# City of Cape May

**Cape May County, New Jersey**

# WATER TREATMENT PLANT

## PROJECT NARRATIVE

## APRIL 25, 2025

CME ASSOCIATES
CONSULTING AND MUNICIPAL ENGINEERS
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Consulting & Municipal ENGINEERS

CME ASSOCIATES

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## Abbreviations

GPM- Gallons per Minute

GPD – Gallons per Day

LF - Linear Feet

MG - Million Gallons

MGD - Million Gallons per Day

MGM - Million Gallons per Month

MGY - Million Gallons per Year

SF – Square Feet

NJDEP - New Jersey Department of Environmental Protection

SCADA - Supervisory Control and Data Acquisition

WAP - Water Allocation Permit

## 1. BACKGROUND

The City of Cape May is located in Cape May County, New Jersey at the southern end of the State where the Atlantic Ocean meets the Delaware Bay. The City owns and operates its own municipal water system, which is identified as Public Water System Identification (PWSID) #0502001. The Water System supplies potable water to approximately 5,000 permanent residents in Cape May City as well as the U.S. Coast Guard Facility, Cape May Point, West Cape May and a portion of Lower Township. During the Summer months the City's population increases to approximately 50,000 people.

The City's existing Water Treatment Plant consists of a Desalination Facility constructed in 1998 which consists of two (2) reverse osmosis trains. The Treatment Plant is supplied by three (3) wells that are screened in the Atlantic City 800-Foot Sand Aquifer (Well 6, 7 and 8). In addition, the City also utilizes a well in the Cohansey Aquifer (Well 5). The existing Water Treatment Plant utilizes Desalination Process through reverse osmosis (RO) for the treatment of brackish water from Well 6, 7 and 8.

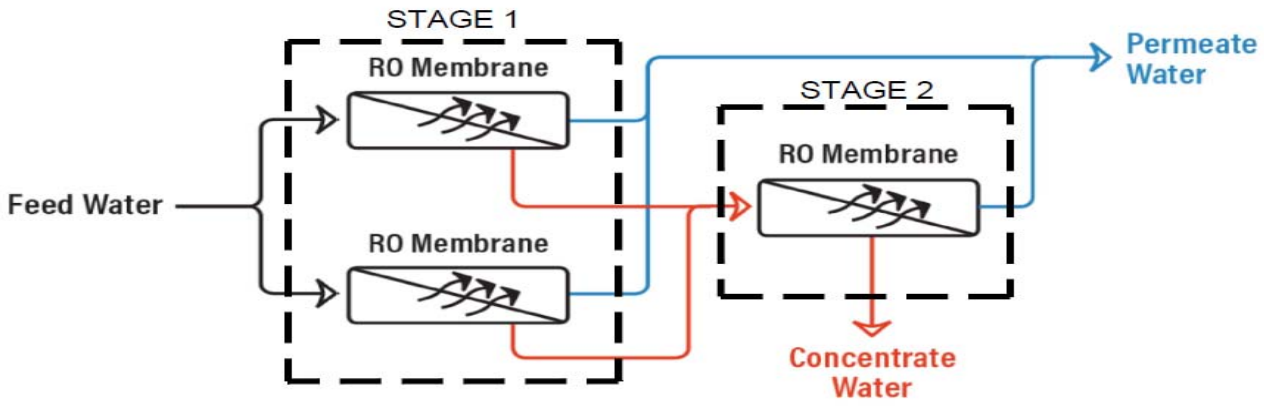
The Treatment Plant is approximately 27 years old and nearing the end of its useful life. Maintenance of the RO System has increased in recent years and repairs have required the treatment systems to be removed from service. Many of the components are obsolete and spare parts are not readily available. This results in longer delays for repairs and as result poses a risk to the community's water supply. Most importantly, the water supply is critical for the U.S. Coast Guard Facility, which is a military and transportation nexus and in its capacity serves as a first line of defence for the Country.

In addition, the Water Treatment Plant does not have Firm Capacity for the current water demands. Expansion of the existing Treatment Plant was considered however due to the limits within the existing Building, expansion is not possible. As a result, the alternative to construct a new Water Treatment Plant was selected to maintain safe and reliable water supply to the City of Cape May, the U.S. Coast Guard Facility and the surrounding communities which rely on City's potable water supply.

## 2. REVERSE OSMOSIS TREATMENT

The City's raw water supply consists of wells with brackish water quality. Brackish water typically has a sodium concentration between 500 mg/L to 30,000 mg/L. Reverse osmosis is the most widely accessible treatment process for desalination and is utilized in many areas of the country. However, it is not commonly used in New Jersey, where other water sources are readily available. Reverse osmosis consists of raw water filtration through a semipermeable membrane. The reverse osmosis treatment trains for potable water supply often consist of two stages of membranes mounted horizontally. High pressure feed pumps are required to push the raw water through the 1$^{st}$ stage of membranes. The water particles that are processed through the membranes are called the permeate. This water is ultimately treated and conveyed to the distribution system. Particles that do not pass through the membrane are called concentrate. To increase the permeate efficiency of the RO train, the concentrate produced from the first stage of membranes is circulated through another series of membranes known as the 2$^{nd}$ stage. Permeate from the 1$^{st}$ and 2$^{nd}$ stages of the membranes combine as the finish water supply. The concentrate from the 2$^{nd}$ stage is conveyed to a surface water discharge. The percentage of permeate water compared to the raw water supply is known as the membrane recovery ratio.

**REVERSE OSMOSIS FLOW DIAGRAM**




## 3. WATER SYSTEM DEMANDS

The Cape May Water Treatment Plant provides potable water supply to the City of Cape May as well as Cape May Point, West Cape May, a portion of Lower Township, and a U.S. Coast Guard Facility. The average annual production from the Water Treatment Plant is approximately 350 MGY. The below Table summarizes the annual water demand for the City and each of its bulk customers over the past six (6) years.

**TABLE 1 - WATER DEMANDS (MGY)**

| | Cape May City | West Cape May | Cape May Point | USCG | Lower Township |
|---|---|---|---|---|---|
| **2018** | 230.127 | 41.847 | 30.147 | 31.392 | 2.132 |
| **2019** | 230.047 | 44.885 | 31.773 | 29.175 | 1.947 |
| **2020** | 221.615 | 48.601 | 31.444 | 32.02 | 2.174 |
| **2021** | 250.927 | 54.05 | 33.418 | 28.565 | 2.07 |
| **2022** | 251.698 | 47.247 | 31.715 | 26.518 | 2.263 |
| **2023** | 241.48 | 48.854 | 30.78 | 25.119 | 1.913 |
| **Average** | **237.649** | **47.581** | **31.546** | **28.798** | **2.083** |

The Water Treatment Plant's annual average demand is approximately 0.95 MGD with an average peak production during the summer months of approximately 2.20 MGD. The water demands during the Summer are up to 70 MGM with a maximum day demand of approximately 2.80 MGD.

Based on a review of the historical water supply for the Treatment Plant, water demands have remained consistent over the past six (6) years. Other than a potential expansion of the United States Coast Guard

Station, water demands in the future are anticipated to increase minimally; however the facility will be designed with the flexibility of adding an additional RO skid if future water demands warrant.

## 4. SOURCE WATER SUPPLY

The Water Treatment Plant receives raw water supply from ground water production wells permitted through Water Allocation Permit No. 5210. The supply system consists of six (6) wells located in two aquifers. The Water Allocation Permit limits are summarized below:

**TABLE 2 – TOTAL ALLOCATION LIMITS**

| Allocation Permit | Gallons Per Minute (GPM) Limit | Million Gallons Per Month (MGM) | Million Gallons Per Year (MGY) |
|---|---|---|---|
| 5210 | 4,330 | 115 | 838 |

**TABLE 3 – LIMITS BY AQUIFER**

| Aquifer Source | Gallons Per Minute (GPM) Limit | Million Gallons Per Year (MGY) |
|---|---|---|
| Cohansey | 2,330 | 160 |
| Atlantic City 800 Foot Sands | 2,000 | 678 |

**TABLE 4 - WELL SOURCES**

| Well Name | Rated Capacity (GPM) | Aquifer | Status |
|---|---|---|---|
| Well 3 | 860 | Cohansey | Inactive |
| Well 4 | 770 | Cohansey | Inactive |
| Well 5 | 700 | Cohansey | Active |
| Well 6 | 1,000 | Atlantic City 800 Foot Sands | Active |
| Well 7 | 1,000 | Atlantic City 800 Foot Sands | Active |
| Well 8 | 1,000 | Atlantic City 800 Foot Sands | Active |

Wells 3 and 4, located in the Cohansey Aquifer, are currently not active sources of water supply due to their high levels of chloride, sodium and iron. Well 5, located further inland than Wells 3 and 4, remains a viable source of raw water supply. Iron levels in Well 5 are approximately 0.50 mg/l and the well is currently treated for iron sequestering and disinfection.

Wells 6, 7 and 8, located in the Atlantic City 800 Foot Sands, are the primary sources of raw water supply for the Treatment Plant. These wells provide a brackish source of raw water supply to the existing Desalination Treatment Plant. The sodium and chloride levels are greater than the NJDEP Regulation Limits of 250 mg/l and 50 mg/l, respectively. In addition, the raw water from the wells contains silica,

which is detrimental to the reverse osmosis process, however silica is not regulated by the NJDEP. The below Table provides a summary of the water quality in Wells 5, 6, 7 and 8.

**TABLE 5 - WELL RAW WATER QUALITY**

| Well Name | Iron (mg/l) | Sodium (mg/l) | Chloride (mg/l) | Silica (mg/l) |
|---|---|---|---|---|
| Well 5 | 0.562 | 65.7 | 100 | 35.80 |
| Well 6 | < 0.050 | 503 | 490 | 58.50 |
| Well 7 | < 0.050 | 419 | 380 | 49.50 |
| Well 8 | < 0.050 | 658 | 750 | 48.80 |

Wells 6 and 7 were constructed in the 1990's with the original Desalination Plant construction and Well 8 was installed in the 2010's for redundancy of the Atlantic City 800 Foot Sands wells.

The water from these wells contain sodium and chloride levels in the range of 400-700 mg/l which exceeds the New Jersey Drinking Water Standards. The plant uses two (2) Reverse Osmosis (RO) skids with a 68% recovery to treat the brackish water to potable standards. The total rated treatment capacity of the RO System is 2.0 MGD.

Potable water to the City is also supplied by Well No. 5, which has a capacity of 700 GPM (1.0 MGD) and is screened in the Cohansey Aquifer. Well No. 5 is located to the north of the Water Treatment Plant and the raw water is treated utilizing chlorine for disinfection and sodium silicate for iron sequestering. Due to increasing iron within this Well, it is anticipated that iron sequestering will no longer be viable in the near future and filtering for iron removal will be required.

The capacity of the existing Water Treatment Plant is not in compliance with the Firm Capacity requirements of the NJDEP Standards. Firm capacity is defined as the treatment capacity when the largest pumping or treatment unit is out of service. Accordingly, the firm capacity of the Water Treatment Plant with the largest unit out of service (either Well 5 or one RO skid) is approximately 2.0 MGD. In addition, the major equipment and components of the existing Desalination Facility have been in operation for approximately twenty-five years and are entering the final stages of their useful service life. The iron levels in Well No. 5 are nearing the limit allowable for sequestering and the projected increase in concentration will require an iron removal treatment system.

Accordingly, the City plans to proceed with the construction of a new 3.24 MGD Desalination Treatment Facility and a 1.0 MGD Iron Removal Treatment Facility. Implementation of this Project will provide the City with an adequate Firm Capacity to meet the existing and future water demands, replace the existing treatment facility which has reached the end of its useful life, and provide iron removal for Well No. 5.

## 5. EXISTING FACILITIES

The current Water Treatment Plant was placed into operation in 1998. Prior to 1998, the City only operated ground water production wells that drew water from the Cohansey Aquifer. These wells were exhibiting increasing levels of sodium and chlorides as a result of saltwater intrusion. Therefore, the City explored other raw water sources including the Atlantic City 800 Foot Sands Aquifer. This Aquifer, which contained brackish water qualities of sodium and chloride, maintained low levels of other water quality

parameters. In addition, relocating the water source from the Cohansey Aquifer would slow the saltwater intrusion into the aquifer and assist with preserving the City's remaining Cohansey source in Well 5.

In 1998 the City constructed the Desalination Plant that is currently in operation. The Project consisted of the installation of Wells 6 and 7 in the Atlantic City 800 Foot Sands Aquifer. Well 8, which also draws water from the Atlantic City 800 Foot Sands Aquifer, was constructed at a later date. To treat the brackish water supply, a reverse osmosis (RO) treatment system was installed. The existing Water Treatment Plant Building was utilized for the new RO treatment system. This Building was constructed in 1926 with the original formation of the City's Public Water Supply system.

The Desalination Plant consists of two (2) RO trains. Well 6, 7 and 8 supply raw water to feed pumps that pump water through the RO trains. Each RO train is rated for a feed water capacity of 1,000 GPM with a recovery of approximately 68%. As a result, 680 GPM of permeate and 320 GPM of concentrate water is produced by each RO skid. The total treated water (permeate) capacity of the RO system is 1,360 GPM (1.96 MGD).

In addition to the RO skid, the existing Treatment Plant contains ancillary treatment equipment. This equipment consists of the following:

- Clean-In-Place (CIP) System for RO membrane cleaning;
- Antiscalant for silica sequestering prior to the RO membranes;
- 5-micron cartridge filters for pre-filtration;
- Lime Slurry System for post-filtration pH adjustment and re-mineralization of permeate;
- Liquid carbon dioxide system for re-mineralization of permeate;
- Calcium hypochlorite tablet feed system for disinfection;
- Corrosion control inhibitor;
- Concentrate Surface Water Discharge (NJPDES Permit No. NJ0108341)

Well 5, located in the Cohansey Aquifer, remains in operation and is not treated by the RO system. The iron concentrations in the raw water allow for treatment by iron sequestering and disinfection. It has been reported that the iron concentrations have been increasing and in order to maintain operation of the well, an iron removal system is being proposed herein.

The capacity of the City's existing Water Treatment Plant is summarized in the below Table.

**TABLE 6 – EXISTING WATER SYSTEM PLANT CAPACITY**

| Supply Source | Feed Rate (GPM) | Recovery (%) | Finished Water (GPM) | Finished Water (MGD) |
|---|---|---|---|---|
| RO Train 1 | 1,000 | 68.0 | 680 | 0.98 |
| RO Train 2 | 1,000 | 68.0 | 680 | 0.98 |
| Well 5 | 700 | - | 700 | 1.00 |
| | | | **Total Plant Capacity** | **2.96** |
| | | | **Firm Plant Capacity** | **1.96** |

## 6. PROPOSED WATER TREATMENT PLANT

The proposed improvements consist of a new 3.24 MGD Desalination Water Treatment Facility and a new 1.0 MGD Iron Removal Treatment Facility. Both treatment facilities will be located in a single Building at the City's Public Works Yard, adjacent to the existing Water Treatment Plant. The new Water Treatment Plant will include prefiltration, RO feed pumps, three (3) RO treatment trains, chemical feed systems, a lime silo, iron removal pressure filters, a backwash tank, electrical components, instrumentation, site improvements, solar panels, electrical distribution equipment, an emergency generator and all other ancillary equipment. All critical components will be located within a Building with a Finished Floor Elevation of 12.5 which is 2 feet higher than the FEMA 500-year flood elevation.

Ultimate build-out of the Project will occur in four (4) phases consisting of the following:

Phase 1A: Desalination Water Treatment Facility – Building Construction

This Phase will include the construction of a new Treatment Plant Building consisting of an approximately 10,000 SF Pre-Engineered Metal Building located adjacent to the existing Water Treatment Plant. Associated site improvements will be performed during this Phase, including buried site utility pipe associated with raw water supply, finished water, concentrate, sanitary waste and buried chlorine contact tanks. A new electrical service will be installed for power supply to the initial building construction and future installation of the water treatment equipment. Building amenities including heating, ventilation, air conditioning, plumbing and lighting will be installed to allow for a fully functional building. Provisions will be included for the future installation of water treatment equipment. The existing Water Treatment Plant will remain in operation until the new Treatment Plant is operational. The anticipated Project Costs for Phase 1A is approximately $13,400,000.

Phase 1B: Desalination Equipment

This Phase will include the construction of new stainless steel process piping and fittings, RO Cartridge Filters, RO feed pumps, RO Skids housing equipment for desalination, remote I/O RO panels, electrical and control equipment, instrumentation, chemical feed systems, Clean-In-Place equipment including a clean in place pump, cartridge filter, tank, and permeate flushing tank, finished water piping, flow meters, valves, static mixers and associated process piping. The anticipated Project Costs for Phase 1B is approximately $12,600,000.

Phase 2: Iron Removal Treatment Facility

This Phase will include the construction of new influent piping from Well No. 5 to the new Treatment Plant building, two (2) greensand vertical pressure filters, stainless steel process piping, decant recycle pumps, backwash piping and fittings, remote I/O filter panels, instrumentation, a backwash holding tank, and all associated site piping. The vertical pressure filters will be installed within the Treatment Plant Building constructed under Phase 1A. Provisions will be included in Phase 1A to allow for the pressure filters to be installed without any disruption. The anticipated Project Costs for Phase 2 is approximately $6,200,000.

Phase 3: Site Improvements and Emergency Generator

This Phase will include site grading, concrete sidewalks and curbs, topsoiling, surface course asphalt, traffic striping, an emergency generator, a concrete pad for the emergency generator, roof mounted solar panels and site restoration. In addition, the existing Water Treatment Plant will be decommissioned during this Phase. Decommissioning will consist of the removal of the old RO filter trains, high lift pumps, cartridge filter, piping and CIP System. The anticipated Project Costs for Phase 3 is approximately $4,400,000.

A breakdown on the anticipated Project Costs for each Phase is included in the Appendix.

## 7. FUNDING SOURCES

Due to the substantial anticipated cost of constructing the Water Treatment Plant, the Project will be implemented in four (4) distinct phases. The City is actively pursuing and securing funding sources to ensure this essential public facility remains financially feasible for the community. Funding sources and matching contributions are summarized in the below Table.

**TABLE 7 – DESALINATION PLANT FUNDING SOURCES**

| Phase | Funding Source | Amount | City Match | Total |
|---|---|---|---|---|
| 1A – Building Construction | ACOE WRDA/EWD | $10,000,000 | $3,400,000 | $13,400,000 |
| 1B – Equipment Installation | Congressman VanDrew Department of Interior | $2,000,000 | $ 500,000 | $2,500,000 |
| | NJ IBank Grant | $3,000,000 | $3,000,000 | $6,000,000 |
| | NJ IBank Loan | | $4,100,000 | $4,100,000 |
| | | | **TOTAL** | **$26,000,000** |

## 8. REVERSE OSMOSIS TREATMENT SYSTEM

The reverse osmosis system primarily consists of raw water supply from Wells 6, 7 and 8, three (3) cartridge filters, antiscalant, RO feed pumps, RO trains, remineralization system and clean-in-place system. The RO trains will consist of three (3) trains to meet Firm Capacity requirements. Each reverse osmosis train will consist of two (2) stages. The 1st stage will have 24 vessels and the 2nd stage will have 12 vessels (24:12 array). All raw water will enter the 1st stage. The concentrate from the 1st stage will then be processed by the 2nd stage. The permeate from both stages combine for a single permeate discharge from the RO train. The estimated recovery for the RO train is 75% which will result in a rated permeate capacity of 750 GPM/train.

**TABLE 8 – REVERSE OSMOSIS CAPACITY**

| Supply Source | Feed Rate (GPM) | Recovery (%) | Finished Water (GPM) | Finished Water (MGD) |
|---|---|---|---|---|
| RO Train 1 | 1,000 | 75.0 | 750 | 1.08 |
| RO Train 2 | 1,000 | 75.0 | 750 | 1.08 |
| RO Train 3 | 1,000 | 75.0 | 750 | 1.08 |
| | | | **RO Total Capacity** | **3.24** |
| | | | **RO Firm Capacity** | **2.16** |

Concentrate from each RO train will be discharged to the existing concentrate discharge pipe and ultimately flow to the Cape Island Creek.

## 9. IRON REMOVAL TREATMENT SYSTEM

The iron removal treatment system primarily consists of raw water supply from Well 5, pre-filtration chemical feed systems, two (2) vertical pressure filters and a backwash holding tank. The construction of the iron removal treatment system will be performed during Phase 2 of the Project and after the construction and start-up of the desalination system.

Vertical Pressure Filters

Two (2), 12' diameter dual media vertical pressure filters will be installed in the new Treatment Plant for the removal of iron from the raw water from Well 5. The filters will utilize a combination of Greensand Plus, gravel, and anthracite. Filter media consists of 18-inches of anthracite, 18-inches of Greensand Plus and 12-inches of gravel. Due to the low iron concentrations in the raw water supplied by Well 5, the Pressure Filter Manufacturer has recommended a flowrate of up to 6.19 GPM/SF per filter. At this loading rate, the two (2) pressure filters proposed will maintain a Firm Capacity of 700 GPM (1.00 MGD)

Backwash Holding Tank

The filter backwashing process will be either initiated by time, differential pressure or volume filtered, whichever set point occurs first. Due to the low iron concentrations, prolonged runtimes between backwashing of 40-50 hours are anticipated. Backwash water will be supplied through an 8-inch water service connection that is protected by a reduced pressure zone backflow device. The total estimated backwash waste volume generated will be 11,400 gallons per filter per backwash.

One (1) 30,000 gallon Backwash Holding Tank will be constructed as part of this Project. The tank is 16-feet in diameter and 20-feet to the overflow. Backwash waste generated from the filters will be directed to the holding tank. The tank has been sized based upon the estimated total backwash of 22,800 gallons generated from one backwash of each pressure filter. In addition, consideration was provided for sludge storage in the bottom of the tank and approximately 1-foot of additional storage between the anticipated maximum water level and the overflow.

Backwash will be held in each tank until the solids have settled. Once the solids have settled, pumps will be utilized to draw the clear decant water from the surface of each tank and recycle the water back to the head of the treatment plant. Sludge settled at the bottom of the tanks will be discharged into a gravity pipe for conveyance to the sanitary sewer collection system. The bottom of the tanks will be filled with concrete and sloped to the center sludge discharge pipe. An air gap will be provided at the discharge location to the sanitary sewer.

## 10. PROPOSED WATER TREATMENT PLANT FIRM CAPACITY

Firm capacity of a treatment plant is the overall capacity with the largest treatment system being out-of-service. As required by NJDEP, the firm capacity must be greater than the water system's demand. Currently, the water system demand for the existing Cape May Water Treatment Plant is greater than the firm capacity. The proposed Water Treatment Plant is designed to provide redundancy within the Desalination and Iron Removal Treatment Systems. As a result, the proposed firm capacity will exceed the current peak demands of the Water System. The capacities of each Treatment System is included in the below Table.

**TABLE 9 – WATER SYSTEM PLANT CAPACITY**

| Supply Source | Feed Rate (GPM) | Recovery (%) | Finished Water (GPM) | Finished Water (MGD) |
|---|---|---|---|---|
| RO Train 1 | 1,000 | 75.0 | 750 | 1.08 |
| RO Train 2 | 1,000 | 75.0 | 750 | 1.08 |
| RO Train 3 | 1,000 | 75.0 | 750 | 1.08 |
| **RO Firm Capacity** | | | **1,500** | **2.16** |
| Pressure Filter 1 | 700 | - | 700 | 1.00 |
| Pressure Filter 2 | 700 | - | 700 | 1.00 |
| **Pressure Filter Firm Capacity** | | | **700** | **1.00** |
| **Water Treatment Plant Firm Capacity** | | | **2,200** | **3.16** |

## 11. COMPLETED WORK ITEMS

Substantial progress has been made for the development of Design Plans and Specifications. The following items have been completed:

- Site survey;
- Geotechnical borings;
- New Jersey Infrastructure Bank Application;
- Environmental Planning Document;
- Cultural Resources Stage 1A Investigation;
- Freshwater Wetlands delineation;
- Review of design flood elevations;
- Analysis of available water supply;

- Analysis of existing water demands and future growth;
- Coordinate and review raw water samples;
- Site investigation to review existing plant operations;
- Process equipment selection including Reverse Osmosis System, Feed Pumps, Cartridge Filters, Chemical Feed Pumps;
- Review requirements for Iron Removal System (Well 5);
- Size holding tank for recycling of backwash water associated with Iron Removal System;
- Review size requirements for hydrated lime and select Lime Silo Storage System;
- Coordinate Clean-In-Place process with City's antiscalant vendor;
- Evaluate downstream sanitary pump station;
- Sizing and selection of chemical feed systems;
- Select liquid CO2 System for permeate re-mineralization;
- Identify locations for water quality analyzer;
- Prepare construction cost estimates;
- Evaluate the use of bulk liquid sodium hypochlorite versus chlorine dioxide generators;
- Identify phasing plans for completion of the Project;
- Review existing and proposed electrical demands;
- Size new emergency generator for back-up power to the Treatment Plant;
- Determine chlorine contact time requirement and size contact tank;
- Review plant maintenance with City's Staff;
- Verify compliance of materials, equipment and additives with AWWA and NSF Standards;
- Preparation of Site Plans associated with Demolition, Grading and Utility Improvements;
- Preparation of Site Profiles associated with Grading and Utility Improvements;
- Preparation of Utility Connection Details associated with Proposed Site Piping;
- Preparation of Process Equipment and Mechanical Floor Plans, Details and Sections;
- Preparation and submission of the following permit applications:
    - NJDEP Bureau of Water System Engineering (currently under review)
    - Cape Atlantic Soil Conservation District (permit approved)
    - NJDEP CAFRA (currently under review)
    - NJDEP Freshwater Wetlands (currently under review)

## 12. OUTSTANDING WORK ITEMS

The Preliminary Design Plans and Specifications are nearing completion and will be progressing to Final Design this year. The following items are currently outstanding and will be completed prior to construction. It is anticipated the project design will be completed and bid-ready by January 2026.

- Finalize Process and Instrumentation Diagrams;
- Finalize Instrumentation and Equipment Schedules;
- Prepare Instrumentation Control Wiring Drawings;
- Prepare Process Functional Descriptions;
- Finalize Design of Structural Foundations for the Lime Silo and Backwash Holding Tank;
- Finalize Design of Architectural and MEP Plans;
- Prepare Building Foundation Design Plans;
- Prepare Architectural Building Construction Plans;
- Prepare Security and Fire Protection Plan;

- Prepare Design Details and Specification for the Treatment Plant's Supervisory Control and Data Acquisition (SCADA) System;
- Coordinate control methods with the Plant Operators;
- Quality assurance and quality control review;
- Cultural Resources Stage 1B Investigation;
- Obtain State Comptroller approval of Bid Specifications;
- Obtain approval of pending regulatory permit applications.

# APPENDIX A

Phase 1A Engineer's Opinion of Probable Cost
Phase 1B Engineer's Opinion of Probable Cost
Phase 2 Engineer's Opinion of Probable Cost
Phase 3 Engineer's Opinion of Probable Cost

**City of Cape May**
**Water Treatment Plant - Reverse Osmosis and Iron Removal**
**Phase 1A**
**Engineer's Opinion of Probable Costs**

Date: April 23, 2025

| ITEM | DESCRIPTION | QUANTITY | UNIT | COST/UNIT | TOTAL |
|---|---|---|---|---|---|
| | | | | | |
| 1 | Mobilization (N.J.A.C. 7:14-2.9) 2% | Lump Sum | - | - | $ 280,000.00 |
| 2 | Environmental Protection Measures | Lump Sum | - | - | $ 50,000.00 |
| 3 | Fuel Price Adjustment | Lump Sum | - | - | $ 20,000.00 |
| 4 | Asphalt Price Adjustment | Lump Sum | - | - | $ 20,000.00 |
| 5 | Clearing Site and Demolition | Lump Sum | - | - | $ 500,000.00 |
| 6 | Excavation, Test Pit | Cubic Yard | 100 | $ 200.00 | $ 20,000.00 |
| 7 | Project Sign | Lump Sum | - | - | $ 5,000.00 |
| 8 | Site Grading | Lump Sum | - | - | $ 200,000.00 |
| 9 | Site Work and Restoration | Lump Sum | - | - | $ 750,000.00 |
| 10 | Site Storm Piping | Lump Sum | - | - | $ 50,000.00 |
| 11 | Site Utility Piping | Lump Sum | - | - | $ 700,000.00 |
| 12 | Chlorine Contact Tank | Lump Sum | - | - | $ 300,000.00 |
| 13 | Lime Silo | Lump Sum | - | - | $ 2,300,000.00 |
| 14 | Water Treatment Plant Building | Lump Sum | - | - | $ 4,750,000.00 |
| 15 | Mechanical HVAC | Lump Sum | - | - | $ 500,000.00 |
| 16 | Plumbing | Lump Sum | - | - | $ 400,000.00 |
| 17 | Electric Service | Lump Sum | - | - | $ 400,000.00 |
| 18 | Electrical Gear and Panel Boards | Lump Sum | - | - | $ 400,000.00 |
| 19 | Electrical Distribution and Lighting | Lump Sum | - | - | $ 500,000.00 |
| | | | | | |
| | | | | Subtotal | $ 12,145,000.00 |
| | | | | Construction Contingency 10% | $ 1,214,500.00 |
| | | | | **Total - Project Costs** | **$ 13,359,500.00** |

**City of Cape May**
**Water Treatment Plant - Reverse Osmosis and Iron Removal**
**Phase 1B**
**Engineer's Opinion of Probable Costs**

Date: April 25, 2024

| ITEM | DESCRIPTION | QUANTITY | UNIT | COST/UNIT | TOTAL |
|---|---|---|---|---|---|
| | | | | | |
| 1 | Mobilization (N.J.A.C. 7:14-2.9) 2% | Lump Sum | - | - | $ 280,000.00 |
| 2 | RO Treatment System | Lump Sum | - | - | $ 6,500,000.00 |
| 3 | Cartridge Filters | Lump Sum | - | - | $ 550,000.00 |
| 4 | CIP System | Lump Sum | - | - | $ 1,250,000.00 |
| 5 | Interior RO Piping | Lump Sum | - | - | $ 600,000.00 |
| 6 | Chemical Feed Tanks and Equipment | Lump Sum | - | - | $ 750,000.00 |
| 7 | Instrumentation | Lump Sum | - | - | $ 400,000.00 |
| 8 | SCADA System | Lump Sum | - | - | $ 350,000.00 |
| 9 | Office Furniture | Lump Sum | - | - | $ 100,000.00 |
| 10 | Laboratory Furniture and Equipment | Lump Sum | - | - | $ 150,000.00 |
| 11 | Electrical Gear and Panel Boards | Lump Sum | - | - | $ 400,000.00 |
| 12 | Electrical Distribution and Lighting | Lump Sum | - | - | $ 100,000.00 |
| | | | | | |
| | | | | Subtotal | $ 11,430,000.00 |
| | | | | Construction Contingency 10% | $ 1,143,000.00 |
| | | | | **Total - Project Costs** | **$ 12,573,000.00** |

**City of Cape May**
**Water Treatment Plant - Reverse Osmosis and Iron Removal**
**Phase 2**
**Engineer's Opinion of Probable Costs**

Date: April 25, 2024

| ITEM | DESCRIPTION | QUANTITY | UNIT | COST/UNIT | TOTAL |
|---|---|---|---|---|---|
| | | | | | |
| 1 | Mobilization (N.J.A.C. 7:14-2.9) 2% | Lump Sum | - | - | $ 100,000.00 |
| 2 | Environmental Protection Measures | Lump Sum | - | - | $ 40,000.00 |
| 3 | Project Sign | Lump Sum | - | - | $ 5,000.00 |
| 4 | Site Utility Piping | Lump Sum | - | - | $ 400,000.00 |
| 5 | Backwash Tank | Lump Sum | - | - | $ 550,000.00 |
| 6 | Pressure Filters | Lump Sum | - | - | $ 3,000,000.00 |
| 7 | Interior Pressure Filter Piping | Lump Sum | - | - | $ 350,000.00 |
| 8 | Backwash Recycle Pumps | Lump Sum | - | - | $ 250,000.00 |
| 9 | Chemical Feed Tanks and Equipment | Lump Sum | - | - | $ 500,000.00 |
| 10 | Instrumentation | Lump Sum | - | - | $ 200,000.00 |
| 11 | SCADA System | Lump Sum | - | - | $ 250,000.00 |
| | | | | | |
| | | | | Subtotal | $ 5,645,000.00 |
| | | | | Construction Contingency 10% | $ 564,500.00 |
| | | | | **Total - Project Costs** | **$ 6,209,500.00** |

**City of Cape May**
**Water Treatment Plant - Reverse Osmosis and Iron Removal**
**Phase 3**
**Engineer's Opinion of Probable Costs**

Date: April 25, 2024

| ITEM | DESCRIPTION | QUANTITY | UNIT | COST/UNIT | TOTAL |
|---|---|---|---|---|---|
| | | | | | |
| 1 | Mobilization (N.J.A.C. 7:14-2.9) 2% | Lump Sum | - | - | $ 250,000.00 |
| 2 | Environmental Protection Measures | Lump Sum | - | - | $ 40,000.00 |
| 3 | Fuel Price Adjustment | Lump Sum | - | - | $ 10,000.00 |
| 4 | Asphalt Price Adjustment | Lump Sum | - | - | $ 10,000.00 |
| 5 | Project Sign | Lump Sum | - | - | $ 5,000.00 |
| 6 | Site Work and Restoration | Lump Sum | - | - | $ 450,000.00 |
| 7 | Emergency Generator | Lump Sum | - | - | $ 2,500,000.00 |
| 8 | Roof Mounted Solar Panels | Lump Sum | - | - | $ 750,000.00 |
| | | | | | |
| | | | | Subtotal | $ 4,015,000.00 |
| | | | | Construction Contingency 10% | $ 401,500.00 |
| | | | | **Total - Project Costs** | **$ 4,416,500.00** |