, the LCCBA is for a 30-year period. It identifies alternatives for evaluation in a life cycle analysis to determine the project with the lowest overall cost of ownership. Such an analysis establishes capital costs and annual operation and maintenance costs for each alternative followed by calculating

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[93] Evansville's response to Docket Entry question 2, Cause No. 45545, October 12, 2021.

[94] Petitioner's response to DR 22-4, Cause No. 45545.

their present worth over a period of years linked to the assets service lives. In discovery asking Petitioner to provide the life cycle cost analyses for the hybrid option and new plant option, Petitioner did not provide the capital costs or annual operating costs in a net present worth analysis but responded as follows:

> Clark Dietz's analysis of the life cycle costs for the hybrid and new plant options (without ozone) are approximately the same over a 20-year planning period. When looking at life cycle costs for this type of infrastructure we generally consider energy, chemical use, disposal, and maintenance. Briefly, our analysis of these components is:
>
> i. Energy: Both options have a similar hydraulic profile so pumping costs will be similar. Building energy use will be minimal compared to pumping energy use.
> ii. Chemical: Both processes utilize the same chemicals in the same amounts, so chemical costs will be similar.
> iii. Disposal: Residual pumping has similar volumes and pumped distances for both options, so life cycle costs will be similar.
> iv. Maintenance: Existing maintenance issues at the WTP are mainly with older electrical gear, corroded piping in the filter galleries, and building systems. Both the hybrid and new plant options eliminate the oldest plant structures and all existing filter buildings. Both options provide all new chemical dosing systems. The main systems being rehabilitated, the low service pump station and the settling basins, are supplied with all new equipment. Therefore, for the 20-year time horizon, the maintenance costs of both systems are expected to be about equal.[95]

Q: Do you agree with Petitioner's response that the life cycle costs for the hybrid and new plant options (without ozone) are approximately the same over a 20-year planning period?

A: I have not done an independent LLCBA. If that statement is true, then Petitioner should have decided to build the new plant and not the Hybrid plant.

[95] *See* Attachment JTP-28 for Petitioner's response to DR 10-14.

Q: Is a Life Cycle Cost-Benefit Analysis ("LCCBA) required for the Evansville WTP project under Indiana law?

A: It appears that the requirement to conduct a LCCBA and submit a certification of completion in accordance with Ind. Code § 13-18-26-3 with Petitioner's permit construction permit application to IDEM may not apply to Evansville because the modification or expansion of the water treatment plant will not increase system design capacity.[96, 97] Petitioner is not increasing the firm or rated capacities of the water treatment plant. Based on the 2016 Water Master Plan, the firm capacity is currently 42 MGD due to limitations of Mixing, Flocculation, Primary Sedimentation and Secondary Sedimentation.[98]

Under the Hybrid Solution that upgrades and reuses the South Plant Sedimentation Basins and demolishes the North Plant Sedimentation Basins, the firm capacity will drop to 36 MGD which is below Petitioner's current firm capacity.

Q: Does the Indiana Finance Authority's State Revolving Fund ("SRF") Program require a LCCBA?

A: It is not called a LCCBA but the SRF program requires applicants to submit an evaluation of alternatives with their Preliminary Engineering Report ("PER") that includes a 20-Year Net Present Worth analysis.

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[96] Under IC 13-18-26-1 (c)(3) a Certificate of Completion for a Life Cycle Cost-Benefit Analysis is not required for a permit for the modification or expansion of a drinking water treatment plant that does not increase system design capacity.

[97] *See* Attachment JTP-28, Life Cycle Cost-Benefit Analysis, IC § ch. 13-18-26 and Indiana Finance Authority SRF Program, Preliminary Engineering Report requirements for evaluation of alternatives and a 20-Year New Present Worth Analysis.

[98] *See* Attachment JTP-23 for the Water Treatment Plant's current firm and rated capacities.

Q: Has Petitioner prepared and submitted a Preliminary Engineering Report with an evaluation of alternatives and a 20-Year Net Present Worth analysis?

A: Petitioner submitted a PER prepared by AECOM and VS Engineering in June 2021 to IFA for AECOM's new WTP project that included Life Cycle Cost Analyses for Unit Process alternatives and for the four Plant-Wide Alternatives. It appears that Petitioner may have not submitted a revised PER. In response to discovery asking if Petitioner will submit to IFA a revised PER for the Hybrid Solution, Petitioner indicated the PER, being prepared by Black & Veatch, will be submitted by Petitioner to IFA on May 1, 2024. The estimated cost of preparation is $233,980.[99]

Q: What is your recommendation regarding LCCBAs for Petitioner's projects?

A: As part of its standard capital project planning efforts, especially for higher cost projects, Petitioner should continue identifying alternatives for its capital projects and should prepare and complete bona fide and required LCCBAs to comply with IC § 13-18-26-3 and 20-Year Net Present Worth analyses to comply with IFA requirements. Based on Petitioner's response to discovery that Clark Dietz's analysis of the life cycle costs for the hybrid and new plant options (without ozone) are approximately the same over a 20-year planning period, Petitioner should revisit its decision to build the Hybrid Solution instead of the new WTP.

IX. BUILD AMERICA BUY AMERICA ("BABA") REQUIREMENTS

Q: What is BABA and what is its relevance to this case?

A: The Build America, Buy America Act, Pub. L. No. 117-58, §§ 70901-52, part of the Infrastructure Investment and Jobs Act ("IIJA"), Pub. L. No. 117-58, was signed

[99] Petitioner's response to DR 10-9.

into law on November 15, 2021, with the goals of strengthening Made in America Laws, bolstering America's industrial base, protecting national security, and supporting high-paying jobs. The Act requires that no later than May 14, 2022, that "none of the funds for a Federal financial assistance program for infrastructure may be used for a project unless all iron, steel, manufactured products, and construction materials are produced in the United States."[100] Evansville identifies BABA as a potential factor increasing the cost of its project if it does not secure the authority it needs by the end of 2024.

Q: Are there already requirements mandating American Iron and Steel ("AIS")?

A: Yes. The State Revolving Fund, administered by the Indiana Finance Authority, has had requirements to use American manufactured iron and steel since 2014.[101]

Q: What is the schedule impact of BABA requirements on Evansville's project?

A: That remains unclear. Mr. Baldessari testified the WTP project is grandfathered in with SRF, but if Petitioner cannot close the bonds by December 31, 2024, the Build America Buy America ("BABA") requirements will apply thereby increasing the cost burden on customers (Mr. Baldessari did not quantify the cost burden to ratepayers but indicates project costs could rise $40 to $50 million). He testified Petitioner intends to redesign the WTP Project, receive additional authorization and complete the financings by September 30, 2024, in advance of the December 31,

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[100] Source: US EPA website, https://www.epa.gov/cwsrf/build-america-buy-america-baba, April 24, 2024.

[101] The Consolidated Appropriations Act of 2014 (Public Law 113-76) included an American Iron and Steel (AIS) requirement for Clean Water State Revolving Fund (CWSRF) and Drinking Water State Revolving Fund (DWSRF) assistance recipients to use American produced iron and steel products for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works.

2024 BABA deadline.[102]

At the September 14, 2023, weekly Progress Meeting for the WTP project, Matt Montgomery, EWSU's Vertical Capital Projects Manager, updated the group on whether BABA needs to be followed, stating EWSU's preliminary determination is that this is still the same project approved by IDEM [sic] (should be IFA) on May 14, 2022, if Evansville closes on financing by September 30, 2024. He reported that if Evansville starts work on the intake structure, this will count, and Evansville needs the final price by June 1, 2024.[103]

Meeting minutes for the September 22, 2023, Progress Meeting on SRF BABA vs. AIS reflected the team's assumption that BABA requirements would not need to be met.[104] Meeting minutes for the October 26, 2023, Progress Meeting reported that SRF has said that if EWSU's loan is not closed on the project by September 2024, then the project will be subject to BABA requirements.[105]

Q: What is BABA's potential cost impact on the project?

A: According to Mr. Baldessari, BABA compliance could add as much as 20% to the project costs or in the range of $40 - $50 million dollars.[106]

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[102] Petitioner's Exhibit No. 1, Case-in-Chief Testimony of Douglas L. Baldessari, January 25, 2024, p. 24.

[103] *See* Attachment JTP-17 for the Progress Meeting minutes for the Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting project, Item 1.2 d. SRF BABA vs. AIS, September 14, 2023, prepared by Clark Dietz, Inc., p. 9 of 38.

[104] *Id.*, p. 12 of 38.

[105] Id., p. 27 of 38.

[106] Petitioner's Exhibit No. 1, Case-in-Chief Testimony of Douglas L. Baldessari, January 25, 2024, pp. 24-25.

Q: What evidence did Mr. Baldessari provide to support his claim that costs could increase by 20% or $40 to $50 million?

A: None.

Q: Did the OUCC ask discovery on the cost impacts of the BABA requirements?

A: Yes. However, Petitioner did not provide evidence supporting its assertion that costs could increase 20%. In discovery asking Petitioner for support of a 20% cost impact, Petitioner responded in part as follows:

> The 20% estimate is based on information provided by Petitioner's management after discussions with the Indiana Finance Authority and information gathered from the EPA webinar referenced in subpart a. Petitioner has not done a full detailed analysis of each and every component for the water treatment plant project which would need to be addressed to satisfy the BABA requirements. That exercise would incur unnecessary time and expenses for a cost that Petitioner is trying to avoid. The $40 to $50 million dollars, as quoted, is based on 20% of the estimated overall cost of the water treatment plant project, assuming costs were in the range of $200,000,000 to $250,000,000.[107]

Q: Since SRF already has American Iron and Steel requirements and many construction materials are locally sourced, which WTP components would BABA affect?

A: Petitioner does not say. Most construction materials such as sand, gravel, ready mix concrete, brick, and asphalt are locally sourced, not imported. BABA would apply to electrical and instrumentation components. It may also apply to imported cement if used by local concrete plants and to ductile iron fittings and valves if imported.

Q: How reasonable is a 20% BABA adder applied to the entire construction cost?

A: Absent an explanation by Petitioner, it is unreasonable to apply an across the board 20% adder to the entire construction cost. A check of major cost components for a hypothetical $100 million project shows this. Assuming 80% of costs or $80 million

[107] *See* Attachment JTP-29 for Petitioner's responses to DR 12-3 regarding BABA requirements and impacts.

are for non-imported items such as construction labor, local materials (sand, gravel, concrete, brick, asphalt), American iron and steel pipe, valves, and fittings (already required to be U.S. made under IFA's American Iron and Steel requirements), bonds, heavy construction equipment (already owned or rented), small tools and safety equipment (already owned), fuel and other consumables, general conditions, contingencies, overhead & profit, permits, Builder's Risk insurance, etc., plus 50% of the remaining $20 million of costs for American process equipment, there would only be 10% or $10 million remaining which could be imported. Even if the cost for American made process equipment was 50% higher than the imported cost, equipment cost would only increase $5 million raising the total project cost to $105 million. This would be a 5% increase, not a 20% increase.

X. PER- AND POLY-FLUOROALKYL SUBSTANCES ("PFAS") REMOVAL FACILITIES

Q: Why are you discussing PFAS regulations in this subdocket?

A: Petitioner's approved funding for the new WTP in Cause No. 45545 included additional costs for deeper filters and granular activated carbon for future PFAS removal. In the 2022 subdocket Petitioner requested additional funding for the same thing – deeper filters. Petitioner also proposed acquiring the Levee Authority property for future WTP expansion for PFAS removal facilities.

Q: Has the U.S. EPA issued the Final PFAS regulations?

A: Yes. On April 10, 2024, the US EPA finalized the federal drinking water regulations for PFAS also known as "forever chemicals" which were first proposed on March

14, 2023. Utilities have three years to monitor for PFAS contaminants and, if above the standards, must construct PFAS removal facilities within two years.

Q: Petitioner's witness Lane T. Young explained in his 2022 rebuttal testimony that AECOM's 60% design and the GMAX price proposal were delayed because of the decision to acquire the Levee Authority property for PFAS removal. Did AECOM include PFAS removal in the new Hybrid WTP design?

A: No. PFAS facilities are absent from AECOM's 2021 Basis of Design Report[108]. AECOM stated that, until PFAS standards come in force in Indiana, it is premature to address PFAS treatment. But AECOM added that, if PFAS became an issue, the most plausible treatment would be use of granular activated carbon (GAC), achieved by converting the BAC filters into GAC filters, or through second stage GAC adsorbers specifically for PFAS sorption.[109, 110] AECOM designed deeper filters with 56-inches of granular activated carbon ("GAC") for the Biologically Active Filters in the 100% design drawings but did not reserve space for future PFAS removal facilities on the layout drawings.[111]

Q: Is PFAS removal included in the Hybrid Solution design?

A: No. Black & Veatch reported that based on the first three quarters of UCMR5 data collection, PFAS levels in the Ohio River source water have historically been just below the minimum reporting limit for all compounds and while space has been

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[108] Petitioner's response to DR 1-5 Preliminary Water Treatment Plant Basis of Design, AECOM, August 2021, provided as part of Petitioner's Request for Qualifications for the Guaranteed Energy Savings Contract.

[109] *Id.*, p. 58 of 124.

[110] GAC contactors are recommended for PFAS removal per the Policy Statement on Per-and Polyfluoroalkyl Substances in the *Recommended Standards for Waterworks*, published by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, 2022 Edition, p. ix. (commonly referred to as the Ten States Standards).

[111] Sheet No. 4-D301 in 100% Design Drawings shows 56-inches of GAC filter media.

allocated for post-filter GAC contactors for future potential PFAS treatment, a PFAS treatment requirement was not included in this scope of the project.[112,113] However, the location for the future PFAS removal facilities is not shown on any of Black & Veatch's 30% design drawings.[114]

Q: Did Petitioner previously justify higher costs to both deepen the filters and acquire the Levee Authority property for future PFAS removal?

A: Yes. In his 2022 subdocket testimony, Petitioner's witness Mr. Baldessari justified including additional funding for PFAS removal as follows:

> ….the footprint for the treatment plant will need to be expanded from the original design to add room to mitigate future requirements for per-and polyfluoroalkyl ("PFAS"). p. 4
>
> A study conducted by the Ohio River Valley Water Sanitation Commission ("ORANCO") in July 2022 identified PFAS in the Ohio River at levels which exceed the current interim guideline published by the United States Environmental Protection Agency. As a result of this study, the design of the water treatment plant will include deeper filter beds to allow for future PFAS treatment if required. - $2,284,000. p. 10
>
> Due to the inclusion of the PFAS remediation and the Levee Authority's willingness to relocate in order to accommodate the expansion of the original site, design will require demolition of the existing Levee Authority facility - $750,000. p. 11[115]

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[112] UMCR5 stands for 5th Unregulated Contaminant Monitoring Rule administered by the U.S. EPA.

[113] *See* Attachment JTP-21 for Petitioner's supplemental response to DR 12-1 - Draft Basis of Design Memorandum, EWSU Water Treatment Plant Improvements, Black & Veatch, March 8, 2024, p. 44 of 153.

[114] Petitioner's response to DR 12-1.

[115] Petitioner's Exhibit No. 1, September 23, 2022, pp. 4, 10-11.

> Item 4: The original site layout was developed due to the previous Levee Authority leadership's desire not to relocate their building and before the proposed PFAS regulations where [sic] known. Since that time, the Levee Authority has changed their stance on relocating and are willing to relocate to assist the utility. This space allows for a better overall facility layout and sets the design up for potential expansion of the pretreatment basin and filter building, which will allow space necessary for the added PFAS treatment once those regulations are determined. This will require demolition of the Levee facility.[116]

In his 2022 Rebuttal testimony, Petitioner's witness Lane T. Young testified:

> The only aspect of the design that is "changing" in this request is Evansville's decision to include deeper filter beds to allow for future PFAS treatment and the need to expand the plant to accommodate the PFAS remediation. There is no question PFAS treatment will be needed in the future and including this flexibility in the design now will mitigate the cost when Evansville later needs to update its treatment process after PFAS regulation becomes a reality. This decision will save Evansville's customers money and it is plainly common sense to include the deeper filter beds and other engineering components in the design.[117]

XI. MASTER PLAN

Q: Does Petitioner have a WTP Master Plan showing existing processes, areas reserved for expansion, and locations reserved for future processes?

A: No. Consultant HNTB created Water Master Plans in 2009 and 2016 which are mainly reviews of the condition and rehabilitation needs of the existing facilities. These Water Master Plans should more appropriately be considered Capital Improvement Plans ("CIP"). They list WTP and distribution system projects, provide project cost estimates, and program the year for each project's completion.

[116] *Id*., Attachment DLB-2, p. 2 of 2.

[117] Petitioner's Exhibit No. 2-R, Rebuttal Testimony of Lane T. Young, December 5, 2022, p. 20.

However, they are not guides laying out the long-term plan for expanding, upgrading, and replacing treatment processes and structures.

Q: Petitioner switched to a Hybrid WTP, replacing AECOM's plan for a new WTP. Does Petitioner have a WTP Master Plan showing space reserved for future facilities that were deleted from the AECOM design?

A: No. Treatment units deleted from the WTP improvements such as coagulation / flocculation facilities, sedimentation tanks, ozonation, biologically active filters, PFAS removal, residuals, a new Administration building, and a new Maintenance building are not discussed in the 2009 and 2016 Water Master Plans or in the Hybrid Solution. Petitioner's current design engineers did show a possible location for a future ozonation system on site layouts for the Hybrid options.[118] In response to discovery, Petitioner stated it does not have a current WTP Master Plan showing reserved spaces for future facilities but added that Black & Veatch is going to prepare a plan showing the space reserved for future use as part of their current work.[119]

Q: Does Petitioner have a Future Site Plan with locations of existing, proposed (current Hybrid project), and future treatment facilities and structures?

A: No. Petitioner prepared several layout drawings for the Hybrid Solution and drawings showing areas of the WTP and the Levee Authority and City Garage properties that could be reused or redeveloped for other purposes. In discovery, the OUCC asked if Petitioner had a Future Site Plan. Petitioner did not provide the plan but responded that currently, EWSU is working on an overall Future Site plan with

[118] *See* Attachment JTP-17 for the four layout drawings for the Hybrid option, pp. 31-34.

[119] Petitioner's response to DR 13-9.

its designer, Black & Veatch, and once the overall layout has been developed it will be made available for review.[120]

Q: Have you reviewed the site layouts prepared by AECOM for the new WTP and by Black & Veatch for the Hybrid Solution?

A: Yes. Black & Veatch's site layout has flipped the new filters' location back to the original 2021 AECOM layout sequence. Through value engineering AECOM and Petitioner had determined the original layout was not optimal with higher costs for raw water piping. AECOM's 2021 planning layout located all new facilities in the low-lying area east of the existing WTP and the Flood Control Levee on the City Garage site.[121] AECOM's original 2021 design changed from the planning layout and 30% design, which located the new Sedimentation Basins farthest away from the existing WTP and located the new Filters in between the existing WTP and the new Sedimentation Basins.[122]

Under AECOM's value engineering effort, the original 2021 arrangement was deemed not optimal and more costly. As a VE idea, AECOM flipped the arrangement of process units to shorten the raw water piping length. The layout for AECOM's new WTP design (100% design) moving east from the existing WTP was 1) new Sedimentation Basins; 2) Ozonation; and 3) new Filters/Clearwells/High Service Pump Station. This improved arrangement follows the hydraulic profile

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[120] Petitioner's response to DR 13-10.

[121] The ground elevation at the new WTP's site is approximately 364 feet which is about 20-feet lower than the 384 feet elevation of the existing WTP and Flood Control Levee.

[122] *See* Attachment JTP-27 for AECOM's Planning and Design Drawings and Black & Veatch's 30% layout Drawing showing changes in the positions of the Sedimentation and Filtration treatment units.

from highest to lowest (Intake Structure, Flocculation / Sedimentation Basins, Ozonation, and Filters/Clearwells/High Service Pump Station).

In response to discovery, Petitioner provided Black & Veatch's layout, which places the filters in their original position shown in AECOM's planning and 30% design documents, which placement had been rejected in value engineering. Black & Veatch reoriented the new filters to a north south orientation to place the new structure next to the flood control levee.[123] Neither Black & Veatch's 30% design nor the layout drawing from the response to DR 13-8 show locations of future treatment units such as new Flocculation/Sedimentation Basins, Ozonation, and PFAS removal facilities. (Flocculation/Sedimentation Basins were deferred in favor of reusing the South Plant Sedimentation Basins. Ozonation was deferred in the Hybrid design as a cost reduction measure.)

Q: What do you recommend regarding a Master Plan and Future Site Plan for Evansville's water treatment plant?

A: I recommend Petitioner develop a long-term plan for orderly expansions, upgrades, and additions to the water treatment plant anticipated to be needed in the future. Such a plan would identify and size those treatment processes and reserve space for these future improvements. The Master Plan should develop a Hydraulic Profile for the build-out condition to set the needed elevation for the new filters proposed in the Hybrid Solution. Petitioner should also create a Future Site Plan or Layout identifying all existing and future treatment processes and structures. Additionally,

[123] Flood elevations and the placement of new facilities behind the flood control levee were concerns to IDEM plan reviewers. *See* Attachment JTP-30 for Petitioner's responses regarding flood protection for the new WTP facilities and information on the 1937 Ohio River flood.

the Future Site Plan should identify and locate all buried process piping and site utilities serving the WTP.

XII. REUSE POTENTIAL OF EXISTING TREATMENT PLANT SITE

Q: Does Petitioner have a plan for what will be done with the historical 1900 Pumping Plant building and the Filters 13-20 building?

A: It appears Petitioner wants to redevelop the northern portion of the existing WTP site due to its riverfront location, but Petitioner has not shared those plans involving the WTP with the OUCC. Evansville highlighted its WTP age seeming to imply all was built over 100 years ago. Ironically, under the Hybrid Solution, Evansville is keeping the only part of the WTP that *was built* from 1895 to 1900, the original 1900 Pumping Plant building which is labeled on drawings as High Service Pump Station No. 1. Today, this building is essentially unused. Evansville retired the original pumps long ago, removed most piping, valves, pumps, and motors in 2011 and filled the 50 ft. diameter 60 feet deep wet well per US Army Corps of Engineers order[124].

Q: What are the near-term plans for the 1900 Pumping Plant building?

A: It appears that it will continue in use for the plant offices and the water laboratory. The site plan for the Hybrid option indicates the 1900 Pumping Plant building will continue in use for Administration facilities.[125] Due to higher costs for the new WTP

[124] See Attachment JTP-31, p. 3. The wet well was filled due to the risk during flood conditions that river water could flow into the well and pose a flooding threat to the protected side of the levee.

[125] Petitioner's Exhibit No. 3, Case-in-Chief Testimony of Andrea W. Bretl, Attachment AWB-3, Technical Memorandum, VE Process Summary, November 14, 2023, p. 7 of 139.

which included new Administration and Maintenance buildings, Petitioner deleted both planned buildings from the Hybrid design.

Q: What are the long-term plans for the 1900 Pumping Plant Building?

Petitioner does not say. Evansville's previous Executive Director, Lane T. Young, discussed the new Water Treatment Plant project and possible uses for a repurposed 1900 Pumping Plant building in a news article in 2023.[126]

> The next big project is replacing the drinking water treatment plant which was first built in 1897. Young said it will eventually be built where a Levee Authority and facilities maintenance building sit now, near the new pump station. The current building will then hopefully be repurposed. "The next thing we hope to have (is) a public-private partnership and have an amenity, maybe some boutique shops and restaurants, maybe some loft apartments, and have an anchor for the riverfront that then just goes all the way there," Young said.

There also appear to be possible future development plans for the Evansville riverfront in the vicinity of the existing WTP. In 2023, plans were announced for the Ohio River Vision and Strategic Plan ("ORVSP") led by consultant Sasaki of Massachusetts.[127] Conceptual plans show the northern part of the existing water plant site being repurposed as part of a park or southern terminus for a greenway.

XIII. PROPERTY ACQUISITION AND RELOCATION COSTS

Q: Has Petitioner acquired the City Garage and Levee Authority properties?

A: No. In discovery, Petitioner indicated it will acquire both properties once the City

[126] *See* Attachment JTP-32 for the news article by WNIN, Tri-State Public Media, Inc. - As Cascade Opens, City Eyes Pump Station Public Access and Plans New Treatment Plant, April 24, 2023.

[127] *See* Attachment JTP-33 for information on the Ohio River Vision and Strategic Plan.

Garage and Levee Authority operations are relocated.[128]

Q: Are both properties needed for the Hybrid Solution?

A: The City Garage property is not needed. Contrary to AECOM's 2021 Advanced Facility Plan and 30% design drawings, no new WTP facilities will be located on the City Garage site under the Hybrid design by Black & Veatch. While the City Garage site is not needed, the new facilities layout provided in response to DR 13-8 shows the new filters will be located partially on the Levee Authority parcel.[129]

The VE Team and EWSU discussed Petitioner's justification for acquiring the Levee Authority and City Garage properties at the September 7, 2023, Progress meeting:

> 1.2 c. Land use – EWSU previously justified taking Levee Authority Bldg. and City Garage because of needing more space to meet PFAS requirements.
> • Decision: If EWSU needs to say that that decision was re-thought, and that the land isn't fully utilized in the current plan, that's ok.[130]
>
> 3.4 Arcadis – Discussed their Alternative 3 as well as 2 and 2B, which reuse parts of the existing north plant. They focused their later alternatives on minimizing the use of the old Levee Authority building given the potential beneficial reuse of that space.[131]

Q: What are the costs to the Water Utility to buy the City Garage and Levee Authority properties and relocate the Street Maintenance Department and Levee Authority operations?

A: In response to discovery, Petitioner indicated the total cost of construction for the Levee Authority property acquisition is $6,172,630 of which EWSU's portion is

[128] *See* Attachment JTP-34 for Petitioner's responses regarding acquisitions. use, and environmental conditions of the City Garage and Levee Authority properties.

[129] *See* Attachment JTP-27 for Black & Veatch's site layout drawing provided in response to DR 13-8.

[130] *See* Attachment JTP-17 for the September 7, 2023, Progress Meeting minutes, p. 5 of 39.

[131] *Id.*

$4,100,000. For the City Garage site, Petitioner reported it has not had to put any money toward the acquisition of the property. The only costs that will be required of EWSU will be demolition, see OUCC DR 13-12. [132]

XIV. OTHER MATTERS

Q: Ms. Bretl states Evansville's existing treatment plant is well over 100 years old, and most structures and treatment components are well past their design life.[133] Do you agree the water plant should be characterized as being 100 years old?

A: While parts of the existing treatment plant have been in place for more than 100 years, most of the facilities are newer than that. Facilities older than 100 years old include the original Pumping Plant building and two active treatment units: 1) the North Plant secondary sedimentation basins which began service in 1912; and 2) Filters 13-16 which were added in the 1923 expansion.[134, 135]

The plant has had improvements, upgrades, and expansions in its history that AECOM summarized including plant-wide upgrades and addition of Filters 33-34 in 1997 to 1999, major electrical and controls upgrades, and new chemical facilities in 2007, and new Filters 35-36 in 2009. [136] Notwithstanding Filters 13-16's age, their

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[132] *See* Attachment JTP-34 for Petitioner's responses to DR 13-11, DR 13-12 (Levee Authority property), DR 13-13, DR 13-14 (City Garage property), and DRs 13-18 and 13-19 (Environmental Assessments).

[133] Petitioner's Exhibit No. 3, Case-in-Chief Testimony of Andrea W. Bretl, p. 16.

[134] *See* Attachment JTP-35 for an article from the Municipal Journal and Engineers, June 2, 1909.describing Filters 1-12 (abandoned but in place) and the sedimentation basins (originally named Coagulating Basins). *See* also Attachment JTP-31 for the history of the Evansville Water Treatment Plant prepared by the Utility in 2013.

[135] *See* Attachment JTP-22 for Petitioner's response to 45545 DR 3-20 from 2021 regarding the years when filters were placed in service and responses to 45545 S1 DR 13-15, 13-16, and DR 13-17.

[136] *See* Cause No. 45545, Attachment SMB-1, *Water Treatment Plant, Advanced Facility Plan, Alternatives Report*, AECOM, March 2021 to the case-in-chief testimony of Simon M. Breese, May 10, 2021, p. 12.

unneeded filtration capacity to meet current demand, and the decision to demolish them in the near future, Petitioner awarded a $1,478,475 contract for the Filters 13-20 Pipe Gallery Rehabilitation Project in early 2023.[137]

Petitioner proposes to demolish the entire North Plant after completing the Hybrid project which includes both active treatment units above along with the abandoned original 1912 Filters (Filters 1-12). But despite being the oldest plant structure and based on my review of Black & Veatch's 30% design drawings, Petitioner does not plan to demolish the original Pumping Plant building constructed from 1895 to 1900 ("1900 Pumping Plant building").[138] The majority of the building is unused for treatment, sits mainly empty, and is used for storage. Demolition costs for the 1900 Pumping Plant building were listed in the Water Plant Select Demolition proposal from Klenck Company, but demolition is not shown on the 30% Design Drawings.[139] Petitioner may have undisclosed long-term plans for the 1900 Pumping Plant building and the North Plant real estate.

Q: Does Ms. Bretl present evidence identifying design lives of the structures and treatment components?

A: No. She neither identifies design lives of any existing structure or treatment unit nor the design lives of any proposed new facilities or rehabilitated facilities. She testifies

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[137] *See* Attachment JTP-36 for the Project Description, competitive bids received on January 31, 2023, and the award to low bidder, Deig Brothers, on February 14, 2023.

[138] The original Pumping Plant building began service in 1900 and was constructed to distribute raw (untreated) Ohio River water via the distribution system. Today, building use is primarily for storage. Petitioner refurbished the exterior bricks (tuck-pointing), windows and installed a new synthetic slate roof with a 50-year warranty in 2006-2007 (Source: *Water Master Plan*, HNTB, September 2016, p. 3-38).

[139] Petitioner's response to DR 12-2 (e), Water Plant Select Demolition proposal, Klenck Company, October 6, 2023. Costs to demolish High Service Pump Station, Removal 3' Below Grade - $422,200 or Complete Removal - $497,300.

"the Hybrid Option is a reasonable alternative to building an entirely new plant, as it will rehabilitate existing components of the plant that have at least 30 years of design life remaining and rebuild new components of the plant and allow the plant to remain on and directly adjacent to the existing site."[140] I have never seen a listing of design lives for water treatment plant structures and equipment.

Q: Shouldn't the focus be on determining the alternative with the lowest life cycle cost-benefit – rehabilitation of existing facilities, all new facilities, or a hybrid?

A: Yes. In late 2020 or 2021, Petitioner and AECOM selected a new surface water treatment plant (with a rehabilitated Raw Water Intake) on a new site (City Garage) as the preferred alternative of four alternatives examined and justified their selection with an analysis of Life Cycle Costs (Capital costs and Operation and Maintenance costs) and Non-Monetary Benefit Score.[141] In my testimony and in my deposition in Cause No. 45545, I noted AECOM's life cycle cost analysis did not include all costs for all alternatives such as demolition and residuals. I also noted problems with AECOM's Non-Monetary Scoring which appeared to be skewed. (Public's Exhibit No. 4, Cause No. 45545, pp. 24-26).

Q: What is the current project schedule?

A: In response to discovery, Petitioner provided an updated project schedule showing 100% design completion by August 16, 2024, a construction start date of January 2, 2025 and a final completion date over five years later on March 31, 2030.[142] The

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[140] Petitioner's Exhibit No. 3, Case-in-Chief Testimony of Andrea W. Bretl, p. 16.

[141] *See* Cause No. 45545, Attachment SMB-1, *Water Treatment Plant, Advanced Facility Plan, Alternatives Report*, Chapter 10 Recommendations, AECOM, March 2021 to the case-in-chief testimony of Simon M. Breese, May 10, 2021, pp. 134-138.

[142] *See* Attachment JTP-20 for Petitioner's response to DR 13-20.

construction duration is longer than the schedule shown by AECOM in the 2021 Advanced Facility Plan of 2022 to 2025.

Q: Has permitting for the Hybrid Solution been initiated- with IDEM?

A: No. Permitting would include the IDEM construction permit and permits issued for construction on the flood control levee and for any piping penetrations through the levee. On May 1, 2024, in response to an inquiry I made via email, IDEM reported they have not yet received design plans or a construction permit application from Petitioner.

XV. RECOMMENDATIONS

Q: What do you recommend?

A: I recommend the following:

1. Because the Hybrid Solution does not provide the stated 50 MGD firm capacity for the rehabilitated and upgraded South Plant Sedimentation Basins, I recommend the Commission condition Petitioner's requested financing authority on Petitioner evaluating whether the third set of South Plant clarifiers, that were originally approved and funded in 2007, would be necessary to achieve the 50 MGD firm capacity.
2. I recommend the Commission condition Petitioner's requested financing authority on Petitioner rehabilitating and reusing the existing South Plant Filter building and Filters 21-28 for continued filtration in the same configuration now in use.

3. I recommend the Commission condition Petitioner's requested financing authority on Petitioner reducing the number of new filters from the proposed fourteen filters to eight filters with a minimum filtration capacity of approximately 3.0 MGD per filter at a 2.0 gpm/ft^2 loading. The rated capacity for all 16 filters (existing Filters 21-28 plus eight new filters) would then be 48 MGD and the firm capacity (with one filter out of service) would be 45 MGD.

4. Based on Petitioner's response to discovery that Clark Dietz's analysis of the life cycle costs for the hybrid and new plant options (without ozone) are approximately the same over a 20-year planning period, I recommend Petitioner explain its decision to build the Hybrid Solution instead of the new WTP.

5. I recommend the Commission condition Petitioner's requested financing authority on Petitioner developing a long-term plan for orderly expansions, upgrades, and additions to the water treatment plant that are anticipated to be needed in the future. Such a plan should identify and size those treatment processes and reserve space for these future improvements. Petitioner should also create a Future Site Plan or Layout identifying all existing and future treatment processes and structures. Additionally, the Future Site Plan should also identify and locate all buried process piping and utilities serving the WTP.

Q: Does this conclude your testimony?

A: Yes.

Appendix A

Q: Please describe your educational background and experience.

A: In 1980 I graduated from Purdue University, where I received a Bachelor of Science degree in Civil Engineering, specializing in Environmental Engineering. I then worked two years with Peace Corps / Honduras as a municipal engineer on self-help rural water supply and sanitation projects funded by the U.S. Agency for International Development (U.S. AID). In 1984 I earned a Master of Science degree in Civil Engineering (Environmental) from Purdue University. I have been a Registered Professional Engineer in Indiana since 1986. In 1984, I accepted an engineering position with Purdue University, and was assigned to work as a process engineer with the Indianapolis Department of Public Works ("DPW") at the City's Advanced Wastewater Treatment Plants. I left Purdue and subsequently worked for engineering consulting firms, first as a Project Engineer for Process Engineering Group of Indianapolis and then as a Project Manager for the consulting firm HNTB in Indianapolis. In 1999, I returned to DPW as a Project Engineer working on planning projects, permitting, compliance monitoring, wastewater treatment plant upgrades, and combined sewer overflow control projects. In 2014 I joined the OUCC as a Utility Analyst II and was promoted to Senior Analyst in 2022.

Q: What are the duties and responsibilities of your current position?

A: My duties include evaluating the condition, operation, maintenance, expansion, and replacement of water and wastewater facilities at utilities subject to Indiana Utility Regulatory Commission ("Commission") jurisdiction.

Q: Have you previously testified before the Commission?

A: Yes.

Appendix B - List of Attachments

Attachment JTP-15	Kokosing Industrial, Inc.'s Guaranteed Saving Contract (GSC) – selection letter.
Attachment JTP-16	AECOM's Engineer's Opinions of Probable Construction Cost ("EOPCC") based on the 75% Design ($310,729,862, May 4, 2023) and 90% Design ($299,938,948, May 16, 2023).
Attachment JTP-17	Petitioner's response to DR 10-1 - Meeting minutes for the nine Progress Meetings examining value engineering and the Hybrid Solution August 31, 2023, to October 26, 2023.
Attachment JTP-18	Petitioner's responses to DR 10-11, Kokosing Industrial, Inc.'s June 28, 2023, GMAX Price proposal for $352,842,000 with no details and July 12, 2023 GMAX Price Revision 1 with details
Attachment JTP-19	Petitioner's responses to DR 10-15 to DR 10-18 and DR 12-10 (Hybrid Estimate)
Attachment JTP-20	Petitioner's response to DR 13-20 regarding the current schedule.
Attachment JTP-21	Petitioner's supplemental response to DR 12-1 - Draft Basis of Design Memorandum, EWSU Water Treatment Plant Improvements, prepared by Black & Veatch, March 8, 2024
Attachment JTP-22	Petitioner's responses to 44760 DR 8-5 from 2016 regarding filter media replacement, 45545 DR 3-20 from 2021 regarding the existing filters and the underdrain and filter media replacements and responses to 45545 S1 DR 13-15, 13-16, and DR 13-17.
Attachment JTP-23	Existing Water Treatment Plant aerial view showing major process units and structures labeled and Table 3.1 Water Treatment Plant Firm Capacities, (Source: Petitioner's response to DR 3-11, Cause No. 45073, Water Master Plan, HNTB Corp. September 2016)
Attachment JTP-24	Excerpts on the 3rd Set of South Plant Sedimentation Basins project and Site Plan from the 2009 and 2016 Water Master Plans, HNTB
Attachment JTP-25	Water Plant Value Engineering and Conceptual Design/Budgeting, Workshop minutes (nine weekly meetings between August 31st and October 26th 2023).
Attachment JTP-26	Rehabilitation Needs for the South Filter Building (Filters 21-28) Cause No. 45545, Case-in-Chief Testimony of Simon M. Breese, Attachment SMB-1, *Water Treatment Plant, Advanced Facility Plan,* March 2021, p. 73 of 276.

Attachment JTP-27	AECOM's Planning and Design Drawings and Black & Veatch's 30% layout Drawing showing changes in the positions of the Sedimentation and Filtration treatment units.
Attachment JTP-28	Life Cycle Cost-Benefit Analysis, IC ch. 13-18-26.
Attachment JTP-29	Petitioner's responses to DR 12-3 regarding BABA requirements and impacts.
Attachment JTP-30	Petitioner's responses regarding flood protection for the new WTP facilities.
Attachment JTP-31	Evansville WTP History Information April 9, 2013.
Attachment JTP-32	News article by WNIN, Tri-State Public Media, Inc. - As Cascade Opens, City Eyes Pump Station Public Access and Plans New Treatment Plant, April 24, 2023
Attachment JTP-33	Ohio River Vision and Strategic Plan information
Attachment JTP-34	Petitioner's responses regarding acquisitions. Use, and environmental conditions of the City Garage and Levee Authority properties.
Attachment JTP-35	Evansville Mechanical Filters, Municipal Journal and Engineers, June 2, 1909. Description of the design of Filters 1-12.
Attachment JTP-36	Filters 13-20 Pipe Gallery Rehabilitation Project - U1024, Project Description, competitive bids received on January 31, 2023, and the award to low bidder, Deig Brothers, on February 14, 2023

AFFIRMATION

I affirm the representations I made in the foregoing testimony are true to the best of my knowledge, information, and belief.

By: James T. Parks
Cause No. 45545 S1
Office of Utility Consumer Counselor (OUCC)

Date: May 2, 2024

LLOYD WINNECKE
MAYOR

LANE T. YOUNG
EXECUTIVE DIRECTOR

EVANSVILLE WATER & SEWER UTILITY
1 SE 9th Street, Suite 200
Evansville, IN 47708

June 29, 2022

Lane T. Young
Executive Director

Re.: GSC Contractor Selection
New 50 MGD Water Filtration Plant

Dear Mr. Young,

The Selection Committee for the Guaranteed Saving Contract (GSC) contractor provider met on June 22, 2022 to secure recommendations for a contractor partner for the above referenced project. A Request for Qualifications (RFQ) was advertised and issued in accordance with Indiana Code 36-1-12.5 on April 19, 2022. Three (3) proposals were received by the committee on June 1, 2022. The firms that submitted are as follows in alphabetical order:

Bowen Engineering
F.A. Wilhelm
Kokosing Industrial

At our June 22 meeting, the committee evaluated the following evaluation criteria as outlined in the RFQ:

Firm Overview and Qualifications (2x)
References (1.5x)
Technical Approach (2x)
Project Implementation (2x)
Financial Approach (1.5x)
Guarantee Management (1x)

Individual independent scoring sheets were utilized by each committee member to rank each firm in each applicable criteria section on a weighted scale of 2pts, 5pts, or 10pts for each category. The highest possible aggregate score was 100 points. Below is a summary of the average points of the total selection team input:

Kokosing 91.3/100
Bowen 76.2/100
FA Wilhelm 58.4/100

In general, the highlights of the input from the selection team regarding each firm are as follows:

FA Wilhelm

While FA Wilhelm had good overall references from their previous customers, the major comment regarding FA Wilhelm from the committee was the fact that they did not demonstrate the past experience of a project of this size. The largest project they had on their resume was approximately $50 million and is currently ongoing. With our project potentially 3x this size, this factor weighed heavily on the committee. Another factor that was considered was the indication that they are proposing to only self-perform 20-30% of the work. This has the potential to introduce less than favorable factors to the project such as additional profit and overhead mark-up layers on a significant portion of the project, and loss of direct control of the work. Finally, they had proposed a fee mark up on the final cost of the project in lieu of applying it as lump sum upfront fee on the GMAX established price. While this may appear appealing at first glance, it was the committee's opinion that this may ultimately "de-incentivize" the contractor to value engineer out work because their fee will reduce as the contract value drops. Contractor's utilizing the fee based on GMAX establishment will be highly motivated to reduce scope and pass on savings to us as their fee remains the same while they reduce the risk of performing the work along with their overall profit margins increasing.

Bowen Engineering

Bowen submitted an overall good proposal as reflected in their scoring. They have done numerous water/wastewater GSC projects in Indiana. While Bowen did have some large Wastewater projects referenced ($100 million WWTP and a $275 million powerplant industrial treatment process), the largest water plant project they presented was $48 million. Another interesting and driving concern of the committee was the impression Bowen's proposal conveyed concerning their work plan. The work plan was very well thought out and specific, but it did not lead the committee to believe EWSU would be an equal partner in the decisions made – in other words it was based how they would do the project *for* us, not necessarily *with* us. Contractors in general tend to steer projects in the direction of what they understand and are capable of, not always what is best for the owner. In this realm the committee felt the breadth of Kokosing/Skanska was much broader thus opening up more opportunity for them to be comfortable and willing to pursue our needs and desires. This is a generational project that we need to get right and should not have to settle in any aspects. Lastly, a concern facing the committee was the personnel structure. The project manager put forth for 100% dedication to this project is currently assigned to our Wansford Yard project. That effort being a 24-month endeavor and this starting in about year, there appears to be an overlap. This was concerning to the group. Additionally, while the management structure was touted heavily, the "boots on the ground" craft level supervisory personnel was not as well defined as others. Harmonious relationships with the local labor pool are critical to the success of a project and having the key front-line supervision to cull, work with, and retain can make or break a project.

Kokosing

Kokosing is a known entity to EWSU as it is in the process of completing close to $65 million in projects, one of which was a GSC formatted project. The projects have been very successful from a performance and cost standpoint. We have been extremely happy with them overall. One of the most enticing aspects of Kokosing's proposal was the inclusion of IC Skanska as a major partner on their team. Skanska has a long successful history as a trusted local partner for the City of Evansville and brings the resources of one of the largest construction firms in the world. Kokosing in themselves brings a strong resume of large complex construction projects and most notably recently completed a $190 million water plant in Dublin Ohio. These factors weighed heavily on the committee's interest and confidence in Kokosing's ability to successfully execute this critical project. Other positive factors regarding Kokosing included a plant turn-over plan and a risk matrix. The turnover process is often overlooked by contractors but is a major piece of the overall success of the project and carries costly consequences if not executed properly. This to committee conveyed a "global" understanding of the project as a whole. The risk matrix acknowledges that a project of this complexity and size carries many risks of different severity. The fact that Kokosing recognizes and put merit into this demonstrates again that they are forward thinking and will help guide the team through these issues through risk mitigation. Kokosing also proposes to self-perform more than 70% of the work. With this, a large layer of contractor mark-up is eliminated and leaves Kokosing in better control of the project while still leaving approximately $40-50 million available for our local smaller contractors and M/WBE partners. As noted earlier, the relationships with the local work force pool is of utmost importance and Kokosing has proven they can do just that by building relationships with the local unions to attract and retain the highest skilled and motivated workers.

Based on the scoring and the above highlights, it is the unanimous consensuses of the selection committee to recommend that we move forward with Kokosing Industrial with scope and fee negotiations. Please let us know how to proceed and do not hesitate to contact us if you should have any questions or need further information.

Sincerely,

Matt Montgomery, PMP
Vertical Capital Projects Manager

Shawn Wright
Director, PMO

Cc: Harry Lawson
Steve Capin
JD Sloan
Rick Glover
Cris Cottom

From:	Young, Lane T
To:	Montgomery, Matthew
Cc:	Wright, Shawn
Subject:	RE: WTP GSC Recommendation Letter
Date:	Thursday, June 30, 2022 1:02:11 PM
Attachments:	image001.png

Thank you for this recommendation. I have spoken with the Mayor and we both concur with your recommendation so you may move the process forward with Kokosing/Skanska as the selected GSC Contractor on the new Water Filtration Plant project.
Lane

Lane T. Young | Executive Director
1 NW Martin Luther King Jr Blvd, Room 104 | Evansville, IN 47708
O: (812) 436-4560 | www.ewsu.com

From: Montgomery, Matthew <mmontgomery@ewsu.com>
Sent: Wednesday, June 29, 2022 11:59 AM
To: Young, Lane T <ltyoung@ewsu.com>
Cc: Wright, Shawn <swright@ewsu.com>
Subject: WTP GSC Recommendation Letter

Lane,

Please see the attached recommendation letter for your consideration. The committee was in agreement to move forward with a recommendation in lieu of interviews, as they did not believe any additional information would be brought forward interviews. The scoring indicated a large enough spread between the providers to confirm this.

Please let me know if you should require any further information or have any questions.

Thanks,

Matt

Matt Montgomery, PMP | Vertical Capital Projects Manager
1 SE 9th Street| Suite 200 | Evansville, IN 47708
O: (812) 421-2120 Ext. 2214 | M: (812) 470-4265

mmontgomery@ewsu.com

www.ewsu.com

OUCC DR 10-10 (Supplemental)

02/21/2024

DATA REQUEST
City of Evansville

Cause No. 45545 S1

Information Requested:

Reference Mr. Wright's Direct testimony, Attachment SW-5, page 3 of 9, which reads in part:

> May 4, 2023 – AECOM estimated construction cost of project to be $310M based on 75% design plans, this caused management to begin working on alternative plans, as that cost was deemed too high and unaffordable for our city. EWSU began preliminary talks with new consultants.

Please provide the following:

a. Copy of AECOM's $310M construction cost estimate based on the 75% design plans. Please include the Excel file with all cells unlocked and all formulas intact.
b. Copies of the detailed costs and supporting equipment and materials price quotes that AECOM relied on for its $310M estimate.

Original Information Provided: 02/08/2024

a. Please see OUCC DR 10-10 Attachment a.
b. Please see OUCC DR 10-10 Attachment a.

Original Attachments Provided: 02/08/2024

OUCC DR 10-10 Attachment a

Supplemental Information Provided: 02/21/2024

The PDF provided with the original response is the only cost support information AECOM provided to the City to support the 75% design. The City did not request additional cost information from AECOM to support the $310 million estimate, because the City determined the $310 million estimated cost for the WTP Project was too high, and therefore the City determined to explore alternative options for building the plant.

AREstimating
BASIS OF EOPCC

May 04, 2023

PROJECT: Evansville WTP
CLIENT: Internal Estimate, AECOM, Roanoke, VA
AECOM PROJECT NO: 60613867
EOPCC NO. & NAME: 20-018 - Evansville WTP 75% EOPCC (updated 05/04/2023)
BY: Josh Jeffrey, P.E., M.ASCE
DESCRIPTION: EOPCC (Engineers Opinion of Probable Construction Cost) for budgeting purposes and to compare with Contractor GMP

OPINION OF PROBABLE CONSTRUCTION COST

1. Opinion of Probable Construction Cost is based on a Class 4 Estimate prepared at the request of the AECOM office located in Roanoke, VA.
2. Opinion of Probable Construction Cost is based on the following documents:
   a. Design 75 Percent - Owner Review Set 03-10-2023_Full Set.pdf
   b. Assemble outputs for Architectural and Process dated March 24, 2023.
   c. Multiple discussions and emails with the design team.
3. Updates made on 5/04/23 the EOPCC submitted on 4/10/23 include the following:
   a. Added Levee Authority Building Demolition & Site Prep Cost of $750,000. Cost added to Site Civil WBS.
   b. Added Contaminated Soil Testing and Hauling Allowance of $6,000,000. Cost added to Site Civil WBS.
   c. Added Electrical Utility Feed Allowance of $2,000,000. Cost added to Transformer Yard WBS.
   d. Added Owner Contingency Allowance of 5% of the Total Construction Costs, totaling $14,796,660.
   e. Reminder that costs carried are in present day value as previously requested. No Escalation is carried within this Estimate.
4. Updates made on 04/10/23 to the Original EOPCC submitted on 3/31/23 include the following:
   a. Electrical Costs carried under Division 26 included have been split between Div. 25, 26 and 28.
   b. Process Equipment pricing has been updated to the most current data provided by the Design team.
   c. Surface square footage of buildings has been updated as a few discrepancies were discovered after the 3/31/23 EOPCC had been prepared.

d. Quantity discrepancies in the Assemble Design output were further identified and corrected. These corrections reduced estimated costs throughout the EOPCC, with a significant cost reduction to the chemical building.
e. Square foot building costs originally carried under masonry have been moved to the proper CSI Division.
f. Percentages carried for Contingency, Overhead & Profit, & General Conditions were reduced.
g. Demo- UST and Monitoring Wells ($36,984.00 ALLOWANCE) was removed as Design Team clarified this was outside the scope of the estimate.
h. Demo Levee Building (($666,629.00 ALLOWANCE) was removed as Design Team clarified this was outside the scope of the estimate.
i. Demo City Garage ($2,776,542.00 ALLOWANCE) was removed as Design Team clarified this was outside the scope of the estimate.

5. Design updates used in this EOPCC are from on or before 3/24/2023. There is a follow up EOPCC update due on 4/26/2023 that will be the final comparison to Contractor GMP submittal. The 4/26/2023 due date is predicated on all final design updates to be conformed into one folder location on or before 4/14/2023 which will be the start of the EOPCC update the by AECOM estimating team.
6. Mark-Up Structure consists of the following:
   a. Bond on Subcontractors 0.50%
   b. Mobilization / Demobilization costs are included at the rate of 2.50%.
   c. Local Sales Tax is excluded. Assume tax exempt
   d. Small Tools & Equipment are included at 1.50%.
   e. Safety Supplies & Equipment are included at 0.50%.
   f. Consumables are included on craft labor only at 1.50% on craft labor and equipment.
   g. Pricing is in US Dollars and includes 0% Total Escalation. This represents present day value.
   h. General Conditions are included at the rate of 9.00%.
   i. Contingency is included at the rate of 16.00%.
   j. Market Conditions are not included in contingency. Assume client has a mitigation strategy and/or additional owner contingency to account for the current labor shortage and supply chain volatility in the market.
   k. Overhead and Profit are included at the rate of 9.00%.
   l. Cost of all permits is included at 0.75%
   m. Builders Risk Insurance is included at the rate of 0.18%.
   n. Performance and Payment Bond is included at the rate of 1.00%.
7. Liquidated damages are not included.
8. Site security guard services are excluded.

9. Site hazardous or contaminated conditions are excluded including but not limited to PCB's, soil, water, specialized treatment, soil amending, disposal and remediation.
10. Environmental monitoring is excluded.
11. Land acquisition or right of way fees are excluded.
12. Engineering and design fees are not included.
13. Life cycle costing and operation & maintenance are not a part of this EOPCC.
14. Agency design contingencies, and other client costs excluded. This EOPCC includes construction contingency only.
15. Standard temporary office and laydown included in General Conditions.
16. General conditions exclude owner and 3rd party onsite office facilities.
17. 3rd Party Inspections are not included
18. EOPCC assumes working a regular 40-hour week. 8 hours per day during daylight shift.
19. Dewatering is allowance only.
20. Quantities on all items from design team output.
21. OH electrical work including pole removals and relocations to be done by others.
22. Assume building excavation material is suitable for onsite fills without drying or amending soil.
23. Assume soils will be reasonably workable and not require drying. Cost to stockpile and amend saturated or unsuitable soil prior to placement is not included.
24. All quantities and cost for major equipment and conveyance components were provided by design team.
25. The electrical estimate items account for grounding, lightning protection, Fire Alarm, CCTV systems and Access Control to the buildings.
26. The estimate has excluded cathodic protection, electrical heat tracing and pipe insulation.
27. Estimate has excluded the Utility power feeder to the 12.47kv utility switches including the duct bank. The estimate has included the feeders and duct bank from the utility switches to the 12.47kv switchgear.
28. Estimate for volume 10 transformer yard is based on all electrical equipment to be located outdoors and no building or enclosure has been included.
29. Estimate has excluded all cable tray.
30. Additional pile and shoring beyond what is shown on the documents listed below is excluded.
31. Estimate has included an allowance for the control panel located in the Administration building as shown on the drawings.
32. Estimate has included the new PLC's and hardware including programming for the systems.
33. Estimate has included the 3 each 2.5MW generators and the estimate is based on them being enclosed weather protection.
34. Estimate has included the Fiber Optic Cables as shown on the site drawings. The estimate has excluded running fiber to offsite or outside of this project scope areas.
35. Estimate has excluded connecting to any other fire alarm system offsite.
36. Electrical progression included in the EOPCC can be summarized as follows:

a. Volume 01 (33 drawings) Electrical is mainly a simple single line (no Xfmr's sizes) with many drawings blank.
b. Volume 02 (47 drawings) Electrical mainly a simple single line (no Xfmr's sizes) with many drawings blank.
c. Volume 03 (41 drawings) Electrical mainly a simple single line (no Xfmr's sizes) with many drawings blank.
d. 04 (69 drawings) Electrical drawings are somewhat advanced than above, single line (no Xfmr's sizes).
e. Volume 05 (27 drawings) Electrical somewhat advanced with single line (no Xfmr's sizes).
f. Volume 06 (32 drawings) Electrical simple single line (no Xfmr's sizes), most E drawings are blank.
g. Volume 07 (38 drawings) Electrical is somewhat advanced with single line (no Xfmr's sizes).
h. Volume 08 (29 drawings) Electrical mainly a simple single line (no Xfmr's sizes) with many drawings blank.
i. Volume 09 (21 drawings) Electrical somewhat advanced with single line (no Xfmr's sizes).
j.
k. Volume 10 (24 drawings) Electrical mainly a simple single line (no Xfmr's sizes) with many drawings blank.
l. Volume 11 (43 drawings) Electrical partially advanced still mainly a simple single line (no Xfmr's sizes) with many drawings blank.

37. The documents are continually progressing and we plan to update the EOPCC accordingly on the next update at 90%.

Project name	20-018 Evansville WTP 75% EOPCC
Estimator	P. Bongiovanni & J. Jeffrey
Labor rate table	1 AECOM RATES 22
Equipment rate table	Equip - ACM 22ld wrk
Job size	50 MGD
Project	Water
Bus Line	Water
Section	Southeast
Office	Roanoke, VA
Principal Party	Pete Baskette
Estimating Office	Virginia Beach
Contract 1	Phil Bongiovanni
Contact 2	Josh Jeffrey
Estimate Class Lvl	4
Estimate Purpose	Budget
FY Estimate	2023
Estimate Number	20-018
Notes	*The enclosed Opinion of Probable Cost is only an EOPCC of possible construction costs for budgeting purposes. This EOPCC is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this EOPCC. AECOM is not responsible for any variance from this Opinion of Probable Cost or actual prices and conditions obtained.*
Report format	Sorted by 'WBS Lvl 1/WBS Lvl 2' 'Detail' summary Print sort level notes
Alternates	

Unit Price Report

20-018 Evansville WTP 75% EOPCC

WBS Lvl 1	WBS Lvl 2	Description	Notes	Takeoff Quantity	Total Cost/Unit	Total Amount	Grand Total Price	Grand Total Amount	% Total	Addon Amount
01 WIB		**BLDG 1 WATER INTAKE BUILDING**								
	DIV 02	Division 02 - Existing Conditions		1.000 LS	277,775.08 /LS	277,775	407,700.44 /LS	407,700	0.13%	129,925
	DIV 03	Division 03 - Concrete		1.000 LS	6,458.10 /LS	6,458	9,364.64 /LS	9,365	0.00%	2,907
	DIV 05	Division 05 - Metals		1.000 LS	427,404.55 /LS	427,405	619,677.21 /LS	619,677	0.20%	192,273
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	28,245.08 /LS	28,245	40,942.15 /LS	40,942	0.01%	12,697
	DIV 09	Division 09 - Finishes		1.000 LS	35,692.98 /LS	35,693	51,682.06 /LS	51,682	0.02%	15,989
	DIV 10	Division 10 - Specialties		1.000 LS	36,161.81 /LS	36,162	52,594.87 /LS	52,595	0.02%	16,433
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	137,578.33 /LS	137,578	200,002.35 /LS	200,002	0.06%	62,424
	DIV 25	Division 25 - Integrated Automation		1.000 LS	713,936.00 /LS	713,936	1,033,840.03 /LS	1,033,840	0.33%	319,904
	DIV 26	Division 26 - Electrical		1.000 LS	3,177,212.00 /LS	3,177,212	4,600,873.14 /LS	4,600,873	1.48%	1,423,661
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	105,966.00 /LS	105,966	153,447.78 /LS	153,448	0.05%	47,482
	DIV 40	Division 40 - Process Integration		1.000 LS	2,853,339.18 /LS	2,853,339	4,123,826.68 /LS	4,123,827	1.33%	1,270,487
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	1,114,396.84 /LS	1,114,397	1,608,637.51 /LS	1,608,638	0.52%	494,241
	DIV 46	Division 46 - Water and Wastewater Equipment		1.000 LS	1,102,500.00 /LS	1,102,500	1,591,901.25 /LS	1,591,901	0.51%	489,401
		01 WIB BLDG 1 WATER INTAKE BUILDING		**1.000 LS**	**10,016,665.95 /LS**	10,016,666	**14,494,490.11 /LS**	14,494,490	**4.66%**	4,477,824
02 PTB		**BLDG 2 PRE-TREATMENT BASIN**								
	DIV 03	Division 03 - Concrete		1.000 LS	2,282,881.18 /LS	2,282,881	3,328,034.00 /LS	3,328,034	1.07%	1,045,153
	DIV 05	Division 05 - Metals		1.000 LS	2,512,225.30 /LS	2,512,225	3,628,424.11 /LS	3,628,424	1.17%	1,116,199
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	26,054.24 /LS	26,054	38,297.17 /LS	38,297	0.01%	12,243
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	203,883.17 /LS	203,883	295,230.48 /LS	295,230	0.10%	91,347
	DIV 08	Division 08 - Openings		1.000 LS	130,502.24 /LS	130,502	189,024.47 /LS	189,024	0.06%	58,522
	DIV 09	Division 09 - Finishes		1.000 LS	517,302.24 /LS	517,302	747,239.76 /LS	747,240	0.24%	229,938
	DIV 10	Division 10 - Specialties		1.000 LS	27,135.21 /LS	27,135	39,491.26 /LS	39,491	0.01%	12,356
	DIV 11	Division 11 - Equipment		1.000 LS	15,118.98 /LS	15,119	21,951.12 /LS	21,951	0.01%	6,832
	DIV 22	Division 22 - Plumbing		1.000 LS	87,078.30 /LS	87,078	125,890.05 /LS	125,890	0.04%	38,812
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	1,022,720.00 /LS	1,022,720	1,480,985.53 /LS	1,480,986	0.48%	458,266
	DIV 25	Division 25 - Integrated Automation		1.000 LS	916,062.00 /LS	916,062	1,326,535.67 /LS	1,326,536	0.43%	410,474
	DIV 26	Division 26 - Electrical		1.000 LS	4,558,814.00 /LS	4,558,814	6,601,550.28 /LS	6,601,550	2.12%	2,042,736
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	960,800.00 /LS	960,800	1,391,320.10 /LS	1,391,320	0.45%	430,520
	DIV 31	Division 31 - Earthwork		1.000 LS	2,654,432.14 /LS	2,654,432	3,844,874.71 /LS	3,844,875	1.24%	1,190,443
	DIV 33	Division 33 - Utilities		1.000 LS	37,057.57 /LS	37,058	53,543.92 /LS	53,544	0.02%	16,486
	DIV 40	Division 40 - Process Integration		1.000 LS	2,516,072.16 /LS	2,516,072	3,649,265.79 /LS	3,649,266	1.17%	1,133,194
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	535,197.38 /LS	535,197	772,527.01 /LS	772,527	0.25%	237,330
	DIV 46	Division 46 - Water and Wastewater Equipment		1.000 LS	5,543,419.02 /LS	5,543,419	8,005,172.57 /LS	8,005,173	2.58%	2,461,754

WBS Lvl 1	WBS Lvl 2	Description	Notes	Takeoff Quantity	Total Cost/Unit	Total Amount	Grand Total Price	Grand Total Amount	% Total	Addon Amount
		02 PTB BLDG 2 PRE-TREATMENT BASIN		1.000 LS	24,546,755.13 /LS	24,546,755	35,539,358.00 /LS	35,539,358	11.44%	10,992,603
03 OZB		BLDG 3 OZONE BUILDING								
	DIV 03	Division 03 - Concrete		1.000 LS	4,553,398.86 /LS	4,553,399	6,639,305.90 /LS	6,639,306	2.14%	2,085,907
	DIV 04	Division 04 - Masonry		1.000 LS	558,023.14 /LS	558,023	810,178.43 /LS	810,178	0.26%	252,155
	DIV 05	Division 05 - Metals		1.000 LS	370,695.24 /LS	370,695	535,729.35 /LS	535,729	0.17%	165,034
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	14,946.14 /LS	14,946	21,808.79 /LS	21,809	0.01%	6,863
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	224,470.14 /LS	224,470	324,768.41 /LS	324,768	0.10%	100,298
	DIV 08	Division 08 - Openings		1.000 LS	44,878.14 /LS	44,878	65,003.23 /LS	65,003	0.02%	20,125
	DIV 09	Division 09 - Finishes		1.000 LS	179,554.56 /LS	179,555	260,220.48 /LS	260,220	0.08%	80,666
	DIV 10	Division 10 - Specialties		1.000 LS	11,202.22 /LS	11,202	16,280.21 /LS	16,280	0.01%	5,078
	DIV 11	Division 11 - Equipment		1.000 LS	7,444.13 /LS	7,444	10,788.30 /LS	10,788	0.00%	3,344
	DIV 22	Division 22 - Plumbing		1.000 LS	52,360.57 /LS	52,361	75,680.74 /LS	75,681	0.02%	23,320
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	673,470.00 /LS	673,470	975,241.83 /LS	975,242	0.31%	301,772
	DIV 25	Division 25 - Integrated Automation		1.000 LS	2,461,782.00 /LS	2,461,782	3,564,869.65 /LS	3,564,870	1.15%	1,103,088
	DIV 26	Division 26 - Electrical		1.000 LS	2,920,099.00 /LS	2,920,099	4,228,551.64 /LS	4,228,552	1.36%	1,308,453
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	399,565.00 /LS	399,565	578,604.09 /LS	578,604	0.19%	179,039
	DIV 31	Division 31 - Earthwork		1.000 LS	2,134,661.38 /LS	2,134,661	3,091,860.05 /LS	3,091,860	1.00%	957,199
	DIV 33	Division 33 - Utilities		1.000 LS	14,988.55 /LS	14,989	21,652.69 /LS	21,653	0.01%	6,664
	DIV 40	Division 40 - Process Integration		1.000 LS	2,251,893.84 /LS	2,251,894	3,259,741.63 /LS	3,259,742	1.05%	1,007,848
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	19,526.75 /LS	19,527	28,336.24 /LS	28,336	0.01%	8,809
	DIV 46	Division 46 - Water and Wastewater Equipment		1.000 LS	6,142,144.16 /LS	6,142,144	8,866,328.29 /LS	8,866,328	2.85%	2,724,184
		03 OZB BLDG 3 OZONE BUILDING		1.000 LS	23,035,103.82 /LS	23,035,104	33,374,949.95 /LS	33,374,950	10.74%	10,339,846
04 FTB		BLDG 4 FILTER BUILDING								
	DIV 03	Division 03 - Concrete		1.000 LS	18,680,447.28 /LS	18,680,447	27,482,128.79 /LS	27,482,129	8.84%	8,801,682
	DIV 04	Division 04 - Masonry		1.000 LS	891,756.75 /LS	891,757	1,294,740.61 /LS	1,294,741	0.42%	402,984
	DIV 05	Division 05 - Metals		1.000 LS	690,671.25 /LS	690,671	997,527.99 /LS	997,528	0.32%	306,857
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	68,972.34 /LS	68,972	100,641.69 /LS	100,642	0.03%	31,669
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	1,036,103.78 /LS	1,036,104	1,497,239.14 /LS	1,497,239	0.48%	461,135
	DIV 08	Division 08 - Openings		1.000 LS	345,301.04 /LS	345,301	499,776.05 /LS	499,776	0.16%	154,475
	DIV 09	Division 09 - Finishes		1.000 LS	1,035,787.19 /LS	1,035,787	1,499,841.99 /LS	1,499,842	0.48%	464,055
	DIV 10	Division 10 - Specialties		1.000 LS	68,961.18 /LS	68,961	100,045.06 /LS	100,045	0.03%	31,084
	DIV 11	Division 11 - Equipment		1.000 LS	68,884.64 /LS	68,885	99,617.65 /LS	99,618	0.03%	30,733
	DIV 22	Division 22 - Plumbing		1.000 LS	138,042.32 /LS	138,042	199,506.81 /LS	199,507	0.06%	61,464
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	1,726,600.00 /LS	1,726,600	2,500,263.60 /LS	2,500,264	0.80%	773,664
	DIV 25	Division 25 - Integrated Automation		1.000 LS	1,866,920.00 /LS	1,866,920	2,703,458.90 /LS	2,703,459	0.87%	836,539

WBS Lvl 1	WBS Lvl 2	Description	Notes	Takeoff Quantity	Total Cost/Unit	Total Amount	Grand Total Price	Grand Total Amount	% Total	Addon Amount
	DIV 26	Division 26 - Electrical		1.000 LS	11,748,519.00 /LS	11,748,519	17,012,854.44 /LS	17,012,854	5.48%	5,264,335
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	1,313,944.00 /LS	1,313,944	1,902,702.63 /LS	1,902,703	0.61%	588,759
	DIV 31	Division 31 - Earthwork		1.000 LS	7,106,691.62 /LS	7,106,692	10,289,240.81 /LS	10,289,241	3.31%	3,182,549
	DIV 33	Division 33 - Utilities		1.000 LS	69,168.06 /LS	69,168	99,921.23 /LS	99,921	0.03%	30,753
	DIV 40	Division 40 - Process Integration		1.000 LS	6,288,709.21 /LS	6,288,709	9,108,172.32 /LS	9,108,172	2.93%	2,819,463
	DIV 41	Division 41 - Material Processing and Handling Equipment		1.000 LS	61,390.60 /LS	61,391	88,731.86 /LS	88,732	0.03%	27,341
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	15,732,108.67 /LS	15,732,109	22,710,016.43 /LS	22,710,016	7.31%	6,977,908
		04 FTB BLDG 4 FILTER BUILDING		**1.000 LS**	**68,938,978.93 /LS**	68,938,979	**100,186,428.00 /LS**	100,186,428	**32.24%**	31,247,449
05 RPS		**BLDG 5 RESIDUAL PUMP STATION**								
	DIV 03	Division 03 - Concrete		1.000 LS	3,089,085.61 /LS	3,089,086	4,546,721.56 /LS	4,546,722	1.46%	1,457,636
	DIV 04	Division 04 - Masonry		1.000 LS	121,314.13 /LS	121,314	176,124.46 /LS	176,124	0.06%	54,810
	DIV 05	Division 05 - Metals		1.000 LS	34,681.57 /LS	34,682	50,090.17 /LS	50,090	0.02%	15,409
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	3,463.40 /LS	3,463	5,053.64 /LS	5,054	0.00%	1,590
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	52,027.22 /LS	52,027	75,182.81 /LS	75,183	0.02%	23,156
	DIV 08	Division 08 - Openings		1.000 LS	43,441.80 /LS	43,442	62,837.99 /LS	62,838	0.02%	19,396
	DIV 09	Division 09 - Finishes		1.000 LS	41,607.32 /LS	41,607	60,299.65 /LS	60,300	0.02%	18,692
	DIV 10	Division 10 - Specialties		1.000 LS	3,462.84 /LS	3,463	5,023.68 /LS	5,024	0.00%	1,561
	DIV 11	Division 11 - Equipment		1.000 LS	3,458.99 /LS	3,459	5,002.25 /LS	5,002	0.00%	1,543
	DIV 22	Division 22 - Plumbing		1.000 LS	12,133.70 /LS	12,134	17,525.03 /LS	17,525	0.01%	5,391
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	86,700.00 /LS	86,700	125,548.96 /LS	125,549	0.04%	38,849
	DIV 25	Division 25 - Integrated Automation		1.000 LS	318,647.00 /LS	318,647	461,427.94 /LS	461,428	0.15%	142,781
	DIV 26	Division 26 - Electrical		1.000 LS	798,682.00 /LS	798,682	1,156,559.45 /LS	1,156,559	0.37%	357,877
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	59,126.00 /LS	59,126	85,619.48 /LS	85,619	0.03%	26,493
	DIV 31	Division 31 - Earthwork		1.000 LS	1,186,422.32 /LS	1,186,422	1,717,831.58 /LS	1,717,832	0.55%	531,409
	DIV 33	Division 33 - Utilities		1.000 LS	3,473.22 /LS	3,473	5,017.48 /LS	5,017	0.00%	1,544
	DIV 40	Division 40 - Process Integration		1.000 LS	470,497.24 /LS	470,497	683,696.52 /LS	683,697	0.22%	213,199
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	133,832.87 /LS	133,833	193,283.85 /LS	193,284	0.06%	59,451
		05 RPS BLDG 5 RESIDUAL PUMP STATION		**1.000 LS**	**6,462,057.23 /LS**	6,462,057	**9,432,846.50 /LS**	9,432,846	**3.04%**	2,970,789
06 CHB		**BLDG 6 CHEMICAL BUILDING**								
	DIV 03	Division 03 - Concrete		1.000 LS	1,116,573.56 /LS	1,116,574	1,623,515.36 /LS	1,623,515	0.52%	506,942
	DIV 04	Division 04 - Masonry		1.000 LS	568,514.39 /LS	568,514	824,143.36 /LS	824,143	0.27%	255,629
	DIV 05	Division 05 - Metals		1.000 LS	510,160.70 /LS	510,161	737,561.09 /LS	737,561	0.24%	227,400
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	17,728.44 /LS	17,728	25,868.61 /LS	25,869	0.01%	8,140

WBS Lvl 1	WBS Lvl 2	Description	Notes	Takeoff Quantity	Total Cost/Unit	Total Amount	Grand Total Price	Grand Total Amount	% Total	Addon Amount
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	266,316.96 /LS	266,317	384,845.80 /LS	384,846	0.12%	118,529
	DIV 08	Division 08 - Openings		1.000 LS	266,275.13 /LS	266,275	384,637.37 /LS	384,637	0.12%	118,362
	DIV 09	Division 09 - Finishes		1.000 LS	212,979.58 /LS	212,980	308,661.88 /LS	308,662	0.10%	95,682
	DIV 10	Division 10 - Specialties		1.000 LS	17,725.57 /LS	17,726	25,715.26 /LS	25,715	0.01%	7,990
	DIV 11	Division 11 - Equipment		1.000 LS	17,705.90 /LS	17,706	25,605.44 /LS	25,605	0.01%	7,900
	DIV 22	Division 22 - Plumbing		1.000 LS	292,930.12 /LS	292,930	424,323.96 /LS	424,324	0.14%	131,394
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	532,560.00 /LS	532,560	771,192.13 /LS	771,192	0.25%	238,632
	DIV 25	Division 25 - Integrated Automation		1.000 LS	948,147.00 /LS	948,147	1,372,997.49 /LS	1,372,997	0.44%	424,850
	DIV 26	Division 26 - Electrical		1.000 LS	1,071,663.00 /LS	1,071,663	1,551,859.14 /LS	1,551,859	0.50%	480,196
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	318,050.00 /LS	318,050	460,563.44 /LS	460,563	0.15%	142,513
	DIV 31	Division 31 - Earthwork		1.000 LS	1,080,612.27 /LS	1,080,612	1,564,818.47 /LS	1,564,818	0.50%	484,206
	DIV 33	Division 33 - Utilities		1.000 LS	17,778.74 /LS	17,779	25,683.44 /LS	25,683	0.01%	7,905
	DIV 40	Division 40 - Process Integration		1.000 LS	1,612,651.82 /LS	1,612,652	2,337,430.38 /LS	2,337,430	0.75%	724,779
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	215,708.78 /LS	215,709	312,978.64 /LS	312,979	0.10%	97,270
	DIV 46	Division 46 - Water and Wastewater Equipment		1.000 LS	569,221.00 /LS	569,221	822,065.20 /LS	822,065	0.26%	252,844
		06 CHB BLDG 6 CHEMICAL BUILDING		**1.000 LS**	**9,653,302.96 /LS**	**9,653,303**	**13,984,466.46 /LS**	**13,984,466**	**4.50%**	**4,331,163**
07 ADM		**BLDG 7 ADMIN BUILDING**								
	DIV 03	Division 03 - Concrete		1.000 LS	2,145,098.56 /LS	2,145,099	3,106,285.12 /LS	3,106,285	1.00%	961,187
	DIV 04	Division 04 - Masonry		1.000 LS	1,601,037.21 /LS	1,601,037	2,317,925.90 /LS	2,317,926	0.75%	716,889
	DIV 05	Division 05 - Metals		1.000 LS	1,505,374.77 /LS	1,505,375	2,173,042.15 /LS	2,173,042	0.70%	667,667
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	328,374.04 /LS	328,374	475,135.19 /LS	475,135	0.15%	146,761
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	1,094,894.52 /LS	1,094,895	1,581,728.88 /LS	1,581,729	0.51%	486,834
	DIV 08	Division 08 - Openings		1.000 LS	821,084.97 /LS	821,085	1,186,066.33 /LS	1,186,066	0.38%	364,981
	DIV 09	Division 09 - Finishes		1.000 LS	711,483.03 /LS	711,483	1,030,783.09 /LS	1,030,783	0.33%	319,300
	DIV 10	Division 10 - Specialties		1.000 LS	54,658.51 /LS	54,659	79,295.48 /LS	79,295	0.03%	24,637
	DIV 11	Division 11 - Equipment		1.000 LS	54,597.84 /LS	54,598	78,956.79 /LS	78,957	0.03%	24,359
	DIV 12	Division 12 - Furnishings		1.000 LS	437,854.04 /LS	437,854	633,055.74 /LS	633,056	0.20%	195,202
	DIV 22	Division 22 - Plumbing		1.000 LS	191,522.09 /LS	191,522	276,620.45 /LS	276,620	0.09%	85,098
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	1,505,350.00 /LS	1,505,350	2,179,874.80 /LS	2,179,875	0.70%	674,525
	DIV 26	Division 26 - Electrical		1.000 LS	1,147,058.00 /LS	1,147,058	1,661,037.53 /LS	1,661,038	0.53%	513,980
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	750,155.00 /LS	750,155	1,086,288.21 /LS	1,086,288	0.35%	336,133
	DIV 31	Division 31 - Earthwork		1.000 LS	1,837,215.51 /LS	1,837,216	2,655,283.29 /LS	2,655,283	0.85%	818,068
	DIV 33	Division 33 - Utilities		1.000 LS	82,192.47 /LS	82,192	118,694.59 /LS	118,695	0.04%	36,502
		07 ADM BLDG 7 ADMIN BUILDING		**1.000 LS**	**14,267,950.56 /LS**	**14,267,951**	**20,640,073.54 /LS**	**20,640,074**	**6.64%**	**6,372,123**
08 ICB		**BLDG 8 INTAKE CHEMICAL BUILDING**								

WBS Lvl 1	WBS Lvl 2	Description	Notes	Takeoff Quantity	Total Cost/Unit	Total Amount	Grand Total Price	Grand Total Amount	% Total	Addon Amount
	DIV 03	Division 03 - Concrete		1.000 LS	171,774.01 /LS	171,774	252,039.89 /LS	252,040	0.08%	80,266
	DIV 04	Division 04 - Masonry		1.000 LS	91,400.05 /LS	91,400	132,695.04 /LS	132,695	0.04%	41,295
	DIV 05	Division 05 - Metals		1.000 LS	17,520.79 /LS	17,521	25,305.06 /LS	25,305	0.01%	7,784
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	1,749.67 /LS	1,750	2,553.06 /LS	2,553	0.00%	803
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	26,283.65 /LS	26,284	37,981.64 /LS	37,982	0.01%	11,698
	DIV 08	Division 08 - Openings		1.000 LS	10,476.06 /LS	10,476	15,170.03 /LS	15,170	0.00%	4,694
	DIV 09	Division 09 - Finishes		1.000 LS	21,019.61 /LS	21,020	30,462.79 /LS	30,463	0.01%	9,443
	DIV 10	Division 10 - Specialties		1.000 LS	1,311.39 /LS	1,311	1,905.86 /LS	1,906	0.00%	594
	DIV 11	Division 11 - Equipment		1.000 LS	1,309.45 /LS	1,309	1,895.00 /LS	1,895	0.00%	586
	DIV 22	Division 22 - Plumbing		1.000 LS	6,129.83 /LS	6,130	8,853.46 /LS	8,853	0.00%	2,724
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	41,172.00 /LS	41,172	59,620.56 /LS	59,621	0.02%	18,449
	DIV 25	Division 25 - Integrated Automation		1.000 LS	419,370.00 /LS	419,370	607,283.43 /LS	607,283	0.20%	187,913
	DIV 26	Division 26 - Electrical		1.000 LS	977,887.00 /LS	977,887	1,416,063.53 /LS	1,416,064	0.46%	438,177
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	34,554.00 /LS	34,554	50,037.12 /LS	50,037	0.02%	15,483
	DIV 31	Division 31 - Earthwork		1.000 LS	2,253.97 /LS	2,254	3,298.69 /LS	3,299	0.00%	1,045
	DIV 33	Division 33 - Utilities		1.000 LS	1,754.64 /LS	1,755	2,534.78 /LS	2,535	0.00%	780
	DIV 40	Division 40 - Process Integration		1.000 LS	31,979.13 /LS	31,979	46,405.82 /LS	46,406	0.01%	14,427
	DIV 41	Division 41 - Material Processing and Handling Equipment		1.000 LS	1,175,525.03 /LS	1,175,525	1,698,372.80 /LS	1,698,373	0.55%	522,848
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	431,316.65 /LS	431,317	622,668.54 /LS	622,669	0.20%	191,352
		08 ICB BLDG 8 INTAKE CHEMICAL BUILDING		**1.000 LS**	**3,464,786.93 /LS**	3,464,787	**5,015,147.10 /LS**	5,015,147	**1.61%**	1,550,360
09 BWS		**BLDG 9 BACKWASH SUPPLY**								
	DIV 03	Division 03 - Concrete		1.000 LS	1,438,917.90 /LS	1,438,918	2,116,959.07 /LS	2,116,959	0.68%	678,041
	DIV 04	Division 04 - Masonry		1.000 LS	219,832.41 /LS	219,832	319,203.43 /LS	319,203	0.10%	99,371
	DIV 05	Division 05 - Metals		1.000 LS	38,561.75 /LS	38,562	55,694.26 /LS	55,694	0.02%	17,133
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	3,850.88 /LS	3,851	5,619.04 /LS	5,619	0.00%	1,768
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	57,848.03 /LS	57,848	83,594.26 /LS	83,594	0.03%	25,746
	DIV 08	Division 08 - Openings		1.000 LS	11,566.95 /LS	11,567	16,774.59 /LS	16,775	0.01%	5,208
	DIV 09	Division 09 - Finishes		1.000 LS	46,262.35 /LS	46,262	67,045.98 /LS	67,046	0.02%	20,784
	DIV 10	Division 10 - Specialties		1.000 LS	2,886.26 /LS	2,886	4,194.59 /LS	4,195	0.00%	1,308
	DIV 11	Division 11 - Equipment		1.000 LS	2,881.99 /LS	2,882	4,170.75 /LS	4,171	0.00%	1,289
	DIV 22	Division 22 - Plumbing		1.000 LS	13,491.22 /LS	13,491	19,485.72 /LS	19,486	0.01%	5,994
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	90,616.00 /LS	90,616	131,219.67 /LS	131,220	0.04%	40,604
	DIV 25	Division 25 - Integrated Automation		1.000 LS	271,580.00 /LS	271,580	393,270.94 /LS	393,271	0.13%	121,691
	DIV 26	Division 26 - Electrical		1.000 LS	1,444,044.00 /LS	1,444,044	2,091,098.50 /LS	2,091,099	0.67%	647,055
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	72,640.00 /LS	72,640	105,188.89 /LS	105,189	0.03%	32,549
	DIV 31	Division 31 - Earthwork		1.000 LS	1,134,650.34 /LS	1,134,650	1,643,599.86 /LS	1,643,600	0.53%	508,950

WBS Lvl 1	WBS Lvl 2	Description	Notes	Takeoff Quantity	Total Cost/Unit	Total Amount	Grand Total Price	Grand Total Amount	% Total	Addon Amount
	DIV 33	Division 33 - Utilities		1.000 LS	3,861.81 /LS	3,862	5,578.84 /LS	5,579	0.00%	1,717
	DIV 40	Division 40 - Process Integration		1.000 LS	626,941.59 /LS	626,942	908,317.45 /LS	908,317	0.29%	281,376
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	1,302,589.10 /LS	1,302,589	1,880,466.03 /LS	1,880,466	0.61%	577,877
		09 BWS BLDG 9 BACKWASH SUPPLY		**1.000 LS**	**6,783,022.58 /LS**	6,783,023	**9,851,481.87 /LS**	9,851,482	**3.17%**	3,068,459
10 TYD		**BLDG 10 TRANSFORMER YARD**								
	DIV 25	Division 25 - Integrated Automation		1.000 LS	171,564.00 /LS	171,564	248,439.26 /LS	248,439	0.08%	76,875
	DIV 26	Division 26 - Electrical		1.000 LS	12,506,450.15 /LS	12,506,450	20,109,122.48 /LS	20,109,122	6.47%	7,602,672
		10 TYD BLDG 10 TRANSFORMER YARD		**1.000 LS**	**12,678,014.15 /LS**	12,678,014	**20,357,561.74 /LS**	20,357,562	**6.55%**	7,679,548
11 CIVIL		**SITE CIVIL**								
	DIV 02	Division 02 - Existing Conditions		1.000 LS	265,251.39 /LS	265,251	7,136,038.68 /LS	7,136,039	2.30%	6,870,787
	DIV 25	Division 25 - Integrated Automation		1.000 LS	371,584.00 /LS	371,584	538,085.22 /LS	538,085	0.17%	166,501
	DIV 26	Division 26 - Electrical		1.000 LS	5,843,622.00 /LS	5,843,622	8,462,061.51 /LS	8,462,062	2.72%	2,618,440
	DIV 31	Division 31 - Earthwork		1.000 LS	9,697,355.07 /LS	9,697,355	14,049,205.12 /LS	14,049,205	4.52%	4,351,850
	DIV 32	Division 32 - Exterior Improvements		1.000 LS	1,974,815.77 /LS	1,974,816	2,871,008.98 /LS	2,871,009	0.92%	896,193
		11 CIVIL SITE CIVIL		**1.000 LS**	**18,152,628.23 /LS**	18,152,628	**33,056,399.51 /LS**	33,056,400	**10.64%**	14,903,771

Estimate Totals

Description	Amount	Totals	Hours	Rate	Cost Basis	Cost per Unit	Percent of Total	
Labor	31,201,990		608,945 hrs			624,039.795 /MGD	10.04%	
Material	57,001,896					1,140,037.929 /MGD	18.34%	
Subcontract	74,662,586					1,493,251.729 /MGD	24.03%	
Bond on Subcontractors	373,313			0.50 %	C	7,466.259 /MGD	0.12%	
Equipment	3,780,587		105,407 hrs			75,611.750 /MGD	1.22%	
Process Equip	31,352,206					627,044.126 /MGD	10.09%	
Partial Direct Subtotal	**198,372,578**	**198,372,578**				**3,967,451.560 /MGD**	**63.84%**	**63.84%**
Mob/Demob	4,959,314			2.50 %	T	99,186.290 /MGD	1.60%	
Sales Tax (Tax Exempt)					C			
Small Tools & Equipment	452,600			1.50 %	C	9,052.003 /MGD	0.15%	
Safety Supplies & Equipment	174,913			0.50 %	C	3,498.258 /MGD	0.06%	
Consumables	452,600			1.50 %	C	9,052.003 /MGD	0.15%	
Mob/Demob, Misc. Subtotal	**6,039,427**	**204,412,005**				**4,088,240.100 /MGD**	**1.94%**	**65.78%**
Escalation (Present Day Value)					T			
Escalation Subtotal		**204,412,005**				**4,088,240.100 /MGD**		**65.78%**
General Conditions (mid)	18,397,081			9.00 %	T	367,941.613 /MGD	5.92%	
General Conditions Subtotal	**18,397,081**	**222,809,086**				**4,456,181.720 /MGD**	**5.92%**	**71.71%**
Contingency (%)	35,649,454			16.00 %	T	712,989.081 /MGD	11.47%	
Contingency Subtotal	**35,649,454**	**258,458,540**				**5,169,170.800 /MGD**	**11.47%**	**83.18%**
Overhead & Profit	23,261,269			9.00 %	T	465,225.375 /MGD	7.49%	
GC OH&P Subtotal	**23,261,269**	**281,719,809**				**5,634,396.180 /MGD**	**7.49%**	**90.66%**
Permits (Excluded)	2,112,899			0.75 %	T	42,257.972 /MGD	0.68%	
Builder's Risk Insurance	507,096			0.18 %	T	10,141.913 /MGD	0.16%	
Performance & Payment Bond (%)	2,843,398			1.00 %	T	56,867.961 /MGD	0.92%	
Permits, Bonds & Insurance	**5,463,393**	**287,183,202**				**5,743,664.040 /MGD**	**1.76%**	**92.42%**
Levee Authority Building Demolition & Site Prep	750,000				L	15,000.000 /MGD	0.24%	
Allowance - Contaminated Soil Testing and Hauling	6,000,000				L	120,000.000 /MGD	1.93%	
Allowance - Electrical Utility Feed	2,000,000				L	40,000.000 /MGD	0.64%	
Total Construction Costs (TCC)	**8,750,000**	**295,933,202**				**5,918,664.040 /MGD**	**2.82%**	**95.24%**
Owner's Contingency	14,796,660			5.00 %	T	295,933.203 /MGD	4.76%	
Total Project Costs (TPC)	**14,796,660**	**310,729,862**				**6,214,597.240 /MGD**	**4.76%**	**100.00%**
Total		***310,729,862***				***6,214,597.240 /MGD***		

Evansville New Water Treatment Plant
AECOM 90% Cost Estimate

May 16, 2023

Received from Lauren Box
December 6, 2023

DRAFT- FOR INTERNAL PURPOSES

May 16, 2023

PROJECT: Evansville WTP
CLIENT: Internal Estimate, AECOM, Roanoke, VA
AECOM PROJECT NO: 60613867
EOPCC NO. & NAME: 20-018 - Evansville WTP 90% EOPCC rev2 (updated05/16/2023)
BY: Josh Jeffrey, P.E., M.ASCE & Phil Bongiovanni
DESCRIPTION: EOPCC (Engineers Opinion of Probable Construction Cost) for budgeting purposes and to compare with Contractor GMP

OPINION OF PROBABLE CONSTRUCTION COST

1. Opinion of Probable Construction Cost is based on a Class 3 Estimate prepared at the request of the AECOM office located in Roanoke, VA.
2. Opinion of Probable Construction Cost is based on the following documents:
   a. Design 90 Percent - Owner Review Set 05-01-2023_Combined Set.pdf
   b. Assemble outputs for Architectural and Process dated March 24, 2023.
   c. Multiple discussions and emails with the design team.
   d. Geotechnical data – used for surcharge and sheet piling assumptions.
3. Inclusion and additions made within the 5/16/23 the EOPCC:
   a. Under “12 GEN” General Notes Details, Schedules and Misc. Items:
      i. Div 01 General Requirements - Added system performance testing -14 days; added full facility operational testing 45 days; added component system adjustment period – 10 days.
      ii. Added Levee Authority Building Demolition & Site Prep Cost of $750,000. Cost added to Div 02 – Existing Conditions.
      iii. Added Contaminated Soil Testing and Hauling Allowance of $6,000,000. Cost added to Div 02 – Existing Conditions.
      iv. Added Demo City Garage Allowance of $2,776,542. Cost added to Div 02 – Existing Conditions.
      v. Added Signs / Plaques Estimate of $85,000. Cost added to Div 10 – Specialties.
      vi. Added Electrical Utility Feed Allowance of $2,000,000. Cost added to Div 26 – Electrical.
   b. Reminder that costs carried are in present day value as previously requested. No Escalation is carried within this Estimate.
   c. Added Owner Contingency Allowance of 5% of the Total Construction Costs, totaling $14,796,660.
   d. Topping slabs were added on the 90% design set, these have been included.

e. Augured Piling has been updated based on the revised details on the 90% design drawings which increased installation lengths throughout the project site.
f. Valves have been updated per revised drawings and schedules.
g. Piping has been included for the additional four filters added.
h. Miscellaneous structural design adjustments have been analyzed and updated accordingly.
i. Miscellaneous architectural design adjustments have been analyzed and updated accordingly.
j. Miscellaneous plumbing design adjustments have been analyzed and updated accordingly.
k. Miscellaneous process design adjustments have been analyzed and updated accordingly.

4. Mark-Up Structure consists of the following:
    a. Bond on Subcontractors 0.50%
    b. Mobilization / Demobilization costs are included at the rate of 2.50%.
    c. Local Sales Tax is excluded. Assume tax exempt
    d. Small Tools & Equipment are included at 1.50%.
    e. Safety Supplies & Equipment are included at 0.50%.
    f. Consumables are included on craft labor only at 1.50% on craft labor and equipment.
    g. Pricing is in US Dollars and includes 0% Total Escalation. This represents present day value.
    h. General Conditions are included at the rate of 9.00%.
    i. Contingency is included at the rate of 10.50%.
    j. Market Conditions are not included in contingency. Assume client has a mitigation strategy and/or additional owner contingency to account for the current labor shortage and supply chain volatility in the market.
    k. Overhead and Profit are included at the rate of 9.00%.
    l. Cost of all permits is included at 0.75%
    m. Builders Risk Insurance is included at the rate of 0.18%.
    n. Performance and Payment Bond is included at the rate of 1.00%.
5. Liquidated damages are not included.
6. Site security guard services are excluded.
7. With the exception of the Soil Testing and Hauling Allowance, Site hazardous or contaminated conditions are excluded including but not limited to PCB's, soil, water, specialized treatment, soil amending, disposal and remediation.
8. Environmental monitoring is excluded.
9. Land acquisition or right of way fees are excluded.
10. Engineering and design fees are not included.
11. Life cycle costing and operation & maintenance are not a part of this EOPCC.

12. Agency design contingencies, and other client costs excluded. This EOPCC includes construction contingency only.
13. Standard temporary office and laydown included in General Conditions.
14. General conditions exclude owner and 3rd party onsite office facilities.
15. 3rd Party Inspections are not included.
16. EOPCC assumes working a regular 40-hour week. 8 hours per day during daylight shift.
17. Dewatering estimated cost has increased but is considered allowance only.
18. Quantities on all items from design team output.
19. OH electrical work including pole removals and relocations to be done by others.
20. Assume building excavation material is suitable for onsite fills without drying or amending soil.
21. Assume soils will be reasonably workable and not require drying. Cost to stockpile and amend saturated or unsuitable soil prior to placement is not included.
22. All quantities and cost for major equipment and conveyance components were provided by design team.
23. Dewatering - Any mass scale dewatering efforts will need to be finalized by the Contractor. With an owner contingency being set at 5%, this would put the burden of cost validation and approach on the Contractor and Owner with cost considerations in place for a measure of effort.
24. Section for all pavement on Outlet Loop, Drive 1, 2, 3, Southeast Staff Entrance, South Entrance (on west side of project), and Access Drive to the South assumed to be as provided by design team.

    3" 9.5mm Asphalt, on
    3" 19.0mm Asphalt, on
    3" 19mm Asphalt, on
    12" Type IC. This treatment consists of 12 in. of subgrade excavated and replaced with coarse aggregate No. 53.
25. Surcharge is included as an allowance only. 40,000 CY was added as a rough calculation to account for 10vf of surcharge on top of areas where over 4' of permanent fill is required. Monitoring costs were also added based on an assumed 9 months surcharge period.
26. "Stacking" yard pipe was discussed with design team but not included in this EOPCC.
27. Electrical Related Scope of Work & Notes included within the 5/16/23 the EOPCC:

    a. The E&I Estimate is based on the 90% Design set but based on the drawings for E&I the AECOM AREstimating Team still had to make assumptions. AECOM estimating did their best to fill in for the missing items that would need to be included for a 90% design. Please note, the included assumptions could affect and inflate a cost comparison between AECOM AREstimating and a Contractor, as a contractor will bid to what is shown on the drawings and not what should be shown on the drawings. The missing details should be reconciled before an actual agreed upon contract value is negotiated with a Contractor.

b. The electrical estimate has included the underground electrical ductbanks and manholes as indicated on the 90% drawings. The 90% drawings did not include section details nor conduit makeup for each branch or ductbank sections, so AECOM used their experience in laying out the ductbanks and added for spare conduits. The estimate us based on power, control, instrumentation and fiber to be routed in the same concrete envelope but did include separate precast electrical manholes for power and for fiber. The estimate assumed the top of all ductbanks not to exceed three feet cover. The estimate has excluded all underground obstructions and relocation of obstructions if located.
c. The electrical estimate for all underground raceway is based on schedule 40 PVC conduit with RGS elbows for stub-ups for ductbanks and site lighting.
d. The estimate for Volume 11 Site Civil includes the electrical and fiber ductbanks, backbone / interconnects electrical cables and fiber, site lighting, site CCTV system and main gate access control.
e. The electrical estimate has included the installation of the precast electrical trench or utility corridor as shown on the 90% drawings for the transformer yard. The estimate has assumed H2O lids for the trench.
f. The electrical estimate has excluded all Hydro-Vac.
g. The electrical estimate has included for grounding and lightning protection based on the footprints of each Volume area and experience due to the 90% not having them designed yet.
h. The electrical estimate has included the new roadway / site lighting as shown on the 90% drawings. The estimate is based on the raceway for site lighting to be direct buried and no concrete incasement.
i. The electrical estimate has included square footage cost associated with process area and building lighting and convenience receptacles for all Volumes with the exception of Volume 07 Admin Building due to the 90% drawings not being completed. Most Volume lighting drawings were missing exit lights, emergency 2- Head lights and Volumes were missing receptacles. Also, the 90% drawings had lighting schedules that were missing fixture types and had fixture types that were not indicated on that Volume drawings. AECOM used budgetary square footage cost from recent projects plus utilized the Admin Building square footage cost since it seemed to have been designed with the above missing items.
j. The estimate for lighting control is based on standard lighting switches and no cost has been included for occupancy sensors nor smart lighting controls.
k. The electrical estimate has included cost for Fire Alarm Systems and for Volumes 03, 06 & 07 it is based on the 90% design drawings and for the other areas AECOM used a square footage cost based established in or within other volumes of this project.

l. Estimate has excluded tying into any other fire alarm system offsite.
m. The electrical estimate has included cost for the CCTV Systems and for Volumes 02, 03, 04, 07, 08 & 11 it is based on the 90% design drawings and for the other areas AECOM used a square footage cost established in or within other volumes of this project.
n. The electrical estimate has included cost for the building communications & Access Control Systems and for all Volumes having buildings the cost was based on a square footage cost due to the 90% design drawings not having the system designed as of now. The estimate has included an allowance for the main gate Access Control as an allowance. The estimate has excluded phones and PBAX Boards and hardware. The communication cost is to capture data ports including interior conduit and CAT6 cabling.
o. The estimate has excluded cathodic protection and electrical heat tracing.
p. Estimate has excluded all cable tray with the exception of adding tray in the precast trenwa utility corridor.
q. Estimate has excluded the Utility power feeder to the 12.47kv utility switches including the ductbank. The estimate has included the feeders and ductbank from the utility switches to the 12.47kv switchgear.
r. Estimate is based on all areas to be Non-Classified areas.
s. Estimate for volume 10 transformer yard is based on all electrical equipment to be located outdoors and no building or prefab electrical enclosure has been included. All outdoor electrical equipment will be NEMA 3R rated.
t. The electrical estimate for all electrical equipment is based on the single lines provided in the 90% drawings.
u. The electrical estimate for all transformer sizes is based on the bus amps they are providing power to due to the single lines not indicating the MVA nor KVA sizes. The estimate is based on all transformers to be non-Oil filled.
v. The electrical estimate for all switchgear and Motor Control Centers to be ARC Flash Resistant.
w. Estimate has included the three each 2.5MW standby generators and the estimate is based on them being enclosed weather / sound protection. The estimate has excluded fuel tanks other than the generator belly tanks. The estimate has excluded first fills of the generators.
x. The electrical estimate has included safety disconnect switches and local control stations.
y. The electrical estimate for power panels is based on the panel schedules and the single lines.
z. The electrical estimate has included 3rd party electrical testing for the electrical equipment.
aa. The electrical estimate for all power, controls and instrumentation cabling is based on the electrical equipment locations to the loads or field junction boxes using the 90% drawing equipment locations and or past project experience.

bb. The electrical estimate has included allowances for LV power feeders from the LV panels to the users.

cc. Estimate has included the new PLC's and hardware including programming for the systems and is based on the 90% drawings and I/O counts which has included 20% spares.

dd. Estimate has included an allowance for the control panel located in the admin building as shown on the drawings.

ee. Estimate has included the network Fiber Optic Cables as shown on the site drawings. The estimate has included an allowance for fiber cable from vendor skids to a local control panel. The estimate has excluded running fiber to offsite or outside of this project scope areas.

ff. Estimate has included the furnishing and installation cost of all field tagged devices as indicated on the 90% drawings which includes analyzers and flow meters. The estimate has included calibration verifications and look checks of all contractor furnished tags. All tags identified as skid or vendor provided are assumed to be furnished and installed by the vendor and wired to a skid control or junction box by the vendor.

gg. All inline actuated valves are furnished and installed by the mechanical contractor and included in that estimate. The instrumentation estimate has included the tagging, stroking and loop checks for the actuated valves.

The enclosed Opinion of Probable Cost is only an EOPCC of possible construction costs for budgeting purposes. This EOPCC is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this EOPCC. AECOM is not responsible for any variance from this Opinion of Probable Cost or actual prices and conditions obtained.

Project name	20-018 Evansville WTP 90% EOPCC
Estimator	P. Bongiovanni & J. Jeffrey
Labor rate table	1 AECOM RATES 23
Equipment rate table	Equip - ACM 22ld wrk
Job size	50 MGD
Project	Water
Bus Line	Water
Section	Southeast
Office	Roanoke, VA
Principal Party	Pete Baskette
Estimating Office	Virginia Beach
Contract 1	Phil Bongiovanni
Contact 2	Josh Jeffrey
Estimate Class Lvl	3
Estimate Purpose	Budget
FY Estimate	2023
Estimate Number	20-018
Notes	*The enclosed Opinion of Probable Cost is only an EOPCC of possible construction costs for budgeting purposes. This EOPCC is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to; local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this EOPCC. AECOM is not responsible for any variance from this Opinion of Probable Cost or actual prices and conditions obtained.*
Report format	Sorted by 'WBS Lvl 1/WBS Lvl 2/WBS Lvl 3' 'Detail' summary Print sort level notes
Alternates	75%, 75%,90%, 90%

WBS Lvl 1	WBS Lvl 2	Description	Notes	Takeoff Quantity	Total Cost/Unit	Total Amount	Grand Total Price	Grand Total Amount	% Total	Addon Amount
01 WIB		BLDG 1 WATER INTAKE BUILDING								
	DIV 02	Division 02 - Existing Conditions		1.000 LS	225,221.31 /LS	225,221	314,534.13 /LS	314,534	0.10%	89,313
	DIV 03	Division 03 - Concrete		1.000 LS	6,467.13 /LS	6,467	8,933.28 /LS	8,933	0.00%	2,466
	DIV 05	Division 05 - Metals		1.000 LS	428,994.68 /LS	428,995	592,527.74 /LS	592,528	0.20%	163,533
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	74,505.47 /LS	74,505	102,762.45 /LS	102,762	0.03%	28,257
	DIV 09	Division 09 - Finishes		1.000 LS	122,613.85 /LS	122,614	169,121.45 /LS	169,121	0.06%	46,508
	DIV 10	Division 10 - Specialties		1.000 LS	31,283.32 /LS	31,283	43,232.85 /LS	43,233	0.01%	11,950
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	117,896.06 /LS	117,896	162,758.15 /LS	162,758	0.05%	44,862
	DIV 25	Division 25 - Integrated Automation		1.000 LS	432,039.00 /LS	432,039	595,920.02 /LS	595,920	0.20%	163,881
	DIV 26	Division 26 - Electrical		1.000 LS	2,657,040.00 /LS	2,657,040	3,664,908.40 /LS	3,664,908	1.22%	1,007,868
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	85,740.00 /LS	85,740	118,262.88 /LS	118,263	0.04%	32,523
	DIV 40	Division 40 - Process Integration		1.000 LS	2,753,875.38 /LS	2,753,875	3,791,288.34 /LS	3,791,288	1.26%	1,037,413
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	1,114,669.82 /LS	1,114,670	1,532,390.68 /LS	1,532,391	0.51%	417,721
	DIV 46	Division 46 - Water and Wastewater Equipment		1.000 LS	1,084,030.92 /LS	1,084,031	1,490,058.92 /LS	1,490,059	0.50%	406,028
		01 WIB BLDG 1 WATER INTAKE BUILDING		1.000 LS	9,134,376.94 /LS	9,134,377	12,586,699.29 /LS	12,586,699	4.20%	3,452,322
02 PTB		BLDG 2 PRE-TREATMENT BASIN								
	DIV 03	Division 03 - Concrete		1.000 LS	2,374,677.75 /LS	2,374,678	3,298,869.82 /LS	3,298,870	1.10%	924,192
	DIV 05	Division 05 - Metals		1.000 LS	2,516,152.29 /LS	2,516,152	3,461,142.64 /LS	3,461,143	1.15%	944,990
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	13,402.00 /LS	13,402	18,674.47 /LS	18,674	0.01%	5,272
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	203,888.50 /LS	203,889	281,217.96 /LS	281,218	0.09%	77,329
	DIV 08	Division 08 - Openings		1.000 LS	117,850.00 /LS	117,850	162,219.43 /LS	162,219	0.05%	44,369
	DIV 09	Division 09 - Finishes		1.000 LS	504,650.00 /LS	504,650	693,836.40 /LS	693,836	0.23%	189,186
	DIV 10	Division 10 - Specialties		1.000 LS	21,107.70 /LS	21,108	29,130.61 /LS	29,131	0.01%	8,023
	DIV 11	Division 11 - Equipment		1.000 LS	12,708.01 /LS	12,708	17,513.62 /LS	17,514	0.01%	4,806
	DIV 22	Division 22 - Plumbing		1.000 LS	87,078.30 /LS	87,078	119,902.13 /LS	119,902	0.04%	32,824
	DIV 25	Division 25 - Integrated Automation		1.000 LS	900,046.00 /LS	900,046	1,241,451.43 /LS	1,241,451	0.41%	341,405
	DIV 26	Division 26 - Electrical		1.000 LS	3,592,420.00 /LS	3,592,420	4,955,096.72 /LS	4,955,097	1.65%	1,362,677
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	667,490.00 /LS	667,490	920,682.30 /LS	920,682	0.31%	253,192
	DIV 31	Division 31 - Earthwork		1.000 LS	3,975,791.36 /LS	3,975,791	5,490,159.97 /LS	5,490,160	1.83%	1,514,369
	DIV 33	Division 33 - Utilities		1.000 LS	37,057.57 /LS	37,058	50,995.66 /LS	50,996	0.02%	13,938
	DIV 40	Division 40 - Process Integration		1.000 LS	2,707,507.43 /LS	2,707,507	3,741,251.19 /LS	3,741,251	1.25%	1,033,744
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	535,268.49 /LS	535,268	735,824.37 /LS	735,824	0.25%	200,556
	DIV 46	Division 46 - Water and Wastewater Equipment		1.000 LS	5,546,123.51 /LS	5,546,124	7,627,790.65 /LS	7,627,791	2.54%	2,081,667
		02 PTB BLDG 2 PRE-TREATMENT BASIN		1.000 LS	23,813,218.91 /LS	23,813,219	32,845,759.37 /LS	32,845,759	10.95%	9,032,540
03 OZB		BLDG 3 OZONE BUILDING								
	DIV 03	Division 03 - Concrete		1.000 LS	4,657,221.38 /LS	4,657,221	6,471,988.59 /LS	6,471,989	2.16%	1,814,767
	DIV 04	Division 04 - Masonry		1.000 LS	558,023.14 /LS	558,023	771,805.98 /LS	771,806	0.26%	213,783
	DIV 05	Division 05 - Metals		1.000 LS	371,043.43 /LS	371,043	510,728.91 /LS	510,729	0.17%	139,685
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	10,595.19 /LS	10,595	14,649.13 /LS	14,649	0.00%	4,054
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	220,119.19 /LS	220,119	303,200.83 /LS	303,201	0.10%	83,082
	DIV 08	Division 08 - Openings		1.000 LS	40,527.19 /LS	40,527	55,785.30 /LS	55,785	0.02%	15,258
	DIV 09	Division 09 - Finishes		1.000 LS	160,576.19 /LS	160,576	221,126.80 /LS	221,127	0.07%	60,551
	DIV 10	Division 10 - Specialties		1.000 LS	9,129.43 /LS	9,129	12,588.65 /LS	12,589	0.00%	3,459
	DIV 11	Division 11 - Equipment		1.000 LS	6,615.03 /LS	6,615	9,107.94 /LS	9,108	0.00%	2,493
	DIV 22	Division 22 - Plumbing		1.000 LS	52,360.57 /LS	52,361	72,080.19 /LS	72,080	0.02%	19,720
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	351,701.00 /LS	351,701	485,108.22 /LS	485,108	0.16%	133,407
	DIV 25	Division 25 - Integrated Automation		1.000 LS	653,582.00 /LS	653,582	901,498.70 /LS	901,499	0.30%	247,917
	DIV 26	Division 26 - Electrical		1.000 LS	2,016,220.00 /LS	2,016,220	2,781,012.57 /LS	2,781,013	0.93%	764,793
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	340,013.00 /LS	340,013	468,986.73 /LS	468,987	0.16%	128,974
	DIV 31	Division 31 - Earthwork		1.000 LS	2,152,214.97 /LS	2,152,215	2,963,543.32 /LS	2,963,543	0.99%	811,328
	DIV 33	Division 33 - Utilities		1.000 LS	14,988.55 /LS	14,989	20,622.01 /LS	20,622	0.01%	5,633
	DIV 40	Division 40 - Process Integration		1.000 LS	2,082,545.90 /LS	2,082,546	2,872,275.72 /LS	2,872,276	0.96%	789,730
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	19,622.19 /LS	19,622	27,127.98 /LS	27,128	0.01%	7,506

WBS Lvl 1	WBS Lvl 2	Description	Notes	Takeoff Quantity	Total Cost/Unit	Total Amount	Grand Total Price	Grand Total Amount	% Total	Addon Amount
	DIV 46	Division 46 - Water and Wastewater Equipment		1.000 LS	6,143,661.89 /LS	6,143,662	8,446,102.50 /LS	8,446,103	2.82%	2,302,441
		03 OZB BLDG 3 OZONE BUILDING		1.000 LS	19,860,760.24 /LS	19,860,760	27,409,340.07 /LS	27,409,340	9.14%	7,548,580
04 FTB		BLDG 4 FILTER BUILDING								
	DIV 03	Division 03 - Concrete		1.000 LS	19,270,887.75 /LS	19,270,888	27,024,457.31 /LS	27,024,457	9.01%	7,753,570
	DIV 04	Division 04 - Masonry		1.000 LS	891,756.75 /LS	891,757	1,233,418.93 /LS	1,233,419	0.41%	341,662
	DIV 05	Division 05 - Metals		1.000 LS	722,251.91 /LS	722,252	993,522.97 /LS	993,523	0.33%	271,271
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	48,893.88 /LS	48,894	67,601.79 /LS	67,602	0.02%	18,708
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	1,001,310.11 /LS	1,001,310	1,376,956.02 /LS	1,376,956	0.46%	375,646
	DIV 08	Division 08 - Openings		1.000 LS	319,996.56 /LS	319,997	440,369.31 /LS	440,369	0.15%	120,373
	DIV 09	Division 09 - Finishes		1.000 LS	948,207.20 /LS	948,207	1,305,187.83 /LS	1,305,188	0.44%	356,981
	DIV 10	Division 10 - Specialties		1.000 LS	59,395.83 /LS	59,396	81,822.28 /LS	81,822	0.03%	22,426
	DIV 11	Division 11 - Equipment		1.000 LS	65,058.56 /LS	65,059	89,488.64 /LS	89,489	0.03%	24,430
	DIV 22	Division 22 - Plumbing		1.000 LS	138,042.32 /LS	138,042	190,014.31 /LS	190,014	0.06%	51,972
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	1,726,600.00 /LS	1,726,600	2,381,533.91 /LS	2,381,534	0.79%	654,934
	DIV 25	Division 25 - Integrated Automation		1.000 LS	2,381,009.00 /LS	2,381,009	3,284,173.29 /LS	3,284,173	1.09%	903,164
	DIV 26	Division 26 - Electrical		1.000 LS	10,499,817.00 /LS	10,499,817	14,482,607.48 /LS	14,482,607	4.83%	3,982,790
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	1,371,612.00 /LS	1,371,612	1,891,891.86 /LS	1,891,892	0.63%	520,280
	DIV 31	Division 31 - Earthwork		1.000 LS	7,974,609.07 /LS	7,974,609	10,995,092.15 /LS	10,995,092	3.67%	3,020,483
	DIV 33	Division 33 - Utilities		1.000 LS	69,168.06 /LS	69,168	95,164.88 /LS	95,165	0.03%	25,997
	DIV 40	Division 40 - Process Integration		1.000 LS	6,756,628.43 /LS	6,756,628	9,320,267.65 /LS	9,320,268	3.11%	2,563,639
	DIV 41	Division 41 - Material Processing and Handling Equipment		1.000 LS	61,390.60 /LS	61,391	84,510.34 /LS	84,510	0.03%	23,120
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	15,948,176.84 /LS	15,948,177	21,932,089.61 /LS	21,932,090	7.31%	5,983,913
		04 FTB BLDG 4 FILTER BUILDING		1.000 LS	70,254,811.87 /LS	70,254,812	97,270,170.56 /LS	97,270,171	32.43%	27,015,359
05 RPS		BLDG 5 RESIDUAL PUMP STATION								
	DIV 03	Division 03 - Concrete		1.000 LS	3,157,088.53 /LS	3,157,089	4,429,864.91 /LS	4,429,865	1.48%	1,272,776
	DIV 04	Division 04 - Masonry		1.000 LS	121,314.13 /LS	121,314	167,782.31 /LS	167,782	0.06%	46,468
	DIV 05	Division 05 - Metals		1.000 LS	68,300.29 /LS	68,300	94,003.93 /LS	94,004	0.03%	25,704
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	2,455.17 /LS	2,455	3,394.58 /LS	3,395	0.00%	939
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	50,280.08 /LS	50,280	69,142.87 /LS	69,143	0.02%	18,863
	DIV 08	Division 08 - Openings		1.000 LS	16,068.40 /LS	16,068	22,112.84 /LS	22,113	0.01%	6,044
	DIV 09	Division 09 - Finishes		1.000 LS	37,209.55 /LS	37,210	51,240.65 /LS	51,241	0.02%	14,031
	DIV 10	Division 10 - Specialties		1.000 LS	2,982.52 /LS	2,983	4,108.65 /LS	4,109	0.00%	1,126
	DIV 11	Division 11 - Equipment		1.000 LS	3,266.87 /LS	3,267	4,493.60 /LS	4,494	0.00%	1,227
	DIV 22	Division 22 - Plumbing		1.000 LS	12,133.70 /LS	12,134	16,690.64 /LS	16,691	0.01%	4,557
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	86,700.00 /LS	86,700	119,587.04 /LS	119,587	0.04%	32,887
	DIV 25	Division 25 - Integrated Automation		1.000 LS	242,310.00 /LS	242,310	334,223.03 /LS	334,223	0.11%	91,913
	DIV 26	Division 26 - Electrical		1.000 LS	615,950.00 /LS	615,950	849,592.16 /LS	849,592	0.28%	233,642
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	115,945.00 /LS	115,945	159,925.25 /LS	159,925	0.05%	43,980
	DIV 31	Division 31 - Earthwork		1.000 LS	1,729,728.01 /LS	1,729,728	2,383,883.75 /LS	2,383,884	0.79%	654,156
	DIV 33	Division 33 - Utilities		1.000 LS	3,473.22 /LS	3,473	4,778.64 /LS	4,779	0.00%	1,305
	DIV 40	Division 40 - Process Integration		1.000 LS	480,091.32 /LS	480,091	664,651.60 /LS	664,652	0.22%	184,560
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	133,924.73 /LS	133,925	184,210.30 /LS	184,210	0.06%	50,286
		05 RPS BLDG 5 RESIDUAL PUMP STATION		1.000 LS	6,879,221.52 /LS	6,879,222	9,563,686.75 /LS	9,563,687	3.19%	2,684,465
06 CHB		BLDG 6 CHEMICAL BUILDING								
	DIV 03	Division 03 - Concrete		1.000 LS	1,204,883.31 /LS	1,204,883	1,669,818.43 /LS	1,669,818	0.56%	464,935
	DIV 04	Division 04 - Masonry		1.000 LS	568,514.39 /LS	568,514	785,049.45 /LS	785,049	0.26%	216,535
	DIV 05	Division 05 - Metals		1.000 LS	517,678.44 /LS	517,678	712,851.56 /LS	712,852	0.24%	195,173
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	12,567.53 /LS	12,568	17,376.15 /LS	17,376	0.01%	4,809
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	257,373.70 /LS	257,374	353,928.58 /LS	353,929	0.12%	96,555
	DIV 08	Division 08 - Openings		1.000 LS	259,770.94 /LS	259,771	357,160.46 /LS	357,160	0.12%	97,390
	DIV 09	Division 09 - Finishes		1.000 LS	190,468.29 /LS	190,468	262,290.72 /LS	262,291	0.09%	71,822
	DIV 10	Division 10 - Specialties		1.000 LS	15,266.92 /LS	15,267	21,031.33 /LS	21,031	0.01%	5,764
	DIV 11	Division 11 - Equipment		1.000 LS	16,722.45 /LS	16,722	23,001.90 /LS	23,002	0.01%	6,279

WBS Lvl 1	WBS Lvl 2	Description	Notes	Takeoff Quantity	Total Cost/Unit	Total Amount	Grand Total Price	Grand Total Amount	% Total	Addon Amount
	DIV 22	Division 22 - Plumbing		1.000 LS	298,097.74 /LS	298,098	411,305.63 /LS	411,306	0.14%	113,208
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	532,560.00 /LS	532,560	734,570.66 /LS	734,571	0.24%	202,011
	DIV 25	Division 25 - Integrated Automation		1.000 LS	619,211.00 /LS	619,211	854,090.11 /LS	854,090	0.28%	234,879
	DIV 26	Division 26 - Electrical		1.000 LS	865,362.00 /LS	865,362	1,193,611.10 /LS	1,193,611	0.40%	328,249
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	496,080.00 /LS	496,080	684,253.07 /LS	684,253	0.23%	188,173
	DIV 31	Division 31 - Earthwork		1.000 LS	1,046,299.96 /LS	1,046,300	1,440,175.94 /LS	1,440,176	0.48%	393,876
	DIV 33	Division 33 - Utilities		1.000 LS	17,778.74 /LS	17,779	24,460.89 /LS	24,461	0.01%	6,682
	DIV 40	Division 40 - Process Integration		1.000 LS	1,582,658.44 /LS	1,582,658	2,183,396.66 /LS	2,183,397	0.73%	600,738
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	216,734.68 /LS	216,735	299,591.25 /LS	299,591	0.10%	82,857
	DIV 46	Division 46 - Water and Wastewater Equipment		1.000 LS	569,560.14 /LS	569,560	783,400.66 /LS	783,401	0.26%	213,841
		06 CHB BLDG 6 CHEMICAL BUILDING		1.000 LS	9,287,588.67 /LS	9,287,589	12,811,364.55 /LS	12,811,365	4.27%	3,523,776
07 ADM		BLDG 7 ADMIN BUILDING								
	DIV 03	Division 03 - Concrete		1.000 LS	2,145,098.56 /LS	2,145,099	2,958,777.31 /LS	2,958,777	0.99%	813,679
	DIV 04	Division 04 - Masonry		1.000 LS	1,604,067.40 /LS	1,604,067	2,212,101.03 /LS	2,212,101	0.74%	608,034
	DIV 05	Division 05 - Metals		1.000 LS	1,507,412.84 /LS	1,507,413	2,072,334.67 /LS	2,072,335	0.69%	564,922
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	306,730.80 /LS	306,731	422,052.32 /LS	422,052	0.14%	115,322
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	1,066,036.87 /LS	1,066,037	1,465,768.75 /LS	1,465,769	0.49%	399,732
	DIV 08	Division 08 - Openings		1.000 LS	801,028.69 /LS	801,029	1,101,338.65 /LS	1,101,339	0.37%	300,310
	DIV 09	Division 09 - Finishes		1.000 LS	642,067.29 /LS	642,067	884,028.94 /LS	884,029	0.29%	241,962
	DIV 10	Division 10 - Specialties		1.000 LS	47,077.02 /LS	47,077	64,852.17 /LS	64,852	0.02%	17,775
	DIV 11	Division 11 - Equipment		1.000 LS	51,565.30 /LS	51,565	70,928.54 /LS	70,929	0.02%	19,363
	DIV 12	Division 12 - Furnishings		1.000 LS	416,210.80 /LS	416,211	572,444.45 /LS	572,444	0.19%	156,234
	DIV 22	Division 22 - Plumbing		1.000 LS	191,522.09 /LS	191,522	263,450.40 /LS	263,450	0.09%	71,928
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	1,505,350.00 /LS	1,505,350	2,076,359.35 /LS	2,076,359	0.69%	571,009
	DIV 26	Division 26 - Electrical		1.000 LS	1,607,106.00 /LS	1,607,106	2,216,713.44 /LS	2,216,713	0.74%	609,607
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	734,517.00 /LS	734,517	1,013,133.97 /LS	1,013,134	0.34%	278,617
	DIV 31	Division 31 - Earthwork		1.000 LS	2,077,172.51 /LS	2,077,173	2,859,269.45 /LS	2,859,269	0.95%	782,097
	DIV 33	Division 33 - Utilities		1.000 LS	82,192.47 /LS	82,192	113,042.63 /LS	113,043	0.04%	30,850
		07 ADM BLDG 7 ADMIN BUILDING		1.000 LS	14,785,155.64 /LS	14,785,156	20,366,596.07 /LS	20,366,596	6.79%	5,581,440
08 ICB		BLDG 8 INTAKE CHEMICAL BUILDING								
	DIV 03	Division 03 - Concrete		1.000 LS	180,333.83 /LS	180,334	252,183.33 /LS	252,183	0.08%	71,850
	DIV 04	Division 04 - Masonry		1.000 LS	91,400.05 /LS	91,400	126,409.92 /LS	126,410	0.04%	35,010
	DIV 05	Division 05 - Metals		1.000 LS	19,558.86 /LS	19,559	26,909.91 /LS	26,910	0.01%	7,351
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	1,240.33 /LS	1,240	1,714.91 /LS	1,715	0.00%	475
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	25,401.01 /LS	25,401	34,930.31 /LS	34,930	0.01%	9,529
	DIV 08	Division 08 - Openings		1.000 LS	9,843.07 /LS	9,843	13,557.59 /LS	13,558	0.00%	3,715
	DIV 09	Division 09 - Finishes		1.000 LS	18,797.90 /LS	18,798	25,886.26 /LS	25,886	0.01%	7,088
	DIV 10	Division 10 - Specialties		1.000 LS	1,068.74 /LS	1,069	1,473.70 /LS	1,474	0.00%	405
	DIV 11	Division 11 - Equipment		1.000 LS	1,212.39 /LS	1,212	1,668.17 /LS	1,668	0.00%	456
	DIV 22	Division 22 - Plumbing		1.000 LS	6,129.83 /LS	6,130	8,431.95 /LS	8,432	0.00%	2,302
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	41,172.00 /LS	41,172	56,789.37 /LS	56,789	0.02%	15,617
	DIV 25	Division 25 - Integrated Automation		1.000 LS	227,066.00 /LS	227,066	313,196.67 /LS	313,197	0.10%	86,131
	DIV 26	Division 26 - Electrical		1.000 LS	810,626.00 /LS	810,626	1,118,112.65 /LS	1,118,113	0.37%	307,487
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	93,409.00 /LS	93,409	128,840.89 /LS	128,841	0.04%	35,432
	DIV 31	Division 31 - Earthwork		1.000 LS	2,253.97 /LS	2,254	3,143.68 /LS	3,144	0.00%	890
	DIV 33	Division 33 - Utilities		1.000 LS	1,754.64 /LS	1,755	2,414.12 /LS	2,414	0.00%	659
	DIV 40	Division 40 - Process Integration		1.000 LS	111,781.97 /LS	111,782	154,083.38 /LS	154,083	0.05%	42,301
	DIV 41	Division 41 - Material Processing and Handling Equipment		1.000 LS	1,476,748.17 /LS	1,476,748	2,031,557.55 /LS	2,031,558	0.68%	554,809
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	431,461.50 /LS	431,462	593,213.20 /LS	593,213	0.20%	161,752
		08 ICB BLDG 8 INTAKE CHEMICAL BUILDING		1.000 LS	3,551,259.26 /LS	3,551,259	4,894,517.56 /LS	4,894,518	1.63%	1,343,258
09 BWS		BLDG 9 BACKWASH SUPPLY								
	DIV 03	Division 03 - Concrete		1.000 LS	1,481,994.74 /LS	1,481,995	2,078,340.61 /LS	2,078,341	0.69%	596,346
	DIV 04	Division 04 - Masonry		1.000 LS	219,832.41 /LS	219,832	304,086.64 /LS	304,087	0.10%	84,254

WBS Lvl 1	WBS Lvl 2	Description	Notes	Takeoff Quantity	Total Cost/Unit	Total Amount	Grand Total Price	Grand Total Amount	% Total	Addon Amount
	DIV 05	Division 05 - Metals		1.000 LS	66,241.28 /LS	66,241	91,152.73 /LS	91,153	0.03%	24,911
	DIV 06	Division 06 - Wood, Plastics, Composites		1.000 LS	2,729.86 /LS	2,730	3,774.36 /LS	3,774	0.00%	1,045
	DIV 07	Division 07 - Thermal and Moisture Protection		1.000 LS	55,905.42 /LS	55,905	76,878.60 /LS	76,879	0.03%	20,973
	DIV 08	Division 08 - Openings		1.000 LS	10,154.14 /LS	10,154	13,988.06 /LS	13,988	0.00%	3,834
	DIV 09	Division 09 - Finishes		1.000 LS	41,372.56 /LS	41,373	56,973.48 /LS	56,973	0.02%	15,601
	DIV 10	Division 10 - Specialties		1.000 LS	2,352.20 /LS	2,352	3,243.47 /LS	3,243	0.00%	891
	DIV 11	Division 11 - Equipment		1.000 LS	2,668.37 /LS	2,668	3,671.52 /LS	3,672	0.00%	1,003
	DIV 22	Division 22 - Plumbing		1.000 LS	13,491.22 /LS	13,491	18,558.01 /LS	18,558	0.01%	5,067
	DIV 23	Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)		1.000 LS	90,616.00 /LS	90,616	124,988.45 /LS	124,988	0.04%	34,372
	DIV 25	Division 25 - Integrated Automation		1.000 LS	278,975.00 /LS	278,975	384,795.80 /LS	384,796	0.13%	105,821
	DIV 26	Division 26 - Electrical		1.000 LS	1,156,818.00 /LS	1,156,818	1,595,622.19 /LS	1,595,622	0.53%	438,804
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	58,775.00 /LS	58,775	81,069.54 /LS	81,070	0.03%	22,295
	DIV 31	Division 31 - Earthwork		1.000 LS	1,458,967.15 /LS	1,458,967	2,012,943.41 /LS	2,012,943	0.67%	553,976
	DIV 33	Division 33 - Utilities		1.000 LS	3,861.81 /LS	3,862	5,313.28 /LS	5,313	0.00%	1,451
	DIV 40	Division 40 - Process Integration		1.000 LS	798,483.22 /LS	798,483	1,101,362.83 /LS	1,101,363	0.37%	302,880
	DIV 43	Division 43 - Process Gas and Liquid Handling, Purification and Storage Equipment		1.000 LS	1,303,005.34 /LS	1,303,005	1,791,480.06 /LS	1,791,480	0.60%	488,475
		09 BWS BLDG 9 BACKWASH SUPPLY		1.000 LS	7,046,243.72 /LS	7,046,244	9,748,243.04 /LS	9,748,243	3.25%	2,701,999
10 TYD		BLDG 10 TRANSFORMER YARD								
	DIV 25	Division 25 - Integrated Automation		1.000 LS	152,619.00 /LS	152,619	210,510.43 /LS	210,510	0.07%	57,891
	DIV 26	Division 26 - Electrical		1.000 LS	10,909,525.81 /LS	10,909,526	15,046,448.59 /LS	15,046,449	5.02%	4,136,923
		10 TYD BLDG 10 TRANSFORMER YARD		1.000 LS	11,062,144.81 /LS	11,062,145	15,256,959.02 /LS	15,256,959	5.09%	4,194,814
11 CIVIL		SITE CIVIL								
	DIV 02	Division 02 - Existing Conditions		1.000 LS	267,160.38 /LS	267,160	370,483.24 /LS	370,483	0.12%	103,323
	DIV 25	Division 25 - Integrated Automation		1.000 LS	323,736.00 /LS	323,736	446,535.54 /LS	446,536	0.15%	122,800
	DIV 26	Division 26 - Electrical		1.000 LS	4,310,661.00 /LS	4,310,661	5,945,780.88 /LS	5,945,781	1.98%	1,635,120
	DIV 28	Division 28 - Electronic Safety and Security		1.000 LS	927,221.00 /LS	927,221	1,278,934.47 /LS	1,278,934	0.43%	351,713
	DIV 31	Division 31 - Earthwork		1.000 LS	13,182,923.49 /LS	13,182,923	18,201,758.65 /LS	18,201,759	6.07%	5,018,835
	DIV 32	Division 32 - Exterior Improvements		1.000 LS	2,607,334.81 /LS	2,607,335	3,607,774.99 /LS	3,607,775	1.20%	1,000,440
		11 CIVIL SITE CIVIL		1.000 LS	21,619,036.68 /LS	21,619,037	29,851,267.77 /LS	29,851,268	9.95%	8,232,231
12 GEN		GENERAL NOTES, DETAILS, SCHEDULES AND MISC ITEMS								
	DIV 01	Division 01 - General Requirements		1.000 LS	1,044,000.00 /LS	1,044,000	1,440,010.07 /LS	1,440,010	0.48%	396,010
	DIV 02	Division 02 - Existing Conditions		1.000 LS	0.03 /LS	0	9,526,542.06 /LS	9,526,542	3.18%	9,526,542
	DIV 10	Division 10 - Specialties		1.000 LS	61,607.80 /LS	61,608	84,982.50 /LS	84,983	0.03%	23,375
	DIV 26	Division 26 - Electrical		1.000 LS	0.01 /LS	0	2,000,000.01 /LS	2,000,000	0.67%	2,000,000
		12 GEN GENERAL NOTES, DETAILS, SCHEDULES AND MISC ITEMS		1.000 LS	1,105,607.84 /LS	1,105,608	13,051,534.64 /LS	13,051,535	4.35%	11,945,927

Estimate Totals

Description	Amount	Totals	Hours	Rate	Cost Basis	Cost per Unit	Percent of Total	
Labor	33,656,427		641,012 hrs			673,128.536 /MGD	11.22%	
Material	65,387,116					1,307,742.316 /MGD	21.80%	
Subcontract	62,840,162					1,256,803.232 /MGD	20.95%	
Bond on Subcontractors	314,201			0.50 %	C	6,284.016 /MGD	0.10%	
Equipment	4,863,516		126,380 hrs			97,270.312 /MGD	1.62%	
Process Equip	31,652,206					633,044.126 /MGD	10.55%	
Partial Direct Subtotal	**198,713,628**	**198,713,628**				**3,974,272.560 /MGD**	**66.25%**	**66.25%**
Mob/Demob	4,967,841			2.50 %	T	99,356.813 /MGD	1.66%	
Sales Tax (Tax Exempt)					C			
Small Tools & Equipment	479,250			1.50 %	C	9,584.990 /MGD	0.16%	
Safety Supplies & Equipment	192,600			0.50 %	C	3,851.994 /MGD	0.06%	
Consumables	479,250			1.50 %	C	9,584.990 /MGD	0.16%	
Mob/Demob, Misc. Subtotal	**6,118,941**	**204,832,569**				**4,096,651.380 /MGD**	**2.04%**	**68.29%**
Escalation (0%)(Present Day Value)					T			
Escalation Subtotal		**204,832,569**				**4,096,651.380 /MGD**		**68.29%**
General Conditions (mid)	18,434,931			9.00 %	T	368,698.619 /MGD	6.15%	
General Conditions Subtotal	**18,434,931**	**223,267,500**				**4,465,350.000 /MGD**	**6.15%**	**74.44%**
Contingency (%)	23,443,087			10.50 %	T	468,861.744 /MGD	7.82%	
Contingency Subtotal	**23,443,087**	**246,710,587**				**4,934,211.740 /MGD**	**7.82%**	**82.25%**
Overhead & Profit	22,203,953			9.00 %	T	444,079.052 /MGD	7.40%	
GC OH&P Subtotal	**22,203,953**	**268,914,540**				**5,378,290.800 /MGD**	**7.40%**	**89.66%**
Permits (Excluded)	2,016,859			0.75 %	T	40,337.181 /MGD	0.67%	
Builder's Risk Insurance	484,046			0.18 %	T	9,680.923 /MGD	0.16%	
Performance & Payment Bond (%)	2,714,154			1.00 %	T	54,283.088 /MGD	0.90%	
Permits, Bonds & Insurance	**5,215,059**	**274,129,599**				**5,482,591.980 /MGD**	**1.74%**	**91.40%**
Demo City Garage Allowance	2,776,542				L	55,530.840 /MGD	0.93%	
Levee Authority Building Demolition & Site Prep	750,000				L	15,000.000 /MGD	0.25%	
Allowance - Contaminated Soil Testing and Hauling	6,000,000				L	120,000.000 /MGD	2.00%	
Allowance - Electrical Utility Feed	2,000,000				L	40,000.000 /MGD	0.67%	
Total Construction Costs (TCC)	**11,526,542**	**285,656,141**				**5,713,122.820 /MGD**	**3.84%**	**95.24%**
Owner's Contingency	14,282,807			5.00 %	T	285,656.139 /MGD	4.76%	
Total Project Costs (TPC)	**14,282,807**	**299,938,948**				**5,998,778.960 /MGD**	**4.76%**	**100.00%**
Total		***299,938,948***				***5,998,778.960 /MGD***		

OUCC DR 10-1 (Supplemental)

02/21/2024

DATA REQUEST
City of Evansville

Cause No. 45545 S1

Information Requested:

In Ms. Bretl's Direct testimony at page 3, Ms. Bretl said "Petitioner originally retained Clark Dietz in June 2023 to engage in 'value engineering' of the original plant design in an effort to identify opportunities for cost savings while maintaining functionality, treatment objectives, and performance." Please provide copies of the following documents:

a. Clark Dietz, Inc.'s proposal to Evansville.
b. Any agreement, contract or other document for value engineering service establishing compensation or scope of services by Clark Dietz, Inc.
c. Copies of all Amendments for engineering services by Clark Dietz, Inc.
d. Copies of all invoices and progress reports from Clark Dietz, Inc.

Original Information Provided: 02/08/2024

a. The proposed scope was discussed during a call and the Agreement was prepared based on the scope discussed.
b. Please see attachment OUCC DR 10-1 Attachment b
c. Please see attachment OUCC DR 10-1 Attachment c
d. Please see zip file attachments OUCC DR 10-1 Attachments d1 and d2

Original Attachments Provided: 02/08/2024

OUCC DR 10-1 Attachment b
OUCC DR 10-1 Attachment c
OUCC DR 10-1 Attachment d1 (zip file)
OUCC DR 10-1 Attachment d2 (zip file)

Supplemental Information Provided: 02/21/2024

Please see attached an Excel version of page 9 of the October 26, 2023 Progress Meeting.

Supplemental Attachments Provided: 02/21/2024

OUCC DR 10-1 Attachment d2 (Supplemental)

Kickoff Meeting Minutes

Project: Water Plant Value Engineering and Conceptual Design/Budgeting
Subject: **Kickoff Meeting**
Date: August 31, 2023, 1:00 pm CDT
Attendees: EWSU: Matt Montgomery, Shawn Wright, Lane Young, Harry Lawson, Steve Capin, Rick Glover
Clark Dietz: Andrea Bretl*, Jim Edenburn*, David Wichman
Arcadis: Amy Smitley, Tony Smurlo*
Black and Veatch: Adam Westermann*, Donnie Ginn*, William Rhoads*, Ben Freeze*
Kokosing: Tim Cooper, Todd Lemen*
*Designates Virtual Attendance
Copies: Attendees

This meeting kicks off a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget. The minutes were prepared by Andrea Bretl and distributed on September 5, 2023. If you have any corrections to these minutes, please inform Andrea by September 12, 2023.

1.0 Team Introductions were made by EWSU, Clark Dietz, Black and Veatch, Arcadis, and Kokosing.

2.0 EWSU's Next Planning Step Goals:

2.1 Matt provided an introduction outlining the steps that led us to this meeting. Arcadis and Black & Veatch were enlisted to individually explore options for rehabilitating the existing facility, while Clark Dietz focused on assessing the initial design plan. EWSU would like to further develop the rehabilitation option to obtain a cost estimate with a tighter probability range.

2.2 Lane emphasized that the current stage involves the engagement of all three consultants, along with Kokosing, working cooperatively to arrive at a realistic cost estimate and one that EWSU can use to make decisions.

2.3 Lane would like to have the cost information that they need for decision making by the end of October.

2.4 In addition to all the rehabilitation considerations, EWSU would also like to consider:
   a. The best use of their real estate/what to do with the old plant.
   b. Life cycle costs associated with rehabilitation vs new construction.
   c. A realistic design life for the rehabilitation option.
   d. How the project might be phased both to keep the current plant in operation and to spread construction costs out over a longer time period.
   e. Design capacity of 50 mgd only.

2.5 EWSU assumes that ozone treatment does not need to be considered to meet current treatment goals.

2.6 Roles:
   a. Clark Dietz: coordinator, facilitating communication among all parties involved (PM: Andrea)
   b. Arcadis and Black & Veatch: refining rehabilitation costs (PMs: Tony, Adam)
   c. Kokosing: provide opinions cost, constructability, and phasing. (PM: Tim)

3.0 Schedule

3.1 The following is a preliminary weekly discussion topic list and milestones with the first meeting on September 7th being more of an extended workshop (~4 hours) to give Arcadis and Black and Veach to present their options and to develop conclusions for treatment goals, salvageable components of the existing plants, and process flow.

Week Of	Discussion	Milestone Decisions
September 7	• Treatment Goals • Salvageable Buildings/Unit Processes • Existing Clearwell • Process Flow Diagram	• Current and Future Treatment Goals • Salvageable Buildings/Unit Processes
September 14	• Process Flow Diagram • Existing Clearwell • Hydraulic Profile/Flood EL requirements • Site Constraints • Seismic Design Criteria–existing and new	• Process Flow Diagram
September 21	• Existing Clearwell • Hydraulic Profile/Flood EL requirements • Seismic Design Criteria–existing and new • Process Layout – Rehab and New • Phasing	• Hydraulic Profile/Flood EL requirements • Site Constraints • Seismic Design Criteria–existing and new
September 28	• Existing Clearwell • Site Layout – Rehab and New with major elements (structure, equipment, electrical) identified • Piping/Materials Design Criteria • Phasing	
October 5	• Existing Clearwell • Process Layout – Rehab and New with major elements (structure, equipment, electrical) cost components • Piping/Materials Design Criteria • Phasing	• Process Layout/Preliminary Phasing • Existing clearwell
October 12	• Cost Component Updates	
October 19	• Cost Component Updates • Final Criteria	• Final Cost components
October 26	• Final Layout • Phasing • Costs	

4.0 Data/Information Needs

4.1 Clark Dietz will work to setup the best tools for information and data sharing amongst all parties.

5.0 Next Meetings:

5.1 September 7: Workshop from 8 am to noon central.

5.2 September 14-October 26: Weekly meetings from 8 am to 10 am central.

Workshop Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Workshop Meeting**
Date: September 7, 2023, 8:00 am CDT
Attendees: EWSU: Matt Montgomery, Lane Young, Harry Lawson, Steve Capin, Rick Glover
Clark Dietz: Andrea Bretl, Jim Edenburn, David Wichman, Jamie Headen (Benton Associates)
Arcadis: Amy Smitley, Tony Smurlo, Stephane Jousset, Jack King
Black and Veatch: Adam Westermann, Donnie Ginn, William Rhoads, Ben Freese
Kokosing: Tim Cooper, Todd Lemen, Alan Holding, Joe Lambdin, Steve Ehret
Sterling: Barb Daum, Andy Carroll, Matt Perkins
Copies: Invitees and Attendees

This meeting was to take a deeper look at the project goals, the rehabilitation options that have already been investigated, and make decisions on the parameters and constraints of the final option to be cost estimated. These minutes were prepared by Andrea Bretl and distributed on September 8, 2023, please inform her of any corrections by September 15.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives

a. Work collaboratively as a single team with all the best ideas on the table.
b. Develop 2023 planning costs for a single alternative that has a higher level of confidence than the current costs.
c. Develop life cycle costs for the hybrid option and new plant option.
d. Meet current water quality requirements, plan for future requirements.
e. Maximize the reuse of the existing plant. Maximize the best and highest use of all real estate.
f. Develop costs for demolition of the un-reused portions of the existing plant.
g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints

a. Capacity: The design capacity of the hybrid options needs to be 50 mgd of finished water.
   i. Current – 36 mgd with a basin out of service
   ii. Winter months have the lowest demand – The Plant could go lower than 36 mgd for sequencing during construction.
   iii. North plant capacity is currently limited to 17 mgd unless there is temporary bypass pumping. If a pipe that was demoed in a previous project was replaced, it could go up to 24 mgd.
   iv. South plant capacity is currently limited to 20 mgd
b. IDEM
   i. Residuals –The existing plans extending the intake pipes. This should handle issues with Residuals.
   ii. Elevations – It was discussed whether the rehab options will have to meet flood elevation requirements and whether the existing plant meets those requirements.
   - **Action Item: Lane will have a phone call with IDEM to determine if the rehab option still needs to meet the flood elevation requirements previously discussed.**
   - **Action Item: EWSU will send the AECOM has a memo that describes the elevation issue to the team.**

   iii. Existing Filter Rating – The hydraulic loading rate of the filters will impact their sizing by a factor of 2. 10 State standards require 2-4 gpm/sf. But to load at 2 gpm/sf might require pilot testing over all seasons. The lower 2 gpm/sf loading will facilitate future PFAS requirements with carbon addition.
   - **Decision: The filters will be laid out for the lower 2 gpm/sf loading.**

c. Land use – EWSU previously justified taking Levee Authority Bldg. and City Garage because of needing more space to meet PFAS requirements.
   - **Decision: If EWSU needs to say that that decision was re-thought, and that the land isn't fully utilized in the current plan, that's ok.**

d. Army Corps – The Corps will need to be coordinated with for any taking of wetlands or current ponding area.

e. Funding – The project is already on SRF's approved funding list. AIS – was included in Kokosing's GMAX budget. If the new rehab/hybrid option is pursued, will the contractor need to follow BABA requirements?
   - **Action Item: EWSU will check on whether BABA needs to be followed if they pursue rehab.**

f. Timing – The only timing constraint is funding. Rehab on the intake may count for starting.

g. DNR – The DNR will eventually need to be coordinated with on the Ohio River water withdrawal.

h. Cost – EWSU currently does not want to put a constraint on the rehab option dollar amount. If it is around $200M they won't have to obtain more borrowing capacity or have additional rate increases. At a certain level above $200M, they will have to make a new rate case.

1.3 Other Conceptual design considerations

a. Determine what will be needed for electrical layout.

b. Parking and traffic flow should be considered.

c. Space for administration and maintenance should be considered.

d. Simple operations should be prioritized in the final layout and design.

2.0 Workshop Objectives

2.1 Review existing preferred alternatives and process flow diagrams.

2.2 Set water quality goals.

2.3 Preliminary list of salvageable vs. unsalvageable areas

2.4 Site Constraints

3.0 Presentations

3.1 Black and Veatch discussed their alternatives focusing on their alternative 2 and the associated process flow diagram.

a. The question was asked whether they have experience with tube settlers on Ohio River water. They do know of plants that use Ohio River water and tube settlers: Northern KY Water and Owensboro.
   - **Action Item: Does EWSU want to visit a plant with tube settlers?**

3.2 Water quality objectives: The water quality objectives used were those previously developed. Those objectives are shown in Attachment 1.
   - **Decision: these are appropriate objectives.**

3.3 Existing Conditions

a. Filters 29-32: The concrete is not in good condition and is not currently being considered for reuse.

b. Filters 29-36: These have trouble getting sufficient flow.

c. Filters 21-28 (south plant): These were recently rehab'd, but the piping is in bad shape, bolts, valves, corrosion at pipe penetrations. The condition of the clearwell is unknown. The 48" raw water line goes through that building and it has pinholes.

d. Existing chemical systems are not in bad shape, but they are spread all over the site.
   - **Decision: Assume new chemical bldgs. for now.**

3.4 Arcadis – Discussed their Alternative 3 as well as 2 and 2B, which reuse parts of the existing north plant. They focused their later alternatives on minimizing the use of the old Levee Authority building given the potential beneficial reuse of that space.

4.0 Discussion

4.1 Site Constraints – The group looked at and discussed a map with various previously discussed options of locating the new components of the facility.

- **Decision: The areas agreed are summarized in Attachment 2.**

4.2 Salvageable vs. unsalvageable – Areas that will be salvaged vs those that won't be salvaged were discussed.

- **Decision: The areas agreed are summarized in Attachment 3.**

5.0 Data requests

5.1 Arcadis's new slides

5.2 Arcadis Asset management

6.0 Next Meeting: Goals and Assignments

6.1 The PMs from BV, Arcadis, Clark Dietz, and Kokosing will met Friday Morning, 9/8, to set assignments for next week's meeting.

a. Black and Veatch: Layout and process flow diagram, electrical reuse, clearwell and settling basin sizing.

b. Arcadis: Filter and chemical storage area sizing, life cycle cost framework, hydraulic profile

c. Kokosing: preliminary costs on another settling basing the same size as the current south primary settling basins.

d. Clark Dietz: Layout and lifecycle cost estimate for the new plant VE option.

7.0 Plant Tour for In-Person Participants

2.0 Process Evaluation of New Plant Design

The proposed processes for the new treatment facility were reviewed to evaluate their necessity and compatibility with the existing raw water quality and finished water quality goals (Table 2-1).

Table 2-1.Raw Water Quality Data, Treatment Performance Indicators, and Finished Water Goals.

Parameter	Average Value[1]	MCL, SMCL, Regulation, or Recommendation	Finished Water Quality Goal[3]
Total Organic Carbon, mg/L	3.8	% Removal Req	<2
Alkalinity, mg/L as $CaCO_3$	88	Influences %TOC Removal	>50
Total Dissolved Solids, mg/L	242	500	
Total Hardness, mg/L as $CaCO_3$	130	<150	100-150
Atrazine, µg/L	0.33[4]	3	<3
Phosphorus, mg/L	0.18		
Nitrate, mg/L	<2	10	
Iron, mg/L	0.29	0.3	<0.2
Manganese, mg/L	0.19	0.05	<0.05
Chloride, mg/L	16	250	
Sulfate, mg/L	38	250	
Chloride:Sulfate mass ratio	0.43	<0.5	
pH	7.78	6.5-8.5	>7.7
TOC Removal, %	>40%	25-35%	
Settled Water Turbidity, NTU			
North Plant Primary	1.46		
North Plant Secondary	1.39	<2	
South Plant Primary	1.97		
South Plant Secondary	1.66	<2	
TTHM Formation, µg/L[2]			
During Chloramine	47	<80	<80
During Free Chlorine	96	<80	<80

Source:
[1] AECOM Advanced Facility Plan Alternatives Report (unless otherwise noted)
[2] "Lab Data 2022" File in "Water Quality" Zip folder
[3] As stated in AECOM Advanced Facility Plan Alternatives Report
[4] Measured seasonally; this reflects average during spring runoff

2.1 OZONE

It is uncertain if the proposed ozone system is required to meet treatment goals. The proposed ozone facility was included for the primary purposes of reducing formation of halogenated disinfection byproducts (DBPs) and its secondary benefits of reducing undesirable taste and odors (T&O), removal of atrazine, and providing some primary disinfection (i.e., CT credit).

The primary period of non-compliance with DBP regulations occurs when the WTP is using free chlorine throughout the distribution system for nitrification control. Calculation methodology for DBP


Priority Areas for new Components: 3, 4, 8
Secondary potential: 5, 6
Not Preferred: 1, 2, 7
1-Preference? Not actually feasible
2-Redevolop
3-Utilities
4-Floodplain
5-Redevelop potential
6-Redevelop potential
7-No
8-Redevelop potential/ clearwells


Yes
Maybe to Repurpose
No
PAC
Admin To Chem?
Alum
Chlorine
North secondary settling
Filters 1-20 To Admin?
HSP
North primary settling
Electrical
HSP
6.5 MG Clearwell

Clark Dietz
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Meeting Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: September 14, 2023, 8:00 am CDT
Attendees: EWSU: Matt Montgomery, Shawn Wright, Lane Young, Harry Lawson, Steve Capin, Rick Glover
Clark Dietz: *Andrea Bretl*, Jim Edenburn, David Wichman
Arcadis: *Tony Smurlo*
Black and Veatch: Adam Westermann, *Ben Freeze*
Kokosing: Tim Cooper, *Todd Lemen*, *Alan Holding*
Sterling: *Matt Perkins*
Copies: Invitees and Attendees

This was a progress meeting as part of a regular series of meetings to develop the conceptual design of a rehabilitated water plant. These minutes were prepared by Andrea Bretl and distributed on September 18, 2023. If you have any corrections, please inform her by September 21, 2023.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives

a. Work collaboratively as a single team with all the best ideas on the table.
b. Develop 2023 planning costs that have a higher level of confidence than the current costs.
c. Develop life cycle costs for the hybrid option and new plant option.
d. Meet current water quality requirements, plan for future requirements.
e. Maximize the reuse of the existing plant. Maximize the best and highest reuse of all real estate.
f. Develop costs for demolition of the un-reused portions of the existing plant.
g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints

a. The design capacity is 50 mgd of finished water. Currently has a 36 mgd firm capacity. For construction, the plant could go lower than 36 mgd temporarily during the winter if need for sequencing.
b. IDEM
   - **Lane provided an update on our previous discussion on whether the hybrid plant option would be required to meet floodplain elevation requirements. Action Item: EWSU would like to know the differential costs between meeting and not meeting the floodplain elevations. This information he can use for future discussions and decision making.**

   ii. The memo previously prepared AECOM memo describing elevation requirements is on the e-Builder site for this project.
c. Army Corps
   i. There was a discussion on whether the wetland to the southeast of the current water plant site is potentially usable for new WTP components. This will be discussed further if this space seems like a good location.
d. SRF BABA vs. AIS
   - **Matt provided an update on whether BABA requirements need to be followed. EWSU's preliminary determination is that this is still the same project as the one approved by IDEM on May 14, 2022, if we close by Sept 30, 2024. If we start work on the intake structure, this will count. Need final price by June 1, 2024.**
e. Cost estimating
   - **Decision: The pricing provided by Kokosing as part of this Value Engineering effort are estimates, not GMAX costs.**

- **Action Item: Kokosing will include all their assumptions with the pricing that they provide.**

2.0 Design Considerations

2.1 Previous decisions:

a. Filter rating 2 gal/min/SF. Testing would need to be done if we are going to increase this to 4 gpm/sf. Filters are currently rated at 3 gpm/sf (Rick).

- **Design Decision: the 2 gal/min/sf loading rate will be assumed for conceptual design as part of this VE engineering effort.**

b. Previous WQ goals will be used.

c. Open tanks/major electrical above EL 384

2.2 Ongoing work:

a. Electrical and site layout (BV)

b. Parking and traffic flow (after site plan development)

c. Administration and maintenance space

d. Chemical buildings – assume new for now.

e. PFAS Information review

2.3 Deliverable

- **Action Item: EWSU would like a rendering of what the site will look like to accompany the final deliverable. Arcadis will work on this.**

3.0 Presentations and Discussion Topics

3.1 BV: layout and process flow diagram, electrical reuse, clearwell and settling basing sizing

a. Hybrid:

i. Rehab of intake not changed from the current design.

ii. Second raw water line to a new distribution box. Question from plant: What would be the hydraulics? Could one line carry the full flow, or would there be restrictions?

iii. Tube settlers in Primary basins – bring from 2 to 3. New splitter boxes.

- **Decision: EWSU does not want to visit a tube settler plant.**

iv. For preliminary sizing, the filter design was copied from AECOM plan. Leave space for future filter expansion.

v. GAC could have space if we pumped using the transfer pumps.

vi. Consider leaving space on the site plan for future ozone.

vii. Admin Building: question should we get an architectural firm to review the feasibility of renovations?

- **Action Item: What is the minimum size of the clearwell volume to get sufficient CT time in the clearwells?**

viii. EWSU reminds us to consider ingress and egress to the proposed water plant site. Make sure the proposed entry road is not too close to Veteran's. Balance potential land redevelopment with traffic needs and logical site design.

- **Design Decision: They keep the existing Alum (HyperIon) room**
- **Design Decision: The preferred layout is 3 equal sized primary settlers.**
- **Action Item: Transfer pump station needs to be further considered. If it is included, it will add flexibility for future treatment either UV or PFAS and above grade clearwells. However, with it, there is the additional capital cost, operational complexity, and lifecycle costs of building, maintaining, and operating another pump station. Space could be left on the site or HSP room so that a transfer pump station could be added in the future. This might be the additional cost of meeting the flood elevation that Layne asked us to consider at the beginning of the meeting.**

b. Black and Veatch also presented a low-cost option that keeps more of the existing plant and adds fewer new elements. This low-cost option included:

i. Demo north

ii. New Primary clarification

iii. Keep all filters 21-36 – no new filters,

iv. High service pump stations would be converted to transfer pump stations.

- **Design Decision: for now, EWSU would prefer to move forward with the hybrid option, this**

low-cost option can be a fallback option, if needed.

3.2 Arcadis: discussed that they have been looking at filter and chemical storage area sizing, life cycle cost framework, and the hydraulic profile.

a. They are trying to determine if it will be possible in the future to get PFAS treatment with the existing treatment.
b. Reuse for admin space: how much room is available for people
c. They are preparing a framework for lifecycle costs.
d. They asked again about the potential for the use of membrane treatment in the future.
- **Design Decision: Membranes treatment will not be a future option.**

3.3 Clark Dietz: presented a revised layout of new plant option VE layout.

a. For this option, the entire existing plant could be demo'd except the intake structure, potentially a structure for chemical storage, and potentially a structure for the administration building.
b. The site plan will be provided to Kokosing to assist with cost estimating for the new plant VE option.

3.4 Kokosing:

a. Currently working on preliminary costs for a 3rd circular primary settling basin.
b. Will also start working on demolition costs for the existing plant structures.
- **Decision: Demo will be costed two ways for each structure. One, to 3 ft below grade with all equipment removed. Two, complete removal.**
- **Decision: Break up cost by structure.**
- **Decision: outfalls will need to be rerouted.**

4.0 Data

4.1 Current

a. Arcadis has a few additional data requests that they will send to Clark Dietz
b. Kokosing requested the BV layouts as well as the CD layout option

4.2 Data sharing: eBuilder will be used for sharing existing data. Clark Dietz will work with EWSU to set up the folder structure. In addition to the background documents and meeting minutes, folders will be added for photos and cost estimates (vendor, lifecycle, etc.).

5.0 Next Meeting:

5.1 Goals

a. North Plant - Demolition Costs (Kokosing)
b. Hydraulics of influent pipes
c. Layout of filters/clearwells
d. Clearwell elevation

5.2 The next meeting will be moved from the 21st to the 22nd from 8-10 am.

Meeting Agenda

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: September 22, 2023, 8:00 am CDT
Attendees: EWSU: Matt Montgomery, Lane Young, Harry Lawson, Rick Glover
Clark Dietz: *Andrea Bretl*, Jim Edenburn, David Wichman, *Jamie Headen* (Benton Associates)
Arcadis: Amy Smitley, *Tony Smurlo*
Black and Veatch: Adam Westermann, *Ben Freeze*
Kokosing: Tim Cooper, *Todd Lemen*
Sterling: *Brian Luigs*
Distribution: Invitees

This is a progress meeting for a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives

a. Work collaboratively as a single team with all the best ideas on the table.
b. Develop 2023 planning costs that have a higher level of confidence than the current costs.
c. Develop life cycle costs for the hybrid option and new plant option.
d. Meet current water quality requirements, plan for future requirements.
e. Maximize the reuse of the existing plant. Maximize best and highest reuse of all real estate.
f. Develop costs for demolition of the un-reused portions of the existing plant.
g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints/Design Considerations

a. Design capacity is 50 mgd of finished water. Current is 36 mgd firm. For construction they could go lower than 36 mgd temporarily during the winter if need for sequencing.
b. Filter rating 2 gal/min/SF
c. Previous WQ goals will be used.
d. IDEM flood elevations: what is the cost differential between meeting and not meeting flood elevations. Open tanks/major electrical above EL 384.
e. Army Corps: while the wetland to the southwest of the site might be able to be used, we will try to avoid it if possible due to potential complications with that site.
f. SRF BABA vs. AIS: for now we will assume BABA requirement do not need to be met.
g. Cost estimates will include all assumptions but are not GMAX prices.

2.0 eBuilder

2.1 Background Documents

a. Geotech, Bridge inspection, Basis of Design Report, Background plans, electrical costs and service contract
   - **AECOM final drawings expected today. Are they really ready for bid. They expect the CAD drawings to follow.**

2.2 First Round Analysis

2.3 Second Round Meetings

a. Minutes, drone photos, historic operating costs (chemical)

3.0 Presentations and Discussion Topics

3.1 Reuse: Keep the area of the existing plant reserved for potential reuse for the utility. Keep the area to the east of the road available for future commercial reuse as much as possible. The north plant and south filters need to be reused during construction.

3.2 Black & Veatch

a. Raw Water Piping – two new 42" pipes per the AECOM design, or one existing 36" and one new 42". Discussion about piping. Temporary piping during construction. Piping through the current Admin Building might be an option. Or where the existing 36" is located. Each pipe should have at least a 36 mgd capacity. 36" should be ok for the short term. Will avoid an exposed pipe on the levee, if possible.

- **Design Decision: new piping is needed from the building to the splitter structure.**
- **Design Decision: Metering on two raw water lines, not into the three tube settlers.**

b. Mixing – B&V has been assuming rapid mix since the plant hasn't had good experience with static mixing.

- **Request: B&V would like pump curves for detailed design.**

c. Filtration

i. The current plan has a lower loading rate (2 gpm/sf) than AECOM (3.2 gpm/sf). The AECOM filters were deeper.

ii. Existing filter to waste is up by the north plant filters. B&V needs to add backwash supply, filter to waste, outfall.

d. Clearwell volume requirements

i. Typically, B&V they like to see at least 10% of storage at the plant, which would be 5 mg.

ii. B&V is currently showing 10 mg, but not all of it may be needed.

iii. There is also clearwell beneath the filters ~0.77 mg each, total is ~1.5 mg

- **Design Decision: Minimum now should be 5 mg with space to add an additional 2.5 in the future. This is usable volume in addition to the storage below the filter clearwells.**

iv. Future: if flow by gravity now and have top of wall ~385 then in the future you could utilize the additional 18' by pumping.

e. Clearwell elevation/pumping discussing: adding transfer pumps now or in the future. Gravity to clearwell would be low ~350 to drain filter clearwells.

- **Design Decisions: For now, flow to the clearwell by gravity. Leave space/access for a future transfer pump station for either future treatment or additional clearwell volume.**

f. Sludge pump station

i. The well itself is ok. It needs new piping/pumps. The discharge needs to be extended into the river.

g. Residual outfall

i. Who is developing plans

ii. Consolidate all outfalls into one

h. Chemical

i. Hyperion – reuse. Location next to the Admin bldg? Keep for now to see where costs are.

ii. PAC – new

3.3 Arcadis

a. Looking at space needed for operation, maintenance, admin.

b. Chemicals – for sodium hypochlorite, sodium hydroxide, corrosion, fluoride space needs (100x40). They will size a footprint for B&V.

c. PFAS – could they just replace the media in the existing filters to get treatment? Media would only last 6 months. And there isn't enough depth. A separate treatment train will be needed.

3.4 Clark Dietz

a. New plant option – revised layout

3.5 Kokosing

a. Demolition costs – meeting with demo contractor today

b. 3rd Settler Costs – will have number next week

c. To estimate other new items – sizes, depths, cross sections, hydraulic profile.

   i. For 21-28 B&V will markup existing drawings, x2 – one for rehab of existing, one for new building.

   ii. For tube settlers B&V will get floc settler within structure. Also need to get a new proposal.

   iii. Settling basin cover – geo dome. Clark Dietz will get info

3.6 Other Cost Estimating

- **Design Decision: All new structures will be estimated with auger cast piles no drilled piers.**

b. Tube settler basins – will they be covered? Experience with other plants are not covered.

c. Next items ready

d. Information needed

4.0 Next Meeting:

4.1 Goals

4.2 September 28, 8:00 am

Meeting Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: September 28, 2023, 8:00 am CDT
Attendees: EWSU: Matt Montgomery, Shawn Wright, Lane Young, Harry Lawson, *Steve Capin*, Rick Glover
Clark Dietz: *Andrea Bretl*, Jim Edenburn, David Wichman, *Jamie Headen* (Benton Associates)
Arcadis: *Amy Smitley, Tony Smurlo*
Black and Veatch: Adam Westermann, *Ben Freeze*
Kokosing: Tim Cooper, *Todd Lemen, Alan Holding*
Sterling: *Barb Daum, Matt Perkins*

This is a progress meeting for a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget. These minutes were prepared by Andrea Bretl and distributed on September 28. If there are any corrections, please let Andrea know by October 5, 2023.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives

a. Work collaboratively as a single team with all the best ideas on the table.
b. Develop 2023 planning costs that have a higher level of confidence than the current costs.
c. Develop life cycle costs for the hybrid option and new plant option.
d. Meet current water quality requirements, plan for future requirements.
e. Maximize the reuse of the existing plant. Maximize best and highest reuse of all real estate.
f. Develop costs for demolition of the un-reused portions of the existing plant.
g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints/Design Considerations – See Attachment A. If there are any corrections to the design decisions, please let Clark Dietz know.

2.0 Site Layout and Land Utilization

2.1 Hybrid Layout – B&V shared their layout. It is largely unchanged from last week.

a. We are moving forward with rectangular tanks.
- **Decision: EWSU preference is to have these tanks largely on the triangular property south of the maintenance facility's access road.**
- **Decision: The existing electrical lines on that property will have to be relocated and will likely need to be buried.**

2.2 VE Layout – CDI shared their layout. It is unchanged from last week. This option does not redesign the treatment of AECOM (except eliminating ozone) but reuses as much existing design work as possible to minimize the need for engineering redesign of the plant elements.

a. We have provided the site plan to Kokosing and will also provide them with a piping layout and hydraulic profile.
b. This layout provides less re-development potential than the hybrid layout.
c. The basis of the cost estimate will be the GMAX pricing that Kokosing has already done with revisions for VE elements. The cost estimating for this will not be detailed like for the hybrid option, because the detail work was already done with the GMAX pricing.

3.0 Presentations and Discussions

3.1 Black & Veatch – this discussion centered around the filter building, clearwell, and pump stations. B&V is developing some additional details that Kokosing needs for cost estimating.

3.2 Arcadis

a. Chemical demand and sizing – Arcadis is about ½ way through looking at chemical demands and building sizing. They anticipate being done next week.
b. People spaces – Arcadis is looking into the square footage requirements for maintenance, administration, and operations. Determining where exactly those spaces are will follow.
c. Asset management – Arcadis is focusing on the buildings that are to remain in the new plan. They will send the asset management plan soon.

4.0 Cost Items: Kokosing

4.1 Current items:

a. Settling basin 3 – Currently at $10.5M – likely to drop after dewatering drops.
   i. Tube settler equipment price was for two large and 2 small clarifiers. Divide those costs in three. Get a new quote
   ii. Dewatering: is it necessary since the new tanks will be essentially above grade.
   iii. Cost includes site piping back to splitter box.
b. Filter Building - New
   i. For concrete estimate, use B&V's new layout. Use the hydraulic profile for the elevation. Use as-built drawings for piping in the middle of the building. There are a few piping details in the existing drawings that are not going to be used for the new.
   ii. Use the pile layout that is in the old drawings.
   iii. Increase the reinforcing from the old drawing. Plan on thicker concrete/more rebar. Can they use the AECOM final drawings for filter wall size/rebar? Probably yes if they have the detail.
   iv. The bottom of the filter building will be approximately 5' below the bottom of the settling basins.
   v. Kokosing would like B&V's revised drawing as well as their current site plan and hydraulic profile. B&V will also send the clearwell drawing.
   vi. We will want two options: 1) transfer pump station, clearwell tank walls 27' tall (25' SWD), 2) no transfer pump station, clearwell tank walls 42' deep (25' SWD). Assume that the transfer pump station (TSP) pumps will be the same layout/piping as the high service pump station (HSP). The TSP will be smaller. The backwash pumps will be separate.
c. Filter Building – Existing (South)
   i. Everything to be rehab'd except for the filters themselves.
d. Clearwell: Start with unit costs of the CSO tanks at the West WWTP. B&V currently shows baffle walls going the length of the tank. They should probably be the width of the tank.
e. Demo – They hope for the estimates next week.

4.2 Currently not carrying owner contingency for the individual items.

4.3 Recommend: All yard piping costs be separate from structures. B&V will provide piping length.

4.4 Next item/current information needs:

a. This week:
   i. Working on new-plant option
   ii. New filter building
b. Next week:
   i. Clearwell
c. Other:
   i. Existing filter building – piping costs will be similar to new + demo
   ii. Existing settlers – Kokosing would like more details on what this would look like/what they would need. B&V has floc zone sized; will get details to Kokosing. Currently the floc zone has paddles. EWSU is ok with paddles. Get a proposal from Mike Row from Pelton.
   iii. Post-chemical (Caustic, LAS)
   iv. Splitter structure

v. PAC – Same as AECOM design
vi. Hypochlorite – Same as AECOM design?
vii. Coagulant system – not many costs at this location
viii. Also need pump quotes.
ix. Influent lift station
x. Site piping
xi. Site electrical – B&V will send information on how to repurpose existing chemical feed. B&V will send information to Kokosing.
xii. Filter to waste and low lift pumps – they need to be new. Will be next to the new filter building.

5.0 eBuilder

5.1 Background Documents: Geotech, Bridge inspection, Basis of Design Report, Background plans including AECOM 100%, electrical costs and service contract

5.2 First Round Analysis; Second Round Meetings: Minutes, drone photos, historic operating costs

- **We will use eBuilder as a place to share our working drawings so everyone can see the same things.**

6.0 Next Meeting:

6.1 October 5, 8:00 am

Water Plant Value Engineering
Hybrid Option Conceptual Design and Budgeting
Evansville Water and Sewer Utility
LAST UPDATED: 09/28/2023

Date	Type	Design Decisions	Notes
9/7/2023	Site	Site Constraints agreed upon at workshop to maximumize beneficial reuse.	
9/7/2023	Site	Salvagable/Unsalvagable areas agreed upon at workshop.	Most of the north plan is unsalvagable.
9/7/2023	Site	Top of structure elevation - 384' (operating floor of intake; max flood 382.5)	Are there savings to not using this elevation? What would the cost savings be for the clearwell structure/shorter pumps?
9/14/2023	Site	Move forward with hybrid option, not rehab.	Also, CDI requested to prepare a drawing for Kokosing to estimate new plant VE option.
9/14/2023	Site	Outfalls need to be rerouted	
9/14/2023	Settling	Preferred layout is 3 equal sized primary settlers.	
9/14/2023	Settling	Membranes treatment will not be a future option.	
9/14/2023	Settling	The two large circularlar clarifiers will be reused and retrofit. A third will be added.	
9/22/2023	Piping	New piping is needed from the building to the splitter structure.	
9/22/2023	Piping	Flow meters will be installed on the two raw water lines, not into the three tube settlers.	
9/22/2023	Intake	The modifications to the intake building, pumps, and screens do not need to be reconsidered.	
9/22/2023	Intake	Two new 42" raw water pipes to the splitter structure are required.	
9/7/2023	General	Water quality objectives used for AECOM's design were discussed and are appropriate.	
9/7/2023	General	Design capacity is 50 mgd of finished water. Current is 36 mgd firm.	For construction they could go lower than 36 mgd temporarily during the winter if need for sequencing.
9/14/2023	General	Assume that BABA requirements do not need to be met for SRF funding.	
9/22/2023	General	All new structures will be estimated with auger cast piles not drilled piers.	
9/22/2023	Filtration	Filtration depth will not be configured for GAC/PFAS removal	
9/7/2023	Filters	The filters will be laid out for 2 gpm/sf loading.	
9/14/2023	Cost	Pricing provided by Kokosing as part of this Value Engineering effort are estimated, not GMAX costs	
9/14/2023	Cost	Demo will be costed two ways for each struction. 1) to 3 ft below grade wth all equipment removed and 2) Complete removal.	
9/14/2023	Cost	Costs will be divided by structure.	
9/22/2023	Clearwell	Flow to the clearwell by gravity (for current design).	In the future the water elevation in the clearwell could be raised and a transfer pump station added.
9/22/2023	Clearwell	Minimum clearwell volume should be 5.0 mg with space to ad 2.5 mg	
9/7/2023	Chemical	Assume new chemical buildings unless existing buildings are reusable.	This may change if additional chemical rooms are reusable.
9/14/2023	Chemical	Keep existing aluminum chloride (Hyper+Ion) room	

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Meeting Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: October 5, 2023, 8:00 am CDT
Attendees: EWSU: Matt Montgomery, Harry Lawson, Steve Capin, Rick Glover
Clark Dietz: *Andrea Bretl*, Jim Edenburn, David Wichman
Arcadis: *Amy Smitley, Tony Smurlo*
Black and Veatch: Adam Westermann
Kokosing: Tim Cooper, *Todd Lemen, Alan Holding*
Sterling: *Barb Daum, Matt Perkins, Brian Luigs*

This was a progress meeting for a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget. The minutes were prepared by Andrea Bretl and distributed on October 6, 2023. Please inform her of any corrections by October 12, 2023.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives

a. Work collaboratively as a single team with all the best ideas on the table.
b. Develop 2023 planning costs that have a higher level of confidence than the current costs.
c. Develop life cycle costs for the hybrid option and new plant option.
d. Meet current water quality requirements, plan for future requirements.
e. Maximize the reuse of the existing plant. Maximize the best and highest reuse of all real estate.
f. Develop costs for demolition of the un-reused portions of the existing plant.
g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints/Design Considerations – See Attachment A

2.0 Presentations and Discussions

2.1 Black & Veatch – Ben sent updated files yesterday. Kokosing is using those documents for cost estimating. Kokosing will use a 3-ft wall thickness for estimating the clearwell concrete volume and use the West Plant CSO basin for rebar estimates.

2.2 Arcadis

a. Chemical demand and sizing – used information from the advanced facility plan and 30% design to determine how much chemical will be needed. Took out bulk and day tank requirements. Arcadis's calculations are similar to AECOM's. Arcadis has laid out a preliminary room dimensions for the storage tanks. There appears to be enough tank in the existing chlorine gas room for sodium hypochloride storage.
   i. EWSU: they rarely get taste and odor complaints
   ii. EWSU: in addition to 10 State requirements, sizing should also consider tanker truck volumes.
b. Asset management – they have updated the current asset management plan. They are tracking items that are salvageable as well as items that need to be accounted for but potentially haven't been accounted for in the current plans. Most recent plant upgrade projects include:
   i. 2019 Filter Bed Rehab - completed
   ii. 2021 Filter Bed Rehab – in process

iii. 2023 Filters 13-20 Rehab (actuators) – in process
iv. 2020 HSP 4 & 5 rehab - completed
v. 2022 HSP 8,9,10 – in process
vi. 2022 Switch Gear - completed

c. People spaces – Arcadis has estimated the total square footage. There will be a single story. Arcadis will meet with Harry, Rick, and Brenna next Tuesday morning to go over space requirements in additional detail.

d. Renderings – They will focus on rendering the hybrid option. They have estimated approximately 80 hours of effort to create basic renderings that are mostly a shell for visual purposes.

2.3 Clark Dietz

a. The existing CenterPoint costs were discussed. The $8.5M estimate from CenterPoint included upgraded power supply as well as burying the line along Waterworks Road. If the power supply is not upgraded, then the estimated cost for just burying the power lines should be $1.5M. Kokosing does not need to account for this.

b. The WTP currently has 2 power feeds plus backup generators. They prefer to continue this power supply operation in the future.

c. The GMAX price did not include the cost of relocating power line along Waterworks Road.

3.0 Cost Items: Kokosing

3.1 Current items:

a. Hybrid buildings
i. Working on settling basin rehab
ii. Working on filter building
iii. Working on clearwell. What should they use for HSP on top? BV may have a similar drawing.
iv. Existing filter building – assume new doors, windows (block to tinted glass), painting, roof, storefront inside.
v. PAC – same as AECOM
vi. Splitter structure – BV will clarify dimensions
vii. Chemical buildings – from Arcadis dimensions (chlorine room); all new equipment

b. Demo
i. Building 7 – Kokosing doesn't have existing drawings, but that's because EWSU didn't put any on eBuilder. EWSU may have some drawings and will check.
ii. Building 8 – Kokosing doesn't have drawings. Neither does EWSU.
iii. Building 17 – Kokosing doesn't have existing drawings.
iv. Building 19 – Kokosing will use photos.
v. Building 20 - There won't be any modifications.

3.2 Next week Kokosing will go first and discuss their cost framework even for the items that are not currently populated with costs.

4.0 eBuilder

4.1 Background Documents; First Round Analysis.

4.2 Second Round Meetings: Minutes, drone photos, historic operating costs

- **Please either send updated working documents to Andrea to upload or upload them into folder 4.4 so everyone has access to the most recent information.**

5.0 Next Meeting:

5.1 October 12, 8:00 am

5.2 Final tour – October 26; 10-noon

Meeting Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: October 12, 2023, 8:00 am CDT
Invitees: EWSU: Matt Montgomery, Shawn Wright, Harry Lawson, Steve Capin
Clark Dietz: *Andrea Bretl*, Jim Edenburn, David Wichman, *Jamie Headen* (Benton Associates)
Arcadis: *Amy Smitley, Tony Smurlo*
Black and Veatch: *Adam Westermann, Ben Freeze*
Kokosing: Tim Cooper, *Todd Lemen, Alan Holding*
Sterling: *Barb Daum, Matt Perkins*

This was a progress meeting for a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget. The minutes were prepared by Andrea Bretl and distributed on October 12, 2023. Please inform her of any corrections by October 19, 2023.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives
- a. Work collaboratively as a single team with all the best ideas on the table.
- b. Develop 2023 planning costs that have a higher level of confidence than the current costs.
- c. Develop life cycle costs for the hybrid option and new plant option.
- d. Meet current water quality requirements, plan for future requirements.
- e. Maximize the reuse of the existing plant. Maximize the best and highest reuse of all real estate.
- f. Develop costs for demolition of the un-reused portions of the existing plant.
- g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints/Design Considerations were included with the Agenda.

2.0 Cost Items: Kokosing

2.1 Project time - Cut time off from the AECOM option for the alternate pile type.
- a. AECOM – 59 weeks
- b. VE – 53 weeks
- c. Hybrid – 53 weeks

2.2 VE Option
- a. Included general costs – supervision; living expenses; field office; survey; dumpster; equipment move; 3rd party testing; central engineering; safety railing, barricades, training; laydown and parking; material handling crew; cleanup (part of mobilization); dust control; documentation; admin; security (OFF); eBuilder (TURN OFF); permits (OFF); escalations (PARTIALLY OFF); mobilization
- b. Cost escalation
  - i. Kokosing to assume that construction will start on January 1, 2024
  - ii. Engineers will add escalation for the items that will take longer because of the need for redesign
- c. AECOM items to be reused (ie. Raw intake building and PAC feed) – AECOM CAD drawings will be reused and one of the firms involved in the redesign will review and stamp.
- d. Demo of Levee Building and Maintenance Building

i. Buildings are in good condition
ii. Maintenance building could be used instead of construction trailers; also for a shop, storage, and laydown. It is fenced. Kokosing currently has $1.3M for construction facilities. There may be a significant savings if this isn't needed.
iii. Levee building could be used as a temporary admin building during construction.

e. Demo – currently in estimate just a as a lump sum; will be updated for line items.
f. Site Concrete – sidewalks, pavements
g. Entrance sign – same as in the AECOM design
h. Earthwork – is it being double counted? Where will excess material be put? Where will soil be stockpiled?
i. Dewatering – currently $5M. Hasn't been adjusted yet for smaller footprint and shallower profile. For the VE option, this will just be one line item, not broken out by building.
j. Raw Water Intake Pipeing – currently brought over AECOM's design. Kokosing needs to double check.
   i. No concrete foundations.
   ii. Why is the 12" WM being run back to the intake? Seal water? It won't need to be heat traced.
k. Utilities: fire water, sanitary, storm, gas, yard
l. Turned off $21M transformer yard
m. Pile foundation – different than AECOM – will be broken out by building.
n. RW Intake Bldg – same as AECOM
o. Settling – do we want the canopy? Yes for now. Assume the same for both the VE and Hybrid options.
p. Same design: Filter, residuals pump station, chem bldg., PAC
q. Backwash pumps – AECOM had backwash pumps and used and below grade tank. We will have the pumping and electrical equipment. The structure eliminated and the backwash pumps will be put into the filter building.
r. Admin building (OFF)
s. Contingencies have been carried through from the original GMAX cost
t. Builders Risk – Kokosing would prefer to carry. They have it included now at $2.6M.
u. Dredging – Currently have an allowance on the intake of $100K. Wasn't included in original.
v. Extending outfalls – Was not included in the original, but will be included with yard piping.

2.3 Hybrid Option

a. General Conditions – GCs will be the same as for the VE option.
b. Mob/Demob – basically the same as the VE option
c. Site work – is going to be tailored to the hybrid layout
d. Dewatering – BV recommends making the specific to building as some of the buildings (filters) will not need much dewatering because of their bottom elevation. BV's design document has bottom elevations for everything.
e. Pile foundations – included in each building separately.
f. Site electrical – Sterling is working on costs based on the one-line diagram they received.
g. Yard piping is being built based on BV's drawing.
h. Raw water intake bldg. – brought over from AECOM. It includes dredging. Assume existing pumps; they will be approximately the same size. AECOM's piping was higher even though their hydraulic profile was lower.
i. Raw water intake piping – brought it over from AECOM and will adjust.
j. PAC Feed - brought it over from AECOM design
k. New Facilities –
   i. Settling basin – discussed two weeks ago. Kokosing needs to make sure that they have tube settler and equipment install for all 3 basins. Make sure there is a canopy cost here too.

ii. Filter Building
iii. HSP – For costing, structurally use AECOM's design. This HSP should be with the Clearwell; not with the Filter Building as it is on the same structure as the clearwell.
iv. Rapid mix/splitter structure – is this cost captured on the VE option? It is a different type of configuration between the AECOM and the VE/hybrid. Both VE/hybrid will use rapid mix/splitter.
v. Residual PS, Existing sludge PS upgrades
vi. New Chemical
vii. Existing Filter Upgrades (Architectural, re-roof, paining and coating, interior piping)
viii. Existing Post-Chemical building – Existing chlorine gas conversion to hypochloride – use AECOM costs for chlorine equipment. Add demo of existing equipment. Existing building with containment, new building systems: mechanical, electrical. Arcadis has a layout – will summarize key information for Kokosing. – revise note on the bid item information
ix. New Post-Chemical - caustic, bisulfite, fluoride, LAS – revise note on the bid item information. Arcadis also has a preliminary layout for this building.
x. Existing coagulant rehab.
xi. Arcadis will send a clarification on what chemicals will go where.

3.0 Updates

3.1 Black & Veatch
- a. Getting information to Tim for cost estimating
- b. Need to get building height to Arcadis for rendering
- c. Cost for raising to grade? All costs right now will be based on elevation 384.

3.2 Arcadis
- a. People spaces – estimating square footages and plan to apply just a square foot cost. Next week will have some ideas on what architectural options will be.
- b. Chemical spaces – will get info to Kokosing as described above.
- c.

3.3 Clark Dietz
- a. Exteriors – Exposed concrete will have form liner; not brick.

3.4 Sterling had asked electrical questions previously; if they don't receive answers they will need to make broad generalizations.
- a. BV has some answers and will send them by tomorrow [sent 10/12].

4.0 Deliverable

4.1 Brief memo with attachments from BV, Arcadis, Clark Dietz and Kokosing with the final version of the working documents we have been discussing over the last 6-8 weeks.

5.0 Schedule

5.1 Next Meeting: October 19, 8:00 am
5.2 October 26 – workshop to VE the cost estimates options. Assume that this meeting will go to noon.
5.3 November 1 – deliverable to EWSU

Meeting Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: October 19, 2023, 8:00 am CDT
Invitees: EWSU: Matt Montgomery, Shawn Wright, Harry Lawson, Steve Capin
Clark Dietz: *Andrea Bretl*, Jim Edenburn, David Wichman, *Jamie Headen* (Benton Associates)
Arcadis: *Amy Smitley, Tony Smurlo*
Black and Veatch: Adam Westermann, *Ben Freese*
Kokosing: Tim Cooper, *Todd Lemen, Steve Ehret*
Sterling: *Barb Daum, Brian Luigs, Matt Perkins*

This was a progress meeting for a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget. The minutes were prepared by Andrea Bretl and distributed on October 19, 2023. Please inform her of any corrections by October 26, 2023.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives

a. Work collaboratively as a single team with all the best ideas on the table.
b. Develop 2023 planning costs that have a higher level of confidence than the current costs.
c. Develop life cycle costs for the hybrid option and new plant option.
d. Meet current water quality requirements, plan for future requirements.
e. Maximize the reuse of the existing plant. Maximize the best and highest reuse of all real estate.
f. Develop costs for demolition of the un-reused portions of the existing plant.
g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints/Design Considerations are unchanged.

2.0 Cost Items: Kokosing

2.1 New Plant VE

a. General conditions – no changes
b. Mobilization –
   i. Third part testing is from CTL. This is currently the same value ($2.38M) as the original GMAX price. Kokosing is checking this.
c. Sitework
   i. Garage and Levee building – these costs are included. The demolition value for both buildings is $675k. It was included in the AECOM price.
   ii. Pump station demo is mechanical demo.
   iii. Klenk demo costs - Current new plan option price includes Klenk costs for demo. Currently that is not broken out, but it will be for next week.
d. Dewatering – has not been updated for different elevations but will be updated for next week.
e. Yard Piping – is being updated.
   i. Kokosing will make sure that they have accounted for the water line that needs to be relocated for both options.
f. Pile foundation has been updated. The auger cast pile cost is $9.3M.
g. Dredging - There is $100,000 for dredging at the intake.
h. Backwash supply – Keep the building put the tank goes away.

i. Hypo – the VE option will have one additional tank.
j. Owner Contingency – Kokosing will not carry this number in their estimate, it will be carried by City spreadsheet.

2.2 How conservative are the current cost estimates? The individual line items don't have a contingency on them. They have an overall contingency. For VE it is 5%. This is something that can be discussed next week.

2.3 Hybrid Option

a. Maintenance of Plant Operation / Sequence
   i. Intake Building should have been included with the original GMAX. That cost needs to be in both options.
   ii. For construction – the south filters need to be maintained as the north filtration capacity is not adequate.
   iii. Build Primary Settler 3 first and connect from there to Filter 21-28. Only one settler is needed to go to Filters 21-28.
   iv. The critical path will be to 1) construct HSP, 2) construct the new filter building and new primary settling, 3) rehab the other settlers and filter building. The north plant can't be demo'd until after this the rehab of the other settlers and filter building because there is no way to get filtered water from the north plant to the south side to get to the new HSP station/tank.
   v. There will be temporary chemical requirements when the chlorine room is being upgraded.
   vi. There will be temporary power requirements. Where will power come from? From the northeast of the HSP2. The intension is to reuse the existing power supply; however, this is going to be difficult if the north plant has to be operated at the same time the new portions of the south plant are being brought online. The biggest power draw will be the new HSP. Likely temporary power will be needed for a portion of the construction.
b. Dewatering – This is being updated.
c. Electrical – will be different than the VE option because there are a different number of buildings.
d. Yard Piping – is being checked.
e. High Service pump station
   i. Currently, Kokosing is using the value of the structure from the AECOM option.
   ii. BV wants to know what/how many pumps are being used. BV recommendation is that the same type and number of pumps should be used for both the hybrid and VE option.
f. The cost-estimate configuration is going to be different for the two options. Hybrid option, unlike VE, has piles included per structure.
g. BV offered to help Kokosing review equipment costs to make sure that nothing is missing.
h. Post-Chemical building – this is going to be very similar to bldg. for VE design, so it was carried across.

2.4 Roadway upgrade costs need to be included for both options and the costs will be the same for both.

2.5 Construction Schedule needs to be updated for both options for next week. Talking about sequencing today was helpful. Kokosing doesn't need any additional information.

2.6 The biggest current electrical questions are at the new intake because the existing to this building is 4160 V and the new will be 480 V. Kokosing had a sequencing plan for this when they did their GMAX. Sterling's bigger question is about what the station looks like at the end.

2.7 Intake was planned to start first; however, the equipment procurement is currently 18 months. It will be faster to get new concrete in the ground than it will be to get some of the large equipment delivered.

2.8 Admin building – don't have dollar numbers for this in either option. The plan is to get the treatment costs finalized first and then get back to the Admin building.

2.9 Effluent lines/bank restoration.

a. The effluent lines have to be extended 500-ft into the River.
b. Currently there has been no discussion about bank restoration, but it needs to be addressed.

Concrete slabs need to be removed and then restored. The Levee Authority hasn't said exactly what the restoration needs to look like. There have not been any discussions with the Corps or Levee Authority to date.

c. BV feels like the new settling basin is far enough away from the levee that there won't be a problem with construction. But the Levee Authority will have to be involved from day 1 when design is started.

3.0 Updates

3.1 Black & Veatch – no updates. They can help review equipment quotes if needed.

3.2 Arcadis

a. People spaces – working on; getting architectural input.

b. Rendering – will have drafts for next week.

3.3 Clark Dietz – no updates; got piping layouts to Tim.

4.0 Deliverable

4.1 Brief memo with attachments from BV, Arcadis, Clark Dietz and Kokosing with the final version of the working documents we have been discussing over the last 6-8 weeks.

5.0 Schedule

5.1 October 25 – Kokosing to send draft costs.

5.2 October 26 – workshop to VE the cost estimates options. Assume that this meeting will go to noon.

5.3 November 1 – deliverable to EWSU

Meeting Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: October 26, 2023, 8:00 am CDT
Invitees: EWSU: Matt Montgomery, Shawn Wright, Harry Lawson, Steve Capin, Rick
Clark Dietz: Andrea Bretl, Jim Edenburn, David Wichman
Arcadis: Amy Smitley, Tony Smurlo
Black and Veatch: *Adam Westermann,* Ben Freese
Kokosing: Tim Cooper, Todd Lemen, Alan Holding, *Steve Ehret*
Sterling: *Brian Luigs, Matt Perkins*

This was a progress meeting for a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget. The minutes were prepared by Andrea Bretl and distributed on October 27, 2023. Please inform her of any corrections by November 2, 2023.

1.0 Intro

1.1 Updated estimated GMAX pricing came in yesterday from Kokosing. The updated costs are:
  a. $256M for the VE option (Attachment 1)
  b. $259M for the hybrid option (Attachment 2)
  c. These costs are still too much for the current funding available to EWSU. These are also not complete project costs as engineering, owner allowance, CenterPoint power relocation, and other costs are not included.

1.2 EWSU has approximately $220M to spend on this project including both the construction and non-construction costs. Any amount significantly above this would require a new rate case, which would be time-consuming.

1.3 SRF has said that if EWSU's loan is not closed on the project by September 2024, then the project will be subject to BABA requirements.

1.4 EWSU would like to have 60% drawings available by July 1, 2024, to get updated GMAX pricing, but would need 100% drawings by August 1, 2024, for bidding, if needed.

2.0 Estimated New GMAX Costs

2.1 The estimated GMAX costs were presented by Kokosing. These cost estimates were made using information previously provided by Clark Diez, Black and Veatch, and Arcadis. Some of the questions/answers included:
  a. Costs do not include either owner allowance, a new administration building, or maintenance space.
  b. Piles for each structure are included in the hybrid option with the structure.
  c. Demolition costs are accounted for in both options to and including the foundation.
  d. There may be some double counting in chemical building costs – Kokosing will check.

2.2 Potential savings ideas considered included: delaying the construction of several new unit processes including: the PAC system, other chemical systems, Filter Building 21-28 upgrades.
  - **The Hybrid option offers more savings opportunities than the VE option. Therefore, we proceeded with looking at cost savings of the hybrid option.**

2.3 The most expensive components of the Hybrid option are the new settling basin and separate structures for the filters and the clearwell. There are potential savings for this option if the filter building and clearwell are combined as that would save on foundation and dewatering costs. There are also savings if a new settling basin is not constructed, but all four settling basins are converted to tube settlers.

2.4 Increasing the design loading rate of the filters, from the current design criteria of 2 gpm/sf, was discussed. This would require pilot testing across all seasons. It would also decrease the margin of safety that the plant has on treated water quality. Currently, the settling basins have a long detention time, when they are converted to tube settling that detention time will decrease. Also, currently the filters almost always have a loading rate of less than 2 gpm/sf. The consensus of both engineers and EWSU operations managers was that increasing design filter loading rate should be avoided.

2.5 Underground pipe routing was discussed, there are some savings opportunities with refining the piping plan again. Kokosing and the engineers walked the site after the meeting and determined a more efficient plan for routing the new dual raw water pipes to the splitter box and from the splitter box to the clarifiers.

2.6 The filter building layout was discussed in depth as well as the advantage of constructing all new filters versus construction half of the filters as new and leaving the remaining half of the filters and rehabbing them.

2.7 As a group, we developed three alternatives for the hybrid option. We estimated cost savings for each and developed a matrix of economic and non-economic scoring criteria for those three options and the original options. The three alternative hybrid layouts, along with the original hybrid layout are included in Attachment 3. The scoring matrix is included in Attachment 4.

2.8 Considering both costs and non-economic factors, the Hybrid Alternative 3 was selected as the best option. The preliminary design criteria are included in Attachment 5.

- **Action Item: Kokosing will update their estimated GMAX price for the Hybrid Alternative 3.**

2.9 Costs outside of the GMAX cost were also discussed.

2.10 PFOS treatment was discussed. The current design option does not include PFOS treatment, though some reduction can be expected with the PAC addition. The facility has been testing for PFOS and has not seen any troubling data, their latest test results were non-detect. If a limit is added and treatment is needed it will need to be a new unit process. The final design can account for this potential future need.

3.0 Deliverable

3.1 Brief memo with attachments from BV, Arcadis, Clark Dietz and Kokosing with the final version of the working documents we have been discussing over the last 6-8 weeks.

4.0 Schedule

4.1 November 1

a. Updated GMAX costs for Hybrid Alternative 3 from Kokosing
b. Draft deliverable to EWSU

Kokosing Industrial Inc 10/25/2023 11 : 59
HID22150CD EVANSVILLE UPGRADED WTP-VE NEW(CLK DTZ)
***

Bid Pricing Report

Biditem	Description	Balanced Price	Bid Price	Bid Total Status
11000	ADMINISTRATIVE (GENERAL C	21,447,611.87	21,447,611.87	21,447,611.87
12000	MOBILIZATION / DEMOBILIZATI	6,598,655.48	6,598,655.48	6,598,655.48
20000	SITEWORK / CIVIL	14,971,922.44	14,971,922.44	14,971,922.44
21000	DEWATERING	4,759,471.99	4,759,471.99	4,759,471.99
22000	RAW WATER INTAKE PIPING	4,498,311.81	4,498,311.81	4,498,311.81
23500	YARD PIPING & STRUCTURES(C	6,962,837.29	6,962,837.29	6,962,837.29
25000	SITE ELECTRICAL DISTRIBUTIO	18,319,117.52	18,319,117.52	18,319,117.52
26000	PILE FOUNDATIONS(CLK DIETZ	10,336,177.74	10,336,177.74	10,336,177.74
1000000	EXISTING RW INTAKE BLDG(WI	12,087,830.00	12,087,830.00	12,087,830.00
2000000	PRETREATMENT BUILDING(PTB	20,109,898.86	20,109,898.86	20,109,898.86
4000000	FILTER BLDG(FTB)/CLEARWELL	83,156,511.42	83,156,511.42	83,156,511.42
5000000	RESIDUALS PUMP STATION(RPS	9,491,689.56	9,491,689.56	9,491,689.56
6000000	CHEMICAL BUILDING(CHB)	13,420,283.24	13,420,283.24	13,420,283.24
8000000	PAC - INTAKE CHEMICAL BUILD	4,301,811.63	4,301,811.63	4,301,811.63
9000000	BACKWASH SUPPLY BUILDING(	8,736,396.80	8,736,396.80	8,736,396.80
9100000	HYPO CONVERSION(RE-PURPOS	321,250.47	321,250.47	321,250.47
9200000	REHAB EXIST. COAGULANT FAC	211,003.21	211,003.21	211,003.21
9501000	CONSTRUCTION CONTINGENCY	12,000,000.00	12,000,000.00	12,000,000.00
9970000	SITE BASED EQUIPMENT	4,535,655.40	4,535,655.40	4,535,655.40
Report Totals				**256,266,436.73**

NOTE:
Italics indicate a nonadditive item. They will not be added to subtotals, unless all items in a subgrouping are nonadditive. They will not be added to the final totals.

Kokosing Industrial Inc 10/25/2023 11 : 41
HID22150B EVANSVILLE UPGRADED WTP-HYBRID(BLK&VTCH)
*** Steve Ehret

Bid Pricing Report

Biditem	Description	Balanced Price	Bid Price	Bid Total	Status
10000	GENERAL CONDITIONS	21,500,107.03	21,500,107.03	21,500,107.03	
10500	MOBILIZATION / DEMOBILIZATI	6,635,383.25	6,635,383.25	6,635,383.25	
11000	SITE BASED EQUIPMENT	4,546,756.69	4,546,756.69	4,546,756.69	
15000	MAINTAINING PLANT OPERATI	554,137.07	554,137.07	554,137.07	
20000	SITEWORK / CIVIL	13,096,982.37	13,096,982.37	13,096,982.37	
21000	DEWATERING	4,773,160.45	4,773,160.45	4,773,160.45	
260000	ELECTRICAL/I & C(NEW FACILIT	13,403,414.18	13,403,414.18	13,403,414.18	
330000	YARD PIPING	10,159,038.06	10,159,038.06	10,159,038.06	
410000	EXISTING RW INTAKE BLDG(WI	12,114,467.31	12,114,467.31	12,114,467.31	
412000	RAW WATER INTAKE PIPING	3,626,800.06	3,626,800.06	3,626,800.06	
480000	PAC - INTAKE CHEMICAL BUILD	4,313,771.55	4,313,771.55	4,313,771.55	
501000	PRIMARY SETTLING BASIN 3	9,392,688.66	9,392,688.66	9,392,688.66	
501500	PRIMARY SETTLING BASINS 1 &	5,868,146.69	5,868,146.69	5,868,146.69	
502000	NEW GRAVITY FILTER BLDG(8E	56,315,824.94	56,315,824.94	56,315,824.94	
503000	CLEAN WATER RESERVOIR TAN	34,573,817.94	34,573,817.94	34,573,817.94	
504000	NEW RAPID MIX/SPLITTER STRU	1,972,881.97	1,972,881.97	1,972,881.97	
505000	EXIST. SLUDGE PS UPGRADES	311,749.76	311,749.76	311,749.76	
506000	NEW BACKWASH/FILTER TO WA	4,976,823.99	4,976,823.99	4,976,823.99	
507000	NEW POST-CHEM BLDG(AS, CAU	14,075,975.19	14,075,975.19	14,075,975.19	
508000	EXIST. FILTERS 21-28 UPGRADES	17,755,969.12	17,755,969.12	17,755,969.12	
509000	HYPO CONVERSION(RE-PURPOS	322,036.76	322,036.76	322,036.76	
510000	REHAB EXIST. COAGULANT FAC	211,519.66	211,519.66	211,519.66	
900000	CONSTRUCTION CONTINGENCY	18,000,000.00	18,000,000.00	18,000,000.00	
Report Totals				**258,501,452.70**	

NOTE:
Italics indicate a nonadditive item. They will not be added to subtotals, unless
all items in a subgrouping are nonadditive. They will not be added to the final totals.

EVANSVILLE, INDIANA
FILTRATION PLANT IMPROVEMENTS
10/27/2023

Hybrid (Base Alternative as Estimated)

EVANSVILLE, INDIANA
FILTRATION PLANT IMPROVEMENTS
10/24/2023
Hybrid Alt 1
Move Filters to Reservoir - No new Basins
Keep Filters 21-28
Revise Raw Water

EVANSVILLE, INDIANA
FILTRATION PLANT IMPROVEMENTS
10/24/2023
Hybrid Alt 2
Transfer Pump Station
18 MGD Plate Settlers

EVANSVILLE, INDIANA
FILTRATION PLANT IMPROVEMENTS
10/24/2023
Hybrid Alt 3
Move Filters to Reservoir - No new Basins
All new Filters
Revise Raw Water

EWSU Notes		VE Option		Hybrid	Hybrid 1 - Split	Hybrid 2- Transfer Pumps	Hybrid 3 - All New Filters
	General Conditions	$21,447,612		$21,500,107	$21,500,000	$21,500,107	$21,500,000
	Mobilizatin/Demob	$6,598,655		$6,635,383	$6,635,000	$6,635,383	$6,635,000
Remove Plant demo from contract	Sitework/Civil/Demolition	$10,000,000		$9,000,000	$9,000,000	$9,000,000	$9,000,000
	Dewatering	$4,759,472		$4,773,160	$4,000,000	$1,193,290	$4,000,000
Two new 42" raw water line required	Raw Water Piping	$4,498,311		$3,626,800	$2,000,000	$2,000,000	$3,600,000
	Yard Piping and Structures	$6,962,837		$10,159,038	$8,000,000	$7,000,000	$8,000,000
	Site Electrical Distribution	$18,319,117		$13,403,414	$13,403,414	$13,403,414	$13,403,414
	Pile Foundations	$10,336,177		$0	$0	$0	$0
Required to be completed	Existing RW Intake PS	$12,087,830		$12,114,467	$12,114,467	$12,114,467	$12,114,467
	Pretreatment Building	$20,109,898		$15,260,834	$6,000,000	$15,000,000	$6,000,000
	Filter Bldg/CW/HSPS	$88,000,000		$56,315,824	$75,000,000	$56,315,824	$88,000,000
Filter upgrades required	Filter Upgrades 21-28	$0		$17,755,969	$17,755,969	$17,755,969	$0
	Clean Water Reservoir	$0		$34,573,000	$0	$11,000,000	$0
	Residual PS	$9,491,689		$4,976,823	$9,000,000	$4,976,823	$9,000,000
	Chemical Bldgs	$13,420,283		$14,075,975	$10,000,000	$13,000,000	$13,000,000
	PAC -Intake Chem Bldg	$4,301,811		$4,313,771	$4,313,771	$4,313,771	$4,313,771
	Backwash Supply PS	$8,736,396		$0	$0	$0	$0
Required to convert to hypo	Hypochlorite Conversion	$321,250		$322,036	$322,036	$322,036	$322,036
	Rehab Coagulant Bldg	$211,003		$211,519	$211,519	$211,519	$211,519
	Const Contingency	$12,000,000		$18,000,000	$12,000,000	$15,000,000	$12,000,000
	Site Based Equipment	$4,535,655		$4,546,756	$4,546,756	$4,546,756	$4,546,756
	Maint Plant Operation	$0		$554,137	$300,000	$300,000	$300,000
	Sludge PS	$0		$311,749	$311,749	$311,749	$311,749
	Rapid Mix/Splitter Structure	$0		$1,972,881	$750,000	$1,972,881	$750,000
	Transfer Pump Station				$0	$13,000,000	$0
	Reduce Capacity to 40 MGD	#######		#######	#######	#######	#######
	TOTAL	########		########	########	########	########

		VE Option	Original	Hybrid	Hybrid reuse existing Filters 21-18	Hybrid 2- Transfer Pumps	Hybrid 3 - All New Filters
Capital Costs/$Millions		$241,137,996	$352,842,000	$239,403,643	$202,164,681	$215,873,989	$202,008,712
Capital Costs	50%	3.0	1.0	3.0	5.0	3.0	5.0
Land Use	5%	3	2	4	4	5	4
Operational Impacts	15%	5	5	3.5	3	2	4
Future Considerations	5%	4	3	3	3	5	4
Resiliency	10%	5	5	3	3	3	4
Project Risks	15%	5	5	2	3	4	4
TOTAL COMPOSITE		**3.85**	**2.75**	**2.98**	**4.05**	**3.20**	**4.50**

Table 1.0. Facilities associated with Hybrid Alternative

ITEM	DESCRIPTION
Raw Water Pump Station	• Replace three intake screens • Replace six raw water pumps, rated at 12 MGD each and 68 ft • Replace piping and valves inside raw water pump station
Raw Water Pipeline	• Install new raw water pipeline from pump station to new rapid mix/splitter structure. • Two – 42 inch raw water pipes. Pipes to be routed north of HSPS1. Temporary piping will be required to allow for demolition of existing piping to clear corridor for raw water pipes.
Rapid Mix	• The two 42-inch raw water pipelines will enter two rapid mix chambers. Each chamber will be sized for 30 seconds of detention time at 36 MGD, equipped with a vertical mixer. • Prior to the rapid mix, coagulant will be added in a vault with optional PAC feed point. • A raw water flowmeter will be installed on each raw water line inside the vault.
Splitter Structure	• The splitter structure will consist of weirs will disperse the flow evenly to the clarifiers. • If a clarifier is offline for maintenance, a weir gate will close to isolate flow. • Space will be provided for a future fourth splitter chamber to go to a future clarifier.
Tube Settlers	• Existing south basins will include installation of tube settlers. Each primary basin will be rated at 18 MGD, and the two existing secondaries will combine to be rated at 18 MGD. This will provide a firm capacity of 36 MGD with basin offline. • New sludge equipment and flocculation equipment will be installed in each basin.
Sludge Pump Station	• The existing south sludge pump station will remain. • The pumps and piping inside the pump station will be replaced.
New Filter Building	• A new filter building will be constructed above a 5 MG clearwell. The new filter building will consist of 14 filters providing 50 MGD of treatment capacity at 2 gpm/sq ft with one filter offline.
Finished Water Clearwell	• A new finished water reservoir with 2-2.5 MG cells will be provided on the east side of Waterworks Drive, to provide a total capacity of 5 MG. • The reservoir will include internal baffling and be configured to allow for a future transfer pump station wetwell. • The reservoir floor elevation will be approximately EL 347, with maximum water depth of 20 ft, and roof elevation at EL 384.0 to extend above the flood elevation.
High Service Pump Station	• A new vertical turbine high service pump station will be located on top of the reservoir.

	• The pump station wetwell depth will be at EL 342 to allow full utilization of the reservoir storage. • Six- 12.5 MGD pumps will be provided. Each pump discharge will have a 6" air/vacuum relief valve, check valve, electric ball valve, and manual butterfly valve.
Site Electric	• The existing plant switchgear will remain. Dual 1500KVA feeds will be routed to the new pump station where transformers will be located to reduce to 480V to feed the low voltage switchgear located in the new HS pump station. • The existing generators will remain.
Admin and Maintenance Areas	• The existing HS PS 1 will be re-purposed for administration area. The old generator building will be re-purposed for maintenance area. • Lab area will be located in existing buildngs.
Chemical Feed	• PAC: A new PAC silo and feed system will be located west of the South Basins. The existing PAC system will be demolished. • Coagulant: The existing coagulant facility will remain. • Chlorine: The existing chlorine gas room will be repurposed to bulk sodium hypochlorite • New Post-Filter Chemical Building consisting of: o LAS feed system o Fluoride feed system o Sodium Hydroxide feed system o Sodium bisulfite feed system (dechlor for outfall)
Disinfection Scheme	• Disinfection will be achieved by feeding free chlorine prior to the filters and in the filter clearwells. LAS(ammonia) feed points will be located at various locations within the clearwell and reservoir to convert to chloramines. • The LAS feed point locations will vary seasonal to meet required disinfection. Additional post-filter chlorine feed points will also be provided to allow for flexibility and reliability.
Demolition	• The following demolishing will occur after construction of new facilities: o North Basins o Filters 1-20, and 29-36 and existing 1.5 MG clearwell. o High Service PS 2 will no longer be used. However, building will remain. o High Service PS 3 and 6.5 MG below grade clearwell. o Existing post-filter chemical building. o Existing filter to waste pump station.

EWSU Notes		VE Option		Hybrid	Hybrid 1 - Split	Hybrid 2- Transfer Pumps	Hybrid 3 - All New Filters
	General Conditions	$21,447,612		$21,500,107	$21,500,000	$21,500,107	$21,500,000
	Mobilizatin/Demob	$6,598,655		$6,635,383	$6,635,000	$6,635,383	$6,635,000
Remove Plant demo from contract	Sitework/Civil/Demolition	$10,000,000		$9,000,000	$9,000,000	$9,000,000	$9,000,000
	Dewatering	$4,759,472		$4,773,160	$4,000,000	$1,193,290	$4,000,000
Two new 42" raw water line required	Raw Water Piping	$4,498,311		$3,626,800	$2,000,000	$2,000,000	$3,600,000
	Yard Piping and Structures	$6,962,837		$10,159,038	$8,000,000	$7,000,000	$8,000,000
	Site Electrical Distribution	$18,319,117		$13,403,414	$13,403,414	$13,403,414	$13,403,414
	Pile Foundations	$10,336,177		$0	$0	$0	$0
Required to be completed	Existing RW Intake PS	$12,087,830		$12,114,467	$12,114,467	$12,114,467	$12,114,467
	Pretreatment Building	$20,109,898		$15,260,834	$6,000,000	$15,000,000	$6,000,000
	Filter Bldg/CW/HSPS	$88,000,000		$56,315,824	$75,000,000	$56,315,824	$88,000,000
Filter upgrades required	Filter Upgrades 21-28	$0		$17,755,969	$17,755,969	$17,755,969	$0
	Clean Water Reservoir	$0		$34,573,000	$0	$11,000,000	$0
	Residual PS	$9,491,689		$4,976,823	$9,000,000	$4,976,823	$9,000,000
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	PAC -Intake Chem Bldg	$4,301,811		$4,313,771	$4,313,771	$4,313,771	$4,313,771
	Backwash Supply PS	$8,736,396		$0	$0	$0	$0
Required to convert to hypo	Hypochlorite Conversion	$321,250		$322,036	$322,036	$322,036	$322,036
	Rehab Coagulant Bldg	$211,003		$211,519	$211,519	$211,519	$211,519
	Const Contingency	$12,000,000		$18,000,000	$12,000,000	$15,000,000	$12,000,000
	Site Based Equipment	$4,535,655		$4,546,756	$4,546,756	$4,546,756	$4,546,756
	Maint Plant Operation	$0		$554,137	$300,000	$300,000	$300,000
	Sludge PS	$0		$311,749	$311,749	$311,749	$311,749
	Rapid Mix/Splitter Structure	$0		$1,972,881	$750,000	$1,972,881	$750,000
	Transfer Pump Station				$0	$13,000,000	$0
	Reduce Capacity to 40 MGD	($15,000,000)		($15,000,000)	($15,000,000)	($15,000,000)	($15,000,000)
	TOTAL	**$241,137,996**		**$239,403,643**	**$202,164,681**	**$215,873,989**	**$202,008,712**

02/08/2024

OUCC DR 10-11

DATA REQUEST
City of Evansville

Cause No. 45545 S1

Information Requested:

Reference Mr. Wright's Direct testimony, Attachment SW-5, page 3 of 9 which reads in part:

> June 28, 2023 – received GMAX price of $353M but this did not include some additional items, final estimated cost of project as proposed over $400M.

Please provide the following:

a. Copy of Kokosing's complete June 28, 2023, GMAX price proposal.
b. Copy of the AECOM design drawings that Kokosing relied on to develop its $353M GMAX price. Please also state the percent completion of the AECOM drawings (e.g., 75%, 90% etc.)
c. Identification of each additional item and its corresponding estimated cost that would increase the WTP project cost to over $400M.

Information Provided:

a. See OUCC DR 10-11 Attachment a
b. See OUCC DR 10-11 Attachment b
c. See as follows:

Total Construction including contingency, overhead, and owner allowance	$353M
Elevation Adjustment (to meet regulatory requirements for flood protection during a levee breach)	$20M
Construction Engineering (estimated)	$18M
Electric Utility (new electrical substation for increased power requirements)	$9M
Permitting (estimated for potential wetland offsets)	$1M

Attachments:

OUCC DR 10-11 Attachment a
OUCC DR 10-11 Attachment b

Kokosing Industrial
3862 N. COMMERCIAL PARKWAY | GREENFIELD IN 46140
317-891-1136

June 28, 2023

Mr. Matt Montgomery, PMP
City of Evansville, IN
1 SE 9th Street, Suite 200
Evansville, IN 47708

RE: The Evansville New Water Filtration Plant Project
Evansville, Indiana
Guaranteed Saving Contract (GSC) – GMP Proposal

Dear Mr. Montgomery:

Kokosing Industrial, Inc.(KII) is pleased to submit the following Guaranteed Maximum Price proposal for the construction of the New Water Filtration Plant. The proposal is based upon AECOM's design documents. The Guaranteed Maximum Price for this project, incorporating clarifications listed below and attached is:

$352,842,000.00
(Three Hundred and Fifty-two Million, eight hundred and forty-two thousand dollars and Zero cents)

See the attached Cost Breakdown Form.

GUARANTEED MAXIMUM CONSTRUCTION COST(Subtotal):	**$293,845,500**
CONSTRUCTION CONTINGENCY:	**$18,750,000**
OWNER'S CONTINGENCY:	**$16,802,000**
CONTRACTOR'S FEE:	**$23,444,500**
TOTAL GMP PROPOSAL:	**$352,842,000**

Proposal Clarifications, Assumptions, and Exceptions:

1. KII has not included any costs for state/local easements. It is our understanding that the Owner will obtain right-of-way easements over and through certain private lands for construction of this project.
2. KII excludes sales tax on materials utilized for this project. We understand the Owner will provide us a tax exemption certificate.
3. KII has not included any investigation and/or remediation of hazardous materials such as contaminated soils, PCB's, lead paint, asbestos, etc. It is our understanding that the Owner has performed no explorations or tests of Hazardous Environmental Conditions at the Site.
4. This proposal is valid for 30 calendar days. Due to continued volatility in pricing and lead times, Kokosing needs an NTP within 30 days of receipt of this proposal in order to lock in pricing of major materials and equipment.

kokosing INDUSTRIAL
3862 N. COMMERCIAL PARKWAY | GREENFIELD IN 46140
317-891-1136

5. KII plans on keeping all excess excavated soils for backfill purposes temporarily on the Owner's property at the East WWTP. This stockpile area will be maintained and restored. In addition, we plan to utilize two covered canopy bays on the south side of the East WWTP as discussed for laydown of materials throughout the entire project as well.
6. Per Section 01 0010, it is our understanding that the Engineer will provide horizontal and vertical control points for our use.
7. KII excludes jet grouting/compaction grout for mitigation of liquefaction in the sand layers. If required, this work would be performed on a T & M basis since it is not quantifiable at this time.
8. KII excludes any concrete repairs or rehabilitation at the Water Intake Building (WIB). This scope is not quantifiable at this time.
9. KII excludes any costs for potable water associated with testing, start-up or commissioning.
10. KII excludes any utility costs for start-up or commissioning.
11. KII excludes any wick drains as mentioned in the response to Teams Question #170.
12. KII excludes the draining or disposal of any fuel, oil, etc. in the tanks at the City Garage prior to the demolition of this structure.
13. KII excludes any oil containment provisions for the new oil-filled transformers since none is shown.
14. Since no electrical ductbank details are provided, we have estimated all of these ductbanks to be shallow (i.e. 3' deep).
15. KII has not included any costs for permits. Per Section 00 8000, SC 6.08 - Permits: The Owner shall obtain the required construction permits from state and local agencies. Also, our schedule has not considered delays in obtaining permits, especially for any permits related to USACE.
16. KII has not included any costs to compensate the resident engineer for hours over 40 hrs/week, although work hours will consistently be over 40 hrs./week based on our schedule.
17. KII has not included any costs to clean up site and/or work areas that may be impacted by flooding of excavations due to power outages, etc.
18. Our drilled shaft subcontractor has included temporary steel casings for the installation of the deep foundations. No permanent steel casings are included in their quote.
19. The 5% Owner's Contingency does not include any mark-up, bond or insurance costs. Future additional work from this contingency will have the specified mark-ups and fees added.
20. KII has not accounted for any costs associated with differential settlement on this project site. Our assumption is that this is accounted for in the project structural design.
21. KII's proposal includes discharging groundwater, via an HDPE header pipe, into existing stormwater manholes on the Northeast and Southwest corners of the project site. Flow rates are estimated between 15,000 & 18,000 GPM.
22. It is our understanding that the Owner will provide all water, power, air, chemicals, etc. for start-up and commissioning of the new WTP at no cost to KII.
23. We have attached a spreadsheet of potential VE cost savings for your review and consideration. Please understand that the costs listed in the "Potential Cost Savings" column are rough order of magnitude(ROM) credits. Each item will need to be reevaluated if accepted and after additional design information is provided.
24. Also, please see the attached additional clarifications from our major subcontractor on this project, Sterling Industrial.

Kokosing Industrial
3862 N. COMMERCIAL PARKWAY | GREENFIELD IN 46140
317-891-1136

We hope our GMP proposal meets your approval. We are available to meet to further discuss our costs and project schedule at your convenience. Kokosing Industrial will continue to explore value engineering opportunities to achieve the best value for the construction of the proposed project. Please contact us with any questions you may have regarding this proposal. We look forward to continue working with you on this project.

Respectfully submitted,

Kokosing Industrial, Inc.

Todd A. Lemen
Assistant Vice President / Indiana Regional Manager

Cc:
Tim Cooper, KII
Alan Holding, KII
Steve Ehret, KII
Tina Wolff, KII

Evansville - New 50 MGD Water Treatment Plant
Kokosing Industrial, Inc.
July 12, 2023 GMAX Price
$352,842,000
Based on AECOM's 90% Design Drawings

provided by Lauren Box, Barnes & Thornburg
December 6, 2023

From: Le Vay, Daniel
To: Bell, Scott; Parks, James; Dellinger, Shawn; Stull, Margaret; Seals, Carl; Compton, Jason T
Subject: FW: Cause No. 45545 S1 - Attorneys Conference - OUCC Information Request
Date: Wednesday, December 6, 2023 12:31:32 PM
Attachments: image001.png
image002.png
image004.png
AECOM 90% EOPC 5-16-2023.pdf
GMAX Submission 7-12-2023.pdf
GMAX Detail.pdf
EWSU Capital Water Main Project Totals.pdf
CN 45545 Water Main Report.pdf

This just in.

From: Box, Lauren <Lauren.Box@btlaw.com>
Sent: Wednesday, December 6, 2023 11:56 AM
To: Le Vay, Daniel <dlevay@oucc.IN.gov>
Cc: Kile, Nicholas <Nicholas.Kile@btlaw.com>; Cloud, Judy <Judy.Cloud@btlaw.com>
Subject: Cause No. 45545 S1 - Attorneys Conference - OUCC Information Request

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Good morning Dan, I hope you are well. I wanted to follow-up after the November 21st Attorneys Conference to provide the information you and Jim requested at that conference. Based on my notes, I believe you and Jim requested the information listed below. I have included our responses to those information requests in red.

If you have any questions, please do not hesitate to contact us. Thank you.

Lauren

Information Requested by OUCC at 11/21 Attorneys Conference

1. AECOM final cost estimate – Please see attached file "AECOM 90% EOPC 5-16-2023.pdf" for AECOM's 90% cost estimate. This is the most current estimate the City has received from AECOM.
2. Kokosing GMAX price – Please see attached files "GMAX Submission 7-12-2023.pdf" and "GMAX Detail.pdf."
3. An explanation of the $40 million in road relocation projects and how we intend to manage those moving forward if the City intends to use the funding for the WTP – I reported at the Attorneys Conference that I needed to confirm this information, but, that my understanding is Evansville has only been required to do one road relocation project since the Order in the main docket was issued, and this road relocation project was funded by INDOT. Lane Young (Executive Director of EWSU) confirmed this information is correct and indicated that the City is not aware of any future road relocation projects. Lane indicated that if a future road relocation project does arise, the City would fund that project using different monies. But Lane confirmed that the City believes the best use for this funding is to repurpose it for the

WTP project.

4. Water main reports that were required from the CN 45545 Order – Please see attached "EWSU Capital Water Main Project Totals.pdf" and "CN 45545 Water Main Report.pdf."

Lauren Box | Partner
Barnes & Thornburg LLP
11 South Meridian Street, Indianapolis, IN 46204
Direct: (317) 231-7289 | Mobile: (317) 590-2455

BARNES & THORNBURG LLP

Atlanta | Boston | California | Chicago | Delaware | Indiana | Michigan | Minneapolis | Nashville | New Jersey
New York | Ohio | Philadelphia | Raleigh | Salt Lake City | South Florida | Texas | Washington, D.C.

kokosing INDUSTRIAL
3862 N. COMMERCIAL PARKWAY | GREENFIELD IN 46140
317-891-1136

July 12, 2023

Mr. Matt Montgomery, PMP
City of Evansville, IN
1 SE 9th Street, Suite 200
Evansville, IN 47708

RE: The Evansville New Water Filtration Plant Project
Evansville, Indiana
Guaranteed Saving Contract (GSC) – GMP Proposal, Rev. 1

Dear Mr. Montgomery:

Kokosing Industrial, Inc. (KII) is pleased to submit the following Guaranteed Maximum Price proposal for the construction of the New Water Filtration Plant. The proposal is based upon AECOM's design documents. The Guaranteed Maximum Price for this project, incorporating clarifications listed below and attached is:

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(Three Hundred and Fifty-two Million, eight hundred and forty-two thousand dollars and Zero cents)

See the attached Cost Breakdown Form.

GUARANTEED MAXIMUM CONSTRUCTION COST(Subtotal):	**$293,845,500**
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Proposal Clarifications, Assumptions, and Exceptions:

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4. This proposal is valid for 30 calendar days. Due to continued volatility in pricing and lead times, Kokosing needs an NTP within 30 days of receipt of this proposal in order to lock in pricing of major materials and equipment.

kokosing INDUSTRIAL
3862 N. COMMERCIAL PARKWAY | GREENFIELD IN 46140
317-891-1136

5. KII plans on keeping all excess excavated soils for backfill purposes temporarily on the Owner's property at the East WWTP. This stockpile area will be maintained and restored. In addition, we plan to utilize two covered canopy bays on the south side of the East WWTP as discussed for laydown of materials throughout the entire project as well.
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22. It is our understanding that the Owner will provide all water, power, air, chemicals, etc. for start-up and commissioning of the new WTP at no cost to KII.
23. We have attached a spreadsheet of potential VE cost savings for your review and consideration. Please understand that the costs listed in the "Potential Cost Savings" column are rough order of magnitude (ROM) credits. Each item will need to be reevaluated if accepted and after additional design information is provided.
24. No conduit or cabling support details have been provided for basis of design. Sterling has included a combination of fiberglass and stainless-steel bolted supports. No welded supports have been included for electrical.
25. We have not included any standby fuel tanks for the generator. There are 24-hour subbase tanks included with the enclosure of each generator.
26. No cost has been included that may be incurred from CenterPoint or any other Utility provider to install new services to the site/buildings or to relocate any existing utilities.

KOKOSING INDUSTRIAL
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317-891-1136

27. We have included an $110,000 allowance for UPS power as needed.
28. The proposal includes a professional structural and process designer for structural supports design and piping routings submitted for approval.
29. An overall site compressed air system has not been incorporated into this proposal.
30. Allow 9-12months for pipe, valve, and fitting deliveries.
31. Payment terms and milestones or schedule of value payments to be mutually agreed upon. Stored materials shall be reimbursed at time of purchase.
32. Startup and commissioning allowance included of approximately 4,000 MH.
33. No other allowances have been included for any other utility services that may be needed. (i.e., AT&T, etc.)
34. We have not included any cost from any utilities to relocate existing services that are necessary for the installation of new facilities.
35. We have included an allowance of $50,000 for engineering services for the fire alarm and card access systems to meet the performance-based specifications.
36. Electrical pricing is based off the 90% drawings received in May 2023 and the updated one lines received on 6/19 (*note - there was no date change to original title block in drawings received on 6/19). Sterling doesn't consider the existing electrical drawings to be at 90% design, as stated. We reserve the right to update pricing as new design drawings are released.

We hope our GMP proposal meets your approval. We are available to meet to further discuss our costs and project schedule at your convenience. Kokosing Industrial will continue to explore value engineering opportunities to achieve the best value for the construction of the proposed project. Please contact us with any questions you may have regarding this proposal. We look forward to continue working with you on this project.

Respectfully submitted,

Kokosing Industrial, Inc.

Todd A. Lemen
Assistant Vice President / Indiana Regional Manager

Cc:
Tim Cooper, KII
Alan Holding, KII
Steve Ehret, KII
Tina Wolff, KII

ESTIMATE SUMMARY (COSTS)

Bid # Engr Bid# Bid Description	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip- Ment	Sub- Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
11000 ADMINISTRATIVE (GENERAL CONDITIO	1.000 LS	132,735 132,735.00	12,866,762	80,000	5,179,712	1,100,132	3,240,711	22,467,317	769,385	23,236,702	23,236,702.03 SAE
11010 PROJECT SUPERVISION - A	*1.000 LS*	*114,224 114,224.00*	*11,640,058*			*606,471*		*12,246,529*			
11020 LIVING EXPENSES - AS	*1.000 LS*				*2,200,470*			*2,200,470*			
11030 FIELD OFFICE - C	*1.000 LS*	*120 120.00*	*6,471*		*238,352*	*3,432*		*248,255*			
11040 SURVEYING & LAYOUT - D	*1.000 LS*						*90,000*	*90,000*			
11050 DUMPSTERS - E	*1.000 LS*				*130,416*			*130,416*			
11060 EQUIPMENT MOVES - F	*1.000 LS*	*6,768 6,768.00*	*446,862*			*402,557*		*849,419*			
11070 ICE AND WATER - J	*1.000 LS*				*30,030*			*30,030*			
11090 3RD PARTY TESTING	*1.000 LS*						*2,381,300*	*2,381,300*			
11100 CENTRAL ENGINEERING - CEG	*1.000 LS*	*2,479 2,479.00*	*209,677*					*209,677*			
11110 SAFETY RAILINGS & BARRICADES - ZSR	*1.000 LS*	*1,256 1,256.00*	*77,273*	*55,000*	*40,219*			*172,492*			
11120 SAFETY TRAINING AND ORIENTATION - ZS	*1.000 LS*	*2,400 2,400.00*	*148,407*					*148,407*			
11140 LAYDOWN/ROADS/PARKING/WAREHOUSE	*1.000 LS*	*768 768.00*	*47,879*		*160,875*	*33,408*		*242,162*			
11145 MATERIAL HANDLING CREW	*1.000 LS*	*3,840 3,840.00*	*236,192*	*25,000*		*31,392*		*292,584*			
11160 SNOW REMOVAL	*1.000 LS*	*480 480.00*	*25,883*					*25,883*			
11170 DUST CONTROL / STREET SWEEPING	*1.000 LS*	*400 400.00*	*28,061*			*22,872*	*103,965*	*154,898*			
11180 PHOTOGRAPHIC DOCUMENTATION(MUL	*1.000 LS*						*49,200*	*49,200*			
11185 ADMIN HELP/SWPPP MONITORING(ENVIR	*1.000 LS*						*616,246*	*616,246*			
11190 SECURITY	*1.000 LS*										
11195 PM SOFTWARE SYSTEM	*1.000 LS*				*64,350*			*64,350*			
11200 BOND ADDER FOR CONTINGENCY	*1.000 LS*										

ESTIMATE SUMMARY (COSTS)

Bid #	Engr Bid#	Bid Description	Quantity Unit	Manhrs	/Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
11210		*ESCALATIONS*	*1.000 LS*					*2,315,000*			*2,315,000*			
12000	1	MOBILIZATION / DEMOBILIZATION	1.000 LS	8,132	8,132.00	471,425	254,113	6,443,882	145,686		7,315,105	250,503	7,565,608	7,565,608.47 SAE
12010		*MOBILIZATION*	*1.000 LS*	*6,632*	*6,632.00*	*389,929*	*4,113*	*6,443,882*	*145,686*		*6,983,609*			
12020		*DEMOBILIZATION*	*1.000 LS*	*1,500*	*1,500.00*	*81,496*	*250,000*				*331,496*			
20000	12	SITEWORK / CIVIL	1.000 LS	19,589	19,588.72	1,221,904	945,081	983,463	615,568	3,551,044	7,317,060	250,570	7,567,630	7,567,630.03 BCL
20100		*SITE PREP*	*1.000 LS*	*4,316*	*4,316.37*	*270,802*	*460,031*	*168,739*	*185,883*	*765,500*	*1,850,954*		*1,850,954*	*1,850,954.67* *BCL*
20110		*EROSION CONTROL*	*1.000 LS*	*452*	*452.00*	*26,453*	*56,119*		*8,453*	*59,100*	*150,126*			*BCL*
20120		*LAYDOWN & PARKING*	*1.000 LS*	*1,629*	*1,628.76*	*104,916*	*265,721*	*69,433*	*80,664*	*80,000*	*600,735*			*BCL*
20130		*CLEAR & GRUB*	*1.000 LS*	*480*	*480.00*	*29,925*		*62,284*	*23,400*	*60,000*	*175,609*			*BCL*
20140		*SITE MONITORING*	*1.000 LS*							*566,400*	*566,400*			*BCL*
20150		*CRANE ROAD*	*1.000 LS*	*729*	*728.95*	*46,853*	*138,190*	*37,022*	*36,063*		*258,127*			*BCL*
20160		*BARRIER WALL*	*1.000 LS*	*1,027*	*1,026.66*	*62,655*			*37,302*		*99,958*			*BCL*
20260		*DEMOLITION*	*1.000 LS*	*304*	*304.00*	*17,998*	*143*	*30,996*	*6,158*	*675,000*	*730,296*		*730,296*	*730,296.05* *MSL*
20261		*DEMO EXC & BF*	*1.000 LS*	*192*	*192.00*	*11,470*		*30,996*	*3,840*		*46,306*			*BCL*
20275		*GARAGE & LEVEE DEMO*	*1.000 LS*	*112*	*112.00*	*6,528*	*143*		*2,318*	*675,000*	*683,989*		*683,989*	*683,989.91* *MSL*
20276		*11-C022*	*1.000 LS*	*112*	*112.00*	*6,528*	*143*		*2,318*		*8,989*			*MSL*
20280		*DEMO SUB*	*1.000 LS*							*675,000*	*675,000*			*MSL*
20300		*SITE CONCRETE - SEE DWG 11-C026*	*1.000 LS*	*5,110*	*5,109.96*	*301,619*	*131,780*	*95,735*	*478*	*207,051*	*736,662*		*736,662*	*736,662.36* *BVN*
20301		*SIDEWALKS - 4"THK*	*13,470.000 SF*	*24*		*1,304*	*16,845*			*132,006*	*150,154*			*BVN*
20303		*SITE CURBS - 6-9"WX20"H*	*5,186.000 LF*	*2,227*	*0.43*	*131,281*	*50,146*	*32,030*			*213,457*			*BVN*
20304		*PAVEMENT 8"THK - NEED TO DOUBLE C*	*780.000 SF*	*70*	*0.09*	*4,018*	*7,375*	*282*		*1,470*	*13,145*			*BVN*
20305			*1.000 CY*	*582*		*34,449*	*13,239*	*13,073*	*79*	*17,785*	*78,624*			

ESTIMATE SUMMARY (COSTS)

Bid # Engr Bid# / Bid Description	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
LOADING DOCK RETAINING WALLS		*582.16*									*BVN*
20306	*1.000 CY*	*78*	*4,594*	*1,481*	*1,665*	*20*	*1,347*	*9,108*			
ADMIN BLDG DUMPSTER PAD 11-C026		*77.89*									*BVN*
20307	*31.000 LF*	*189*	*11,163*	*3,621*	*4,221*	*14*	*5,387*	*24,405*			
OZB RETAINING WL		*6.08*									*BVN*
20308	*151.000 CY*	*1,376*	*81,727*	*26,827*	*33,741*	*144*	*39,085*	*181,525*			
FORCE MAIN VALVE VAULT DWG 11-C046		*9.12*									*BVN*
20310	*1.000 CY*	*563*	*33,083*	*12,246*	*10,723*	*222*	*9,970*	*66,244*			
MISC SITE WORK ITEMS		*563.15*									*BVN*
20400	*1.000 LS*	*438*	*26,127*	*46,013*	*13,184*	*5,486*	*78,821*	*169,631*		*169,631*	*169,631.44*
ENTRANCE SIGN/FLAGPOLES		*437.96*									*ALL*
20410	*1.000 LS*	*192*	*11,782*	*22,070*	*9,520*	*5,476*		*48,848*			
EXCAVATION/BACKFILL		*192.00*									*BCL*
20420	*1.000 LS*	*198*	*11,756*	*3,685*	*3,664*	*10*	*3,534*	*22,650*			
CONCRETE		*197.96*									*BVN*
20430	*1.000 LS*						*50,287*	*50,287*			
MASONRY											*SAE*
20440	*1.000 LS*	*48*	*2,588*	*13,289*				*15,877*			
FLAGPLOES		*48.00*									*SAE*
20450	*1.000 LS*			*6,969*				*6,969*			
SIGNAGE											*SAE*
20460	*1.000 LS*						*25,000*	*25,000*			
ELECTRICAL											*REM*
20500	*1.000 LS*	*5,953*	*387,139*	*7,983*	*641,533*	*303,280*	*30,000*	*1,369,935*		*1,369,935*	*1,369,935.34*
SITE GRADING		*5,952.63*									*BCL*
20510	*1.000 LS*	*1,375*	*88,018*		*506,250*	*74,850*		*669,118*			
PRELOADING		*1,375.00*									*BCL*
20520	*1.000 LS*	*1,609*	*106,313*		*135,283*	*83,192*		*324,788*			
SITE CUT & FILL		*1,608.63*									*BCL*
20530	*1.000 LS*	*2,969*	*192,807*	*7,983*		*145,238*	*30,000*	*376,028*		*376,028*	*376,028.64*
DUMPSITES & STOCKPILES		*2,969.00*									*BCL*
20531	*1.000 LS*	*914*	*59,290*	*3,895*		*44,434*	*12,000*	*119,619*			
STOCKPILE SITE		*914.00*									*BCL*
20532	*1.000 LS*	*2,055*	*133,517*	*4,088*		*100,805*	*18,000*	*256,409*			
DUMPSITE		*2,055.00*									*BCL*
20600	*1.000 LS*	*3,468*	*218,219*	*299,132*	*33,276*	*114,283*	*1,734,933*	*2,399,843*		*2,399,843*	*2,399,843.75*
SITE RESTORATION		*3,467.80*									*BCL*
20610	*1.000 LS*	*1,532*	*95,196*	*235,170*		*51,413*	*1,144,598*	*1,526,377*		*1,526,377*	*1,526,377.91*
PAVING		*1,532.00*									*BCL*
20611	*1.000 LS*	*728*	*46,531*	*198,666*		*32,270*	*1,132,768*	*1,410,235*			
ASPHALT		*728.00*									*BCL*
20612	*1.000 LS*	*40*	*2,561*	*10,881*		*1,793*	*5,980*	*21,215*			
GRAVEL ACCESS RD		*40.00*									*BCL*

ESTIMATE SUMMARY (COSTS)

Bid # Engr Bid# / Bid Description	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
20613	*1.000 LS*	*40*	*2,561*	*10,530*		*1,793*	*5,850*	*20,734*			
CONCRETE APRONS		*40.00*									*BCL*
20615	*1.000 LS*	*724*	*43,543*	*15,093*		*15,557*		*74,193*			
CURBS		*724.00*									*BCL*
20620	*1.000 LS*	*924*	*61,380*		*25,740*	*37,208*	*40,000*	*164,328*			
TOPSOIL & SEED		*924.40*									*BCL*
20630	*1.000 LS*	*640*	*38,699*	*11,583*		*14,472*		*64,754*			
SIDEWALKS		*640.00*									*BCL*
20640	*1.000 LS*						*293,252*	*293,252*			
FENCING											*BCL*
20650	*1.000 LS*						*100,000*	*100,000*			
LANDSCAPING											*BCL*
20660	*1.000 LS*	*371*	*22,943*	*52,379*	*7,536*	*11,190*	*157,083*	*251,132*		*251,132*	*251,132.15*
RETAINING WALLS		*371.40*									*BCL*
20661	*1.000 LS*	*362*	*22,406*	*52,110*	*7,536*	*10,991*	*137,083*	*230,126*			
RETAINING WALL 1		*362.40*									*BCL*
20662	*1.000 LS*	*9*	*538*	*269*		*199*	*20,000*	*21,006*			
RETAINING WALL 2		*9.00*									*BCL*
20700	*1.000 LS*						*17,000*	*17,000*			
CAULKING											*SAE*
20900	*1.000 LS*						*42,739*	*42,739*			
PAINTING											*SAE*
21000	1.000 LS	6,752	374,087	802,355		42,854	4,100,000	5,319,297	182,157	5,501,454	5,501,454.33
DEWATERING		6,752.00									BCL
22000	1.000 LS	4,911	304,288	6,491,687	284,980	284,366	29,044	7,394,364	253,217	7,647,582	7,647,581.70
RAW WATER INTAKE PIPING		4,910.80									CDH
22010	*3,180.000 LF*	*3,104*	*193,243*	*6,017,529*	*255,344*	*215,444*		*6,681,559*			
42" RAW WATER A & B		*0.98*									
22011	*1.000 LS*	*227*	*13,355*	*3,962*	*3,018*	*50*	*5,944*	*26,328*			
CONCRETE FOUNDATIONS		*226.80*									
22015	*1,630.000 LF*	*944*	*58,808*	*244,241*	*20,792*	*43,718*		*367,559*			
12" WATER		*0.58*									
22020	*257.000 LF*	*224*	*13,774*	*33,536*	*5,186*	*8,410*		*60,905*			
4" DUAL ICB CHEM FEED		*0.87*									
22021	*123.000 LF*	*112*	*6,887*	*15,526*	*640*	*4,205*		*27,257*			
4" ICB CHEM FEED TO RW MH		*0.91*									
22270	*1.000 LS*	*108*	*6,213*	*1,346*		*1,296*	*23,100*	*31,956*			
YARD PIPE GENERAL CONDITIONS		*108.00*									
22280	*1.000 LS*	*192*	*12,009*	*175,548*		*11,244*		*198,801*			
INSTALL EXTRA FITTINGS FOR BYPASS		*192.00*									*JCB*
23000	1.000 LS	8,104	499,611	7,546,159	185,500	415,835	6,200,535	14,847,639	508,452	15,356,091	15,356,091.16
YARD PIPING & STRUCTURES		8,103.51									CDH
23010	*2,372.000 LF*	*2,816*	*175,118*	*3,196,096*	*107,846*	*170,910*	*478,460*	*4,128,430*			

ESTIMATE SUMMARY (COSTS)

Bid # / Bid Description	Engr Bid#	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
36"-42" FINISHED WATER			*1.19*									
23020		*1,900.000 LF*	*1,607*	*100,277*	*503,465*	*32,108*	*92,825*		*728,675*			
16" RESIDUAL FM			*0.85*									
23060		*246.000 LF*	*328*	*19,864*	*537,079*		*11,402*		*568,345*			
36" BWW FROM OZONE			*1.33*									
23070		*124.000 LF*	*136*	*8,210*	*89,756*		*4,650*		*102,616*			
18" FTW			*1.10*									
23080		*336.000 LF*	*496*	*30,195*	*1,508,641*		*17,709*		*1,556,544*			
42" OB1 & OB2			*1.48*									
23090		*104.000 LF*	*124*	*7,426*	*53,171*		*5,162*		*65,759*			
12" DRAIN TO RPS			*1.19*									
23110		*1,547.000 LF*	*240*	*14,656*	*37,564*		*8,706*		*60,926*			
1.5" SAMPLE LINES			*0.16*									
23270		*1.000 LS*	*40*	*2,352*	*673*		*648*	*82,700*	*86,373*			
YARD PIPE GENERAL CONDITIONS			*40.00*									
23310		*180.000 LF*	*768*	*47,681*	*346,723*	*17,000*	*44,757*		*456,162*			
FILTER TO BACKWASH			*4.27*									*JCB*
23320		*236.000 LF*	*336*	*20,661*	*1,136,210*	*10,080*	*12,614*		*1,179,566*			
SETTLED WATER			*1.42*									*JCB*
23330		*1,013.000 LF*	*532*	*32,395*	*87,022*	*13,220*	*24,752*		*157,390*			
DRAIN LINES			*0.53*									*JCB*
23340		*300.000 LF*	*681*	*40,776*	*49,759*	*5,246*	*21,699*	*4,312*	*121,791*			
CHEMICAL FEED TRENCH			*2.27*									*JCB*
23400		*1.000 LS*						*5,635,063*	*5,635,063*			
EXTERIOR EXPOSED PIPING - STERLING												*ERS*
24000		1.000 LS	4,020	246,049	839,957	94,128	171,560	138,999	1,490,693	51,048	1,541,742	1,541,741.52
UTILITIES			4,019.50									CDH
24025		*2,701.000 LF*	*1,060*	*64,218*	*444,405*	*48,322*	*47,712*		*604,656*			
FIRE WATER			*0.39*									*CDH*
24030		*1,325.000 LF*	*1,304*	*80,970*	*178,362*	*27,870*	*52,781*		*339,983*			
SANITARY			*0.98*									*CDH*
24034		*2,505.000 LF*	*1,388*	*84,674*	*195,544*	*17,936*	*65,451*	*8,000*	*371,605*			
JCB STORM			*0.55*									*JCB*
24036		*1,444.000 LF*	*160*	*9,975*	*20,300*		*4,320*		*34,595*			
GAS (EXCAVATE BACKFILL)			*0.11*									
24040		*1.000 LS*	*108*	*6,213*	*1,346*		*1,296*	*23,100*	*31,956*			
YARD PIPE GENERAL CONDITIONS			*108.00*									*CDH*
24240		*1.000 LS*						*107,899*	*107,899*			
GAS(STERLING)												*ERS*
25000	11	1.000 LS	9,056	538,328	681,144	199,347	138,662	17,859,161	19,416,642	664,916	20,081,558	20,081,558.29
SITE ELECTRICAL DISTRIB.(INCLUDES T			9,056.19									REM
25260		*1.000 LS*						*17,796,288*	*17,796,288*			
ELECTRICAL(STERLING)												*REM*

ESTIMATE SUMMARY (COSTS)

Bid # / Engr Bid# / Bid Description	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
25300	*62.000 CY*	*313*	*18,232*	*21,457*	*3,805*	*276*	*4,615*	*48,387*			
10/11 - TYD & SITEWORK ELEC CONCRET		*5.04*									*BVN*
25305	*1.000 CY*	*72*	*4,315*	*2,142*	*783*		*510*	*7,750*			
CONCRETE - LIGHT POLE FNDS		*72.00*									*BVN*
25310	*537.000 CY*	*1,140*	*65,841*	*158,142*	*20,722*		*57,747*	*302,453*			
CONCRETE - ELECTRICAL DUCT BANKS		*2.12*									*BVN*
25350	*1.000 LS*	*7,532*	*449,939*	*499,403*	*174,037*	*138,386*		*1,261,765*			
DUCT BANK EXC & BF		*7,531.59*									*BCL*
25500	1.000 LS	6,763	443,440	1,173,799	261,800	199,525	15,484,560	17,563,124	601,443	18,164,567	18,164,567.04
PILE FOUNDATIONS		6,763.44									BCL
25505	*1.000 LS*						*2,343,324*	*2,343,324*			
PTB											*BCL*
25510	*1.000 LS*						*2,600,388*	*2,600,388*			
OZB											*BCL*
25515	*1.000 LS*						*4,741,884*	*4,741,884*			
FTB											*BCL*
25520	*1.000 LS*						*1,019,760*	*1,019,760*			
RPS											*BCL*
25525	*1.000 LS*						*3,092,362*	*3,092,362*			
ADM											*BCL*
25530	*1.000 LS*						*1,294,731*	*1,294,731*			
CHB											*BCL*
25535	*1.000 LS*						*373,912*	*373,912*			
BWS											*BCL*
25550	*1.000 LS*	*6,763*	*443,440*	*1,173,799*	*261,800*	*199,525*	*18,200*	*2,096,764*		*2,096,764*	*2,096,764.74*
SUB ASSIST		*6,763.44*									*BCL*
25551	*1.000 LS*	*5,370*	*356,569*		*261,800*	*147,480*	*18,200*	*784,049*			
PILE ASSIST		*5,370.00*									*BCL*
25552	*1.000 LS*	*1,393*	*86,871*	*1,173,799*		*52,045*		*1,312,715*			
WORKING PAD		*1,393.44*									*BCL*
115101	*1.000 LS*						*3,558,468*	*3,558,468*			
PROCESS PIPING - STERLING											*ERS*
116100	*1.000 LS*	*135*	*9,338*	*112,987*			*81,075*	*203,399*			
GATES - KII		*135.00*									*ERS*
215101	*1.000 LS*						*2,522,904*	*2,522,904*			
PROCESS PIPING - STERLING											*ERS*
216100	*1.000 LS*	*180*	*11,797*	*33,630*				*45,427*			
GATES - KII		*180.00*									*ERS*
315101	*1.000 LS*						*6,463,832*	*6,463,832*			
PROCESS PIPING - STERLING											*ERS*
316100	*1.000 LS*	*226*	*13,139*	*326,030*				*339,169*			
MANWAYS - KII		*226.01*									*ERS*
415101	*1.000 LS*						*23,939,873*	*23,939,873*			

ESTIMATE SUMMARY (COSTS)

Bid # / Bid Description	Engr Bid#	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
PROCESS PIPING - STERLING												*ERS*
416100		*1.000 LS*	*318*	*21,995*	*169,873*				*191,869*			
GATES - KIIQ			*318.00*									*ERS*
466123		*1.000 LS*			*6,684,910*				*6,684,910*			
GRAVITY FILTRATION SYSTEM - BASE												*JWA*
515101		*1.000 LS*						*1,611,598*	*1,611,598*			
PROCESS PIPING - STERLING												*ERS*
515200		*1.000 LS*	*84*	*5,810*	*19,203*				*25,013*			
GATES - KII			*84.00*									*ERS*
615101		*1.000 LS*						*2,907,545*	*2,907,545*			
PROCESS PIPING - STERLING												
815101		*1.000 LS*						*343,202*	*343,202*			
PROCESS PIPING - STERLING												
915101		*1.000 LS*						*2,385,717*	*2,385,717*			
PROCESS PIPING - STERLING												*ERS*
915200		*1.000 LS*	*42*	*2,905*	*11,385*				*14,290*			
GATES - KII			*42.00*									*ERS*
1000000	2	1.000 LS	841	51,421	2,007,249	772	8,280	7,793,077	9,860,800	337,680	10,198,479	10,198,479.11
EXISTING RW INTAKE			840.97									ALL
1026100		*1.000 LS*	*54*	*3,033*					*3,033*		*3,033*	*3,033.56*
DEMOLITION			*54.00*									*MSL*
1026110		*1.000 LS*										
1-D100												
1026120		*1.000 LS*										
1-D101												
1026130		*1.000 LS*										
1-D102												
1026140		*1.000 LS*										
1-D103												
1026150		*1.000 LS*	*54*	*3,033*					*3,033*			
1-D104			*54.00*									
1032000		*1.000 LS*										
CONCRETE REINFORCEMENT												*BVN*
1033000		*1.000 LS*	*130*	*7,259*	*2,757*	*772*		*433*	*11,222*		*11,222*	*11,222.48*
CAST-IN-PLACE CONCRETE			*129.87*									*BVN*
1033900		*1.000 CY*	*130*	*7,259*	*2,757*	*772*		*433*	*11,222*		*11,222*	*11,222.48*
ELEC CONCRETE			*129.87*									*BVN*
1033901		*1.000 CY*	*130*	*7,259*	*2,757*	*772*		*433*	*11,222*			
ELEC INTERIOR PADS			*129.87*									*BVN*
1040100		*1.000 LS*										
PROCESS PIPING - STERLING												
1050000		*1.000 LS*						*19,510*	*19,510*			
METALS												*RLC*

ESTIMATE SUMMARY (COSTS)

Bid # / Bid Description	Engr Bid#	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
1059000		*1.000 LS*	*24*	*1,618*	*72,960*				*74,578*			
METAL METERIAL - WIB			*24.00*									*RLC*
1061000		*1.000 LS*	*44*	*2,725*	*4,336*				*7,061*			
CARPENTRY			*44.00*									*RLC*
1075400		*1.000 LS*						*116,600*	*116,600*			
ROOFING - TPO												*SAE*
1099000		*1.000 LS*						*436,763*	*436,763*			
PAINTING & COATING												*SAE*
1099600		*1.000 LS*										
COATING FOR CHEMICAL AREAS												*SAE*
1101400		*1.000 LS*	*11*	*671*	*4,113*				*4,784*			
SIGNS			*11.00*									*SAE*
1104400		*1.000 LS*										
FIRE PROTECTION CABINETS & FIRE EXT												*SAE*
1145000		*1.000 LS*	*19*	*1,290*	*16,000*				*17,290*			
HOIST			*19.10*									*RLC*
1150000		*1.000 LS*	*135*	*9,338*	*112,987*			*3,639,543*	*3,761,867*		*3,761,867*	*3,761,867.89*
INTERIOR PIPE			*135.00*									*MSL*
1230000		*1.000 LS*						*369,246*	*369,246*			
HVAC(STERLING)												*ERS*
1260000		*1.000 LS*						*2,063,445*	*2,063,445*			
ELECTRICAL(STERLING)												*REM*
1270000		*1.000 LS*						*1,062,799*	*1,062,799*			
INSTRUMENTATION & CONTROL												*REM*
1430000		*1.000 LS*			*1,793,265*				*1,793,265*		*1,793,265*	*1,793,265.50*
PROCESS EQUIPMENT PACKAGES - KII												*TAL*
1431000		*1.000 LS*			*1,793,265*				*1,793,265*			
RW INTAKE EQ PKGS												*JWA*
1435000		*1.000 LS*	*424*	*25,487*	*831*		*8,280*		*34,598*		*34,598*	*34,598.51*
PROCESS EQUIPMENT INSTALL - KII			*424.00*									*JWA*
1435010		*1.000 LS*	*424*	*25,487*	*831*		*8,280*		*34,598*			
INSTALL TRAVELING WATER SCREENS			*424.00*									*JWA*
1440000		*1.000 LS*						*84,738*	*84,738*			
PROCESS EQUIPMENT INSTALL - STERLIN												*ERS*
2000000	3	1.000 LS	25,112	1,531,935	6,421,428	607,149	158,434	9,007,355	17,726,301	607,031	18,333,332	18,333,331.92
PRETREATMENT BUILDING(PTB) / BASI			25,111.54									ALL
2032000		*1.000 LS*						*2,153,065*	*2,153,065*			
CONCRETE REINFORCEMENT												*BVN*
2033000		*1.000 LS*	*16,942*	*1,004,554*	*878,710*	*352,875*	*11,152*	*89,292*	*2,336,582*		*2,336,582*	*2,336,582.83*
CAST-IN-PLACE CONCRETE			*16,941.92*									*BVN*
2033001		*3,703.000 CY*	*16,635*	*987,666*	*597,710*	*347,179*	*4,360*	*88,969*	*2,025,883*			
2 - PTB			*4.49*									*BVN*
2033002		*1.000 CY*										

ESTIMATE SUMMARY (COSTS)

Bid # / Engr Bid# / Bid Description	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
2 - PTB PRECAST VALVE VLT											*BVN*
2033010	*1.000 CY*	*101*	*5,702*	*2,101*	*730*		*323*	*8,856*		*8,856*	*8,856.48*
2 - ELEC CONCRETE		*101.38*									*BVN*
2033011	*1.000 CY*	*101*	*5,702*	*2,101*	*730*		*323*	*8,856*			
ELEC INTERIOR PADS		*101.38*									*BVN*
2033015	*1.000 CY*	*206*	*11,187*	*13,634*	*4,966*	*6,791*		*36,579*			
WINTER CONCRETE		*205.90*									*BVN*
2033020	*1.000 CY*			*265,264*				*265,264*			
READYMIX ADMIX & ESCL											*BVN*
2050000	*1.000 LS*						*204,920*	*204,920*			
METALS											*RLC*
2051000	*1.000 LS*						*151,967*	*151,967*			
STRUCTURAL STEEL											*RLC*
2059000	*1.000 LS*	*96*	*6,472*	*1,595,740*				*1,602,212*			
METALS MATERIAL - TPB		*96.00*									*RLC*
2071300	*1.000 LS*										
WATERPROOFING - SELF-ADHERING SHE											*RLC*
2074200	*1.000 LS*										
METAL WALL PANELS											*SAE*
2075400	*1.000 LS*						*92,777*	*92,777*			
ROOFING - MBCI METAL ROOF PANELS											*SAE*
2079200	*1.000 LS*						*57,800*	*57,800*			
JOINT SEALANTS											*SAE*
2099000	*1.000 LS*						*9,070*	*9,070*			
PAINTING & COATING											*SAE*
2099600	*1.000 LS*						*250,000*	*250,000*			
COATING FOR CHEMICAL AREAS											*SAE*
2101400	*1.000 LS*	*33*	*2,014*	*4,113*				*6,127*			
SIGNS		*33.00*									*SAE*
2104400	*1.000 LS*	*10*	*610*	*1,924*				*2,534*			
FIRE PROTECTION CABINETS & FIRE EXT		*10.00*									*SAE*
2150000	*1.000 LS*	*180*	*11,797*	*33,630*			*2,522,904*	*2,568,331*		*2,568,331*	*2,568,331.78*
INTERIOR PIPE		*180.00*									*MSL*
2220000	*1.000 LS*										
PLUMBING											*ERS*
2230000	*1.000 LS*										
HVAC											*ERS*
2260000	*1.000 LS*						*1,818,176*	*1,818,176*			
ELECTRICAL											*REM*
2270000	*1.000 LS*						*1,193,442*	*1,193,442*			
INSTRUMENTATION & CONTROL											*REM*
2310000	*1.000 LS*	*3,691*	*233,298*	*570,618*	*254,274*	*147,282*	*463,942*	*1,669,414*		*1,669,414*	*1,669,414.43*
EARTHWORK		*3,690.62*									*BCL*

ESTIMATE SUMMARY (COSTS)

Bid # / Bid Description	Engr Bid#	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
2313000		*1.000 LS*	*3,691*	*233,298*	*570,618*	*254,274*	*147,282*	*463,942*	*1,669,414*		*1,669,414*	*1,669,414.43*
BENCH CUT SITE			*3,690.62*									*BCL*
2313100		*1.000 LS*	*3,437*	*217,078*	*563,612*	*254,274*	*143,408*	*17,062*	*1,195,434*			
EXC & BF			*3,436.54*									*BCL*
2313200		*1.000 LS*	*254*	*16,220*	*7,006*		*3,874*	*446,880*	*473,980*		*473,980*	*473,980.19*
S.O.E.			*254.08*									*BCL*
2313210		*1.000 LS*						*446,880*	*446,880*			
SUBCONTRACTOR												*BCL*
2313220		*1.000 LS*	*254*	*16,220*	*7,006*		*3,874*		*27,100*			
SUB ASSIST			*254.08*									*BCL*
2430000		*1.000 LS*			*3,330,000*				*3,330,000*		*3,330,000*	*3,330,000.50*
PROCESS EQUIPMENT PACKAGES - KII												*TAL*
2431000		*1.000 LS*			*3,330,000*				*3,330,000*			
PTB EQ PKGS												*JWA*
2435000		*1.000 LS*	*4,160*	*273,190*	*6,693*				*279,883*		*279,883*	*279,883.52*
PROCESS EQUIPMENT INSTALL - KII			*4,160.00*									*JWA*
2435010		*1.000 LS*	*768*	*52,395*	*741*				*53,136*			
INSTALL HOSELESS SLUDGE COLLECTOR			*768.00*									*JWA*
2435020		*1.000 LS*	*864*	*48,529*	*1,278*				*49,807*			
INSTALL FLOCCULATORS			*864.00*									*JWA*
2435030		*1.000 LS*	*1,664*	*113,420*	*1,532*				*114,952*			
INSTALL INCLINED PLATE SETTLERS			*1,664.00*									*JWA*
2435040		*1.000 LS*	*864*	*58,845*	*3,142*				*61,987*			
INSTALL SS BAFFLE WALL			*864.00*									*JWA*
2440000		*1.000 LS*										
PROCESS EQUIPMENT INSTALL - STERLIN												*ERS*
3000000	4	1.000 LS	25,687	1,532,856	8,062,103	597,676	149,653	15,042,026	25,384,313	869,277	26,253,590	26,253,589.67
OZONE BLDG(OZB)/BASINS, GENERATIO			25,687.15									ALL
3032000		*1.000 LS*						*1,837,785*	*1,837,785*			
CONCRETE REINFORCEMENT												*BVN*
3033000		*1.000 LS*	*21,378*	*1,265,277*	*1,044,985*	*404,707*	*10,766*	*92,438*	*2,818,173*		*2,818,173*	*2,818,173.64*
CAST-IN-PLACE CONCRETE			*21,378.44*									*BVN*
3033001		*3,485.000 CY*	*21,039*	*1,246,647*	*707,879*	*398,359*	*3,123*	*92,115*	*2,448,123*			
3 - OZB			*6.04*									*BVN*
3033010		*1.000 CY*	*107*	*6,040*	*2,220*	*760*		*323*	*9,343*		*9,343*	*9,343.11*
3 - ELEC CONCRETE			*107.42*									*BVN*
3033011		*1.000 CY*	*107*	*6,040*	*2,220*	*760*		*323*	*9,343*			
ELEC INT PADS			*107.42*									*BVN*
3033015		*1.000 CY*	*232*	*12,589*	*15,344*	*5,589*	*7,643*		*41,165*			
WINTER CONCRETE			*231.72*									*BVN*
3033020		*1.000 LS*			*319,543*				*319,543*			
READYMIX ADMIX & ESCALATIONS												*BVN*
3033500		*1.000 LS*	*200*	*11,201*	*12,000*				*23,201*			

ESTIMATE SUMMARY (COSTS)

Bid # Engr Bid# / Bid Description	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
HYDRAULIC LEAKAGE TEST TANKS		*200.00*									*MSL*
3034000	*1.000 LS*	*56*	*3,139*	*14,660*			*106,824*	*124,623*			
PRECAST HOLLOWCORE PLANKS		*56.00*									*BVN*
3034100	*1.000 LS*			*29,979*			*125,165*	*155,144*			
PRECAST DOUBLE TEES											*BVN*
3040000	*1.000 LS*						*1,090,170*	*1,090,170*			
MASONRY											*SAE*
3050000	*1.000 LS*						*117,100*	*117,100*			
METALS											*RLC*
3059000	*1.000 LS*	*24*	*1,618*	*543,470*				*545,088*			
METAL MATERIAL - OZB		*24.00*									*RLC*
3061000	*1.000 LS*	*65*	*4,061*	*4,138*				*8,199*			
ROUGH CARPENTRY		*65.38*									*RLC*
3068000	*1.000 LS*	*64*	*3,967*	*45,943*				*49,910*			
FRP FABRICATIONS		*63.72*									*RLC*
3071300	*1.000 LS*						*225,000*	*225,000*			
WATERPROOFING - SELF-ADHERING SHE											*RLC*
3075400	*1.000 LS*						*271,800*	*271,800*			
ROOFING - TPO											*SAE*
3078410	*1.000 LS*										
PENETRATION FIREPROOFING											*ALL*
3079200	*1.000 LS*						*92,000*	*92,000*			
JOINT SEALANTS											*SAE*
3081100	*1.000 LS*			*62,350*			*8,602*	*70,952*			
DOORS, FRAMES & HARDWARE											*RLC*
3081200	*1.000 LS*										
ALUMINUM DOORS											*RLC*
3083300	*1.000 LS*						*26,950*	*26,950*			
COILING OVERHEAD DOORS											*RLC*
3084500	*1.000 LS*						*4,020*	*4,020*			
FIBERGLASS SANDWICH PANELS											*RLC*
3088000	*1.000 LS*						*2,000*	*2,000*			
GLAZING											*RLC*
3092000	*1.000 LS*										
GYPSUM BOARD & METAL FRAMING											*SAE*
3093000	*1.000 LS*										
CERAMIC TILE											*SAE*
3095100	*1.000 LS*										
ACOUSTICAL CEILING											*SAE*
3096500	*1.000 LS*										
RESILIENT BASE											*SAE*
3099000	*1.000 LS*						*155,155*	*155,155*			
PAINTING & COATING											*SAE*

ESTIMATE SUMMARY (COSTS)

Bid # / Bid Description	Engr Bid#	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
3101400		*1.000 LS*	*33*	*2,014*	*4,113*				*6,127*			
SIGNS			*33.00*									*SAE*
3102100		*1.000 LS*						*14,390*	*14,390*			
TOILET COMPARTMENTS												*SAE*
3102800		*1.000 LS*	*7*	*412*	*6,375*				*6,787*			
TOILET & BATH ACCESSORIES			*6.75*									*SAE*
3104400		*1.000 LS*	*5*	*305*	*1,924*				*2,229*			
FIRE PROTECTION CABINETS & FIRE EXT			*5.00*									*SAE*
3104500		*1.000 LS*	*2*	*122*	*500*				*622*			
KNOX BOX			*2.00*									*SAE*
3104600		*1.000 LS*	*4*	*244*	*1,000*				*1,244*			
DOCK BUMPERS			*4.00*									*SAE*
3150000		*1.000 LS*	*226*	*13,139*	*326,030*			*6,463,832*	*6,803,001*		*6,803,001*	*6,803,001.35*
INTERIOR PIPE			*226.01*									*MSL*
3210000		*1.000 LS*						*115,000*	*115,000*			
FIRE SUPPRESSION												*ERS*
3220000		*1.000 LS*						*206,644*	*206,644*			
PLUMBING												*ERS*
3230000		*1.000 LS*						*776,014*	*776,014*			
HVAC												*ERS*
3260000		*1.000 LS*						*2,201,991*	*2,201,991*			
ELECTRICAL												*REM*
3270000		*1.000 LS*						*892,481*	*892,481*			
INSTRUMENTATION & CONTROL												*REM*
3310000		*1.000 LS*	*3,536*	*222,068*	*714,063*	*192,969*	*138,887*	*16,746*	*1,284,732*		*1,284,732*	*1,284,732.57*
EARTHWORK			*3,536.40*									*BCL*
3311000		*1.000 LS*	*3,536*	*222,068*	*714,063*	*192,969*	*138,887*	*16,746*	*1,284,732*			
EXC & BF			*3,536.40*									*BCL*
3410000		*1.000 LS*	*38*	*2,594*	*45,000*				*47,594*			
CRANES & HOISTS			*38.45*									*RLC*
3430000		*1.000 LS*			*5,205,500*				*5,205,500*		*5,205,500*	*5,205,500.50*
PROCESS EQUIPMENT PACKAGES - KII												*TAL*
3431000		*1.000 LS*			*5,205,500*				*5,205,500*			
OZB EQ PKGS												*JWA*
3435000		*1.000 LS*	*48*	*2,696*	*72*				*2,768*			
PROCESS EQUIPMENT INSTALL - KII			*48.00*									*JWA*
3440000		*1.000 LS*						*199,918*	*199,918*			
PROCESS EQUIPMENT INSTALL - STERLIN												*ERS*
4000000	5	1.000 LS	133,497	7,971,171	17,810,017	4,282,241	608,984	47,500,094	78,172,507	2,676,989	80,849,496	80,849,496.30
FILTER BLDG(FTB)/CLEARWELLS/HS PU			133,497.05									ALL
4032000		*1.000 LS*						*4,796,566*	*4,796,566*			
CONCRETE REINFORCEMENT												*BVN*
4033000		*1.000 LS*	*114,227*	*6,785,169*	*4,879,939*	*2,248,576*	*39,483*	*404,291*	*14,357,457*		*14,357,457*	*14,357,457.55*

ESTIMATE SUMMARY (COSTS)

Bid #	Bid Description	Quantity Unit	Manhrs	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
	CAST-IN-PLACE CONCRETE		*114,226.68*										*BVN*
4033001	*4 - FTB/HSP*	*14,793.000 CY*	*113,024*	*7.64*	*6,719,442*	*3,241,021*	*2,223,344*	*6,938*	*403,662*	*12,594,406*			*BVN*
4033010	*4 - ELEC CONCRETE*	*1.000 CY*	*217*	*216.67*	*12,147*	*4,290*	*1,434*		*629*	*18,500*		*18,500*	*18,500.07 BVN*
4033011	*ELEC INT PADS*	*1.000 CY*	*217*	*216.67*	*12,147*	*4,290*	*1,434*		*629*	*18,500*			*BVN*
4033015	*WINTER CONCRETE*	*1.000 CY*	*986*	*986.20*	*53,581*	*65,336*	*23,798*	*32,545*		*175,259*			*BVN*
4033020	*READYMIX ADMIX & ESCLATIONS*	*1.000 LS*				*1,569,292*				*1,569,292*			*BVN*
4034000	*PRECAST HOLLOWCORE PLANKS*	*1.000 LS*	*420*	*420.00*	*23,542*	*179,081*			*774,146*	*976,769*			*BVN*
4040000	*MASONRY*	*1.000 LS*							*1,854,532*	*1,854,532*			*SAE*
4050000	*METALS*	*1.000 LS*							*89,970*	*89,970*			*RLC*
4059000	*METAL MATERIAL - FTB*	*1.000 LS*	*48*	*48.00*	*3,236*	*464,850*				*468,086*			*RLC*
4061000	*ROUGH CARPENTRY*	*1.000 LS*	*208*	*208.00*	*12,950*	*14,111*				*27,061*			*RLC*
4071300	*WATERPROOFING - SELF-ADHERING SHE*	*1.000 LS*							*665,000*	*665,000*			*RLC*
4072100	*THERMAL INSULATION*	*1.000 LS*											*RLC*
4072700	*FLUID APPLIED AIR BARRIERS*	*1.000 LS*											*SAE*
4075400	*ROOFING - TPO*	*1.000 LS*							*903,920*	*903,920*			*SAE*
4078410	*PENETRATION FIREPROOFING*	*1.000 LS*											*ALL*
4079200	*JOINT SEALANTS*	*1.000 LS*							*92,500*	*92,500*			*SAE*
4081100	*DOORS, FRAMES & HARDWARE*	*1.000 LS*				*57,010*			*9,096*	*66,106*			*RLC*
4081200	*ALUMINUM DOORS*	*1.000 LS*											*RLC*
4083300	*COILING OVERHEAD DOORS*	*1.000 LS*							*35,940*	*35,940*			*RLC*
4084100	*ALUMINUM ENTRANCES & STOREFRONTS*	*1.000 LS*							*937,570*	*937,570*			*RLC*
4088000	*GLAZING*	*1.000 LS*							*7,000*	*7,000*			*RLC*

ESTIMATE SUMMARY (COSTS)

Bid # Engr Bid# / Bid Description	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
4099000	*1.000 LS*						*578,619*	*578,619*			
PAINTING & COATING											*SAE*
4099600	*1.000 LS*						*250,000*	*250,000*			
COATING FOR CHEMICAL AREAS											*SAE*
4101400	*1.000 LS*	*22*	*1,343*	*4,113*				*5,456*			
SIGNS		*22.00*									*SAE*
4104400	*1.000 LS*	*10*	*610*	*1,924*				*2,534*			
FIRE PROTECTION CABINETS & FIRE EXT		*10.00*									*SAE*
4150000	*1.000 LS*	*318*	*21,995*	*169,873*			*23,939,873*	*24,131,742*		*24,131,742*	*24,131,742.64*
INTERIOR PIPE		*318.00*									*MSL*
4220000	*1.000 LS*						*342,508*	*342,508*			
PLUMBING											*ERS*
4230000	*1.000 LS*						*840,177*	*840,177*			
HVAC											*ERS*
4260000	*1.000 LS*						*4,263,976*	*4,263,976*			
ELECTRICAL											*REM*
4270000	*1.000 LS*						*2,661,685*	*2,661,685*			
INSTRUMENTATION & CONTROL											*REM*
4310000	*1.000 LS*	*13,851*	*874,605*	*1,735,999*	*2,007,113*	*566,302*	*3,884,746*	*9,068,765*		*9,068,765*	*9,068,765.02*
EARTHWORK		*13,851.26*									*BCL*
4313000	*1.000 LS*	*13,851*	*874,605*	*1,735,999*	*2,007,113*	*566,302*	*3,884,746*	*9,068,765*		*9,068,765*	*9,068,765.02*
BENCH CUT SITE		*13,851.26*									*BCL*
4313100	*1.000 LS*	*12,601*	*795,183*	*1,665,370*	*2,007,113*	*543,380*	*70,306*	*5,081,351*			
EXC & BF		*12,601.10*									*BCL*
4313200	*1.000 LS*	*1,250*	*79,423*	*70,629*		*22,921*	*3,814,440*	*3,987,413*		*3,987,413*	*3,987,413.71*
S.O.E.		*1,250.16*									*BCL*
4313210	*1.000 LS*						*3,814,440*	*3,814,440*			
SUBCONTRACTOR											*BCL*
4313220	*1.000 LS*	*1,250*	*79,423*	*70,629*		*22,921*		*172,973*			
SUB ASSIST		*1,250.16*									*BCL*
4410000	*1.000 LS*	*69*	*4,672*	*68,155*				*72,827*			
CRANES & HOISTS		*69.10*									*RLC*
4430000	*1.000 LS*			*7,613,845*				*7,613,845*		*7,613,845*	*7,613,845.50*
PROCESS EQUIPMENT PACKAGES - KII											*TAL*
4431000	*1.000 LS*			*928,935*				*928,935*			
FILTRATION BLDG EQ PKGS											*JWA*
4435000	*1.000 LS*	*4,324*	*243,047*	*2,621,118*	*26,553*	*3,200*	*35,700*	*2,929,618*		*2,929,618*	*2,929,618.38*
PROCESS EQUIPMENT INSTALL - KII		*4,324.01*									*JWA*
4435010	*10.000 EA*	*3,136*	*176,167*	*29,013*	*20,689*	*3,200*	*17,850*	*246,918*		*246,918*	*24,691.89*
INSTALL GRAVITY FILTERS - BASE 10		*313.60*									*JWA*
4435012	*1.000 LS*	*964*	*54,272*	*1,000*	*6,306*	*3,200*	*17,850*	*82,628*			
INSTALL GRAVITY FILTER MEDIA		*964.00*									*JWA*
4435014	*1.000 LS*	*2,172*	*121,896*	*28,013*	*14,382*			*164,291*			

ESTIMATE SUMMARY (COSTS)

Bid # / Bid Description	Engr Bid#	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
INSTALL GRAVITY FILTER UNDERDRAINS			*2,172.00*									*JWA*
4435050		*4.000 EA*	*1,188*	*66,880*	*2,592,105*	*5,864*		*17,850*	*2,682,699*		*2,682,699*	*670,674.99*
INSTALL GRAVITY FILTERS - ADD 4			*297.00*									
4435060		*4.000 EA*	*475*	*26,775*	*400*	*112*		*17,850*	*45,136*			
INSTALL GRAVITY FILTER MEDIA			*118.84*									
4435070		*4.000 EA*	*713*	*40,105*	*11,205*	*5,753*			*57,063*			
INSTALL GRAVITY FILTER UNDERDRAINS			*178.16*									
4435080		*1.000 LS*			*2,580,500*				*2,580,500*			
GRAVITY FILTRATION SYSTEM - ADD 4												
4440000		*1.000 LS*						*132,278*	*132,278*			
PROCESS EQUIPMENT INSTALL - STERLIN												*ERS*
5000000	6	1.000 LS	18,421	1,107,971	1,508,856	593,981	153,039	5,595,934	8,959,781	306,824	9,266,606	9,266,605.59
RESIDUALS PUMP STATION(RPS)			18,420.96									ALL
5032000		*1.000 LS*						*891,946*	*891,946*			
CONCRETE REINFORCEMENT												*BVN*
5033000		*1.000 LS*	*14,529*	*861,703*	*649,991*	*274,568*	*6,765*	*56,397*	*1,849,423*		*1,849,423*	*1,849,423.61*
CAST-IN-PLACE CONCRETE			*14,529.41*									*BVN*
5033001		*2,420.000 CY*	*14,300*	*849,115*	*384,326*	*269,957*	*1,056*	*56,253*	*1,560,706*			
5 - RPS			*5.91*									*BVN*
5033010		*1.000 CY*	*57*	*3,188*	*1,009*	*437*		*145*	*4,779*		*4,779*	*4,779.02*
5 - ELEC CONCRETE			*56.59*									*BVN*
5033011		*1.000 CY*	*57*	*3,188*	*1,009*	*437*		*145*	*4,779*			
ELEC INT PADS			*56.59*									*BVN*
5033015		*1.000 CY*	*173*	*9,399*	*11,461*	*4,175*	*5,709*		*30,744*			
WINTER CONCRETE			*173.00*									*BVN*
5033020		*1.000 CY*			*253,195*				*253,195*			
READYMIX ADMIX & ESCL												*BVN*
5034000		*1.000 LS*	*40*	*2,242*	*9,766*			*57,122*	*69,130*			
PRECAST HOLLOWCORE PLANKS			*40.00*									*BVN*
5040000		*1.000 LS*						*312,531*	*312,531*			
MASONRY												*SAE*
5050000		*1.000 LS*						*8,323*	*8,323*			
METALS												*RLC*
5059000		*1.000 LS*	*24*	*1,618*	*25,445*				*27,063*			
METAL MATERIAL - RPS			*24.00*									*RLC*
5061000		*1.000 LS*	*53*	*3,286*	*2,568*				*5,855*			
ROUGH CARPENTRY			*53.00*									*RLC*
5071300		*1.000 LS*										
WATERPROOFING - SELF-ADHERING SHE												*RLC*
5075400		*1.000 LS*						*79,600*	*79,600*			
ROOFING - TPO												*SAE*
5079200		*1.000 LS*						*48,200*	*48,200*			
JOINT SEALANTS												*SAE*

ESTIMATE SUMMARY (COSTS)

Bid # / Bid Description	Engr Bid#	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
5081200		*1.000 LS*										
ALUMINUM DOORS												*RLC*
5099000		*1.000 LS*						*62,014*	*62,014*			
PAINTING & COATING												*SAE*
5101400		*1.000 LS*	*11*	*671*	*4,113*				*4,784*			
SIGNS			*11.00*									*SAE*
5104400		*1.000 LS*	*1*	*61*	*1,924*				*1,985*			
FIRE PROTECTION CABINETS & FIRE EXT			*1.00*									*SAE*
5150000		*1.000 LS*	*84*	*5,810*	*19,203*			*1,611,598*	*1,636,610*		*1,636,610*	*1,636,610.92*
INTERIOR PIPE			*84.00*									*MSL*
5230000		*1.000 LS*						*388,747*	*388,747*			
HVAC												*ERS*
5260000		*1.000 LS*						*417,895*	*417,895*			
ELECTRICAL												*REM*
5270000		*1.000 LS*						*331,108*	*331,108*			
INSTRUMENTATION & CONTROL												*REM*
5310000		*1.000 LS*	*3,679*	*232,580*	*637,705*	*319,413*	*146,275*	*1,293,878*	*2,629,850*		*2,629,850*	*2,629,850.87*
EARTHWORK			*3,678.55*									*BCL*
5313000		*1.000 LS*	*3,679*	*232,580*	*637,705*	*319,413*	*146,275*	*1,293,878*	*2,629,850*		*2,629,850*	*2,629,850.87*
BENCH CUT SITE			*3,678.55*									*BCL*
5313100		*1.000 LS*	*3,246*	*205,088*	*613,201*	*319,413*	*138,330*	*1,118*	*1,277,149*			
EXC & BF			*3,245.79*									*BCL*
5313200		*1.000 LS*	*433*	*27,492*	*24,504*		*7,945*	*1,292,760*	*1,352,702*		*1,352,702*	*1,352,702.00*
S.O.E.			*432.76*									*BCL*
5313210		*1.000 LS*						*1,292,760*	*1,292,760*			
SUBCONTRACTOR												*BCL*
5313220		*1.000 LS*	*433*	*27,492*	*24,504*		*7,945*		*59,942*			
SUB ASSIST			*432.76*									*BCL*
5430000		*1.000 LS*			*158,141*				*158,141*		*158,141*	*158,141.50*
PROCESS EQUIPMENT PACKAGES - KII												*TAL*
5431000		*1.000 LS*			*158,141*				*158,141*			
RPS EQ PKGS												*JWA*
5440000		*1.000 LS*						*36,576*	*36,576*			
PROCESS EQUIPMENT INSTALL - STERLIN												*ERS*
6000000	7	1.000 LS	8,498	503,856	1,654,828	140,128	39,095	9,193,662	11,531,570	394,894	11,926,465	11,926,464.87
CHEMICAL BUILDING(CHB)			8,498.25									ALL
6032000		*1.000 LS*						*460,794*	*460,794*			
CONCRETE REINFORCEMENT												*BVN*
6033000		*1.000 LS*	*6,473*	*378,669*	*244,104*	*93,262*	*2,161*	*19,907*	*738,104*		*738,104*	*738,104.00*
CAST-IN-PLACE CONCRETE			*6,473.43*									*BVN*
6033001		*862.000 CY*	*6,420*	*375,653*	*168,318*	*92,849*	*2,161*	*19,763*	*658,744*			
6 - CHB			*7.45*									*BVN*
6033010		*1.000 CY*	*54*	*3,016*	*966*	*413*		*145*	*4,539*		*4,539*	*4,539.58*

ESTIMATE SUMMARY (COSTS)

Bid # Engr Bid# / Bid Description	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
6 - ELEC CONCRETE		*53.53*									*BVN*
6033011	*1.000 CY*	*54*	*3,016*	*966*	*413*		*145*	*4,539*			
ELEC INT PADS		*53.53*									*BVN*
6033015	*1.000 CY*										
WINTER CONCRETE											*BVN*
6033020	*1.000 LS*			*74,821*				*74,821*			
READYMIX ADMIX & ESCL											*BVN*
6034000	*1.000 LS*	*154*	*8,632*	*53,582*			*269,867*	*332,081*			
PRECAST HOLLOWCORE PLANKS		*154.00*									*BVN*
6040000	*1.000 LS*						*848,863*	*848,863*			
MASONRY											*SAE*
6050000	*1.000 LS*						*53,670*	*53,670*			
METALS											*RLC*
6051000	*1.000 LS*	*17*	*1,181*					*1,181*			
STRUCTURAL STEEL		*17.40*									*RLC*
6059000	*1.000 LS*	*72*	*4,854*	*259,020*				*263,874*			
METAL MATERIAL - CHB		*72.00*									*RLC*
6061000	*1.000 LS*	*125*	*7,787*	*5,432*				*13,219*			
ROUGH CARPENTRY		*125.08*									*RLC*
6068000	*1.000 LS*	*254*	*15,820*	*137,232*				*153,052*			
FRP FABRICATIONS		*254.39*									*RLC*
6071300	*1.000 LS*						*155,000*	*155,000*			
WATERPROOFING - SELF-ADHERING SHE											*RLC*
6075400	*1.000 LS*						*258,300*	*258,300*			
ROOFING - TPO											*SAE*
6079200	*1.000 LS*						*100,200*	*100,200*			
JOINT SEALANTS											*SAE*
6081100	*1.000 LS*			*67,445*			*11,866*	*79,311*			
DOORS, FRAMES & HARDWARE											*RLC*
6081200	*1.000 LS*						*23,000*	*23,000*			
ALUMINUM DOORS											*RLC*
6083300	*1.000 LS*						*35,940*	*35,940*			
COILING OVERHEAD DOORS											*RLC*
6084500	*1.000 LS*						*42,060*	*42,060*			
FIBERGLASS SANDWICH PANELS											*RLC*
6099000	*1.000 LS*						*210,976*	*210,976*			
PAINTING & COATING											*SAE*
6099600	*1.000 LS*						*250,000*	*250,000*			
COATING FOR CHEMICAL AREAS											*SAE*
6101400	*1.000 LS*	*22*	*1,343*	*4,113*				*5,456*			
SIGNS		*22.00*									*SAE*
6104400	*1.000 LS*	*10*	*610*	*1,924*				*2,534*			
FIRE PROTECTION CABINETS & FIRE EXT		*10.00*									*SAE*

ESTIMATE SUMMARY (COSTS)

Bid # / Bid Description	Engr Bid#	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
6104500		*1.000 LS*	*2*	*122*	*500*				*622*			
KNOX BOX			*2.00*									*SAE*
6119000		*1.000 LS*	*73*	*5,022*	*15,045*				*20,067*			
PALLET RACK			*73.00*									*RLC*
6150000		*1.000 LS*						*2,907,545*	*2,907,545*		*2,907,545*	*2,907,545.74*
INTERIOR PIPE												*MSL*
6210000		*1.000 LS*						*262,000*	*262,000*			
FIRE SUPPRESSION												*ERS*
6220000		*1.000 LS*						*367,430*	*367,430*			
PLUMBING												*ERS*
6230000		*1.000 LS*						*677,844*	*677,844*			
HVAC												*ERS*
6260000		*1.000 LS*						*1,489,678*	*1,489,678*			
ELECTRICAL												*REM*
6270000		*1.000 LS*						*593,317*	*593,317*			
INSTRUMENTATION & CONTROL												*REM*
6310000		*1.000 LS*	*1,295*	*79,816*	*201,542*	*46,866*	*36,934*	*32,784*	*397,941*		*397,941*	*397,941.44*
EARTHWORK			*1,294.95*									*BCL*
6311000		*1.000 LS*	*1,295*	*79,816*	*201,542*	*46,866*	*36,934*	*32,784*	*397,941*			
EXC & BF			*1,294.95*									*BCL*
6430000		*1.000 LS*			*664,890*				*664,890*		*664,890*	*664,890.50*
PROCESS EQUIPMENT PACKAGES - KII												*TAL*
6431000		*1.000 LS*			*664,890*				*664,890*			
CHB EQ PKGS												*JWA*
6440000		*1.000 LS*						*122,622*	*122,622*			
PROCESS EQUIPMENT INSTALL - STERLIN												*ERS*
7000000	8	1.000 LS	9,202	545,780	3,634,590	169,361	56,872	12,345,506	16,752,108	573,670	17,325,778	17,325,778.00
ADMINISTRATION BUILDING(ADM)			9,201.62									ALL
7032000		*1.000 LS*						*784,158*	*784,158*			
CONCRETE REINFORCEMENT												*BVN*
7033000		*1.000 LS*	*5,927*	*345,725*	*297,248*	*72,749*	*1,235*	*25,995*	*742,951*		*742,951*	*742,951.32*
CAST-IN-PLACE CONCRETE			*5,927.08*									*BVN*
7033001		*1,408.000 CY*	*5,893*	*343,815*	*229,768*	*72,513*	*1,235*	*25,876*	*673,207*			
7 - ADM			*4.19*									*BVN*
7033010		*1.000 CY*	*34*	*1,909*	*766*	*236*		*119*	*3,030*		*3,030*	*3,030.94*
7 - ELEC CONCRETE			*33.97*									*BVN*
7033011		*1.000 CY*	*34*	*1,909*	*766*	*236*		*119*	*3,030*			
ELEC INT PADS			*33.97*									*BVN*
7033015		*1.000 CY*										
WINTER CONCRETE												*BVN*
7033020		*1.000 LS*			*66,714*				*66,714*			
READYMIX ADMIX & ESCL												*BVN*
7034500		*1.000 LS*	*232*	*12,795*	*233,334*		*233*	*1,021,896*	*1,268,257*			

ESTIMATE SUMMARY (COSTS)

Bid # Engr Bid# / Bid Description	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
PRECAST INSULATED WALL PANELS		*232.00*									*BVN*
7040000	*1.000 LS*						*573,875*	*573,875*			
MASONRY											*SAE*
7050000	*1.000 LS*						*29,270*	*29,270*			
METALS											*RLC*
7051000	*1.000 LS*						*592,660*	*592,660*			
STRUCTURAL STEEL											*RLC*
7059000	*1.000 LS*	*72*	*4,854*	*2,659,560*				*2,664,414*			
METAL MATERIAL - ADM		*72.00*									*RLC*
7061000	*1.000 LS*	*384*	*22,989*	*15,000*				*37,989*			
ROUGH CARPENTRY		*384.00*									*RLC*
7071300	*1.000 LS*						*9,000*	*9,000*			
WATERPROOFING - SELF-ADHERING SHE											*RLC*
7074200	*1.000 LS*						*125,000*	*125,000*			
METAL WALL PANELS											*SAE*
7075400	*1.000 LS*						*790,671*	*790,671*			
ROOFING - TPO											*SAE*
7078410	*1.000 LS*										
PENETRATION FIREPROOFING											*ALL*
7078440	*1.000 LS*										
FIRESTOPPING											*ALL*
7079200	*1.000 LS*						*111,500*	*111,500*			
JOINT SEALANTS											*SAE*
7081100	*1.000 LS*			*137,170*			*51,416*	*188,586*			
DOORS, FRAMES & HARDWARE											*RLC*
7081200	*1.000 LS*										
ALUMINUM DOORS											*RLC*
7083300	*1.000 LS*						*134,800*	*134,800*			
COILING OVERHEAD DOORS											*RLC*
7084100	*1.000 LS*						*125,900*	*125,900*			
ALUMINUM ENTRANCES & STOREFRONTS											*RLC*
7088000	*1.000 LS*						*10,000*	*10,000*			
GLAZING											*RLC*
7092000	*1.000 LS*						*897,030*	*897,030*			
METAL FRAMING/DRYWALL/ACOUSTICAL											*SAE*
7093000	*1.000 LS*						*145,610*	*145,610*			
CERAMIC TILE											*SAE*
7096700	*1.000 LS*						*140,000*	*140,000*			
RESINOUS FLOORING											*SAE*
7096800	*1.000 LS*						*142,605*	*142,605*			
TILE CARPETING/RESILIENT TILE & BASE											*SAE*
7099000	*1.000 LS*						*106,742*	*106,742*			
PAINTING & COATING											*SAE*

ESTIMATE SUMMARY (COSTS)

Bid # / Bid Description	Engr Bid#	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
7101400		*1.000 LS*	*70*	*4,288*	*9,613*		*275*		*14,176*			
SIGNS			*70.00*									*SAE*
7102100		*1.000 LS*	*126*	*7,845*	*7,700*				*15,545*			
TOILET COMPARTMENTS			*126.00*									*SAE*
7102800		*1.000 LS*	*112*	*6,836*	*6,375*				*13,211*			
TOILET & BATH ACCESSORIES			*112.00*									*SAE*
7104400		*1.000 LS*	*20*	*1,221*	*1,924*				*3,145*			
FIRE PROTECTION CABINETS & FIRE EXT			*20.00*									*SAE*
7105100		*1.000 LS*						*12,710*	*12,710*			
LOCKERS												*SAE*
7113000		*1.000 LS*	*6*	*327*	*3,300*				*3,627*			
RESIDENTIAL APPLIANCES			*6.00*									*RLC*
7122400		*1.000 LS*						*21,487*	*21,487*			
ROLLER WINDOW SHADES												*RLC*
7123500		*1.000 LS*						*423,270*	*423,270*			
LABORATORY CASEWORK & COUNTERTO												*RLC*
7142400		*1.000 LS*						*175,000*	*175,000*			
HYDRAULIC ELEVATORS												*RLC*
7210000		*1.000 LS*						*256,000*	*256,000*			
FIRE SUPPRESSION												*ERS*
7220000		*1.000 LS*						*911,977*	*911,977*			
PLUMBING												*ERS*
7230000		*1.000 LS*						*1,781,304*	*1,781,304*			
HVAC												*ERS*
7260000		*1.000 LS*						*2,715,506*	*2,715,506*			
ELECTRICAL												*REM*
7270000		*1.000 LS*						*182,525*	*182,525*			
INSTRUMENTATION & CONTROL												*REM*
7310000		*1.000 LS*	*2,161*	*132,663*	*263,367*	*96,612*	*55,130*	*47,600*	*595,372*		*595,372*	*595,372.65*
EARTHWORK			*2,160.54*									*BCL*
7311000		*1.000 LS*	*2,161*	*132,663*	*263,367*	*96,612*	*55,130*	*47,600*	*595,372*			
EXC & BF			*2,160.54*									*BCL*
7410000		*1.000 LS*	*92*	*6,237*					*6,237*			
CRANES & HOISTS			*92.00*									*RLC*
8000000	9	1.000 LS	1,247	73,967	1,134,573	11,721	8,900	2,410,173	3,639,334	124,628	3,763,962	3,763,962.13
INTAKE CHEMICAL BUILDING((ICB)			1,246.85									ALL
8032000		*1.000 LS*						*13,474*	*13,474*			
CONCRETE REINFORCEMENT												*BVN*
8033000		*1.000 LS*	*832*	*47,945*	*27,295*	*9,007*	*937*	*848*	*86,032*		*86,032*	*86,032.30*
CAST-IN-PLACE CONCRETE			*831.85*									*BVN*
8033001		*103.000 CY*	*770*	*44,531*	*19,249*	*8,209*	*257*	*721*	*72,967*			
8 - ICB			*7.48*									*BVN*
8033010		*1.000 CY*	*41*	*2,295*	*833*	*301*		*128*	*3,556*		*3,556*	*3,556.69*

ESTIMATE SUMMARY (COSTS)

Bid # Engr Bid# / Bid Description	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
8 - ELEC CONCRETE		*40.77*									*BVN*
8033011	*1.000 CY*	*41*	*2,295*	*833*	*301*		*128*	*3,556*			
ELEC INT PADS		*40.77*									*BVN*
8033015	*1.000 CY*	*21*	*1,119*	*1,365*	*497*	*680*		*3,661*			
WINTER CONCRETE		*20.60*									*BVN*
8033020	*1.000 LS*			*5,848*				*5,848*			
READYMIX ADMIX & ESCL											*BVN*
8034000	*1.000 LS*	*20*	*1,121*	*2,586*			*36,248*	*39,955*			
PRECAST HOLLOWCORE PLANKS		*20.00*									*BVN*
8040000	*1.000 LS*						*187,850*	*187,850*			
MASONRY											*SAE*
8050000	*1.000 LS*						*12,680*	*12,680*			
METALS											*RLC*
8059000	*1.000 LS*	*72*	*4,854*	*66,370*				*71,224*			
METAL MATERIAL - ICB		*72.00*									*RLC*
8061000	*1.000 LS*	*30*	*1,860*	*2,438*				*4,299*			
ROUGH CARPENTRY		*30.00*									*RLC*
8071300	*1.000 LS*										
WATERPROOFING - SELF-ADHERING SHE											*RLC*
8075400	*1.000 LS*						*50,700*	*50,700*			
ROOFING - TPO											*SAE*
8079200	*1.000 LS*						*19,300*	*19,300*			
JOINT SEALANTS											
8081200	*1.000 LS*										
ALUMINUM DOORS											*RLC*
8084500	*1.000 LS*						*19,820*	*19,820*			
FIBERGLASS SANDWICH PANELS											*RLC*
8099000	*1.000 LS*						*50,993*	*50,993*			
PAINTING & COATING											*SAE*
8099600	*1.000 LS*						*100,000*	*100,000*			
COATING FOR CHEMICAL AREAS											*SAE*
8101400	*1.000 LS*	*11*	*671*	*4,113*				*4,784*			
SIGNS		*11.00*									*SAE*
8104400	*1.000 LS*	*2*	*122*	*1,924*				*2,046*			
FIRE PROTECTION CABINETS & FIRE EXT		*2.00*									*SAE*
8150000	*1.000 LS*						*343,202*	*343,202*		*343,202*	*343,202.68*
INTERIOR PIPE											*MSL*
8210000	*1.000 LS*						*99,000*	*99,000*			
FIRE SUPPRESSION											*ERS*
8220000	*1.000 LS*						*64,890*	*64,890*			
PLUMBING											*ERS*
8230000	*1.000 LS*						*449,764*	*449,764*			
HVAC											*ERS*

ESTIMATE SUMMARY (COSTS)

Bid # / Bid Description	Engr Bid#	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
8260000		1.000 LS						571,215	571,215			
ELECTRICAL												REM
8270000		1.000 LS						332,223	332,223			
INSTRUMENTATION & CONTROL												REM
8310000		1.000 LS	280	17,394	41,783	2,714	7,963		69,853		69,853	69,853.82
EARTHWORK			280.00									BCL
8311000		1.000 LS	280	17,394	41,783	2,714	7,963		69,853			
EXC & BF			280.00									BCL
8430000		1.000 LS			988,064				988,064		988,064	988,064.50
PROCESS EQUIPMENT PACKAGES - KII												TAL
8431000		1.000 LS			988,064				988,064			
ICB EQ PKGS												JWA
8440000		1.000 LS						57,966	57,966			
PROCESS EQUIPMENT INSTALL - STERLIN												ERS
9000000	10	1.000 LS	9,645	579,993	1,499,214	297,709	72,824	6,439,217	8,888,957	304,399	9,193,356	9,193,356.07
BACKWASH SUPPLY BUILDING(BWS) / T			9,644.99									ALL
9032000		1.000 LS						485,046	485,046			
CONCRETE REINFORCEMENT												BVN
9033000		1.000 LS	7,568	448,664	293,546	144,484	2,825	26,386	915,904		915,904	915,904.91
CAST-IN-PLACE CONCRETE			7,568.14									BVN
9033001		1,101.000 CY	7,407	439,766	182,514	141,824		26,199	790,303			
9 - BWS			6.73									BVN
9033010		1.000 CY	75	4,248	1,342	594		187	6,370			
9 - ELEC CONCRETE			75.35									BVN
9033015		1.000 CY	86	4,651	5,671	2,066	2,825		15,212			
WINTER CONCRETE			85.60									BVN
9033020		1.000 LS			104,019				104,019			
READYMIX ADMIX & ESCL												BVN
9034000		1.000 LS	40	2,242	8,510			74,046	84,798			
PRECAST HOLLOWCORE PLANKS			40.00									BVN
9040000		1.000 LS						329,132	329,132			
MASONRY												SAE
9050000		1.000 LS						18,000	18,000			
METALS												RLC
9059000		1.000 LS	72	4,854	99,560				104,414			
METAL MATERIAL - BWS			72.00									RLC
9061000		1.000 LS	31	1,956	1,459				3,415			
ROUGH CARPENTRY			31.42									RLC
9071300		1.000 LS						95,000	95,000			
WATERPROOFING - SELF-ADHERING SHE												RLC
9075400		1.000 LS						104,900	104,900			
ROOFING - TPO												SAE
9079200		1.000 LS						11,600	11,600			

ESTIMATE SUMMARY (COSTS)

Bid # Engr Bid# / Bid Description	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
JOINT SEALANTS											SAE
9081200	1.000 LS										
Aluminum door											
9083300	1.000 LS						17,970	17,970			
COILING OVERHEAD DOORS											RLC
9099000	1.000 LS						160,571	160,571			
PAINTING & COATING											SAE
9101400	1.000 LS	22	1,343	4,113				5,456			
SIGNS		22.00									SAE
9104400	1.000 LS	2	122	1,924				2,046			
FIRE PROTECTION CABINETS & FIRE EXT		2.00									SAE
9150000	1.000 LS	42	2,905	11,385			2,385,717	2,400,007		2,400,007	2,400,007.74
INTERIOR PIPE		42.00									MSL
9220000	1.000 LS						12,715	12,715			
PLUMBING											ERS
9230000	1.000 LS						404,304	404,304			
HVAC											ERS
9260000	1.000 LS						719,657	719,657			
ELECTRICAL											REM
9270000	1.000 LS						332,179	332,179			
INSTRUMENTATION & CONTROL											REM
9310000	1.000 LS	1,867	117,906	330,993	153,226	69,999	1,206,310	1,878,434		1,878,434	1,878,434.52
EARTHWORK		1,867.43									BCL
9313000	1.000 LS	1,867	117,906	330,993	153,226	69,999	1,206,310	1,878,434		1,878,434	1,878,434.52
BENCH CUT SITE		1,867.43									BCL
9313100	1.000 LS	1,533	96,661	311,274	153,226	63,811		624,973			
EXC & BF		1,532.95									BCL
9313200	1.000 LS	334	21,245	19,718		6,188	1,206,310	1,253,461		1,253,461	1,253,461.88
S.O.E.		334.48									BCL
9313210	1.000 LS						1,206,310	1,206,310			
SUBCONTRACTOR											BCL
9313220	1.000 LS	334	21,245	19,718		6,188		47,151			
SUB ASSIST		334.48									BCL
9430000	1.000 LS			747,725				747,725		747,725	747,725.50
PROCESS EQUIPMENT PACKAGES - KII											TAL
9431000	1.000 LS			747,725				747,725			
BWS EQ PKGS											JWA
9440000	1.000 LS						55,685	55,685			
PROCESS EQUIPMENT INSTALL - STERLIN											ERS
9501000	1.000 LS			18,750,000				18,750,000		18,750,000	18,750,000.00
CONSTRUCTION CONTINGENCY											SAE
9503000	1.000 LS										
OWNER CONTROLLED CONTINGENCY -											SAE

ESTIMATE SUMMARY (COSTS)

Bid # / Bid Description	Engr Bid#	Quantity Unit	Manhrs /Unit	Direct Labor	Perm Matl	Constr Matl	Equip-Ment	Sub-Contr	Direct Total	Indirect Charge	Total Cost	Biditem U. Cost
9504000	16	1.000 LS			70,000				70,000		70,000	70,000.00
OWNER SELECTED APPLIANCES & SHOP												SAE
TOTALS:			432,211	30,864,846	81,367,152	20,333,548	4,370,269	165,931,099	302,866,915	9,727,083	312,593,998	
SITE BASED EQUIPMENT			15,760	1,077,802			3,198,115		4,275,917			
C, SI, V, W						3,534,608	1,916,559		5,451,167			
INSURANCES & TAXES												
INDIRECT TOTALS:			15,760	1,077,802		3,534,608	5,114,674		9,727,083			
COST TOTALS =====>			447,971	31,942,648	81,367,152	23,868,156	9,484,943	165,931,099	312,593,998		312,593,998	

Owner's Contingency: +$16,802,000
Contractor's Fee: +$23,444,500
Total: $352,840,498...rounded to $352,842,000

-------- ESTIMATE NOTES: --------

Bid Date: 06/28/2023 Owner: EWSU Engineering Firm: AECOM
Estimator-In-Charge: SAE

HoldAcct= N Subitems= Y NonAdd= N

** in front of the Biditem indicates a Non-Additive item
Last Summary on 06/29/2023 at 12:46 PM.
Last Spread on 06/29/2023 at 12:46 PM.

02/08/2024

OUCC DR 10-15

DATA REQUEST
City of Evansville

Cause No. 45545 S1

Information Requested:

Please provide a copy of the current Engineer’s Opinion of Probable Construction Cost (“EOPCC”) (commonly known as the Engineer’s Estimate) for the Hybrid Solution.

Information Provided:

See attached.

Attachment:

OUCC DR 10-15 Attachment

Engineering's Opinion of Probable Construction Costs
Evansville Water Plant
Hybrid Solution
December 2023

Cost Category	Budgetary Estimate
General Conditions	$18,000,000
Mobilization/Demobilization	$5,900,000
Sitework/Civil/Demolition	$7,000,000
Dewatering	$4,760,000
Raw Water Piping	$3,000,000
Yard Piping and Structures	$6,400,000
Site Electrical Distribution	$13,255,000
Existing RW Intake PS	$11,600,000
Exist. Final Settling Basins #1 & #2	$5,800,000
Exist. Secondary Settling Basins #1&#2	$3,000,000
Filter Bldg/CW/HSPS	$98,700,000
Residual PS	$9,900,000
Chemical Bldgs	$11,400,000
PAC -Intake Chem Bldg	$4,250,000
Hypochlorite Conversion	$322,000
Rehab Coagulant Bldg	$212,000
Const Contingency	$10,000,000
Site Based Equipment	$3,750,000
Maintenance of Plant Operation	$300,000
Sludge PS	$311,000
Rapid Mix/Splitter Structure	$1,985,000
SUBTOTAL CONSTRUCTION COST	**$219,845,000**
Owner Allowance	$4,000,000
Design Engineering	$8,000,000
Construction Engineering	$13,000,000
Overhead electrical relocation	$2,000,000
Inflation (8 months at 0.3% per month)	$5,000,000
Permitting including wetland offsets	$1,000,000
Abandoned Water Plant Structure Demolition	$7,000,000
TOTAL	**$259,845,000**

02/08/2024

OUCC DR 10-16

DATA REQUEST
City of Evansville

Cause No. 45545 S1

Information Requested:

Please identify who prepared the Engineer's Estimate for the Hybrid Solution and state the date it was prepared.

Information Provided:

Clark Dietz's team. November 14, 2023.

02/08/2024

OUCC DR 10-17

DATA REQUEST
City of Evansville

Cause No. 45545 S1

Information Requested:

In addition to a pdf of the cost estimate, please provide the Engineer's Estimate for the Hybrid Solution as an Excel file with all cells unlocked and all formulas intact.

Information Provided:

See OUCC DR 10-15 Attachment.

02/08/2024

OUCC DR 10-18

DATA REQUEST
City of Evansville

Cause No. 45545 S1

Information Requested:

Please provide all supporting documentation the Engineer relied on to prepare the Engineer's Estimate for the Hybrid Solution.

Information Provided:

Please see the Direct Testimony of Andrea W. Bretl, P.E., Attachment AWB-3 pages 8 through 139.

02/23/2024

OUCC DR 12-10

DATA REQUEST
City of Evansville

Cause No. 45545 S1

Information Requested:

Reference Table 5 Hybrid Option Cost Estimate and Classifications from the November 14, 2023, Technical Memorandum by Clark Dietz provided in Ms. Bretl's Direct testimony, Attachment AWD-3, p. 6 of 139. Please provide the following:

a. Copies of drawings and other information that were provided to Kokosing for their use in preparing the Hybrid Solution costs shown in Table 5.
b. Copies of communications between Evansville, the design team, and Kokosing regarding the preparation of Kokosing's Hybrid Solution cost estimate.
c. All assumptions, data, and information that was relied on by Kokosing to determine the AACE International Cost Estimate Classifications.

Information Provided:

a. See attached. Kokosing representatives were present at the weekly meetings as the conceptual Hybrid Solution was being discussed and formulated. The conceptual sketches were discussed during those meetings. Their Hybrid Solution costs were developed based on their knowledge of the project components from the AECOM 90% and 100% design documents, copies of historic design drawings of the existing WTP, and their conversations with the Engineering team and EWSU.
b. See OUCC DR 12-10 Attachments b.zip
c. Assumptions, data, and information used by the team to determine AACE International Cost Estimate Classifications is included in the response to subpart a and b.

Attachments:

OUCC DR 12-10a Attachment 1.pdf
OUCC DR 12-10a Attachment 2.pdf
OUCC DR 12-10a Attachment 3.pdf
OUCC DR 12-10a Attachment 4.pdf
OUCC DR 12-10b.zip (consisting of Attachments 12-10b 1 through 27)

04/26/2024

OUCC DR 13-20

DATA REQUEST
City of Evansville

Cause No. 45545 S1

Information Requested:

Please provide a copy of the current project schedule showing major milestones including. 60%, 90% and 100% design completions, PER submittal date, PER approval date, SRF loan closing, GMAX price due date if Guaranteed Energy Savings Contract used, Advertisement for Bids if competitive bidding is utilized, Bid submittal date, Bid award date, construction start date, Substantial completion date, Final completion date. WTP start-up date.

Information Provided:

This is the anticipated design schedule as of the date of this response.

PER Submittal	May 1, 2024
60% Design	May 17, 2024
PER Approval	June 15, 2024
90% Design	July 12, 2024
GMAX Price Due	July 31, 2024
100% Design	August 16, 2024
Advertisement for Bid, if needed	August 28, 2024
Bid Submittal, if needed	October 16, 2024
Bid Award, if needed	November 5, 2024
SRF Loan closing	December 3, 2024
Construction Start	January 2, 2025
Substantial Completion	December 31, 2029
Final Completion	March 31, 2030

Cause No. 45545 S1

Page 1 of 153

DRAFT

BASIS OF DESIGN MEMORANDUM

EWSU Water Treatment Plant Improvements

BLACK & VEATCH PROJECT NO. 418136
BLACK & VEATCH FILE NO. 40.3000

PREPARED FOR

Evansville Water and Sewer Utility

8 MARCH 2023

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Appendix A. Drawings

Appendix B. Specification List

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1.0 Project Description

Evansville Water and Sewer Utility (EWSU) owns and operates the city's water treatment plant (WTP) along the Ohio River in downtown Evansville. The WTP was first constructed in the late 1800's and has gone through multiple expansions, including:

- 1873 to 1910: Starting with direct river intake, there were various improvements related to pumping capacity
- 1912 to 1949: Gravity filters constructed for the existing north plant
- 1960: 6.5 million-gallon clearwell was constructed
- 1967: Construction of the south plant, including the powdered activated carbon (PAC) feed facility
- 1980: New river intake and pump station
- 1983: New high service pump station
- 1997: Filters 33 and 34
- 2007: Electrical and controls upgrades, new chemical feed and storage, and various improvements and equipment replacement throughout plant
- 2009: Construction of filters 35 and 36
- 2020-2021: Filter rehabilitation of Filters #22, #25, #26, and #33-#36
- 2021-2023: Preliminary and Final Design for multiple plant upgrades including ozone, biological filters, chemical feed, treated water reservoir, and high service pump station (AECOM)

The WTP currently serves more than 120,000 people and has a rated capacity of 60 million gallons per day (mgd); however, there are hydraulic restrictions that limit production to approximately 50 mgd.

The September 2016 Master Plan indicated several critical infrastructure upgrades that present a challenge to address while maintaining existing plant production. Given the condition of some WTP components, EWSU began preparations for the construction of a new WTP near the existing WTP site. During the final stages of the design process in 2023, pricing estimates submitted by the contractor were higher than anticipated. EWSU contracted with several firms including Clark-Dietz serving as the Owner's representative, Kokosing serving as the selected GMAX partner working at risk, and Black & Veatch (BV) and Arcadis serving as the design consultants to conduct value engineering (VE) of the proposed design and identify more cost-effective alternatives that can meet EWSU's water quality goals. Through a series of workshops conducted in late 2023, EWSU selected an alternative treatment plant arrangement from the VE and executed contracts with the involved firms to proceed with the project.

1.1 Purpose and Organization

The Basis of Design Memorandum (BDM) documents the Civil, Structural, Architectural, Process, Mechanical, Electrical, and Instrumentation design criteria used in detailed design of the improvements. The BDM is organized as follows:

- Section 1 – Project Description: Provides a summary of the project development, along with the document organization, the project team organization, and the abbreviations used in this document
- Section 2 – Project Requirements: Summarizes the scope of improvements and relevant information related to surveying, building codes, related reports, utilities, permitting, overall schedule, and costs
- Section 3 – Existing Information: Describes the existing water treatment plant arrangement along with existing design criteria
- Section 4 – Process Design Criteria: Describes the process requirements and improvements through the plant based on the proposed modifications
- Section 5 – Facility Design Criteria: Describes the key design criteria including flow, capacity, velocity, type, materials, volume, quantity as applicable for each facility
- Section 6 – Discipline Design Criteria: Summarizes the related design criteria for each design discipline (Civil, Structural, Architectural, Geotechnical, Mechanical, Electrical, and Instrumentation)
- Section 7 – Implementation: Provides discussion of options that may be used during construction of modifications, such as seasonal or low flow periods of plant operation, temporary outages for tie-ins to facilities, and partial operation of North Plant and South Plant to sequence the work

Some of the analysis of flow projections and finished water quality goals described in the following sections had been previously studied by others in coordination with EWSU. This information is included without modification.

1.2 Project Team

The project team organization is as follows:

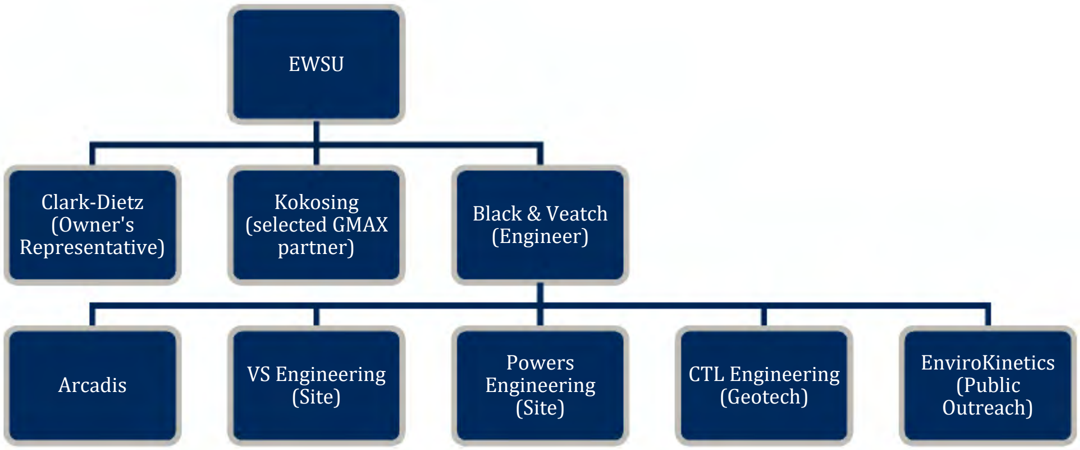

Figure 1-1: Project Team Organization

1.3 Basis of Design Reference Documents

An independent study and evaluation of the raw and treated water quality and regulatory compliance was not conducted. The following documents were reviewed and considered for developing this basis of design memorandum:

- Evansville Water and Sewer Utility Water Treatment Plant Advance Facility Plan Alternatives Report, April 2021 (AECOM)
- Preliminary Engineering Report Water Treatment Plant Evansville, Indiana, June 2021 (AECOM)
- Evansville Water and Sewer Utility Water Treatment Plant Basis of Design Report, August 2021 (AECOM)
- Water Treatment Plant Value Engineering Summary Report, January 2022 (AECOM)
- DRAFT Water Treatment Plant Alternative Evaluation Technical Memorandum, July 2023 (BV)
- DRAFT Water Treatment Plant Hybrid Option Technical Memorandum, November 2023 (BV)

1.4 Abbreviations

µg/L	Micrograms per liter
ACI	American Concrete Institute
ACOE	US Army Corps of Engineers
AFD	Adjustable frequency drive
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASPE	American Society of Plumbing Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
BAS	Building Automation System
BDM	Basis of Design Memorandum
BF	Baffling Factor
BODR	Basis of Design Report
BV	Black & Veatch
BW	Backwash
Cfm	Cubic feet per minute
CFU/100 mL	Colony forming units per 100 milliliters
CLR	Clearwell
CMU	Concrete Masonry Unit
CPVC	Chlorinated Polyvinyl Chloride
CSMR	Chloride-to-sulfate mass ratio
CT	Contact Time
D/DBPR	Disinfectants and Disinfection Byproducts Rule
DBP	Design Best Practice
DBP	Disinfection byproduct
Dia	Diameter
DPBGM	Disinfection Profiling and Benchmarking Guidance Manual
EL	Elevation
EPA	Environmental Protection Agency
EWSU	Evansville Water and Sewer Utility
F'c	Compressive strength of concrete
f'm	Compressive strength of masonry
Fed Spec	Federal Specification
FPS	Feet per second
FRP	Fiber-reinforced plastic
ft^2	Foot/Feet Cubed
ft^3	Foot/Feet cubed
FTB	Filter building
FTW	Filter-to-waste

Fy	Yield stress
GFI	Ground fault circuit interrupter
GMP	Guaranteed Maximum Price
Gph	Gallons per hour
Gpm	Gallons per minute
HAA5	Five haloacetic acids
HGL	Hydraulic Grade Line
HMI	Human-machine interface
HRT	Hydraulic Retention Time
HS	High service
HSPS	High Service Pump Station
HVAC	Heating, Ventilation and Air Conditioning
I&C	Instrumentation and Control
IBC	International Building Code
ICEA	Insulated Cable Engineers Association
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IFA	Indiana Finance Authority
IFGC	International Fuel Gas Code
IPC	International Plumbing Code
kV	Kilovolt
kVA	Kilo-volt-amperes
LAS	Liquid ammonium sulfate
Lbs	Pounds
LCR	Lead and Copper Rule
LCRI	Lead and Copper Rule Improvements
LCRR	Lead and Copper Rule Revisions
LED	Light emitting diode
MCCs	Motor control centers
MCL	Maximum Contaminant Level
MERV	Minimum Efficiency Reporting Value
mg/L	Milligrams per liter
mg/L	Milligrams per liter
mg/L $CaCO_3$	Calcium Carbonate milligrams per liter
mgd	Million gallons per day
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPDWR	National Primary Drinking Water Regulations

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NTU	Nephelometric turbidity units
OIT	Operator–Interface-Terminal
P&IDs	Process and instrumentation diagrams
PAC	powered activated carbon
PACl	Polyaluminum Chloride
PER	Preliminary Engineering Report
PFAS	Per- and Poly-Fluoroalkyl Substances
PLC	Programmable Logic Controller
Psf	Pounds per Square Foot Pressure Unit
Psi	Pounds per Square Inch
PSIG	Pounds per Square Inch Gauge
PVC	Polyvinyl Chloride
PW	Potable Water
RAAs	Running Annual Averages
RPS	Residuals Pump Station
RTD	Resistance Temperature Detector
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
SF	Square feet
SMCL	Secondary Maximum Contaminant Level
SPS	Sludge Pump Station
SRF	State Revolving Funds
SU	Standard Unit
SWTR	Surface Water Treatment Rule
T&O	Taste and Odor
TCR	Total Coliform Rule
TDH	Total dynamic head
TM	Technical Memorandum
TOC	Total Organic Carbon
TPO	Thermoplastic Polyolefin
TSS	Total Suspended Solids
TTHMs	Total trihalomethanes
UCMR	Unregulated Contaminant Monitoring Rule
UFRV	Unit filter run volume
UL	Underwriters' Laboratories
VE	Value Engineering
VFD	Variable Frequency Drive
WTP	Water Treatment Plant

2.0 Project Requirements

The overall project scope consists of the following plant modifications and new facilities as show in Table 2-1. Refer to Sections 5 and 6 for additional detail.

Table 2-1: Summary of Plant Modifications and New Facilities

Item	Description
Intake Pump Station	• Replace three intake screens • Replace six raw water pumps • Replace piping and valves inside existing raw water pump station
Raw Water Pipelines	• Install two new raw water pipelines from the existing intake pump station to a new rapid mix/splitter structure.
Rapid Mix	• The two raw water pipelines will enter two new rapid mix chambers. • Prior to the rapid mix, coagulant will be added in a vault with optional PAC feed point. • A raw water flowmeter will be installed on each raw water line inside the vault.
Splitter Structure	• A new splitter structure will consist of weirs that will distribute the flow evenly to the four existing settling basins. • If a settling basin is offline for maintenance, a weir gate will close to isolate flow. • Space will be provided for a future fifth splitter chamber to go to a future settling basin.
Settling Basins	• Existing south settling basins will be modified and retrofitted with installation of tube settlers for high-rate clarification to allow for an increased treatment capacity within the existing footprint. • The secondary basins will be converted to primary basins so all four basins will be fed from the new splitter structure. • New sludge collection and flocculation equipment will be installed in each basin.
Sludge Pump Station	• The existing south sludge pump station will remain. • The pumps and piping inside the pump station will be replaced.
New Filter Building	• A new filter building will be constructed, consisting of 14 filters to provide finished water treatment.
Finished Water Clearwell	• A new finished water reservoir will be constructed under the filter building, to provide a total storage capacity of 5 MG.
Residuals Pump Station	• A new residuals pump station to handle all backwash and filter to waste residuals from the new filters

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Item	Description
High Service Pump Station	• A new high service pump station utilizing vertical turbine type pumps will be located on top of the wet well at the outlet of the finished water clearwell.
Site Electric	• The existing plant switchgear will remain. Dual 1500KVA feeds will be routed to the new pump station where transformers will be located to reduce to 480V to feed the low voltage switchgear located in the new HS pump station. • The existing generators will remain.
Sitework	• Sitework improvements related to new or rehabbed facilities including yard piping, chemical injection vaults, grading, roadways, curb and gutter
Administration and Maintenance Areas	• Conceptual plans will be prepared to illustrate repurposing of the existing HS PS 1 to serve as an administration area. The old generator building will be re-purposed for maintenance area. • Lab area will be located in existing buildings. • No detailed design and construction is included as part of this project for the modifications to these areas.
Chemical Feed	• PAC: A new PAC silo and feed system will be located west of the South settling basins. The existing PAC system will be decommissioned and demolished. • Coagulant: The existing coagulant facility will remain. • Chlorine: The existing chlorine gas room will be repurposed to bulk sodium hypochlorite • A new Post-Filter Chemical Building will be constructed adjacent to the new filter building, consisting of storage and feed systems for the following chemicals: o Liquid ammonium sulfate (LAS) o Fluoride o Sodium hydroxide o Sodium bisulfite o Filter aid polymer

Item	Description
Demolition	• The following facilities will no longer be required and will be decommissioned and demolished after construction of the new facilities: o North Basins o Filters 1-36 o Existing 0.5 and 1.5 MG clearwell o Piping and equipment within High Service PS 2 (building will remain) o High Service PS 3 and 6.5 MG below grade clearwell o Existing post-filter chemical building o Existing filter to waste pump station

2.1 Project Benchmarks and Survey Control

The water treatment plant survey was collected horizontally on NAD83(2011)/INGCS Vanderburgh County Zone and vertically on NAVD88.

The reference to 328.51' = Water works datum is relating the NAVD88 vertical datum to the NOAA river datum 0 mark

2.2 Local Flood Levels

The existing WTP is protected from the Ohio River by a US Army Corps of Engineers (ACOE) levee. The existing WTP operating floor is Elevation 384, above the river flood stage. This floor elevation will be matched at new facilities to protect mechanical, electrical and controls infrastructure and critical facilities.

2.3 Geotechnical Information

The Geotechnical design Report was prepared by CTL Engineering Inc.

2.4 Special Design Requirements and Applicable Codes of the Client

The project design will follow the International Building Code 2012 edition, with 2014 local amendments.

2.5 Titles and Dates of Applicable Reports

- Draft Preliminary Engineering Report, AECOM 2023
- Draft Basis of Design Report, AECOM 2023
- Water Treatment Plant Additions, BV 1967
- Intake and Low Service Pumping Station, BV 1977

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2.6 Sources of Utilities (power, gas, etc.)

Electrical utility is CenterPoint Energy. The area east of the WTP will be used for the new filters, reservoir, HSPS, and Post Filter Chemical Feed Building. As a result, the existing overhead power lines that serve the area and provide incoming power to the WTP will need to be relocated. EWSU has stated their preference to move the power lines underground. BV has discussed this with CenterPoint and CenterPoint expressed preliminary approval to move overhead lines underground. BV will prepare the design documents showing the new facility locations and required power requirements and submit to EWSU for coordination and approval with CenterPoint.

2.7 States and Federal Agencies Involvement

State funding is being requested through the Indiana Finance Authority (IFA) State Revolving Funds (SRF) Program. SRF requires a Preliminary Engineering Report (PER) to be prepared and submitted on behalf of EWSU. The PER will document the need for the proposed improvements and will be based on the BDM.

2.8 Permitting

It is expected that multiple permits will be required, reflecting the construction of the Project's facilities. BV and subconsultants shall perform all work required to prepare permit applications for submitting to the appropriate agencies on a timetable appropriate for construction. Draft permits shall be submitted for EWSU comment and approval prior to submittal. EWSU will be responsible for all permit fees and application costs. EWSU shall act as the key contact for the permits, coordinating with Engineer on any comments and/or additional requests from the agencies. The potential permits identified are:

- Vanderburgh County *Drainage Permit*
- Indiana Department of Environmental Management (IDEM) *Construction Permit for Public Water System*
- IDEM Construction Stormwater General Permit
- U.S. Army Corps of Engineers (USACE) *Application for Department of the Army Permit* (Section 404)
- USACE Levee/Floodwall System Alteration Letter of No Objection Request (Section 408)
- Indiana Department of Natural Resources (IDNR) *Permit for Construction in a Floodway*
- City of Evansville Improvement Location Permit for new building structures

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- City of Evansville and Vanderburgh County Right-Of-Way Permits for new driveway(s) and signage

The findings of the evaluation shall be documented in a log that includes identification of key timetables, milestones, and requirements.

The Engineer shall support EWSU coordination with Authorities Having Jurisdiction by developing and providing descriptive materials including mapping, graphic images, and data. Engineer will seek regulatory buy-in at 60 percent design.

As the project moves to final design, there may be additional field activities to determine sensitive areas and meet permit requirements that the above agencies request, including, but not limited to wetland delineation, endangered species habitat delineation, floodway / floodplain delineation, and State Historic Preservation Office. These field activities may need to be performed by others.

2.9 Project Schedule

The project schedule milestones are as follows:

- Final Basis of Design Report, 30% Deliverable by March 8, 2024
- Preliminary Engineering Report Deliverable to SRF by April 1, 2024
- 60% Detailed Design and Permit Review Deliverable by May 17, 2024
- 90% Detailed Design Deliverable by July 12, 2024
- Final Design Deliverable by August 17, 2024
- Construction anticipated 2025-2026

2.10 Construction Cost

EWSU has established a project budget including all design and construction costs during the project planning stage in 2023 in coordination with Kokosing serving as the construction estimator. BV will coordinate with Kokosing throughout Preliminary and Final Design to seek input on constructability and potential construction costs to stay within the overall Project budget. Kokosing will review the 60% Design Deliverable and prepare a Guaranteed Maximum Price (GMP). Pending approval of the GMP by EWSU, the Project will proceed to construction in 2025.

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3.0 Existing Information

The existing WTP consists of two treatment trains Figure 3-1. The North Plant is the original plant, which was constructed in the late 1800s. The South Plant was constructed in the 1960s to add treatment capacity. This section provides a summary of the current plant processes based on the City of Evansville's 2012 EWSU WTP Background report and other documents provided by the City of Evansville:

- Background Report on the EWSU Water Treatment Plant, January 2012
- HNTB EWSU Water Master Plan, September 2016
- AECOM EWSU WTP PER, June 2021
- AECOM EWSU WTP BODR, August 2021
- Black and Veatch WTP Alternatives Evaluation TM, July 2023

Figure 3-1: Aerial View of WTP Delineating North and South Plants

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3.1 Plant Capacity

Historic (2020) and average and peak day water demand are presented in Table 3-1. Though the existing plant has a rated capacity of 60 mgd, it is hydraulically limited to 50 mgd. Typical water demands are 20-25 mgd, with peak day demand currently reaching 31.7 mgd.

Table 3-1: Existing Plant Capacity and Average

Demand	Historic (2020)
Existing Plant Capacity	60 mgd (rated) 50 mgd (hydraulically limited)
Average Day Demand	23.6 mgd
Peak day Demand	31.7 mgd
[1] Source: April 2021 Preliminary Engineering Report by others	

3.2 Narrative Description of Treatment Processes

The process flow diagram of the existing plant is presented on Figure 3-2. The City of Evansville uses the Ohio River for its public drinking water supply. After leaving the intake pump station, the WTP is split into separate North and South Plants for water treatment. The plants have the following processes:

- Intake Pump Station (Shared)
- Coagulation and Flocculation (Separate)
- Primary and Secondary Sedimentation (Separate)
- Filtration (Separate)
- Clearwell Storage (Shared)
- High Service Pump Station (Shared)

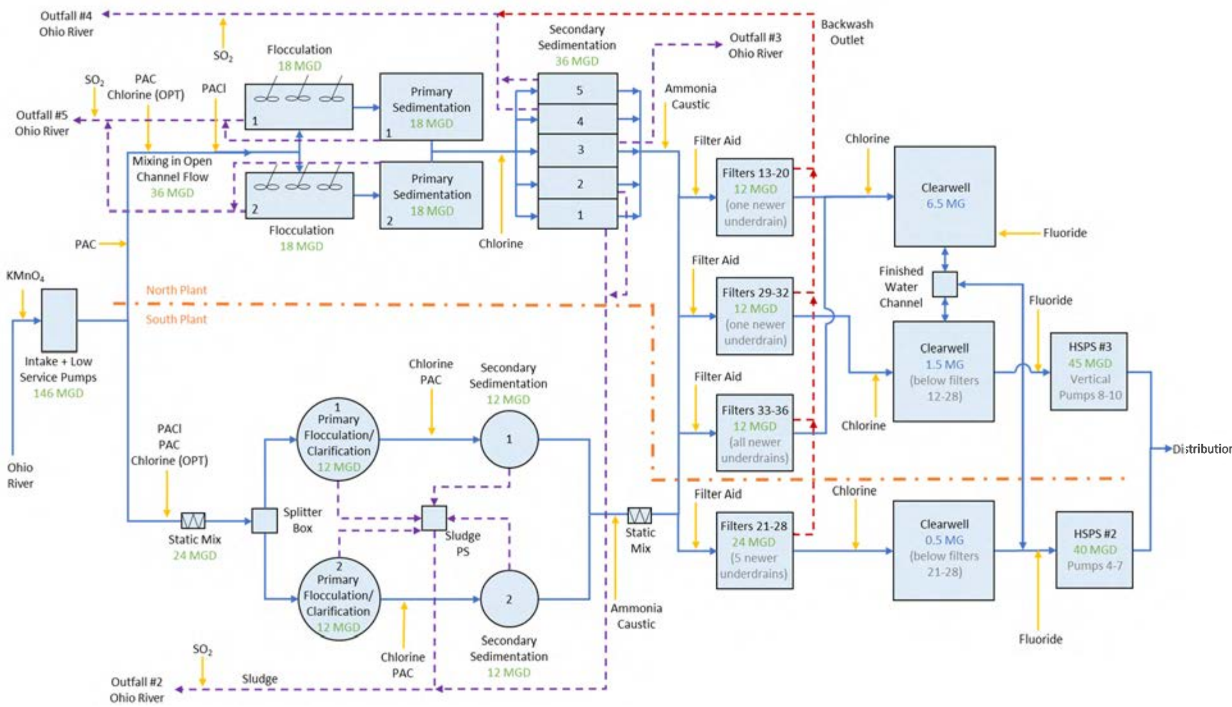

Figure 3-2: Existing WTP Process Flow Diagram

3.2.1 Intake Pump Station

The Intake Pump Station pulls water from the Ohio River through three intake openings with attached grates to screen large debris. The three intake openings each have a dedicated wetwell to store the water until it's pumped out to the treatment plant. Prior to pumping, the water passes through traveling screens that catch smaller debris. The screens are rinsed, and debris is drained back to the river. Once the water passes through the traveling screen, it's pumped out of the wetwells to either the North or the South treatment train. Each of the three wetwells has two pumps rated at 14.41 (MGD). A plan view of the Intake Pump Station from the 1977 as-built drawings is presented in Figure 3-3 for reference.

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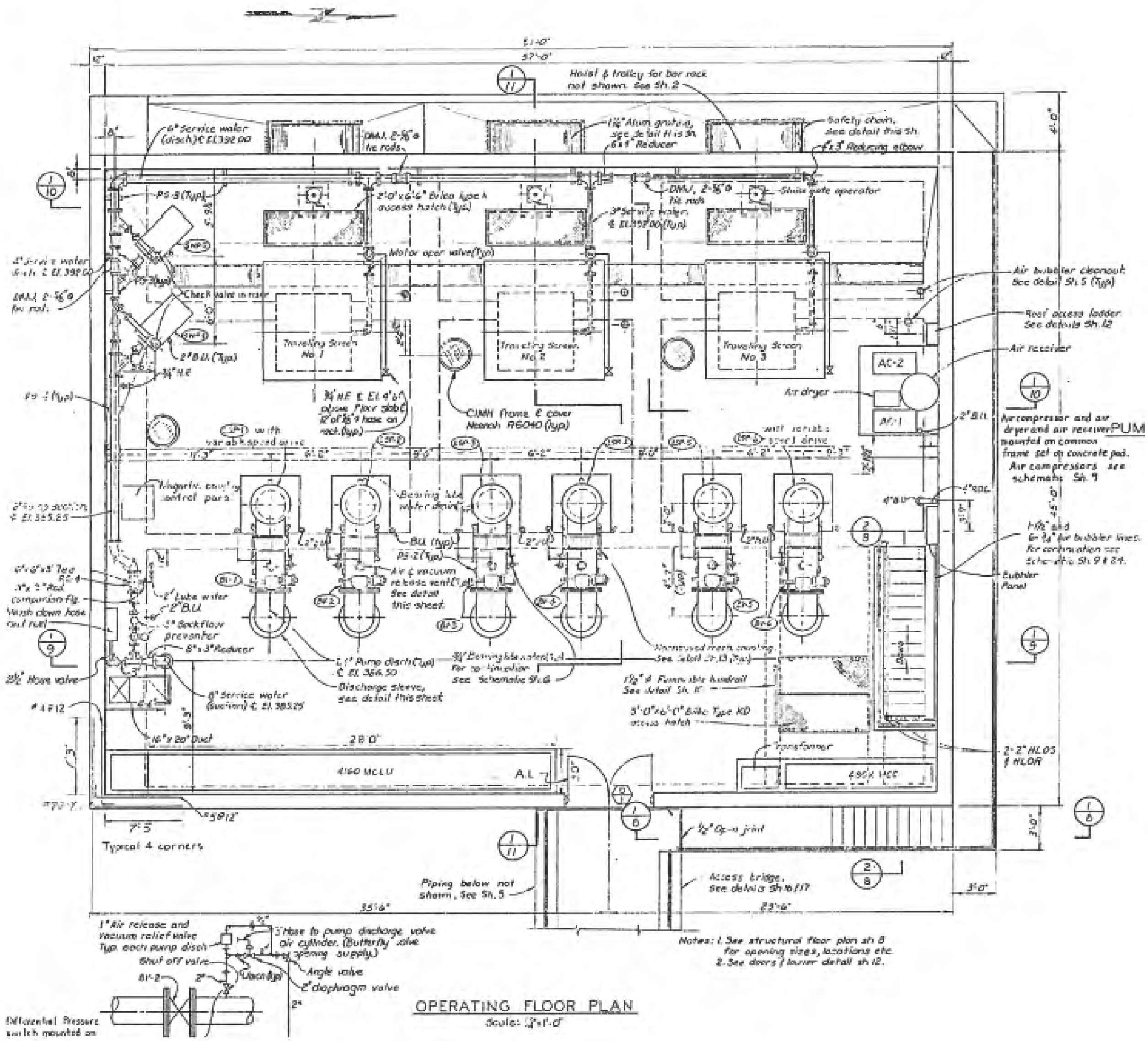

Figure 3-3: Intake Pump Station Operating Floor Plan (existing)

3.2.2 Coagulation and Flocculation

Polyaluminum chloride (PACl) chemical is the coagulant used at the WTP (specifically the HyperIon® 4064 product).

In the North plant, water from the Low Service Pumps flows through the raw water flume via gravity, which includes an optional PAC feed point for PAC. PACl is added to the flocculation basin influent flume and rapid mixing is achieved through baffled open channel flow. Water is gently mixed in the flocculation basins to promote floc formation prior to entering the rectangular primary settling basins.

In the South Plant, PACl, chlorine (optional dose point), and PAC (optional dose point) is added prior to a static mixer.

3.2.3 Sedimentation

The North Plant has two (2) primary settling basins and five (5) secondary settling basins. The primary settling basin outlet is conveyed to the secondary settling basins for additional settling time. Settled water is conveyed to the filters via the secondary settling basin effluent flume. The settled solids from both primary and secondary settling basins are collected and transported via outfall structures back to the river after they are dechlorinated.

The South Plant contains two (2) circular primary settling basins and two (2) circular secondary settling basins, as displayed on Figure 3-4. In the primary settling basins, clarification occurs in the outer portion of the basin after flocculation in the center of the basin. The primary settling basin outlet is conveyed to the secondary settling basins for additional settling time. The secondary settling basins do not have a center flocculation zone. Solids from both the primary and secondary settling basins are collected via rake arm and periodic blow down, dechlorinated, and transported via outfall structure back to the river. The water is conveyed to the filters through a buried pipeline.

In both the North and South plants, chlorine is added between the primary and secondary settling basins for primary disinfection within the secondary basins, as discussed further in Section 3.2.6. The North secondary settling basins contain baffling for an optimized baffling factor classification.

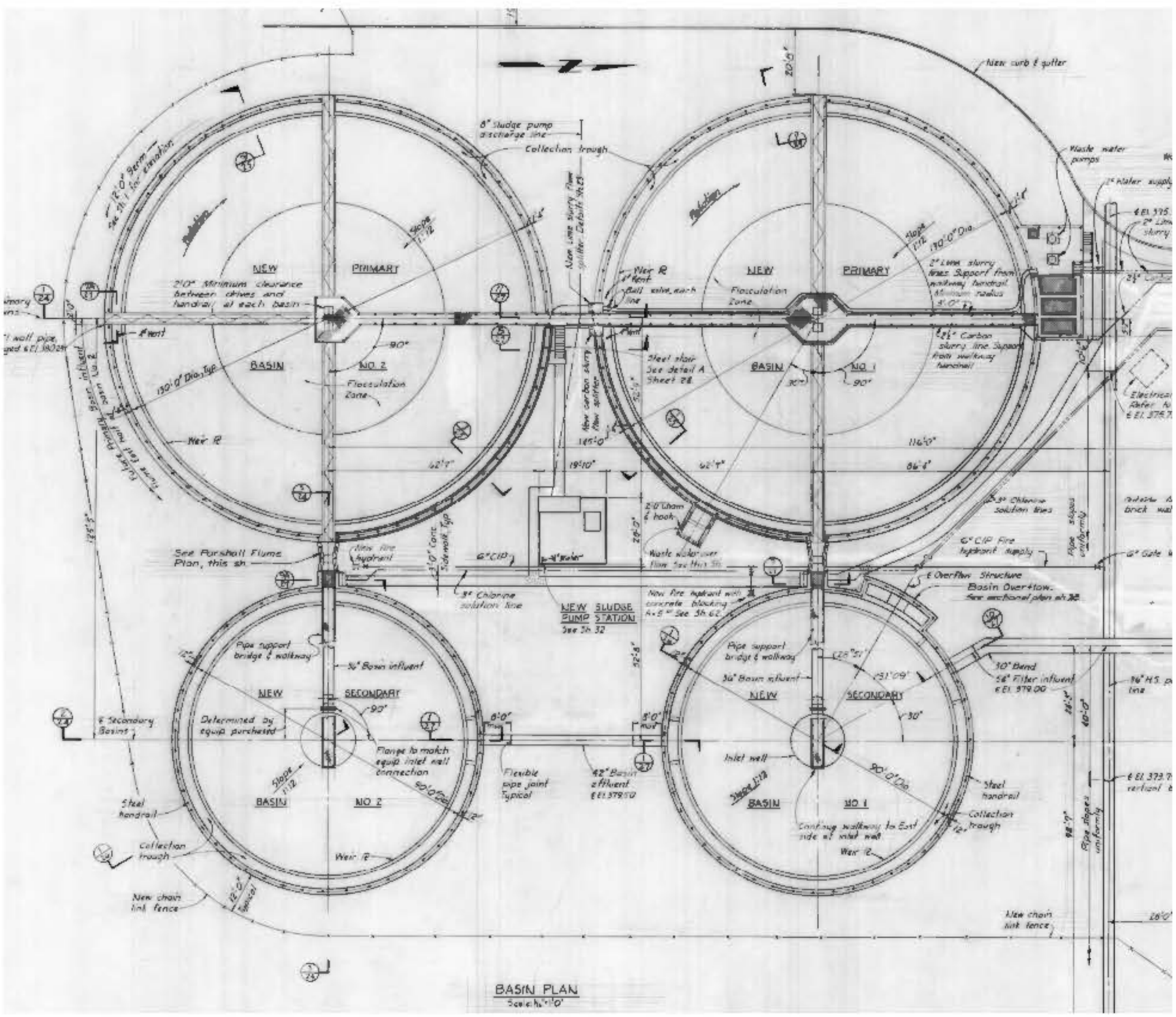

Figure 3-4: South Plant Primary and Secondary Settling Basins Plan (existing)

3.2.4 Filtration

Water from the secondary settling basins is routed to a filter plant containing a total of 24 filters numbered between #13- #36. Filters #1 - #12 have been decommissioned. Filters #13-#20 and #29-#36 (16 filters) serve the North Plant and Filters #21-#28 serve the South Plant. A plan view of the South Plant filters from the 1967 as-built drawings is presented on Figure 3-5 for reference.

The filter beds are composed of layers of anthracite, silica sand, and coarse sand and gravel for support on top of filter underdrains. Most of the filter underdrains are the original clay tile from when the filters were constructed; however, several failed underdrains have been replaced with Leopold underdrains. Filtered water is collected in the underdrain and conveyed to one of the three clearwells that are also located within the filter plant.

The existing filters include provisions for surface wash and filter-to-waste (FTW). Finished water from the HSPS is pumped into two above-ground washwater storage tanks, which store water for both the surface washing and backwashing. FTW is performed after backwashing to prime the filter media. The spent backwash water and FTW water is conveyed to an existing filter to waste basin and ultimately discharged to a permitted outfall on the river after dechlorination.

As part of this project, the existing filters will be left in service until a new filter building is constructed and commissioned.

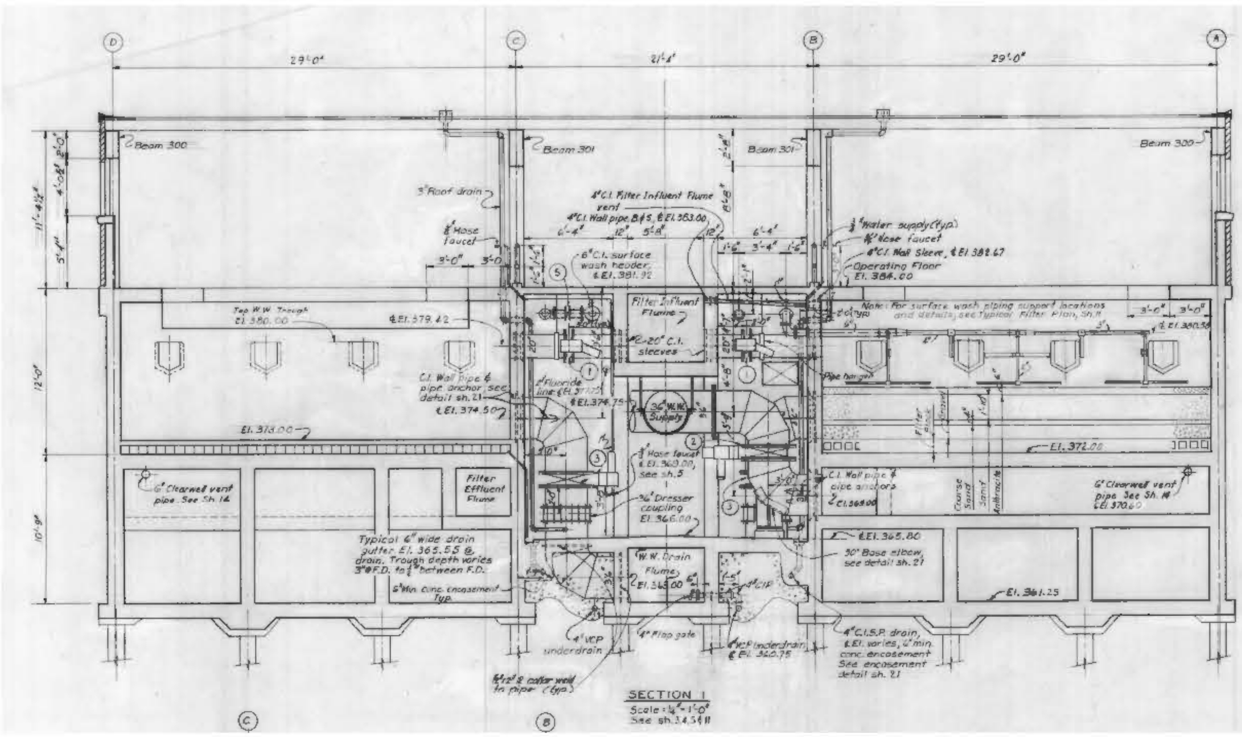

Figure 3-5: South Plant Filters 21-28 Section View (existing)

3.2.5 Clearwell Storage

The filter plant comprises three clearwells of varying capacities for a total of 8.5 MG of storage. Clearwells are hydraulically connected, but water flow from one clearwell to another is not tracked.

3.2.6 Primary and Secondary Disinfection

EWSU has clarified that disinfection (CT) credits required for primary disinfection are achieved within the secondary sedimentation basins at both the North and South plants. Primary disinfection is achieved using free chlorine. No specific CT calculations are available from EWSU.

Free chlorine is converted to chloramines prior to filtration to establish the secondary disinfectant residual for the distribution system and limit formation of disinfection byproducts.

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Chloramines are maintained through the filters, clearwell storage, and distribution system during normal operations. Once or twice per year, a free chlorine burn is completed, whereby ammonia addition is omitted prior to the filters and free chlorine is maintained through the clearwells and distribution system to reduce issues related to nitrification.

Under most operational conditions, free chlorine will be established in the pipeline to the filter gallery, maintained in the filter box, and then finished water chloramine concentrations will be formed prior to the chlorine contact basin portion of the clearwell and maintained in the storage reservoir portion of the clearwell prior to distribution to achieve the minimum amount of disinfection credit required. At high flows and low water temperatures, free chlorine will be maintained in the chlorine contact basin portion of the clearwell to meet minimum disinfection requirements. In general, the target free chlorine concentration will be adjusted based water temperature and flow. Figure 3-6 presents the water temperature and flow conditions under which free chlorine is required in the chlorine contact portion of the clearwell versus when chloramine can used to achieved disinfection requirements.

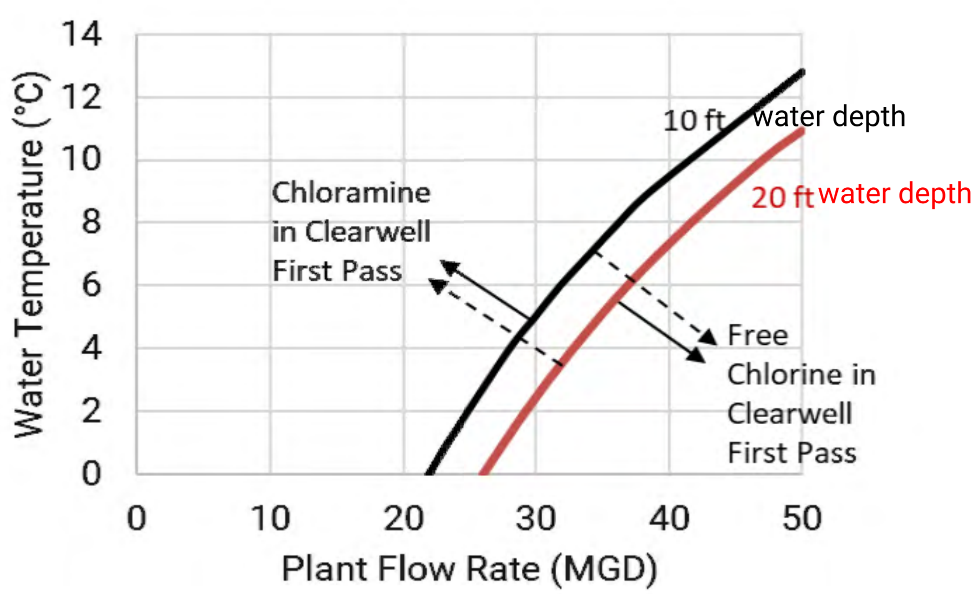

Figure 3-6: Operational Conditions Determining Which Residual Disinfectant to Maintain in the Contact Basin Portion of the Clearwell

3.2.7 High Service Pump Station

Water is pumped from the clearwells into the distribution system by one of seven high service pumps. Each pump is rated for 14.41 MGD. The number of operational pumps varies based on system demand, with water leaving the plant at approximately 70 psi.

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3.3 Existing Facility Design Data

The existing design criteria data for South Plant is presented in this section; North Plant was omitted from this report since it will be decommissioned after this project is completed.

3.3.1 Hydraulic Profile Information

The existing South Plant hydraulic profile is shown in Figure 3-7.

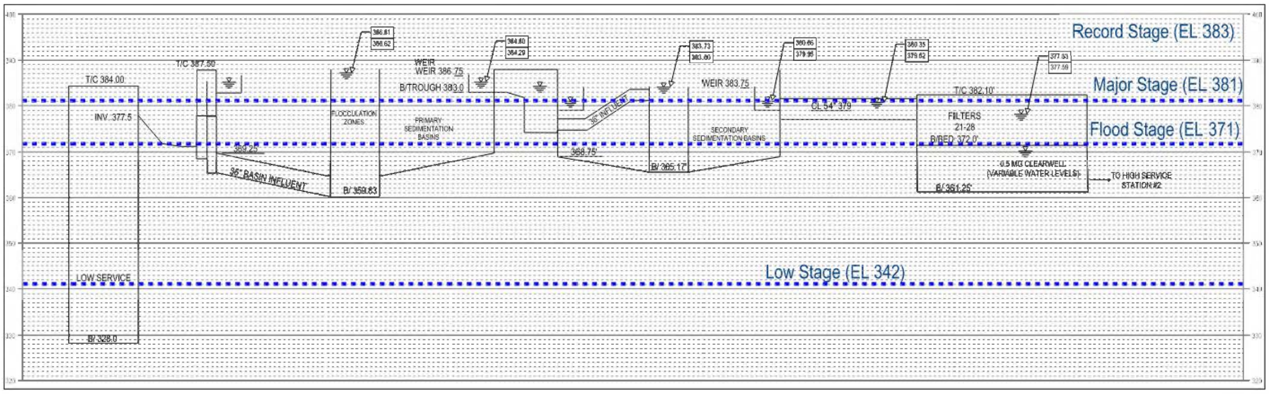

Figure 3-7: Hydraulic Profile of South Plant

3.3.2 Intake Pump Station Design Data

The existing pump intake was constructed in 1980. It consists of three screened intakes, each with two 12 MGD vertical turbine pumps as indicated in Table 3-2. It is in fair structural condition according the 2016 Master Plan and 2021 Preliminary Engineering Report. The screens are currently beyond their design useful life span and need to be replaced. When they are taken offline for service, there are issues meeting the total pumping capacity requirements of the plant. The pumps are schedule to be rebuilt every three years (i.e., two rebuilt per year).

Table 3-2: River Intake Pump Station

Screened Intake	Pump Arrangement (including power and controls)
1	P1 (480V with AFD) P2 (4160V constant speed)
2	P3 (4160V constant speed) P4 (4160V constant speed)
3	P5 (4160V constant speed) P6 (480V with AFD)

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EWSU has reported challenges with this arrangement of pumps and screened intakes. Intake screen maintenance requires two pumps to be taken offline, which drops the rated pump station capacity. In addition, if Screened Intake 1 or 3 is offline, Screened Intake 2 is utilized which does not have an AFD. This can create flow mismatches between the constant speed pumps and downstream processes. As part of this Project, the incoming power will be modified to only 480V power, and all six intake pumps will be replaced and include AFDs. This will maximize flexibility with operations.

3.3.3 South Plant Static Mixer Design Data

The South Plant static mixer design criteria is presented in Table 3-3.

Table 3-3: Existing Static Mixer Design Criteria

Description	Design Criteria
Static Mixer	
Length	12 ft
Diameter	42 in
Capacity	24 mgd
HRT at Design Flow	3.1 seconds
Number of Elements	5
Aspect Ratio	0.68

3.3.4 South Plant Settling Basin Design Data

The South Plant primary and secondary setline basin design criteria are presented in Table 3-4.

Table 3-4: South Plant Settling Basin Design Data

Description	Design Criteria
Flocculation and Primary Sedimentation	
Overall Basin	2 Circular Concrete Basins Capacity = 24 mgd (12 mgd/basin) Diameter = 130 ft Total Surface Area = 21,707 ft^2 Total Volume = 3,484,000 gal Overflow rate = 1,105 gpm/ ft^2 HRT at Design Flow = 208 min

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Flocculation	Floc Diameter = 65 ft Floc Surface Area, per basin = 3,317 ft^2 Floc Volume, per basin = 328,711 gal Floc HRT at Design Flow, per basin = 40 min
Primary Sedimentation	Sed Surface Area, per basin = 9,956 ft^2 Sed Volume, per basin = 1,413,289 gal Sed HRT at Design flow, per basin = 170 min Solids collected by rake arm
Secondary Sedimentation	
Overall Basin	2 Circular Concrete Basins Capacity = 24 mgd (12 mgd/basin) Diameter = 90 ft Total Surface Area = 12,724 ft^2 Total Volume = 1,431,500 gal Overflow rate = 1,886 gpm/ ft^2 HRT at Design Flow, per basin = 86 min

3.3.5 Chemical Storage and Feed System Data

A summary of the various chemical systems utilized at the WTP are presented in Table 3-5. Additional details of the process equipment for each chemical system are presented throughout this section.

Table 3-5: Chemical Systems Summary Data

Chemical	Application Points	Purpose	Chemical Dose 5th Percentile/Avg/95th Percentile	Storage Container	Storage Amount
Potassium Permanganate (powder)	Raw Water Intake	Zebra Mussel Control and taste & odor oxidation	0.41/ 0.47/ 0.49 (mg/L)	5-gallon bucket	5,000 lbs max.
Powdered Activated Carbon (slurry)(Note 1)	Static mixer upstream of primary settling basin	Aesthetics (Taste & Odor); reduce organic compounds (Note 1)	0.85/ 2.07 /7.93 (mg/L)	5 concrete tanks	50,000-200,000 lbs
Polyaluminum Chloride (Hyper+Ion 4064)	Static mixer upstream of primary settling basin	Coagulation	17.71/21.97/27.77 (mg/L)	3 concrete tanks and 2 day tanks	22,800 gallons per tank; 3,000 gallons per day tank
Chlorine gas	Static mixer upstream of primary settling basin (OPTIONAL) Primary Settling Basin effluent (TYPICAL) Filter #21-#38 Effluent (TRIM)	Primary and Secondary Disinfection (Note 2)	3.76/5.53/7.81 (mg/L)	1-ton cylinders	20,000-30,000 lbs
Ammonia (19% Solution)	Filter Influent flume	Formation of Chloramines for Residual Secondary Disinfection	0.62/ 1.06/1.75 (mg/L)	Steel Horizontal Tank	1,000-6,000 gallons
Hydrofluoric Acid (Fluoride)	Filter Influent flume	Fluoridation (Note 3)	0.36/0.44/0.55 (mg/L)	2 composite tanks	500-8,000 gallons
Sodium Hydroxide (Caustic, 25-50%)	Filter Influent flume	pH Adjustment (Note 4)	7.8/35.75/113.97 (mg/L)	4 tanks, one day tank	52,000 gallon tank; 3,650 day tank
Sodium Chlorite	Not in use	Nitrification Control		Composite Tank	6,000 gallons

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Chemical	Application Points	Purpose	Chemical Dose 5th Percentile/Avg/95th Percentile	Storage Container	Storage Amount
Sulfur Dioxide	Dechlorination at outfalls for WTP residual streams	Dechlorination prior to discharge		1 ton cylinders	1,000-4,000 lbs 1 ton cylinders

Notes:

1. PAC is fed on an as-needed basis ranging from a few days to a few months at a time.
2. A chlorine residual at the point of distribution entry is typically between 2.8 and 3 mg/L.
3. The plant typically maintains a finished water fluoride concentration of 0.6 to 0.7 mg/L
4. Sodium hydroxide (caustic soda) is fed to raise the pH of finished water between 7.8 to 8.0. Although this is consistent with raw water pH range, chlorine gas and PACl cause pH to depress through the treatment process.
5. Data was collected from January 2021 to October 2023

3.3.6 Filter Design Criteria

Filter design parameters are presented in Table 3-6. Existing filters are dual media with layers of anthracite and sand over support bed of course sand and gravel on top of underdrains. Most of the filter beds still have the original clay tile underdrains, though some have been replaced with Leopold underdrains after failure occurred. Although filter effluent goals are met, with one incident of 1.3 NTU in June of 2017 associated with rehabilitation activities, the age of the filters presents an operational concern. The existing filter design and average loading rates are 3 gpm/sf and 0.85 gpm/sf, respectively. Typical industry standard recommend design flow loading rate is 2-4 gpm/sf.

Table 3-6: Filter Design Parameters

Parameter	Design Criteria
Quantity	24
Type	Dual media gravity filters
Total Filtering Capacity, MGD	60
Average Flow, MGD	26
Total filter area, sf	21,152
Average loading rate, gpm/ sf	0.85
Media configuration, typical	6-inches anthracite 22-inches silica sand 4-inches coarse sand 12-inches gravel
Underdrain type	Clay tile, typical Filters #22, #25, #26, and #33-#36: Leopold

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3.3.7 Description of Filter Operations and Controls

Filter backwash design parameters are presented in Table 3-7. A single filter bed is currently backwashed at the end of each 8-hour shift, for a total of three filter backwashes per day. With 24 filter beds in operation, average a single filter runtime is 7 to 8 days. Filter backwash water supply is supplied by two washwater storage tanks filled by HSPS 2. This tank is filled with finished water.

Table 3-7: Filter Backwash Design Parameters

Parameter	Design Criteria
Typical Backwash Trigger	One filter per 8-hr shift or once loss of head has reached 8 ft.
Backwash Protocol	Variable rate
Backwash Frequency, Per Day	3
Filters Backwashed per Cycle	1
Average Volume of Water Used for Backwashing, 2021, MGD	0.25
Backwash Storage	2 washwater tanks, filled by HSPS 2 31 ft diameter 31.25 ft tall Approx. 175,000 gallons, each
Backwash Sequence	Surface wash – hold 1 min. after setpoint reached backwash water back flow, 30% for 1 min then open 65-75% - hold 3-8 min.
Filter to Waste Provided?	Yes
Filter to Waste Duration, min	30, or until turbidity <0.1 NTU

3.3.8 Clearwells

The capacity and location of the three existing clearwells is presented in Table 3-8. All three clearwells are currently in poor condition, as noted in the 2016 Water Master Plan. The most urgent concerns are related to the 1.5 MG clearwell, which has severe corrosion on the metal stairs, steel supports, and pipes near the water. Additionally, the vent pipe leading into the filter gallery is causing humidity issues within the pipe gallery, and the stairs outside of the clearwell are also affected. The 6.5 MG clearwell cannot be taken out of service for inspection or repair. Tracking how water flows into or between each clearwell is not conducted. All water from filters #21-#28 flow through the 0.5 MG clearwell below the filter gallery, but all three clearwells are hydraulically connected with a 60-inch pipe.

Table 3-8: Capacity and Location of Existing Clearwells

Clearwell Capacity, MG	Location
0.5	Below Filters #21-#28
1.5	Below Filters #1-#20
6.5	Adjacent to HSPS #3

3.3.9 Residuals Management

The current residuals management practices at the WTP facility operated by EWSU do not include gravity thickening or mechanical dewatering. Instead, all treatment residuals, including sludge blow-down from sedimentation basins, filter to waste, backwash, and process tank drains, are directly discharged into the Ohio River under a permitted outfall. Water is dechlorinated using sulfur dioxide prior to discharge. The outfalls, depicted in Figure 3-8, include:

- Outfall 001: Wastewater from primary basin wastewater plenum at the south plant
- Outfall 002: Sludge from the primary and secondary settling basins of the south plant.
- Outfall 003: Basin drain outlet, which is seldom used.
- Outfall 004: Filter backwash and stormwater collected onsite.
- Outfall 005: Sludge from the primary and secondary settling basins of the north plant.

Additionally, the water used to backwash screens at the raw water intake structure is discharged into the river, technically constituting another outfall.

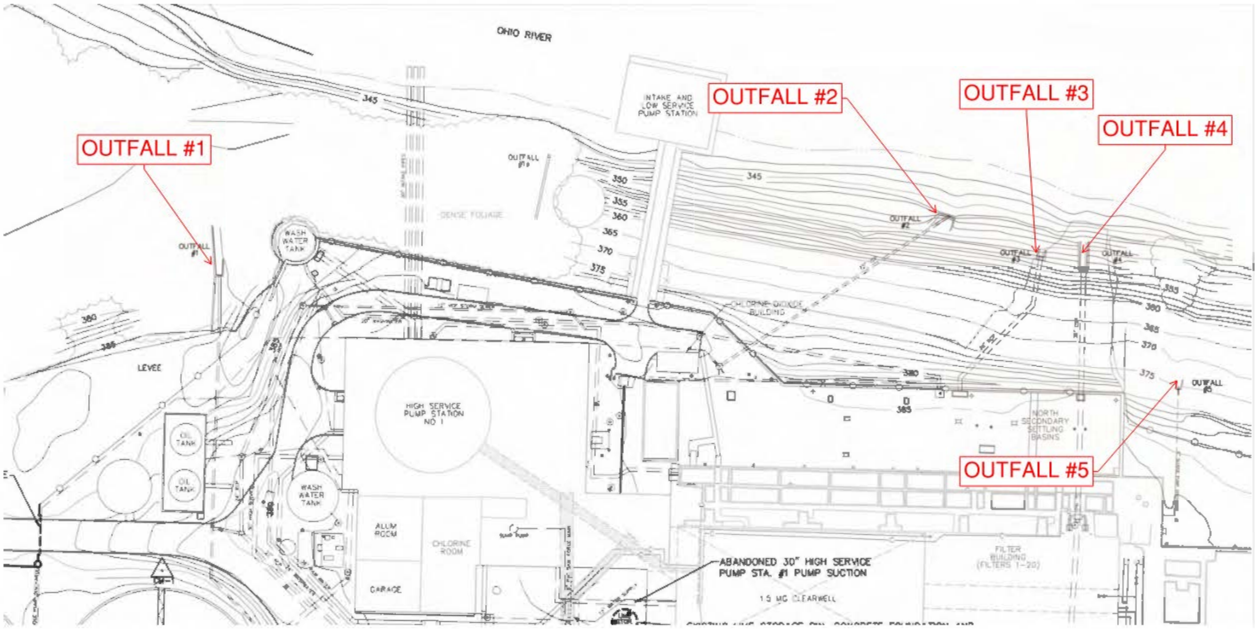

Figure 3-8: Outfall Locations

The existing outfalls are monitored for TSS, total residual chlorine, and mercury but discharge is only limited to the level of total residual chlorine. Existing legislation provided by EWSU states the outfalls are exempt from mercury controls as long as additional mercury is not added.

As part of this project, the existing 18” outfall (001) near the south end of the plant will be upsized and modified to extend further into the Ohio River for the purpose of discharging water from the backwashing and filter to waste processes.

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3.3.10 HSPS No. 2 and 3

The water plant has two high service pump stations, described in Table 3-9. Station #2 uses four horizontal split case pumps (Pump Nos. 4-7) to draw water from the 0.5 and 1.5 MG clearwells, while station #3 uses three vertical turbine pumps (Pump Nos. 8-10) to draw from the 6.5 MG clearwell.

These pumps have been rebuilt or replaced within the past 20 to 30 years. Over the anticipated service life, the seven existing high service pumps in High Service Pump Station Nos. 2 and 3 will require rebuilding and replacement motors and drives. High Service Pump Nos. 6, 7, and 9 were rebuilt in a 2015 project, and Pump Nos. 7 and 9 had new motors and drives installed. Additionally, all piping and equipment in these pump stations will need coating over the 30-year planning period.

EWSU would benefit from better control over the diversion of flows between clearwells and pump stations, which would allow for clearwells to be taken out of service for inspection and repair. The high service pumps transfer finished water to the distribution network of piping and booster pump stations.

Table 3-9: High Service PS No. 2 - 3 Design Data

Process Description	Unit	HSPS 2	HSPS 3
Type of Pump	-	Horizontal Split Case	Vertical Turbine
Number of Pumps		4 (3 Duty, 1 Standby)	3 (2 Duty, 1 Standby)
Design Point – Flow Rate of Each Pump	MGD	10	14.41
Design Point – Total Dynamic Head	Feet	185	155
Motor Size	Horsepower	350	500
Motor Drive	-	VFD	VFD
Discharge Pressure to Distribution System	psi	70	70

3.4 Raw Water Quality

Ohio River water quality is variable due to the large drainage area and subsequent variations in flows, runoff conditions, and seasonality. EWSU monitors several river water quality parameters through a combination of online analyzers and grab samples. A summary of historical raw water quality data is presented in Table 3-10. Most of the information was collected in daily increments from the City's SCADA server spanning 2014 through 2018, as summarized in the April 2021 Preliminary Engineering Report. Specific parameters were monitored daily from January 2021 to October 2023, for the purpose of IDEM.

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Table 3-10: Raw Water Quality

Parameter	Units	Average	10th Percentile	90th Percentile
Turbidity(Note 2)	NTU	47	11	107
Total Organic Carbon	mg/L	3.8	2.8	4.7
Iron(Note 2)	mg/L	0.58	0.09	0.81
Manganese(Note 2)	mg/L	0.37	0.07	0.38
Calcium	mg/L	37	31	44
Magnesium	mg/L	10	7	13
Total Hardness	mg/L $CaCO_3$	133	107	154
Alkalinity(Note 2)	mg/L $CaCO_3$	88	74	104
pH(Note 2)	S.U.	8.15	7.7	7.9
Atrazine	ug/L	0.33	BDL	0.90
Chloride	mg/L	16	10	22
Sulfate	mg/L	38	27	52
Nitrates	mg/L	<2		
Phosphorus	mg/L	0.18	0.09	0.27
Silica	mg/L	3.9	1.5	6.2
Total Dissolved Solids	mg/L	242	184	308
Total Coliforms	CFU/100 mL	6,125	687	15,531
E. coli	CFU/100 mL	176	5	403
CSMR	None	0.43	0.26	0.63

Notes:

1. Data summarized in 2021 PER by others
2. The following parameters' data was summarized from 2021 to 2023.

3.5 Drinking Water Regulations

Finished water quality goals based on compliance with applicable regulations is presented in Table 3-11. The EWSU source water is a surface water source; therefore, the WTP is subject to regulations including the following:

- Surface Water Treatment Rule (SWTR)
- Total Coliform and Revised Total Coliform Rules (TCR)
- Stage 1 and 2 D/DBPR
- Lead and Copper and Revised Lead and Copper Rules (LCR/LCRR)
- Chemical Contaminant Rules
- Radionuclides Rule

Note that this list does not encompass all contaminants regulated under the national primary drinking water regulations (NPDWR). Currently, EWSU is placed in Bin 1 for *Cryptosporidium* removal, indicating there are not additional removal requirements via inactivation. However, prior studies (e.g., PER from April 2021) noted that there is potential for bin reclassification due to changes in runoff events in the watershed associated with climate change. If the water source is reclassified, additional treatment would be required to provide *Cryptosporidium* inactivation.

Another potential impact of climate changes documented in prior studies is the potential for increased algae and associated taste and odor issues in the source water. EWSU periodically encounters issues with algal growth in summer months in the clarification basins. The existing plant has potassium permanganate in the raw water feed and chlorine upstream of the static mixer for algae control, as well as PAC for taste and odor control. No specific finished water goals are established for compounds related to these water quality issues; however, reference threshold values are provided in Table 3-11.

Table 3-11: Finished Water Quality Goals Based on Compliance with Applicable Regulations

Parameter (Note 1)	MCL, SMCL, Regulation, or Recommendation	Finished Water Quality Goal
Alkalinity, mg/L as $CaCO_3$		>50
Total Dissolved Solids, mg/L	500	<500
Total Hardness, mg/L as $CaCO_3$	(Note 2)	100-150
Atrazine, µg/L	3	<3
Arsenic, µg/L	<10	<10

Parameter(Note 1)	MCL, SMCL, Regulation, or Recommendation	Finished Water Quality Goal
Nitrate, mg/L	10	<10
Iron, mg/L	0.3	<0.2
Manganese, mg/L	0.05	<0.05
Chloride, mg/L	250	NA
Sulfate, mg/L	250	NA
Chloride:Sulfate mass ratio	<0.58	<0.5
pH	6.5-8.5	>7.7
TOC Removal, %	25-35% (Note 3)	25-35%
Algal toxins, µg/L Microcystin Cylindrospermospin	 0.3(Note 4) 0.7(Note 4)	
Taste and Odor(Note 5) TON MIB, ng/L Geosmin, ng/L	 <3 Threshold: 1.3-4 Threshold: 6.3-15	Minimal complaints
Giardia	**3-log Removal:** 2.5-log Credit for Filtration 0.5-log Inactivation Required	Meet filter effluent turbidity goals to achieve 2.5-log credit removal (see below) ≥0.75-log inactivation
Viruses	**4-log Removal:** 2.0-log Credit for Filtration 2.0-log Inactivation Required	Meet filter effluent turbidity goals to achieve 2.0-log credit removal (see below) ≥3.0-log inactivation
Cryptosporidium	**2-log Removal** 2.0-log Credit for Filtration Bin 1: No additional Removal(Note 2)	Meet filter effluent turbidity goals to achieve 2.0-log credit removal (see below)

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Parameter(Note 1)	MCL, SMCL, Regulation, or Recommendation	Finished Water Quality Goal
Turbidity	**Combined Filter Effluent:** ≤0.3 NTU in 95% of samples ≤1 NTU in 100% of samples **Individual Filter Effluent:** Additional follow-up required if ≥1 NTU in 2 consecutive readings taken 15 minutes apart	**Combined Filter Effluent:** ≤0.3 NTU in 95% of samples ≤1 NTU in 100% of samples **Individual Filter Effluent:** Additional follow-up required if ≥1 NTU in 2 consecutive readings taken 15 minutes apart
Chloramine Residual Secondary Disinfectant	≤4.0 mg/L Measurable at all points in distribution	3.5 mg/L exiting plant ≥0.2 mg/L at all points in distribution system
Total Coliform and E. coli	Total coliforms absent from 95% of samples *E. coli* absent from samples	Total coliforms absent from 95% of samples *E. coli* absent from samples
Lead and Copper	**Pb[1]:** ≤ 15 µg/L in 90% of samples **Cu:** ≤ 1.3 mg/L in 90% of samples	**Pb:** ≤ 10 µg/L in 90% of samples **Cu:** ≤ 1.3 mg/L in 90% of samples
TTHM RAA, µg/L	<80 µg/L	<80 µg/L
HAA5 RAA, µg/L	<60 µg/L	<60 µg/L

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Parameter(Note 1)	MCL, SMCL, Regulation, or Recommendation	Finished Water Quality Goal

Notes:

1. This list does not encompass all contaminants regulated under the national primary drinking water regulations (NPDWR).
2. Hardness is not regulated. The USGS classifies water with 61 to 120 mg/L as moderately hard and 121 to 180 mg/L as hard.
3. The source water is classified in "Bin 1" for *Cryptosporidium* removal, which requires no additional log removal via inactivation beyond what is credited by compliance with filter effluent turbidity requirements. If source water quality changes due to runoff events due to climate change, the bin classification could change, requiring ozone or UV for additional log inactivation.
4. Bottle-fed infant and pre-school aged child 10-day health advisory
5. No finished water goal threshold specified beyond not receiving T&O complaints; MIB and Geomin threshold ranges correspond to the level at which they are detectable by most people per Young, W. F., Horth, H., Crane, R., Ogden, T., & Arnott, M. (1996). Taste and odour threshold concentrations of potential potable water contaminants. Water Research, 30(2), 331-340 and Watson, S. B. (2004). Aquatic taste and odor: a primary signal of drinking-water integrity. Journal of Toxicology and Environmental Health, Part A, 67(20-22), 1779-1795.

3.5.1 Contaminants on the Regulatory Horizon

The US EPA's Unregulated Contaminant Monitoring Rule (UCMR) was first introduced in 1996 as part of the Safe Drinking Water Act (SDWA) amendments. The UCMR requires public water systems to monitor and report the levels of certain contaminants that are not currently regulated by the EPA. The data collected by the UCMR process is used to assess contaminant occurrence and to support determination of whether to regulate a contaminant to protect public health. The contaminants included in the UCMR monitoring cycles therefore have the potential to become regulated in the future. UCMR data was not reviewed for this project, and a review of EWSU's UCMR results as compared to future potential regulatory limits was not found in the information provided.

Notable regulatory changes on the horizon include those associated with the Lead and Copper Rule Improvements (LCRI) and per- and poly-fluoroalkyl substances (PFAS). In the absence of UCMR data, the focus of this section is on these two pending regulations.

The LCRI is anticipated to be finalized prior to the compliance deadline for the Lead and Copper Rule Revisions (LCRR). Therefore, the LCRI would take precedence for compliance and essentially replace the LCRR. The most notable changes in the LCRI relative to the existing LCR

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or LCRR related to treatment goals is that the lead action level will be reduced to 0.010 mg/L from 0.015 mg/L. Thus, EWSU's current goal for lead reflects the anticipated regulatory limit of the LCRI.

PFAS are a group of manufactured chemicals that have been used in industry and consumer products since the 1940s. PFAS are long lasting chemicals, components of which break down very slowly over time. Because of their widespread use and their persistence in the environment, many PFAS are found in water, air, soil, food, and the blood of people and animals all over the world. Studies have indicated exposure to some PFAS may be linked to harmful health effects in humans and animals; thus, they have quickly become contaminants of great concern in drinking water.

On March 14th, 2023, the US EPA issued the first proposed federal drinking water regulation for PFAS (EPA, 2023), which is expected to be finalized in the first quarter of 2024. Proposed MCLs were established for 6 different PFAS compounds, as summarized in Table 3-12. Compliance would be enforced as a RAA at the point of entry to the distribution system and any result below the practical quantitation level (PQL) will be assumed to be 0 ppt in the RAA calculation.

Table 3-12: Proposed PFAS Regulation

PFAS	Health Effect	Proposed MCL	PQL
PFOA	Cancer	4 ppt	4 ppt
PFOS	Cancer	4 ppt	4 ppt
PFHxS	Thyroid	Aggregate Hazard Index (HI) = 1.0(Note 1)	3 ppt
GenX Chemicals	Liver		5 ppt
PFNA	Developmental		4 ppt
PFBS	Thyroid		3 ppt

1. The HI approach limits the aggregate concentration of four PFAS. The HI is calculated using the following formula:

HI = [GenX]/[10 ppt] + [PFBS]/[2000 ppt] + [PFNA]/[10 ppt] + [PFHxS]/[9 ppt]

2. Where [x] = concentration in water sample in ppt and the denominator is a health-based water concentration for each compound

Based on the first three quarters of UCMR5 data collection, the levels of PFAS in the Ohio River source water have historically been just below the minimum reporting limit for all compounds (Fifth Unregulated Contaminant Monitoring Rule Data Finder | US EPA). Thus, while space has been allocated for post-filter GAC contactors for future potential PFAS treatment, a PFAS treatment requirement was not included in this scope of the project.

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3.6 Existing Plant Performance

Existing plant performance was summarized in the April 2021 Water Treatment Plant Advanced Facility Plant Alternatives Report, June 2021 Preliminary Engineering Report, and the August 2021 Basis of Design Report. Separate water quality and treatment plant performance analysis for compliance with current regulations or future potential regulations was not conducted. This basis of design report is based on the analyses presented in the prior reports by others, which was not exhaustive for all regulated compounds.

3.6.1 Turbidity and Suspended Solids

Raw water suspended particles and turbidity are reduced via coagulation, flocculation, sedimentation, and filtration. As summarized in the June 2021 PER, historical average settled water turbidity in the South Plant is 1.5 NTU in the primary basin and 1.7 NTU for the secondary basin. Settled water turbidity less than 2 NTU is considered optimized pretreatment (Linder, 2015). Additional turbidity is reduced via filtration. Maximum daily combined filter effluent turbidity has historically been at or below 0.1 NTU, meeting filter performance regulations for obtaining pathogen log-removal credits. Thus, the overall plant performance is considered good regarding particulate and turbidity removal.

Based on the average plant flow (26 mgd) and filter loading rate (0.85 gpm/ft^2) presented in the June 2021 PER, the overall plant average unit filter run volume (UFRV) is approximately 8,604 gal/ft^2. Industry best practices typically recommend 5,000 gal/ft^2 as the minimum filter performance, with 10,000 indicating good performance and 15,000 indicating excellent performance (Kawamura, 2000). As previously discussed, one filter is backwashed every 8-hour shift, so filter run time may be extended if relying on effluent turbidity or headloss triggers. The relatively low average filter loading rate of 0.85 gpm/ft^2 likely causes slightly lower performance than what would be achieved if the filter operations and backwash were optimized. Thus, while there is room for filter performance improvement, the overall performance meets regulations and filter productivity is considered adequate.

3.6.2 Total Organic Carbon Removal and Disinfection Byproducts

Per the Stage 1 and 2 Disinfectants and Disinfection Byproducts Rule (D/DBPR), given the raw water TOC concentration and alkalinity, the WTP is required to remove 25 to 35 percent of the TOC in the raw through the treatment processes. As summarized in the April 2021 Alternatives Report, the WTP historically achieves approximately 50 percent TOC removal, meeting this treatment requirement.

TOC removal is important because it contains disinfection byproduct (DBP) precursors that react with chlorine disinfectants to form DBPs. Total trihalomethanes (TTHMs) and five haloacetic acids (HAA5) DBPs are regulated as locational running annual averages (RAAs) calculated at monitoring stations within the distribution system. The RAA MCLS are 80 µg/L and 60 µg/L for TTHMs and HAA5, respectively. The WTP achieves primary disinfection in the South

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Plant secondary settling basin using free chlorine. The WTP converts to chloramines after CT is achieved, upstream of the filters, to limit DBP formation. As summarized in the April 2021 Alternatives Report, the RAA for TTHMs and HAA5 have historically been significantly lower than the MCL requirements. For instance, in 2022, the TTHM RAA was 33.3 µg/L and HAA5 was 26.2 µg/L.

The WTP typically conducts free chlorine burns for nitrification control in the distribution system twice per year. During a free chlorine burn, high amounts of TTHMs and HAA5s are formed, which is typical for chloramination systems using free chlorine burns for nitrification control. DBP measurements during these periods are not commonly included in the RAA calculation. Optimization of chloramine formation at the WTP should allow for improved nitrification control, potentially limiting free chlorine burns to once per year, thereby reducing overall DBP formation in the finished water.

3.6.3 Iron and Manganese

The Ohio River contains iron and manganese above the secondary MCLs of 0.3 mg/L and 0.05 mg/L, respectively. However, these metals are oxidized in the raw water and/or secondary settling basin where they are exposed to chlorine and physically removed through sedimentation and filtration. As documented in the April 2021 Alternatives Report, finished water iron and manganese have historically been below detection limits.

3.6.4 Hardness

The WTP does not currently include softening treatment. As documented in the April 2021 Alternatives Report, the historic raw water hardness ranges from approximately 100 to 150 mg/L as CaCO3; thus, softening is not considered cost effective for this water source.

3.6.5 Seasonal Events

Typically, taste and odor (T&O) events, atrazine agricultural runoff, and algal blooms in the source water are highly seasonal. The existing plant has powered activated carbon (PAC) to adsorb compounds related to these events. However, PAC was not used in 2016 or 2018, and was only used one time in 2017, suggesting there are not frequent seasonal issues that require a treatment intervention.

3.6.6 Corrosivity

The 90th percentile lead and copper concentrations have historically been below the current action limits of 0.015 mg/L for lead and 1.3 mg/L for copper, confirming adequacy of the existing finished water chemistry for corrosion control in the distribution system. For instance, 2022 90th percentile for lead was <0.001 mg/L and was <0.025 mg/L for copper.

The relationship between concentrations of chloride and sulfate in water has been used to understand and predict galvanic lead corrosion in distribution systems and premise plumbing

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(Hill & Cantor, 2011). This relationship is largely independent of the traditional lead solubility chemistry and instead is based on the chloride-to-sulfate mass ratio (CSMR) as defined in Equation 1.

$$Equation\ 1.\quad CSMR = \frac{Cl^{-}\ (mg/L)}{SO_4^{\ 2-}\ (mg/L)}$$

CSMR theory predicts that galvanic corrosion potential for lead increases as the CSMR increases (Nguyen, Stone, & Edwards, 2011). Galvanic corrosion occurs where a dissimilar metal is galvanically connected to lead; for example, copper piping joined with lead solder or in the case of most partial lead service line replacements. Decreased CSMR reduces the potential for galvanic corrosion because sulfate forms highly insoluble precipitates with lead, forming protective lead-sulfate coatings over lead materials in contact with water. In contrast, chloride can form soluble complexes with lead that prevent the formation of protective coatings and cause corrosion of lead materials. CSMR has not been shown to impact lead release from brass or pure lead pipe not galvanically connected to a dissimilar metal; nor has it been shown to impact copper release.

A 1999 study of 24 water utilities demonstrated that utilities with a CSMR less than 0.58 had a 90^{th} percentile lead concentration that met the EPA action level of 15 µg/L (Edwards, Jacobs, & Dodrill, 1999), whereas utilities with CSMR greater than 0.58 had a much higher probability of exceeding the AL. Many of the utilities that exceeded the action level for lead had recently made water treatment and/or operational changes that resulted in an increased CSMR in the finished water. Treatment changes include transitioning from sulfate-based coagulants to chloride-based coagulants or changes in chemicals used for disinfection.

As documented in the April 2021 Alternatives Report, the average CSMR of the raw water is 0.43, indicating the water is not considered to be corrosive

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4.0 Process Requirements and Improvements

The proposed process flow diagram is presented on Figure 4-1. As discussed in Section 3, memoranda completed by others indicated that the performance of the existing plant meets regulatory requirements. The most cost-effective alternative value engineering approach was to retain the processes at the existing plant. This consists of:

- Raw water intake with permanganate and optional PAC addition
- Coagulation, flocculation, and sedimentation using PACl as the primary coagulant
- Granular media filtration
- Primary disinfection using free chlorine in the settled water pipeline, filters, and portions of the clearwell if needed
- Secondary disinfection using chloramines, with conversion to chloramines primary disinfection is achieved to minimize DBP formation

The following process improvements relative to the existing plant are planned as part of this project:

- Construct new PAC facility with a feed point that is at the effluent to the raw water intake to maximize PAC contact time with raw water prior to sedimentation (instead of current addition at the static mixer just upstream of primary sedimentation).
- Construct a new rapid mix basin to enhance dispersion of pretreatment chemicals into the flow (instead of the static mixer currently in use at South Plant).
- Construct a new flow splitter structure to direct flow to the four South Plant settling basins such that they can be operated in parallel or in series to provide operational flexibility to respond to changes in water demand.
- Outfit the existing South Plant settling basins with tube settlers to increase the maximum treatable capacity of each basin. This allows the existing South Plant basin structures, which are in good condition, to be reused and avoids the need for construction of additional basins with the same anticipated overall performance.
- Construct a new pipeline to a new 50 mgd filter facility with a new 5 mg clearwell directly underneath. These process upgrades have several benefits:
    - Because the four settling basins will be used as primary clarification basins in the proposed design, the first free chlorine application point is delayed until the entry point of the pipeline to the new filter building, avoiding the long contact

time associated with the hydraulic retention time in the secondary settling basin in the existing plant configuration. This approach will likely reduce DBP formation.

- Beyond the chlorine application at the pipeline entry, there will be additional points free chlorine and ammonia can be fed (at the entry and first pass of the clearwell). This will allow for chlorine application that can respond to seasonal temperature and flow trends relative to the existing CT approach that is achieved in the secondary settling basin with a fixed volume. This approach will also likely help reduce DBP formation.

- The filter media configuration will consist of a smaller layer of sand under a larger layer of anthracite in relation to the existing filter media profile. This configuration should improve head loss and associated filter performance.

- Improved controls associated with the new filter building will allow for optimized filter run times to improve filter performance (i.e., increase UFRV).

- The proposed media configuration will allow higher loading rates to be used in the future. The current design approach is to use a surface loading rate of 2 gpm/ft^2 filter area; however, the Recommended Standards for Water Works (10 States Standards) allows for a surface loading rate up 4 gpm/ft^2 without the need for demonstration testing. Therefore, the plant filter capacity can be expanded in the future without capital investment.

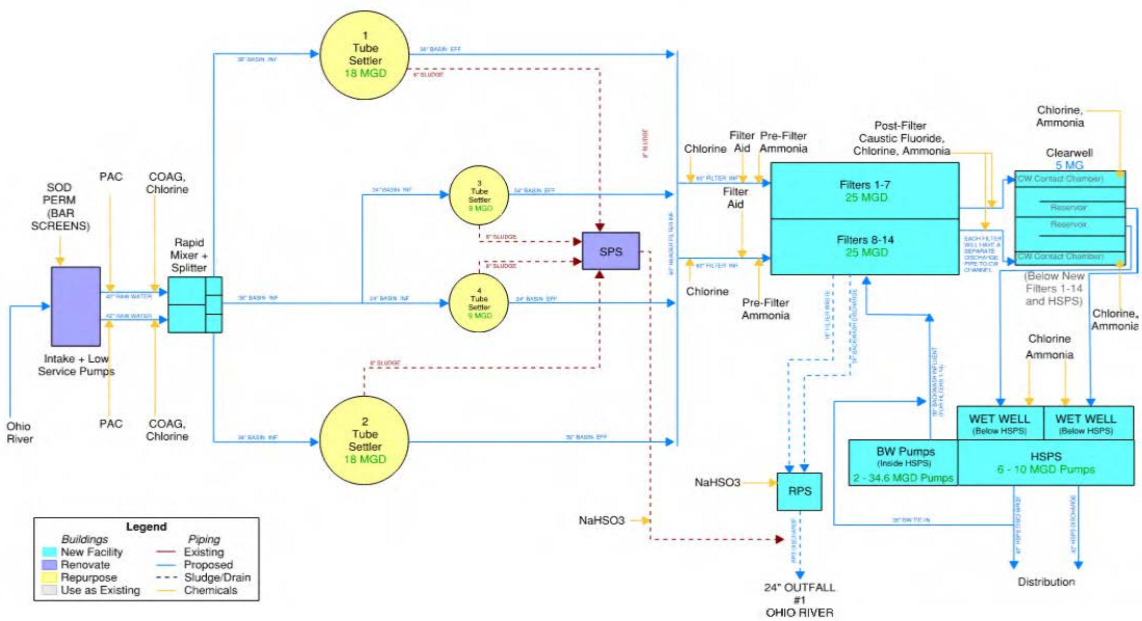

Figure 4-1: Process Flow Diagram

5.0 Facility Design Criteria

This section describes the new facilities and modifications to existing facilities. Figure 5-1 illustrates the overall facility arrangement including new, modified, and demolished structures used for planning. Refer to Appendix A drawings for the most up to date facility and piping layouts.

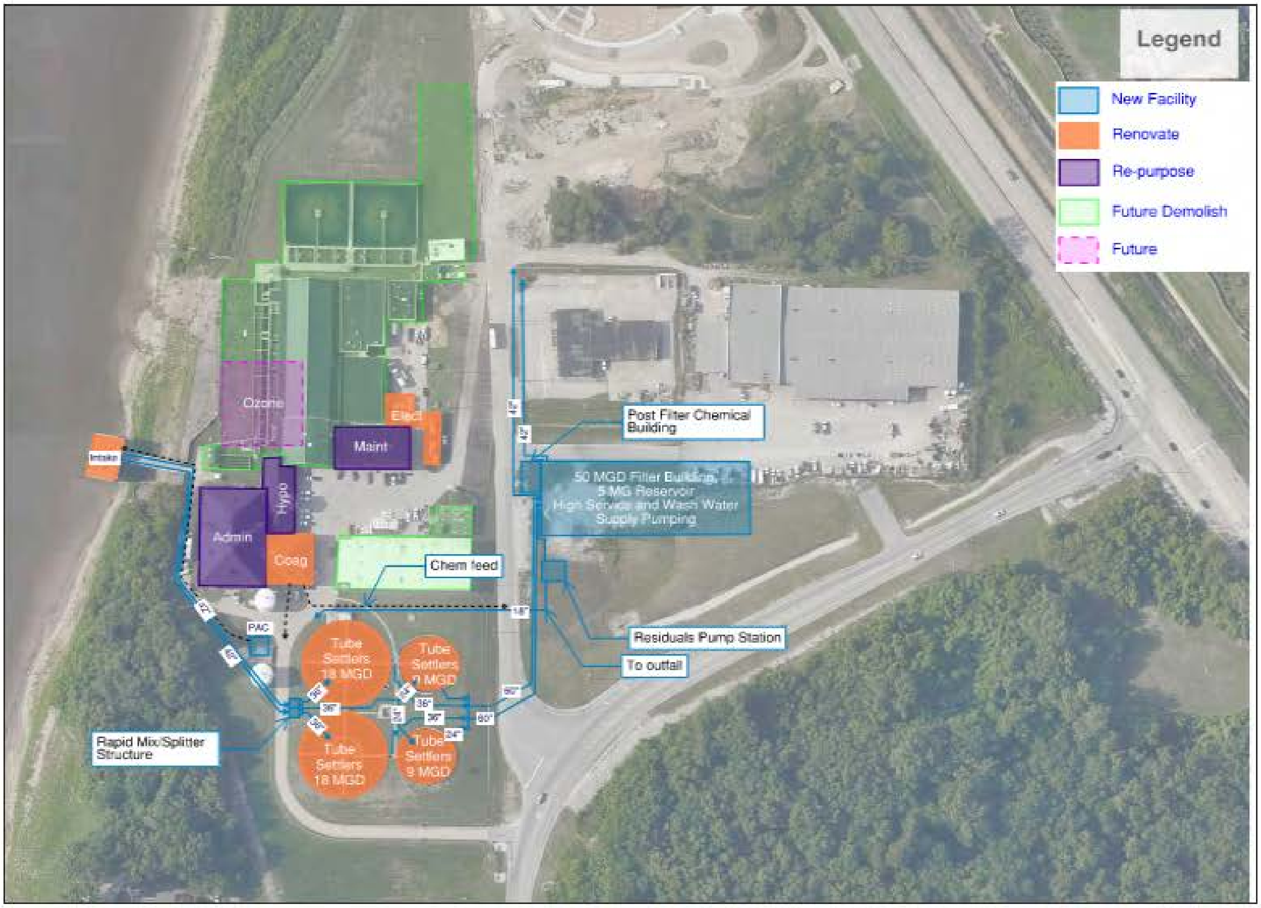

Figure 5-1: Overall Site Schematic

5.1 Design Flow Rates

Table 5-1: Facility Average and Design FlowratesTable 5-1 summarizes the design and average flows for major process streams and the projected flow rates by 2050. These numbers are a result of a flow balance completed for the facility, accounting for residuals streams such as sedimentation basin blow down, filter backwashing, and filter to waste, to ensure adequate finished water capacities. The design flow of individual unit processes must be equal to or greater than the flows listed in the design column for the 50 mgd plant capacity to be met. The current, future average, and future peak flows are as presented in the June 2021 Preliminary Engineering Report.

Table 5-1: Facility Average and Design Flowrates

Stream Description	Design (mgd)	Current Avg Flow (mgd)	Future (2050) Avg Flow (mgd)	Future (2050) Peak Flow (mgd)
Raw Water Supply Capacity	51.5	27.3	37.3	50.7
Tube Settler Capacity	51.5	27.3	37.3	50.7
Filter Capacity	51	27	37	50.4
Finished Water to Distribution	50	26	36	49.4
Plant Residuals Discharge	1.5	1.3	1.3	1.3

5.2 Proposed Plant Hydraulic Profile

The new WTP hydraulic shown in Figure 5-2 is based on a design flow of 50 mgd. The new facilities essentially match the existing plant operation hydraulics, with some modifications to insert a new rapid mix / flow splitter that can flow by gravity through the tube settler basins and maintain a similar water level in the new filters. The HSPS would be sized similar to existing to pump to the distribution system at a fixed operating pressure.

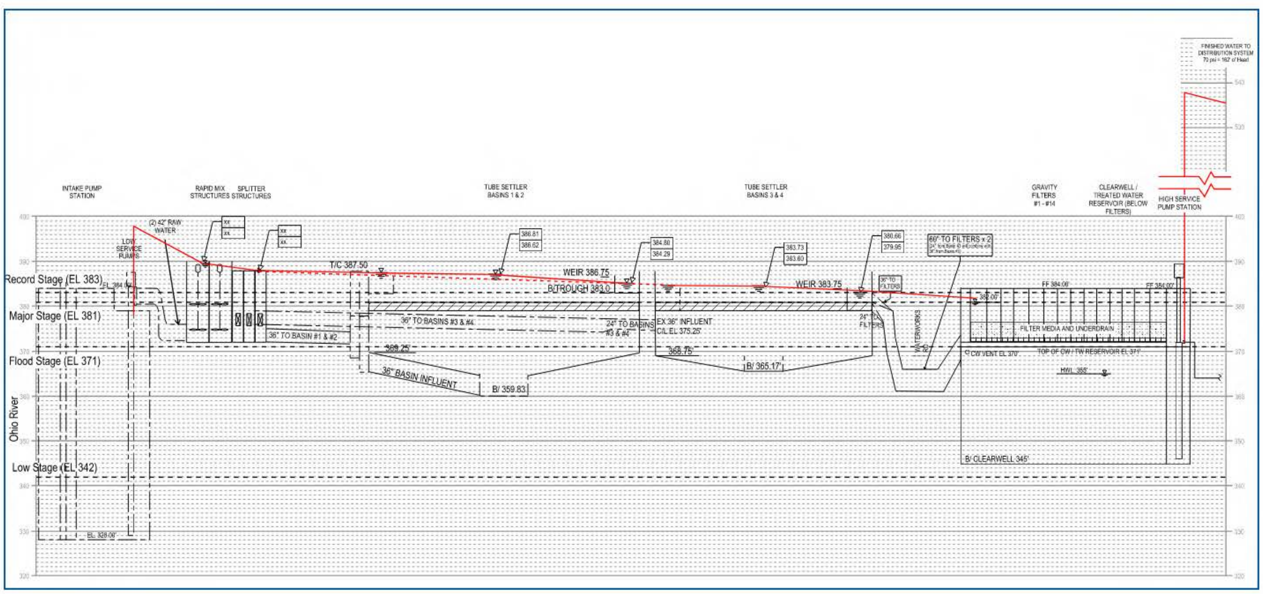

Figure 5-2: Hydraulic Profile

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5.3 Intake Pump Station

The Intake Pump Station will be rehabilitated, complete with new pumps, intake screens, process piping and valves, chemical feed, HVAC, and electrical systems.

The Intake Pump Station will have all electrical distribution equipment demolished and removed. This includes the 4.16kV Motor Control Line-Up, 4.16kV-480V step down transformers, motor control center, and 480V Adjustable Frequency Drives. A new Motor Control Center will be provided to serve all of the intake Pump Station Loads. New 480V adjustable frequency drives are being evaluated in coordination with EWSU for between 3 and 6 pumps. Evaluation is also taking place to add a dedicated electrical room with air conditioning to the Intake Pump Station. With current equipment proposed, the existing concrete slab has sufficient capacity to support the electrical equipment and an electrical room enclosure. Confirmation of existing slab strength will be required once final layout of enclosure, equipment, and required openings is finalized.

Table 5-2: Intake Pump Station Screens and Pump Design Criteria

Description / Parameter	Design Criteria
Intake Pump Station	
Intake Screens	
Capacity Each (3)	25 mgd
Intake Pumps	
Capacity Each (6, in an n+1 configuration)	12.5 mgd

5.4 Raw Water Pipeline

Table 5-3: Raw Water Pipeline Design Criteria between Intake PS and Rapid Mix

Description / Parameter	Design Criteria
Size	42”
Quantity	2
Capacity, each	30 mgd
Maximum Velocity, each	4.8 fps

5.5 Rapid Mix & Flow Splitter

The proposed modifications to the south settling basins, as pictured in Figure 5-3, include the addition of two rapid mix chambers following by a splitter box to distribute flow to the four existing settling basins and a future settling basin. A raw water flowmeter and coagulant injection port for chemical dosing will be installed upstream of the rapid mix chambers on each 42-inch diameter raw water main.

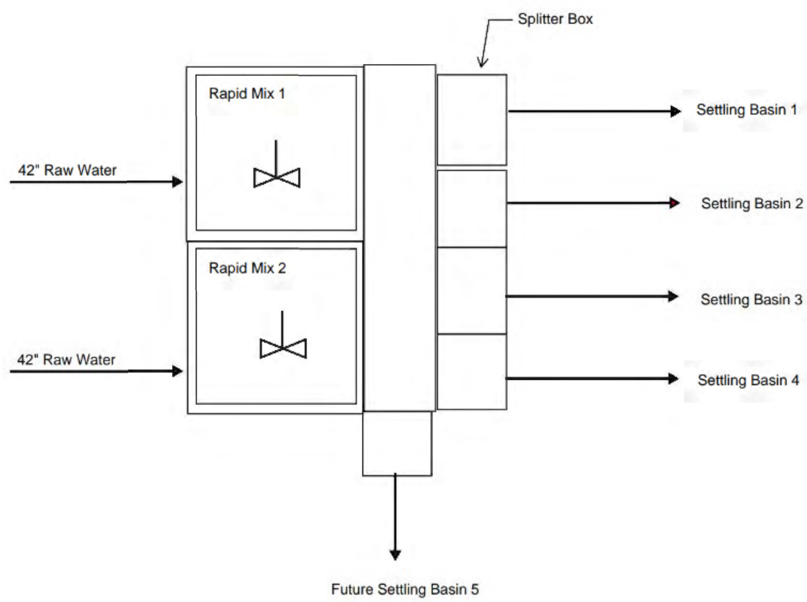

Figure 5-3: Rapid Mix and Splitter Box Overview

Each rapid mix chamber will be sized for a detention time of 30 seconds at a flow rate of 54 MGD. Each rapid mix chamber will contain a top entry mixer for rapid dispersion of chemicals into the water that will then enter the splitter box. The splitter box will contain five chambers, for the distribution of flow to Settling Basin 1, Settling Basin 2, Settling Basin 3, Settling Basin 4 (former Secondary Settling Basin 1 and 2), and a fifth chamber reserved for a future settling basin. The use of weir gate(s) within the splitter box will be evaluated during the design. The addition of sluice gates and stop plates for isolation and maintenance will be evaluated as well as flow meters for each of the settling basins.

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Table 5-4: Summary of Rapid Mix and Flow Splitter Design Criteria

Design Criteria	Design Parameters	Ten State Standard Requirements
Number of Rapid Mix Chambers	Two	
Maximum Flow Rate	54 MGD / Rapid Mix Chamber	
Detention Time	30 seconds	≤30 seconds
Rapid Mix Chamber Volume	18,750 Gallons / Rapid Mix Chamber	
Type of Rapid Mixer	One Top Entry Tank Agitator / Rapid Mix Chamber	
Velocity Gradient	750 feet per second/foot minimum	750 feet per second/foot minimum
Number of Flow Splitter Chambers	Five	
Flow Splitter Control	Weir Gates	

5.6 Settling Basin/ Tube Settler

The proposed modification to the south settling basins, as show in Figure 5-4, include increasing capacity and improving performance. To achieve this, each of the existing settling basin will be modified to operate as standalone flocculation and sedimentation basins. Therefore, each settling basin will operate in parallel rather than as two trains in series. This will require new influent and effluent pipe connections to be installed for each settling basin. Additionally, each of the four settling basins will be retrofitted with tube settler modules. Each settling basin will be receive influent flow from the proposed flow splitter box discussed in Section 5.5. Each of the large primary settling basins will be rated at 18 MGD, and the small settling basins will be rated at 9 MGD. This results in a firm capacity of 36 MGD with the largest basin is out of service.

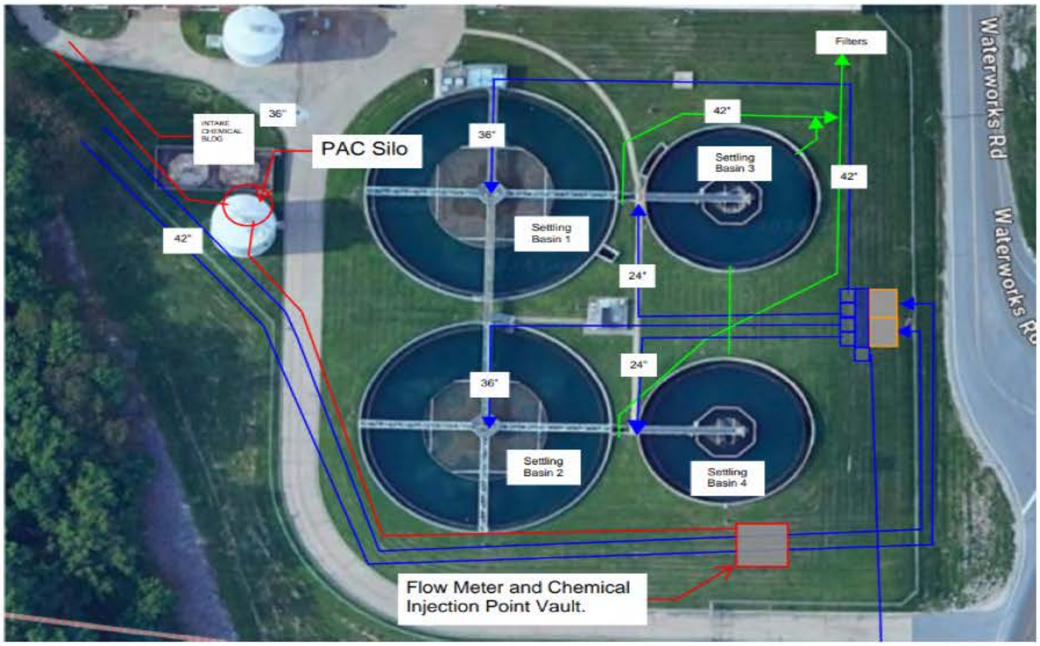

Figure 5-4: Proposed Settling Basin Piping

The settling basin weir design and modifications will adhere to the following 10 States Standards criteria:

- The units should be equipped with either overflow weirs or orifices constructed so that water does not travel over 10 feet horizontally to the collection trough or launder.
- Weirs shall be adjustable, and at least equivalent in length to the perimeter of the tank.
- Weir loading shall not exceed 10 gpm per foot of weir length for clarifiers.
- The rate of flow over the outlet weir shall not exceed 20,000 gallons per day per foot of the outlet launder circumference.

The proposed modification to the four setting basins is presented in Table 5-5 and Table 5-6.

Table 5-5: Modification to Existing Settling Basins

	Modification
Settling Basin 1	• Formerly Primary Settling Basin 1 • New capacity of 18 MGD with installation of tube settlers • New 36-Inch Influent Pipe, to be connected at the existing splitter box or new location on western wall. Connection to Primary Settling Basin 2 will no longer be used. • New 42-Inch Effluent Pipe, to be connected on the east end of basin, near current Parshall flume discharge. Parshall flume will be demolished, and a new concrete junction chamber will be provided. • Existing 8-inch sludge line to be replaced in conjunction with new sludge pumps. • No change to overflow, flocculation basin within clarifier, drain and wastewater plenum.
Settling Basin 2	• Formerly Primary Settling Basin 2 • New capacity of 18 MGD with installation of tube settlers • New 36-Inch Influent Pipe, to be connected at the existing splitter box or new location on the west side of basin. • New 42-Inch Effluent Pipe, to be connected on the east end of basin, near current Parshall flume discharge. Parshall flume will be demolished, and a new concrete junction chamber will be provided. • Existing 8-inch sludge line to be replaced in conjunction with new sludge pumps • No change to overflow, flocculation basin within clarifier, drain and wastewater plenum.
Settling Basin 3	• Formerly Secondary Settling Basin 1 • New capacity of 9 MGD with addition of flocculation zone and installation of tube settlers. • New 24-Inch Influent Pipe, to be connected to new concrete junction box at current Parshall flume location on the east of basin. New 42-Inch Effluent Pipe, to be connected on the southwest of basin. • Existing 8-inch sludge line to be replaced in conjunction with new sludge pumps. • No change to overflow or drainpipe.

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	Modification
Settling Basin 4	• Formerly Secondary Settling Basin 2 • New capacity of 9 MGD with addition of flocculation zone and installation of tube settlers. • New 24-Inch Influent Pipe, to be connected at current Parshall flume on the north of basin. Parshall flume will no longer be used. • New 42-Inch Effluent Pipe, to be connected on the southeast of basin • Existing 8-inch sludge line to be replaced in conjunction with new sludge pump station. • No change to drainpipe.

The capacity and overflow rates of the existing V-notch weirs will be evaluated during the design. Modification or replacement will be considered depending on the tube settler requirements and current life expectancy of the weirs.

Additional collection troughs will be installed above the tube settler modules as need to meet design criteria and achieve the expected capacity as shown in Table 5-6. The outer wall of the small primary settlings basins is the same elevation as the primary however, the record drawings indicate the weir elevation is 3 feet lower than that of the primary settling basins. Further evaluation on the hydraulic profile impacts will be conducted to determine if the height of the weir in the secondary settling basins can be raised.

Table 5-6: Summary of Settling Basins Design Criteria

Design Criteria	Design Parameters	Ten State Standard Requirements
Number and Diameter of Settling Basins	Two 130.0-foot Dia. Two 90.0-foot Dia.	N/A
Maximum Flow Rate	18 MGD / 130.0-foot Dia. Basins 9 MGD / 90.0-foot Dia. Basins	N/A
Flocculation Detention Time at Design Flow	30 Minutes	30 Minutes
Flocculation flow-through velocity at Design Flow		0.5 feet per minute – 1.5 feet per minute
Flocculation Agitators		Variable speed paddles with peripheral speed of 0.5 to 3.0 feet per second
Sedimentation Basin Detention Time at Design Flow	4 Hours	4 Hours
Velocity	< 0.5 feet per minute	< 0.5 feet per minute

Design Criteria	Design Parameters	Ten State Standard Requirements
Weir Loading	< 10 gpm per foot of weir length for clarifiers	< 10 gpm per foot of weir length for clarifiers
Rate of Flow over the Outlet Weir	< 20,000 gallons per day per foot of the outlet launder circumference.	< 20,000 gallons per day per foot of the outlet launder circumference.
Sludge Collection	Mechanical Sludge Collection	N/A
Drainage and Flushing Lines	1% of Influent Flow	Drain piping from the settler units must be sized to facilitate a quick flush

Tube settlers consists of multiple layers of tube-shaped channels which are installed at an angle to enhance the settling of solids. For application within a circular upflow clarifier, the tube settlers can be arranged in a ring along the outer diameter of the basin. The tube modules are structurally supported to rest just below the top layer of water. Accumulation of solids is enhanced by creating a sloped surface with greater surface area for solids to collide and settle. If additional weir length is needed, a series of troughs located above the tube settlers and along the perimeter of the basin can be added as shown in Figure 5-5.

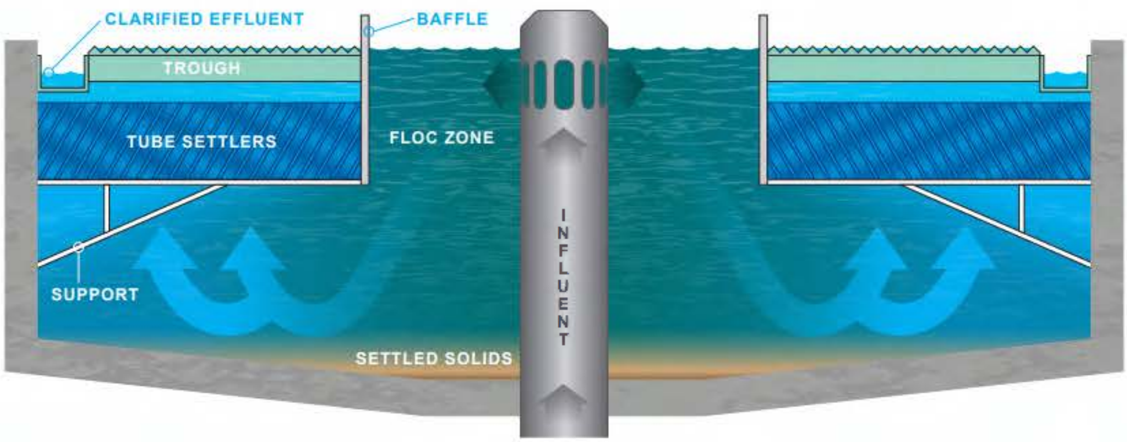

Figure 5-5: Overview of Circular Basin Tube Settler Application (Figure courtesy of Brentwood)

The design of the tube settlers will be in compliance with 10 States Standards and will adhere to the following criteria:

- The design shall maintain velocities suitable for settling in the basin and minimize short--circuiting.

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- Provide sufficient freeboard above the top of settlers to prevent freezing in the units. A cover or enclosure is strongly recommended.
- A maximum rate of 2 gpm per square foot of cross-sectional area for tube settlers, unless higher rates are successfully shown through pilot plant or in plant demonstration studies.
- Flushing lines shall be provided to facilitate maintenance and must be properly protected against backflow or back siphonage.
- Drain piping from the settler units must be sized to facilitate a quick flush of the settler units and to prevent flooding other portions of the plant.
- Modules should be placed in zones of stable hydraulic conditions; or in areas nearest effluent launders for basins not completely covered by the modules.
- Inlets shall be designed to distribute the water equally and at uniform velocities.

The modification of the existing settling basins will include installing tube settler modules in each basin. The proposed design would increase the capacity of each settling basin to meet the minimum requirement of the larger Settling Basins rated at 18 MGD, and the two smaller Settling Basins rated at 9 MGD. The characteristics of the proposed tube settler modification are summarized in Table 5-7.

Table 5-7: Tube Settler Design Criteria

Parameter	Design Criteria			
Equipment	• PVC Tube Settler Media Modules • HDPE Protective Surface Grating • Stainless Steel Support System Bracing • FRP Baffle Wall with Stainless Steel Frame			
Design Application Rate (gpm/sf)	2	2	2	2
Module Tube Area Required (sf)	6,250	6,250	3,125	3,125
Min. Tube Vertical Height (inches)	24	24	24	24
Module Volume (ft^3)	12,500	12,500	6,250	6,250
Design Flow Rate (MGD)	18.0	18.0	9.0	9.0

At a maximum rate of 2 gpm/sf across the area of the tube settler modules, the design will meet the required minimum rated capacity of each basin. The summary above indicates the

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minimum area of tube settler modules required to meet the design criteria. The maximum capacity of each primary settling basin will be determined for planning purposes.

Each basin will be covered utilizing a geodesic dome or alternative style of cover to control algal growth and prevent freezing. Design details will be developed further along in the design.

The existing sludge pump station is located within the center of the four settling basins at the South Plant. In conjunction with the upgrades to be made to the south plant settling basins, the two pumps and piping inside the sludge pump station will be replaced. No other modifications to the structure are intended for design. The capacity and head requirements of the proposed sludge pumps will be evaluated further in the design. It is anticipated that the replacement sludge pump piping will be eight-inch diameter ductile iron, which is consistent with the existing piping.

The pump station discharges through Outfall 002. Modifications to the discharge piping to combine with the new plant outfall will be finalized in detailed design.

5.6.1 Basin Effluent Piping

Water exiting the settling basins will be conveyed to the new filter building through two buried pipelines, with design criteria listed in Table 5-8. The influent to the pipelines will be the primary location for free chlorine application to achieve primary disinfection.

Table 5-8: Clarification Basin Effluent Piping

Description / Parameter	Design Criteria	Ten State Standards Requirement
Size	60” Dia	
Quantity	2	
Volume, each	69,000 gal	
Capacity & Velocity, each	25 mgd @ 2.0 fps	≤2.0 fps
Capacity & Velocity, each	30 mgd @ 2.4 fps	

5.7 Filtration

Flow will enter the filters through two square concrete influent flumes to distribute water to each side of the filter gallery. Design parameters for the filter influent flume are presented in

Table 5-9.

Table 5-9: Filter Influent Flume Design Criteria

Parameters	Value	Ten State Standards Requirement
Maximum Velocity	2.0 fps	≤2.0 fps
Size	60"x60" Concrete Channel	
Quantity	2	
Capacity, each	30 mgd	

The filter gallery will contain 14 total filters with an equal number of filters on each side. The proposed filter design criteria are summarized in Table 5-10.

Table 5-10: Filter Design Criteria

Parameter	Value	Ten State Standards Requirement
Design Influent Capacity, mgd	51	
Quantity	14	≥2
Rated Flow (1 filter offline), each, mgd	3.92	
Loading Rate, (1 filter offline), GPM/ ft^2	2.5 @ 50 mgd	2.0-4.0
Filter Dimensions, ft x ft	39' x 28'	
Filter Area, ft^2	1,090	
Type	Dual media gravity filters	
Filter Media (Note 1)	**Total Depth – 36inches** **Anthracite** Depth 24 inches Effective Size 0.90-1.10 mm Uniformity Coefficient <1.5 **Sand** Depth 12 inches Effective Size 0.45-0.55 mm Uniformity Coefficient <1.5	≥30 inches

Parameter	Value	Ten State Standards Requirement
Underdrains and Media Support	Block underdrains with media retainer, such as: 1. Leopold Type XA underdrain with IMS 200 media retainer 2. Roberts Infinity low profile extruded PVA underdrains with 3 inches of torpedo sand	
Water Depth over Media, ft	6.0 (Note 2)	
Filter Box Depth, ft	12.0 (Note 3)	

Notes:

1. As summarized in Table 3-6 the existing filters contain 22 inches of 0.5 mm silica sand underneath 6 inches of 0.9 mm anthracite, resulting in an L/d_e ratio of 1,287. While this exceeds the minimum recommended L/d_e ratio of 1,000 for dual media beds (Kawamura, 2000), the deep sand layer underneath the shallow anthracite later likely contributes to excessive head loss formation within the filter bed. The proposed media profile maintains an L/d_e ratio of 1,219, with media depths that are more typical for dual media filters. The deeper anthracite layer allows for more particle capture prior to the sand/anthracite interface, reducing headloss and improving filter productivity, likely allowing the filters to be operated at a higher SLR.
2. A minimum water depth of 6 feet on top of media minimizes problems associated with air binding (Kawamura, 2000).
3. Box depth is deeper than what is required for the proposed media arrangement, but provides flexibility for future, alternative media profiles. While 36-inches of media included in this design, up to 54-inches of media could be installed in the future.

5.8 Clearwell / Treated Water Reservoir

Filter effluent water will be routed to a clearwell contact basin and storage reservoir through two concrete channels under each filter gallery. Two chlorine and ammonia injection points and four chlorine sampling points will be provided in each clearwell to provide operational flexibility, accurate calculation of disinfection credits (i.e., CT) achieved, and confirmation that target residuals are met. One clearwell is shown in Figure 5-6 to depict how water flow, chlorine monitoring, and chlorine and ammonia injection will be provided. The same approach will be taken with the other clearwell. The following description provides an overview of how the clearwell will be operated:

- Filter effluent water will be collected in a flume below the filter gallery and direct water to the clearwell.

- Free chlorine will be monitored at Sample Point 1, which is the most downstream location of the filter effluent flume. Free chlorine will be monitored because only free chlorine will be used for disinfection in the filter box, never chloramines. This sample point will be used to calculate CT achieved in the filter box and determine the free chlorine and ammonia dose to apply just downstream of its location.

- Free chlorine and ammonia dose points will be located downstream of Sample Point 1 within the first turn of the clearwell to provide adequate mixing prior to chlorine contact in the first and second pass of the clearwell contact basin. Under most operational conditions, both free chlorine and ammonia will be dosed at this location to establish chloramines in the chlorine contact basin. However, when high flow and/or low temperature conditions, only free chlorine will be dosed to provide enough disinfection to meet CT requirements when necessary.

- Total chlorine will be monitored at Sample Point 2 to calculate CT achieved in the chlorine contact basin and determine the free chlorine and ammonia dose required to increase the residual and/or form chloramines in the remainder of the clearwell. Total chlorine will be monitored because under most operational conditions, chloramines will be formed prior to the contact basin portion of the clearwell. Under conditions when free chlorine is used in the clearwell, it will be assumed that total chlorine monitored at this location is equivalent to free chlorine because no ammonia will have been added.

- Free chlorine and ammonia dose points will be located immediately downstream of Sampling Point 2. Under most operational conditions, chloramines will already be formed in the contact basin portion of the clearwell, so only free chlorine would be required to trim the chloramine dose. Flow will be conveyed to the storage reservoir portion of the clearwell over a weir to maintain a constant depth in the clearwell for CT calculations and provide sufficient mixing for the chemical application.

- Total chlorine will be monitored at Sample Point 3. This is the final monitoring point to quantify the finished water chlorine concentration for regulatory compliance; it may also be used to calculate the CT achieved in the storage reservoir portion of the clearwell, if desired. However, the design assumes all CT will be achieved upstream of the weir.

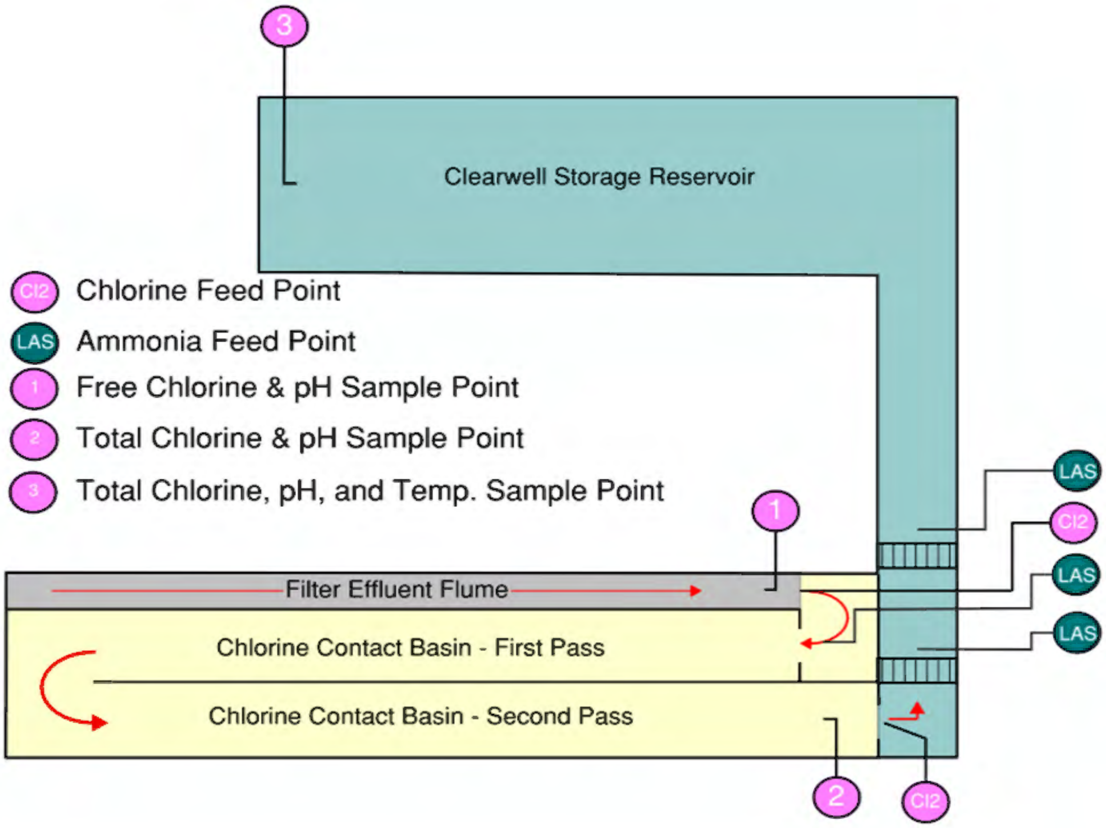

Figure 5-6: Example Flow Path, Sampling Points, and Chemical Feed Points within the Clearwells

A summary of the clearwell design criteria is summarized in Table 5-11. The weir controlling the water depth in the clearwell will be motorized and will have the ability to be bypassed such that the water within the clearwell can be drained for maintenance or emergency conditions (e.g., draining the clearwell if a contamination event occurs).

Table 5-11: Clearwell Structure Design Criteria

Parameter	Design Criteria
Type of Clearwell	Reinforced concrete with serpentine flow channels
No. of Post Filtration Contact Basins	2
Maximum usable Water Depth, ft	20
Minimum Water Depth in Contact Basin, ft(Note 1)	10
Clearwell 1 Volume, gal(Note 2)	Inlet Channel: 170,250 Contact Basin: 1,316,230 Storage Reservoir: 1,160,950
Clearwell 2 Volume, gal(Note 2)	Inlet Channel: 111,900 Contact Basin: 1,323,870 Storage Reservoir: 914,710

Parameter	Design Criteria
Total Clearwell Volume, gal (Including BW Volume)	5 MG
Hydraulic Retention Time at 50 mgd, hr(Note 2)	2.4
Anticipated Baffling Factor	0.5
Giardia Inactivation Required, log removal	0.5
Minimum Design Giardia Inactivation, log removal	0.75 (1.5 times higher than requirement)

Notes:

1. Weir included at Clearwell 1 and 2 location upstream of HSPS to control minimum water depth. Provision for draining contact basin will be provided.
2. Calculations based off maximum usable water depth of 20 ft.

5.9 High Service Pump Station

High Service Pump Station is designed to pump water from a new wetwell at the outlet of the treated water storage reservoir portion of the new clearwell cells to the distribution system.

The wet pit vertical turbine HSPS consists of a vertical turbine pump installed in a wet well, which is an open pit or basin that is usually filled with water. The pump is connected to a motor located above the wet well, which drives the impeller of the pump.

HSPS consists of six (6) vertical turbine pumps (5 duty, 1 standby) that provide redundancy and ensure continuous supply of finished water. The pumps each contain a capacity of 10 mgd at 194 feet of TDH. The pump station also includes a control system that monitors and regulates the pump operation to ensure efficient and reliable performance. A design summary of the pumps is presented in Table 5-12.

Table 5-12: High Service Pump Station Design Criteria

Parameter	Design Criteria	Value
Type of Pump	-	Vertical Turbine
Number of Pumps	-	5 duty, 1 standby
Design Point – Flow Rate of Each Pump	MGD/gpm	10 / 6945
Design Point – Total Dynamic Head	Feet	194
Minimum Motor Rating	Horsepower	450

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Parameter	Design Criteria	Value
Motor Drive	-	VFD
Distribution System Connection Point, Operating Pressure / HGL	Psi / Feet	70 / 535.8
Speed, Rated	Rpm	880

5.10 Backwashing

Water utilized for backwashing will be taken directly from the HSPS wet well. The backwashing process will include a variable rate protocol with air scour, followed by filter to waste to prime the filter for operation.

The flow to the backwash filters range between a high rate of 24,000 gpm and a low rate of 5,450 gpm. During normal operation, the backwash pump will operate at 24,000 gpm for high-rate flow and 15,000 gpm for low-rate flow. To meet the low-rate filter backwash requirement of 5,450 gpm, a recycle line will be used to discharge the excess flow back into the wetwell. In the event that the duty and standby backwash pumps are not available, a HSPS tie-in line with a pressure reducing valve has been included for redundancy. This allows the high service pumps to be used for backwashing.

Spent backwash water will be routed to the residuals pump station and discharged to a permitted outfall in the Ohio River. The high-rate backwash rate is specified to ensure full fluidization of both the sand and anthracite media layers. The summer rate was calculated to provide full fluidization at the historic 95th percentile water temperature. A design summary for the backwash pumps, backwash procedure, and the variable rate protocol are presented in Table 5-13 and Table 5-14.

The air wash blower will be used to supply backwash air to the dual media sand and anthracite filters. An intake air filter silencer will be provided.

Table 5-13: Backwash Sequence Design Criteria

Parameter	Summer (Water Temperature ≥15 °C)	Winter (Water Temperature <15 °C)	Ten State Standards
Backwash Protocol	Variable(Note 2)		
Low Rate, gpm/ft^2 (note 1)	5		

Parameter	Summer (Water Temperature ≥15 °C)	Winter (Water Temperature <15 °C)	Ten State Standards
High Rate, gpm/ft^2	21.2	18.7	≥15
Filter to Waste Rate, gpm/ft^2	2.0		
Air Scour Rate, scfm/ft^2	3.0		3-5
Backwash Protocol	Drain water to 6" above media surface Air Scour – 10 min Low-Rate Ramp Up with air scour – 1 min Low Rate Hold with air scour – 3 min(Note 3) Low-Rate Hold – 2 min High-Rate Ramp Up – 1 min High Rate Hold – 10 min(Note 4) High-Rate Ramp Down – 1 min ETS wash Ramp Hold – 9 min(Note 5) ETS wash Ramp Down – 1 min Filter to Waste – 15 min(Note 5)		Total Duration >15 min
Backwash Volume, gal	356,000	328,000	
Filter to Waste Volume, gal(note 6)	34,000		

Parameter	Summer (Water Temperature ≥15 °C)	Winter (Water Temperature <15 °C)	Ten State Standards

Notes:

1. Backwash volumes provided for summer and winter conditions to reflect impact of differences in water temperature on flow required to fluidize the bed.
2. Filter backwash protocol assumes simultaneous backwash of both filter cells.
3. Air scour is terminated when wash water reaches 6” below the trough invert to avoid media loss. Based on proposed filter geometry, low-rate ramp-up duration, and low-rate wash rate, 3 minutes will be allowable for the concurrent air/wash step before the air wash should be shut offline.
4. High-rate backwash step can be terminated when backwash water turbidity drops below 10 NTU. This step may be between 5-10 minutes in duration. 10 minutes included in this design to ensure enough water is allocated for backwash.
5. A short backwash period applied at a subfluidization flowrate is an effective means of displacing residual washwater from a filter box following high-rate backwash. This practice, termed extended terminal subfluidization (ETS) wash, extends the normal backwash duration for the amount of time necessary to flush the entire volume of water, both within and above the media, from a filter box (Ambergey, 2003). Extended terminal subfluidization wash reduces the turbidity peak and ripening time when a backwashed filter is returned to service, which reduces the duration of filter-to-waste required to meet a utility’s filtered water goal.
6. Filter to waste can be terminated when filtered water turbidity drops below 0.3 NTU. An optimized high-rate backwash duration and ETS wash can minimize filter to waste duration, saving spent wash water volumes and returning filters to service faster.

Table 5-14: Filter Backwash Ancillaries Design Criteria

Parameter	Value
Backwash Supply Pumps	
No. of Backwash Supply Pumps	2 (one duty, one stand-by)
Type	Vertical Turbine
Recommended Power, hp	450
Rated Speed, rpm	590
Pump Capacity (each), gpm / MGD	24,000 / 34.56
Pump Rated Head, ft	54
Backwash Supply Pump Piping	
No. of Pipelines	2
Diameter, in	36 inches
Velocity, fps	7.56
Air Scour Blowers	
No. of Blowers	2 (one duty, one shelf spare)
Type	Multi-stage centrifugal
Location	Air Wash Blower Room
Summer rated flow, inlet cfm	4,950
Discharge pressure at rated flow, psig	5.5
Secondary discharge pressure point, psig	5.8
Secondary summer flow at secondary pressure, inlet cfm	3,720
Minimum surge pressure, psig	8.3
Motor size, hp	250

Controls for air scour blower consist of following sequence: When the blower is requested to start, the blowoff motor operated valve will open and the motorized blower inlet valve will close. The automatic, open-close, blowoff valve is provided for reducing the load as the blower starts. Once the blower motor reaches full speed, the automatic air wash valve at the water filter inlet associated with the filter to be cleaned will be opened. Once the fully closed limit switches on the air wash valve are no longer making contact, the blower inlet valve will begin to open and the blowoff valve will begin to close. A manual blower inlet valve will be provided to manually adjust the inlet air flow to save power in the winter. Protection controls will be provided, including surge, overload, and high vibration. The surge protection will be from the calibrated ammeter and the trip point will automatically adjust based on inlet air temperature. Inlet air temperature will be sensed by an RTD in each blower inlet pipe. An alarm will be provided for high intake air filter differential pressure.

An inlet air filter silencer will be provided and mounted outdoors for the installed blower. The inlet filter silencer will be a cartridge type and will remove 98% of particles 10 microns and larger.

5.11 Residuals Handling

The Residuals Pump Station (RPS) will receive liquid waste from treatment processes including backwash waste and filter to waste. The RPS includes a wet well with two submersible pumps (1 duty, 1 standby), instruments, VFDs and two wet wells. The RPS will convey waste from both process areas to the Ohio River via a 24” pipe that will tie into the existing 18” outfall 001 north of the existing settling basins. A summary of the design criteria is shown below in Table 5-15.

The RPS design provides flexibility in adjusting the design and operation of the proposed system, including the number of pumps, wet well area, high water level, and pump control strategies. The current design includes one standby and one duty pump, with the lead pump operating as the primary and the standby pump serving as a backup. An alternative option is the lead/lag pump system which requires a third pump to serve as standby, increasing the cost of the pump station. This involves the lead pump operating at a higher capacity, while the lag pump operates at a lower capacity and can take over as lead pump if demand increases or lead pump failure occurs.

The high-water level of the RPS should be below the filter washwater drain, which drives the depth of the RPS lower.

The RPS will consist of a reinforced concrete structure constructed at grade, with manual isolation valves and check valves below grade in an accessible valve pit. The perimeter of the wet well and valve pit will be protected by handrail. The top of the wet well will be open to atmosphere. All electrical and controls for the RPS will be located in the HSPS above flood elevation to minimize the risk of equipment failure should the area flood.

Table 5-15: Residuals Pump Station Design Criteria

Parameter	Design Criteria
Quantity	2 (1 duty, 1 standby)
Type	Submersible
Capacity	7000 gpm / 15.6 MGD
Recommended Power, hp	150
Rated Speed, rpm	592
TDH	46 Feet
VFD	Yes
Wet Well Dimensions	50' L x 50' W x 20' D
Number Of Cells	2
Storage Volume	374,000 Gallons

5.12 Chemical Systems

All chemical storage and feed systems will be replaced with the exception of coagulant where the concrete storage tanks will be reused, and the feed equipment will be replaced.

Chemical facilities and feeds associated with this design are summarized below:

- PAC – A new PAC silo and feed system will be provided and located west of the south basins. The existing PAC system will be demolished.
- Sodium Permanganate – A new feed system will be provided in a new chemical intake building west of the south basins.
- Coagulant – The existing coagulant concrete storage tanks will remain while all else will be replaced.
- Chlorine – The existing chlorine gas system will be removed, and bulk sodium hypochlorite will be provided in Post Filter Chemical Building.
- New Chemical Building consisting of:
    - Liquid Ammonium Sulfate feed system
    - Sodium hydroxide feed system
    - Fluoride feed system
    - Sodium bisulfite feed system

- Sodium Hypochlorite
- Future Corrosion Inhibitor System

The following sections will describe in detail each of the chemical facilities and systems. Figure 5-7 shows the overall location of these facilities.

Figure 5-7: Proposed Permanent Chemical Facilities

Ten State Standards requires:

- Receiving a full truck load during deliveries
- A minimum of 30 days of storage for bulk tanks
- 30-hours of supply (125% of daily volumetric requirements) for day tanks.
- For sodium hypochlorite, separate day tanks and metering pumps for unfiltered and filtered water injection points.
- Chemical storage areas shall be enclosed in dikes or curbs which will contain the volume to provide secondary containment.
- All piping for corrosive or hazardous chemicals shall be identified with labels every 10 feet and at least two labels in each room/area.

Injection points for the plant can be seen in Figure 5-8.

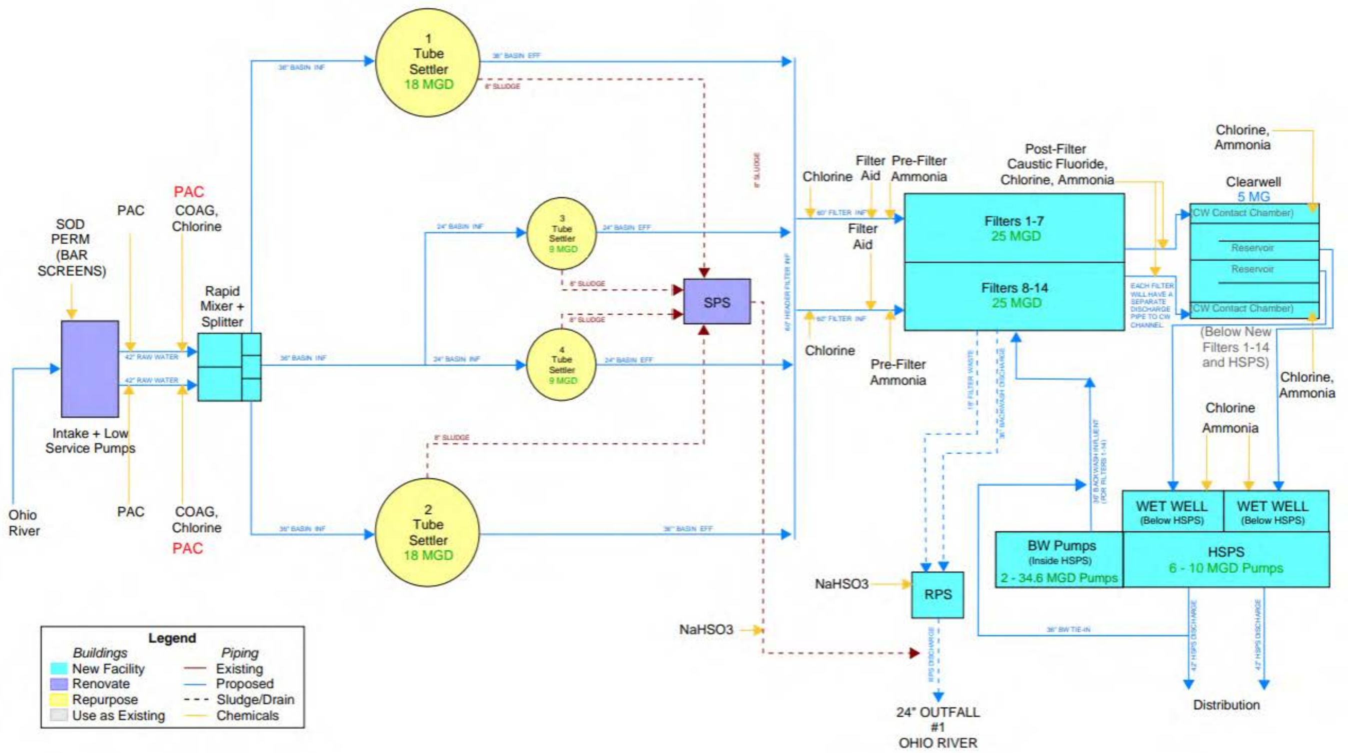

Figure 5-8: Chemical Injection Point Process Flow Diagram

5.12.1 Powder Activated Carbon

Powder activated carbon (PAC) is occasionally fed for removal of short-term organic contaminants in the river. EWSU did not feed PAC in 2016 or 2018, and it was only fed once in 2017 (received a delivery of 40,000 pounds). As such, a consistent historical use or typical dosage cannot be accurately identified.

The existing PAC system will be demolished. A new PAC silo and feed system will be located west of the South Basins, within the proposed intake chemical building. Figure 5-9 shows the location of the proposed Intake Chemical Building and Figure 5-10 shows an isometric view of the building and the PAC silo. Table 5-16 shows design criteria for the proposed PAC.

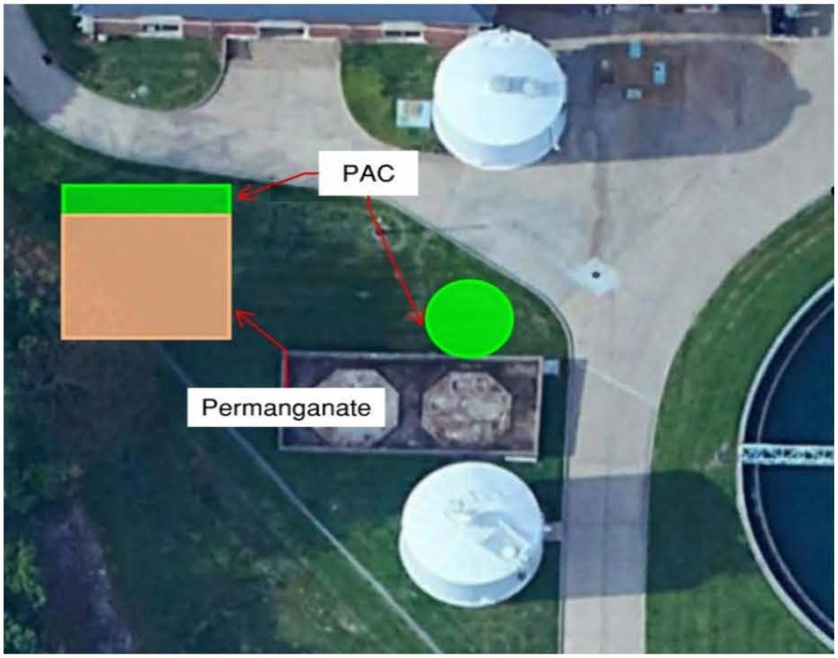

Figure 5-9: Proposed Intake Chemical Building

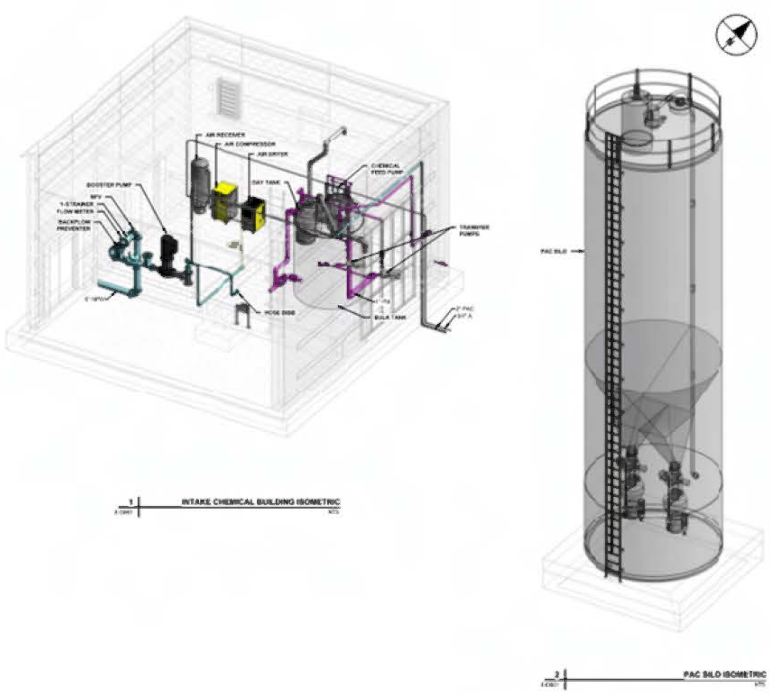

Figure 5-10: Intake Chemical Building and PAC Silo Isometric View

Table 5-16: PAC Design Criteria

Description	PAC
Proposed Average Dosage, mg/L	40.0
Average WTP Flow, MGD	37.3
Maximum WTP Flow, MGD	50
Average Usage, lbs/day	12,444
Maximum Usage, lbs/day	16,700
Number of Bulk Storage Silos (2,000 ft^3)	1
Number of Volumetric Screw Feeders	2
Note: Dosages and Sizing for Bulk Storage taken from previous 2023 design by others.	

The current dosages and feed rates shown in Table 5-16 are preliminary and representative of the overall system. Once more information is provided on the breakdown between the injection points, specific dosages and feed rates will be determined. The proposed PAC injection points are as follows:

- 42" Raw Water Main 1
- 42" Raw Water Main 2

5.12.2 Sodium Permanganate

The existing potassium permanganate system will be replaced by a sodium permanganate system that will be located on shore. Sodium permanganate is delivered as a dark purple solution (20%) and only requires basic tanks and feed pumps. Sodium permanganate is proposed to be fed to the screens in the Water Intake Building. Although use of permanganate may add the benefit of pre-oxidation and help with taste and odors, its primary use in this facility is for control of zebra mussels. Due to the reduced length of the proposed raw water mains, the detention time will be verified during the design.

Sodium permanganate will be stored at the proposed Intake Chemical Building as shown in Figure 5-11. Table 5-17 shows design criteria for sodium permanganate.

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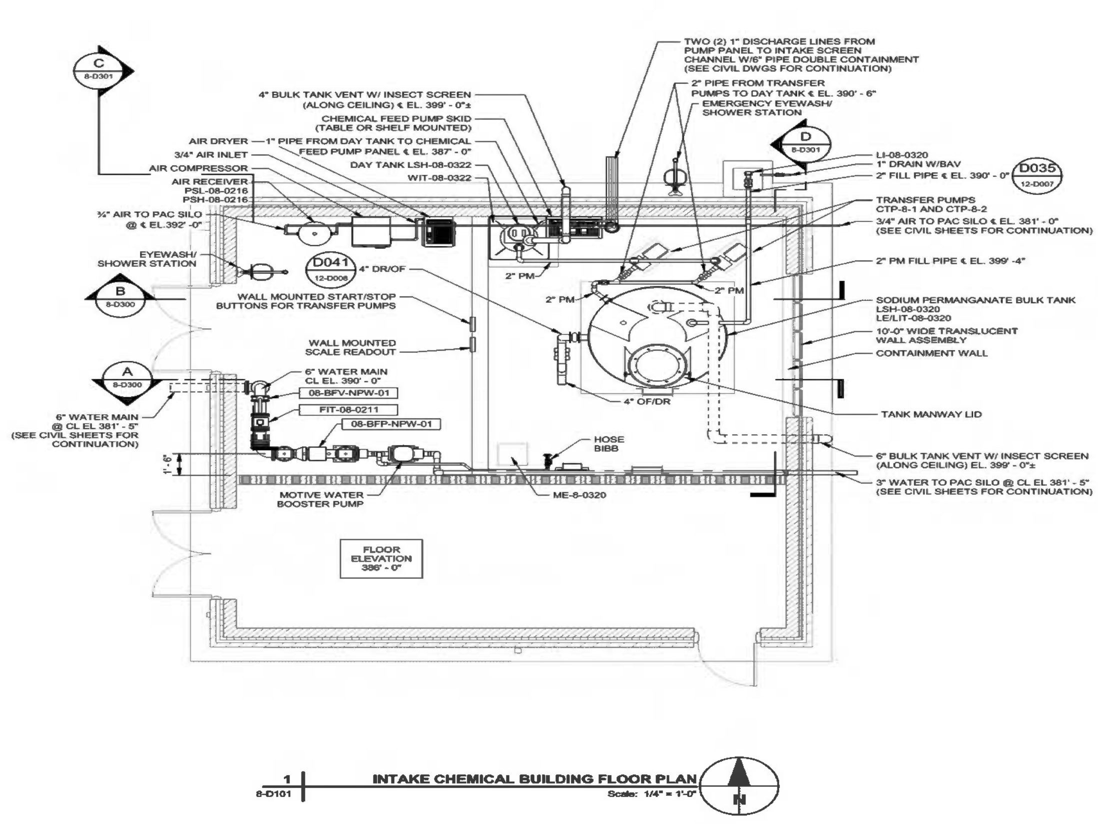

Figure 5-11: Intake Chemical Building Floor Plan

Table 5-17: Permanganate Design Criteria

Description	Sodium Permanganate ($NaMnO_4$)
Chemical Concentration, %	20
Proposed Average Dosage, mg/L	0.50
Average WTP Flow, MGD	37.3
Maximum WTP Flow, MGD	50
Average Usage, gal solution/day	75.6
Number of Bulk Storage Tanks (2,000 gal)	1
Available Storage, days (Avg. Usage)	29.2
Number of Day Tanks (80 gal)	1
Available Storage, days (Avg. Usage)	1.0
Number of Feed Pumps	3

Description	Sodium Permanganate ($NaMnO_4$)
Typical Service Flow, gallon per hour	1.0 to 4.5
Note: Working capacity of each tank is less than listed capacity above. Storage days are calculated using working capacity. Data design from 2023 by others	

The current dosages and feed rates shown in Table 5-17 are preliminary and representative of the overall system. Once more information is provided on the breakdown between the injection points, specific dosages and feed rates will be determined. The proposed sodium permanganate injection points are as follows:

- Intake Screen 1
- Intake Screen 2
- Intake Screen 3

5.12.3 Coagulant (PACl)

Since the existing coagulant was installed in 2007 and has been reported to be in good working condition, the existing feed equipment will be replaced. The existing concrete storage tanks will remain, and the chemical feed equipment will be replaced in kind. Please refer to Table 3-5 to see the full system description and feed equipment details.

The proposed coagulant injection points are as follows:

- 42” Raw Water Main 1
- 42” Raw Water Main 2
- Pre-Filters 1-7 (Filter Aid)
- Pre-Filters 8-14 (Filter Aid)

5.12.4 Sodium Hypochlorite

EWSU currently uses chlorine gas for disinfection. Due to hazards associated with chlorine gas, the disinfectant will be switched to sodium hypochlorite. Modifications to the existing Chlorine Storage Room were proposed to house the new bulk sodium hypochlorite storage and feed system.

After reviewing the existing drawings and photos, the existing Chlorine Storage Room is not supported by piles, and it is ground supported. The interior floor slab is assumed to be a floating slab-on-grade, which is supported by photos. A typical floating slab-on-grade design loading is

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300 psf where the typical loading for a bulk storage tank is 750 to 1000 psf. As for the subsurface data, the Alt & Witzig Engineering Inc. Floodwall Settlement Evaluation performed in 2010 took borings just west of the existing high service pump station. These are the closest borings available. Based on the information provided, the existing buildings (which includes the Chlorine Storage Room) appear to be built on roughly 30' of fill and the Alt & Witzig geotechnical report borings went through this 30' of fill, so it is reasonable to assume those findings are applicable to this review. Based on the geotechnical report, it recommends all new structures to be pile supported. Since the addition of bulk storage tanks greatly increases the floor slab loading, it is safe to assume piles would be needed. Because of the required depth of piles recommended and the size of equipment required to install deep piles, adding deep piles within the existing Chlorine Storage Room is not feasible or would be extremely costly. In addition, given the amount of construction required to modify this room to change its use to sodium hypochlorite storage, the building code would require that all structural elements and auxiliary systems be brought up to current code requirements. Given the age of this building (1890s) and latest seismic standards, it would be cost prohibitive to bring this building up to current code requirements. With that said, it is not recommended to renovate the existing Chlorine Storage Room to house the sodium hypochlorite storage. A bulk sodium hypochlorite (12.0%) solution, where the chemical is injected at the raw water influent, filter influent, filter effluent, Clearwell and High Service Pump Station influent for disinfection will be provided. A proposed layout of the sodium hypochlorite storage and feed room is shown in Figure 5-12 below. The sodium hypochlorite system will be provided in the new post filter chemical building.

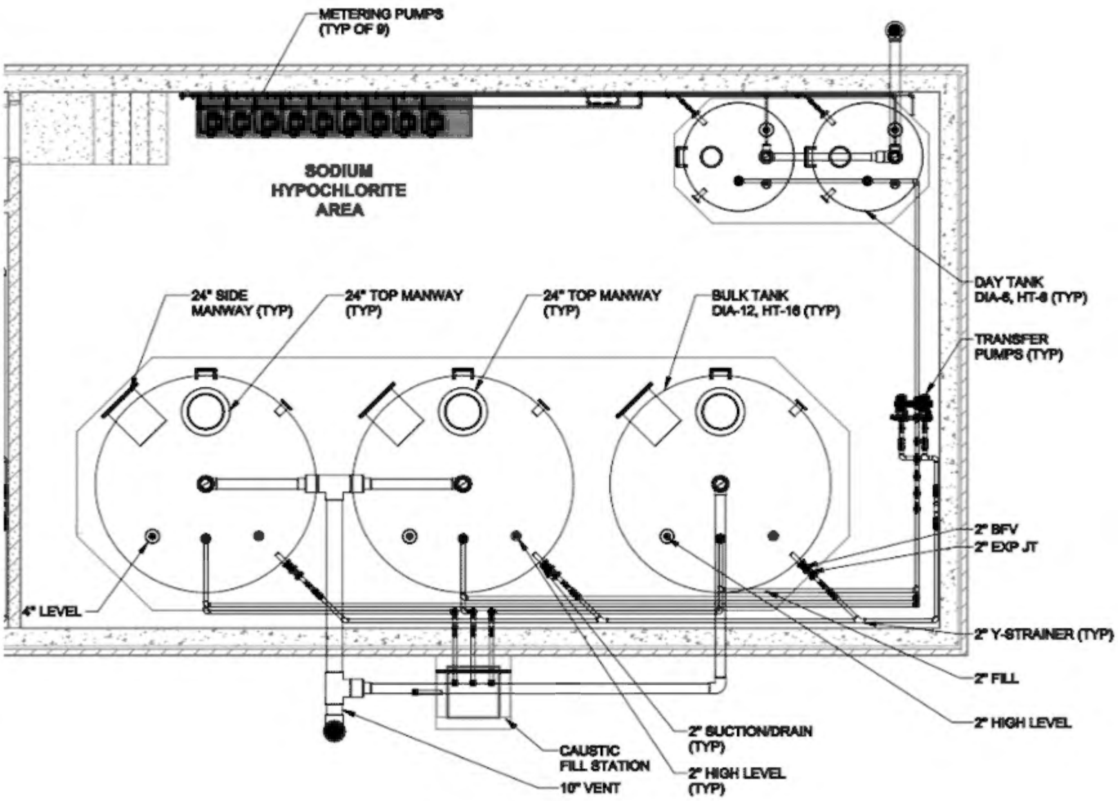

Figure 5-12: Sodium Hypochlorite Plan View

5.12.4.1 Chemical Doses

The sodium hypochlorite system will use 12.0% sodium hypochlorite. Table 5-18 summarizes the proposed minimum, average, and maximum dosages for sodium hypochlorite as calculated from previous chlorine gas chemical usage data provided by the Evansville WTP for 2023, confirmed by comparing previous years chlorine usage, and then converting to a 12% liquid sodium hypochlorite system. Dosages are in milligrams per liter (mg/L).

Table 5-18: Sodium Hypochlorite Dosages

Chemical	Min Dose (mg/L)	Avg Dose (mg/L)	Max Dose (mg/L)
Sodium Hypochlorite (NaOCl)	3.80	5.50	7.80
Note: Dosages calculated from previous plant chemical use data for Chlorine Gas for the 2023 year and verified with previous plant data.			

The sodium hypochlorite bulk storage tanks will be designed for at least 30 days of storage at average flow and average dose conditions. Table 5-19 summarizes the new bulk storage requirements for the sodium hypochlorite and the resulting days of storage provided under average plant flow usage and average dose and maximum plant flow and average dose usage.

Table 5-19: Sodium Hypochlorite Bulk Storage Design Criteria

Description	Sodium Hypochlorite (NaOCl)
Chemical Concentration, %	12
Proposed Average Dosage, mg/L	5.50
Average Plant Flow, MGD	37.3
Maximum Plant Flow, MGD	50
Dosage Ratio, gal NaOCl soln/(lbCl2)	0.90
Average Usage, gal solution/day	1,540.0
Max Flow/ Avg. Dosage, gal solution/day	2,064.0
Number of Bulk Storage Tanks (15,250 gal)	3
Available Storage, days (Avg. Usage)	29.6
Available Storage, days (Max Flow/Avg Dose)	22.1
Number of Day Tanks (Post: 1000-gal, Pre: 750 gal)	2
Available Storage (Pre-treatment), days (Avg. Usage)	1.2
Available Storage (Post-treatment), days (Avg. Usage)	1.1
Note: Storage days are calculated using working capacity.	

Fiberglass reinforced polyester (FRP) tanks were chosen for the initial design and layout, however other compatible tank materials can be used for this application such as polyethylene.

A fill station for the sodium hypochlorite will be located on the south exterior of the new Post Filter Chemical Building, where a new chemical delivery area will be constructed. The chemical delivery area will be located between the new Post Filter Chemical Building and the Filter Building. Fill piping will be routed through the building to the sodium hypochlorite room to fill the three bulk tanks. Secondary containment for the bulk storage tanks will be provided withing the sodium hypochlorite room.

5.12.4.2 Chemical Feed Rates

Chemical feed rates were calculated using Evansville WTP flows, and chemical doses shown in Table 5-18 and Table 5-19 as well as the chemical concentration. Table 5-20 summarizes the Sodium Hypoc

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hlorite chemical concentration and relevant information for the acid to calculate the chemical feed rates.

Table 5-20: Sodium Hypochlorite Chemical Feed

Description	Sodium Hypochlorite (NaOCl)
Chemical Concentration, %	12
Dosage Ratio, gal NaOCl soln/($lbCl_2$)	0.90
Minimum Dosage, mg/L	1.0
Maximum Dosage, mg/L	7.8
Number of Metering Pumps	15
Minimum Feed Rate, gal/hr	2.2
Maximum Feed Rate, gal/hr	45.3

The current dosages and feed rates shown in Table 5-20 are preliminary and representative of the overall system. Once more information is provided on the breakdown between the injection points, specific dosages and feed rates will be determined. The proposed sodium hypochlorite injection points are as follows:

- Pre-Filters 1-7
- Pre-Filters 8-14
- Post-Filters
- 42” Raw Water Main 1
- 42” Raw Water Main 2
- Clearwell 1
- Clearwell 2
- High Service Pump Wet Well 1
- High Service Pump Wet Well 2

5.12.4.3 Manufacturers and Materials of Construction

Fiberglass reinforced polyester (FRP) and polyethylene are compatible materials for sodium hypochlorite storage tanks, and polyethylene is the selected material as previously mentioned. The fill piping will be Sch 80 PVC/CPVC, which is compatible with sodium hypochlorite. Sch 80 PVC/CPVC will also be used for metering pump suction piping. For injection piping, Sch 80 PVC/CPVC will be used from the metering pumps to the injection point. Within the building, piping will be secured to the walls with brackets and from the ceilings with pipe supports that are chemically resistant.

It is Arcadis' recommendation that peristaltic metering pumps be used for this application. Metering pumps will be arranged in a duty/standby arrangement and will be sized appropriately for the usage range listed above in Figure 5-13. The pumps shall be mounted on a FRP table. Discharge piping shall be routed through the building to the injection points.

5.12.5 Liquid Ammonium Sulfate

Liquid ammonium sulfate (LAS) is used in combination with chlorine to generate monochloramines for disinfection purposes. The LAS feed system will be located at the new Chemical Building, north of the proposed filter building as shown in Figure 5-13.

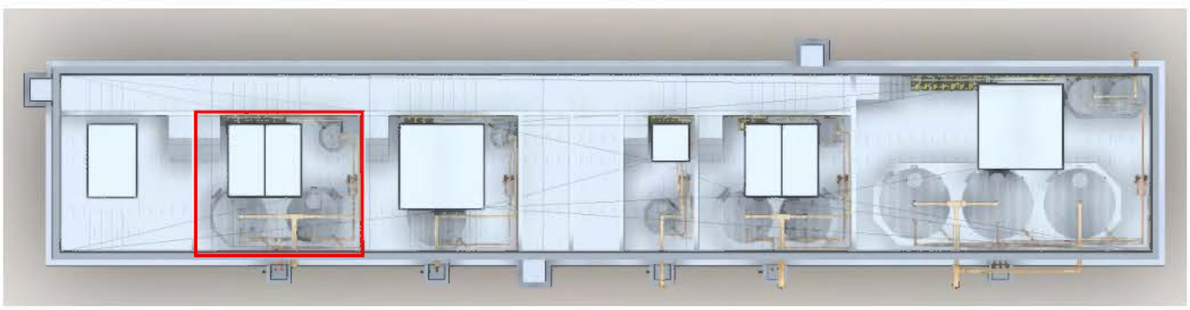

Figure 5-13: LAS Location

5.12.5.1 Chemical Doses

The Liquid Ammonium Sulfate system will use 40% LAS. Table 5-21 summarizes the proposed minimum, average, and maximum dosages for LAS at the WTP as calculated from previous aqueous ammonia chemical usages. Dosages are in milligrams per liter (mg/L).

Table 5-21: LAS Chemical Doses

Chemical	Min Dose (mg/L)	Avg Dose (mg/L)	Max Dose (mg/L)
Liquid Ammonium Sulfate, $(NH_4)_2SO_4$	0.62	0.62	1.75
Note: Dosages calculated from previous plant chemical use data for Aqueous Ammonia for the 2023 year and verified with previous plant data.			

The Liquid Ammonium Sulfate bulk storage tanks will be designed for at least 30 days of storage at average flow and average dose conditions. Table 5-22 summarizes the new bulk storage requirements for the as well as the resulting days of storage provided under average plant flow usage and average dose and maximum plant flow and average dose usage.

Table 5-22: LAS Bulk Storage Design Criteria

Description	Liquid Ammonium Sulfate, $(NH_4)_2SO_4$
Chemical Concentration, %	40
Proposed Average Dosage, mg/L	1.06
Chlorine:Ammonia ratio	5:1
Average WTP Flow, MGD	37.3
Maximum WTP Flow, MGD	50
Dosage Ratio, gal $(NH_4)_2SO_4$ soln/(lbNH_4-N)	0.95
Average Usage, gal solution/day	314.6
Max Flow/ Avg. Dosage, gal solution/day	421.6
Number of Bulk Storage Tanks (5250 gal)	2
Available Storage, days (Avg. Usage)	33.3
Available Storage, days (Max Flow/Avg Dose)	24.8
Number of Day Tanks (550 gal)	1
Available Storage, days (Avg. Usage)	1.5
Available Storage, days (Max Flow/Avg Dose)	1.1
Note: Storage days are calculated using working capacity.	

The new chemical building will have an approximate height of 18' internally so the size of the bulk storage tanks will be limited to a height of no more than 14'. A proposed layout of the LAS storage and feed room is shown in Figure 5-14. The storage tanks will be FRP or polyethylene vertical type with ultrasonic level indicators. The bulk tanks will have a molded outlet fitting that act as a combination suction/drain. The size of the bulk storage system will allow for receiving a full load during deliveries. The day tank will be approximately 550-gallons and located on a raised concrete pad to provide flooded suction to the metering pumps.

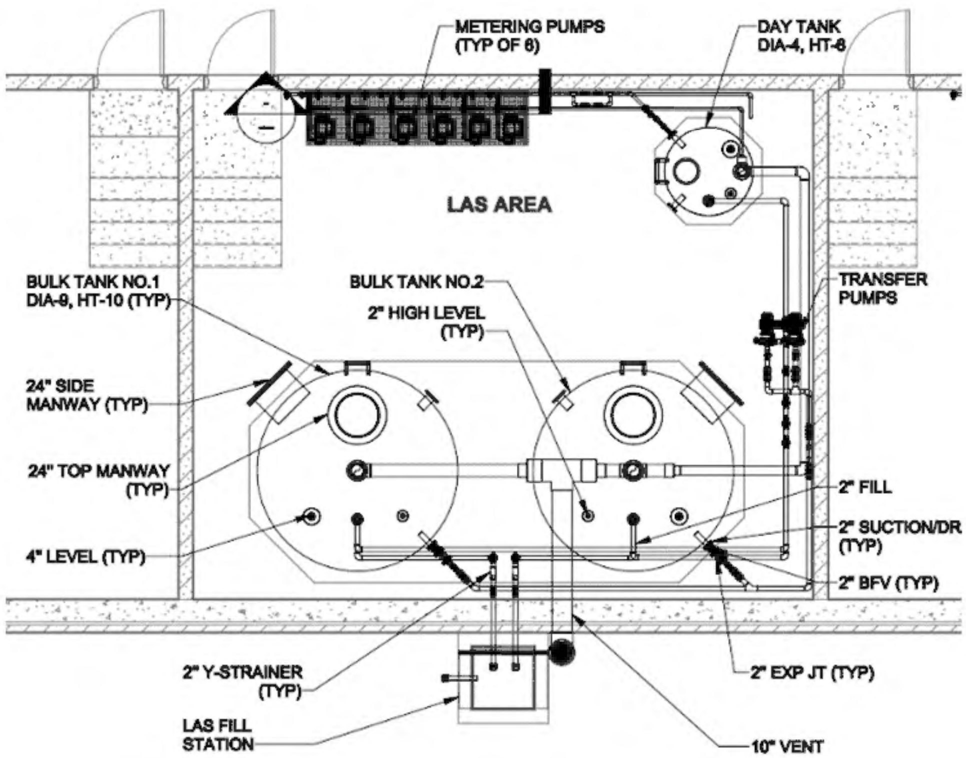

Figure 5-14: LAS Plan View

Spill containment for this chemical system will be provided in the room. An opening in the roof will be provided to install and remove bulk and day tanks for future replacement. The opening in the roof will be secured with a hatch.

A fill station for the Liquid Ammonium Sulfate will be located on the south side of the new Chemical Building, where a new chemical delivery area will be constructed. The chemical delivery area will be located between the new Chemical Building and the Filter Building. Fill piping will be routed through the building to the LAS room to fill the two bulk tanks.

5.12.5.2 Chemical Feed Rates

Chemical feed rates were calculated using Evansville WTP flows, and chemical doses shown in Table 5-22 as well as the chemical concentration. Table 5-23 summarizes the Liquid Ammonium Sulfate chemical concentration and relevant information for the acid to calculate the chemical feed rates.

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Table 5-23: LAS Chemical Feed Calculations

Description	Liquid Ammonium Sulfate, $(NH_4)_2SO_4$
Chemical Concentration, %	40
Minimum Dosage, mg/L	0.62
Maximum Dosage, mg/L	1.75
Dosage Ratio, gal $(NH_4)_2SO_4$ soln/(lb NH_4-N)	0.95
Number of Metering Pumps	12
Minimum Feed Rate, gal/hr	2.9
Maximum Feed Rate, gal/hr	29.0

The current dosages and feed rates shown in Table 5-23 are preliminary and representative of the overall system. Once more information is provided on the breakdown between the injection points, specific dosages and feed rates will be determined. The proposed LAS injection points are as follows:

- Pre-Filters 1-7
- Pre-Filters 8-14
- Post-Filters 1-7
- Post Filter 8-14
- Clearwell 1
- Clearwell 2
- High Service Pump Station Wet Well 1
- High Service Pump Station Wet Well 2

5.12.5.3 Manufacturers and Materials of Construction

Fiberglass reinforced polyester (FRP) and polyethylene are compatible materials for ammonium sulfate storage tanks, and polyethylene is the selected material as previously mentioned. The fill piping will be Sch 80 PVC/CPVC, which is compatible with Liquid Ammonium Sulfate. Sch 80 PVC/CPVC will also be used for metering pump suction piping. For injection piping, Sch 80 PVC/CPVC will be used from the metering pumps to the injection point. Within the building, piping will be secured to the walls with brackets and from the ceilings with pipe supports that are chemically resistant.

Peristaltic metering pumps will be used for this application. Metering pumps will be arranged in a duty/standby arrangement and will be sized appropriately for the usage range listed above in Table 5-23. The pumps shall be mounted on a FRP table. Discharge piping shall be routed through the building to the injection points.

5.12.6 Sodium Hydroxide (Caustic)

Sodium hydroxide or caustic is used in water treatment for pH adjustment and is currently used to adjust the pH of finished water to be between 7.8 and 8.0. The addition of chlorine gas depresses pH while sodium hypochlorite raises pH. The sodium hydroxide feed system will be located at the new Chemical Building, north of the proposed filter building as shown in Figure 5-15.

Figure 5-15: Caustic Location

5.12.6.1 Chemical Doses

The caustic system will use 50% Sodium Hydroxide. As mentioned previously in the existing chemicals section, the plant currently uses 25% Sodium Hydroxide for caustic applications but has requested that 50% Caustic be used for the new chemical system. Table 5-24 summarizes the proposed minimum, average, and maximum dosages for sodium hydroxide at the WTP as calculated from previous plant chemical usages from 2023, confirmed with data from 2021 and 2022, then converted from 25% to 50% Caustic. Dosages are in milligrams per liter (mg/L).

Table 5-24: Sodium Hydroxide Chemical Doses

Chemical	Min Dose (mg/L)	Avg Dose (mg/L)	Max Dose (mg/L)
Sodium Hydroxide (NaOH)	4.83	7.45	11.52
Note: From plant chemical usage data of 25% Sodium Hydroxide converted to 50% estimated usages.			

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The Caustic bulk storage tanks will be designed for at least 30 days of storage at average flow and average dose conditions. Table 5-25 summarizes the new bulk storage requirements for the caustic as well as the resulting days of storage provided under average plant flow usage and average dose and also maximum plant flow and average dose usage.

Table 5-25: Sodium Hydroxide Bulk Storage Tank Design Criteria

Description	Sodium Hydroxide (NaOH)
Chemical Concentration, %	50
Proposed Average Dosage, mg/L	7.45
Average Plant Flow, MGD	37.3
Maximum Plant Flow, MGD	50.00
Average Usage, gal solution/day	363.2
Max Flow/ Avg. Dosage, gal solution/day	486.9
Number of Bulk Storage Tanks (6500 gal)	2
Available Storage, days (Avg. Usage)	34.0
Available Storage, days (Max Flow/Avg Dose)	25.4
Number of Day Tanks (750 gal)	1
Available Storage, days (Avg. Usage)	1.8
Available Storage, days (Max Flow/Avg Dose)	1.4
Note: Working capacity of each tank is less than listed capacity above. Storage days are calculated using working capacity.	

The new Chemical Building will have an approximate height of 18’ internally so the size of the bulk storage tanks will be limited to a height of no more than 14’. The storage tanks will be fiberglass reinforced polyester (FRP) vertical type with ultrasonic level indicators. The 6,500-gallon bulk tanks will have a molded outlet fitting that act as a combination suction/drain. Two tanks allow for receiving a full load during deliveries. The day tank will be approximately 750-gallons and located on a raised concrete pad to provide flooded suction to the metering pumps. The proposed layout is shown in Figure 5-16.

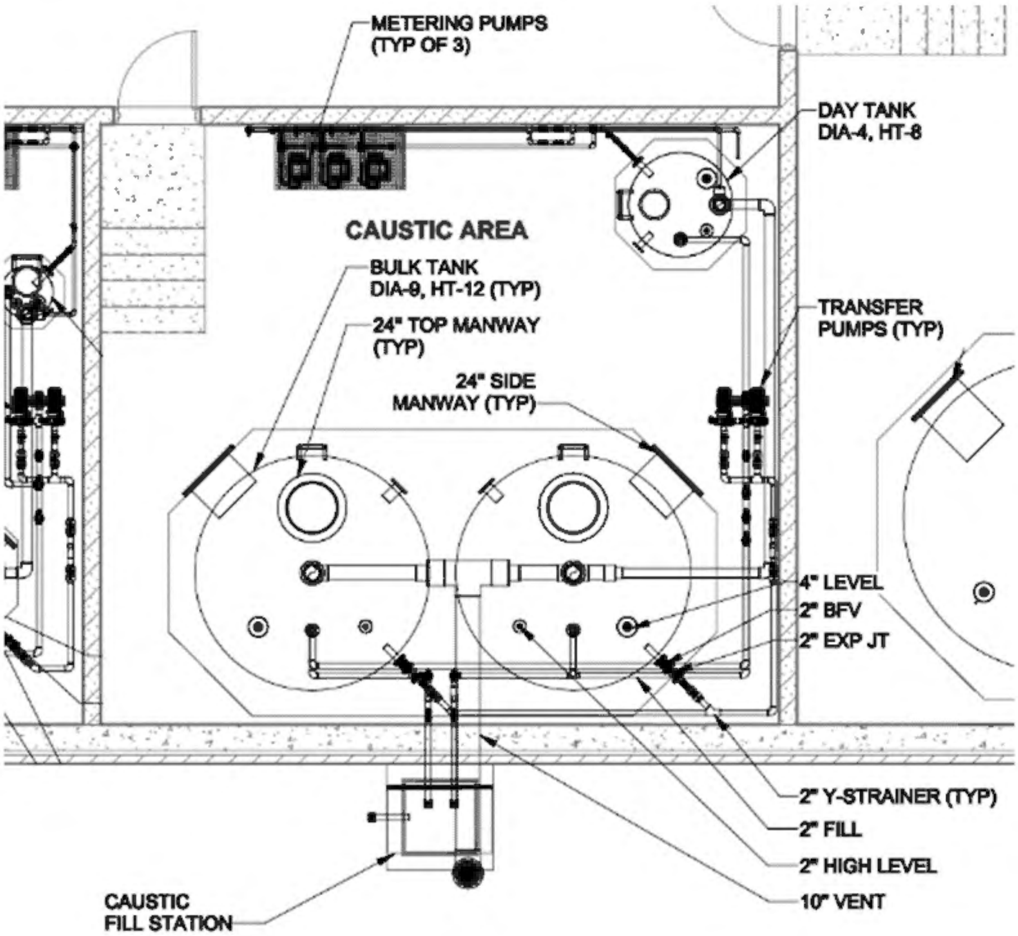

Figure 5-16: Caustic Plan View

Spill containment for this chemical system will be provided in the room. An opening in the roof will be provided to install and remove bulk and day tanks for future replacement. The opening in the roof will be equipped with a hatch.

A fill station for the Sodium Hydroxide will be located on the south side of the new Chemical Building, where a new chemical delivery area will be constructed. The chemical delivery area will be located between the new Chemical Building and the Filter Building. Fill piping will be routed through the building to the Caustic room to fill the two bulk tanks.

5.12.6.2 Chemical Feed Rates

Chemical feed rates were calculated using EWSU WTP flows, and chemical doses shown in Table 5-25 and Table 5-26 as well as the chemical concentration. Table 5-26 summarizes the Sodium Hydroxide chemical concentration and relevant information to calculate the chemical feed rates.

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Table 5-26: Sodium Hydroxide Chemical Feed Calculations

Description	Sodium Hydroxide (NaOH)
Chemical Concentration, %	50
Minimum Dosage, mg/L	4.83
Maximum Dosage, mg/L	11.52
Number of Metering Pumps	3
Minimum Feed Rate, gal/hr	3.7
Maximum Feed Rate, gal/hr	31.4

The current dosage and feed rates shown in Table 5-26 are preliminary. The proposed caustic injection point is as follows:

- Post-Filters

5.12.6.3 Manufacturers and Materials of Construction

Carbon steel, fiberglass reinforced polyester (FRP) and special rated cross-linked polyethylene are compatible materials for caustic storage tanks, and FRP is the selected material as previously mentioned. The fill piping will be Sch 80 CPVC, which is compatible with 50% Sodium Hydroxide. Sch 80 CPVC will also be used for metering pump suction piping. For injection piping, Sch 80 CPVC will be used from the metering pumps to the injection point. Within the building, piping will be secured to the walls with brackets and from the ceilings with pipe supports that are chemically resistant.

It is Arcadis' recommendation that peristaltic metering pumps be used for this application. Metering pumps will be arranged in a duty/standby arrangement and will be sized appropriately for the usage range listed above in Table 5-26. The pumps shall be mounted on a FRP table. Discharge piping shall be routed through the building to the injection points.

5.12.7 Fluoride

Fluoride is applied in water treatment plants to reduce tooth decay. The fluoride feed system will be located at the new Chemical Building, north of the proposed filter building as shown in Figure 5-17.

Figure 5-17: Fluoride Location

5.12.7.1 Chemical Doses

The fluoride system will use 23% Hydrofluosilicic acid. Table 5-27 summarizes the proposed minimum, average, and maximum dosages for fluoride at the WTP as calculated from previous plant chemical usages and chemical concentration. Dosages are in milligrams per liter (mg/L).

Table 5-27: Fluoride Dosages

Chemical	Min Dose (mg/L)	Avg Dose (mg/L)	Max Dose (mg/L)
Fluoride (Hydrofluosilicic Acid, H2SiF6)	0.36	0.44	0.55
Note: Average dose based on U.S. Department of Health and Human Services recommendations.			

The Fluoride bulk storage will be designed for at least 30 days of storage at average flow and average dose conditions. Table 5-28 summarizes the new bulk storage requirements for the fluoride system and the resulting days of storage provided under average plant flow usage and average dose and maximum plant flow and average dose usage.

Table 5-28: Fluoride Bulk Storage Design Criteria

Description	Fluoride (Hydrofluosilicic Acid, H2SiF6)
Chemical Concentration, %	23
Proposed Average Dosage, mg/L	0.44
Average WTP Flow, MGD	37.3
Maximum WTP Flow, MGD	50
Dosage Ratio, gal H2SiF6 soln/lbF-	0.54
Average Usage, gal solution/day	73.3

Description	Fluoride (Hydrofluosilicic Acid, H_2SiF_6)
Max Flow/ Avg. Dosage, gal solution/day	73.3
Number of Bulk Storage Tanks (6500 gal)	1
Available Storage, days (Avg. Usage)	76.8
Available Storage, days (Max Flow/Avg Dose)	57.3
Number of Day Tanks (250 gal)	1
Available Storage, days (Avg. Usage)	2.6
Available Storage, days (Avg. Usage)	2.0
Note: Working capacity of each tank is less than listed capacity above. Storage days are calculated using working capacity.	

The new Chemical Building will have an approximate height of 18' internally so the size of the bulk storage tanks will be limited to a height of no more than 14'. The storage tanks will be polyethylene vertical type with ultrasonic level indicators. The 6,500-gallon bulk tank will have a molded outlet fitting that act as a combination suction/drain. The size of the bulk storage will allow for receiving a full load during deliveries. The day tank will be approximately 250-gallons and located on a raised concrete pad to provide flooded suction to the metering pumps. The proposed layout is shown in Figure 5-18.

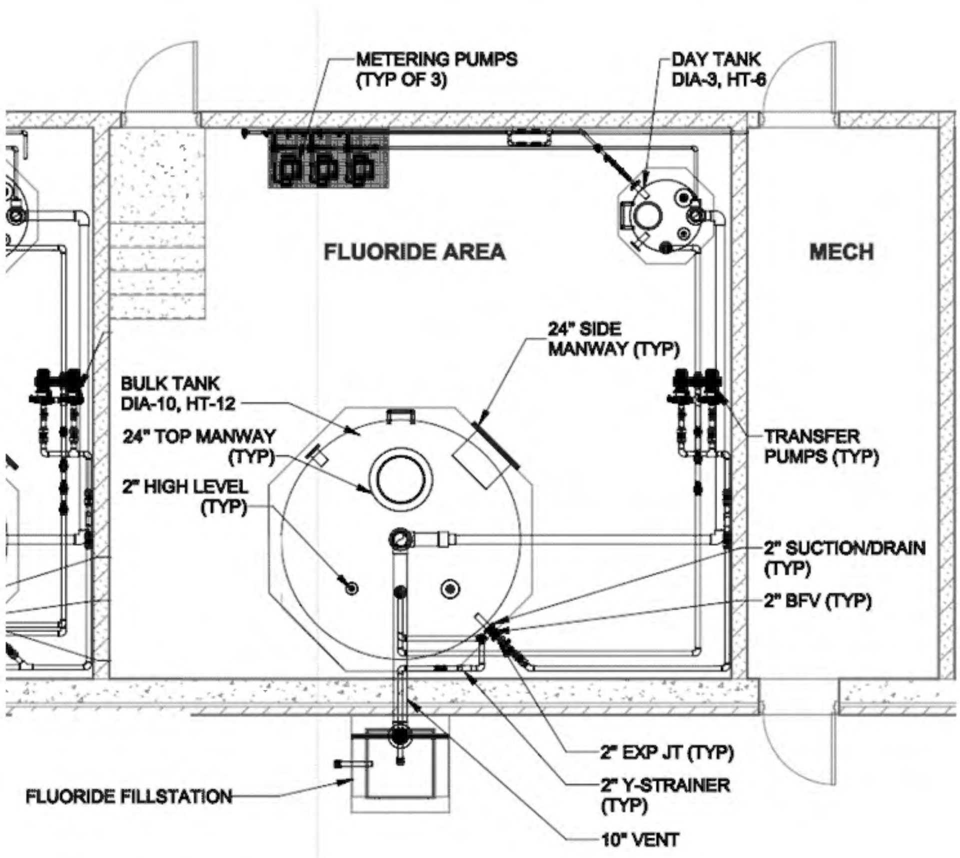

Figure 5-18: Fluoride Plan View

Spill containment for this chemical system will be provided in the room. An opening in the roof will be provided to install and remove bulk and day tanks for future replacement. The opening in the roof will be secured with a hatch.

A fill station for the Fluoride system will be located on the south side of the new chemical building, where a new chemical delivery area will be constructed. The chemical delivery area will be located between the new chemical building and the filter building. Fill piping will be routed through the building to the Fluoride room to fill the two bulk tanks.

5.12.7.2 Chemical Feed Rates

Chemical feed rates were calculated using EWSU WTP flows, and chemical doses shown in Table 5-27 and Table 5-28 as well as the chemical concentration. Table 5-29 summarizes the Fluoride chemical concentration and relevant information to calculate the chemical feed rates.

Table 5-29: Fluoride Chemical Feed Calculations

Description	Fluoride (Hydrofluosilicic Acid, H2SiF6)
Chemical Concentration, %	23
Minimum Dosage, mg/L	0.36
Maximum Dosage, mg/L	0.55
Dosage Ratio, gal H2SiF6 soln/lbF-	0.54
Number of Metering Pumps	3
Minimum Feed Rate, gal/hr	0.9
Maximum Feed Rate, gal/hr	2.6

The current dosage and feed rates shown in Table 5-29 are preliminary. The proposed Fluoride injection point is as follows:

- Post-Filters

5.12.7.3 Manufacturers and Materials of Construction

Fiberglass reinforced polyester (FRP) with a special liner, and polyethylene are compatible materials for Hydrofluosilicic acid storage tanks with polyethylene being recommended. The fill piping will be Sch 80 PVC/CPVC, which is compatible with Hydrofluosilicic acid. Sch 80 PVC/CPVC will also be used for metering pump suction piping. For injection piping, Sch 80 PVC/CPVC will be used from the metering pumps to the injection point. Within the building, piping will be secured to the walls with brackets and from the ceilings with pipe supports that are chemically resistant.

It is Arcadis' recommendation that peristaltic metering pumps be used for this application. Metering pumps will be arranged in a duty/standby arrangement and will be sized appropriately for the usage range listed above in Table 5-29. The pumps shall be mounted on a FRP table. Discharge piping shall be routed through the building to the Fluoride room.

5.12.8 Sodium Bisulfite

Sodium bisulfite is used in water treatment for dechlorination of residual chlorine in the residual waste stream to discharge to the Ohio River. The sodium bisulfite feed system will be located at the new Chemical Building, north of the proposed filter building as shown in Figure 5-19.

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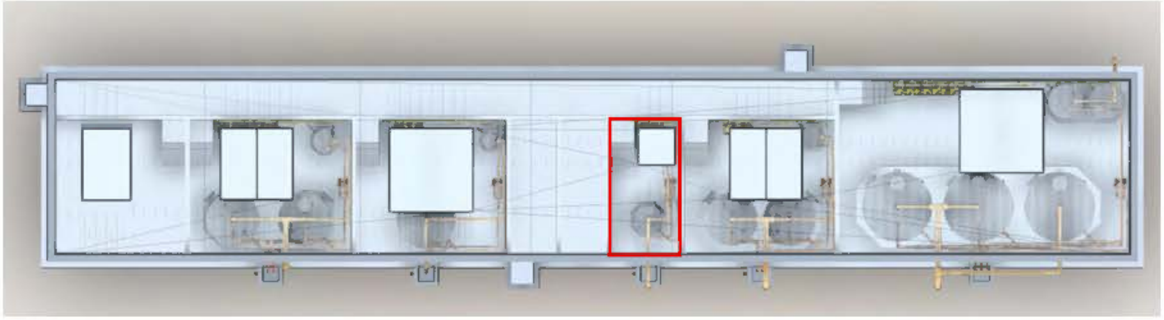

Figure 5-19: Sodium Bisulfite Location

5.12.8.1 Chemical Doses

The sodium bisulfite system will use 38% by weight Sodium Bisulfite. Table 5-30 summarizes the proposed minimum, average, and maximum dosages for sodium bisulfite at the WTP as calculated from previous plant chemical usages and chemical concentration. Dosages are in milligrams per liter (mg/L).

Table 5-30: Sodium Bisulfite Dosages

Chemical	Min Dose (mg/L)	Avg Dose (mg/L)	Max Dose (mg/L)
Sodium Bisulfite	0.65	4.89	7.82
Note: Dosages calculated from previous plant chemical use data for Sulfur Dioxide and converted to estimated usage of Sodium Bisulfite.			

The sodium bisulfite bulk storage tanks will be designed for at least 30 days of storage at average flow and average dose conditions. Table 5-31 summarizes the new bulk storage requirements for the sodium bisulfite system as well as the resulting days of storage provided under average plant flow usage and average dose and maximum plant flow and average dose usage.

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Table 5-31: Sodium Bisulfite Design Criteria

Description	Sodium Bisulfite
Chemical Concentration, %	38
Proposed Average Dosage, mg/L	4.89
Average Backwash Flow, MGD	1.70
Maximum Backwash Flow, MGD	5.00
Mass Dosage Ratio, mg NaHSO3/mg Cl2	1.46
Average Usage, gal solution/day	16.8
Max Flow/ Avg. Dosage, gal solution/day	49.5
Number of Bulk Storage Tanks (850 gal)	1
Available Storage, days (Avg. Usage)	45.6
Available Storage, days (Max Flow/Avg Dose)	15.5
Number of Day Tanks (60 gal)	1
Available Storage, days (Avg. Usage)	2.2
Available Storage, days (Max Flow/Avg Dose)	0.8
Note: Working capacity of each tank is less than listed capacity above. Storage days are calculated using working capacity.	

The storage tanks will be polyethylene vertical type with ultrasonic level indicators. The bulk tanks will have a molded outlet fitting that act as a combination suction/drain. Two bulk tanks are provided for redundancy. The total capacity of the bulk storage system does not allow for a full load during deliveries. The day tank will be approximately 60-gallons and located on a raised concrete pad to provide flooded suction to the metering pumps. The proposed layout is shown in Figure 5-20.

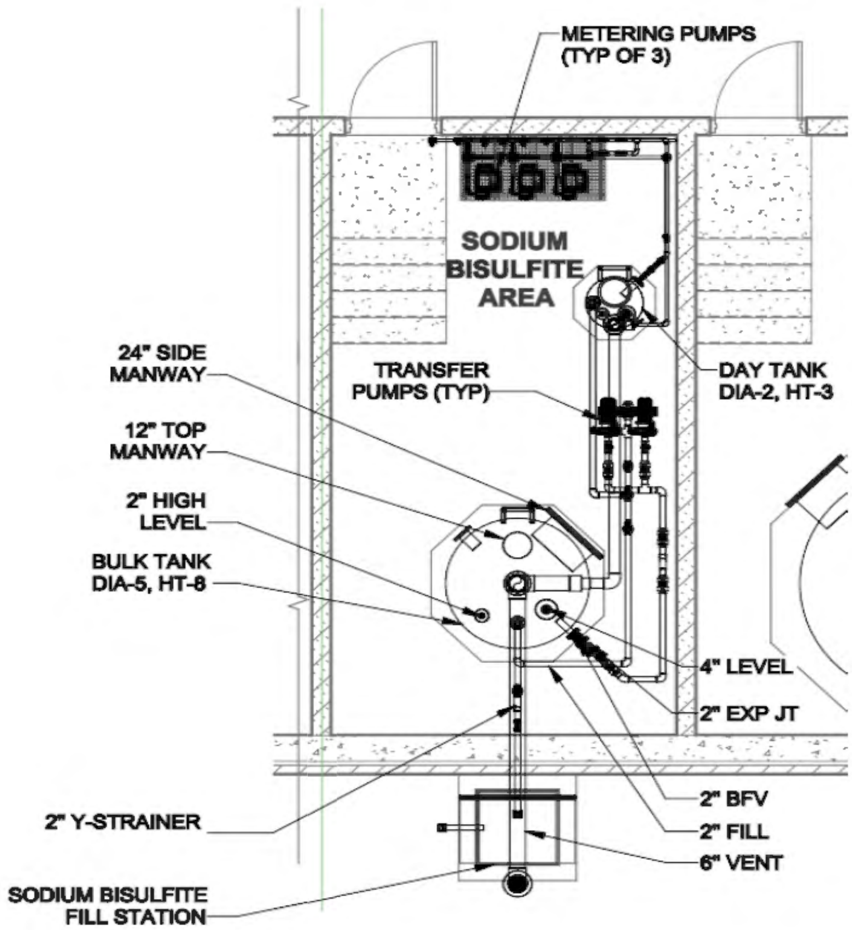

Figure 5-20: Sodium Bisulfite Layout

Spill containment for this chemical system will be provided in the room. An opening in the roof will be provided to install and remove bulk and day tanks for future replacement. The opening in the roof will be secured with a hatch.

A fill station for the sodium bisulfite system will be located on the east side of the new chemical building, where a new chemical delivery area will be constructed. The chemical delivery area will be located between the new chemical building and the filter building. Fill piping will be routed through the building to the Fluoride room to fill the two bulk tanks.

5.12.8.2 Chemical Feed Rates

Chemical feed rates were calculated using EWSU WTP flows, and chemical doses shown in Table 5-30 and Table 5-31 as well as the chemical concentration. Table 5-32 summarizes the sodium bisulfite chemical concentration and relevant information to calculate the chemical feed rates.

Table 5-32: Sodium Bisulfite Chemical Feed Calculations

Description	Sodium Bisulfite
Chemical Concentration, %	38
Minimum Dosage, mg/L	0.6
Maximum Dosage, mg/L	7.8
Mass Dosage Ratio, mg NaHSO3/mg Cl2	1.46
Number of Metering Pumps	3
Minimum Feed Rate, gal/hr	0.03
Maximum Feed Rate, gal/hr	3.3

The current dosages and feed rates shown in Table 5-32 are preliminary and representative of the overall system. Once more information is provided on the breakdown between the injection points, specific dosages and feed rates will be determined. The proposed sodium bisulfite injection points are as follows:

- Residuals Pump Station Discharge
- Solids Pump Station Discharge

5.12.8.3 Manufacturers and Materials of Construction

Fiberglass reinforced polyester (FRP) and polyethylene are compatible materials for sodium bisulfite storage tanks, and polyethylene is the selected material as previously mentioned. The instrumnfill piping will be Sch 80 PVC/CPVC, which is compatible with sodium bisulfite. Sch 80 PVC/CPVC will also be used for metering pump suction piping. For injection piping, Sch 80 PVC/CPVC will be used from the metering pumps to the injection point. Within the building, piping will be secured to the walls with brackets and from the ceilings with pipe supports that are chemically resistant.

It is Arcadis' recommendation that peristaltic metering pumps be used for this application, however if an alternative is preferred by the City of Evansville, further discussion can be had. Metering pumps will be arranged in a duty/standby arrangement and will be sized appropriately for the usage range listed above in Table 5-32. The pumps shall be mounted on a FRP table. Discharge piping shall be routed through the building to the injection points.

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5.12.9 Corrosion Inhibitor

A corrosion inhibitor may be required for future compliance with the Lead & Copper Rule. Modifications to the WTP will include leaving space in the new Chemical Building for a corrosion inhibitor chemical system, as shown in Figure 5-21.

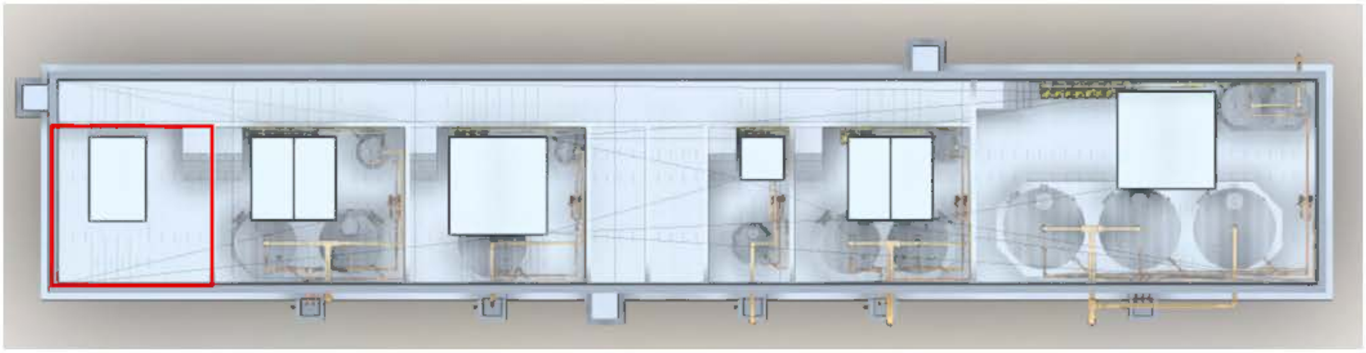

Figure 5-21: Corrosion Inhibitor Location

When any long-term change in water treatment is submitted to the State, the State may require any such water system to conduct additional monitoring or to take other actions the State deems appropriate to ensure that such water system maintains minimal levels of corrosion control in its distribution system. This additional action can include but is not limited to the addition of a new treatment process or modification of an existing treatment process. Long-term changes can also include dose changes to existing inhibitor concentration. A study desktop review of CCT is currently underway to determine the needs for a corrosion inhibitor chemical feed system at the Evansville Water Treatment Plant.

In order to account for the need for a future corrosion inhibitor chemical system, an additional future chemical room is provided in the new Post Filter Chemical Building layout, seen in Figure 5-22. To size the room accordingly for a future system, assumptions were made, and 75% phosphoric acid was used to size a hypothetical corrosion inhibitor chemical feed system based on an estimated average dose of 2.0 mg/L of anti-scalent and average plant flow of 37.3 MGD. The size of the room is large enough to accommodate an exterior chemical fill station, two 6 foot diameter bulk tanks, one small day tank, transfer pumps, metering pumps, and the necessary piping for the corrosion inhibitor system.

5.12.10 Filter Chemical Building Truck Unloading Area

The unloading area for the five chemical systems will be outside and adjacent to the new chemical building. The unloading area will be designed to allow one-way traffic flow for delivery trucks. A separate fill station will be provided for each chemical system. Each fill pipe will be provided with a locking cap and signage above. A small containment “sink” will be constructed for each chemical like Figure 5-22 shown below.

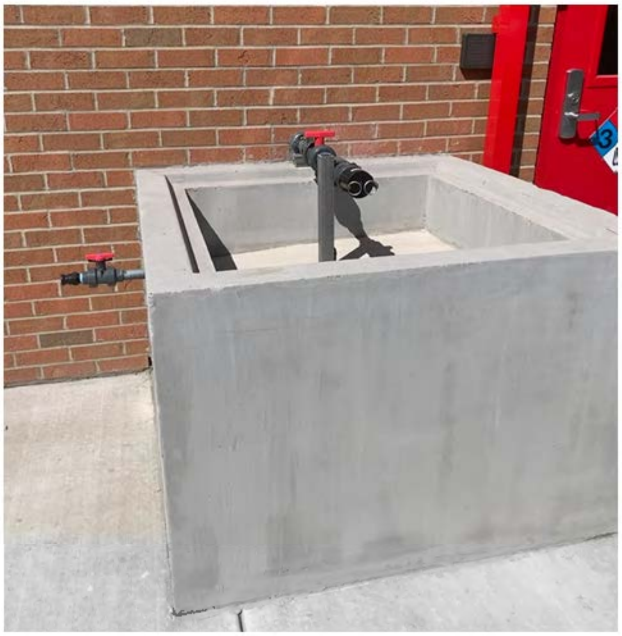

Figure 5-22: Example Chemical Fill Station

The unloading area will be sized to park two tanker trucks on and capture a full truck load of chemical plus a 25-year storm event. Piping and valving will be provided to discharge normal storm water captured to storm/sanitary piping. During chemical unloading, valves will be closed to isolate any chemical spills that would be pumped out for hazardous waste disposal.

5.13 Primary and Secondary Disinfection

As specified in Table 3-11, 0.5 log inactivation of *Giardia* and 2.0 log inactivation of viruses is required for primary disinfection. Disinfection credit, or CT is calculated as shown in Equation 1.

Equation 1

$$CT\left(\frac{mg * min}{L}\right) = Disinfectant\ residual\left(\frac{mg}{L}\right)x\ Total\ Detention\ Time\ (min)\ x\ Bafflin$$

Where:

- Disinfectant residual (mg/L) is the lowest residual chlorine concentration at the outlet of the reactor;
- Total detention time (min) is the time process water spends in the reactor (Reactor volume divided by flow rate); and
- Baffling factor is a measure of the flow characteristics through the reactor. A BF ranges from 0.1 to 1.0, 0.1 is indicative of no baffling (such as a tank with common inlet/outlet,

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leading to considerable short-circuiting) and 1.0 is indicative of perfect plug flow (such as a pipeline).

CT values for free chlorine are influenced by the disinfectant residual, pH, and temperature, where the lowest disinfectant residual, lowest water temperature, and highest pH result in worst-case conditions, or the highest CT requirements. The USEPA Disinfection Profiling and Benchmarking Guidance Manual (DPBGM) outlines the CT required to achieve the log removal values under these various conditions. A segmented disinfection model was utilized, which includes empirical formulas developed from the CT tables within the USEPA DPBGM to evaluate various water quality conditions and determine feasible disinfection strategies for the proposed plant configuration.

Primary disinfection will be primarily achieved using free chlorine and then converted to chloramines to minimize DBP formation potential. CT credit will also be available due to contact time with chloramines. There are three available segments to achieve the minimum level of disinfection required, including the following:

- Settled water pipeline
- Filter boxes
- Clearwell contact basin

The volume in the finished water reservoir will not be used to claim CT. Table 5-33 presents the segments available for disinfection in the proposed design, their assumed baffling factors (BF), associated volumes, residual disinfectant type, and the modelled pH used in the analysis.

Table 5-33: Segmented Disinfection Calculation Model Inputs

Segment	BF (Note 1)	Water Depth (ft)	Volume (gal)	Residual (Note 2)	pH (s.u.)	Temperature, deg C
Pipeline to Filters	0.9	NA	69,033 (Note 3)	Free Chlorine	7.90 (Note 4)	1.0 (Note 6)
Filter Box	0.5	6	284,918 (Note 3)	Free Chlorine	8.10 (Note 5)	
Clearwell Contact Basin	0.5	Max: 20 Min: 10	Max: 1,316,241 Min: 658,120 (Note 7)	Free Chlorine or Chloramines, depending on season		

Notes:

1. The BFs were assumed using conservative estimates to facilitate the permitting process.
2. This value reflects the type of residual (free chlorine or chloramine) that is required to achieve the adequate disinfection.
3. The volume of the pipelines and water above the filters (with one filter offline) are fixed.
4. Since high pH conditions drive CT requirements, the modeled pH in the pipeline represents the 90th percentile raw water pH. Because the proposed new design uses sodium hypochlorite and not chlorine gas, the slight pH suppression observed in the secondary settling basin of the existing plant is not expected to remain. The PACl dose is assumed to not be sufficient to suppress pH of the raw given the high alkalinity of the water (raw water average alkalinity = 88 mg/L as $CaCO_3$).
5. The modelled pH of the clearwell contact basin reflects the 95th percentile of the existing plant finished water, which would be achieved after sodium hydroxide addition, in the combined filter effluent channel.
6. Calculations were conducted at 5th percentile historical finished water temperature.
7. The smaller of the two volumes of the two clearwell contact basins was assumed.

An analysis was performed to determine the plant flows that could be treated while achieving the minimum required level of disinfection with an inactivation ratio of at least 1.5 (i.e., at least 1.5 times the minimum required CT is always achieved) under various temperatures. The results are presented in Table 5-34. These calculations were completed at a conservative clearwell depth of 10 feet.

Table 5-34: Various CT Strategies at a Clearwell Water Depth of 10 ft

Flow Rate (MGD)	Temp (°C) (Note 2)	Settled Water Pipeline	Filter Box	Clearwell First Pass Contact Basin (Note 1)
50 (design) (Note 2)	>12.7	<3.0 mg/L free chlorine	<3.0 mg/L free chlorine	3.0 mg/L chloramine
32 (current peak day) (Note 3)	>6	<3.0 mg/L free chlorine	<3.0 mg/L free chlorine	3.0 mg/L chloramine
24 (current avg) (Note 4)	>1.5	<3.0 mg/L free chlorine	<3.0 mg/L free chlorine	3.0 mg/L chloramine
	>4	<2.5 mg/L free chlorine	<2.5 mg/L free chlorine	3.0 mg/L chloramine

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Notes:

1. The existing chloramine residual at the effluent of the plant is typically greater than 3.0 mg/L to achieve secondary disinfection throughout the distribution system. This residual was used for all alternatives for conservatism.
2. As temperature increases, the free chlorine residual required in the settled water pipeline and filter box to achieve CT decreases.
3. At design flows and temperatures above 12.7 degrees C, primary disinfection can be achieved using free chlorine in the settled water pipeline and the filter box, and chloramines in the first pass of the contact basin within the clearwells. At temperatures below 12.7 degrees C (which likely will not co-occur), free chlorine would be required in the first pass of the contactor basin to achieve CT.
4. At the current peak day flowrate of 32 mgd and temperatures above 6 degrees C, primary disinfection can be achieved using free chlorine in the settled water pipeline and the filter box, and chloramines in the first pass of the contact basin within the clearwells. At temperatures below 6 degrees C (which likely will not co-occur), free chlorine would be required in the first pass of the contactor basin to achieve CT.
5. At the current average day flowrate of 24 mgd and temperatures above 1.5 degrees C, primary disinfection can be achieved using free chlorine in the settled water pipeline and the filter box, and chloramines in the first pass of the contact basin within the clearwells. At historical 5th percentile temperature of 4 degrees C, the free chlorine residual in the first two segments could be decreased to 2.5 mg/L.

The various disinfection approaches are also displayed graphically on Figure 5-23 at the minimum and maximum clearwell depth. All operational scenarios to the left of the line would require chloramines in the first pass of the Clearwell to achieve the target inactivation ratio of 1.5, whereas all scenarios to the right of the line would require free chlorine.

Under most operational conditions, free chlorine will be established in the pipeline to the filter gallery, maintained in the filter box, and then finished water chloramine concentrations will be formed prior to the chlorine contact basin portion of the clearwell and maintained in the storage reservoir portion of the clearwell prior to distribution to achieve the minimum amount of disinfection credit required. At high flows and low water temperatures, free chlorine will be maintained in the chlorine contact basin portion of the clearwell to meet minimum disinfection requirements. In general, the target free chlorine concentration will be adjusted based on water temperature and flow.

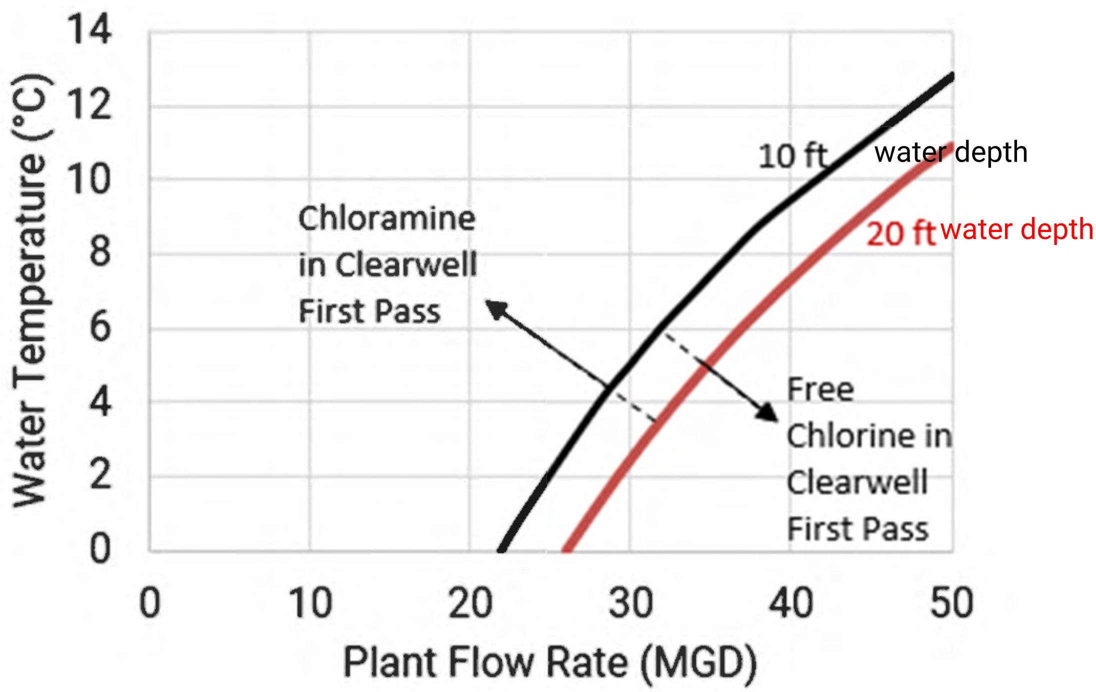

Figure 5-23: CT Strategies at Various Plant Flows, Temperatures and Clearwell Depths

This analysis shows that adequate disinfection can be achieved under all scenarios. The design primary disinfection strategy will be to maintain free chlorine in the pipeline and filter box, adjusting the free chlorine residual to respond to flow and temperature conditions, and maintain a target minimum chlorine residual in the clearwell of 3 mg/L at the high service pump station. When free chlorine residual is required in the first pass of the clearwell due to plant flows and temperatures, the optional ammonia feed points at the entrance to the reservoir will be utilized.

6.0 Discipline Design Criteria

6.1 Civil/Site

The codes, standards, and references listed below will serve as the basis for civil-site design.

- Evansville Water & Sewer Utility, Water and Sewer Manual
- Evansville City Engineer Standard Detail Drawings
- Vanderburgh County Drainage Ordinance
- Vanderburgh County Technical Memorandum 1
- Stormwater Pollution Prevention Plan Requirements

6.1.1 Site Demolition

Existing structure and utility demolition will be accomplished with two approaches:

- Shallow at grade structures or piping: Complete removal of equipment, structures, ductbanks, and piping including at grade slab foundations
- Below grade basins/reservoirs: Removal of all equipment, plugging of buried piping with concrete, cutting and removal of concrete structures to a minimum of 5 feet below grade, and backfilling with job excavated material and restoration of grade to combine with the surrounding area.

For existing structures where adjacent buildings are removed, the remaining exposed building faces will be treated as described in the Architectural section below.

6.1.2 Yard Piping

Proposed yard piping will consist of the following:

- Ductile iron pipe with mechanical restraints for raw water, settling basin influent and effluent, filter influent, residuals, washwater drain, and filter to waste systems
- Spiral weld steel piping for raw water piping on the bridge walkway at the Intake Pump Station
- Storm sewers shall be reinforced concrete or HDPE.
- Yard chemical piping will consist of oversized carrier pipes with room for multiple chemical tubing pipes.

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6.1.3 Fencing and Access Gates

New perimeter fencing will be provided around the proposed facilities on the east side of Waterworks Road (i.e., filter/clearwell/HSPS, chemical building, residuals pump station). Perimeter fencing will be galvanized chain link with 3-strand barbed wire top similar to existing fencing at the WTP.

New access gates will be provided at the chemical delivery drive entrance on Shawnee Drive and exit on Waterworks Road. Access gates will be complete with motorized gates, intercom, and security cameras similar to existing entrance gates at the WTP.

6.2 Architectural

6.2.1 General

This Section describes the basis of architectural design for the new filter building, post chemical filter building and repairs after the demolition of the existing filter buildings, clearwell, and settling basins.

After demolition of the existing filter buildings and clearwell, the remaining existing structures will be patched and repaired to like new condition with materials that match or coordinate with the existing adjacent materials and finishes to provide a complete water and weather tight enclosure of remaining existing structures. New aluminum doors and windows will be installed where existing wall openings are exposed by the demolition to be exterior openings. Concrete stoops, stairs, and sidewalks will be installed to tie in flush with existing sidewalks and grading at newly exposed doors and passageways.

6.2.2 Applicable Codes and Standards

The architectural design of the new building will conform to the following codes:

- 2012 International Building Code (with 2014 Indiana Building Code amendments)
- 2006 International Plumbing Code (with 2012 Indiana Plumbing Code amendments)
- 2005 NFPA 70 National Electrical Code (With 2005 Indiana Electrical Code amendments)
- 2012 International Mechanical Code (with 2014 Indiana Mechanical Code amendments)
- 2007 ANSI/ASHRAE 90.1 Energy Standard for Buildings (with 2010 Indiana Energy Conservation Code amendments)
- 2012 International Fire Code (with 2014 Indiana Fire Code amendments)

The new building will conform to the following requirements in Table 6-1from the 2012 International Building Code:

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Table 6-1: Filter Building

Building Code Analysis	
Occupancy	Group F-2
Construction Type	II-B
Allowable Area	23,000 ft^2 per story
Allowable Height	55 FT, 3 Stories
Fire Separation Distance	Greater than or equal to 10 ft plus separation distance required by adjacent building (IBC Table 602) or rated exterior walls
Design Occupant Load	100 gross ft^2/person
Means of Egress	2 minimum or maximum 75 ft travel distance
Fire Suppression	N/A
Accessibility	N/A (IBC 1103.2.9)

6.2.3 Architectural Design Considerations

The architectural design for the Filter Building will follow the exterior aesthetics of the existing filter building onsite. The building will be two-story above grade, consisting of at grade access to the filter pipe gallery, HSPS pump room, chemical unloading area, and chemical buildings, whereas the second floor will include the HSPS motors and electrical panels and controls, and the filter operating floor. The height will be approximately 34 ft high and two interior stair wells are planned for roof access.

6.2.4 Architectural Building Components

Exterior walls adjacent to occupiable spaces will be masonry cavity walls consisting of 8-inch CMU with a 4-in brick veneer. The cavity walls will allow space for 2.5-inches of rigid insulation and an air gap. The overall height of the walls will be approximately 34 ft to accommodate a 42" parapet for fall protection. The top of the parapet walls will be protected with a prefinished aluminum coping.

Exterior walls at water containing spaces will be cast in place concrete with an architectural formliner relief design cast into the concrete walls.

Roof construction will consist of tapered rigid insulation with white, single-ply thermoplastic polyolefin (TPO) membrane over structural metal deck and open web joists. Roof drainage will be achieved through scuppers/downspouts. A lower roof over the clearwell water channels will be constructed in the same manner.

Interior walls will be single-wythe CMU construction for durability. The interior surfaces of CMU will be painted. Aluminum storefront and glazing will provide separation and visibility into the

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filter basin areas. No ceilings are planned for interior rooms, which will remain open to concrete deck above.

The concrete floors throughout the building will be protected with a clear floor sealer finish. The exterior concrete slab around the Filter Building will be protected with a fluid applied deck coating for water proofing.

All exterior and interior personnel doors will be aluminum construction, except exterior doors at grade or below will be flood proof steel doors. Overhead coiling doors will be insulated aluminum construction. Panic hardware will be used where required for emergency egress.

The new post filter chemical building will conform to the following occupancy requirements in Table 6-2 from the 2012 International Building Code.

Table 6-2: Post Filter Chemical Building

Building Code Analysis	
Occupancy	Group H-4
Construction Type	II-B
Allowable Area	17,500 PER STORY (H-4)
Allowable Height	55 FT, 3 Stories (H-4)
Fire Separation Distance	Greater than or equal to 10 FT plus separation distance required by adjacent building (IBC Table 602) or rated exterior walls
Design Occupant Load	300 gross ft^2/person
Means of Egress	2 minimum or maximum 75 FT travel distance
Fire Suppression	N/A
Accessibility	N/A (IBC 1103.2.9)

The architectural design for the Chemical Building will follow the exterior aesthetics of the proposed filter building. Roof construction will consist of tapered rigid insulation with single-ply thermoplastic polyolefin (TPO) membrane over structural hollow core concrete planks. Roof drainage will be achieved through scuppers / downspouts. All exterior doors will be flood proof steel doors. Interior walls will be 8" CMU to separate the chemical areas and a common corridor will be provided to access each chemical area. All interior doors from the corridor to the chemical rooms will be FRP doors and will not require flood resistance since the corridor is protected from flooding.

6.3 Structural / Geotechnical

6.3.1 Scope

This section describes the basis of structural design associated with Evansville Water and Sewer Utility Water Treatment Plant Improvements.

6.3.2 Applicable Codes and Standards

The codes, standards, and references listed below will serve as the basis for structural design.

- International Building Code (IBC), 2012 Edition (as amended by Indiana Building Code, 2014)
- ASCE 7-10: Minimum Design Loads for Buildings and Structures.
- Geotechnical Investigation Report (future).
- ACI 318-11: Building Code Requirements for Structural Concrete.
- ACI 350-20: Code Requirements for Environmental Engineering Concrete Structures and Commentary ACI 350R-20.
- ACI 350.3-20: Seismic Design of Liquid Containing Structures and Commentary ACI 350.3R-20.
- ACI 530-11: Building Code Requirements for Masonry Structures.
- Aluminum Design Manual, 2010 Edition.
- AISC Manual of Steel Construction, 14th Edition.
- AISC 360: Specification for Structural Steel Buildings 2010.
- PCI MNL 120-10: PCI Design Handbook, Precast and Prestressed Concrete, 7th Edition.
- US Army Corps of Engineers (USACE) Engineering Manual (EM) 1110-2-2100, Stability Analysis of Concrete Structures.

6.3.3 Specified Material Properties

Table 6-3: Concrete

Parameter	Design Criteria
Cast-in-Place Structural Concrete	
Flatwork, mortar puddle, and drilled piers:	F’c = 4000 psi
Environmental Structures:	F’c = 4500 psi
Other Structures:	F’c = 4500 psi

Prestressed/precast Structural Concrete:	F'c = 5000 psi
Nonstructural Concrete (Concrete fill, duct banks, pipe blocking, pipe encasement):	F'c = 3000 psi

Table 6-4: Concrete and Masonry Reinforcement

Parameter	Design Criteria
Reinforcing Bars (ASTM A615 or ASTM A706)	fy = 60000 psi
Welded Wire Mesh (ASTM A1064)	fy= 70000 psi

Table 6-5: Masonry

Parameter	Design Criteria
Masonry Unit Assembly	f'm = 2500 psi

Table 6-6: Structural Steel

Parameter	Design Criteria
W and WT shapes (ASTM A992, Grade 50)	fy = 50000 psi
M, S, C and MC shapes (ASTM A36)	fy = 36000 psi
Angles, bars, plates, and other structural shapes (ASTM A36):	fy = 36000 psi
HP shapes (ASTM A572, Grade 50):	fy = 50000 psi
Pipe sections (ASTM A53, Type E or S, Grade B):	fy = 35000 psi
Round Structural Tube sections (ASTM A500, Grade C):	fy = 45000 psi
Square and Rectangular Tube sections (ASTM A500, Grade C):	fy = 50000 psi
Welded materials (ANSI/AWS D1.1, Table 3.1), using E70XX filler metal with minimum tensile strength:	Fw = 70 ksi
High strength bolts (ASTM F3125, Grade A325, Type 1 or Grade F1852 Twist-Off/TC, Type 1), tensile strength:	Fu = 120 ksi

6.3.4 Loading Criteria

Dead load will include the weight of all permanent construction including roofs, walls, floors, partitions, interior finishes, fixed equipment, tanks and bins including contents, equipment bases, pipes, HVAC ducting, and electrical lighting. Dead load criteria are indicated below in Table 6-7. Roof construction will include an additional allowance of 15 psf for the suspended loads not specifically itemized.

Table 6-7: Dead Load Criteria

Parameter	Design Criteria
Equipment, Tanks, Silos, etc. =	Actual weights
Pipe, 12-inch diameter and smaller =	25 psf over full member length
{Pipe, 14-inch diameter and larger =	Actual weights
Phantom Load =	2 kips on primary beams, 1 kip on secondary beams, 300 lbs on steel joists
Concrete (normal weight) =	150 psf
Roofing and rigid insulation board =	Actual, 15 psf (minimum)
HVAC Ductwork (general)	5 psf
Lighting (general)	3 psf

Table 6-8: Live Load Criteria

Parameter	Design Criteria
First Floor/slab-on-grade (ADM) =	100 psf
Corridors at First floor =	100 psf
Floors above First floor (ADM) =	80 psf
Laboratory spaced (ADM) =	100 psf
Stairways =	100 psf
Mechanical and Electrical Rooms =	150 psf
Slab-on-grade (Process areas) =	300 psf
Mezzanines and access platforms =	100 psf
Catwalks and maintenance platforms =	40 psf
Light storage =	125 psf
Process equipment =	Operating weight of individual equipment
Filter Building gallery Slab =	675 psf (allowance for stacked media replacement)
Roof Live Load =	20 psf (no reduction taken)
HS-20/Service Loads for Truck Wheels =	8000 lbs (front axle) and 32000 lbs (each rear axle)

Table 6-9: Snow Load Criteria

Parameter	Design Criteria
Minimum Ground Snow Load =	20 psf
Terrain Category	C
Importance Factor =	1.1
Exposure Factor, Ce =	1.0
Thermal Factor, Ct =	1.0

Table 6-10: Wind Load Criteria

Parameter	Design Criteria
Risk Category	III
Ultimate Wind Speed =	120 mph
Nominal Wind Speed =	93 mph
Exposure Category	C

Table 6-11: Seismic Load Criteria

Parameter	Design Criteria
Ss =	0.57
S1 =	0.2
Site Class	F
Risk Category	III
Seismic Design Category	D

6.3.5 FEMA NFIP Flood Elevations

100-yr flood for site (Zone AE): EL 364.00 ft (note that the projected site grade will be above this flood elevation, with projected water levels within the site's granular materials at approximately matching elevations that will be verified with the geotechnical engineer).

Below grade structures will be designed to resist buoyant hydrostatic forces from groundwater and flood level water within the soils. This hydrostatic force results in inward lateral pressures plus upward "buoyant uplift forces on structure base slabs.

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6.3.6 Other Load Considerations

Building structures, components, and cladding will be designed in accordance with the load combinations contained in IBC, Section 1605 or ASCE 7. Reinforced concrete for non-environmental structures will be designed using the load combinations in ACI 318, Section 9.2. Reinforced concrete for environmental structures will be designed using load combinations in ACI 350, Section 9.2.

6.3.7 Geotechnical Findings (CTL Engineering)

6.3.8 Systems for Each Structure

The facility includes multiple structures ranging from closed tanks for the residuals pump station (RPS), filter building (FTB), clearwell (CLR), chemical building, and a high service pump station (HPS). The structure for each will be tailored to suit the actives and/or process intended. The following provides a brief overview of each structure's proposed design.

- RPS –Combination of below grade-level containment sump areas, plus at-grade access. Above the grade -level slab, a pump control structure will consist of concrete bearing wall supporting a precast hollow-core slab roof structure.
- FTB, CLR, HSPS – Combination of deep-structure clear well tank with top slab (CLR) plus adjoining "stacked" filter structure with piping galleries and backwash flume-channels. Roof structure is anticipated to include precast framing (precast double tees spanning the longer areas, hollow-core sab spanning the center filter gallery.) For the framing supports of the stacked "filter over clearwell" and the "roof over filter", concrete moment frame construction will provide vertical and lateral supports. Filter tank structure walls will be supported upon clearwell structure via "divider-baffle walls" plus column piers and concrete beams where stacked framing does not continue to base. The HPS is planned to include overhead bridge cranes for maintenance access and repair-replacement of process equipment. Cranes will be hung from the roof structure that is designed for load support. Preliminary crane capacity is estimated at 2.5 T lifted load, with specific requirements, along with remaining crane parameters (range for pick-points, vertical hook height for lifted loads), to be determined in the final design phase.
- Chemical Building – The chemical building will be designed to resist a flood condition up to EL 384.00. To resist the flood conditions, exterior walls will be cast-in-place concrete. The building will rest on a cast-in-place concrete mat foundation supported by drilled shafts, which will resist buoyancy during flood conditions. Floor elevation in the corridor will be set around EL 370.00 to match the same elevation as the filter and HSPS, and the chemical areas will be recessed to EL 367.00 to provide spill containment. The roof will consist of 12" precast plank with a flat roof. Skylights will be provided in the roof to facilitate bulk tank removal.

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6.4 Mechanical (Building Systems)

This section presents the criteria and basis of mechanical design associated with the plumbing, heating, ventilating, and air conditioning (HVAC) and fire protection systems. The intent of this section is to define the design criteria, establish the minimum design requirements, and describe the mechanical systems. The selection of the systems will be based on operating performance, system efficiency, life safety considerations, long-term durability, redundancy, local representation/service, ease of operation as well as site and specific requirements identified by the project team or Owner as described herein.

6.4.1 Applicable Codes and Standards

The mechanical building systems design will conform to the referenced versions of the following building codes:

- 2014 Indiana Building Code, based on the International Building Code (IBC), 2012
- 2014 Indiana Mechanical Code, based on the International Mechanical Code (IMC), 2012
- 2012 Indiana Plumbing Code, based on the International Plumbing Code (IPC), 2006
- International Fire Code (IFC), 2012
- 2014 Indiana Fuel Gas Code, based on the International Fuel Gas Code (IFGC), 2012
- 2010 Indiana Energy Conservation Code, based on ASHRAE Standard 90.1, 2007

In addition to the applicable building codes and standards identified above the system designs will also be based on but not limited to the following publications and standards:

- American Society of Plumbing Engineers (ASPE) Handbooks.
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Handbooks and Standards.
- Sheet Metal and Air Conditioning Contractor National Association (SMACNA) Handbooks.
- National Fire Protection Association Recommended Practices (NFPA) and Manuals.
- Occupational Safety and Health Act (OSHA) Standards Manual.

6.4.2 Location and Meteorological Design Criteria

Table 6-12 describes the design criteria that will be used for the building mechanical systems

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Table 6-12: Location and Meteorological Design Criteria

CRITERIA	VALUE
Weather Station Site Elevation, above sea level, ft	400
Weather Station Site Location[(a)]	
Evansville, IN, USA	
North Latitude, degrees	38.044
West Longitude, degrees	87.521
Ambient Design Temperatures [(b)]	
Winter, design dry bulb, F	8.3
Summer, design dry bulb/mean coincident wet bulb, F	93.7/75.8
Summer, design wet bulb, F	79.1
Dehumidification, design dew point, F	76.1
Climate Zone	4A
Climate Data	
Mean Daily Dry Bulb Temperature Range, F	17.2

[(a)] The site location is for determining representative weather data for the project site but is not necessarily the specific project location.

[(b)] The winter and summer design temperatures are based on the ASHRAE frequency levels 99.6 percent and 0.4 percent, respectively.

6.4.3 Materials

Materials will be selected giving preference to those materials that require the least maintenance and have the longest life. Ductwork materials will not require painting. These are summarized in Table 6-13.

Table 6-13: Mechanical Systems Materials

SYSTEM	MATERIALS
Sanitary Drainage Systems	PVC, Cast Iron
Water Systems	Type K Copper DR 9 HDPE (2” and larger)
Plumbing Fixtures	Stainless Steel, or Composites
Ductwork	Galvanized steel (clean, dry areas) Aluminum (humid areas) Fiberglass reinforced plastic (corrosive area exhaust)

6.4.4 Seismic

The seismic design will comply with the "Seismic Design Requirements for Nonstructural Components" of the latest edition of American Society of Civil Engineers Standard ASCE/SEI 7, "Minimum Design Loads for Buildings and Other Structures".

6.4.5 Building Design Requirements

6.4.5.1 Plumbing Design

The following is a description of the plumbing systems serving the areas of the facility.

6.4.5.2 Storm Drainage Systems

Primary and secondary roof drainage systems will be provided for all flat roofed areas of the new Filter Building /High Service Pump Station under the architectural design. The primary systems will consist of scuppers and downspouts which will discharge above grade to splash blocks and to a below grade storm drainage system as necessary to prevent a nuisance.

6.4.5.3 Sanitary Drainage Systems

General floor drainage will be provided in the Pipe Gallery, Blower Room, Operating Level and High Service Pump Room of the new Filter Building/High Service Pump Station. Funnel receptors will be located adjacent to equipment with equipment drains. Where practical, receptors will be located to serve multiple equipment drains. Drains will be provided at overhead doors to collect any water off vehicles or wind driven rain that enters the building when the door is open. Drainage in the Pipe Gallery will consist of gutters containing floor drains adjacent to water-backed walls with the drainage piped to sumps as described below.

All floor drains, bell-up drains, and plumbing fixtures connected to the sanitary drainage system will be provided with traps and vents. Where individual vents cannot be provided for each trap due to physical constraints, a combination waste and vent system will be utilized for floor drains and funnel receptor drains. All other drains will be individually vented. Piping materials will be cast iron soil pipe with hubless or bell and spigot joints for above grade locations and bell and spigot joints for below grade locations. PVC DWV piping can be used as a secondary option.

All plumbing fixtures and floor drains located on the floor at or above grade will discharge by gravity to the plant sanitary sewer. Below grade floors of the new Filter Building/High Service Pump Station will drain to sumps with duplex submersible type sewage pumps. The sump pumps will discharge to the sanitary sewer system.

6.4.5.4 Water Piping Systems

Potable water from the finished water pump system will be supplied to the domestic water fixtures. The anticipated water pressure is between 59 and 74 psig, therefore water pressure boosting equipment and pressure reducing stations will not be required. Water metering equipment will be provided on the building water service. Piping materials will consist of soft annealed copper tubing with flared fittings for buried sizes 2" and smaller and type K hard drawn copper tubing with solder joint fittings for pipe sizes less than 2" and DR 9 HDPE for pipe sizes 2" and larger for above grade piping.

All materials in contact with the potable water will comply with the Safe Drinking Water Act of 1986 as amended by the Reduction of Lead in Drinking Water Act of 2011. All plumbing fittings and fixtures intended to convey or dispense water for human consumption will comply with the requirements of NSF/ANSI 61 and NSF/ANSI 372 for low lead.

Protection of the potable water system will be in accordance with local codes or standards. Reduced pressure principle backflow preventers will be provided on the water supply to a non-potable water system serving the hose faucets.

Hose faucets will be provided in areas that may require periodic washdown. Frostproof wall hydrants will be provided at intervals around the exterior of the structures.

Potable hot and cold water will be provided to service sinks in the Pump Room and Pipe Gallery.

6.4.5.5 Plumbing Fixtures

Plumbing fixtures will be selected for durability and ease of maintenance and housekeeping. Plumbing fixtures accessible to the disabled are not required.

Service sinks will be provided in the Pump Room and Pipe Gallery and will be free-standing stainless steel utility type. Hot water will be provided by point-of-use instantaneous electric water heaters.

Water heaters located downstream from a backflow prevention device will be protected by use of an expansion tank.

6.4.5.6 Emergency Eyewash / Shower Stations

Emergency eyewash and shower stations will be provided where required near chemical storage and feed facilities. Indoor and outdoor units will be provided with tempered water and flow switches for monitoring. Outdoor eyewash and shower stations will be provided with heat tracing and insulation systems for freeze protection.

6.4.5.7 Heating, Ventilation, and Air Conditioning

The following is a description of the HVAC systems that will be included on the project.

6.4.5.8 Indoor Design Conditions

Table 6-14 describes the indoor design conditions that will be used for the design of the HVAC system.

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Table 6-14: Indoor Design Conditions

Area	Design Temperatures (F) [1]			Ventilation requirements	Ventilation notes
	SUMMER	WINTER			
	DESIGN	DESIGN	SETPOINT		
New Filter Building					
Pipe Gallery	104	60	55	DH	3
Air Scour Blower Rm	104	60	55	6 AC/HR (I)	1
Stairs	104	60	55	6 AC/HR (I)	1
Filter Rooms	104	60	55	1 CFM/ ft^2 (C)	2
Operating Level	104	60	55	6 AC/HR (I)	1
New High Service Pump Station					
Pump Room	104	60	55	6 AC/HR (I)	1
Motor / Electrical Rm	80	60	55	AC	3

[1] Indoor conditions reflect operating temperatures for personnel comfort, code/standard recommendations, or equipment protection.

AC/HR - designates air changes per hour.

AC – designates the space is air conditioned and ventilation is for occupancy.

DH – designates the space is de-humidified and ventilation is for occupancy.

(C) - designates the ventilation system operates continuously.

(I) - designates the ventilation system operates intermittently.

Notes:

1. The ventilation system will be sized on the more restrictive of the AC/HR listed or the airflow required to maintain the indoor design temperature based on the summer outside design temperature.
2. Additional intermittent ventilation will be provided as required to maintain the indoor design temperature based on the summer outside design temperature.
3. The ventilation rate will be based on the mechanical code or ASHRAE Standard 62.1 requirements for occupancy.

6.4.6 HVAC General Requirements

6.4.6.1 Intakes

Outdoor air intakes will be designed to manage rain entrainment in accordance with the latest ASHRAE standards. Louvers will be selected to limit water penetration to a maximum of 0.01 oz/ft2 of louver free area at the maximum intake velocity. Corrosion resistant screens will cover the openings with openings of 1/2 inch. Rain hoods will be sized for no more than 500 fpm face velocity with a downward-facing intake such that all air passes vertically upward through a horizontal plane before entering the system.

6.4.6.2 Air Filtration

Outdoor air and return air will be filtered where it is supplied to air-conditioned areas, de-humidified areas, and process blower rooms. Filtration will consist of 2" disposable pleated media filters with a minimum efficiency reporting value (MERV) based on ASHRAE 52.2 guidelines of at least 8.

Outdoor air will be filtered where it is supplied to process pump rooms. Filtration will consist of washable metal mesh filters with a MERV value of 6.

6.4.6.3 Internal Load Factors

Heating and cooling loads will be calculated in accordance with ASHRAE Standard 183-2007. Internal heat gains will be included in the calculations based on the following:

- Lighting: 1.1 watts/sq ft (unless otherwise indicated)
- People: 230 btuh/person sensible and 190 btuh/person latent (seated, light work)
- Equipment: Equipment heat loss from equipment anticipated to operate simultaneously

6.4.6.4 Ductwork

Ductwork will be sized for a friction loss of 0.08-inch water column per 100 feet. Ductwork will be insulated for air conditioning systems, outside air, and heating systems. Insulation will consist of duct liner tested to be resistant to mold growth and erosion under a standardized test method. Insulated plenums will be externally insulated and include drain provisions for removal of any moisture that may carryover through the outside air louver.

6.4.6.5 Outside Air

Outside air ventilation will be provided through air conditioning systems and dehumidification systems in areas that can be occupied in accordance with the Mechanical Code and ASHRAE Standard 62.1.

6.4.6.6 Heating Systems

Space heating will be provided by individual electric unit heaters, electric wall heaters or electric cabinet heaters in the new Filter Building / High Service Pump Station. The heaters will be located to provide uniform space heating of the area served where possible. In certain spaces, process piping and equipment locations may not allow for ideal placement of heaters and temperature variation could be experienced. Each unit heater will be controlled by an adjustable wall mounted temperature sensor and the building automation system. Basis of design heater manufacturers include Chromalox, Brasch, and Indeeco.

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6.4.6.7 Ventilation Systems

In the new Filter Building / High Service Pump Station, ventilation will be provided by continuous and intermittent ventilation systems. Control dampers in the supply and exhaust systems will be used to isolate the spaces from ambient conditions upon system shutdown. The ventilation systems will be designed to promote removal of exhaust air from all portions of the ventilated space. The ventilation system will be arranged to avoid short-circuiting of supply and exhaust air from the space. Louvers will be provided under the architectural design. Basis of design manufacturers for dampers include Ruskin, and Arrow United. Basis of design manufacturers for fans include Greenheck, PennBarry and Loren Cook. Basis of design manufacturers for makeup air units include Engineered Air, Hastings, and Greenheck.

A continuous ventilation system will be provided for the Filter Rooms and Operating Level and will consist of a continuous makeup air unit with electric heat for supply, and power roof ventilators for exhaust. Exhaust ductwork constructed of FRP pipe will extend through the walkway around each filter to pick up chlorine vapor from close to the water surface. The makeup air unit will be controlled by a local "ON-OFF-AUTO" selector switch on the equipment panel and the power roof ventilators will be controlled by a “ON-OFF-AUTO" selector switches at the respective motor starter. When the makeup air unit selector switch is in the "AUTO" position, the makeup air unit will be controlled by the building automation system. When the power roof ventilator selector switch is in the "AUTO" position, the power roof ventilator will be controlled by the building automation system and interlocked with the makeup air unit. The makeup air will be filtered and tempered to the room design temperature before supplied to the space. A temperature sensor will modulate the discharge air temperature to the design space temperature.

Intermittent ventilation systems will be provided for the Filter Rooms and Operating Level and will consist of louvers, dampers, roof-mounted power roof ventilators, and sheet metal ductwork. Control dampers in the supply and exhaust systems will be used to isolate the spaces from ambient conditions upon system shutdown. The systems will be controlled by an "ON-OFF-AUTO" selector switch at the fan motor starter. When the switch is in the "AUTO" position, control will be from a room temperature sensor and the building automation system.

An intermittent ventilation system will be provided for the High Service Pump Room and will consist of a roof-mounted supply fan, dampers, roof-mounted power roof ventilator, and sheet metal ductwork. The supply fan will be controlled by a local "ON-OFF-AUTO" selector switch on the equipment panel and the power roof ventilator will be controlled by an “ON-OFF-AUTO" selector switch at the respective motor starter. When the supply fan selector switch is in the "AUTO" position, the supply fan will be controlled by the building automation system. When the power roof ventilator selector switch is in the "AUTO" position, the power roof ventilator will be controlled by the building automation system and interlocked with the supply fan. The makeup air will be filtered and tempered to the room design temperature before supplied to the space.

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At the Filter Building, an intermittent ventilation system will be provided for the Air Scour Blower Room and will consist of a roof mounted filtered air supply unit, dampers, a roof-mounted power roof ventilator, and sheet metal ductwork. The air supply unit will be controlled by a local "ON-OFF-AUTO" selector switch on the equipment panel. When the supply fan selector switch is in the "AUTO" position, the supply fan will be controlled by a room temperature sensor, a discharge air temperature sensor and the building automation system. The supply air will be filtered. The discharge air temperature sensor will modulate the outdoor air and return air dampers to maintain a discharge air temperature above freezing.

6.4.6.8 Air Conditioning Systems

In the High Service Pump Station, an air conditioning system will be provided for the motor/electrical room. The air conditioning system will consist of single zone, variable air volume packaged rooftop air conditioning units. Each unit will be controlled by a wall mounted temperature sensor with setpoint adjustment and the building automation system to maintain the desired space temperature. Basis of design manufacturers for packaged air conditioning units include Trane, Carrier, and Daikin.

Full 100% HVAC system redundancy will be provided. Two units, each sized to provide the total cooling load, will be used to maintain the indoor design conditions. Only one unit will operate at a time and the units will alternate in operation so that the run times for each unit remain approximately the same. In the event that a single unit fails, the other unit will start and maintain the desired space conditions.

6.4.6.9 Dehumidification System

In the Filter Building, a dehumidification system will be provided for the Pipe Gallery. The de-humidification system will consist of a desiccant wheel dehumidifier with electric heat regeneration, dampers, sheet metal ductwork and roof hoods. The unit will be controlled by a pipe-mounted condensation controller, room humidity sensor, room temperature sensor and the building automation system. Basis of design manufacturers for de-humidification systems include Innovative Air Systems, Bry-Air, and Munters.

6.4.6.10 Building Control Systems

The HVAC controls will consist of a building automation system (BAS) to provide central monitoring, operation, and management of the HVAC systems. The BAS will be comprised of a network of interoperable, stand-alone digital controllers communicating to a Network Area Controller (NAC) within the facility. The BAS system will be specified to be a stand-alone, web-based system with software and integration provided by Automated Logic without exception. Access to the BAS will be provided locally in the building and via the internet. The BAS system will utilize Tridium hardware and Niagara 4 software. The main system user interface will be on a new Niagara 4 server with an operator workstation. Communication protocol will be BACnet MSTP between network controllers, and stand-alone field level programmable controllers.

Temperature control hardware will be specified as native BACnet. Communication protocol to the operator workstation/web server will be specified as HTTP or FOX. Controllers will be specified with 25% additional point capacity. Basis of design manufacturers for field level components will be Automated Logic, Alerton, or Schneider Electric.

Control component enclosures will be selected based on the environment where they are installed. Typical controls will consist of the following:

- Differential pressure indication across supply and exhaust fans designed to operate continuously to indicate fan flow or failure. Where insufficient differential pressure occurs due to limited ductwork, motor current switches will be used.
- Duct mounted smoke detectors where systems have airflows greater than 2000 CFM and are capable of spreading smoke beyond the enclosing walls, floors and ceilings of the room or space in which the smoke is generated.
- Differential pressure gauge and differential pressure sensor with dirty filter alarm across air filters.
- Temperature sensors for control of intermittent ventilation systems to start and stop equipment operation.
- Electronic sensors to control equipment for maintaining the leaving air temperature within the design temperature range.
- Temperature sensors for detection and alarming of low air temperatures.
- Temperature sensors and duty/standby controllers for control of packaged air conditioning systems.

6.4.7 Fire Protection

A wet pipe sprinkler fire protection system will be provided in the new and modified buildings for below grade levels exceeding 1500 ft^2 without direct exterior access and all hazardous occupancy areas as required by local Building and Fire Codes. Additionally, sprinkler systems will be required for building fire areas exceeding the maximum allowed area limit as mentioned in the building code. The fire protection system will consist of a backflow preventer, alarm check valve, fire department connection, and piping. The fire protection system will be designed according to the requirements of applicable NFPA standards. Each project building shall be provided with fire hydrants within 400 ft from the most remote perimeter area for manual firefighting emergency response and to deliver required fire flow. Water to fire protection systems will be delivered through a city potable water supply with adequate flow and pressure to meet system demands.

6.4.7.1 Applicable Codes and Safety

The fire protection systems design will conform to the referenced versions of the following building and fire codes:

- 2014 Indiana Building Code, based on the International Building Code (IBC), 2012
- 2014 Indiana Fire Code, based on the International Fire Code (IFC), 2012

6.5 Electrical

Electrical power distribution systems modifications will focus on the following key elements:

- Safety
- Reliability
- Simplicity of Operation
- Maintenance
- Flexibility

For this project all work will be performed, and materials will be furnished in accordance with the National Electrical Code, National Electrical Safety Code, and the following standards where applicable:

- ANSI-American National Standards Institute.
- ASTM-American Society for Testing and Materials.
- Fed Spec-Federal Specification.
- ICEA-Insulated Cable Engineers Association.
- IEEE-Institute of Electrical and Electronics Engineers.
- IES-Illuminating Engineering Society.
- NEMA-National Electrical Manufacturers Association.
- NFPA-National Fire Protection Association.
- UL-Underwriters' Laboratories.

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6.5.1 Existing Power Distribution System

The EWSU power distribution system receives electrical service from CenterPoint Energy via a single 4.16kV circuit.

This circuit enters the site overhead on power poles then drops down a power pole and is routed through duct bank to the Service Entrance-Rated 5kV Main Switchgear. The 5kV switchgear is also served with 2 back up emergency generators. Generators are connected to a 480V switchgear which feeds a step up 2000kVA 480V-4160V transformer which feeds the 5kV switchgear.

Power is distributed to the site at 4.16kV. Step down transformers are provided around the site to step down distribution voltage to utilization voltage.

6.5.2 Existing Power Distribution System Modifications

To provide power to the new High Service Pump Station, a new section will be added to the end of the 5kV Switchgear. The new section will contain two new breakers. New breakers will feed two new 1500kVA 4.16kV-480V transformers that will feed the new High Service Pump Station Switchgear and Motor Control Center.

Existing Medium Voltage Motor Control Line-Ups located at Intake Pump Station and the High Service Pump Station No. 3 will be demolished.

Intake Pump Station will be re-energized through two new 1800kVA 4.16kV-480V transformers. New Transformers will feed a new 480V Motor Control Center which will feed the entirety of the Intake Pump Station. New 480V adjustable frequency drives will be provided for the new 480V LSP pumps.

Existing High Service Pump Station No. 3 will be demolished at the end of the project.

6.5.3 Power Distribution Transformers

Transformers will be configured with a delta 4.16 kV primary winding and a wye 480/277 volt secondary winding. Transformer primary cable terminations will be dead front and secondary terminations will be spade type. Transformers will be provided with a load break switches for isolation purpose.

Transformers located outside will be liquid filled pad mount style and insulated with a biodegradable less flammable dielectric fluid.

Transformers located inside will be dry type transformers.

6.5.4 Low Voltage Switchgear

Each switchgear line-up will be arranged main-tie-main and will have circuit breakers on each side of the tie feeding each process buildings. Main and tie breakers will be key interlocked such that all three breakers cannot be closed at the same time. Switchgear will be metal enclosed furnished with electrically operated drawout 100 percent rated power circuit breakers. Each circuit breaker will be furnished with a microprocessor based trip unit with long time, short time, instantaneous, and ground fault trip functions. In addition each trip will be furnished with an arc flash reduction setting that will allow the normal instantaneous settings of the breakers to be temporarily bypassed to allow for faster tripping time. This setting will be used to reduce arc flash incident energy levels on downstream motor control centers or switchboards if maintenance is required to be performed on indicated equipment while energized.

A circuit breaker remote racking device will be furnished to allow circuit breaker racking and open/close operation from a remote distance outside of the arc flash boundary. The remote racking device will be powered from a 120 volt convenience outlet.

A circuit breaker lifting device will be provided for lifting circuit breakers on and off of rails for maintenance purpose.

The switchgear enclosure will be NEMA 1 rated.

Acceptable switchgear manufacturers will include Eaton, Square D, General Electric, or Siemens.

6.5.5 Motor Control Center

MCCs will be furnished with minimum 20 inch wide by 21-inch-deep vertical sections. MCCs will be furnished with a 65,000-amp short circuit rating.

Main and tie breakers will be 100 percent rated and will be key interlocked such that all three breakers cannot be closed at the same time. Main and tie breakers will be furnished with electronic trip units with long time, short time, instantaneous, and ground fault trip functions.

Power monitors and surge protection devices will be provided.

MCCs will be provided with circuit breakers, combination motor starters with solid state overload relays, and contactors as required to power and control process loads. For motors over 50 HP, combination starters will be reduced voltage solid state.

Motor control center pilot devices including control stations and indicating lights will be 30.5 mm. All indicating lights will be full voltage with LED lights. Light color will be red for run amber for alarm.

Nameplates will be provided on each MCC to identify the MCC, and on each individual breaker starter, breaker, and contactor to identify the individual load.

Acceptable motor control center manufacturers will include Allen-Bradley, Eaton, General Electric, Schneider-Electric, or Siemens without exception.

6.5.6 Adjustable Frequency Drives

Adjustable frequency drives will be provided for pumps requiring variable speed operation. Power supply to AFDs will be 480-volt three phase. AFDs will be provided in free standing NEMA 12 rated enclosures. AFDs will be furnished with an integral main circuit breaker or fused disconnect switch and will have an overall 65,000-amp short circuit rating. Panel mounted pilot devices will be 30.5 mm and indicating lights will be LED type. LED light color will be red for run, and amber for alarm conditions. Where power cables from the drive to the motor exceed 100 feet output dv/dt filters will be provided.

Acceptable manufacturers will include ABB, Eaton, Rockwell Automation, Siemens, Schneider-Electric, or Toshiba.

6.5.7 Power Panels, Lighting Panels, and Lighting Transformers

Three phase 480 volt power panels will be provided as required to power process loads. Power panels will be located in electrical rooms and will be furnished in surface mounted NEMA 1 rated enclosures. Power panels will be provided with a main breaker, surge protection device, and branch breakers. Power panels will have a 65,000 amp short circuit rating.

Three phase 120/208 volt lighting panels will be provided to power lighting, receptacles, instrumentation and other miscellaneous 120 and 208 volt loads. Lighting panels will be located in electrical rooms and will be furnished in surface mounted NEMA 1 rated enclosures. Lighting panels will be provided with a main breaker, surge protection device, and branch breakers. All lighting panels will be 42 pole minimum. Lighting panels will have a 10,000 amp short circuit rating. Lighting transformers will be located in electrical rooms and will be, three phase 480-120/208-volt, air cooled, energy efficient, dry type. Floor mount transformers will be installed on an electrical equipment base.

6.5.8 Raceways

Existing conduit will be reused where applicable. The following general guidelines will be used for raceway sizing, selection, and installation for new conduits:

- Conduit will be sized based on XHHW-2 insulation for all equipment power and control conductors rated 600 volts and below.
- The minimum diameter of exposed conduit in all areas will be 3/4 inch.
- Raceways in duct banks generally will not be smaller than 2 inches.
- The number of conduit bends will be limited to an equivalent of 270 degrees between pulling points or boxes.
- Exterior, exposed conduit will be rigid aluminum.

- Exterior, underground, concrete-encased conduit (and direct-buried conduit, where applicable) will be Schedule 40 PVC to within 5-feet of foundation walls, at which point the conduit will transition to PVC-coated rigid steel.
- Interior, exposed conduit will be rigid aluminum.
- Final connections to motors, field instruments and other equipment with rotating parts will be liquid-tight flexible non-metallic or metallic conduit.
- Final connections to instruments, and other equipment will be liquid-tight flexible metallic conduit only when required or recommended by the equipment manufacturer.
- Cable tray will be considered for the new High Service Pump Station

6.5.9 Cable

New cable will be provided and the following parameters will be used for electrical cable sizing, selection and installation:

- Power circuits at 4,160 Volts will use 8,000V Shielded EPR compressed stranded copper cable.
- Circuits above and below 600 Volts will be separated in all raceway installations.
- All lighting, power, and control wiring rated 600 volts and below will use stranded copper conductors with type XHHW-2 insulation. Individual 14 AWG conductors will be used for discrete control circuits.
- Twisted-shielded pair control cable with 16 AWG individual stranded copper conductors, PVC jacket and insulation, and an aluminum mylar tape shield around the pair will be used for analog signals. Multi-pair cables will be used where grouping of circuits is practical. Cables will have 600 volt insulation.

6.5.10 Receptacles

Standard convenience receptacles will be installed in all new buildings. Receptacles will be duplex three wire 20-amp grounding type. Receptacles installed in below grade locations and outdoors will be mounted 48 inches above finished floor.

Ground fault circuit interrupter (GFI) receptacles will be duplex 20 amp. Receptacles installed in bathrooms, kitchens, on rooftops, outdoors, within 6 feet of sinks, in locker rooms where shower facilities are provided, and in indoor wet locations will be GFI type.

6.5.11 Junction Boxes

Junction boxes will meet the following requirements:

- Junction boxes and wiring gutters in indoor locations will be rated NEMA 12. NEMA 12 junction boxes and wiring gutters will be constructed from painted carbon steel.

- The following enclosure types will be used in the Project:
  - NEMA 12 – Indoor dry process locations.
  - NEMA 4X – Indoor wet process locations & outdoor areas.

6.5.12 Control Stations

Control stations will be provided as required for the equipment furnished. Pilot devices will be 30.5 mm heavy duty and oil-tight. Indoor, unclassified, non-corrosive locations will have control stations furnished with NEMA 13 enclosures for indoor dry areas, and NEMA 4x for indoor wet areas & outsides areas.

6.5.13 Grounding Design

The electrical system and equipment will be grounded in compliance with the NEC.

New buildings and structures with electrical equipment will be furnished with a grounding electrode system consisting of ground rods and a No. 4/0 AWG bare copper ground ring. Each ground ring will be bonded to building piping and to reinforcing rebar in the building or structure foundation, as applicable. Power panel and lighting panel ground buses will be bonded to the ground ring at their building location. A ground test well will be provided at each building.

Electrical equipment, devices, panel boards, and metallic raceways that do not carry current will be bounded to the ground system. An equipment ground conductor will be installed in all raceways that contain power conductors at any voltage.

All new grounding systems will be tested to determine resistance to ground. The measured resistivity will meet the specification requirements.

6.5.14 Lighting Requirements

Lighting levels will be provided following the suggested levels as stated in the IES Lighting Handbook. To reduce power use, all lighting fixtures specified will be LED type.

Power supply for building interior and exterior fixtures will be 120-volt single phase. Battery powered emergency and exit discharge lighting will be provided in all buildings to allow safe exit in the event of a power failure. Exit lighting will be provided in all buildings to provide direction to all building exits.

Power supply for fixtures mounted on yard structures will be 208-volt single phase. All yard structure lighting will be powered through lighting contactors and controlled manually or in automatic mode by the photocell.

Roadway lighting will be provided to illuminate plant access roads and for general site lighting. Roadway lighting power supply will be 480-volt single phase. All roadway lighting will be powered through separately enclosed lighting contactors located in electrical rooms and controlled manually or in automatic mode by photocell.

Roadway lighting fixtures will match exiting fixtures as much as possible.

6.6 Instrumentation and Control (I&C) – Including Control Descriptions

This section describes the project instrumentation and control systems including architecture, reliability, strategy, and modes. The section also discusses instrumentation and equipment tagging. Process instrumentation diagrams (P&IDs) are included at the end of this section.

6.6.1 General

This section describes the instrumentation and control system design criteria for the Evansville Water and Sewer Utility (EWSU) Water Treatment Plant Expansion. The control system will be connected to the Evansville Water existing SCADA system for monitoring and controls via Fiber connection. All I&C work will be in accordance with local and state codes, the criteria outlined in this report, EWSU standards, Black & Veatch design standards, and other requirements applicable to the I&C design of the facility.

6.6.2 Codes and Industry Standards

The I&C system design will conform to the latest editions of the following applicable codes:

- NEC NFPA 70
- NESC
- Life Safety Code (NFPA 101-HB)

Standards of the following organizations will also govern, where applicable:

- ANSI
- ASTM International
- Electronics Industries Alliance (EIA)
- International Electrotechnical Commission (IEC)
- ISA
- NEMA
- IEEE
- OSHA

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- Telecommunication Industry Association (TIA)
- Uniform Fire Code (UFC)
- UL

6.6.3 Control System

The new filter complex, chemical building, high service pump station and residuals pump station control system will utilize an Allen Bradley ControlLogix PLC that are installed in backplane style rack (chassis). The racks will contain the power supply, analog modules, discrete modules, and Ethernet communication modules. An Operator–Interface-Terminal (OIT) will be provided to allow local monitoring and control. Two ethernet modules will be provided– one to connect to the Filter IO Panels and one to the existing SCADA system.

6.6.4 Control System Programming, Configuration, and Integration

The Owner's preferred I&C system integrator will be hired directly by the Owner to program and test PLCs and the plant SCADA human-machine interface (HMI) software to monitor and control new equipment and instrumentation. The I&C system integrator will coordinate with the Owner and Contractor to schedule and participate in testing and commissioning new equipment and instruments. The Contractor shall provide support when proving out signal and control circuits from instruments, motor controls, etc., that are wired to PLCs

6.6.5 Computer Hardware and Software

The plants existing software Rockwell RSView will be updated and converted to Indusoft HMI package.

6.6.6 Plant Control System Network

The plant control system utilizes an Ethernet IP based Plant SCADA Network communication system. The control system will be connected to SCADA via fiber connection from the existing Server Room (adjacent to the Control Room). The PLC and OIT will be connected to one Ethernet switch, and the Filter IO Panels will connect to a second ethernet switch. Network cabling within the area envelope is generally category-6 metallic network cable.

6.6.7 Plant Power Monitoring

Power monitoring will be provided using Ethernet IP communication protocol. Power monitoring will be integrated into the new HMI software. Power monitors will be Owner preference.

6.6.8 Equipment Networks

The Filter IO Panels hard-wired status, alarm and controls in addition to Ethernet IP communication to SCADA for data.

Typical instruments will have hard-wired 4-20 mA signals and not be networked.

UPS', VFDs/RVSS', and power monitors will be networked to SCADA over Ethernet IP.

6.6.9 Instrumentation and I/O Signal Standards

Analog field instrumentation will utilize 4-20 mA type signals to/from the plant control system. Discrete signals (running status, alarm, etc.) will utilize 24-volt DC signals to/from the plant control system.

Additional I/O data from the VFDs/RVSS will be transmitted via Ethernet/IP to the plant control system.

6.6.10 Vendor-Packaged Control Systems

No vendor-packaged control systems are planned for the inclusion in design.

6.6.11 Software Configuration

The Owner's preferred I&C system integrator will be hired directly by the Owner to program and test PLCs and the plant SCADA human-machine interface (HMI) software to monitor and control new equipment and instrumentation. The I&C system integrator will coordinate with the Owner and Contractor to schedule and participate in testing and commissioning new equipment and instruments. The Contractor shall provide support when proving out signal and control circuits from instruments, motor controls, etc., that are wired to PLCs. Remote monitoring, alarming, and control of these systems will be integrated into the overall plant control system as previously described. Network switch software configuration will be provided by the Owner Engineer.

6.6.12 P&ID Drawings

Process and Instrumentation Diagram (P&ID) drawings for the expansion are included in Appendix A. Drawing format follows Black and Veatch standard P&ID drawings. Tag numbering conventions will follow numbering as described herein. Drawings will be schematic in nature and will not show every fitting or miscellaneous valve. Piping system codes will be shown on the P&IDs and will denote the associated process stream such as PW for potable water. Pipeline size will be indicated on the P&ID drawings. Pipeline material will be indicated on pipelines related to chemical systems, or as otherwise required.

6.6.13 Device Tag Numbers and Instrument Loop Numbers

Each piece of major process equipment will be assigned a tag number in accordance with the equipment tagging scheme as described on the P&ID legend sheets. Certain components of major equipment that can be separated such as large pumps and pump motors, and gates and gate actuators, will be assigned separate tag numbers.

The tag numbers will consist of a system code, a function code, and a sequence code. System codes denote the associated system stream, function codes denote the associated equipment abbreviation, and the sequence code is a unique numeric identifier as presented as the final four digits.

Each instrument shown on the P&ID drawings will be assigned a tag number consisting of identification letters and loop numbers. The identification letters will follow ISA standards. All abbreviations used are given on the legend sheets.

6.6.14 Specific Process Control Descriptions

The P&IDs indicate basic control functions for individual pieces of equipment and identify interlocks. Detailed control functions will be provided in the Software Control Block Descriptions section of the detailed design specifications.

6.6.15 Control Modes

All equipment will be operated in one or more of the following control modes:

Local Manual: The equipment is manually controlled locally or from a nearby MCC, local device control panel, or hand station.

Local Automatic: The equipment is automatically controlled locally through some physical interlocking scheme in the local device control panel.

Remote Manual: The equipment is controlled manually through the PLC/HMI based on commands issued from a SCADA workstation. Such commands are received by the local PLC and converted into physical outputs to field devices.

Remote Automatic: The equipment is automatically controlled by the PLC/HMI based on process setpoints issued from the SCADA workstations. The PLC will automatically adjust process equipment to meet the process setpoint.

The control mode will be selectable where applicable based on local/remote and auto/manual switches located at the devices, MCC, and/or device control panels. Selector switch position feedback will be wired to the PLC, allowing an operator using the workstation to know whether a device is being automatically controlled and determine if control from the operator workstation is active.

Transition between automatic and manual control will be "bumpless". Controlled equipment will not start/stop or change position when transferring between manual and automatic control modes.

The I&C designer will create text-based control descriptions used in defining the PLC and operator workstation programming requirements. These descriptions will be included as a part of the Detailed Design.

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7.0 Implementation

This section describes options to evaluate in coordination with EWSU and the construction contractor to facilitate construction of the proposed facilities. The existing WTP needs to always remain in operation. Short outages on the order of a few hours may be required for power modifications, cutting and modifying pipe connections, and cutting and modifying existing structures. The GMAX contractor will be included in discussions for phasing and constructability and how it relates to cost. As described in Section 2.9, constructed is anticipated throughout 2025 and 2026.

7.1 Seasonal / Low Flow Periods

During construction, there will likely be periods with lower flow demands. As illustrated in Figure 7-1 below, during July through December, river levels may be reduced such that excavations and associated dewatering may be less impacted.

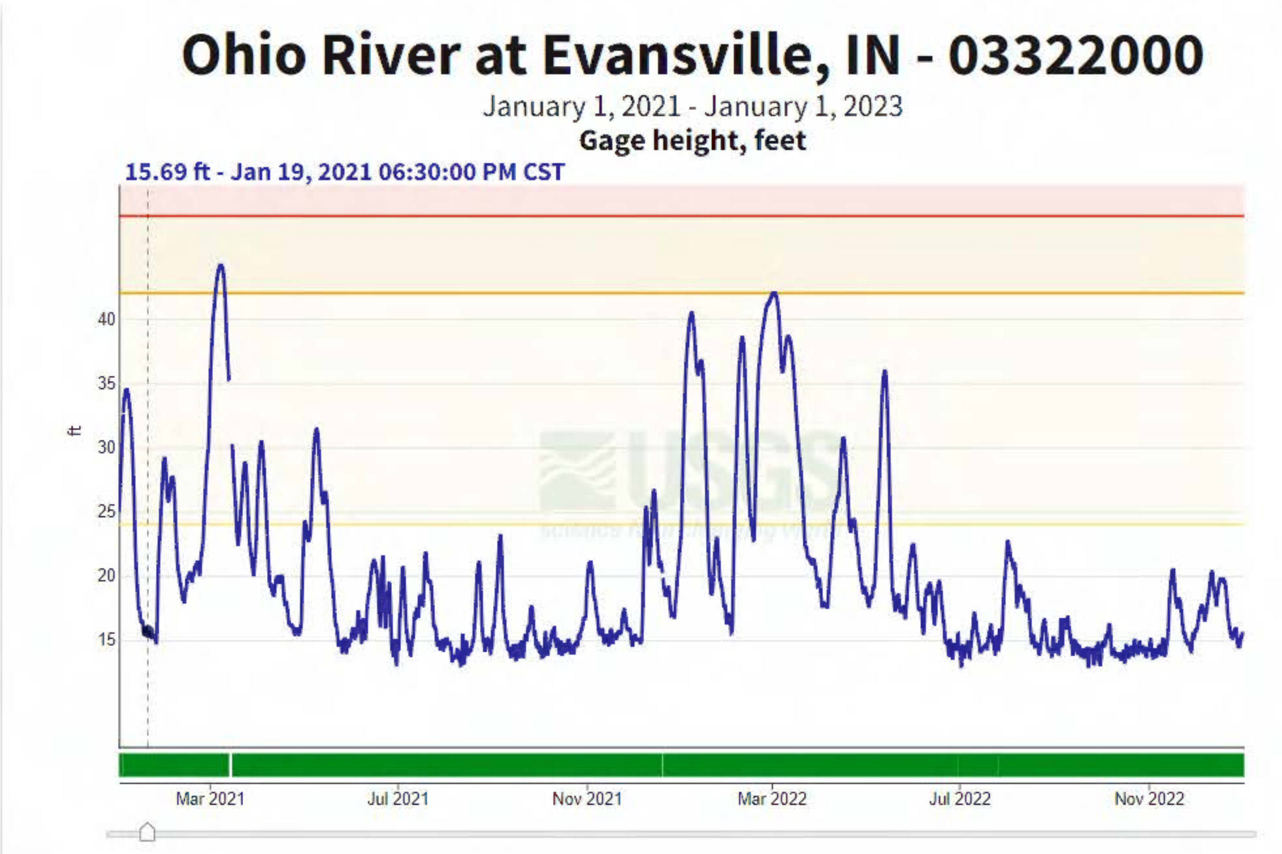

Figure 7-1: Ohio River Level near WTP (example)

Table 7-1 below indicates the minimum, average, and maximum Intake Pump Station flows over a two-year period. As indicated, the winter months have generally less flows where there may be opportunities for more extensive construction that is less disruptive to plant operations.

Table 7-1: Intake Pump Station Monthly Flow Data

Raw Water Intake (mgd)				Raw Water Intake (mgd)			
2021	Min	Avg	Max	2022	Min	Avg	Max
January	22.3	25.4	28.1	January	22.1	25.3	29.0
February	23.7	28.4	38.4	February	22.8	25.9	30.1
March	18.2	24.7	29.4	March	20.0	24.0	26.8
April	21.1	24.7	29.7	April	22.7	25.2	30.2
May	20.2	26.8	36.6	May	21.2	25.3	28.9
June	22.2	26.8	32.3	June	22.6	27.4	31.5
July	22.0	26.2	30.9	July	22.0	27.4	31.5
August	22.8	26.1	29.5	August	16.3	27.1	35.1
September	21.1	25.8	29.3	September	20.0	24.5	28.4
October	15.6	22.2	27.7	October	15.9	25.3	29.5
November	15.6	21.2	25.8	November	13.5	21.2	25.1
December	17.8	23.5	27.1	December	16.6	20.2	22.2

7.2 Construction Requirements

Figure 7-2 below illustrates the major construction activities anticipated.

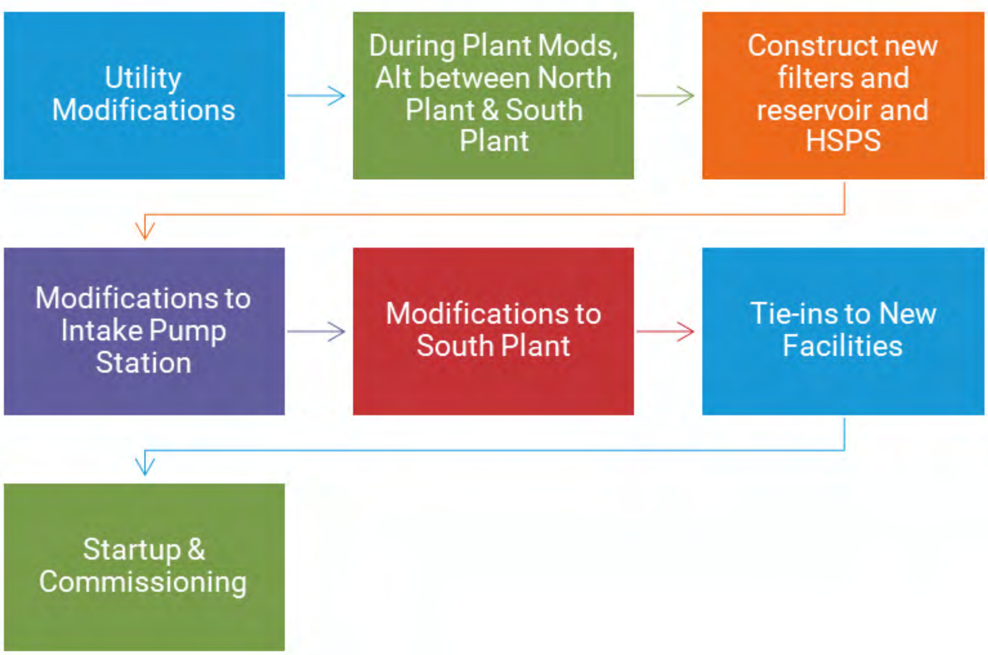

Figure 7-2: WTP Improvements Construction Activities Overview

7.2.1 Utility Modifications

In order to construct the new facilities on the east side of Waterworks Road, existing utilities will need to be relocated. These utilities will be identified in detailed design and submittals will be made to the respective agencies for those utilities that need to be relocated or may be protected in place. The primary utility corridor impacted by the new structures is the dual electric utility overhead power lines to the WTP. Discussions are ongoing with CenterPoint Energy to identify alternate corridors and coordinate the sequencing.

7.2.2 North Plant and South Plant Operations

As indicated earlier, the Intake Pump Station includes a discharge header with isolation valves that splits the flow with into two 42" diameter raw water pipelines. During construction, it is anticipated the construction contractor can utilize either the North Plant or South Plant to have flexibility to work on new pumps, piping and valves in the Intake Pump Station, new raw water piping to the rapid mix / flow splitter, conversion of the South Plant clarifiers to tube settlers, and various other civil, structural, mechanical, electrical, and instrumentation activities

7.2.3 Construct New Filters, Clearwell, and HSPS

The area east of Waterworks Road proposed for the new filter / clearwell / HSPS structure is relatively open, requiring minimal site preparation other than relocation of overhead poles and other utilities. The construction contractor can construct this entire structure without impacting the existing plant operations.

7.2.4 Modifications to Intake Pump Station

There are extensive modifications required for the Intake Pump Station, including removal and replacement of all intake pumps, piping, and valves, new electrical service, new intake screens, replacement of switchgear, motor control centers, and variable frequency drives, and new coating systems. The construction contractor will need to select the North Plant or South Plant as the base facilities to remain in operation. During this period, approximately half the piping header can be removed along with the associated intake pumps, and new pumps, piping and valves can be installed. Once the new pumps, piping and valves have been installed, this new assembly can be functionally tested and put into operation while the remaining header section and remaining pumps are taken offline and replaced.

The construction sequence may follow this general outline:

Demolish existing intake pumps 4 through 6 along with the associated discharge piping. See the Figure 7-3 below. While pumps 4 through 6 are offline, intake screen 3 will also be replaced.

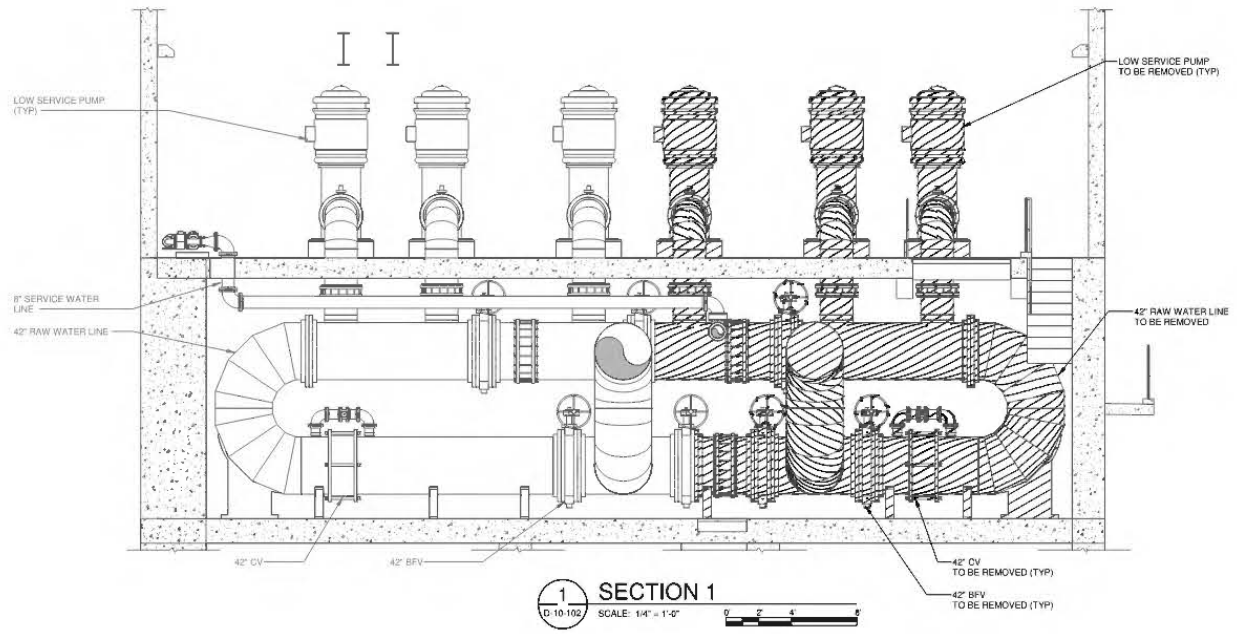

Figure 7-3: Intake pump station section 1

Following replacement of intake pumps 4 through 6 as well as intake screen 3, work can begin on demolition of intake pumps 1 through 3, their discharge piping as well as intake screen 1, see Figure 7-4 below.

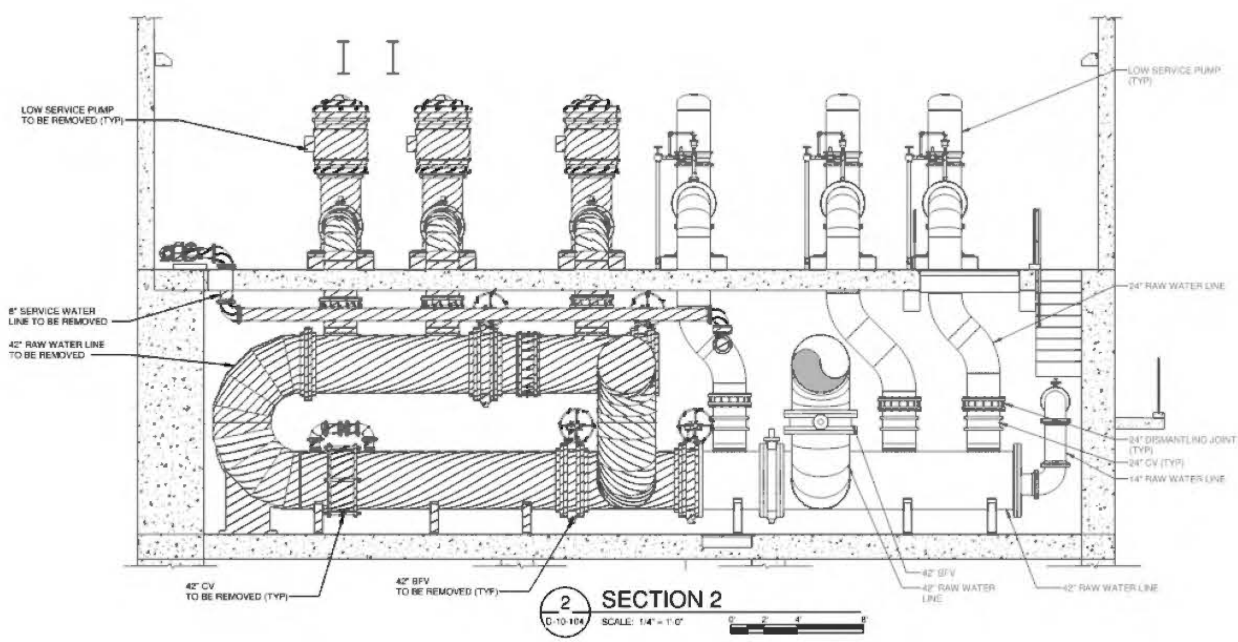

Figure 7-4: Intake pump station section 2

Following the replacement of intake pumps 1 through 3 as well as intake screen 1, the Intake Pump Station can be brought back online.

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Due to the fact that intake pumps 3 and 4 share a common wet well but are likely to be replaced as part of separate shutdowns, a third shutdown will be required to complete the replacement of intake screen 2. During this third shutdown intake pumps 1, 2, 5 and 6 will be available.

Figure 7-5 below shows the completed intake pump replacements as well as the proposed discharge header.

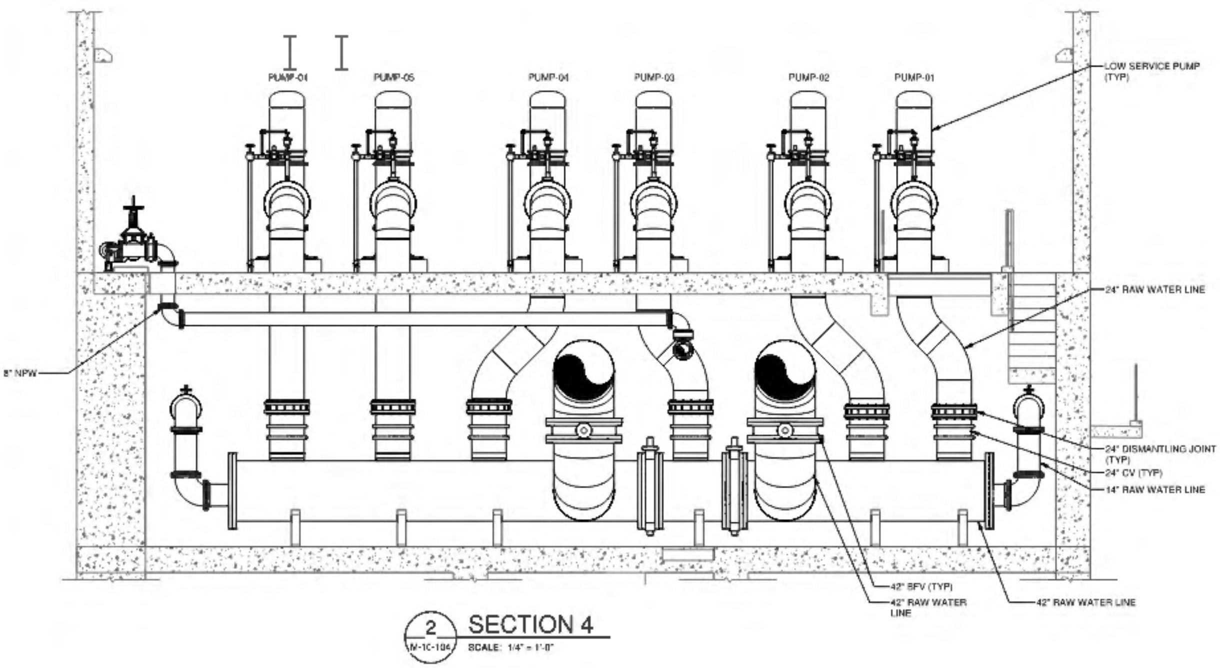

Figure 7-5: Intake pump station section 4

7.2.5 Modifications to South Plant

Modifications to the South Plant will require outages for demolition, modifications, and rehabilitation of existing facilities. Installation of the two 42" raw water pipes between the levee wall and HSPS 1 will require subsurface investigation to verify abandoned and in-service utilities and temporary piping and valving to clear corridors. Modifications and rehabilitation of the four existing settling basins will be accomplished during outages in the South Plant and use of the North Plant

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00 43 14 Bid Security Form 1 :

00 43 16 Bid Bond – Damages Form 1 :

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00 43 32 Instrumentation and Control System Supplier Questionnaire 1 :

00 43 36 Proposed Subcontractors Form 1 :

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00 45 33 Non-Segregated Facilities Affidavit 1 :

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03 20 00	Concrete Reinforcing	1 :
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40 05 31.12	Polyvinyl Chloride (PVC) Pressure Pipe	1 :
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40 62 00	Computer System Hardware	1 :
40 64 00	Programmable Logic Controllers	1 :
40 66 11	Network Systems	1 :
40 66 33	Metallic and Fiber Optic Communication Cable and Connectors	1 :
40 67 11	Panels, Consoles, and Appurtenances	1 :
40 68 83	Software Control Block Descriptions	1 :
40 69 13	Uninterruptible Power Supply	1 :
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46 41 23	Submersible Mixers	1 :
46 41 24	Vertical Mixers	1 :
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46 43 76	Tube Settlers	1 :
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OUCC DR 8-005

DATA INFORMATION REQUEST 06/20/2016
City of Evansville, Indiana

Cause No. 44760

Information Requested:

Please list each filter (by number) and provide the date the media was last replaced.

Information Provided:

Filter Bed No.	Media Replacement Date
Filter Bed #13	2001
Filter Bed #14	2001
Filter Bed #15	2001
Filter Bed #16	2001
Filter Bed #17	2001
Filter Bed #18	2001
Filter Bed #19	2001
Filter Bed #20	2001
Filter Bed #21	1969
Filter Bed #22	2012
Filter Bed #23	1969
Filter Bed #24	1969
Filter Bed #25	2013
Filter Bed #26	2013
Filter Bed #27	1969
Filter Bed #28	1969
Filter Bed #29	over 34 years ago
Filter Bed #30	over 34 years ago
Filter Bed #31	over 34 years ago
Filter Bed #32	over 34 years ago
Filter Bed #33	1999
Filter Bed #34	1999
Filter Bed #35	2009
Filter Bed #36	2009

OUCC DR 3-20

06/21/2021

DATA REQUEST
City of Evansville

Cause No. 45545

Information Requested:

For each of Evansville's 24 active filters, please identify the original year installed, the current permitted filtration rate (gpm/ft2), the year the filter media was last replaced and the year the underdrain was last replaced.

Information Provided:

See attachment OUCC DR 3-20.

Attachment:

OUCC DR 3-20.xlsx

Cause No. 45545 EWSU response to OUCC DR 3-20 06/21/2021
Filter Information
6/15/2021
Filtration Design Rate 2-4 gpm/sf per 10 States Standards
Filtration Rate managed to meet enhanced filtration requirements for Cryptosporidium

Filter Bed	Year Built	Size (sf)	Underdrain Updated	Media Replaced
13	1923	522	Original/clay	date unknown
14	1923	522	Original/clay	2001
15	1923	522	Original/clay	date unknown
16	1923	522	Original/clay	2001
17	1938	522	2015	2015
18	1938	522	Original/clay	2001
19	1938	522	Original/clay	date unknown
20	1938	522	Original/clay	2001
21	1970	1036	2018	2018
22	1970	1036	2021	2021
23	1970	1036	2019	2019
24	1970	1036	2018	2018
25	1970	1036	2021	2021
26	1970	1036	2021	2021
27	1970	1036	2019	2019
28	1970	1036	2019	2019
29	1949	1058	2018	2018
30	1949	1058	Original/clay	date unknown
31	1949	1058	Original/clay	date unknown
32	1949	1058	Original/clay	date unknown
33	1999	1058	Original/ HDPE	2021
34	1999	1058	Original/ HDPE	2021
35	2009	1058	Original/ HDPE	2021
36	2009	1058	Original/ HDPE	2021

date unknown indicates prior to 2001.
2021 work is contracted and ongoing.

04/26/2024

OUCC DR 13-15

DATA REQUEST
City of Evansville

Cause No. 45545 S1

Information Requested:

For the existing active filters 21-28, please state the year the filter media was last replaced in each filter and the year the underdrain was last replaced in each filter.

Information Provided:

EWSU replaced the filter media and underdrains over a five-year period starting in 2017 and ending in 2021.

04/26/2024

OUCC DR 13-16

DATA REQUEST
City of Evansville

Cause No. 45545 S1

Information Requested:

During the Tech-to-Tech teleconference on March 27, 2024, Petitioner indicated some filters in the South Filter building will have media and underdrains replaced and that it was in the process of bidding this filter work. Please identify which filters will be addressed, describe the planned work, and provide the current work schedule.

Information Provided:

This project is still being evaluated.

04/26/2024

OUCC DR 13-17

DATA REQUEST
City of Evansville

Cause No. 45545 S1

Information Requested:

Please identify rehabilitations and upgrades that have been completed on existing filters 21-28 and the South Filter building since 2005.

Information Provided:

To EWSU's knowledge, the underdrains and filter media are the rehabilitations and upgrades that have been completed for this building.

(leaving the plant with only 40 MGD of pumping capacity). As such, an additional 6.0 MG clearwell with 30 MGD of pumping capacity should be added within the 30-year study period.

FIGURE 3-1
Site Plan of the Water Treatment Plant

TABLE 3.1
Water Treatment Plant Firm Capacities

Unit Process	*North Plant[1]*	*South Plant[1]*	*Total Capacity*	*Firm Capacity[2]*
River Intakes[3]			**90-140 MGD**	**70 MGD**
Screened Cells (3)			60-80 MGD	
30-inch Pipes Backup (3)			30-60 MGD	
Low Service Pumping	**86 MGD**	**60 MGD**	**146 MGD**	**126 MGD**
Pumps 4-6[4]	86 MGD			
Pumps 1-3		60 MGD		
Mixing	**36 MGD**	**24 MGD**	**60 MGD**	**42 MGD[5]**
Type	Rapid	Static		
G-Value Estimate	1,200 s^{-1}	500-1,500 s^{-1}		
Hydraulic Detention Time	10 sec	2 sec		
Flocculation	**36 MGD**	**24 MGD**	**60 MGD[6]**	**42 MGD[6]**
G-Value Estimate	60 - 80 s^{-1}	45 s^{-1}		
Hydraulic Detention Time	24 min	38 min		
Primary Sedimentation	**36 MGD**	**24 MGD**	**60 MGD[6]**	**42 MGD[6]**
Total Area	20,000 sf[7]	21,707 sf[7]		
Overflow Rate	1,800 gpd/sf[7]	1,105 gpd/sf[7]		
Total Volume	2,550,000 gal	3,484,000 gal		
Hydraulic Detention Time	102 min	208 min		
Secondary Sedimentation	**36 MGD**	**24 MGD**	**60 MGD[6]**	**42 MGD[6]**
Total Area	19,795 sf	12,724 sf		
Overflow Rate	1,818 gpd/sf	1,886 gpd/sf		
Total Volume	2,078,500 gal	1,431,500 gal		
Hydraulic Detention Time	83 min	86 min		
Gravity Filtration[8]	**36 MGD**	**24 MGD**	**60 MGD**	**57 MGD**
Filters 13-20	12 MGD			
Filters 21-28		24 MGD		
Filters 29-32	12 MGD			
Filters 33-36	12 MGD			
Finished Water Storage	**8.0 MG[9]**	**0.5 MG**	**8.5 MG**	**2.0 MG[10]**
High Service Pumping	**85 MGD**	**0 MGD**	**85 MGD**	**70 MGD**
HSP Station 2 (Pumps 4-7)	40 MGD			
HSP Station 3 (Pumps 8-10)	45 MGD			
Plant Firm Capacity			**60 MGD**	**42 MGD[6]**

Notes:
[1] Capacity figures are based on previous engineering reports and analyses.
[2] Firm capacity based on largest single unit being out of service under worst-case conditions (such as high raw turbidity and high system demand).
[3] Capacity estimates vary based on river elevations and actual pipe velocities.
[4] Pump capacities based on 53 ft. TDH.
[5] Plant functioned adequately without rapid mixer until 1997; coagulation may be impacted, but it is not recommended to limit overall plant capacity by the firm capacity of mixing process.
[6] Total and firm capacities are based on nominal design overflow rates; operational information and historical experience indicate an operational capacity of approximately 48 MGD.
[7] South primary clarifiers are flocculating clarifiers with 18-percent of volume and surface area for flocculation and 82-percent for clarification.
[8] Filters 1-12 are currently out of service.
[9] All 3 clearwells are interconnected via finished water channel between the Diesel Room and Filters 29-32 Building.
[10] Although plant firm capacity is not based on firm clearwell capacity, risk of failure/emergency closure of 6.5 MG clearwell poses significant potential impact to plant capacity and disinfection capabilities.

UTILITY MASTER PLANS
Volume 2: Water Master Plan

City of Evansville, Indiana
Water and Sewer Utility

OCTOBER 2009

Prepared By

HNTB

Table W-3-2
WTP CIP Project Summary

CIP Project Number	Priority	Project Start Year	Category	Project Name	Project Description	Total Project Cost	Planning Cost	Design Cost	Construction Cost
WTP-590-2009-12010	15	2013	Flow Monitoring	Filter Effluent Flow Meter Project	Individual filter effluent flow meters for 29-34	$120,000		$20,000	$100,000
WTP-230-2009-12012	16	2013	Replacement	Low Service Building Coating	Coat low service building on the interior and exterior	$120,000		$11,000	$109,000
WTP-250-2009-12013	17	2014	Upgrade	High/Low Service Pumping Improvements	Replace 4160-volt motor starters on LS Pumps #1-#6. Replace magnetic drive on LS Pump #1 with a VFD and add a control unit. Replace 4160-volt motor starters on HS Pumps #8-#10. Replace magnetic drive on HS Pump #9 with a VFD and add a control unit.	$4,000,000		$625,000	$3,375,000
WTP-190-2009-12037	18	2015	Other New Facility	WTP Expansion Project	Addition of a Third Set of Primary and Secondary Sedimentation Basins	$5,600,000		Currently Under Design	$5,600,000
WTP-290-2009-12014	19	2015	Other Existing Facility	Lead Paint Abatement	Complete Phase III of lead paint abatement program in Filter Building and coat lead based painted walls	$290,000		$38,000	$252,000
WTP-220-2009-12015	20	2015	Rehabilitation	North Plant Flocculation Basins	Recondition North Plant flocculation tanks (baffles and mixers) and primary sedimentation basin sludge scrapers	$1,500,000		$250,000	$1,250,000
WTP-190-2009-12016	21	2015	Other New Facility	Water Quality Lab Project	Update laboratory facilities	$570,000		$94,000	$476,000
WTP-190-2009-12017	22	2016	Other New Facility	Clearwell and HSP Station Installation Project	Install new 6.0 MG clearwell and HS Pump Station #4 in Sunset Park, Increase finished water storage and high service pumping capacities	$12,300,000		$2,000,000	$10,300,000
WTP-390-2009-12018	23	2017	Other Regulatory	CLO_2 Feed System Expansion Project	Increase size of chlorine dioxide feed system and install additional chlorine dioxide feed lines for pre-settled water (as primary disinfectant) to help meet Stage 2 DBPR requirements	$1,500,000		$250,000	$1,250,000
WTP-250-2009-12019	24	2017	Upgrade	Variable Speed Mixing Project	Convert Rapid Mix to Variable Speed	$80,000		$13,000	$67,000
WTP-190-2009-12027	25	2018	Other New Facility	Membrane Filter Project	Retrofit Filters 1-12 with membrane filters (6 MGD capacity)	$3,000,000		$500,000	$2,500,000
WTP-390-2009-12033	26	2018	Other Regulatory	Ferrous Chloride & Chlorine Feed Installation Project	Install ferrous chloride and chlorine feed systems with iron contact tanks for Stage 2 DBPR requirements	$2,000,000		$330,000	$1,670,000
WTP-190-2009-12028	27	2018	Other New Facility	Primary Basin Cover Project	Cover No. & So. Primary Basins to prevent chlorate formation due to photodecomposition. This will eliminate the need to go to raw water chlorination for algae control & improve taste and odors during algae blooms	$2,400,000		$410,000	$1,990,000
WTP-190-2009-12029	28	2018	Other New Facility	North Floc Tank Cover Project	Cover No. Floc. Tanks to prevent chlorate formation due to photodecomposition. This will eliminate the need to go to raw water chlorination for algae control & improve taste and odors during algae blooms	$280,000		$46,000	$234,000
WTP-220-2009-12020	29	2018	Rehabilitation	Sampling Station Rehabilitation Project	Install sampling spigots at all stations	$50,000			$50,000

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Date Last Revised:
October 2009

FIGURE W-3-3
WTP CIP Projects

0 35 70 140 Feet

frequency drives and associated control units will help increase pumping efficiency and flow variation control, which may reduce operational concerns with flow surges. Total Cost Estimate: $4,000,000.

14. **Water Treatment Plant Expansion Project (WTP-190-2009-12037) (95% Design Submitted to Utility)**
This project involves the addition of a third, covered primary sedimentation basin and a third secondary sedimentation basin at the South Plant to increase the treatment capacity of the South Plant and assist with flow balancing between the two plants.
Total Cost Estimate: $5,600,000.

7-10 YEAR TIMEFRAME (2015-2018)

1. **Lead Paint Abatement Project (WTP-290-2009-12014)**
This maintenance project involves completion of Phase III of the Lead Abatement Program to remove lead paint in the Filter Building. The work involves recoating the lead-based painted walls with lead-free paint. Total Cost Estimate: $290,000.

2. **North Plant Flocculation Basins Project (WTP-220-2009-12015)**
This project includes rehabilitation of the flocculation tank baffles and mixers and primary sedimentation basin sludge scrapers at the North Plant. This work will enhance the operational efficiency of the North Plant flocculation and sedimentation processes. The existing baffles, mixers, gates, and scrapers have outlived their useful service life and require rehabilitation in order to maintain continuous, efficient operation. During design of this project, it will be determined whether certain components may be rehabilitated or if full replacement is warranted. The sedimentation process is the limiting unit process in the overall plant capacity rating under the estimated growth scenarios. Thus, it is critical that all components of this process, including mixers, baffles, and scrapers, perform at maximum efficiency to meet increased future capacity requirements. Total Cost Estimate: $1,500,000.

3. **Water Quality Laboratory Project (WTP-190-2009-12016)**
This project involves updating the existing laboratory facilities to replace the existing laboratory with its aging and severely crowded facilities and fixed equipment (e.g., fume hoods, incubators, sterilizers, glass washers, etc.). The project will include modernized sample collection facilities. Replacement of analytical equipment is not included in this project. Stricter regulations will require more rigorous and exacting testing procedures, and it is critical that large water treatment plants have on-site analytical facilities possessing current technology. The new laboratory would be located in the general vicinity of the Diesel Room area, but would not involve removing the diesel generators. Total Cost Estimate: $570,000.

4. **Clearwell Installation Project (WTP-190-2009-12017)**
This project involves construction of a new 6.0 MG underground clearwell and High Service Pump (HSP) Station No. 4 across Waterworks Road from the plant on City park property (Sunset Park). The reinforced concrete clearwell would be designed to allow continued use of the property as a public park. The new clearwell and associated pump

EVANSVILLE WATER AND SEWER UTILITY
EVANSVILLE, INDIANA

WATER MASTER PLAN

SEPTEMBER 2016

Prepared by

The HNTB Companies
Infrastructure Solutions

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HNTB Job No. 66201-PL-001

deposition at the intake, as well as minor corrosion and paint chipping inside the building. The electrical equipment was given a condition score of two due to the age (around 40 years old) and the lack of redundancy. The station is vulnerable to complete shut down if a single electrical fault were to occur.

Improvements recommended at the low service pumping station include: maintenance and replacement of each traveling screen, low service pump annual maintenance, low service pump motor and drive replacements, river dredging, coating or all interior and exterior of the building and bridge, coating of all interior and exterior process piping, HVAC system improvements, air compressor replacement, pneumatic actuator rebuilds, additional sump pump in lower level for redundancy, upgrades to the potassium permanganate system, and replacement of the MCC and switchgear.

3.6.2 Primary Sedimentation

The rapid mix equipment at the North Plant was given a condition score of three, the flocculation equipment was given a condition score of seven, and the primary sedimentation basins were assigned a condition score of four. The immediate concerns that were identified were the age of the infrastructure, the lack of redundancy in the rapid mixer, the degradation of the concrete, the condition of the sludge removal mechanisms, and the corrosion in the bridges and gates. The sludge station was given a condition score of six. The immediate concerns were the condition of the concrete and the metals within the station.

Recommended improvements at the North Plant include equipment replacement in Basin No. 1 and No. 2, drive rebuild in each of the flocculation units, concrete tank improvements, new rapid mixer with redundancy, coating of all support beams for walkways and handrails, and replacement of sluice gates and tank access ladders.

The primary sedimentation equipment at the South Plant was given a condition score of six. Recommended improvements at the South Plant include replacement of all the basin equipment, coating all equipment, concrete rehabilitation to existing basins, and the addition of the third primary and all associated sludge equipment.

3.6.3 Secondary Sedimentation

The secondary sedimentation basins at the North Plant were not scored since the infrastructure is buried, but the conditions are concerning due to the settlement above the basins and the crack in the wall between the basins. Recommendations include structural repair to basin wall separating Basin No. 1 and No. 2, installation of fall protection grating over basin inlets, concrete rehabilitation and bridge replacement over the influent flume, and washwater piping rehab/lining to fix ground settlement over basins.

The secondary sedimentation basins at the South Plant were given a condition score of four. The immediate concerns included the corrosion and integrity of the equipment below the water line and the condition of the weirs. The South Plant recommendations include coating of all equipment, addition of third basin and all associated sludge equipment, replacement of the weirs, and concrete rehabilitation to existing basins.

3.6.4 Filtration

Filters 13-20 were given a condition score of two. The immediate concerns were the corrosion in the equipment, the bed failure in Filter 17 and the lead paint in the building. It was identified that these filters are beyond their intended life. It is recommended to recoat support beams and trusses throughout the filter gallery, to rehabilitate the piping, to replace the filter underdrains and the filter media, and to remediate any lead paint issues. Since the decommissioned filters are reducing the firm capacity of the plant, they need to be restored so the plant can meet the system demands.

Filters 21-28 were given a condition score of six. The immediate concerns were the pipe corrosion, the status of the heaters, concrete efflorescence, and the condition of the condensate pump and surface wash pumps. It is recommended to rehabilitate or replaced the dehumidifier, to replace the unit heaters and associated piping, to recoat all piping and equipment, and to replace or repair equipment.

Filters 29-32 were given a condition score of five. The immediate concerns were the corrosion on the metal roofs, the steel pipe supports, the lintels and the stairs, and the status of the dehumidifier. It is recommended to install a functional dehumidifier, to replace all steel pipe supports, to rehabilitate the piping, and to address the issue of roof drainage into the filters.

Filters 33-36 were given a condition score of six. The immediate concerns were the leakage of steam in the active filter gallery, and the corrosion in the steel piping. It was recommended to repair the steam piping, to ensure that the dehumidifier is operational, and to recoat the piping.

3.6.5 Chemical Systems

Many of the chemical systems were in fair condition but the major equipment including bulk tanks, day tanks, transfer pumps, metering pumps, scales, and control equipment will need replaced during the planning period due to the harsh environments this equipment is exposed to. Costs have been assigned to each chemical system in **Appendix D**.

The carbon building was given a condition score of six. The immediate concerns are the condition of the mixer in the southeast corner (cracked equipment pad), the status of the dilute slurry pump out of service, and the equipment access limitations. There appears to be several minor leaks in the concrete walls between the holding tanks.

The chlorine dioxide system was given a condition score of six; however, the plant does not feed this chemical any longer and this system (the bulk chlorite storage and generator building) shall be demolished.

The fluoride room was given a condition score of six. The immediate concerns in this room are one leaking transfer pump and the other pump appears to be out of service due to a failure. Both

TABLE D.1
Water Treatment Plant Project List and Cost Estimates

						Timeframe(s) of Improvements (2016 Dollars)								
Description	Unit	Quantity	Unit Cost	Installation	Present Cost	2017	2018	2019	2020	2021	2022 - 2026	2027 - 2031	2032 - 2036	2037 - 2046
HVAC System Rehab (Exhaust Fans, Louvers, Dampers, Etc)	ls	1	$ 60,000	$ 21,000	$ 81,000						$ 81,000			
North Flocculation / Sedimentation Basins /Rapid Mix/Sec Sed Basins/Flumes														
North Settling Basin No. 1 (Costs Includes Replacing Scrapers)	ea	1	$ 240,000	$ 60,000	$ 300,000						$ 300,000			
North Settling Basin No. 2 (Costs Includes Replacing Scrapers)	ea	1	$ 240,000	$ 60,000	$ 300,000						$ 300,000			
Floc. Unit Replacement	ea	6	$ 48,000	$ 12,000	$ 360,000						$ 360,000			$ 360,000
North Basin Variable Speed Rapid Mixer	ea	1	$ 80,000	$ 20,000	$ 100,000						$ 100,000			
Coating of All Tanks/Channel Walls/Floors/Troughs	ls	1	$ 1,300,000	$ -	$ 1,300,000						$ 1,300,000			
Coating of support beams/handrail	ls	1	$ 20,000	$ -	$ 20,000						$ 20,000			
Sec Sed Basin Inlet Protection	ea	6	$ 1,000	$ -	$ 6,000	$ 6,000								
Flumes - Concrete Rehab, Replacement Walkways, and Coating	ls	1	$ 290,000	$ -	$ 290,000						$ 290,000			
Replacement of 30" x 30" Sluice Gates (Floc. Structure)	ea	6	$ 20,000	$ 5,000	$ 150,000						$ 150,000			
Replacement of 48" x 48" Sluice Gates (Primary Sed Basins)	ea	2	$ 30,000	$ 5,000	$ 70,000						$ 70,000			
Replacement of Slide Gates (Inlets to Sec. Sed. Basins)	ea	5	$ 15,000	$ 5,000	$ 100,000						$ 100,000			
Replacement of Motor Control Center	ls	1	$ 120,000	$ 30,000	$ 150,000						$ 150,000			
North Sludge Station / Electrical Building														
Rehabilitation of small building and deep pipe/valve vault	ea	1	$ 25,000	$ -	$ 25,000				$ 25,000					
Replacement of Electrical Components	ls	1	$ 30,000	$ -	$ 30,000				$ 30,000					
South Primary/ Secondary Sedimentation Basins														
Replace South Pri. and Sec. Sed. Basin 1 & 2 Equip. (4 tanks)	ls	1	$ 1,192,000	$ 298,000	$ 1,490,000					$ 1,490,000				
South Pri. and Sec. Sed. Basin Expansion (New 3rd Set)	ls	1	$ 4,560,000	$ 1,140,000	$ 5,700,000						$ 5,700,000			
Coat Equipment in all South Pri./Sec. Basins (6 tanks)	ls	1	$ 72,000	$ 18,000	$ 90,000					$ 90,000				$ 90,000
Replacement of Electrical Components	ls	1	$ 30,000	$ -	$ 30,000					$ 30,000				
South Sludge Pump Station														
Rehabilitation of South Sludge Pump Station (Stairs, Hatches, Floc/Sed No. 3 Needs)	ls	1	$ 272,000	$ 68,000	$ 340,000				$ 340,000					
Additional Sump Pump Installation	ea	1	$ 1,000	$ 350	$ 1,350				$ 1,350					
Plant Interconnect														
36" DIP Between South Plant and North Plant 1.5 MG Clearwell	ls	1	$ 300,000	$ 75,000	$ 375,000			$ 375,000						
Filter Media Replacement (24 Filter Beds)														
Media Replacement Filters 13-20 (8 filters)	ls	1	$ 666,000	$ -	$ 666,000	$ 133,200	$ 133,200	$ 133,200	$ 133,200	$ 133,200		$ 666,000		$ 666,000
Media Replacement Filters 21-28 (8 filters)	ls	1	$ 1,322,000	$ -	$ 1,322,000						$ 1,322,000		$ 1,322,000	$ 1,322,000
Media Replacement Filters 29-36 (8 filters)	ls	1	$ 1,350,000	$ -	$ 1,350,000							$ 1,350,000		$ 1,350,000
Underdrain Replacement Filters 13-20 HDPE Blocks (8 filters)	ls	1	$ 1,796,000	$ -	$ 1,796,000	$ 359,200	$ 359,200	$ 359,200	$ 359,200	$ 359,200				
Underdrain Replacement Filters 21-28 HDPE Blocks (8 filters)	ls	1	$ 3,564,000	$ -	$ 3,564,000						$ 3,564,000			
Underdrain Replacement Filters 29-36 HDPE Blocks (8 filters)	ls	1	$ 3,640,000	$ -	$ 3,640,000							$ 3,640,000		
Filter Buildings and Pipe Galleries														
Allowance for Lead Paint Removal/Abatement	ls	1	$ 350,000		$ 350,000			$ 350,000						
Filters 1-12 Membrane Filtration Retrofit	ea	12	$ 300,000	$ 75,000	$ 4,500,000			$ 2,250,000	$ 2,250,000					
Filters 1-12 Building Upper Floor Coating/Rehab.	ls	1	$ 16,000	$ 4,000	$ 20,000			$ 10,000	$ 10,000					
Filters 1-12 Pipe Gallery Demo for Membrane Retrofit/Relocate 1.5 MG Vent	ls	1	$ 100,000	$ -	$ 100,000			$ 50,000	$ 50,000					
Filters 1-20 Building Dehumidification Improvements	ls	1	$ 75,000	$ 18,750	$ 93,750				$ 93,750					
Filters 13-20 Building Upper Floor Coating/Rehab.	ls	1	$ 16,000	$ 4,000	$ 20,000					$ 20,000				
Filters 13-20 Pipe Gallery Coatings/Rehab/Replace	ls	1	$ 64,000	$ 16,000	$ 80,000					$ 80,000			$ 20,000	
Filters 21-28 Pipe Gallery Coatings/Rehab.	ls	1	$ 48,000	$ 12,000	$ 60,000					$ 60,000			$ 40,000	
Filters 29-32 Building Dehumidification Improvements	ls	1	$ 55,000	$ 13,750	$ 68,750				$ 68,750					

TABLE E.1 (continued)
Water Master Plan Compiled Project List

Project Name	Project Description	Project Year	Total Project Cost
LS Pump #5 Pump Maintenance	LS Pump #5 Pump Maintenance	2022-2026	$30,000
LS Pump #6 Pump Maintenance	LS Pump #6 Pump Maintenance	2022-2026	$30,000
Dredging in front of Intake Structure (Approx. $100,000/YR.)	Dredging in front of Intake Structure (Approx. $100,000/YR.)	2022-2026	$500,000
Duplex Air Compressor Replacement	Duplex Air Compressor Replacement in Intake and Low Service Pumping	2022-2026	$8,100
Pneumatic Actuator Rehabilitation	Pneumatic Actuator Rehabilitation in Intake and Low Service Pumping	2022-2026	$5,400
HS Pump #4 Pump Maintenance	HS Pump #4 Pump Maintenance	2022-2026	$250,000
HS Pump #5 Pump Maintenance	HS Pump #5 Pump Maintenance	2022-2026	$250,000
HS Pump #8 Pump Maintenance	HS Pump #8 Pump Maintenance	2022-2026	$250,000
HS Pump #10 Pump Maintenance	HS Pump #10 Pump Maintenance	2022-2026	$250,000
HS Pump #10 Motor	HS Pump #10 Motor	2022-2026	$70,000
Coating of High Service Pump Station #3 Piping/Equipment	Coating of High Service Pump Station #3 Piping/Equipment	2022-2026	$40,000
HVAC System Rehab (Exhaust Fans, Louvers, Dampers, Etc)	HVAC System Rehab (Exhaust Fans, Louvers, Dampers, Etc) in High Service Pump Station	2022-2026	$81,000
North Settling Basin No. 1 (Costs Includes Replacing Scrapers)	North Settling Basin No. 1 (Costs Includes Replacing Scrapers)	2022-2026	$300,000
North Settling Basin No. 2 (Costs Includes Replacing Scrapers)	North Settling Basin No. 2 (Costs Includes Replacing Scrapers)	2022-2026	$300,000
Floc. Unit Replacement	Floc. Unit Replacement	2022-2026	$360,000
North Basin Variable Speed Rapid Mixer	North Basin Variable Speed Rapid Mixer	2022-2026	$100,000
Coating of All Tanks/Channel Walls/Floors/Troughs	Coating of All Tanks/Channel Walls/Floors/Troughs in North Flocculation / Sedimentation Basins / Rapid Mix / Sec Sed Basins / Flume	2022-2026	$1,300,000
Coating of support beams/handrai	Coating of support beams/handrail in North Flocculation / Sedimentation Basins / Rapid Mix / Sec Sed Basins / Flumes	2022-2026	$20,000
Flumes - Concrete Rehab, Replacement Walkways, and Coating	Flumes - Concrete Rehab, Replacement Walkways, and Coating	2022-2026	$290,000
Replacement of 30" x 30" Sluice Gates (Floc. Structure)	Replacement of 30" x 30" Sluice Gates (Floc. Structure)	2022-2026	$150,000
Replacement of 48" x 48" Sluice Gates (Primary Sed Basins)	Replacement of 48" x 48" Sluice Gates (Primary Sed Basins)	2022-2026	$70,000
Replacement of Slide Gates (Inlets to Sec. Sed. Basins)	Replacement of Slide Gates (Inlets to Sec. Sed. Basins)	2022-2026	$100,000
Replacement of Motor Control Cente	Replacement of Motor Control Center in North Flocculation / Sedimentation Basins / Rapid Mix / Sec Sed Basins / Flumes	2022-2026	$150,000
South Pri. and Sec. Sed. Basin Expansion (New 3rd Set)	South Pri. and Sec. Sed. Basin Expansion (New 3rd Set)	2022-2026	$5,700,000
Media Replacement Filters 21-28 (8 filters)	Media Replacement Filters 21-28 (8 filters)	2022-2026	$1,322,000
Underdrain Replacement Filters 21-28 HDPE Blocks (8 filters)	Underdrain Replacement Filters 21-28 HDPE Blocks (8 filters)	2022-2026	$3,564,000
Replace Washwater Pump in 1.5 MG Clearwell	Replace Washwater Pump in 1.5 MG Clearwell	2022-2026	$60,000
Ammonium Hydroxide	Ammonium Hydroxide	2022-2026	$50,000
Gaseous Chlorine - Install Chlorinators (EWSU Already Purchased)	Gaseous Chlorine - Install Chlorinators (EWSU Already Purchased)	2022-2026	$35,000
Flood Pump Maintenance (Two -100 HP Vert. Turbines on VFDs)	Flood Pump Maintenance (Two -100 HP Vert. Turbines on VFDs)	2022-2026	$30,000
Replacement of Electrical Components	Replacement of Electrical Components	2022-2026	$20,000
*Sludge Hauling/Management Vehicles	*Sludge Hauling/Management Vehicles	2022-2026	$400,000
Decommissioning and Removal of Abandoned Equipment	Decommissioning and Removal of Abandoned Equipment	2022-2026	$1,000,000
Office and Headhouse Improvements	Office and Headhouse Improvements	2022-2026	$100,000
Lab Expansion and Improvements	Lab Expansion and Improvements	2022-2026	$200,000
Diesel Storage Tanks for 3-day Supply w/ Conditioning System (Two 5000 Gal Tanks)	Diesel Storage Tanks for 3-day Supply w/ Conditioning System (Two 5000 Gal Tanks)	2022-2026	$62,500
Demo Old Fuel Tanks, Containment Area, and All Piping	Demo Old Fuel Tanks, Containment Area, and All Piping	2022-2026	$200,000
Peerless Rd	Upper Mt Vernon from West Wind to Peerless and Peerless from Upper Mt Vernon to Moya (4,020' of 12"; 800' of 16")	2027-2031	$1,424,000
Marlene Dr	Marlene north from Hogue to dead end (1,230' of 8")	2027-2031	$219,000
Boehne Camp Rd	Boehne Camp north from Hogue to dead end (2,300' of 8")	2027-2031	$382,000
Neighborhood of Broadway between Felstead and Hillside	Residential area north of Broadway between Felstead and Hillside (15,080' of 8")	2027-2031	$3,143,000
Broadway Ave - Phase III	Nurenbern from Lyle to Red Bank, Red Bank fro Nurenbern to Broadway, Broadway from Red Bank to Tekoppel (10,010' of 8"; 2,720' of 12")	2027-2031	$2,203,000
Neighborhood of Broadway, Tekoppel, and rail yard	Residential area bounded by Broadway, Tekoppel, and rail yard (14,480' of 8")	2027-2031	$3,217,000

Kickoff Meeting Minutes

Project: Water Plant Value Engineering and Conceptual Design/Budgeting
Subject: **Kickoff Meeting**
Date: August 31, 2023, 1:00 pm CDT
Attendees: EWSU: Matt Montgomery, Shawn Wright, Lane Young, Harry Lawson, Steve Capin, Rick Glover
Clark Dietz: Andrea Bretl*, Jim Edenburn*, David Wichman
Arcadis: Amy Smitley, Tony Smurlo*
Black and Veatch: Adam Westermann*, Donnie Ginn*, William Rhoads*, Ben Freeze*
Kokosing: Tim Cooper, Todd Lemen*
*Designates Virtual Attendance
Copies: Attendees

This meeting kicks off a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget. The minutes were prepared by Andrea Bretl and distributed on September 5, 2023. If you have any corrections to these minutes, please inform Andrea by September 12, 2023.

1.0 Team Introductions were made by EWSU, Clark Dietz, Black and Veatch, Arcadis, and Kokosing.

2.0 EWSU's Next Planning Step Goals:

2.1 Matt provided an introduction outlining the steps that led us to this meeting. Arcadis and Black & Veatch were enlisted to individually explore options for rehabilitating the existing facility, while Clark Dietz focused on assessing the initial design plan. EWSU would like to further develop the rehabilitation option to obtain a cost estimate with a tighter probability range.

2.2 Lane emphasized that the current stage involves the engagement of all three consultants, along with Kokosing, working cooperatively to arrive at a realistic cost estimate and one that EWSU can use to make decisions.

2.3 Lane would like to have the cost information that they need for decision making by the end of October.

2.4 In addition to all the rehabilitation considerations, EWSU would also like to consider:

a. The best use of their real estate/what to do with the old plant.
b. Life cycle costs associated with rehabilitation vs new construction.
c. A realistic design life for the rehabilitation option.
d. How the project might be phased both to keep the current plant in operation and to spread construction costs out over a longer time period.
e. Design capacity of 50 mgd only.

2.5 EWSU assumes that ozone treatment does not need to be considered to meet current treatment goals.

2.6 Roles:

a. Clark Dietz: coordinator, facilitating communication among all parties involved (PM: Andrea)
b. Arcadis and Black & Veatch: refining rehabilitation costs (PMs: Tony, Adam)
c. Kokosing: provide opinions cost, constructability, and phasing. (PM: Tim)

3.0 Schedule

3.1 The following is a preliminary weekly discussion topic list and milestones with the first meeting on September 7th being more of an extended workshop (~4 hours) to give Arcadis and Black and Veach to present their options and to develop conclusions for treatment goals, salvageable components of the existing plants, and process flow.

Week Of	Discussion	Milestone Decisions
September 7	• Treatment Goals • Salvageable Buildings/Unit Processes • Existing Clearwell • Process Flow Diagram	• Current and Future Treatment Goals • Salvageable Buildings/Unit Processes
September 14	• Process Flow Diagram • Existing Clearwell • Hydraulic Profile/Flood EL requirements • Site Constraints • Seismic Design Criteria–existing and new	• Process Flow Diagram
September 21	• Existing Clearwell • Hydraulic Profile/Flood EL requirements • Seismic Design Criteria–existing and new • Process Layout – Rehab and New • Phasing	• Hydraulic Profile/Flood EL requirements • Site Constraints • Seismic Design Criteria–existing and new
September 28	• Existing Clearwell • Site Layout – Rehab and New with major elements (structure, equipment, electrical) identified • Piping/Materials Design Criteria • Phasing	
October 5	• Existing Clearwell • Process Layout – Rehab and New with major elements (structure, equipment, electrical) cost components • Piping/Materials Design Criteria • Phasing	• Process Layout/Preliminary Phasing • Existing clearwell
October 12	• Cost Component Updates	
October 19	• Cost Component Updates • Final Criteria	• Final Cost components
October 26	• Final Layout • Phasing • Costs	

4.0 Data/Information Needs

4.1 Clark Dietz will work to setup the best tools for information and data sharing amongst all parties.

5.0 Next Meetings:

5.1 September 7: Workshop from 8 am to noon central.

5.2 September 14-October 26: Weekly meetings from 8 am to 10 am central.

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Workshop Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Workshop Meeting**
Date: September 7, 2023, 8:00 am CDT
Attendees: EWSU: Matt Montgomery, Lane Young, Harry Lawson, Steve Capin, Rick Glover
Clark Dietz: Andrea Bretl, Jim Edenburn, David Wichman, Jamie Headen (Benton Associates)
Arcadis: Amy Smitley, Tony Smurlo, Stephane Jousset, Jack King
Black and Veatch: Adam Westermann, Donnie Ginn, William Rhoads, Ben Freese
Kokosing: Tim Cooper, Todd Lemen, Alan Holding, Joe Lambdin, Steve Ehret
Sterling: Barb Daum, Andy Carroll, Matt Perkins
Copies: Invitees and Attendees

This meeting was to take a deeper look at the project goals, the rehabilitation options that have already been investigated, and make decisions on the parameters and constraints of the final option to be cost estimated. These minutes were prepared by Andrea Bretl and distributed on September 8, 2023, please inform her of any corrections by September 15.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives

a. Work collaboratively as a single team with all the best ideas on the table.
b. Develop 2023 planning costs for a single alternative that has a higher level of confidence than the current costs.
c. Develop life cycle costs for the hybrid option and new plant option.
d. Meet current water quality requirements, plan for future requirements.
e. Maximize the reuse of the existing plant. Maximize the best and highest use of all real estate.
f. Develop costs for demolition of the un-reused portions of the existing plant.
g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints

a. Capacity: The design capacity of the hybrid options needs to be 50 mgd of finished water.
   i. Current – 36 mgd with a basin out of service
   ii. Winter months have the lowest demand – The Plant could go lower than 36 mgd for sequencing during construction.
   iii. North plant capacity is currently limited to 17 mgd unless there is temporary bypass pumping. If a pipe that was demoed in a previous project was replaced, it could go up to 24 mgd.
   iv. South plant capacity is currently limited to 20 mgd
b. IDEM
   i. Residuals –The existing plans extending the intake pipes. This should handle issues with Residuals.
   ii. Elevations – It was discussed whether the rehab options will have to meet flood elevation requirements and whether the existing plant meets those requirements.
   - **Action Item: Lane will have a phone call with IDEM to determine if the rehab option still needs to meet the flood elevation requirements previously discussed.**
   - **Action Item: EWSU will send the AECOM has a memo that describes the elevation issue to the team.**
   iii. Existing Filter Rating – The hydraulic loading rate of the filters will impact their sizing by a factor of 2. 10 State standards require 2-4 gpm/sf. But to load at 2 gpm/sf might require pilot testing over all seasons. The lower 2 gpm/sf loading will facilitate future PFAS requirements with carbon addition.
   - **Decision: The filters will be laid out for the lower 2 gpm/sf loading.**

c. Land use – EWSU previously justified taking Levee Authority Bldg. and City Garage because of needing more space to meet PFAS requirements.
   - **Decision: If EWSU needs to say that that decision was re-thought, and that the land isn't fully utilized in the current plan, that's ok.**

d. Army Corps – The Corps will need to be coordinated with for any taking of wetlands or current ponding area.

e. Funding – The project is already on SRF's approved funding list. AIS – was included in Kokosing's GMAX budget. If the new rehab/hybrid option is pursued, will the contractor need to follow BABA requirements?
   - **Action Item: EWSU will check on whether BABA needs to be followed if they pursue rehab.**

f. Timing – The only timing constraint is funding. Rehab on the intake may count for starting.

g. DNR – The DNR will eventually need to be coordinated with on the Ohio River water withdrawal.

h. Cost – EWSU currently does not want to put a constraint on the rehab option dollar amount. If it is around $200M they won't have to obtain more borrowing capacity or have additional rate increases. At a certain level above $200M, they will have to make a new rate case.

1.3 Other Conceptual design considerations

a. Determine what will be needed for electrical layout.

b. Parking and traffic flow should be considered.

c. Space for administration and maintenance should be considered.

d. Simple operations should be prioritized in the final layout and design.

2.0 Workshop Objectives

2.1 Review existing preferred alternatives and process flow diagrams.

2.2 Set water quality goals.

2.3 Preliminary list of salvageable vs. unsalvageable areas

2.4 Site Constraints

3.0 Presentations

3.1 Black and Veatch discussed their alternatives focusing on their alternative 2 and the associated process flow diagram.

a. The question was asked whether they have experience with tube settlers on Ohio River water. They do know of plants that use Ohio River water and tube settlers: Northern KY Water and Owensboro.
   - **Action Item: Does EWSU want to visit a plant with tube settlers?**

3.2 Water quality objectives: The water quality objectives used were those previously developed. Those objectives are shown in Attachment 1.
   - **Decision: these are appropriate objectives.**

3.3 Existing Conditions

a. Filters 29-32: The concrete is not in good condition and is not currently being considered for reuse.

b. Filters 29-36: These have trouble getting sufficient flow.

c. Filters 21-28 (south plant): These were recently rehab'd, but the piping is in bad shape, bolts, valves, corrosion at pipe penetrations. The condition of the clearwell is unknown. The 48" raw water line goes through that building and it has pinholes.

d. Existing chemical systems are not in bad shape, but they are spread all over the site.
   - **Decision: Assume new chemical bldgs. for now.**

3.4 Arcadis – Discussed their Alternative 3 as well as 2 and 2B, which reuse parts of the existing north plant. They focused their later alternatives on minimizing the use of the old Levee Authority building given the potential beneficial reuse of that space.

4.0 Discussion

4.1 Site Constraints – The group looked at and discussed a map with various previously discussed options of locating the new components of the facility.

- **Decision: The areas agreed are summarized in Attachment 2.**

4.2 Salvageable vs. unsalvageable – Areas that will be salvaged vs those that won't be salvaged were discussed.

- **Decision: The areas agreed are summarized in Attachment 3.**

5.0 Data requests

5.1 Arcadis's new slides

5.2 Arcadis Asset management

6.0 Next Meeting: Goals and Assignments

6.1 The PMs from BV, Arcadis, Clark Dietz, and Kokosing will met Friday Morning, 9/8, to set assignments for next week's meeting.

a. Black and Veatch: Layout and process flow diagram, electrical reuse, clearwell and settling basin sizing.

b. Arcadis: Filter and chemical storage area sizing, life cycle cost framework, hydraulic profile

c. Kokosing: preliminary costs on another settling basing the same size as the current south primary settling basins.

d. Clark Dietz: Layout and lifecycle cost estimate for the new plant VE option.

7.0 Plant Tour for In-Person Participants

2.0 Process Evaluation of New Plant Design

The proposed processes for the new treatment facility were reviewed to evaluate their necessity and compatibility with the existing raw water quality and finished water quality goals (Table 2-1).

Table 2-1.Raw Water Quality Data, Treatment Performance Indicators, and Finished Water Goals.

Parameter	Average Value[1]	MCL, SMCL, Regulation, or Recommendation	Finished Water Quality Goal[3]
Total Organic Carbon, mg/L	3.8	% Removal Req	<2
Alkalinity, mg/L as $CaCO_3$	88	Influences %TOC Removal	>50
Total Dissolved Solids, mg/L	242	500	
Total Hardness, mg/L as $CaCO_3$	130	<150	100-150
Atrazine, µg/L	0.33[4]	3	<3
Phosphorus, mg/L	0.18		
Nitrate, mg/L	<2	10	
Iron, mg/L	0.29	0.3	<0.2
Manganese, mg/L	0.19	0.05	<0.05
Chloride, mg/L	16	250	
Sulfate, mg/L	38	250	
Chloride:Sulfate mass ratio	0.43	<0.5	
pH	7.78	6.5-8.5	>7.7
TOC Removal, %	>40%	25-35%	
Settled Water Turbidity, NTU			
North Plant Primary	1.46		
North Plant Secondary	1.39	<2	
South Plant Primary	1.97		
South Plant Secondary	1.66	<2	
TTHM Formation, µg/L[2]			
During Chloramine	47	<80	<80
During Free Chlorine	96	<80	<80

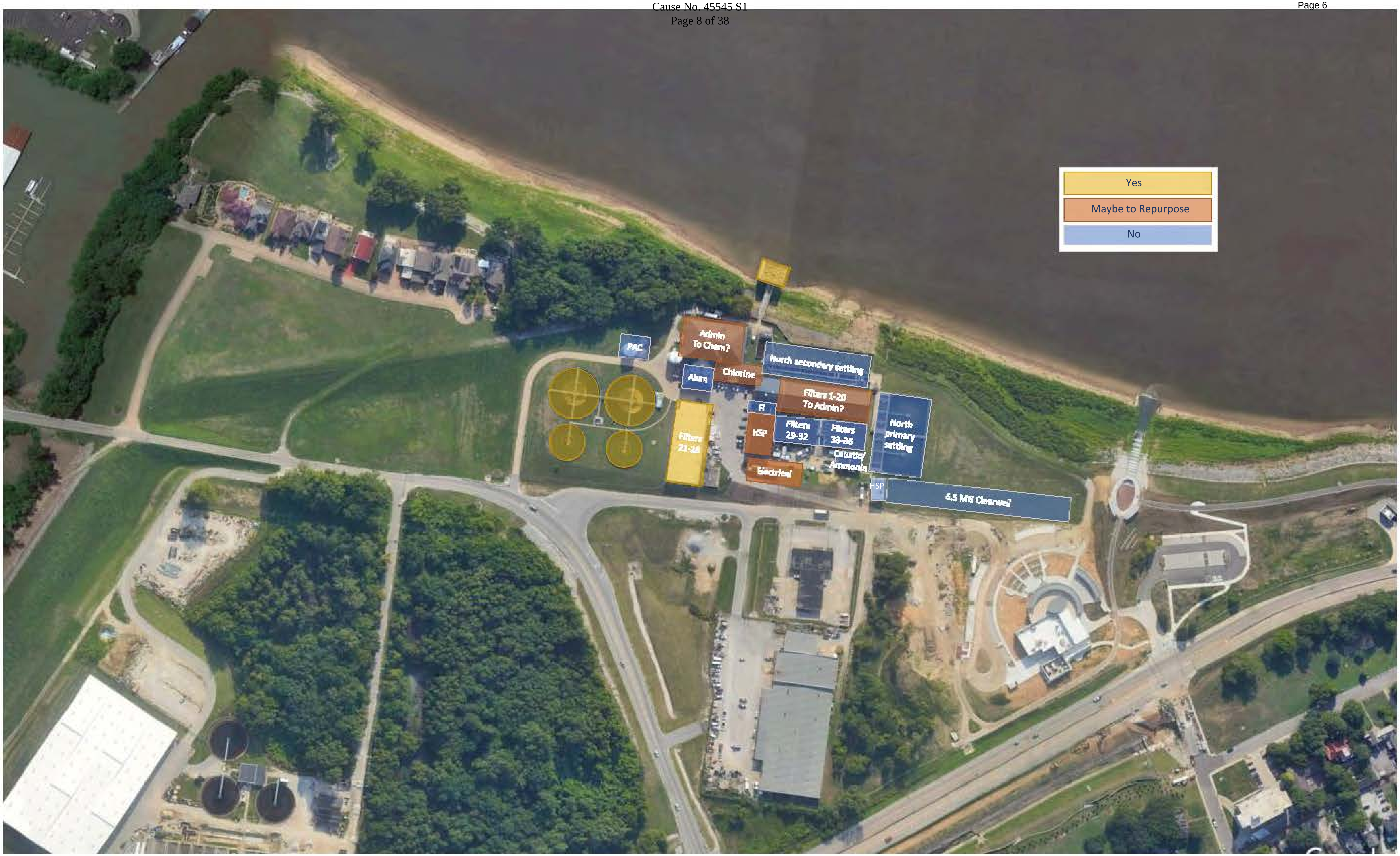
Source:
[1] AECOM Advanced Facility Plan Alternatives Report (unless otherwise noted)
[2] "Lab Data 2022" File in "Water Quality" Zip folder
[3] As stated in AECOM Advanced Facility Plan Alternatives Report
[4] Measured seasonally; this reflects average during spring runoff

2.1 OZONE

It is uncertain if the proposed ozone system is required to meet treatment goals. The proposed ozone facility was included for the primary purposes of reducing formation of halogenated disinfection byproducts (DBPs) and its secondary benefits of reducing undesirable taste and odors (T&O), removal of atrazine, and providing some primary disinfection (i.e., CT credit).

The primary period of non-compliance with DBP regulations occurs when the WTP is using free chlorine throughout the distribution system for nitrification control. Calculation methodology for DBP


Priority Areas for new Components: 3, 4, 8
Secondary potential: 5, 6
Not Preferred: 1, 2, 7
1-Preference? Not actually feasible
2-Redevolop
3-Utilities
4-Floodplain
5-Redevelop potential
6-Redevelop potential
7-No
8-Redevelop potential/ clearwells


Yes
Maybe to Repurpose
No
Admin
To Chem?
PAC
Alum
Chlorine
North secondary settling
Filters 1-20
To Admin?
Fl
HSP
Filters 29-32
Filters 33-36
Clearwell/
Ammonia
Electrical
North primary settling
Filters 21-28
HSP
6.5 MG Clearwell

Meeting Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: September 14, 2023, 8:00 am CDT
Attendees: EWSU: Matt Montgomery, Shawn Wright, Lane Young, Harry Lawson, Steve Capin, Rick Glover
Clark Dietz: *Andrea Bretl*, Jim Edenburn, David Wichman
Arcadis: *Tony Smurlo*
Black and Veatch: Adam Westermann, *Ben Freeze*
Kokosing: Tim Cooper, *Todd Lemen*, *Alan Holding*
Sterling: *Matt Perkins*
Copies: Invitees and Attendees

This was a progress meeting as part of a regular series of meetings to develop the conceptual design of a rehabilitated water plant. These minutes were prepared by Andrea Bretl and distributed on September 18, 2023. If you have any corrections, please inform her by September 21, 2023.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives

a. Work collaboratively as a single team with all the best ideas on the table.

b. Develop 2023 planning costs that have a higher level of confidence than the current costs.

c. Develop life cycle costs for the hybrid option and new plant option.

d. Meet current water quality requirements, plan for future requirements.

e. Maximize the reuse of the existing plant. Maximize the best and highest reuse of all real estate.

f. Develop costs for demolition of the un-reused portions of the existing plant.

g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints

a. The design capacity is 50 mgd of finished water. Currently has a 36 mgd firm capacity. For construction, the plant could go lower than 36 mgd temporarily during the winter if need for sequencing.

b. IDEM

- **Lane provided an update on our previous discussion on whether the hybrid plant option would be required to meet floodplain elevation requirements. Action Item: EWSU would like to know the differential costs between meeting and not meeting the floodplain elevations. This information he can use for future discussions and decision making.**

ii. The memo previously prepared AECOM memo describing elevation requirements is on the e-Builder site for this project.

c. Army Corps

i. There was a discussion on whether the wetland to the southeast of the current water plant site is potentially usable for new WTP components. This will be discussed further if this space seems like a good location.

d. SRF BABA vs. AIS

- **Matt provided an update on whether BABA requirements need to be followed. EWSU's preliminary determination is that this is still the same project as the one approved by IDEM on May 14, 2022, if we close by Sept 30, 2024. If we start work on the intake structure, this will count. Need final price by June 1, 2024.**

e. Cost estimating

- **Decision: The pricing provided by Kokosing as part of this Value Engineering effort are estimates, not GMAX costs.**

- **Action Item: Kokosing will include all their assumptions with the pricing that they provide.**

2.0 Design Considerations

2.1 Previous decisions:

a. Filter rating 2 gal/min/SF. Testing would need to be done if we are going to increase this to 4 gpm/sf. Filters are currently rated at 3 gpm/sf (Rick).
- **Design Decision: the 2 gal/min/sf loading rate will be assumed for conceptual design as part of this VE engineering effort.**

b. Previous WQ goals will be used.

c. Open tanks/major electrical above EL 384

2.2 Ongoing work:

a. Electrical and site layout (BV)

b. Parking and traffic flow (after site plan development)

c. Administration and maintenance space

d. Chemical buildings – assume new for now.

e. PFAS Information review

2.3 Deliverable
- **Action Item: EWSU would like a rendering of what the site will look like to accompany the final deliverable. Arcadis will work on this.**

3.0 Presentations and Discussion Topics

3.1 BV: layout and process flow diagram, electrical reuse, clearwell and settling basing sizing

a. Hybrid:

i. Rehab of intake not changed from the current design.

ii. Second raw water line to a new distribution box. Question from plant: What would be the hydraulics? Could one line carry the full flow, or would there be restrictions?

iii. Tube settlers in Primary basins – bring from 2 to 3. New splitter boxes.
- **Decision: EWSU does not want to visit a tube settler plant.**

iv. For preliminary sizing, the filter design was copied from AECOM plan. Leave space for future filter expansion.

v. GAC could have space if we pumped using the transfer pumps.

vi. Consider leaving space on the site plan for future ozone.

vii. Admin Building: question should we get an architectural firm to review the feasibility of renovations?
- **Action Item: What is the minimum size of the clearwell volume to get sufficient CT time in the clearwells?**

viii. EWSU reminds us to consider ingress and egress to the proposed water plant site. Make sure the proposed entry road is not too close to Veteran's. Balance potential land redevelopment with traffic needs and logical site design.
- **Design Decision: They keep the existing Alum (HyperIon) room**
- **Design Decision: The preferred layout is 3 equal sized primary settlers.**
- **Action Item: Transfer pump station needs to be further considered. If it is included, it will add flexibility for future treatment either UV or PFAS and above grade clearwells. However, with it, there is the additional capital cost, operational complexity, and lifecycle costs of building, maintaining, and operating another pump station. Space could be left on the site or HSP room so that a transfer pump station could be added in the future. This might be the additional cost of meeting the flood elevation that Layne asked us to consider at the beginning of the meeting.**

b. Black and Veatch also presented a low-cost option that keeps more of the existing plant and adds fewer new elements. This low-cost option included:

i. Demo north

ii. New Primary clarification

iii. Keep all filters 21-36 – no new filters,

iv. High service pump stations would be converted to transfer pump stations.
- **Design Decision: for now, EWSU would prefer to move forward with the hybrid option, this**

low-cost option can be a fallback option, if needed.

3.2 Arcadis: discussed that they have been looking at filter and chemical storage area sizing, life cycle cost framework, and the hydraulic profile.

a. They are trying to determine if it will be possible in the future to get PFAS treatment with the existing treatment.
b. Reuse for admin space: how much room is available for people
c. They are preparing a framework for lifecycle costs.
d. They asked again about the potential for the use of membrane treatment in the future.
   - **Design Decision: Membranes treatment will not be a future option.**

3.3 Clark Dietz: presented a revised layout of new plant option VE layout.

a. For this option, the entire existing plant could be demo'd except the intake structure, potentially a structure for chemical storage, and potentially a structure for the administration building.
b. The site plan will be provided to Kokosing to assist with cost estimating for the new plant VE option.

3.4 Kokosing:

a. Currently working on preliminary costs for a 3rd circular primary settling basin.
b. Will also start working on demolition costs for the existing plant structures.
   - **Decision: Demo will be costed two ways for each structure. One, to 3 ft below grade with all equipment removed. Two, complete removal.**
   - **Decision: Break up cost by structure.**
   - **Decision: outfalls will need to be rerouted.**

4.0 Data

4.1 Current

a. Arcadis has a few additional data requests that they will send to Clark Dietz
b. Kokosing requested the BV layouts as well as the CD layout option

4.2 Data sharing: eBuilder will be used for sharing existing data. Clark Dietz will work with EWSU to set up the folder structure. In addition to the background documents and meeting minutes, folders will be added for photos and cost estimates (vendor, lifecycle, etc.).

5.0 Next Meeting:

5.1 Goals

a. North Plant - Demolition Costs (Kokosing)
b. Hydraulics of influent pipes
c. Layout of filters/clearwells
d. Clearwell elevation

5.2 The next meeting will be moved from the 21st to the 22nd from 8-10 am.

Meeting Agenda

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: September 22, 2023, 8:00 am CDT
Attendees: EWSU: Matt Montgomery, Lane Young, Harry Lawson, Rick Glover
Clark Dietz: *Andrea Bretl*, Jim Edenburn, David Wichman, *Jamie Headen* (Benton Associates)
Arcadis: Amy Smitley, *Tony Smurlo*
Black and Veatch: Adam Westermann, *Ben Freeze*
Kokosing: Tim Cooper, *Todd Lemen*
Sterling: *Brian Luigs*
Distribution: Invitees

This is a progress meeting for a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives

a. Work collaboratively as a single team with all the best ideas on the table.
b. Develop 2023 planning costs that have a higher level of confidence than the current costs.
c. Develop life cycle costs for the hybrid option and new plant option.
d. Meet current water quality requirements, plan for future requirements.
e. Maximize the reuse of the existing plant. Maximize best and highest reuse of all real estate.
f. Develop costs for demolition of the un-reused portions of the existing plant.
g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints/Design Considerations

a. Design capacity is 50 mgd of finished water. Current is 36 mgd firm. For construction they could go lower than 36 mgd temporarily during the winter if need for sequencing.
b. Filter rating 2 gal/min/SF
c. Previous WQ goals will be used.
d. IDEM flood elevations: what is the cost differential between meeting and not meeting flood elevations. Open tanks/major electrical above EL 384.
e. Army Corps: while the wetland to the southwest of the site might be able to be used, we will try to avoid it if possible due to potential complications with that site.
f. SRF BABA vs. AIS: for now we will assume BABA requirement do not need to be met.
g. Cost estimates will include all assumptions but are not GMAX prices.

2.0 eBuilder

2.1 Background Documents

a. Geotech, Bridge inspection, Basis of Design Report, Background plans, electrical costs and service contract
   - **AECOM final drawings expected today. Are they really ready for bid. They expect the CAD drawings to follow.**

2.2 First Round Analysis

2.3 Second Round Meetings

a. Minutes, drone photos, historic operating costs (chemical)

3.0 Presentations and Discussion Topics

3.1 Reuse: Keep the area of the existing plant reserved for potential reuse for the utility. Keep the area to the east of the road available for future commercial reuse as much as possible. The north plant and south filters need to be reused during construction.

3.2 Black & Veatch

a. Raw Water Piping – two new 42" pipes per the AECOM design, or one existing 36" and one new 42". Discussion about piping. Temporary piping during construction. Piping through the current Admin Building might be an option. Or where the existing 36" is located. Each pipe should have at least a 36 mgd capacity. 36" should be ok for the short term. Will avoid an exposed pipe on the levee, if possible.

- **Design Decision: new piping is needed from the building to the splitter structure.**
- **Design Decision: Metering on two raw water lines, not into the three tube settlers.**

b. Mixing – B&V has been assuming rapid mix since the plant hasn't had good experience with static mixing.

- **Request: B&V would like pump curves for detailed design.**

c. Filtration

i. The current plan has a lower loading rate (2 gpm/sf) than AECOM (3.2 gpm/sf). The AECOM filters were deeper.

ii. Existing filter to waste is up by the north plant filters. B&V needs to add backwash supply, filter to waste, outfall.

d. Clearwell volume requirements

i. Typically, B&V they like to see at least 10% of storage at the plant, which would be 5 mg.

ii. B&V is currently showing 10 mg, but not all of it may be needed.

iii. There is also clearwell beneath the filters ~0.77 mg each, total is ~1.5 mg

- **Design Decision: Minimum now should be 5 mg with space to add an additional 2.5 in the future. This is usable volume in addition to the storage below the filter clearwells.**

iv. Future: if flow by gravity now and have top of wall ~385 then in the future you could utilize the additional 18' by pumping.

e. Clearwell elevation/pumping discussing: adding transfer pumps now or in the future. Gravity to clearwell would be low ~350 to drain filter clearwells.

- **Design Decisions: For now, flow to the clearwell by gravity. Leave space/access for a future transfer pump station for either future treatment or additional clearwell volume.**

f. Sludge pump station

i. The well itself is ok. It needs new piping/pumps. The discharge needs to be extended into the river.

g. Residual outfall

i. Who is developing plans

ii. Consolidate all outfalls into one

h. Chemical

i. Hyperion – reuse. Location next to the Admin bldg? Keep for now to see where costs are.

ii. PAC – new

3.3 Arcadis

a. Looking at space needed for operation, maintenance, admin.

b. Chemicals – for sodium hypochlorite, sodium hydroxide, corrosion, fluoride space needs (100x40). They will size a footprint for B&V.

c. PFAS – could they just replace the media in the existing filters to get treatment? Media would only last 6 months. And there isn't enough depth. A separate treatment train will be needed.

3.4 Clark Dietz

a. New plant option – revised layout

3.5 Kokosing

a. Demolition costs – meeting with demo contractor today

b. 3rd Settler Costs – will have number next week

c. To estimate other new items – sizes, depths, cross sections, hydraulic profile.

   i. For 21-28 B&V will markup existing drawings, x2 – one for rehab of existing, one for new building.

   ii. For tube settlers B&V will get floc settler within structure. Also need to get a new proposal.

   iii. Settling basin cover – geo dome. Clark Dietz will get info

3.6 Other Cost Estimating

- **Design Decision: All new structures will be estimated with auger cast piles no drilled piers.**

b. Tube settler basins – will they be covered? Experience with other plants are not covered.

c. Next items ready

d. Information needed

4.0 Next Meeting:

4.1 Goals

4.2 September 28, 8:00 am

ClarkDietz
Engineering Quality of Life™

Meeting Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: September 28, 2023, 8:00 am CDT
Attendees: EWSU: Matt Montgomery, Shawn Wright, Lane Young, Harry Lawson, *Steve Capin*, Rick Glover
Clark Dietz: *Andrea Bretl*, Jim Edenburn, David Wichman, *Jamie Headen* (Benton Associates)
Arcadis: *Amy Smitley, Tony Smurlo*
Black and Veatch: Adam Westermann, *Ben Freeze*
Kokosing: Tim Cooper, *Todd Lemen, Alan Holding*
Sterling: *Barb Daum, Matt Perkins*

This is a progress meeting for a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget. These minutes were prepared by Andrea Bretl and distributed on September 28. If there are any corrections, please let Andrea know by October 5, 2023.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives

a. Work collaboratively as a single team with all the best ideas on the table.
b. Develop 2023 planning costs that have a higher level of confidence than the current costs.
c. Develop life cycle costs for the hybrid option and new plant option.
d. Meet current water quality requirements, plan for future requirements.
e. Maximize the reuse of the existing plant. Maximize best and highest reuse of all real estate.
f. Develop costs for demolition of the un-reused portions of the existing plant.
g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints/Design Considerations – See Attachment A. If there are any corrections to the design decisions, please let Clark Dietz know.

2.0 Site Layout and Land Utilization

2.1 Hybrid Layout – B&V shared their layout. It is largely unchanged from last week.

a. We are moving forward with rectangular tanks.
   - **Decision: EWSU preference is to have these tanks largely on the triangular property south of the maintenance facility's access road.**
   - **Decision: The existing electrical lines on that property will have to be relocated and will likely need to be buried.**

2.2 VE Layout – CDI shared their layout. It is unchanged from last week. This option does not redesign the treatment of AECOM (except eliminating ozone) but reuses as much existing design work as possible to minimize the need for engineering redesign of the plant elements.

a. We have provided the site plan to Kokosing and will also provide them with a piping layout and hydraulic profile.
b. This layout provides less re-development potential than the hybrid layout.
c. The basis of the cost estimate will be the GMAX pricing that Kokosing has already done with revisions for VE elements. The cost estimating for this will not be detailed like for the hybrid option, because the detail work was already done with the GMAX pricing.

3.0 Presentations and Discussions

3.1 Black & Veatch – this discussion centered around the filter building, clearwell, and pump stations. B&V is developing some additional details that Kokosing needs for cost estimating.

3.2 Arcadis

a. Chemical demand and sizing – Arcadis is about ½ way through looking at chemical demands and building sizing. They anticipate being done next week.

b. People spaces – Arcadis is looking into the square footage requirements for maintenance, administration, and operations. Determining where exactly those spaces are will follow.

c. Asset management – Arcadis is focusing on the buildings that are to remain in the new plan. They will send the asset management plan soon.

4.0 Cost Items: Kokosing

4.1 Current items:

a. Settling basin 3 – Currently at $10.5M – likely to drop after dewatering drops.

i. Tube settler equipment price was for two large and 2 small clarifiers. Divide those costs in three. Get a new quote

ii. Dewatering: is it necessary since the new tanks will be essentially above grade.

iii. Cost includes site piping back to splitter box.

b. Filter Building - New

i. For concrete estimate, use B&V's new layout. Use the hydraulic profile for the elevation. Use as-built drawings for piping in the middle of the building. There are a few piping details in the existing drawings that are not going to be used for the new.

ii. Use the pile layout that is in the old drawings.

iii. Increase the reinforcing from the old drawing. Plan on thicker concrete/more rebar. Can they use the AECOM final drawings for filter wall size/rebar? Probably yes if they have the detail.

iv. The bottom of the filter building will be approximately 5' below the bottom of the settling basins.

v. Kokosing would like B&V's revised drawing as well as their current site plan and hydraulic profile. B&V will also send the clearwell drawing.

vi. We will want two options: 1) transfer pump station, clearwell tank walls 27' tall (25' SWD), 2) no transfer pump station, clearwell tank walls 42' deep (25' SWD). Assume that the transfer pump station (TSP) pumps will be the same layout/piping as the high service pump station (HSP). The TSP will be smaller. The backwash pumps will be separate.

c. Filter Building – Existing (South)

i. Everything to be rehab'd except for the filters themselves.

d. Clearwell: Start with unit costs of the CSO tanks at the West WWTP. B&V currently shows baffle walls going the length of the tank. They should probably be the width of the tank.

e. Demo – They hope for the estimates next week.

4.2 Currently not carrying owner contingency for the individual items.

4.3 Recommend: All yard piping costs be separate from structures. B&V will provide piping length.

4.4 Next item/current information needs:

a. This week:

i. Working on new-plant option

ii. New filter building

b. Next week:

i. Clearwell

c. Other:

i. Existing filter building – piping costs will be similar to new + demo

ii. Existing settlers – Kokosing would like more details on what this would look like/what they would need. B&V has floc zone sized; will get details to Kokosing. Currently the floc zone has paddles. EWSU is ok with paddles. Get a proposal from Mike Row from Pelton.

iii. Post-chemical (Caustic, LAS)

iv. Splitter structure

v. PAC – Same as AECOM design
vi. Hypochlorite – Same as AECOM design?
vii. Coagulant system – not many costs at this location
viii. Also need pump quotes.
ix. Influent lift station
x. Site piping
xi. Site electrical – B&V will send information on how to repurpose existing chemical feed. B&V will send information to Kokosing.
xii. Filter to waste and low lift pumps – they need to be new. Will be next to the new filter building.

5.0 eBuilder

5.1 Background Documents: Geotech, Bridge inspection, Basis of Design Report, Background plans including AECOM 100%, electrical costs and service contract

5.2 First Round Analysis; Second Round Meetings: Minutes, drone photos, historic operating costs

- **We will use eBuilder as a place to share our working drawings so everyone can see the same things.**

6.0 Next Meeting:

6.1 October 5, 8:00 am

Water Plant Value Engineering
Hybrid Option Conceptual Design and Budgeting
Evansville Water and Sewer Utility
LAST UPDATED: 09/28/2023

Date	Type	Design Decisions	Notes
9/7/2023	Site	Site Constraints agreed upon at workshop to maximumize beneficial reuse.	
9/7/2023	Site	Salvagable/Unsalvagable areas agreed upon at workshop.	Most of the north plan is unsalvagable.
9/7/2023	Site	Top of structure elevation - 384' (operating floor of intake; max flood 382.5)	Are there savings to not using this elevation? What would the cost savings be for the clearwell structure/shorter pumps?
9/14/2023	Site	Move forward with hybrid option, not rehab.	Also, CDI requested to prepare a drawing for Kokosing to estimate new plant VE option.
9/14/2023	Site	Outfalls need to be rerouted	
9/14/2023	Settling	Preferred layout is 3 equal sized primary settlers.	
9/14/2023	Settling	Membranes treatment will not be a future option.	
9/14/2023	Settling	The two large circularlar clarifiers will be reused and retrofit. A third will be added.	
9/22/2023	Piping	New piping is needed from the building to the splitter structure.	
9/22/2023	Piping	Flow meters will be installed on the two raw water lines, not into the three tube settlers.	
9/22/2023	Intake	The modifications to the intake building, pumps, and screens do not need to be reconsidered.	
9/22/2023	Intake	Two new 42" raw water pipes to the splitter structure are required.	
9/7/2023	General	Water quality objectives used for AECOM's design were discussed and are appropriate.	
9/7/2023	General	Design capacity is 50 mgd of finished water. Current is 36 mgd firm.	For construction they could go lower than 36 mgd temporarily during the winter if need for sequencing.
9/14/2023	General	Assume that BABA requirements do not need to be met for SRF funding.	
9/22/2023	General	All new structures will be estimated with auger cast piles not drilled piers.	
9/22/2023	Filtration	Filtration depth will not be configured for GAC/PFAS removal	
9/7/2023	Filters	The filters will be laid out for 2 gpm/sf loading.	
9/14/2023	Cost	Pricing provided by Kokosing as part of this Value Engineering effort are estimated, not GMAX costs	
9/14/2023	Cost	Demo will be costed two ways for each struction. 1) to 3 ft below grade wth all equipment removed and 2) Complete removal.	
9/14/2023	Cost	Costs will be divided by structure.	
9/22/2023	Clearwell	Flow to the clearwell by gravity (for current design).	In the future the water elevation in the clearwell could be raised and a transfer pump station added.
9/22/2023	Clearwell	Minimum clearwell volume should be 5.0 mg with space to ad 2.5 mg	
9/7/2023	Chemical	Assume new chemical buildings unless existing buildings are reusable.	This may change if additional chemical rooms are reusable.
9/14/2023	Chemical	Keep existing aluminum chloride (Hyper+Ion) room	

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Meeting Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: October 5, 2023, 8:00 am CDT
Attendees: EWSU: Matt Montgomery, Harry Lawson, Steve Capin, Rick Glover
Clark Dietz: *Andrea Bretl*, Jim Edenburn, David Wichman
Arcadis: *Amy Smitley, Tony Smurlo*
Black and Veatch: Adam Westermann
Kokosing: Tim Cooper, *Todd Lemen, Alan Holding*
Sterling: *Barb Daum, Matt Perkins, Brian Luigs*

This was a progress meeting for a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget. The minutes were prepared by Andrea Bretl and distributed on October 6, 2023. Please inform her of any corrections by October 12, 2023.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives

a. Work collaboratively as a single team with all the best ideas on the table.
b. Develop 2023 planning costs that have a higher level of confidence than the current costs.
c. Develop life cycle costs for the hybrid option and new plant option.
d. Meet current water quality requirements, plan for future requirements.
e. Maximize the reuse of the existing plant. Maximize the best and highest reuse of all real estate.
f. Develop costs for demolition of the un-reused portions of the existing plant.
g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints/Design Considerations – See Attachment A

2.0 Presentations and Discussions

2.1 Black & Veatch – Ben sent updated files yesterday. Kokosing is using those documents for cost estimating. Kokosing will use a 3-ft wall thickness for estimating the clearwell concrete volume and use the West Plant CSO basin for rebar estimates.

2.2 Arcadis

a. Chemical demand and sizing – used information from the advanced facility plan and 30% design to determine how much chemical will be needed. Took out bulk and day tank requirements. Arcadis's calculations are similar to AECOM's. Arcadis has laid out a preliminary room dimensions for the storage tanks. There appears to be enough tank in the existing chlorine gas room for sodium hypochloride storage.
   i. EWSU: they rarely get taste and odor complaints
   ii. EWSU: in addition to 10 State requirements, sizing should also consider tanker truck volumes.
b. Asset management – they have updated the current asset management plan. They are tracking items that are salvageable as well as items that need to be accounted for but potentially haven't been accounted for in the current plans. Most recent plant upgrade projects include:
   i. 2019 Filter Bed Rehab - completed
   ii. 2021 Filter Bed Rehab – in process

iii. 2023 Filters 13-20 Rehab (actuators) – in process
iv. 2020 HSP 4 & 5 rehab - completed
v. 2022 HSP 8,9,10 – in process
vi. 2022 Switch Gear - completed

c. People spaces – Arcadis has estimated the total square footage. There will be a single story. Arcadis will meet with Harry, Rick, and Brenna next Tuesday morning to go over space requirements in additional detail.

d. Renderings – They will focus on rendering the hybrid option. They have estimated approximately 80 hours of effort to create basic renderings that are mostly a shell for visual purposes.

2.3 Clark Dietz

a. The existing CenterPoint costs were discussed. The $8.5M estimate from CenterPoint included upgraded power supply as well as burying the line along Waterworks Road. If the power supply is not upgraded, then the estimated cost for just burying the power lines should be $1.5M. Kokosing does not need to account for this.

b. The WTP currently has 2 power feeds plus backup generators. They prefer to continue this power supply operation in the future.

c. The GMAX price did not include the cost of relocating power line along Waterworks Road.

3.0 Cost Items: Kokosing

3.1 Current items:

a. Hybrid buildings
i. Working on settling basin rehab
ii. Working on filter building
iii. Working on clearwell. What should they use for HSP on top? BV may have a similar drawing.
iv. Existing filter building – assume new doors, windows (block to tinted glass), painting, roof, storefront inside.
v. PAC – same as AECOM
vi. Splitter structure – BV will clarify dimensions
vii. Chemical buildings – from Arcadis dimensions (chlorine room); all new equipment

b. Demo
i. Building 7 – Kokosing doesn't have existing drawings, but that's because EWSU didn't put any on eBuilder. EWSU may have some drawings and will check.
ii. Building 8 – Kokosing doesn't have drawings. Neither does EWSU.
iii. Building 17 – Kokosing doesn't have existing drawings.
iv. Building 19 – Kokosing will use photos.
v. Building 20 - There won't be any modifications.

3.2 Next week Kokosing will go first and discuss their cost framework even for the items that are not currently populated with costs.

4.0 eBuilder

4.1 Background Documents; First Round Analysis.

4.2 Second Round Meetings: Minutes, drone photos, historic operating costs

- **Please either send updated working documents to Andrea to upload or upload them into folder 4.4 so everyone has access to the most recent information.**

5.0 Next Meeting:

5.1 October 12, 8:00 am

5.2 Final tour – October 26; 10-noon

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Meeting Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: October 12, 2023, 8:00 am CDT
Invitees: EWSU: Matt Montgomery, Shawn Wright, Harry Lawson, Steve Capin
Clark Dietz: *Andrea Bretl*, Jim Edenburn, David Wichman, *Jamie Headen* (Benton Associates)
Arcadis: *Amy Smitley, Tony Smurlo*
Black and Veatch: *Adam Westermann, Ben Freeze*
Kokosing: Tim Cooper, *Todd Lemen, Alan Holding*
Sterling: *Barb Daum, Matt Perkins*

This was a progress meeting for a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget. The minutes were prepared by Andrea Bretl and distributed on October 12, 2023. Please inform her of any corrections by October 19, 2023.

1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives
- a. Work collaboratively as a single team with all the best ideas on the table.
- b. Develop 2023 planning costs that have a higher level of confidence than the current costs.
- c. Develop life cycle costs for the hybrid option and new plant option.
- d. Meet current water quality requirements, plan for future requirements.
- e. Maximize the reuse of the existing plant. Maximize the best and highest reuse of all real estate.
- f. Develop costs for demolition of the un-reused portions of the existing plant.
- g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints/Design Considerations were included with the Agenda.

2.0 Cost Items: Kokosing

2.1 Project time - Cut time off from the AECOM option for the alternate pile type.
- a. AECOM – 59 weeks
- b. VE – 53 weeks
- c. Hybrid – 53 weeks

2.2 VE Option
- a. Included general costs – supervision; living expenses; field office; survey; dumpster; equipment move; 3rd party testing; central engineering; safety railing, barricades, training; laydown and parking; material handling crew; cleanup (part of mobilization); dust control; documentation; admin; security (OFF); eBuilder (TURN OFF); permits (OFF); escalations (PARTIALLY OFF); mobilization
- b. Cost escalation
  - i. Kokosing to assume that construction will start on January 1, 2024
  - ii. Engineers will add escalation for the items that will take longer because of the need for redesign
- c. AECOM items to be reused (ie. Raw intake building and PAC feed) – AECOM CAD drawings will be reused and one of the firms involved in the redesign will review and stamp.
- d. Demo of Levee Building and Maintenance Building

i. Buildings are in good condition
ii. Maintenance building could be used instead of construction trailers; also for a shop, storage, and laydown. It is fenced. Kokosing currently has $1.3M for construction facilities. There may be a significant savings if this isn't needed.
iii. Levee building could be used as a temporary admin building during construction.

e. Demo – currently in estimate just a as a lump sum; will be updated for line items.
f. Site Concrete – sidewalks, pavements
g. Entrance sign – same as in the AECOM design
h. Earthwork – is it being double counted? Where will excess material be put? Where will soil be stockpiled?
i. Dewatering – currently $5M. Hasn't been adjusted yet for smaller footprint and shallower profile. For the VE option, this will just be one line item, not broken out by building.
j. Raw Water Intake Pipeing – currently brought over AECOM's design. Kokosing needs to double check.
    i. No concrete foundations.
    ii. Why is the 12" WM being run back to the intake? Seal water? It won't need to be heat traced.
k. Utilities: fire water, sanitary, storm, gas, yard
l. Turned off $21M transformer yard
m. Pile foundation – different than AECOM – will be broken out by building.
n. RW Intake Bldg – same as AECOM
o. Settling – do we want the canopy? Yes for now. Assume the same for both the VE and Hybrid options.
p. Same design: Filter, residuals pump station, chem bldg., PAC
q. Backwash pumps – AECOM had backwash pumps and used and below grade tank. We will have the pumping and electrical equipment. The structure eliminated and the backwash pumps will be put into the filter building.
r. Admin building (OFF)
s. Contingencies have been carried through from the original GMAX cost
t. Builders Risk – Kokosing would prefer to carry. They have it included now at $2.6M.
u. Dredging – Currently have an allowance on the intake of $100K. Wasn't included in original.
v. Extending outfalls – Was not included in the original, but will be included with yard piping.

2.3 Hybrid Option

a. General Conditions – GCs will be the same as for the VE option.
b. Mob/Demob – basically the same as the VE option
c. Site work – is going to be tailored to the hybrid layout
d. Dewatering – BV recommends making the specific to building as some of the buildings (filters) will not need much dewatering because of their bottom elevation. BV's design document has bottom elevations for everything.
e. Pile foundations – included in each building separately.
f. Site electrical – Sterling is working on costs based on the one-line diagram they received.
g. Yard piping is being built based on BV's drawing.
h. Raw water intake bldg. – brought over from AECOM. It includes dredging. Assume existing pumps; they will be approximately the same size. AECOM's piping was higher even though their hydraulic profile was lower.
i. Raw water intake piping – brought it over from AECOM and will adjust.
j. PAC Feed - brought it over from AECOM design
k. New Facilities –
    i. Settling basin – discussed two weeks ago. Kokosing needs to make sure that they have tube settler and equipment install for all 3 basins. Make sure there is a canopy cost here too.

ii. Filter Building
iii. HSP – For costing, structurally use AECOM's design. This HSP should be with the Clearwell; not with the Filter Building as it is on the same structure as the clearwell.
iv. Rapid mix/splitter structure – is this cost captured on the VE option? It is a different type of configuration between the AECOM and the VE/hybrid. Both VE/hybrid will use rapid mix/splitter.
v. Residual PS, Existing sludge PS upgrades
vi. New Chemical
vii. Existing Filter Upgrades (Architectural, re-roof, paining and coating, interior piping)
viii. Existing Post-Chemical building – Existing chlorine gas conversion to hypochloride – use AECOM costs for chlorine equipment. Add demo of existing equipment. Existing building with containment, new building systems: mechanical, electrical. Arcadis has a layout – will summarize key information for Kokosing. – revise note on the bid item information
ix. New Post-Chemical - caustic, bisulfite, fluoride, LAS – revise note on the bid item information. Arcadis also has a preliminary layout for this building.
x. Existing coagulant rehab.
xi. Arcadis will send a clarification on what chemicals will go where.

3.0 Updates

3.1 Black & Veatch
   a. Getting information to Tim for cost estimating
   b. Need to get building height to Arcadis for rendering
   c. Cost for raising to grade? All costs right now will be based on elevation 384.

3.2 Arcadis
   a. People spaces – estimating square footages and plan to apply just a square foot cost. Next week will have some ideas on what architectural options will be.
   b. Chemical spaces – will get info to Kokosing as described above.
   c.

3.3 Clark Dietz
   a. Exteriors – Exposed concrete will have form liner; not brick.

3.4 Sterling had asked electrical questions previously; if they don't receive answers they will need to make broad generalizations.
   a. BV has some answers and will send them by tomorrow [sent 10/12].

4.0 Deliverable

4.1 Brief memo with attachments from BV, Arcadis, Clark Dietz and Kokosing with the final version of the working documents we have been discussing over the last 6-8 weeks.

5.0 Schedule

5.1 Next Meeting: October 19, 8:00 am
5.2 October 26 – workshop to VE the cost estimates options. Assume that this meeting will go to noon.
5.3 November 1 – deliverable to EWSU

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Meeting Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: October 19, 2023, 8:00 am CDT
Invitees: EWSU: Matt Montgomery, Shawn Wright, Harry Lawson, Steve Capin
Clark Dietz: *Andrea Bretl*, Jim Edenburn, David Wichman, *Jamie Headen* (Benton Associates)
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1.0 Hybrid VE Objectives – Completed by October 26

1.1 Planning Objectives

a. Work collaboratively as a single team with all the best ideas on the table.
b. Develop 2023 planning costs that have a higher level of confidence than the current costs.
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f. Develop costs for demolition of the un-reused portions of the existing plant.
g. Develop a phasing plan and associated costs per phase.

1.2 Planning Constraints/Design Considerations are unchanged.

2.0 Cost Items: Kokosing

2.1 New Plant VE

a. General conditions – no changes
b. Mobilization –
   i. Third part testing is from CTL. This is currently the same value ($2.38M) as the original GMAX price. Kokosing is checking this.
c. Sitework
   i. Garage and Levee building – these costs are included. The demolition value for both buildings is $675k. It was included in the AECOM price.
   ii. Pump station demo is mechanical demo.
   iii. Klenk demo costs - Current new plan option price includes Klenk costs for demo. Currently that is not broken out, but it will be for next week.
d. Dewatering – has not been updated for different elevations but will be updated for next week.
e. Yard Piping – is being updated.
   i. Kokosing will make sure that they have accounted for the water line that needs to be relocated for both options.
f. Pile foundation has been updated. The auger cast pile cost is $9.3M.
g. Dredging - There is $100,000 for dredging at the intake.
h. Backwash supply – Keep the building put the tank goes away.

i. Hypo – the VE option will have one additional tank.
j. Owner Contingency – Kokosing will not carry this number in their estimate, it will be carried by City spreadsheet.

2.2 How conservative are the current cost estimates? The individual line items don't have a contingency on them. They have an overall contingency. For VE it is 5%. This is something that can be discussed next week.

2.3 Hybrid Option

a. Maintenance of Plant Operation / Sequence
   i. Intake Building should have been included with the original GMAX. That cost needs to be in both options.
   ii. For construction – the south filters need to be maintained as the north filtration capacity is not adequate.
   iii. Build Primary Settler 3 first and connect from there to Filter 21-28. Only one settler is needed to go to Filters 21-28.
   iv. The critical path will be to 1) construct HSP, 2) construct the new filter building and new primary settling, 3) rehab the other settlers and filter building. The north plant can't be demo'd until after this the rehab of the other settlers and filter building because there is no way to get filtered water from the north plant to the south side to get to the new HSP station/tank.
   v. There will be temporary chemical requirements when the chlorine room is being upgraded.
   vi. There will be temporary power requirements. Where will power come from? From the northeast of the HSP2. The intension is to reuse the existing power supply; however, this is going to be difficult if the north plant has to be operated at the same time the new portions of the south plant are being brought online. The biggest power draw will be the new HSP. Likely temporary power will be needed for a portion of the construction.
b. Dewatering – This is being updated.
c. Electrical – will be different than the VE option because there are a different number of buildings.
d. Yard Piping – is being checked.
e. High Service pump station
   i. Currently, Kokosing is using the value of the structure from the AECOM option.
   ii. BV wants to know what/how many pumps are being used. BV recommendation is that the same type and number of pumps should be used for both the hybrid and VE option.
f. The cost-estimate configuration is going to be different for the two options. Hybrid option, unlike VE, has piles included per structure.
g. BV offered to help Kokosing review equipment costs to make sure that nothing is missing.
h. Post-Chemical building – this is going to be very similar to bldg. for VE design, so it was carried across.

2.4 Roadway upgrade costs need to be included for both options and the costs will be the same for both.

2.5 Construction Schedule needs to be updated for both options for next week. Talking about sequencing today was helpful. Kokosing doesn't need any additional information.

2.6 The biggest current electrical questions are at the new intake because the existing to this building is 4160 V and the new will be 480 V. Kokosing had a sequencing plan for this when they did their GMAX. Sterling's bigger question is about what the station looks like at the end.

2.7 Intake was planned to start first; however, the equipment procurement is currently 18 months. It will be faster to get new concrete in the ground than it will be to get some of the large equipment delivered.

2.8 Admin building – don't have dollar numbers for this in either option. The plan is to get the treatment costs finalized first and then get back to the Admin building.

2.9 Effluent lines/bank restoration.

a. The effluent lines have to be extended 500-ft into the River.
b. Currently there has been no discussion about bank restoration, but it needs to be addressed.

Concrete slabs need to be removed and then restored. The Levee Authority hasn't said exactly what the restoration needs to look like. There have not been any discussions with the Corps or Levee Authority to date.

c. BV feels like the new settling basin is far enough away from the levee that there won't be a problem with construction. But the Levee Authority will have to be involved from day 1 when design is started.

3.0 Updates

3.1 Black & Veatch – no updates. They can help review equipment quotes if needed.

3.2 Arcadis

a. People spaces – working on; getting architectural input.

b. Rendering – will have drafts for next week.

3.3 Clark Dietz – no updates; got piping layouts to Tim.

4.0 Deliverable

4.1 Brief memo with attachments from BV, Arcadis, Clark Dietz and Kokosing with the final version of the working documents we have been discussing over the last 6-8 weeks.

5.0 Schedule

5.1 October 25 – Kokosing to send draft costs.

5.2 October 26 – workshop to VE the cost estimates options. Assume that this meeting will go to noon.

5.3 November 1 – deliverable to EWSU

ClarkDietz
Engineering Quality of Life™

Meeting Minutes

Project: Water Plant Value Engineering: Hybrid Option Conceptual Design and Budgeting
Subject: **Progress Meeting**
Date: October 26, 2023, 8:00 am CDT
Invitees: EWSU: Matt Montgomery, Shawn Wright, Harry Lawson, Steve Capin, Rick
Clark Dietz: Andrea Bretl, Jim Edenburn, David Wichman
Arcadis: Amy Smitley, Tony Smurlo
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Kokosing: Tim Cooper, Todd Lemen, Alan Holding, *Steve Ehret*
Sterling: *Brian Luigs, Matt Perkins*

This was a progress meeting for a series of regular meetings to develop the conceptual design of a rehabilitated water plant whose total project costs fit withing the City's budget. The minutes were prepared by Andrea Bretl and distributed on October 27, 2023. Please inform her of any corrections by November 2, 2023.

1.0 Intro

1.1 Updated estimated GMAX pricing came in yesterday from Kokosing. The updated costs are:
- a. $256M for the VE option (Attachment 1)
- b. $259M for the hybrid option (Attachment 2)
- c. These costs are still too much for the current funding available to EWSU. These are also not complete project costs as engineering, owner allowance, CenterPoint power relocation, and other costs are not included.

1.2 EWSU has approximately $220M to spend on this project including both the construction and non-construction costs. Any amount significantly above this would require a new rate case, which would be time-consuming.

1.3 SRF has said that if EWSU's loan is not closed on the project by September 2024, then the project will be subject to BABA requirements.

1.4 EWSU would like to have 60% drawings available by July 1, 2024, to get updated GMAX pricing, but would need 100% drawings by August 1, 2024, for bidding, if needed.

2.0 Estimated New GMAX Costs

2.1 The estimated GMAX costs were presented by Kokosing. These cost estimates were made using information previously provided by Clark Diez, Black and Veatch, and Arcadis. Some of the questions/answers included:
- a. Costs do not include either owner allowance, a new administration building, or maintenance space.
- b. Piles for each structure are included in the hybrid option with the structure.
- c. Demolition costs are accounted for in both options to and including the foundation.
- d. There may be some double counting in chemical building costs – Kokosing will check.

2.2 Potential savings ideas considered included: delaying the construction of several new unit processes including: the PAC system, other chemical systems, Filter Building 21-28 upgrades.
- **The Hybrid option offers more savings opportunities than the VE option. Therefore, we proceeded with looking at cost savings of the hybrid option.**

2.3 The most expensive components of the Hybrid option are the new settling basin and separate structures for the filters and the clearwell. There are potential savings for this option if the filter building and clearwell are combined as that would save on foundation and dewatering costs. There are also savings if a new settling basin is not constructed, but all four settling basins are converted to tube settlers.

2.4 Increasing the design loading rate of the filters, from the current design criteria of 2 gpm/sf, was discussed. This would require pilot testing across all seasons. It would also decrease the margin of safety that the plant has on treated water quality. Currently, the settling basins have a long detention time, when they are converted to tube settling that detention time will decrease. Also, currently the filters almost always have a loading rate of less than 2 gpm/sf. The consensus of both engineers and EWSU operations managers was that increasing design filter loading rate should be avoided.

2.5 Underground pipe routing was discussed, there are some savings opportunities with refining the piping plan again. Kokosing and the engineers walked the site after the meeting and determined a more efficient plan for routing the new dual raw water pipes to the splitter box and from the splitter box to the clarifiers.

2.6 The filter building layout was discussed in depth as well as the advantage of constructing all new filters versus construction half of the filters as new and leaving the remaining half of the filters and rehabbing them.

2.7 As a group, we developed three alternatives for the hybrid option. We estimated cost savings for each and developed a matrix of economic and non-economic scoring criteria for those three options and the original options. The three alternative hybrid layouts, along with the original hybrid layout are included in Attachment 3. The scoring matrix is included in Attachment 4.

2.8 Considering both costs and non-economic factors, the Hybrid Alternative 3 was selected as the best option. The preliminary design criteria are included in Attachment 5.

- **Action Item: Kokosing will update their estimated GMAX price for the Hybrid Alternative 3.**

2.9 Costs outside of the GMAX cost were also discussed.

2.10 PFOS treatment was discussed. The current design option does not include PFOS treatment, though some reduction can be expected with the PAC addition. The facility has been testing for PFOS and has not seen any troubling data, their latest test results were non-detect. If a limit is added and treatment is needed it will need to be a new unit process. The final design can account for this potential future need.

3.0 Deliverable

3.1 Brief memo with attachments from BV, Arcadis, Clark Dietz and Kokosing with the final version of the working documents we have been discussing over the last 6-8 weeks.

4.0 Schedule

4.1 November 1

a. Updated GMAX costs for Hybrid Alternative 3 from Kokosing
b. Draft deliverable to EWSU

Kokosing Industrial Inc 10/25/2023 11 : 59
HID22150CD EVANSVILLE UPGRADED WTP-VE NEW(CLK DTZ)
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Bid Pricing Report

Biditem	Description	Balanced Price	Bid Price	Bid Total Status
11000	ADMINISTRATIVE (GENERAL C	21,447,611.87	21,447,611.87	21,447,611.87
12000	MOBILIZATION / DEMOBILIZATI	6,598,655.48	6,598,655.48	6,598,655.48
20000	SITEWORK / CIVIL	14,971,922.44	14,971,922.44	14,971,922.44
21000	DEWATERING	4,759,471.99	4,759,471.99	4,759,471.99
22000	RAW WATER INTAKE PIPING	4,498,311.81	4,498,311.81	4,498,311.81
23500	YARD PIPING & STRUCTURES(C	6,962,837.29	6,962,837.29	6,962,837.29
25000	SITE ELECTRICAL DISTRIBUTIO	18,319,117.52	18,319,117.52	18,319,117.52
26000	PILE FOUNDATIONS(CLK DIETZ	10,336,177.74	10,336,177.74	10,336,177.74
1000000	EXISTING RW INTAKE BLDG(WI	12,087,830.00	12,087,830.00	12,087,830.00
2000000	PRETREATMENT BUILDING(PTB	20,109,898.86	20,109,898.86	20,109,898.86
4000000	FILTER BLDG(FTB)/CLEARWELL	83,156,511.42	83,156,511.42	83,156,511.42
5000000	RESIDUALS PUMP STATION(RPS	9,491,689.56	9,491,689.56	9,491,689.56
6000000	CHEMICAL BUILDING(CHB)	13,420,283.24	13,420,283.24	13,420,283.24
8000000	PAC - INTAKE CHEMICAL BUILD	4,301,811.63	4,301,811.63	4,301,811.63
9000000	BACKWASH SUPPLY BUILDING(	8,736,396.80	8,736,396.80	8,736,396.80
9100000	HYPO CONVERSION(RE-PURPOS	321,250.47	321,250.47	321,250.47
9200000	REHAB EXIST. COAGULANT FAC	211,003.21	211,003.21	211,003.21
9501000	CONSTRUCTION CONTINGENCY	12,000,000.00	12,000,000.00	12,000,000.00
9970000	SITE BASED EQUIPMENT	4,535,655.40	4,535,655.40	4,535,655.40
Report Totals				**256,266,436.73**

NOTE:
Italics indicate a nonadditive item. They will not be added to subtotals, unless all items in a subgrouping are nonadditive. They will not be added to the final totals.

Kokosing Industrial Inc 10/25/2023 11 : 41
HID22150B EVANSVILLE UPGRADED WTP-HYBRID(BLK&VTCH)
*** Steve Ehret

Bid Pricing Report

Biditem Description	Balanced Price	Bid Price	Bid Total Status
10000 GENERAL CONDITIONS	21,500,107.03	21,500,107.03	21,500,107.03
10500 MOBILIZATION / DEMOBILIZATI	6,635,383.25	6,635,383.25	6,635,383.25
11000 SITE BASED EQUIPMENT	4,546,756.69	4,546,756.69	4,546,756.69
15000 MAINTAINING PLANT OPERATI	554,137.07	554,137.07	554,137.07
20000 SITEWORK / CIVIL	13,096,982.37	13,096,982.37	13,096,982.37
21000 DEWATERING	4,773,160.45	4,773,160.45	4,773,160.45
260000 ELECTRICAL/I & C(NEW FACILIT	13,403,414.18	13,403,414.18	13,403,414.18
330000 YARD PIPING	10,159,038.06	10,159,038.06	10,159,038.06
410000 EXISTING RW INTAKE BLDG(WI	12,114,467.31	12,114,467.31	12,114,467.31
412000 RAW WATER INTAKE PIPING	3,626,800.06	3,626,800.06	3,626,800.06
480000 PAC - INTAKE CHEMICAL BUILD	4,313,771.55	4,313,771.55	4,313,771.55
501000 PRIMARY SETTLING BASIN 3	9,392,688.66	9,392,688.66	9,392,688.66
501500 PRIMARY SETTLING BASINS 1 &	5,868,146.69	5,868,146.69	5,868,146.69
502000 NEW GRAVITY FILTER BLDG(8E	56,315,824.94	56,315,824.94	56,315,824.94
503000 CLEAN WATER RESERVOIR TAN	34,573,817.94	34,573,817.94	34,573,817.94
504000 NEW RAPID MIX/SPLITTER STRU	1,972,881.97	1,972,881.97	1,972,881.97
505000 EXIST. SLUDGE PS UPGRADES	311,749.76	311,749.76	311,749.76
506000 NEW BACKWASH/FILTER TO WA	4,976,823.99	4,976,823.99	4,976,823.99
507000 NEW POST-CHEM BLDG(AS, CAU	14,075,975.19	14,075,975.19	14,075,975.19
508000 EXIST. FILTERS 21-28 UPGRADES	17,755,969.12	17,755,969.12	17,755,969.12
509000 HYPO CONVERSION(RE-PURPOS	322,036.76	322,036.76	322,036.76
510000 REHAB EXIST. COAGULANT FAC	211,519.66	211,519.66	211,519.66
900000 CONSTRUCTION CONTINGENCY	18,000,000.00	18,000,000.00	18,000,000.00
Report Totals			**258,501,452.70**

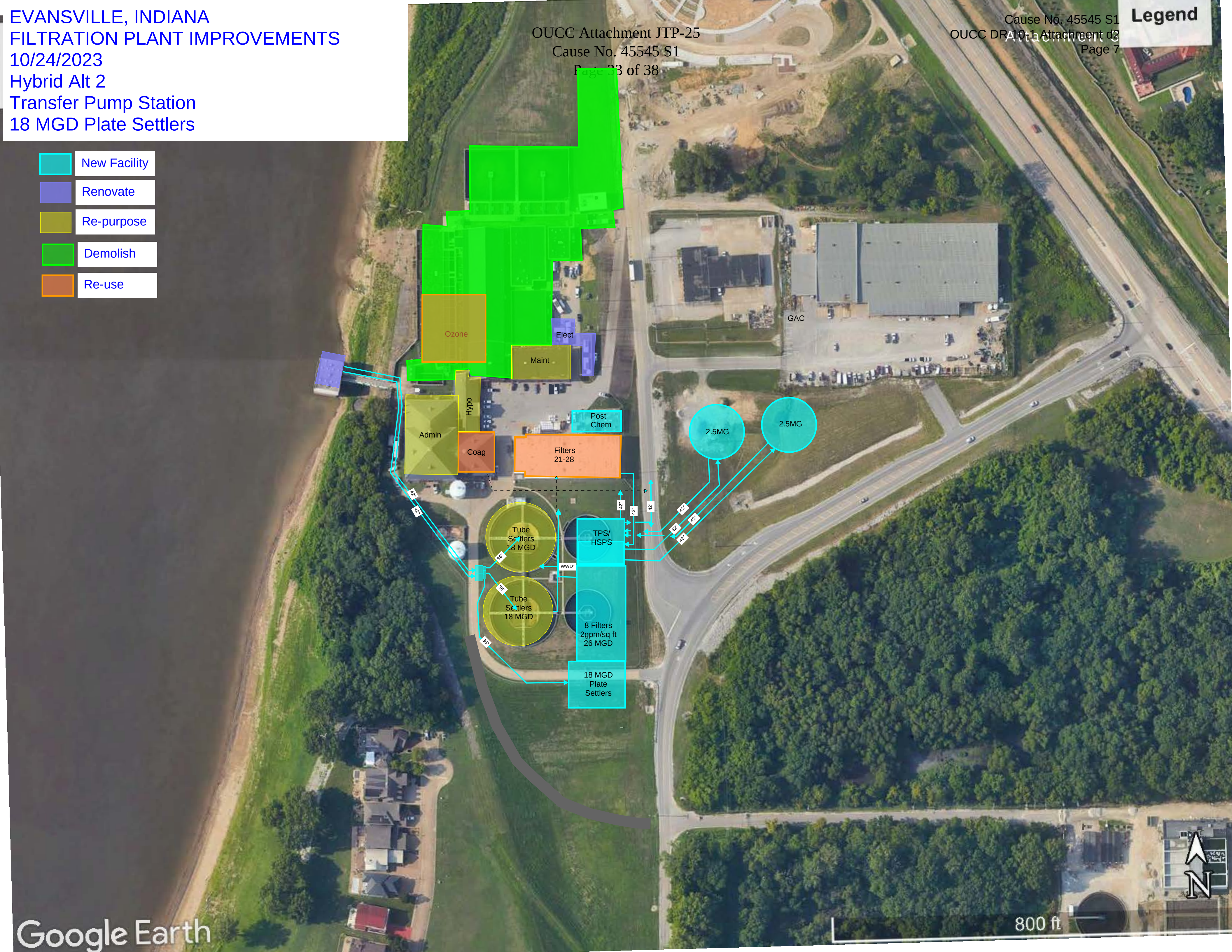
NOTE:
Italics indicate a nonadditive item. They will not be added to subtotals, unless
all items in a subgrouping are nonadditive. They will not be added to the final totals.

EVANSVILLE, INDIANA
FILTRATION PLANT IMPROVEMENTS
10/27/2023

Hybrid (Base Alternative as Estimated)

EVANSVILLE, INDIANA
FILTRATION PLANT IMPROVEMENTS
10/24/2023
Hybrid Alt 1
Move Filters to Reservoir - No new Basins
Keep Filters 21-28
Revise Raw Water

EVANSVILLE, INDIANA
FILTRATION PLANT IMPROVEMENTS
10/24/2023
Hybrid Alt 2
Transfer Pump Station
18 MGD Plate Settlers



EVANSVILLE, INDIANA
FILTRATION PLANT IMPROVEMENTS
10/24/2023
Hybrid Alt 3
Move Filters to Reservoir - No new Basins
All new Filters
Revise Raw Water

EWSU Notes		VE Option		Hybrid	Hybrid 1 - Split	Hybrid 2- Transfer Pumps	Hybrid 3 - All New Filters
	General Conditions	$21,447,612		$21,500,107	$21,500,000	$21,500,107	$21,500,000
	Mobilizatin/Demob	$6,598,655		$6,635,383	$6,635,000	$6,635,383	$6,635,000
Remove Plant demo from contract	Sitework/Civil/Demolition	$10,000,000		$9,000,000	$9,000,000	$9,000,000	$9,000,000
	Dewatering	$4,759,472		$4,773,160	$4,000,000	$1,193,290	$4,000,000
Two new 42" raw water line required	Raw Water Piping	$4,498,311		$3,626,800	$2,000,000	$2,000,000	$3,600,000
	Yard Piping and Structures	$6,962,837		$10,159,038	$8,000,000	$7,000,000	$8,000,000
	Site Electrical Distribution	$18,319,117		$13,403,414	$13,403,414	$13,403,414	$13,403,414
	Pile Foundations	$10,336,177		$0	$0	$0	$0
Required to be completed	Existing RW Intake PS	$12,087,830		$12,114,467	$12,114,467	$12,114,467	$12,114,467
	Pretreatment Building	$20,109,898		$15,260,834	$6,000,000	$15,000,000	$6,000,000
	Filter Bldg/CW/HSPS	$88,000,000		$56,315,824	$75,000,000	$56,315,824	$88,000,000
Filter upgrades required	Filter Upgrades 21-28	$0		$17,755,969	$17,755,969	$17,755,969	$0
	Clean Water Reservoir	$0		$34,573,000	$0	$11,000,000	$0
	Residual PS	$9,491,689		$4,976,823	$9,000,000	$4,976,823	$9,000,000
	Chemical Bldgs	$13,420,283		$14,075,975	$10,000,000	$13,000,000	$13,000,000
	PAC -Intake Chem Bldg	$4,301,811		$4,313,771	$4,313,771	$4,313,771	$4,313,771
	Backwash Supply PS	$8,736,396		$0	$0	$0	$0
Required to convert to hypo	Hypochlorite Conversion	$321,250		$322,036	$322,036	$322,036	$322,036
	Rehab Coagulant Bldg	$211,003		$211,519	$211,519	$211,519	$211,519
	Const Contingency	$12,000,000		$18,000,000	$12,000,000	$15,000,000	$12,000,000
	Site Based Equipment	$4,535,655		$4,546,756	$4,546,756	$4,546,756	$4,546,756
	Maint Plant Operation	$0		$554,137	$300,000	$300,000	$300,000
	Sludge PS	$0		$311,749	$311,749	$311,749	$311,749
	Rapid Mix/Splitter Structure	$0		$1,972,881	$750,000	$1,972,881	$750,000
	Transfer Pump Station				$0	$13,000,000	$0
	Reduce Capacity to 40 MGD	#######		#######	#######	#######	#######
	TOTAL	########		########	########	########	########

		VE Option	Original	Hybrid	Hybrid reuse existing Filters 21-18	Hybrid 2- Transfer Pumps	Hybrid 3 - All New Filters
Capital Costs/$Millions		$241,137,996	$352,842,000	$239,403,643	$202,164,681	$215,873,989	$202,008,712
Capital Costs	50%	3.0	1.0	3.0	5.0	3.0	5.0
Land Use	5%	3	2	4	4	5	4
Operational Impacts	15%	5	5	3.5	3	2	4
Future Considerations	5%	4	3	3	3	5	4
Resiliency	10%	5	5	3	3	3	4
Project Risks	15%	5	5	2	3	4	4
TOTAL COMPOSITE		**3.85**	**2.75**	**2.98**	**4.05**	**3.20**	**4.50**

Table 1.0. Facilities associated with Hybrid Alternative

ITEM	DESCRIPTION
Raw Water Pump Station	• Replace three intake screens • Replace six raw water pumps, rated at 12 MGD each and 68 ft • Replace piping and valves inside raw water pump station
Raw Water Pipeline	• Install new raw water pipeline from pump station to new rapid mix/splitter structure. • Two – 42 inch raw water pipes. Pipes to be routed north of HSPS1. Temporary piping will be required to allow for demolition of existing piping to clear corridor for raw water pipes.
Rapid Mix	• The two 42-inch raw water pipelines will enter two rapid mix chambers. Each chamber will be sized for 30 seconds of detention time at 36 MGD, equipped with a vertical mixer. • Prior to the rapid mix, coagulant will be added in a vault with optional PAC feed point. • A raw water flowmeter will be installed on each raw water line inside the vault.
Splitter Structure	• The splitter structure will consist of weirs will disperse the flow evenly to the clarifiers. • If a clarifier is offline for maintenance, a weir gate will close to isolate flow. • Space will be provided for a future fourth splitter chamber to go to a future clarifier.
Tube Settlers	• Existing south basins will include installation of tube settlers. Each primary basin will be rated at 18 MGD, and the two existing secondaries will combine to be rated at 18 MGD. This will provide a firm capacity of 36 MGD with basin offline. • New sludge equipment and flocculation equipment will be installed in each basin.
Sludge Pump Station	• The existing south sludge pump station will remain. • The pumps and piping inside the pump station will be replaced.
New Filter Building	• A new filter building will be constructed above a 5 MG clearwell. The new filter building will consist of 14 filters providing 50 MGD of treatment capacity at 2 gpm/sq ft with one filter offline.
Finished Water Clearwell	• A new finished water reservoir with 2-2.5 MG cells will be provided on the east side of Waterworks Drive, to provide a total capacity of 5 MG. • The reservoir will include internal baffling and be configured to allow for a future transfer pump station wetwell. • The reservoir floor elevation will be approximately EL 347, with maximum water depth of 20 ft, and roof elevation at EL 384.0 to extend above the flood elevation.
High Service Pump Station	• A new vertical turbine high service pump station will be located on top of the reservoir.

	• The pump station wetwell depth will be at EL 342 to allow full utilization of the reservoir storage. • Six- 12.5 MGD pumps will be provided. Each pump discharge will have a 6" air/vacuum relief valve, check valve, electric ball valve, and manual butterfly valve.
Site Electric	• The existing plant switchgear will remain. Dual 1500KVA feeds will be routed to the new pump station where transformers will be located to reduce to 480V to feed the low voltage switchgear located in the new HS pump station. • The existing generators will remain.
Admin and Maintenance Areas	• The existing HS PS 1 will be re-purposed for administration area. The old generator building will be re-purposed for maintenance area. • Lab area will be located in existing buildngs.
Chemical Feed	• PAC: A new PAC silo and feed system will be located west of the South Basins. The existing PAC system will be demolished. • Coagulant: The existing coagulant facility will remain. • Chlorine: The existing chlorine gas room will be repurposed to bulk sodium hypochlorite • New Post-Filter Chemical Building consisting of: o LAS feed system o Fluoride feed system o Sodium Hydroxide feed system o Sodium bisulfite feed system (dechlor for outfall)
Disinfection Scheme	• Disinfection will be achieved by feeding free chlorine prior to the filters and in the filter clearwells. LAS(ammonia) feed points will be located at various locations within the clearwell and reservoir to convert to chloramines. • The LAS feed point locations will vary seasonal to meet required disinfection. Additional post-filter chlorine feed points will also be provided to allow for flexibility and reliability.
Demolition	• The following demolishing will occur after construction of new facilities: o North Basins o Filters 1-20, and 29-36 and existing 1.5 MG clearwell. o High Service PS 2 will no longer be used. However, building will remain. o High Service PS 3 and 6.5 MG below grade clearwell. o Existing post-filter chemical building. o Existing filter to waste pump station.

EWSU Notes		VE Option		Hybrid	Hybrid 1 - Split	Hybrid 2- Transfer Pumps	Hybrid 3 - All New Filters
	General Conditions	$21,447,612		$21,500,107	$21,500,000	$21,500,107	$21,500,000
	Mobilizatin/Demob	$6,598,655		$6,635,383	$6,635,000	$6,635,383	$6,635,000
Remove Plant demo from contract	Sitework/Civil/Demolition	$10,000,000		$9,000,000	$9,000,000	$9,000,000	$9,000,000
	Dewatering	$4,759,472		$4,773,160	$4,000,000	$1,193,290	$4,000,000
Two new 42" raw water line required	Raw Water Piping	$4,498,311		$3,626,800	$2,000,000	$2,000,000	$3,600,000
	Yard Piping and Structures	$6,962,837		$10,159,038	$8,000,000	$7,000,000	$8,000,000
	Site Electrical Distribution	$18,319,117		$13,403,414	$13,403,414	$13,403,414	$13,403,414
	Pile Foundations	$10,336,177		$0	$0	$0	$0
Required to be completed	Existing RW Intake PS	$12,087,830		$12,114,467	$12,114,467	$12,114,467	$12,114,467
	Pretreatment Building	$20,109,898		$15,260,834	$6,000,000	$15,000,000	$6,000,000
	Filter Bldg/CW/HSPS	$88,000,000		$56,315,824	$75,000,000	$56,315,824	$88,000,000
Filter upgrades required	Filter Upgrades 21-28	$0		$17,755,969	$17,755,969	$17,755,969	$0
	Clean Water Reservoir	$0		$34,573,000	$0	$11,000,000	$0
	Residual PS	$9,491,689		$4,976,823	$9,000,000	$4,976,823	$9,000,000
	Chemical Bldgs	$13,420,283		$14,075,975	$10,000,000	$13,000,000	$13,000,000
	PAC -Intake Chem Bldg	$4,301,811		$4,313,771	$4,313,771	$4,313,771	$4,313,771
	Backwash Supply PS	$8,736,396		$0	$0	$0	$0
Required to convert to hypo	Hypochlorite Conversion	$321,250		$322,036	$322,036	$322,036	$322,036
	Rehab Coagulant Bldg	$211,003		$211,519	$211,519	$211,519	$211,519
	Const Contingency	$12,000,000		$18,000,000	$12,000,000	$15,000,000	$12,000,000
	Site Based Equipment	$4,535,655		$4,546,756	$4,546,756	$4,546,756	$4,546,756
	Maint Plant Operation	$0		$554,137	$300,000	$300,000	$300,000
	Sludge PS	$0		$311,749	$311,749	$311,749	$311,749
	Rapid Mix/Splitter Structure	$0		$1,972,881	$750,000	$1,972,881	$750,000
	Transfer Pump Station				$0	$13,000,000	$0
	Reduce Capacity to 40 MGD	($15,000,000)		($15,000,000)	($15,000,000)	($15,000,000)	($15,000,000)
	TOTAL	**$241,137,996**		**$239,403,643**	**$202,164,681**	**$215,873,989**	**$202,008,712**