



Delaware River Basin Commission Nitrogen Reduction Cost Estimation Study – Supplemental Cost Addendum 2 Technical Memorandum – Final

To: John Yagecic, P.E.

From: Timothy D. Bradley, P.E.

Date: August 25, 2023

cc: Namsoo Suk, Tom Amidon, Tushar Roy, Erin Dovel

Re: **Nitrogen Reduction Cost Estimation Study Addendum 2 Technical Memorandum**

The purpose of this second Supplemental Cost Addendum to the previously completed Nitrogen Reduction Cost Estimation Study Final Summary Report (Nitrogen Reduction Cost Study), is to present cost estimates for increasing the effluent dissolved oxygen (DO) concentration for a subset of the twelve (12) dischargers that were the subject of the Nitrogen Reduction Cost Study.

This Technical Memorandum is arranged into the following sections:

- Section 1.0 – Background
- Section 2.0 – Cost Estimating Methodology
- Section 3.0 – Capital Cost Summary

- Appendix A – Individual Capital Cost Estimates
- Appendix B – Conceptual Aerial Site Plans

1.0 BACKGROUND

The Nitrogen Reduction Cost Study presented capital and annualized cost estimates for the twelve (12) largest NH₃-N loading dischargers to the Delaware River Estuary to achieve three (3) levels of ammonia nitrogen reduction and one (1) level of total nitrogen reduction. The cost estimates were in 2019 dollars.

At the Delaware River Basin Commission's (DRBC's) request, Kleinfelder recently prepared an addendum to the Nitrogen Reduction Cost Study which presented updated capital and annualized cost estimates for the Delaware County Regional Water Quality Control Authority (DELCORA)

Wastewater Treatment Plant (WWTP) based on a planned plant expansion of the DELCORA WWTP to a permitted capacity of 70 mgd.

The objective of this second addendum to the Nitrogen Reduction Cost Study is to develop capital and annualized cost estimates to raise the effluent DO concentration for seven (7) of the twelve (12) WWTPs to three (3) levels: 4 mg/L, 5 mg/L and 6 mg/L. The seven (7) plants are: Philadelphia Water Department (PWD) Southwest Water Pollution Control Plant (WPCP), PWD Southeast WPCP, PWD Northeast WPCP, Camden County Municipal Utilities Authority (CCMUA) WWTP, Gloucester County Utilities Authority WWTP, DELCORA WWTP, and the Wilmington WWTP. For consistency, DRBC requested that the cost estimates be in 2019 dollars.

2.0 COST ESTIMATING METHODOLOGY

The improvements that served as the basis for development of capital cost estimates consisted of the following:

- The addition of a rectangular post aeration tank sized for a 15-minute detention time at the WWTP's permitted flow capacity, and which is divided into two (2) sections such that half the tank can be taken out of service for maintenance. The depth of the post aeration tank was assumed to be 15 feet and was used in the calculation of diffuser oxygen transfer efficiency and blower horsepower.
- The installation of 9-inch-diameter membrane fine bubble diffusers in the post aeration tank and the addition of high-efficiency blowers to supply air to the fine bubble diffusers. The high-efficiency blowers were assumed to be in a new building. Blower cost was based on Lamson/Gardner Denver multi-stage centrifugal blowers.
- Piping to and from the new post aeration tank.

Alternatives to a new post aeration tank were not evaluated, but if DO effluent limits are established, each plant should conduct an evaluation of alternatives to determine a site-specific optimum approach to achieve the effluent limit.

To size the fine bubble diffusers and high-efficiency blowers for the three (3) different effluent levels, it was assumed that each plant will be required to remove ammonia nitrogen to a low effluent concentration, and as a result, the increased demand for process air will result in an effluent DO concentration of approximately 2 mg/L. Therefore, the effluent levels of 4 mg/L, 5 mg/L and 6 mg/L will require increases in effluent DO concentrations of 2 mg/L, 3 mg/L and 4 mg/L, respectively. It was also assumed that the effluent levels of 4 mg/L, 5 mg/L and 6 mg/L are monthly average values and not instantaneous minimum values.

The capital cost estimates are in 2019 dollars and were prepared by using the same construction unit costs (i.e., for concrete, earth excavation, etc.) as previously used in the Nitrogen Reduction Cost Study. For equipment costs that were not estimated as part of the Nitrogen Reduction Cost Study, Kleinfelder requested and obtained 2019 equipment costs from the equipment manufacturers.

The annual operation and maintenance (O&M) costs were estimated using the same 2019 cost for energy as used in the Nitrogen Reduction Cost Study.

To estimate annual energy costs, it was assumed that the DO effluent limits would be year-round rather than seasonal such that the post aeration system would be operated 12 months of the year.

3.0 CAPITAL COST SUMMARY

Table 1 on the following page summarizes the following for each of the seven (7) plants:

1. Blower capacity in standard cubic feet per minute (scfm) required for each level of DO.
2. Blower horsepower (HP) required for each level of DO.
3. Budgetary capital cost estimate for each level of DO.
4. Annual O&M cost estimate for each level of DO.
5. Total capital and O&M costs to achieve an effluent level of 4 mg/L.
6. Total capital and O&M costs to achieve an effluent level of 5 mg/L.
7. Total capital and O&M costs to achieve an effluent level of 6 mg/L.

As indicated, the total capital cost for achieving an effluent level of 4 mg/L is not significantly different than the total capital cost to achieve an effluent level of 6 mg/L. However, the total annual O&M cost is significantly impacted by the effluent DO level.

The detailed capital cost estimates are presented in Appendix A.

The conceptual aerial site plans depicting a potential location for the post aeration tank at each plant are presented in Appendix B.

Table 1: Summary of Blower Sizing, Capital Cost and O&M Cost

| Plant | DESCRIPTION | 4 mg/l DO | 5 mg/l DO | 6 mg/l DO |
|----------------|-----------------------|------------------|------------------|------------------|
| PWD-NE WPCP | Blower Capacity, scfm | 1442 | 2764 | 5106 |
| | Blower HP | 2 X 100 | 3 X 100 | 2 X 300 |
| | Total Capital cost | \$ 23,143,000 | \$ 23,725,000 | \$ 24,893,000 |
| | O&M Cost | \$52,280 | \$104,559 | \$156,839 |
| PWD - SE WPCP | Blower Capacity, scfm | 755 | 1448 | 2675 |
| | Blower HP | 2 X 50 | 3 X 50 | 2 X 175 |
| | Total Capital cost | \$14,346,000 | \$14,797,000 | \$15,238,000 |
| | O&M Cost | \$26,140 | \$52,280 | \$91,489 |
| PWD - SW WPCP | Blower Capacity, scfm | 1373 | 2633 | 4863 |
| | Blower HP | 2 X 100 | 3 X 100 | 2 X 300 |
| | Total Capital cost | \$22,328,000 | \$22,898,000 | \$23,796,000 |
| | O&M Cost | \$52,280 | \$104,559 | \$156,839 |
| CCMUA - WWTP | Blower Capacity, scfm | 549 | 1053 | 1945 |
| | Blower HP | 2 X 35 | 3 X 35 | 2 X 125 |
| | Total Capital cost | \$11,118,000 | \$11,531,000 | \$11,842,000 |
| | O&M Cost | \$18,298 | \$36,596 | \$65,350 |
| GCUA - WWTP | Blower Capacity, scfm | 185 | 355 | 657 |
| | Blower HP | 2 X 12 | 2X30 | 2 X 40 |
| | Total Capital cost | \$5,598,000 | \$5,827,000 | \$5,858,000 |
| | O&M Cost | \$6,274 | \$15,684 | \$20,912 |
| DELCORA - WRTP | Blower Capacity, scfm | 343 | 658 | 1216 |
| | Blower HP | 2 X 20 | 3 X 20 | 2 X 75 |
| | Total Capital cost | \$8,127,000 | \$8,455,000 | \$8,532,000 |
| | O&M Cost | \$10,456 | \$20,912 | \$39,210 |
| COW - WWTP | Blower Capacity, scfm | 920 | 1764 | 3258 |
| | Blower HP | 2 X 60 | 3 X 60 | 2 X 200 |
| | Total Capital cost | \$17,188,000 | \$17,616,000 | \$18,538,000 |
| | O&M Cost | \$31,368 | \$62,736 | \$104,559 |
| | DESCRIPTION | 4 mg/l DO | 5 mg/l DO | 6 mg/l DO |
| | Total Capital cost = | \$101,848,000 | \$104,849,000 | \$108,697,000 |
| | Total O&M cost = | \$197,094 | \$397,326 | \$635,198 |

Appendix A
Individual Capital Cost Estimates

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
PWD Northeast WWTP
Effluent DO Level = 4 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 1442 SCFM | 2 | LS | \$ 31,000 | \$ 62,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 1442 | LS | \$ 27 | \$ 38,934 | Quote from Sanitaire |
| Effluent weir | 53 | ft | \$ 2,500 | \$ 132,500 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 45,000 | \$ 90,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 64,687 | |
| | | | <i>Subtotal</i> | \$ 388,121 | |
| Installation | | 25% | | \$ 97,030 | |
| | | | Major Equipment & Systems Subtotal | 485,151 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 3142 | CY | \$ 600 | \$ 1,885,200 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 1060 | CY | \$ 900 | \$ 954,000 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 25200 | CY | \$ 58 | \$ 1,461,600 | Unit quote from similar project |
| Sheeting/Shoring | 15300 | SF | \$ 37 | \$ 566,100 | Unit quote from similar project |
| Blower building excavation | 253 | CY | \$ 58 | \$ 14,674 | Unit quote from similar project |
| Blower building base slab | 100 | CY | \$ 600 | \$ 60,000 | Unit quote from similar project |
| Pile Foundations | 20220 | SF | \$ 120 | \$ 2,426,400 | Unit quote from similar project |
| Construction Dewatering | 19500 | SF | \$ 9 | \$ 175,500 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 7,693,474 | |
| Buildings | | | | | |
| Blower building | 720 | SF | \$ 350 | \$ 252,000 | Complete with lighting and HVAC |
| | | | | \$ 252,000 | |
| | | | Buildings Subtotal | 252,000 | |
| Bulk Work Percentage | | | | | |
| Civil Site | | | 10% | \$ 843,000 | |
| Electrical | | | 20% | \$ 1,686,000 | |
| Instrumentation & Controls | | | 10% | \$ 843,000 | |
| Site and Process air Piping | | | 15% | \$ 1,265,000 | |
| | | | Bulk Work Subtotal | 4,637,000 | |
| Subtotal Direct Costs | | | | \$ 13,068,000 | |
| CG OH&P and General Conditions | | | 24% | \$ 3,136,000 | |
| Contingency | | | 30% | \$ 3,920,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 20,124,000 | |
| Engineering, Legal, and Administration | | | 15% | \$ 3,018,600 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 23,143,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
PWD Northeast WWTP
Effluent DO Level = 5 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 1442 SCFM | 3 | LS | \$ 31,000 | \$ 93,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 2764 | LS | \$ 27 | \$ 74,628 | Quote from Sanitaire |
| Effluent weir | 53 | ft | \$ 2,500 | \$ 132,500 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 45,000 | \$ 90,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 78,026 | |
| | | | <i>Subtotal</i> | \$ 468,154 | |
| Installation | | 25% | | \$ 117,038 | |
| | | | Major Equipment & Systems Subtotal | 585,192 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 3142 | CY | \$ 600 | \$ 1,885,200 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 1060 | CY | \$ 900 | \$ 954,000 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 25200 | CY | \$ 58 | \$ 1,461,600 | Unit quote from similar project |
| Sheating/Shoring | 15300 | SF | \$ 37 | \$ 566,100 | Unit quote from similar project |
| Blower building excavation | 310 | CY | \$ 58 | \$ 17,980 | Unit quote from similar project |
| Blower building base slab | 125 | CY | \$ 600 | \$ 75,000 | Unit quote from similar project |
| Pile Foundations | 20420 | SF | \$ 120 | \$ 2,450,400 | Unit quote from similar project |
| Construction Dewatering | 19500 | SF | \$ 9 | \$ 175,500 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 7,735,780 | |
| Buildings | | | | | |
| Blower building | 920 | SF | \$ 350 | \$ 322,000 | Complete with lighting and HVAC |
| | | | | Buildings Subtotal | \$ 322,000 |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 864,000 | |
| Electrical | | 20% | | \$ 1,729,000 | |
| Instrumentation & Controls | | 10% | | \$ 864,000 | |
| Site and Process air Piping | | 15% | | \$ 1,296,000 | |
| | | | Bulk Work Subtotal | 4,753,000 | |
| Subtotal Direct Costs | | | | \$ 13,396,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 3,215,000 | |
| Contingency | | 30% | | \$ 4,019,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 20,630,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 3,094,500 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 23,725,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
PWD Northeast WWTP
Effluent DO Level = 6 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 5106 SCFM | 2 | LS | \$ 120,300 | \$ 240,600 | Quote from Lamson |
| New fine bubble membrane diffusers | 5106 | LS | \$ 27 | \$ 137,862 | Quote from Sanitaire |
| Effluent weir | 53 | ft | \$ 2,500 | \$ 132,500 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 45,000 | \$ 90,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 120,192 | |
| | | | <i>Subtotal</i> | \$ 721,154 | |
| Installation | | 25% | | \$ 180,289 | |
| | | | Major Equipment & Systems Subtotal | 901,443 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 3142 | CY | \$ 600 | \$ 1,885,200 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 1060 | CY | \$ 900 | \$ 954,000 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 25200 | CY | \$ 58 | \$ 1,461,600 | Unit quote from similar project |
| Sheating/Shoring | 15300 | SF | \$ 37 | \$ 566,100 | Unit quote from similar project |
| Blower building excavation | 365 | CY | \$ 58 | \$ 21,170 | Unit quote from similar project |
| Blower building base slab | 145 | CY | \$ 600 | \$ 87,000 | Unit quote from similar project |
| Pile Foundations | 20620 | SF | \$ 120 | \$ 2,474,400 | Unit quote from similar project |
| Construction Dewatering | 19500 | SF | \$ 9 | \$ 175,500 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 7,774,970 | |
| Buildings | | | | | |
| Blower building | 1120 | SF | \$ 350 | \$ 392,000 | Complete with lighting and HVAC |
| | | | | Buildings Subtotal | \$ 392,000 |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 907,000 | |
| Electrical | | 20% | | \$ 1,814,000 | |
| Instrumentation & Controls | | 10% | | \$ 907,000 | |
| Site and Process air Piping | | 15% | | \$ 1,360,000 | |
| | | | Bulk Work Subtotal | 4,988,000 | |
| Subtotal Direct Costs | | | | \$ 14,056,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 3,373,000 | |
| Contingency | | 30% | | \$ 4,217,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 21,646,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 3,246,900 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 24,893,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
PWD Southeast WWTP
Effluent DO Level = 4 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 755 SCFM | 2 | LS | \$ 17,700 | \$ 35,400 | Quote from Lamson |
| New fine bubble membrane diffusers | 755 | LS | \$ 27 | \$ 20,385 | Quote from Sanitaire |
| Effluent weir | 28 | ft | \$ 2,500 | \$ 70,000 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 28,000 | \$ 56,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 36,357 | |
| | | | <i>Subtotal</i> | \$ 218,142 | |
| Installation | | 25% | | \$ 54,536 | |
| | | | Major Equipment & Systems Subtotal | 272,678 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 1770 | CY | \$ 600 | \$ 1,062,000 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 771 | CY | \$ 900 | \$ 693,900 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 14150 | CY | \$ 58 | \$ 820,700 | Unit quote from similar project |
| Sheating/Shoring | 13950 | SF | \$ 37 | \$ 516,150 | Unit quote from similar project |
| Blower building excavation | 241 | CY | \$ 58 | \$ 13,978 | Unit quote from similar project |
| Blower building base slab | 100 | CY | \$ 600 | \$ 60,000 | Unit quote from similar project |
| Pile Foundations | 10892 | SF | \$ 120 | \$ 1,307,040 | Unit quote from similar project |
| Construction Dewatering | 10212 | SF | \$ 9 | \$ 91,908 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 4,715,676 | |
| Buildings | | | | | |
| Blower building | 680 | SF | \$ 350 | \$ 238,000 | Complete with lighting and HVAC |
| | | | | Buildings Subtotal | \$ 238,000 |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 523,000 | |
| Electrical | | 20% | | \$ 1,045,000 | |
| Instrumentation & Controls | | 10% | | \$ 523,000 | |
| Site and Process air Piping | | 15% | | \$ 784,000 | |
| | | | Bulk Work Subtotal | 2,875,000 | |
| Subtotal Direct Costs | | | | \$ 8,101,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 1,944,000 | |
| Contingency | | 30% | | \$ 2,430,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 12,475,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 1,871,250 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 14,346,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
PWD Southeast WWTP
Effluent DO Level = 5 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 755 SCFM | 3 | LS | \$ 17,700 | \$ 53,100 | Quote from Lamson |
| New fine bubble membrane diffusers | 1448 | LS | \$ 27 | \$ 39,096 | Quote from Sanitaire |
| Effluent weir | 28 | ft | \$ 2,500 | \$ 70,000 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 28,000 | \$ 56,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 43,639 | |
| | | | <i>Subtotal</i> | \$ 261,835 | |
| Installation | | 25% | | \$ 65,459 | |
| | | | Major Equipment & Systems Subtotal | 327,294 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 1770 | CY | \$ 600 | \$ 1,062,000 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 771 | CY | \$ 900 | \$ 693,900 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 14150 | CY | \$ 58 | \$ 820,700 | Unit quote from similar project |
| Sheating/Shoring | 13950 | SF | \$ 37 | \$ 516,150 | Unit quote from similar project |
| Blower building excavation | 301 | CY | \$ 58 | \$ 17,458 | Unit quote from similar project |
| Blower building base slab | 120 | CY | \$ 600 | \$ 72,000 | Unit quote from similar project |
| Pile Foundations | 11092 | SF | \$ 120 | \$ 1,331,040 | Unit quote from similar project |
| Construction Dewatering | 10212 | SF | \$ 9 | \$ 91,908 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 4,755,156 | |
| Buildings | | | | | |
| Blower building | 880 | SF | \$ 350 | \$ 308,000 | Complete with lighting and HVAC |
| | | | | | |
| | | | Buildings Subtotal | \$ 308,000 | |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 539,000 | |
| Electrical | | 20% | | \$ 1,078,000 | |
| Instrumentation & Controls | | 10% | | \$ 539,000 | |
| Site and Process air Piping | | 15% | | \$ 809,000 | |
| | | | Bulk Work Subtotal | 2,965,000 | |
| Subtotal Direct Costs | | | | \$ 8,355,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 2,005,000 | |
| Contingency | | 30% | | \$ 2,507,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 12,867,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 1,930,050 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 14,797,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
PWD Southeast WWTP
Effluent DO Level = 6 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 2675 SCFM | 2 | LS | \$ 57,200 | \$ 114,400 | Quote from Lamson |
| New fine bubble membrane diffusers | 2675 | LS | \$ 27 | \$ 72,225 | Quote from Sanitaire |
| Effluent weir | 28 | ft | \$ 2,500 | \$ 70,000 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 28,000 | \$ 56,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 62,525 | |
| | | | <i>Subtotal</i> | \$ 375,150 | |
| Installation | | 25% | | \$ 93,788 | |
| | | | Major Equipment & Systems Subtotal | 468,938 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 1770 | CY | \$ 600 | \$ 1,062,000 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 771 | CY | \$ 900 | \$ 693,900 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 14150 | CY | \$ 58 | \$ 820,700 | Unit quote from similar project |
| Sheating/Shoring | 13950 | SF | \$ 37 | \$ 516,150 | Unit quote from similar project |
| Blower building excavation | 310 | CY | \$ 58 | \$ 17,980 | Unit quote from similar project |
| Blower building base slab | 125 | CY | \$ 600 | \$ 75,000 | Unit quote from similar project |
| Pile Foundations | 11124 | SF | \$ 120 | \$ 1,334,880 | Unit quote from similar project |
| Construction Dewatering | 10212 | SF | \$ 9 | \$ 91,908 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 4,762,518 | |
| Buildings | | | | | |
| Blower building | 912 | SF | \$ 350 | \$ 319,200 | Complete with lighting and HVAC |
| | | | | Buildings Subtotal | \$ 319,200 |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 555,000 | |
| Electrical | | 20% | | \$ 1,110,000 | |
| Instrumentation & Controls | | 10% | | \$ 555,000 | |
| Site and Process air Piping | | 15% | | \$ 833,000 | |
| | | | Bulk Work Subtotal | 3,053,000 | |
| Subtotal Direct Costs | | | | \$ 8,604,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 2,065,000 | |
| Contingency | | 30% | | \$ 2,581,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 13,250,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 1,987,500 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 15,238,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
PWD Southwest WWTP
Effluent DO Level = 4 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 1373 SCFM | 2 | LS | \$ 29,500 | \$ 59,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 1373 | LS | \$ 27 | \$ 37,071 | Quote from Sanitaire |
| Effluent weir | 51 | ft | \$ 2,500 | \$ 127,500 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 45,000 | \$ 90,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 62,714 | |
| | | | <i>Subtotal</i> | \$ 376,285 | |
| Installation | | 25% | | \$ 94,071 | |
| | | | Major Equipment & Systems Subtotal | 470,357 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 3025 | CY | \$ 600 | \$ 1,815,000 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 1036 | CY | \$ 900 | \$ 932,400 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 24200 | CY | \$ 58 | \$ 1,403,600 | Unit quote from similar project |
| Sheating/Shoring | 15000 | SF | \$ 37 | \$ 555,000 | Unit quote from similar project |
| Blower building excavation | 253 | CY | \$ 58 | \$ 14,674 | Unit quote from similar project |
| Blower building base slab | 100 | CY | \$ 600 | \$ 60,000 | Unit quote from similar project |
| Pile Foundations | 19288 | SF | \$ 120 | \$ 2,314,560 | Unit quote from similar project |
| Construction Dewatering | 18568 | SF | \$ 9 | \$ 167,112 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 7,412,346 | |
| Buildings | | | | | |
| Blower building | 720 | SF | \$ 350 | \$ 252,000 | Complete with lighting and HVAC |
| | | | | Buildings Subtotal | \$ 252,000 |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 813,000 | |
| Electrical | | 20% | | \$ 1,627,000 | |
| Instrumentation & Controls | | 10% | | \$ 813,000 | |
| Site and Process air Piping | | 15% | | \$ 1,220,000 | |
| | | | Bulk Work Subtotal | 4,473,000 | |
| Subtotal Direct Costs | | | | \$ 12,608,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 3,026,000 | |
| Contingency | | 30% | | \$ 3,782,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 19,416,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 2,912,400 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 22,328,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
PWD Southwest WWTP
Effluent DO Level = 5 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 1373 SCFM | 3 | LS | \$ 29,500 | \$ 88,500 | Quote from Lamson |
| New fine bubble membrane diffusers | 2633 | LS | \$ 27 | \$ 71,091 | Quote from Sanitaire |
| Effluent weir | 51 | ft | \$ 2,500 | \$ 127,500 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 45,000 | \$ 90,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 75,418 | |
| | | | <i>Subtotal</i> | \$ 452,509 | |
| Installation | | 25% | | \$ 113,127 | |
| | | | Major Equipment & Systems Subtotal | 565,637 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 3025 | CY | \$ 600 | \$ 1,815,000 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 1036 | CY | \$ 900 | \$ 932,400 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 24200 | CY | \$ 58 | \$ 1,403,600 | Unit quote from similar project |
| Sheating/Shoring | 15000 | SF | \$ 37 | \$ 555,000 | Unit quote from similar project |
| Blower building excavation | 310 | CY | \$ 58 | \$ 17,980 | Unit quote from similar project |
| Blower building base slab | 125 | CY | \$ 600 | \$ 75,000 | Unit quote from similar project |
| Pile Foundations | 19488 | SF | \$ 120 | \$ 2,338,560 | Unit quote from similar project |
| Construction Dewatering | 18568 | SF | \$ 9 | \$ 167,112 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 7,454,652 | |
| Buildings | | | | | |
| Blower building | 920 | SF | \$ 350 | \$ 322,000 | Complete with lighting and HVAC |
| | | | | Buildings Subtotal | \$ 322,000 |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 834,000 | |
| Electrical | | 20% | | \$ 1,668,000 | |
| Instrumentation & Controls | | 10% | | \$ 834,000 | |
| Site and Process air Piping | | 15% | | \$ 1,251,000 | |
| | | | Bulk Work Subtotal | 4,587,000 | |
| Subtotal Direct Costs | | | | \$ 12,929,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 3,103,000 | |
| Contingency | | 30% | | \$ 3,879,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 19,911,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 2,986,650 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 22,898,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
PWD Southwest WWTP
Effluent DO Level = 6 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 4863 SCFM | 2 | LS | \$ 113,350 | \$ 226,700 | Quote from Lamson |
| New fine bubble membrane diffusers | 4863 | LS | \$ 27 | \$ 131,301 | Quote from Sanitaire |
| Effluent weir | 51 | ft | \$ 2,500 | \$ 127,500 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 45,000 | \$ 90,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 115,100 | |
| | | | <i>Subtotal</i> | \$ 690,601 | |
| Installation | | 25% | | \$ 172,650 | |
| | | | Major Equipment & Systems Subtotal | 863,252 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 3025 | CY | \$ 600 | \$ 1,815,000 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 1036 | CY | \$ 900 | \$ 932,400 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 24200 | CY | \$ 58 | \$ 1,403,600 | Unit quote from similar project |
| Sheating/Shoring | 15000 | SF | \$ 37 | \$ 555,000 | Unit quote from similar project |
| Blower building excavation | 253 | CY | \$ 58 | \$ 14,674 | Unit quote from similar project |
| Blower building base slab | 100 | CY | \$ 600 | \$ 60,000 | Unit quote from similar project |
| Pile Foundations | 19288 | SF | \$ 120 | \$ 2,314,560 | Unit quote from similar project |
| Construction Dewatering | 18568 | SF | \$ 9 | \$ 167,112 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 7,412,346 | |
| Buildings | | | | | |
| Blower building | 1120 | SF | \$ 350 | \$ 392,000 | Complete with lighting and HVAC |
| | | | | Buildings Subtotal | \$ 392,000 |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 867,000 | |
| Electrical | | 20% | | \$ 1,734,000 | |
| Instrumentation & Controls | | 10% | | \$ 867,000 | |
| Site and Process air Piping | | 15% | | \$ 1,300,000 | |
| | | | Bulk Work Subtotal | 4,768,000 | |
| Subtotal Direct Costs | | | | \$ 13,436,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 3,225,000 | |
| Contingency | | 30% | | \$ 4,031,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 20,692,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 3,103,800 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 23,796,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
Camden County Municipal Utilities Authority (CCMUA) WWTP
Effluent DO Level = 4 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 549 SCFM | 2 | LS | \$ 14,000 | \$ 28,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 549 | LS | \$ 27 | \$ 14,823 | Quote from Sanitaire |
| Effluent weir | 20 | ft | \$ 2,500 | \$ 50,000 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 25,000 | \$ 50,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 28,565 | |
| | | | <i>Subtotal</i> | \$ 171,388 | |
| Installation | | 25% | | \$ 42,847 | |
| | | | Major Equipment & Systems Subtotal | 214,235 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 1294 | CY | \$ 600 | \$ 776,400 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 661 | CY | \$ 900 | \$ 594,900 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 10350 | CY | \$ 58 | \$ 600,300 | Unit quote from similar project |
| Sheating/Shoring | 9800 | SF | \$ 37 | \$ 362,600 | Unit quote from similar project |
| Blower building excavation | 241 | CY | \$ 58 | \$ 13,978 | Unit quote from similar project |
| Blower building base slab | 100 | CY | \$ 600 | \$ 60,000 | Unit quote from similar project |
| Pile Foundations | 8107 | SF | \$ 120 | \$ 972,840 | Unit quote from similar project |
| Construction Dewatering | 7427 | SF | \$ 9 | \$ 66,843 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 3,597,861 | |
| Buildings | | | | | |
| Blower building | 680 | SF | \$ 350 | \$ 238,000 | Complete with lighting and HVAC |
| | | | | | |
| | | | Buildings Subtotal | \$ 238,000 | |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 405,000 | |
| Electrical | | 20% | | \$ 810,000 | |
| Instrumentation & Controls | | 10% | | \$ 405,000 | |
| Site and Process air Piping | | 15% | | \$ 608,000 | |
| | | | Bulk Work Subtotal | 2,228,000 | |
| Subtotal Direct Costs | | | | \$ 6,278,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 1,507,000 | |
| Contingency | | 30% | | \$ 1,883,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 9,668,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 1,450,200 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 11,118,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
Camden County Municipal Utilities Authority (CCMUA) WWTP
Effluent DO Level = 5 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 549 SCFM | 3 | LS | \$ 14,000 | \$ 42,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 1053 | LS | \$ 27 | \$ 28,431 | Quote from Sanitaire |
| Effluent weir | 20 | ft | \$ 2,500 | \$ 50,000 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 25,000 | \$ 50,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 34,086 | |
| | | | <i>Subtotal</i> | \$ 204,517 | |
| Installation | | 25% | | \$ 51,129 | |
| | | | Major Equipment & Systems Subtotal | 255,647 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 1294 | CY | \$ 600 | \$ 776,400 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 661 | CY | \$ 900 | \$ 594,900 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 10350 | CY | \$ 58 | \$ 600,300 | Unit quote from similar project |
| Sheating/Shoring | 9800 | SF | \$ 37 | \$ 362,600 | Unit quote from similar project |
| Blower building excavation | 301 | CY | \$ 58 | \$ 17,458 | Unit quote from similar project |
| Blower building base slab | 120 | CY | \$ 600 | \$ 72,000 | Unit quote from similar project |
| Pile Foundations | 8307 | SF | \$ 120 | \$ 996,840 | Unit quote from similar project |
| Construction Dewatering | 7427 | SF | \$ 9 | \$ 66,843 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 3,637,341 | |
| Buildings | | | | | |
| Blower building | 880 | SF | \$ 350 | \$ 308,000 | Complete with lighting and HVAC |
| | | | | | |
| | | | Buildings Subtotal | \$ 308,000 | |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 420,000 | |
| Electrical | | 20% | | \$ 840,000 | |
| Instrumentation & Controls | | 10% | | \$ 420,000 | |
| Site and Process air Piping | | 15% | | \$ 630,000 | |
| | | | Bulk Work Subtotal | 2,310,000 | |
| Subtotal Direct Costs | | | | \$ 6,511,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 1,563,000 | |
| Contingency | | 30% | | \$ 1,953,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 10,027,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 1,504,050 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 11,531,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
Camden County Municipal Utilities Authority (CCMUA) WWTP
Effluent DO Level = 6 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 1945 SCFM | 2 | LS | \$ 41,000 | \$ 82,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 1945 | LS | \$ 27 | \$ 52,515 | Quote from Sanitaire |
| Effluent weir | 20 | ft | \$ 2,500 | \$ 50,000 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 25,000 | \$ 50,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 46,903 | |
| | | | <i>Subtotal</i> | \$ 281,418 | |
| Installation | | 25% | | \$ 70,355 | |
| | | | Major Equipment & Systems Subtotal | 351,773 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 1294 | CY | \$ 600 | \$ 776,400 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 661 | CY | \$ 900 | \$ 594,900 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 10350 | CY | \$ 58 | \$ 600,300 | Unit quote from similar project |
| Sheating/Shoring | 9800 | SF | \$ 37 | \$ 362,600 | Unit quote from similar project |
| Blower building excavation | 310 | CY | \$ 58 | \$ 17,980 | Unit quote from similar project |
| Blower building base slab | 122 | CY | \$ 600 | \$ 73,200 | Unit quote from similar project |
| Pile Foundations | 8339 | SF | \$ 120 | \$ 1,000,680 | Unit quote from similar project |
| Construction Dewatering | 7427 | SF | \$ 9 | \$ 66,843 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 3,642,903 | |
| Buildings | | | | | |
| Blower building | 912 | SF | \$ 350 | \$ 319,200 | Complete with lighting and HVAC |
| | | | | | |
| | | | Buildings Subtotal | \$ 319,200 | |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 431,000 | |
| Electrical | | 20% | | \$ 863,000 | |
| Instrumentation & Controls | | 10% | | \$ 431,000 | |
| Site and Process air Piping | | 15% | | \$ 647,000 | |
| | | | Bulk Work Subtotal | 2,372,000 | |
| Subtotal Direct Costs | | | | \$ 6,686,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 1,605,000 | |
| Contingency | | 30% | | \$ 2,006,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 10,297,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 1,544,550 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 11,842,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
Gloucester County Utilities Authority (GCUA) WWTP
Effluent DO Level = 4 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 185 SCFM | 2 | LS | \$ 11,000 | \$ 22,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 185 | LS | \$ 27 | \$ 4,995 | Quote from Sanitaire |
| Effluent weir | 7 | ft | \$ 2,500 | \$ 17,500 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 18,000 | \$ 36,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 16,099 | |
| | | | <i>Subtotal</i> | \$ 96,594 | |
| Installation | | 25% | | \$ 24,149 | |
| | | | Major Equipment & Systems Subtotal | 120,743 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 503 | CY | \$ 600 | \$ 301,800 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 394 | CY | \$ 900 | \$ 354,600 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 4023 | CY | \$ 58 | \$ 233,334 | Unit quote from similar project |
| Sheating/Shoring | 6100 | SF | \$ 37 | \$ 225,700 | Unit quote from similar project |
| Blower building excavation | 208 | CY | \$ 58 | \$ 12,064 | Unit quote from similar project |
| Blower building base slab | 83 | CY | \$ 600 | \$ 49,800 | Unit quote from similar project |
| Pile Foundations | 3077 | SF | \$ 120 | \$ 369,240 | Unit quote from similar project |
| Construction Dewatering | 2507 | SF | \$ 9 | \$ 22,563 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 1,719,101 | |
| Buildings | | | | | |
| Blower building | 570 | SF | \$ 350 | \$ 199,500 | Complete with lighting and HVAC |
| | | | | Buildings Subtotal | \$ 199,500 |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 204,000 | |
| Electrical | | 20% | | \$ 408,000 | |
| Instrumentation & Controls | | 10% | | \$ 204,000 | |
| Site and Process air Piping | | 15% | | \$ 306,000 | |
| | | | Bulk Work Subtotal | 1,122,000 | |
| Subtotal Direct Costs | | | | \$ 3,161,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 759,000 | |
| Contingency | | 30% | | \$ 948,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 4,868,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 730,200 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 5,598,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
Gloucester County Utilities Authority (GCUA) WWTP
Effluent DO Level = 5mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 355 SCFM, 30 HP blower | 2 | LS | \$ 16,000 | \$ 32,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 355 | LS | \$ 27 | \$ 9,585 | Quote from Sanitaire |
| Effluent weir | 7 | ft | \$ 2,500 | \$ 17,500 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 18,000 | \$ 36,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 19,017 | |
| | | | <i>Subtotal</i> | \$ 114,102 | |
| Installation | | 25% | | \$ 28,526 | |
| | | | Major Equipment & Systems Subtotal | 142,628 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 503 | CY | \$ 600 | \$ 301,800 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 394 | CY | \$ 900 | \$ 354,600 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 4023 | CY | \$ 58 | \$ 233,334 | Unit quote from similar project |
| Sheating/Shoring | 6100 | SF | \$ 37 | \$ 225,700 | Unit quote from similar project |
| Blower building excavation | 241 | CY | \$ 58 | \$ 13,978 | Unit quote from similar project |
| Blower building base slab | 96 | CY | \$ 600 | \$ 57,600 | Unit quote from similar project |
| Pile Foundations | 3187 | SF | \$ 120 | \$ 382,440 | Unit quote from similar project |
| Construction Dewatering | 2507 | SF | \$ 9 | \$ 22,563 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 1,742,015 | |
| Buildings | | | | | |
| Blower building | 680 | SF | \$ 350 | \$ 238,000 | Complete with lighting and HVAC |
| | | | | | |
| | | | Buildings Subtotal | \$ 238,000 | |
| Bulk Work Percentage | | | | | |
| Civil Site | | | 10% | \$ 212,000 | |
| Electrical | | | 20% | \$ 425,000 | |
| Instrumentation & Controls | | | 10% | \$ 212,000 | |
| Site and Process air Piping | | | 15% | \$ 318,000 | |
| | | | Bulk Work Subtotal | 1,167,000 | |
| Subtotal Direct Costs | | | | \$ 3,290,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 790,000 | |
| Contingency | | 30% | | \$ 987,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 5,067,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 760,050 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 5,827,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
Gloucester County Utilities Authority (GCUA) WWTP
Effluent DO Level = 6mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 657 SCFM | 2 | LS | \$ 16,000 | \$ 32,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 657 | LS | \$ 27 | \$ 17,739 | Quote from Sanitaire |
| Effluent weir | 7 | ft | \$ 2,500 | \$ 17,500 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 18,000 | \$ 36,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 20,648 | |
| | | | <i>Subtotal</i> | \$ 123,887 | |
| Installation | | 25% | | \$ 30,972 | |
| | | | Major Equipment & Systems Subtotal | 154,859 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 503 | CY | \$ 600 | \$ 301,800 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 394 | CY | \$ 900 | \$ 354,600 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 4023 | CY | \$ 58 | \$ 233,334 | Unit quote from similar project |
| Sheating/Shoring | 6100 | SF | \$ 37 | \$ 225,700 | Unit quote from similar project |
| Blower building excavation | 241 | CY | \$ 58 | \$ 13,978 | Unit quote from similar project |
| Blower building base slab | 96 | CY | \$ 600 | \$ 57,600 | Unit quote from similar project |
| Pile Foundations | 3187 | SF | \$ 120 | \$ 382,440 | Unit quote from similar project |
| Construction Dewatering | 2507 | SF | \$ 9 | \$ 22,563 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 1,742,015 | |
| Buildings | | | | | |
| Blower building | 680 | SF | \$ 350 | \$ 238,000 | Complete with lighting and HVAC |
| | | | | | |
| | | | Buildings Subtotal | \$ 238,000 | |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 213,000 | |
| Electrical | | 20% | | \$ 427,000 | |
| Instrumentation & Controls | | 10% | | \$ 213,000 | |
| Site and Process air Piping | | 15% | | \$ 320,000 | |
| | | | Bulk Work Subtotal | 1,173,000 | |
| Subtotal Direct Costs | | | | \$ 3,308,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 794,000 | |
| Contingency | | 30% | | \$ 992,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 5,094,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 764,100 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 5,858,000 | |

**SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
DELICORA WRTP
Effluent DO Level = 4 mg/l**

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 343 SCFM | 2 | LS | \$ 11,500 | \$ 23,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 343 | LS | \$ 27 | \$ 9,261 | Quote from Sanitaire |
| Effluent weir | 15 | ft | \$ 2,500 | \$ 37,500 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 22,000 | \$ 44,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 22,752 | |
| | | | <i>Subtotal</i> | \$ 136,513 | |
| Installation | | 25% | | \$ 34,128 | |
| | | | Major Equipment & Systems Subtotal | 170,642 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 865 | CY | \$ 600 | \$ 519,000 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 531 | CY | \$ 900 | \$ 477,900 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 6923 | CY | \$ 58 | \$ 401,534 | Unit quote from similar project |
| Sheating/Shoring | 8000 | SF | \$ 37 | \$ 296,000 | Unit quote from similar project |
| Blower building excavation | 217 | CY | \$ 58 | \$ 12,586 | Unit quote from similar project |
| Blower building base slab | 87 | CY | \$ 600 | \$ 52,200 | Unit quote from similar project |
| Pile Foundations | 5242 | SF | \$ 120 | \$ 629,040 | Unit quote from similar project |
| Construction Dewatering | 4642 | SF | \$ 9 | \$ 41,778 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 2,580,038 | |
| Buildings | | | | | |
| Blower building | 600 | SF | \$ 350 | \$ 210,000 | Complete with lighting and HVAC |
| | | | | | |
| | | | Buildings Subtotal | \$ 210,000 | |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 296,000 | |
| Electrical | | 20% | | \$ 592,000 | |
| Instrumentation & Controls | | 10% | | \$ 296,000 | |
| Site and Process air Piping | | 15% | | \$ 444,000 | |
| | | | Bulk Work Subtotal | 1,628,000 | |
| Subtotal Direct Costs | | | | \$ 4,589,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 1,101,000 | |
| Contingency | | 30% | | \$ 1,377,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 7,067,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 1,060,050 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 8,127,000 | |

**SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
DELICORA WRTP
Effluent DO Level = 5 mg/l**

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 343 SCFM | 3 | LS | \$ 11,500 | \$ 34,500 | Quote from Lamson |
| New fine bubble membrane diffusers | 658 | LS | \$ 27 | \$ 17,766 | Quote from Sanitaire |
| Effluent weir | 15 | ft | \$ 2,500 | \$ 37,500 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 22,000 | \$ 44,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 26,753 | |
| | | | <i>Subtotal</i> | \$ 160,519 | |
| Installation | | 25% | | \$ 40,130 | |
| | | | Major Equipment & Systems Subtotal | 200,649 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 865 | CY | \$ 600 | \$ 519,000 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 531 | CY | \$ 900 | \$ 477,900 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 6923 | CY | \$ 58 | \$ 401,534 | Unit quote from similar project |
| Sheating/Shoring | 8000 | SF | \$ 37 | \$ 296,000 | Unit quote from similar project |
| Blower building excavation | 265 | CY | \$ 58 | \$ 15,370 | Unit quote from similar project |
| Blower building base slab | 106 | CY | \$ 600 | \$ 63,600 | Unit quote from similar project |
| Pile Foundations | 5402 | SF | \$ 120 | \$ 648,240 | Unit quote from similar project |
| Construction Dewatering | 4642 | SF | \$ 9 | \$ 41,778 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 2,613,422 | |
| Buildings | | | | | |
| Blower building | 760 | SF | \$ 350 | \$ 266,000 | Complete with lighting and HVAC |
| | | | | | |
| | | | Buildings Subtotal | \$ 266,000 | |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 308,000 | |
| Electrical | | 20% | | \$ 616,000 | |
| Instrumentation & Controls | | 10% | | \$ 308,000 | |
| Site and Process air Piping | | 15% | | \$ 462,000 | |
| | | | Bulk Work Subtotal | 1,694,000 | |
| Subtotal Direct Costs | | | | \$ 4,774,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 1,146,000 | |
| Contingency | | 30% | | \$ 1,432,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 7,352,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 1,102,800 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 8,455,000 | |

**SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
DELCORA WRTP
Effluent DO Level = 6 mg/l**

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 1216 SCFM | 2 | LS | \$ 26,500 | \$ 53,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 1216 | LS | \$ 27 | \$ 32,832 | Quote from Sanitaire |
| Effluent weir | 15 | ft | \$ 2,500 | \$ 37,500 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 22,000 | \$ 44,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 33,466 | |
| | | | <i>Subtotal</i> | \$ 200,798 | |
| Installation | | 25% | | \$ 50,200 | |
| | | | Major Equipment & Systems Subtotal | 250,998 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 865 | CY | \$ 600 | \$ 519,000 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 531 | CY | \$ 900 | \$ 477,900 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 6923 | CY | \$ 58 | \$ 401,534 | Unit quote from similar project |
| Sheating/Shoring | 8000 | SF | \$ 37 | \$ 296,000 | Unit quote from similar project |
| Blower building excavation | 253 | CY | \$ 58 | \$ 14,674 | Unit quote from similar project |
| Blower building base slab | 101 | CY | \$ 600 | \$ 60,600 | Unit quote from similar project |
| Pile Foundations | 5362 | SF | \$ 120 | \$ 643,440 | Unit quote from similar project |
| Construction Dewatering | 4642 | SF | \$ 9 | \$ 41,778 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 2,604,926 | |
| Buildings | | | | | |
| Blower building | 720 | SF | \$ 350 | \$ 252,000 | Complete with lighting and HVAC |
| | | | | | |
| | | | Buildings Subtotal | \$ 252,000 | |
| Bulk Work Percentage | | | | | |
| Civil Site | | | 10% | \$ 311,000 | |
| Electrical | | | 20% | \$ 622,000 | |
| Instrumentation & Controls | | | 10% | \$ 311,000 | |
| Site and Process air Piping | | | 15% | \$ 466,000 | |
| | | | Bulk Work Subtotal | 1,710,000 | |
| Subtotal Direct Costs | | | | \$ 4,818,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 1,156,000 | |
| Contingency | | 30% | | \$ 1,445,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 7,419,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 1,112,850 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 8,532,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
City of Wilmington WWTP
Effluent DO Level = 4 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 920 SCFM | 2 | LS | \$ 21,000 | \$ 42,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 920 | LS | \$ 27 | \$ 24,840 | Quote from Sanitaire |
| Effluent weir | 34 | ft | \$ 2,500 | \$ 85,000 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 32,000 | \$ 64,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 43,168 | |
| | | | <i>Subtotal</i> | \$ 259,008 | |
| Installation | | 25% | | \$ 64,752 | |
| | | | Major Equipment & Systems Subtotal | 323,760 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 2177 | CY | \$ 600 | \$ 1,306,200 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 978 | CY | \$ 900 | \$ 880,200 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 17417 | CY | \$ 58 | \$ 1,010,186 | Unit quote from similar project |
| Sheating/Shoring | 17000 | SF | \$ 37 | \$ 629,000 | Unit quote from similar project |
| Blower building excavation | 223 | CY | \$ 58 | \$ 12,934 | Unit quote from similar project |
| Blower building base slab | 89 | CY | \$ 600 | \$ 53,400 | Unit quote from similar project |
| Pile Foundations | 13060 | SF | \$ 120 | \$ 1,567,200 | Unit quote from similar project |
| Construction Dewatering | 12440 | SF | \$ 9 | \$ 111,960 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 5,721,080 | |
| Buildings | | | | | |
| Blower building | 620 | SF | \$ 350 | \$ 217,000 | Complete with lighting and HVAC |
| | | | | | |
| | | | Buildings Subtotal | \$ 217,000 | |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 626,000 | |
| Electrical | | 20% | | \$ 1,252,000 | |
| Instrumentation & Controls | | 10% | | \$ 626,000 | |
| Site and Process air Piping | | 15% | | \$ 939,000 | |
| | | | Bulk Work Subtotal | 3,443,000 | |
| Subtotal Direct Costs | | | | \$ 9,705,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 2,329,000 | |
| Contingency | | 30% | | \$ 2,912,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 14,946,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 2,241,900 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 17,188,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
City of Wilmington WWTP
Effluent DO Level = 5 mg/l

Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 920 SCFM | 3 | LS | \$ 21,000 | \$ 63,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 1764 | LS | \$ 27 | \$ 47,628 | Quote from Sanitaire |
| Effluent weir | 34 | ft | \$ 2,500 | \$ 85,000 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 32,000 | \$ 64,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 51,926 | |
| | | | <i>Subtotal</i> | \$ 311,554 | |
| Installation | | 25% | | \$ 77,888 | |
| | | | Major Equipment & Systems Subtotal | 389,442 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 2177 | CY | \$ 600 | \$ 1,306,200 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 978 | CY | \$ 900 | \$ 880,200 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 17417 | CY | \$ 58 | \$ 1,010,186 | Unit quote from similar project |
| Sheating/Shoring | 17000 | SF | \$ 37 | \$ 629,000 | Unit quote from similar project |
| Blower building excavation | 271 | CY | \$ 58 | \$ 15,718 | Unit quote from similar project |
| Blower building base slab | 108 | CY | \$ 600 | \$ 64,800 | Unit quote from similar project |
| Pile Foundations | 13220 | SF | \$ 120 | \$ 1,586,400 | Unit quote from similar project |
| Construction Dewatering | 12440 | SF | \$ 9 | \$ 111,960 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 5,754,464 | |
| Buildings | | | | | |
| Blower building | 780 | SF | \$ 350 | \$ 273,000 | Complete with lighting and HVAC |
| | | | | Buildings Subtotal | \$ 273,000 |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 642,000 | |
| Electrical | | 20% | | \$ 1,283,000 | |
| Instrumentation & Controls | | 10% | | \$ 642,000 | |
| Site and Process air Piping | | 15% | | \$ 963,000 | |
| | | | Bulk Work Subtotal | 3,530,000 | |
| Subtotal Direct Costs | | | | \$ 9,947,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 2,387,000 | |
| Contingency | | 30% | | \$ 2,984,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 15,318,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 2,297,700 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 17,616,000 | |

SUPPLEMENTAL COST ESTIMATES TO INCREASE PLANT EFFLUENT DISSOLVE OXYGEN CONCENTRATION
City of Wilmington WWTP
Effluent DO Level = 6 mg/l

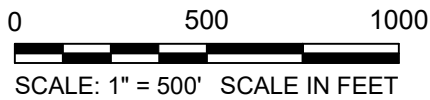
Budgetary Construction Cost Estimate (±20% accuracy)

| <i>Item/Description</i> | <i>Quantity</i> | <i>Unit/Basis</i> | <i>Unit Budgetary Cost</i> | <i>Item Budgetary Cost</i> | <i>Comments</i> |
|--|-----------------|-------------------|---|----------------------------|---------------------------------|
| Major Equipment & Systems | | | | | |
| New Blowers, 3258 SCFM | 3 | LS | \$ 71,000 | \$ 213,000 | Quote from Lamson |
| New fine bubble membrane diffusers | 3258 | LS | \$ 27 | \$ 87,966 | Quote from Sanitaire |
| Effluent weir | 34 | ft | \$ 2,500 | \$ 85,000 | Estimate |
| Influent slide gates for flow isolation | 2 | LS | \$ 32,000 | \$ 64,000 | Quote from Wipps |
| Valves, fittings and accessories @20% | | | | \$ 89,993 | |
| | | | <i>Subtotal</i> | \$ 539,959 | |
| Installation | | 25% | | \$ 134,990 | |
| | | | Major Equipment & Systems Subtotal | 674,949 | |
| Unit Price & Other Items | | | | | |
| PA Tank Conc Foundation-base slab | 2177 | CY | \$ 600 | \$ 1,306,200 | Unit quote from similar project |
| PA Tank - Cast in Place Concrete | 978 | CY | \$ 900 | \$ 880,200 | Unit quote from similar project |
| Excavation/Backfill/Compaction - PA Tanks | 17417 | CY | \$ 58 | \$ 1,010,186 | Unit quote from similar project |
| Sheating/Shoring | 17000 | SF | \$ 37 | \$ 629,000 | Unit quote from similar project |
| Blower building excavation | 295 | CY | \$ 58 | \$ 17,110 | Unit quote from similar project |
| Blower building base slab | 118 | CY | \$ 600 | \$ 70,800 | Unit quote from similar project |
| Pile Foundations | 13314 | SF | \$ 120 | \$ 1,597,680 | Unit quote from similar project |
| Construction Dewatering | 12440 | SF | \$ 9 | \$ 111,960 | Unit quote from similar project |
| Misc. Conc. repair and patchwork | 1 | LS | \$ 50,000 | \$ 50,000 | |
| Misc. metal (grating, platforms, handrails and stairs) | 1 | LS | \$ 100,000 | \$ 100,000 | |
| | | | Unit Price & Other Item Subtotal | 5,773,136 | |
| Buildings | | | | | |
| Blower building | 874 | SF | \$ 350 | \$ 305,900 | Complete with lighting and HVAC |
| | | | | Buildings Subtotal | \$ 305,900 |
| Bulk Work Percentage | | | | | |
| Civil Site | | 10% | | \$ 675,000 | |
| Electrical | | 20% | | \$ 1,351,000 | |
| Instrumentation & Controls | | 10% | | \$ 675,000 | |
| Site and Process air Piping | | 15% | | \$ 1,013,000 | |
| | | | Bulk Work Subtotal | 3,714,000 | |
| Subtotal Direct Costs | | | | \$ 10,468,000 | |
| CG OH&P and General Conditions | | 24% | | \$ 2,512,000 | |
| Contingency | | 30% | | \$ 3,140,000 | |
| TOTAL BUDGETARY CONSTRUCTION COST | | | | \$ 16,120,000 | |
| Engineering, Legal, and Administration | | 15% | | \$ 2,418,000 | |
| TOTAL BUDGETARY CAPITAL COST | | | | \$ 18,538,000 | |

Appendix B
Conceptual Aerial Site Plans



NOTE - REV.R2
POST AERATION TANKS WITH
BLOWER BUILDING ADDED.



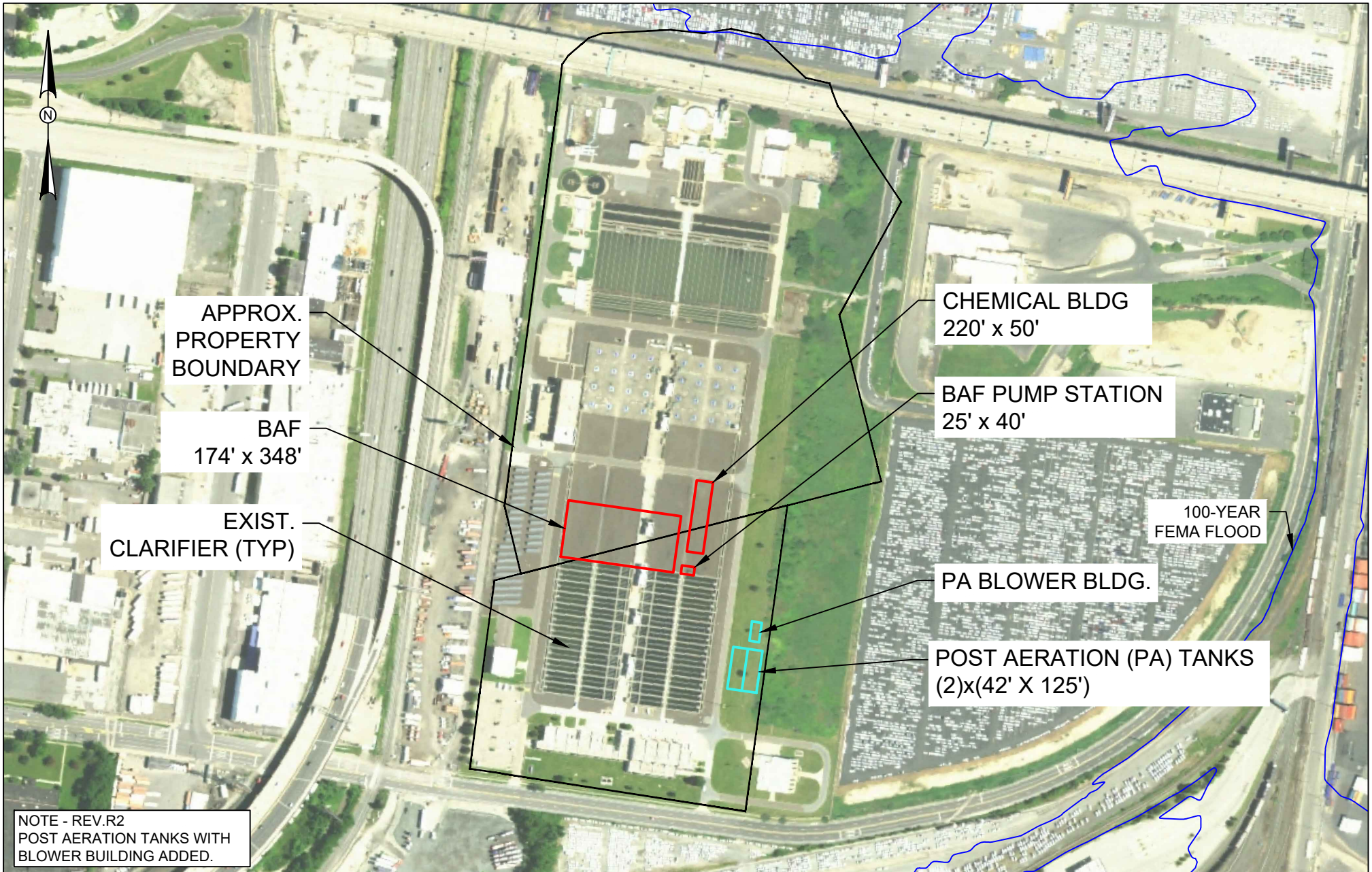
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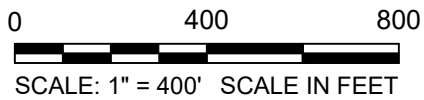
PROJECT NO. 6736
DRAWN BY: ELD
CHECKED BY: TKR
DATE: 05-20-2020
REV.R2: 11-07-2022

PWD NORTHEAST WPCP
NH3-N = 1.5 mg/l
AND POST AERATION SYSTEM
NITROGEN REDUCTION
COST ESTIMATION STUDY
DELAWARE RIVER BASIN COMMISSION

FIGURE
M-2



NOTE - REV.R2
POST AERATION TANKS WITH
BLOWER BUILDING ADDED.

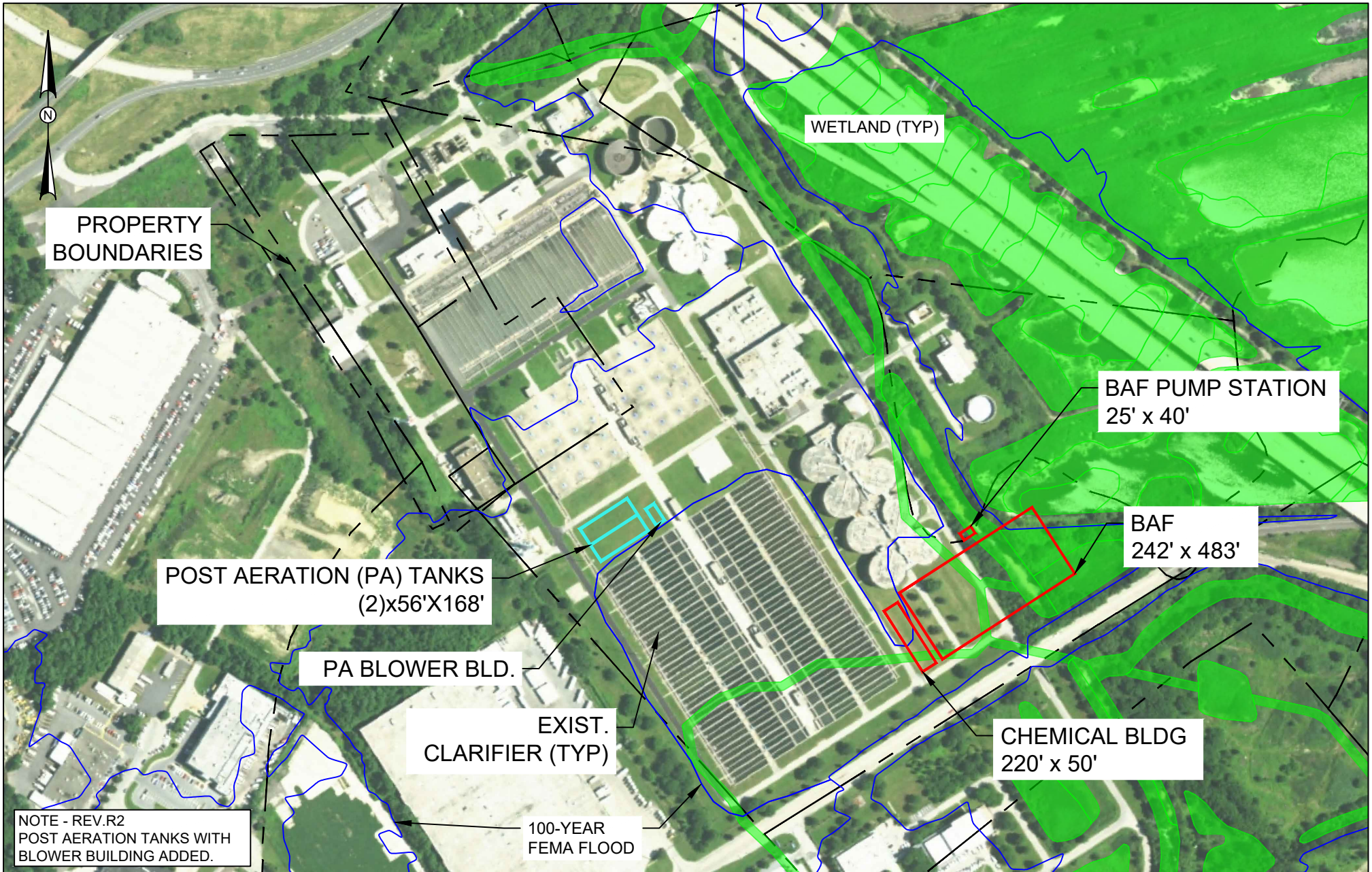


PROJECT NO. 6736
DRAWN BY: ELD
CHECKED BY: TKR
DATE: 05-20-2020
REV.R2: 11-07-2022

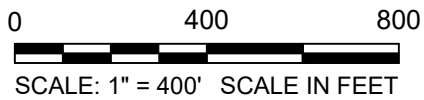
PWD SOUTHEAST WPCP
NH₃-N = 1.5 mg/l
AND POST AERATION SYSTEM

NITROGEN REDUCTION
COST ESTIMATION STUDY
DELAWARE RIVER BASIN COMMISSION

FIGURE
K-2



NOTE - REV.R2
POST AERATION TANKS WITH
BLOWER BUILDING ADDED.



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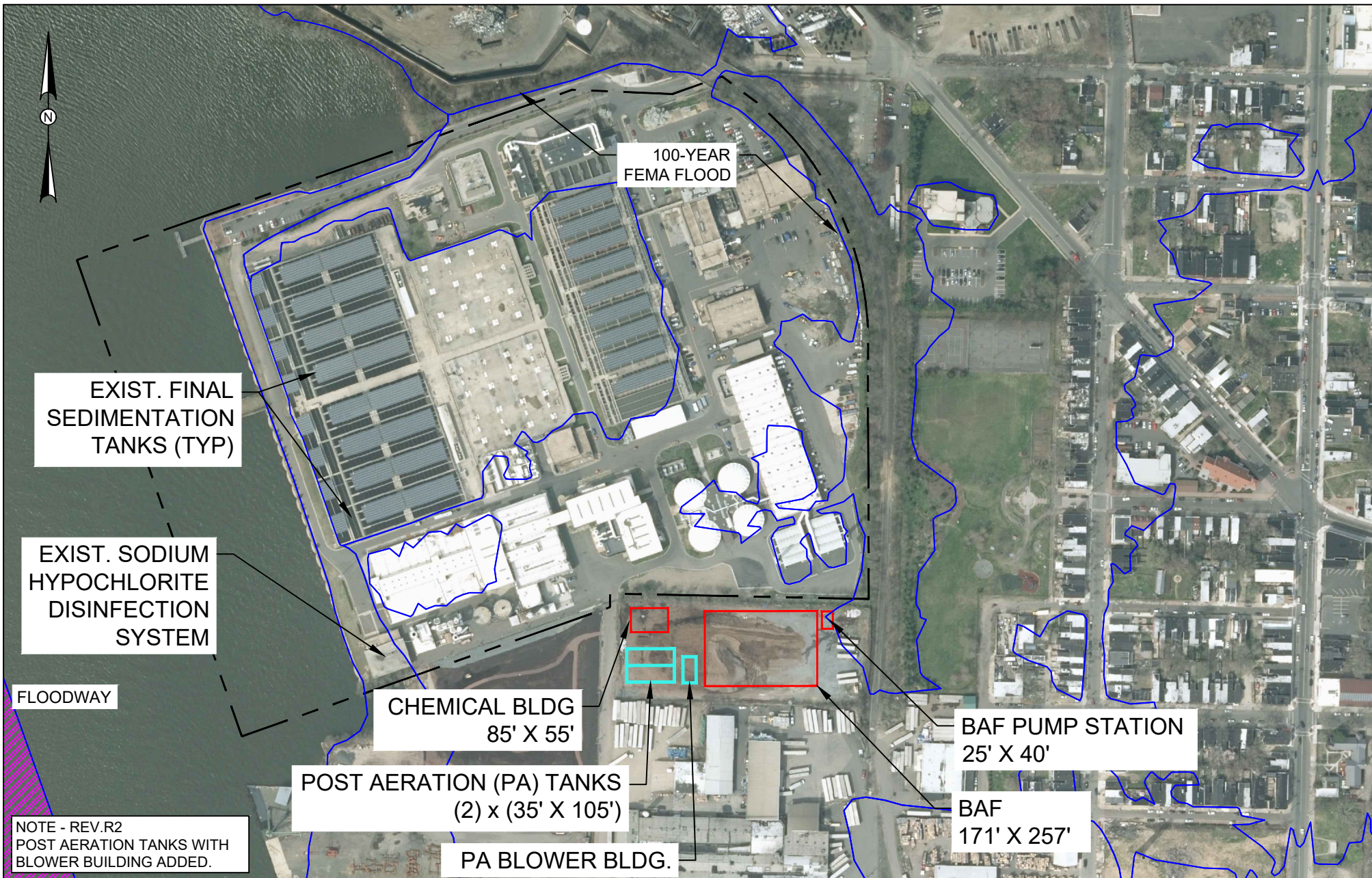
PROJECT NO. 6736
DRAWN BY: ELD
CHECKED BY: TKR
DATE: 05-20-2020
REV.R2: 11-07-2022

PWD SOUTHWEST WPCP
NH3-N = 1.5 mg/l
AND POST AERATION SYSTEM

NITROGEN REDUCTION
COST ESTIMATION STUDY
DELAWARE RIVER BASIN COMMISSION

FIGURE

D-2



NOTE - REV.R2
 POST AERATION TANKS WITH
 BLOWER BUILDING ADDED.

0 300 600
 SCALE: 1" = 300' SCALE IN FEET

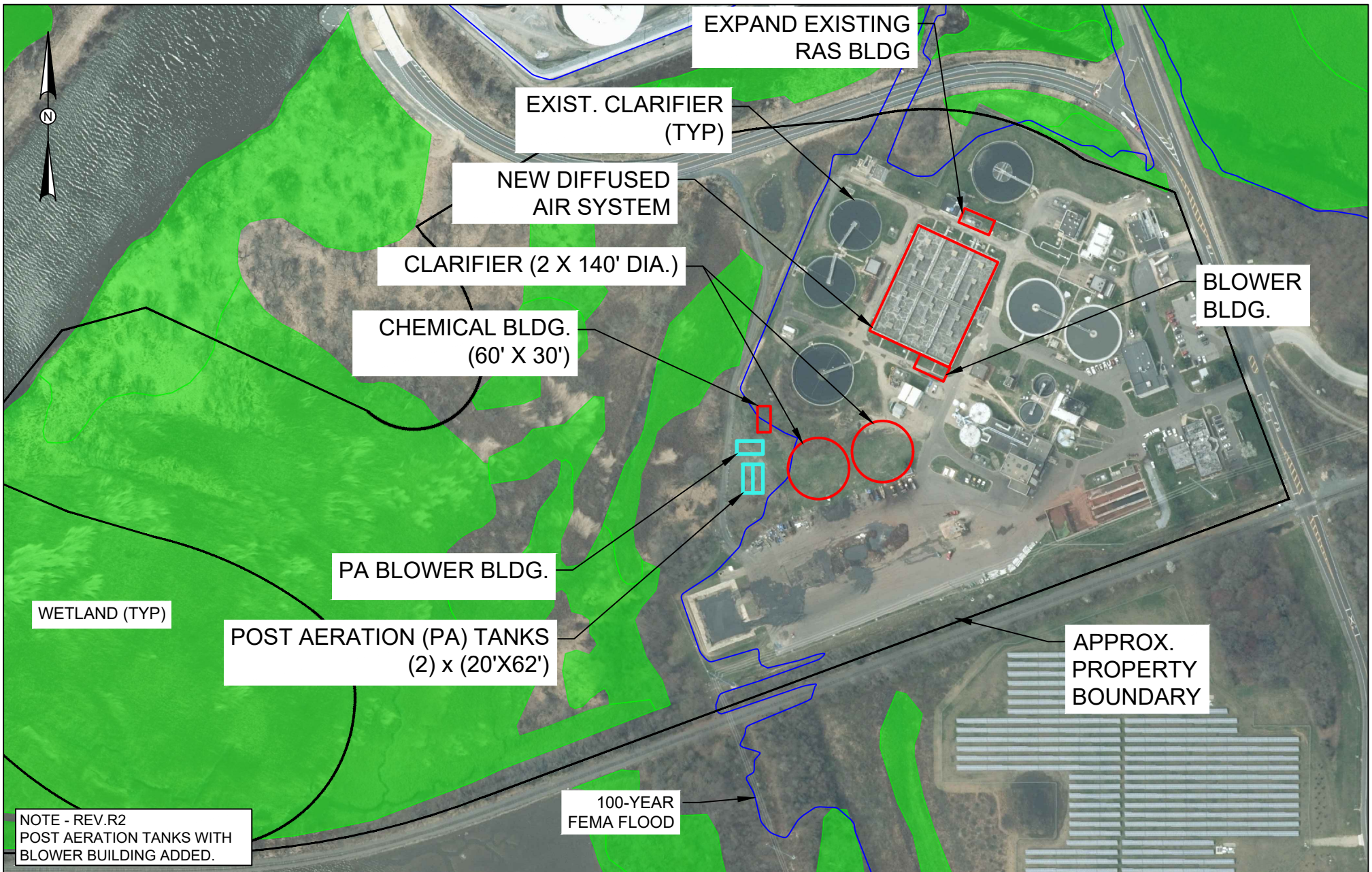
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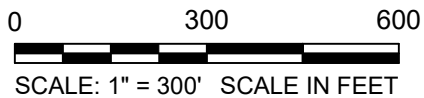
DELAWARE #1 WPCF (CCMUA)
 NH3-N = 1.5 mg/l
 AND POST AERATION SYSTEM

NITROGEN REDUCTION
 COST ESTIMATION STUDY
 DELAWARE RIVER BASIN COMMISSION

FIGURE
 C-2



NOTE - REV.R2
POST AERATION TANKS WITH
BLOWER BUILDING ADDED.



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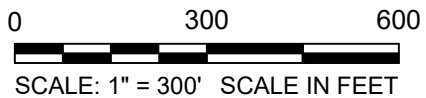
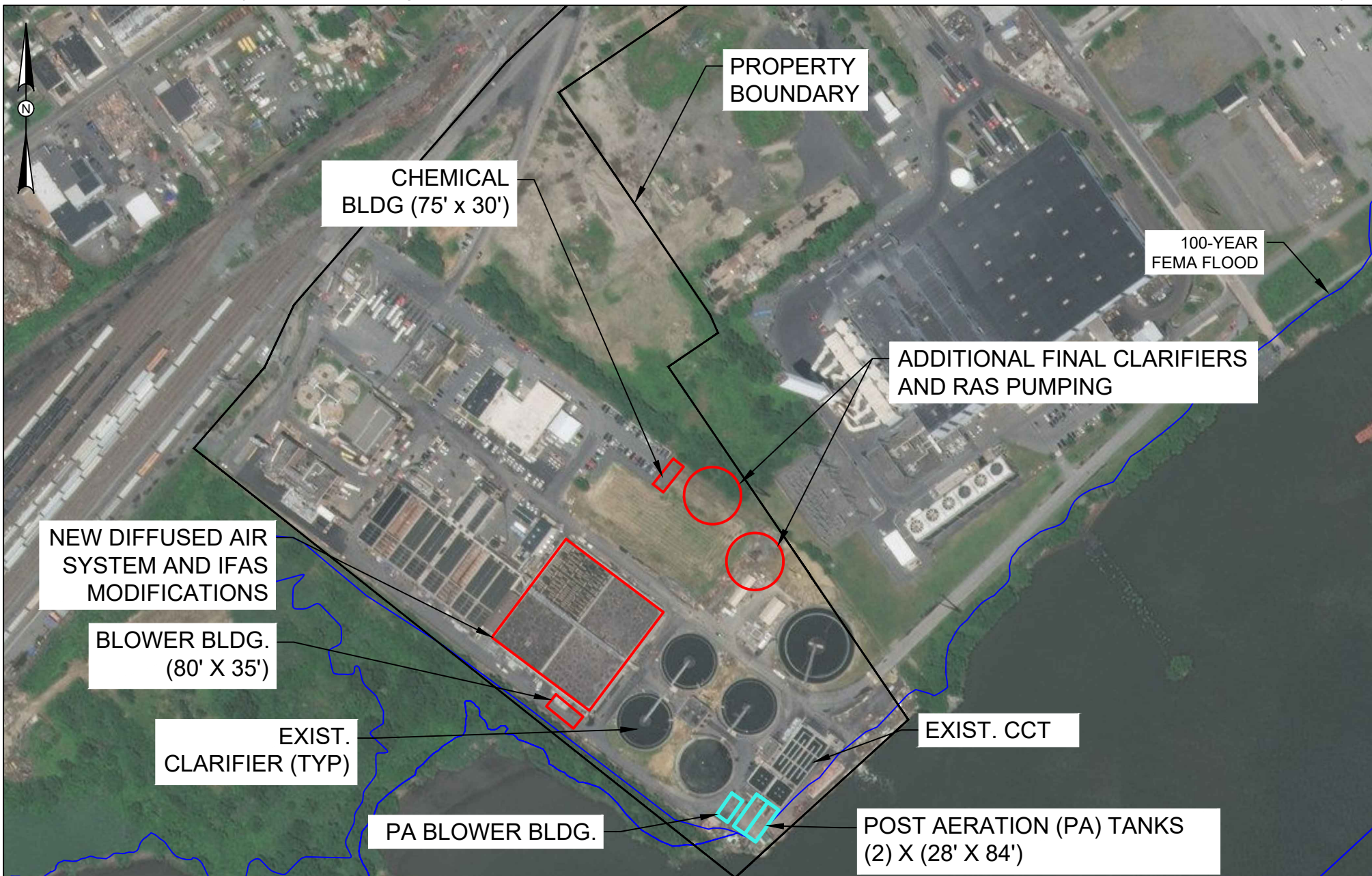
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GCUA
NH₃-N = 1.5 mg/l
AND POST AERATION SYSTEM

NITROGEN REDUCTION
COST ESTIMATION STUDY
DELAWARE RIVER BASIN COMMISSION

FIGURE

I-2

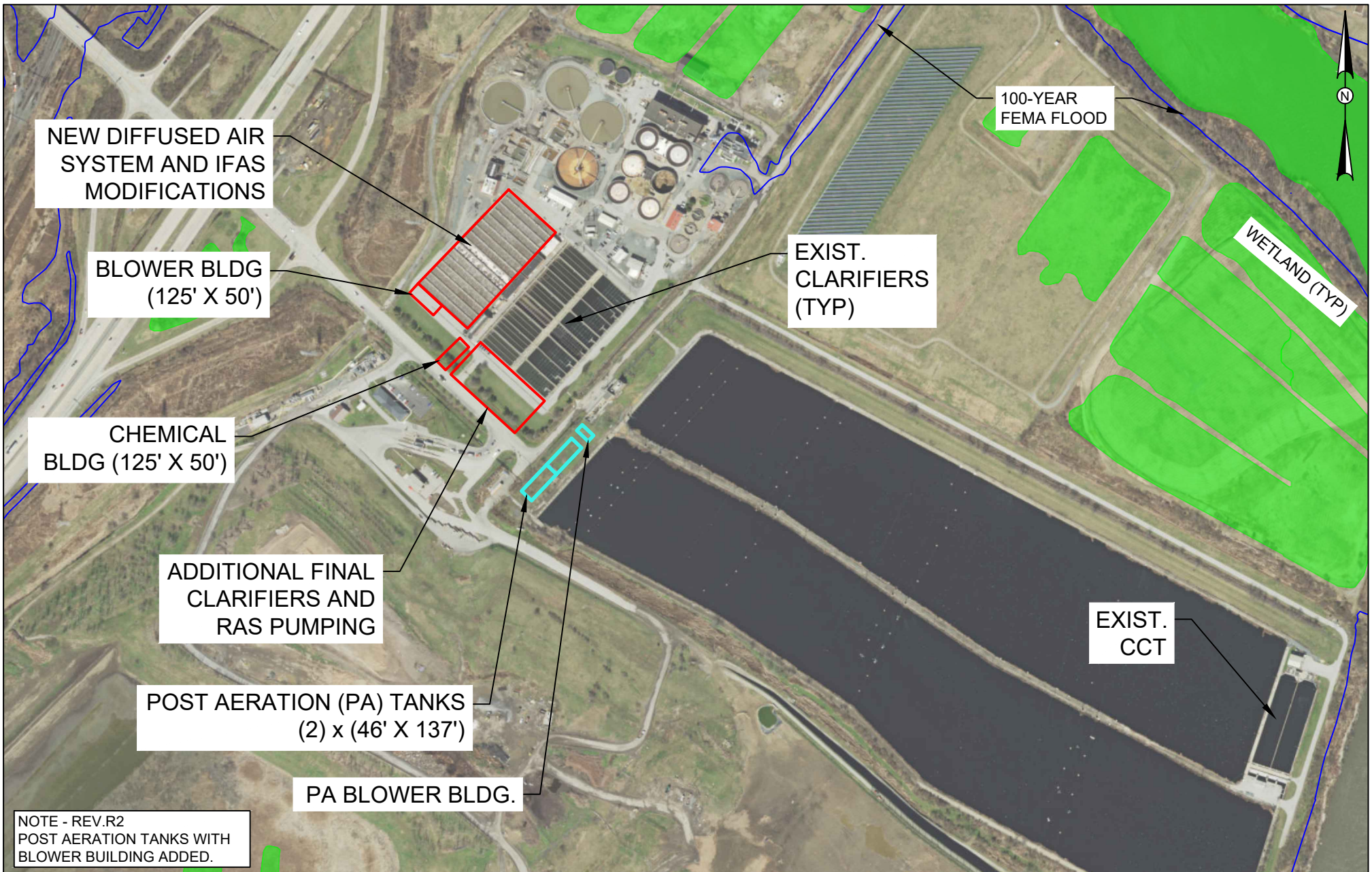


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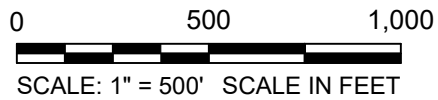
DELCORA WRTP
 NH3-N = 1.5 mg/l
 AND POST AERATION SYSTEM

NITROGEN REDUCTION
 COST ESTIMATION STUDY
 DELAWARE RIVER BASIN COMMISSION

FIGURE
J-1



NOTE - REV.R2
POST AERATION TANKS WITH
BLOWER BUILDING ADDED.



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CITY OF WILMINGTON STP
NH3-N = 1.5 mg/l
AND POST AERATION SYSTEM

NITROGEN REDUCTION
COST ESTIMATION STUDY
DELAWARE RIVER BASIN COMMISSION

FIGURE

L-2