APPENDIX C 2017 ENGINEERING REPORT[1]

[1] The Long Beach WCPC Order on Consent is included as Appendix E of the 2017 Engineering Report.

ENGINEERING REPORT

FOR THE

CITY OF LONG BEACH

FLOW DIVERSION PUMP STATION & FORCE MAIN

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ENGINEERING REPORT FOR THE CITY OF LONG BEACH FLOW DIVERSION PUMP STATION & FORCE MAIN

July 2017

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1. Executive Summary

This City of Long Beach owns and operates a 7.5 Million Gallon per Day (MGD) secondary wastewater treatment plant (WWTP), located on the northern end of National Boulevard at West Pine Street currently treating approximately 4.2 MGD on a 30 day average. The WWTP was originally constructed in 1951 as a primary treatment facility to remove settleable solids and provide disinfection of the wastewater, before discharging chlorinated effluent into Reynolds Channel. Secondary treatment via trickling filters was introduced in the mid-1960's. In the late 1980's, a major rehabilitation project provided for expansion of the Plant's permitted flow from 6.36 MGD TO 7.5 MGD, improved screenings and grit facilities, upgrading of the trickling filter and recirculation systems and added an automatic sand filter system to provide for enhanced filtration of fifty percent (50%) of the Plant's effluent. These upgrades did not include the capabilities to either reduce ammonia or reduce the total residual chlorine. The WWTP receives and treats wastewater from its residents (population of 33,275 per 2010 Census) and wastewater from the adjacent hamlet of Lido Beach an unincorporated area of Nassau County (population of 2,897 per 2010 Census).

The WWTP's northern boundary is Reynolds Channel, and the WWTP discharges into this receiving waterbody, classified as a SB receiving water suitable for primary and secondary contact recreation and fishing. Reynolds Channel is located within the western portion of Hempstead Bay, also known as the Western Bays. Reynolds Channel is a connector channel between Jones Inlet to the east and East Rockaway Inlet to the west. Hempstead Bay, which is on the Impaired Waters (Clean Water Act Section 303(d)) list, includes the Western Bay area. The Western Bays are a critical intertidal waterbody that serve as a nursery for finfish and shellfish, and provide for the natural reduction of pollutants via the marshlands. These marshlands have deteriorated over the past decade due to increased nutrient levels contained with the discharges of area wastewater treatment plants. Reynolds Channel, in addition to receiving the City's WWTP effluent discharge, receives the treated discharge from the County of Nassau's Bay Park STP located in East Rockaway and the discharge from the Greater Atlantic

Beach Water Reclamation District (GABWRD). The City of Long Beach's discharge is estimated to comprise approximately 5% of the nitrogen loading from point discharges

The Bay Park STP discharge outfall is located approximately 3300 linear feet to the west of the City's discharge outfall and represents the largest source of point discharge of nitrogen into the estuary. The flow from Bay Park STP averages in excess of 50 MGD, with STP having a permitted capacity of 71 MGD. In early 2008, the New York State Department of Environmental Conservation (DEC) enacted Water Quality Based standards for ammonia and dissolved oxygen for treatment facilities discharging into marine waters, including Reynolds Channel. The DEC proceeded to modify SPDES permits for discharges into the Western Bays (Class SA/SB waterbody) including the discharge permits of the Greater Atlantic Beach Water Reclamation District, Village of Lawrence, Jones Beach State Park STP, the County of Nassau and the City of Long Beach for both ammonia and dissolved oxygen. Subsequently, a new effluent limitation for Total Residual Chlorine (TRC) was added as an effluent limitation to all dischargers. Since 2008, both the Village of Lawrence and Jones Beach State Park STP discharges have been redirected out of the Western Bays. The City's WWTP as configured in 2008 was not capable of meeting the new discharge limitations for ammonia and TRC.

The City developed an Engineering Report in January of 2011 that provided a detailed analysis of the existing WWTP and the options available for achieving compliance for both ammonia reduction and total residual chlorine. The City submitted the Engineering Report to the DEC and it was subsequently approved, along with a Compliance Schedule, in September of 2011. However, on October 29, 2012, before its recommended plan of action could be implemented, Superstorm Sandy came ashore in southwestern Nassau County (including Long Beach) and wreaked significant damage to the City's WWTP, as well as the County's Bay Park STP. The City's WWTP suffered damage to influent control valves, influent raw sewage pumps, electrical systems, sand filters, clarifier drives and other electrical and mechanical appurtenances. The City focused on the restoration of these critical systems and proceeded with expending approximately **$5.0 Million** on WWTP and pump station repairs. The ammonia

reduction options identified in the January 2011 engineering report were put on hold while these repair efforts were underway. A TRC project (dechlorination) was completed at end of 2016 ahead of schedule with the City gaining compliance with the new effluent limitation for TRC of 0.5 mg/l at an additional expenditure of **$1 Million**.

The County of Nassau, on behalf of the City, prepared a Robert T. Stafford Disaster Relief and Emergency Assistance Act Section 406 Hazard Mitigation Proposal in September of 2014. The purpose was to establish the cost of mitigation involving future anticipated storms as a step in securing grant funding that would allow the County to accept the flow from the City via a new pump station and force main. The County had similarly submitted a 406 Hazard Mitigation Grant application for repairs and mitigation measures for its Bay Park STP. The County's consultants (Hazen & Sawyer/ARCADIS JV) estimated the costs for hardening the STP from future storm events (with no upgrades to current treatment processes) at **$43.3 Million**. Additionally, the County's consultants estimated that project costs for upgrading the City's WWTP to achieve a total nitrogen effluent concentration of 8 mg/l would be on the order of **$138 Million** in 2014 dollars. This would put the total cost of upgrading the City's WWTP for nitrogen reduction and hardening the facility from future storm events at **$181.3 Million** (2014 dollars).These estimated costs are well in excess of those identified in the earlier approved 2011 engineering report of **$24 Million** for ammonia reduction (no nitrogen reduction) and UV disinfection (2011 dollars with mid-point of construction escalation). The 2011 report did not address hardening as Superstorm Sandy had not yet occurred. The DEC had approved the 2011 engineering report and the Compliance Schedule contained therein. The Superstorm Sandy event impacted the ability of the City to adhere to the schedule as the City was focused on the necessary emergency repairs to restore vital equipment and systems to maintain reliable and compliant operations. The City was able to allocate funds **($1 Million)** for achieving compliance with the TRC limitation and constructed a dechlorination process.

The assessment of Superstorm Sandy's after-effects has been instrumental in prompting meaningful discussions aimed at consolidating the City of Long Beach WWTP into the County of Nassau's Sewer and Stormwater Authority. The County has successfully consolidated other municipally-owned wastewater treatment infrastructure including most recently, the Villages of Lawrence and Cedarhurst. Both of these villages owned aged sewage collection systems and wastewater treatment plants. These two (2) facilities were originally constructed in the 1950's and were upgraded to secondary treatment in the 1960's by installation of trickling filters, very similar to the City of Long Beach. Through consolidation, the sewage from the two villages is transferred via an upgraded Nassau County Inwood Pump Station and a three (3) mile force main from the Inwood Pump Station to the Bay Park Sewage Treatment Plant for treatment. This consolidation allowed for the two (2) antiquated facilities to be taken off line, decommissioned with the land to be available for an alternate use. This is the desired model guiding the City in its assessment of the future of its wastewater treatment plant. Conversion of the WWTP to a pump station with a force main to the mainland for treatment at the County's Bay Park STP represents a sound consolidation of services with numerous benefits. The Engineering Report looks at this consolidation alternative as well as the option of upgrading the treatment plant and a do-nothing alternative that is not a viable option. The conclusions and recommendations clearly state that conversion of the City's WWTP to a pump station with a force main to the mainland is the most cost effective and environmentally sound option.

This alternative includes the hardening of the existing pump station (or construction of a new pump station), installation of four (4) new pumping units with a hydraulic capacity of 17 MGD with one unit off line and a force main. The force main will leave the pump station and traverse eastward crossing underneath the LIRR tracks to a point east to a location suitable for the horizontal directional drilling (HDD) of 1700 linear feet of the new force main underneath Reynolds Channel to a location on the northern shoreline. From there the new force main will traverse northerly up Austin Boulevard to Cortland

Avenue for approximately 13,000 linear feet. Total force main length is estimated between 17,500 and 18,000 linear feet dependent upon final routing. The cost of this work is currently estimated at **$42 Million** and provides a long term solution to addressing the future wastewater treatment needs of the City of Long Beach residents. It is important to note that the County of Nassau is currently evaluating the technical components for redirecting its final effluent from Bay Park STP to its Cedar Creek WPCP, located in Wantagh, NY. If technically and financially viable, the Bay Park STP discharge would be removed from the Western Bays and would be combined with the Cedar Creek WPCP discharge that terminates approximately 3 miles offshore in the Atlantic Ocean. The local environment (Western Bays) will benefit greatly from the reduction of pollutant loadings, including total nitrogen, suspended solids, biochemical oxygen demand and fecal coliforms from the relocation of these discharges. The reduction of nitrogen and in particular ammonia will result in a decided improvement to the receiving waterways. Using a total combined flow of 60 MGD for the discharge of the two facilities and a conservative current effluent concentration of 20 mg/l average for TSS, BOD and Nitrogen, the reduction of pollutant loading from the removal of these two (2) discharges would be approximately 10,000 pounds per day for each of the three (3) pollutants or roughly a removal of **15 tons per day** of pollutants. Both County and City residents that use the local waterways for swimming, boating and fishing should see improvement to the waters. The marine organisms would benefit greatly and macro algal blooms would commence to decrease in both frequency and duration. City residents that live within close proximity to the WWTP will obtain relief from the odors, noise and vectors associated with the operations of a wastewater treatment plant.

In preparing this report, three (3) previously developed documents were reviewed and provided a significant amount of both technical and cost details. These documents included:

1. “Nitrification Upgrade and Sewage Treatment Plant Improvements Engineering Report”, January 2011, Dvirka & Bartilucci

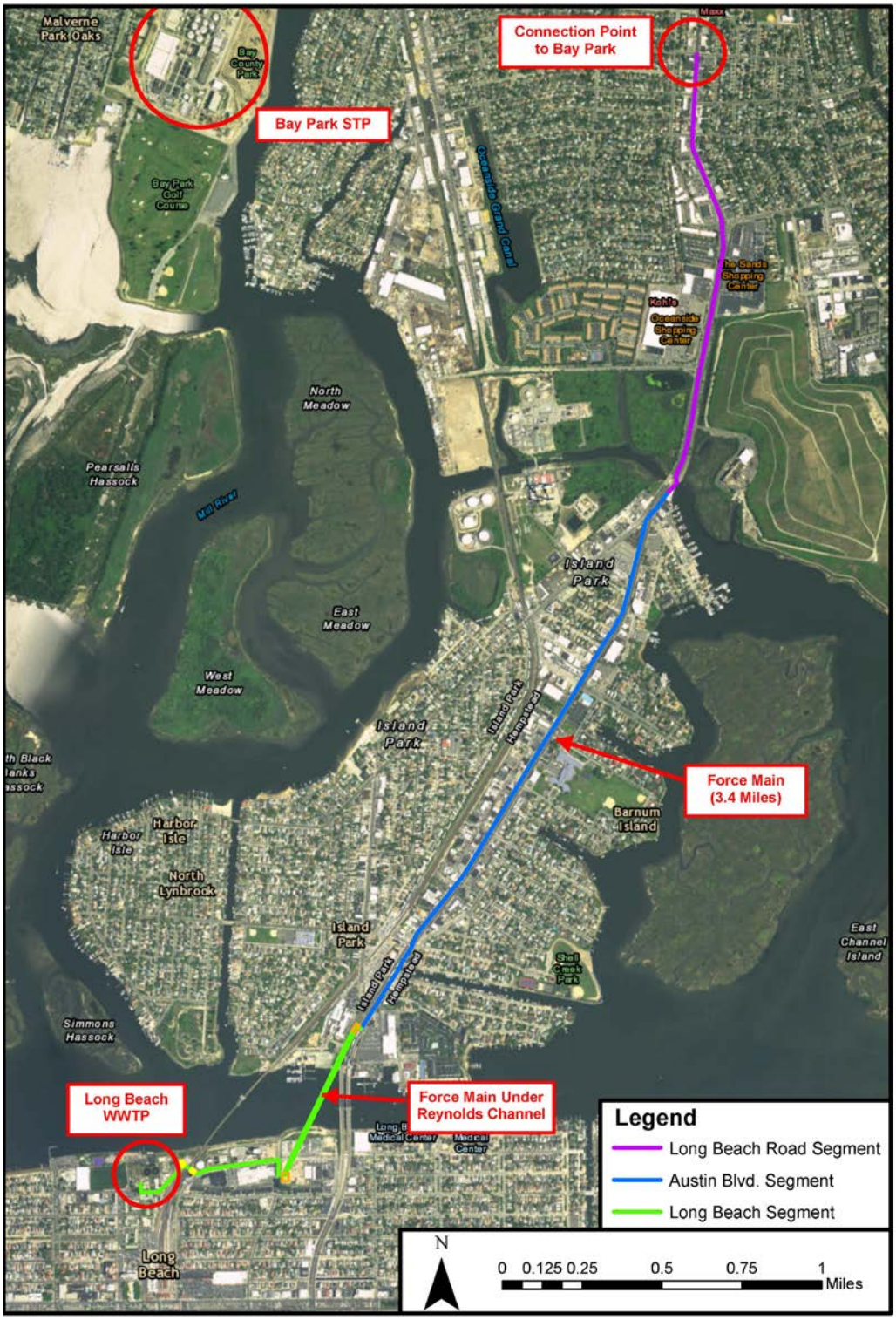
2. "Long Beach WPCP Diversion Technical Memorandum", February 2016, Hazen & Sawyer-Arcadis, Joint Venture
3. "406 Hazard Mitigation Grant Program Flood Proofing Mitigation Alternatives at Long Beach Water Pollution Control Plant", September 2014, Hazen & Sawyer-Arcadis, Joint Venture

The effort that went into these respective documents from the consulting firms were significant as evidenced by the level of details provided in the deliverables. It is not within the scope of this report to replicate in entirety the efforts expended in the development of the above documents however the information provided from these documents provided both the historical background and understanding of alternatives that are detailed in this Engineering Report.

Figure 1 on the next page provides an illustration of the recommended option.

This report was prepared in accordance with NYSEFC Guidelines for Engineering Reports. Engineers Certification Form is provided in Appendix A.

Figure 1 – City of Long Beach WWTP Proposed Flow Diversion Project



2. Introduction

The City of Long Beach owns and operates a secondary treatment Wastewater Treatment Plant (WWTP) with an existing design capacity of 7.5 million gallons per day (MGD), servicing approximately 33,725 residents (2010 Census) within the City and 2,897 residents (2010 Census) of the neighboring community of Lido Beach. The WWTP was originally constructed in 1951 as a primary treatment plant, and was upgraded to secondary treatment in the late 1960's with a number of subsequent upgrades including new trickling filters, sand filtration for effluent polishing, chlorine contact tank and Total Residual Chlorine. The WWTP has had a good performance record over the years however the facility has structures that are in excess of 50 years in age and are in need of refurbishment and or replacement. As a result of Superstorm Sandy, it will be necessary to undertake hardening measures if the facility is to remain in service at the current site for the foreseeable future. Additionally, SPDES permit modifications require that the facility at a minimum achieve reduction of ammonia and most likely within a few years, the reduction of total nitrogen. Such improvements are discussed further in the report.

2.1. Location

The City of Long Beach Wastewater Treatment Plant (WWTP) is located at the northern terminus of National Boulevard in the City of Long Beach, Nassau County, New York. A location plan of the WPCP is shown Figure 2. The facility is owned and operated by the City of Long Beach and operates under SPDES Permit No. NY-0020567 (Appendix B).

Figure 2 – Project Location Map

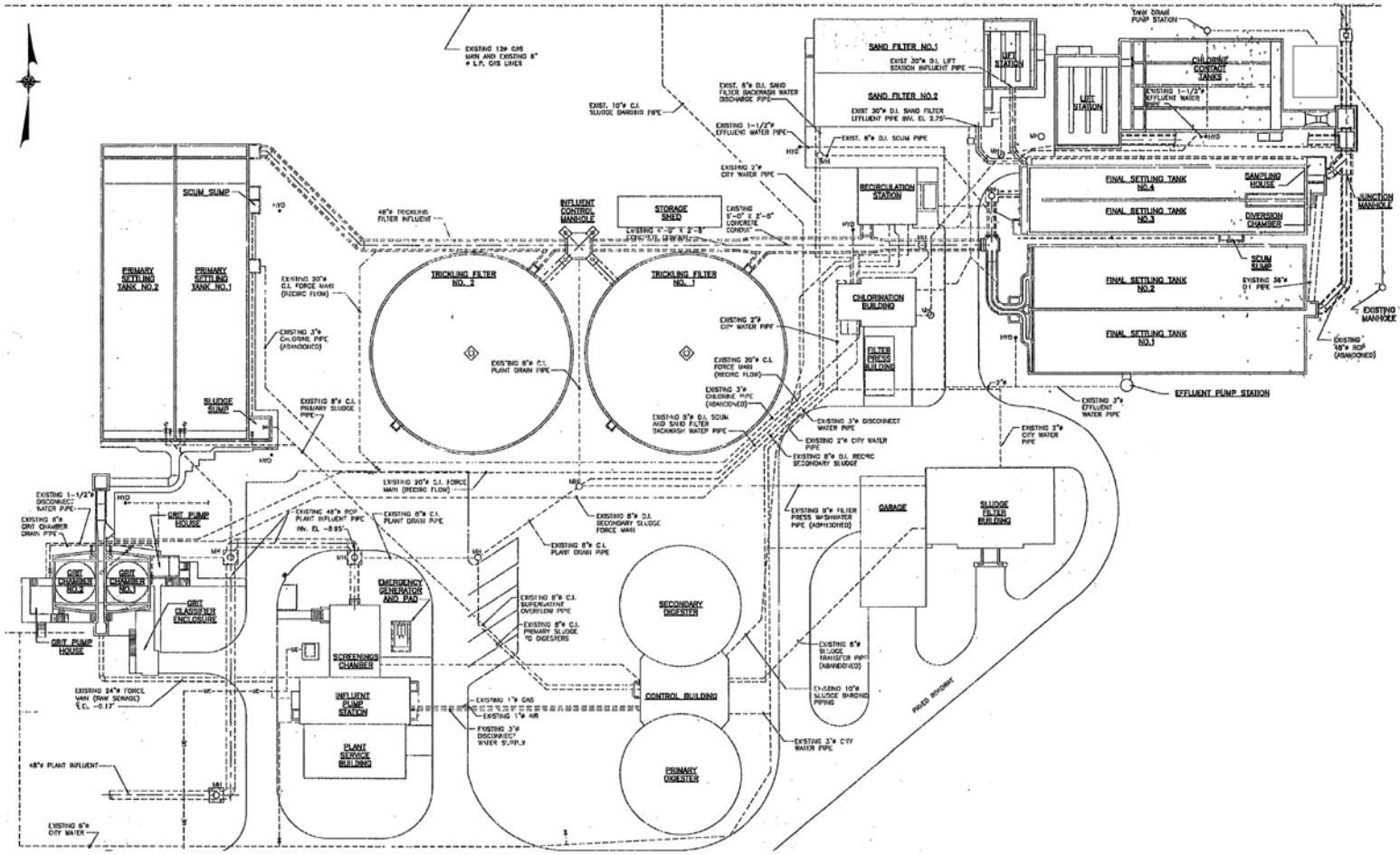
2.2. General Facility Description

The WWTP is secondary treatment facility featuring high rate trickling filters and is designed to remove settleable solids, BOD and TSS reduction, effluent disinfection and reduction of chlorine residual of the effluent prior to its discharge into Reynolds Channel. Figure 3 on the next page provides a site plan of existing facility. In the late 1980's, a major rehabilitation project provided for expansion of the Plant's permitted flow from 6.36 MGD TO 7.5 MGD, improved screenings and grit facilities, and sand filter system to provide for enhanced filtration of fifty (50%) percent of the WWTP's effluent. In the early 1990's, the disinfection system process was upgraded with the construction of contact tanks and lift station to provide for proper chlorination of secondary effluent. The City recently completed the Total Residual Chlorine (TRC) project to gain compliance with effluent chlorine residual concentration. In the past two (2) years, the City has been conducting repairs and upgrades of equipment and systems heavily damaged by Superstorm Sandy. Improvements including new influent pumping units, valve and isolation gates in headworks, new collector drives, electrical and HVAC repairs in dry well area, new sand filter building spiral lift screw pumps and new sand filtration units.

The treatment plant currently has a design capacity of 7.5 MGD, and average daily flow for period Jan 2015 through December 2016 was 4.19 MGD.

Figure 3 – Existing Site Plan

City of Long Beach
Engineering Report
EXISTING SITE PLAN



2.2.1. Sanitary Sewage Collection System

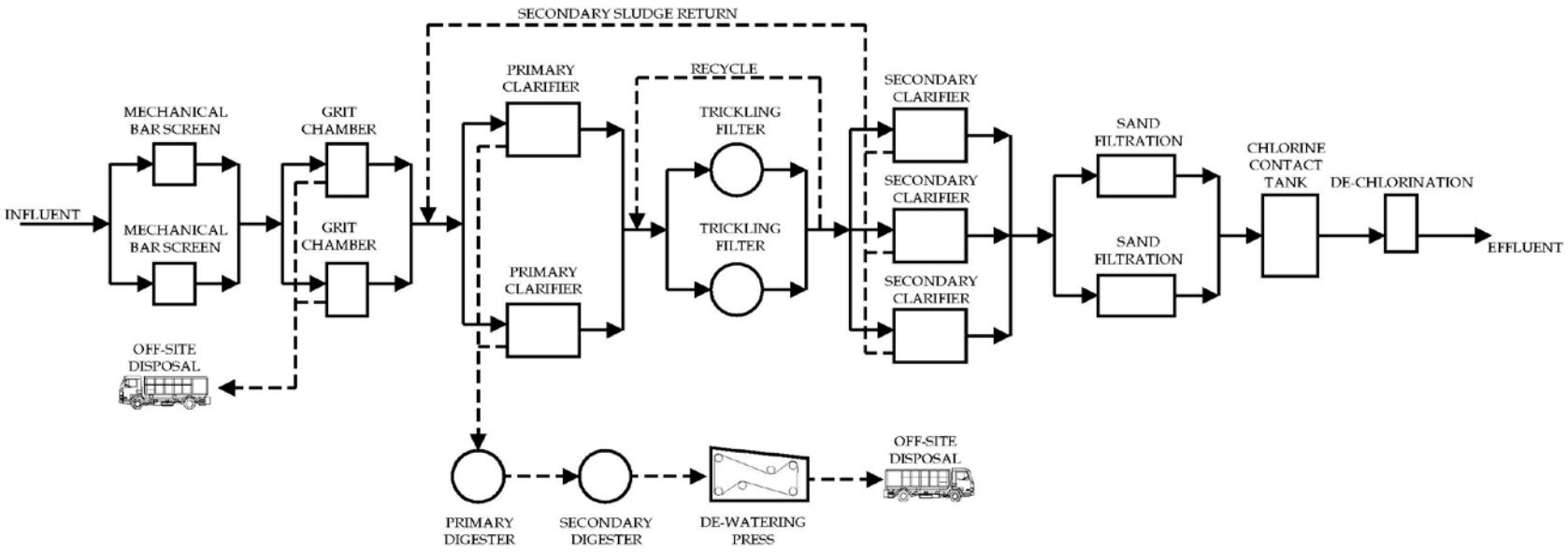
The City's WWTP treats the sewage collected by a network of piping comprised on various diameters from eight (8") inch up forty-eight (48") and made of vitrified clay pipe (VCP), reinforced concrete pipe (RCP), ductile iron pipe (DIP) and newer sections of Poly Vinyl Chloride (PVC). Total length of piping networks is in excess of fifty-one (51) miles. The City operates and maintains three (3) sewage pumping stations that transfer sewage from low lying areas and transfer it to gravity sections of the collection system that convey the sewage to the WWTP. All three (3) pumping stations; Roosevelt Avenue, Indiana Avenue and New York Avenue suffered severe damage during Superstorm Sandy and required significant rebuilding and replacement of damaged electrical and mechanical equipment and systems. The City has a separate department specifically involved in the operation and maintenance of the collection system.

2.3. Unit Processes

The WWTP's preliminary treatment includes screening of the raw sewage through mechanically cleaned bar screens (2 units), followed by raw wastewater pumping (4 units) to the grit removal system comprised of rectangular grit collectors (2 units), grit pump and cyclone degritter. Three (3) of the four (4) influent pumps were recently upgraded (January 2015) as part of the Superstorm Sandy Repair Project. The three new raw sewage pumping units are of the dry pit submersible style. The fourth unit is a standard centrifugal pump driven by shaft connected to motor on main floor. Figure 3 provides a schematic of existing flow process.

Figure 4 – Process Flow Schematic

City of Long Beach
Engineering Report
EXISTING PROCESS FLOW



The influent pumping units are as follows:

Pump No. 1 Fairbanks Morse Centrifugal Pump (Existing)

6,300 gpd (9.07 MGD) @ 34' TDH

Pump No. 2 Fairbanks Nijhuis Dry Pit Submersible (New)

5,800 gpd (8.35 MGD) @ 34' TDH

Pump No. 3 Fairbanks Nijhaus Dry Pit Submersible (New)

4,800 gpd (6.91 MGD) @ 34' TDH

Pump No. 4 Fairbanks Nijhuis Dry Pit Submersible (New)

5,800 gpd (8.35 MGD) @ 34' TDH

Photo 1 – Photograph of Raw Sewage Pumps

Pumping capacity is approximately 23 MGD with the largest pump off line. Pumping capacity prior to Superstorm Sandy was stated (2011 Engineering Report) as 21.2 MGD with largest pump off line. Taking into account losses in piping when multiple pumps are on line, the pumping capacity would drop another 1-2 MGD to approximately 21 MGD. As stated earlier, Pump No.1 is the only shaft driven pump the three (3) new units are dry pit submersible units. The dry pit submersibles represent a mitigation measure should the dry well become flooded by a storm event.

Screened influent is then pumped up, passing through the new magnetic flow meter to two (2) grit removal tanks. Each tank is 20 feet wide by 20 feet long with a circular grit collector in each unit. Grit is removed from the hopper in each collector by a grit pump. The pump discharges to a cyclone degritter and classifier that removes the heavy inert materials and returns the overflow back into the flow stream. The grit is conveyed by a screw auger into a 3 cubic yard dumpster for off-site disposal.

Photo 2 – Grit Chamber

Following the grit tank, wastewater is then directed to the two (2) primary clarifiers to settle out solids both settleable and suspended. Settled sludge is pumped to a heated and mixed primary anaerobic digester. On a prescribed schedule, operators transfer digested sludge to the secondary digester for separation of solids from supernant and additional stabilization and concentration. Digested sludge is removed and dewatered by a contractor before being hauled off-site for disposal.

Biological treatment for Biochemical Oxygen Demand (BOD) removal occurs in the two (2) trickling filters that are fitted with high density plastic cross flow media to maximize surface area for enhanced BOD removal efficiency. Trickling filter effluent is recirculated on a continuous basis back to the head of the trickling filter where it mixes with primary clarifier effluent to pass through the filters again for treatment

Trickling filter effluent flow continues on to three (3) secondary clarifiers for separation of humus sludge from secondary effluent. Humus sludge is returned to the head of the primary clarifiers where it co-settles with the primary sludge. A portion (minimum of 50%) of the effluent is directed to the sand filters (2 units) for additional removal of suspended solids. Filtered effluent combines with unfiltered secondary effluent and is pumped via spiral lift pumps (4 units) to the four (4) pass chlorine contact tank for disinfection of effluent to reduce pathogen levels.

This effluent is then dosed with 15% strength sodium hypochlorite for disinfection. As per the modified SPDES permit condition for total residual chlorine (TRC) of 0.5 mg/l, the City constructed a new chemical (sodium bisulfite) dechlorination system that reduces chlorine residual before its discharge into Reynolds Channel.

This dechlorination system was installed in late 2016. This system consists of piping, diffusers and baffle walls installed in the final 10 feet of each chlorine contact cell. A small chemical storage (sodium bisulfite) and distribution system

building allows for pumps to inject the sodium bisulfite into the mixing zone constructed in each tank. Final effluent after residual reduction flows through the Parshall Flume where a flow meter records the flow prior to discharge into the 48" outfall pipe. Effluent continues through the outfall and into Reynolds Channel.

Biosolids generated within the unit processes including the settleable solids in the raw wastewater collected in the primary clarifiers as well as the humus sludge sloughed off the trickling filters and returned to the primary clarifiers where it co-settles with the primary solids is sent to the anaerobic digesters for treatment. The WWTP has a primary digester that is heated and mixed where volatile solids are digested by anaerobic bacteria resulting in the generation of both methane gas and a stabilized sludge. The primary digestion process occurs over a 21 day cycle. A second unheated digester receives transferred biosolids form the primary digester. In this unheated unit, digested solids are thickened by the drawing off of supernatant to the head of the plant for retreatment. Solids are in the secondary digestion for an additional 30 days. A contractor periodically dewaters the biosolids from the secondary digester and transfer the dewatered cake off site for permitted disposal.

Photo 3 – Digesters

3. Existing conditions

3.1. Wastewater Flow

The sources of the City's wastewater are a combination of both domestic and commercial. The City is often described as a summer destination, with a significant daily population change in the summer season. There are also numerous events throughout the year that draws an attendance outside of the City's residents. These events include races, art festivals, music concerts, fundraising, polar bear plunge, surfing competitions, restaurant weeks, and Irish Day. In order to characterize the plant's flow rate to provide for an upgrade or possible conversion of the facility to a pump station, the plant's flow data for the last two (2) years (2015-2016) was tabulated and analyzed. Table 1 below shows various flow values for the plant as well as the design peaking factor.

Table 1 - Wastewater Flow Data-Effluent

Flow Type	Flow (MGD)	Peaking Factor* (using 100 gpcd)	Peak Hourly Flow (MGD)
Lowest Recorded Value of Average Daily Flow – 2015-2016 (June 17, 2015)	3.18	2.45	7.79
Recorded Average Daily Flow - 2015-2016 (Actual)	4.20	2.34	9.83
Permitted Design Flow	7.50	2.11	15.83
**Highest Recorded Value of Average Daily Flow & Peak– 2015-2016 (Oct. 3, 2015)	8.50	-	14.00**

*Peaking Factor based on 10 States' Standards for Wastewater Facilities, 2014 Edition

It is noted that the average daily flow has reduced over the past few years. In the previous five (5) year period, the average daily flow was 4.63 MGD. A plausible reason for the drop in sewage flow may be a result of the City's capital improvement plan. The City has been proactive in replacing defective sections of sewage collection piping when it reconstructs roadways. Additionally as part of the post-Sandy improvements, a new flowmeter was installed in September 2014 to replace the storm damaged meter. The new flowmeter is a magnetic flowmeter and is more accurate than the original 50 year old Venturi flowmeter.

This meter required constant maintenance and recalibration due to its poor condition. As with many gravity sewer collection systems, there is a presence of infiltration and inflow (I/I) in the WWTP's flow measurements and treatment volume. Sizing of the new flow diversion pump station and force main will need take into account these existing flows, existing I/I as well as addition flow allocation for future buildout considerations.

3.1.1. Future Flow Considerations

- Three (3) large vacant oceanfront parcels, currently estimated in draft planning documents to provide up to 1200 units, conservatively estimated at 225 gpd per unit for total of 270,000 gpd
- Point Lookout, current population of 2,000 with seasonal population that could be as much as 50% greater (3000). At 75 gpd per capita (new sewer system), this would be a potential flow of 170,000 gpd average with a seasonal (June – September) increase of 50% of flow for a seasonal average of 225,000 gallons per day.
- Atlantic Beach, currently served by the Greater Atlantic Beach Water Reclamation District's 1.5 MGD wastewater treatment plant. There are no current plans to consolidate this facility and its flow into the City of Long Beach. Therefore no flow increase is considered from this source.
- Climate change is expected to continue to raise sea level and due to the City's proximity to the ocean and bay, a resultant rise in local groundwater levels should be expected. This occurrence would result in a greater percentage of the City's sewer system being submerged in groundwater. An increase in both infiltration and inflow (I&I) would be expected. For purposes of this report, mitigation measures such as lining and piping replacement would be expected to neutralize the potential increase in flow and therefore no flow increase is considered from this source.

- Total potential future flow to be added to current flow conditions is therefore 0.44 MGD on daily average and 0.5 MGD for daily average for peak summer months (July-September).

Table 2 below notes existing flow conditions and potential additional flow. In the Technical Memorandum (2014) (Appendix C), the diameter of the force main was preliminarily sized at 18". Further analysis of the force main velocities through the force main notes both a reduced velocity and reduced operating pressure if a 24" diameter pipe is used. At this time, a 24" diameter force main is to be considered. Additional analysis of the force main sizing could be considered as part of a Value Engineering exercise in the detailed design phase.

Table 2 - Force Main Sizing

Flow Type	Flow (MGD)	Peak Hourly Flow (MGD)	Velocity (fps) 18" Force Main	Velocity (fps) 24" Force Main
Lowest Recorded Value of Average Daily Flow –2015-2016 (June 17, 2015)	3.18	7.79	6.83	3.84
Recorded Average Daily Flow - 2015-2016 (Actual)	4.20	9.83	8.61	4.84
Permitted Design Flow	7.50	15.83	13.86	7.80
Highest Recorded Value of Average Daily Flow & Peak Flow– 2015-2016 (Oct. 3, 2015)	8.50	14.00*	12.26	6.90

3.2. Process Systems

As noted earlier and depicted in Figure 4, the WWTP has the following unit processes:

- Influent Screening
- Influent Pumping
- Grit removal
- Primary sedimentation
- Trickling Filters with recirculation
- Secondary sedimentation
- Effluent Polishing

- Disinfection
- Dechlorination
- Sludge digestion (2 stage)
- Sludge dewatering

Following sections provide design criteria and process times for the processing units. Average Daily Peak flow is 8 MGD, Peak Instantaneous flow rate is the 13 MGD rate for two (2) pumps on line per the facility operator. Calculations are provided in Appendix D

3.2.1. Influent Screening

Two (2) mechanically cleaned bar screens each rated at 11 MGD for a total of 22 MGD capacity. Rags and other materials captured and screened off are placed in a container for off-site disposal.

3.2.2. Influent Pumping

Total of four (4) pumping units, (3) installed 2014 post Superstorm Sandy.

Pump No.1 Fairbanks Morse Centrifugal Pump (Existing-2012)

6,300 gpd (9.07 MGD) @ 34' TDH
14" diameter
75 HP

Pump No.2 Fairbanks Nijhuis Dry Pit Submersible (New-2014)

5,800 gpd (8.35 MGD) @ 34' TDH
14' diameter
71.1 HP

Pump No.3 Fairbanks Nijhaus Dry Pit Submersible (New-2014)

4,800 gpd (6.91 MGD) @ 34' TDH
12" diameter
50 HP

Pump No.4 Fairbanks Nijhuis Dry Pit Submersible (New-2014)

5,800 gpd (8.35 MGD) @ 34' TDH
14' diameter
71.1 HP

3.2.3. Grit Removal

There are two (2) grit collection tanks, each are 20 foot x 20 foot with center drive collector arm and a side water depth of 2.5 feet. For total of 1,000 cf per unit or 7,480 gallons per unit for total of 14,960 gallons.

Detention Time (DT) at average daily peak hourly flow rate of 8 MGD would be 0.045 hours or 2.7 minutes. At instantaneous peak flow rate of 13 MGD, DT decreases to 0.028 hours or 1.7 minutes. These detention times are less than desired. Per Ten State Standards (2014 edition) detention time should be 3-5 minutes during peak flow conditions. Short detention times leads to carryover of inerts into the primary settling tanks. These inerts can be transferred over to the anaerobic digester when the primary sludge is pumped over. In the digester, the inerts would occupy valuable space and would negatively impact mixing, heating and detention time of the solids.

Should one unit go off line for scheduled or unscheduled maintenance event, the detention time would be halved and would result in the reduction of grit removal.

3.2.4. Primary Setting

There are two (2) rectangular units each 136 feet long by 34 feet wide with operating side water depth of 12 feet. Total volume is 39,168 cf or 292,977 gallons per unit for total of 585,953 gallons. Detention Time at average daily peak hourly flow rate of 8 MGD would be 105 minutes (1.75 hrs), at instantaneous peak flow rate of 13 MGD, DT decreases to 64.9 minutes (1.08 hrs). These detention times are on the lower range of acceptable DT (2-3 hrs) and could lead to higher levels of both BOD and TSS being imparted on the downstream trickling filters.

The surface area of settling tanks is 4,624 sf per tank for total of 9,248 sf. At average daily flow of 4.2 MGD the surface settling rate would be 454 gpd/sf

well within the standard (Ten States) of 1,000 gpd/sf. At average peak hourly flow rate of 8 MGD the surface settling rate increases to 865 gpd/sf which is within acceptable range (Ten States) of 1,500-2,000 gpd/sf for tanks not receiving activated sludge.

Should one of the primary clarifiers go off line for either scheduled or unscheduled maintenance event, the detention times would be halved and the surface settling rates would be doubled and a significant reduction in both TSS and BOD removal would be expected.

At the time of this report preparation, one of the primary clarifiers was off line pending repairs. The City is preparing to undertake repairs to the primary clarifier in the later part of 2017.

3.2.5. Trickling Filters

There are two (2) high rate trickling filters each having a diameter of 96 feet with a media depth of 5 feet. Media specifications of 30 sq feet per cubic foot. Total media of 11,520 cf per unit or 23,040 total cubic feet. Recirculation flow is maintained by constant speed centrifugal pumps and is typically held at 2 MGD rate by plant operators. As noted above, a portion of the trickling filter effluent is returned to the front of the units where it is combined with the primary clarifier effluent. Recirculation maintains distribution of flow, keeps media wet during low flow conditions, enhances natural ventilation through the media and improves overall BOD reduction.

The synthetic media installed years ago as a replacement to the original stone media significantly increased the surface area. The media has a surface of 30 square feet per cubic foot (sf/cf) and is suitable for carbonaceous BOD reduction. For nitrification or ammonia reduction as required by the modified SPDES permit would require that a media having a 45 sf/cf surface area installed to increase the surface area for biomass attachment.

3.2.6. Secondary Settling

There are three (3) clarifiers each 133 feet in length, 30 wide and a SWD of 9.5 feet. Surface area would be 3,990 sf per unit for total of 11,970 sf. Surface settling rate (SSR) at average daily peak hourly flow rate of 8 MGD would be 668 gpd/sf. This is well below the Ten State Standards of 1,200 gpd/ft for units following attached biological growth units. At peak instantaneous flow of 13 MGD, the SSR increases to 1,086 gpd/sf still in an acceptable range. As current daily average flow (4.2 MGD) is well below the design capacity of 7.5 MGD, the surface settling rate is well within the standards at an estimated 821 gpd/sf.

Humus sludge collected by the flights to a hopper located at the influent end of the clarifiers is periodically removed via telescoping valves. Operators lower the valve introducing the humus sludge into the sludge well. Transfer pumps located in the Recirculation Building pump the humus sludge to the influent end of the primary clarifiers for removal (co-settling) with the primary sludge.

3.2.7. Effluent Polishing

The WWTP has two (2) automatic backwashing sand filters. Each unit is 56 feet long and 16 feet wide for total square footage of 1792 square feet. With a design loading rate of 1.5 gpm/sf the capacity of the units would be approximately 3.87 MGD. At current average daily flow rate of 4.2 MGD, this would be equal to 92% of filtering capacity. Operators adjust the flow to the filters at a minimum of 50% of daily flow. The original sand filter mechanicals were recently replaced with new units as a result of the damage from Superstorm Sandy. Additionally, the three (3) spiral lift pumps that feed the Sand Filter Building were replaced due to damage incurred during Superstorm Sandy.

Filters are subject to automatic backwashing of the 11 inch thick media using filtered effluent. Backwash water containing captured solids is returned to the head of the plant for retreatment. Filtered effluent exits the Filter Building and combines with the unfiltered secondary effluent from the secondary clarifiers and is pumped to the Chlorine Contact Tank for disinfection.

Photo 4 – Sand Filter Pumps

3.2.8. Chlorine Contact Tank

A total of four (4) spiral lift pumps are in place to transfer secondary effluent (filtered and unfiltered) up to the Chlorine Contact Tank (CCT). One (1) of the pumps is out of service for maintenance. The CCT is comprised of four separate cells each measuring 60 feet in length, 10 feet wide and a SWD of 12 feet. For the TRC project, 10 feet of length was used for introduction of sodium bisulfite for reduction of the total residual chlorine.

Operators use 15% strength sodium hypochorite that is received and stored in two (2) 3,000 gallon tanks (replaced post Sandy) and with three (3) metering pumps controlled by signal from effluent flow meter can deliver up to 43 gallons per hour of disinfectant. Residual analyzers are located in each cell of the CCT as well as in the final effluent channel.

The volume of CCT for disinfection is therefore 6,000 cf or 44,880 gallons per cell for a total of 179,520 gallons. At current average peak hourly rate of 8 MGD, the detention time would be 32.3 minutes and in accordance with Ten State Standards. At peak instantaneous flow of 13 MGD, the DT decreases to 19.9 minutes, still within the minimum 15 minute requirement.

The TRC reaction occurs within last 10 feet of each chlorine contact cell and that volume is 1,200 cf or 8,976 gallons per cell for a total of 35,904 gallons. Detention time at average daily peak hourly rate of 8 MGD would be approximately 6.5 minutes. At peak instantaneous flow rate the DT drops to 3.9 minutes. The bisulfite reaction is very rapid. Dechlorinated effluent is used as the carrier liquid for the addition of stock bisulfite. Bisulfite metering pump dosage is adjusted automatically by feedback from the effluent chlorine analyzer.

Photo 5 - TRC

Dechlorinated effluent is discharged through the 48” diameter outfall pipe into Reynolds Channel.

It should be noted that the NYSDEC is contemplating the change of the disinfection indicator organism from coliform (Total and Fecal) to

Enterococci. To date, data collected from other facilities indicates that in order to meet an *Enterocci* limitation of 30 colony forming units per liter that chlorine detention time may have to increase to 30 minutes or the dosage to disinfect may have to increase by a factor of 2 or more. Dechlorination dosages of bisulfite would have to be increased in a similar dosage as the hypochlorite dosage in order to maintain compliance with the 0.5 mg/l TRC limitation. Should this new standard be implemented, increasing the dosage of chlorine would be the only usable option as there is no room to expand the chlorine contact tank.

3.2.9. Sludge Digestion

The WWTP has two (2) sludge processing tanks. Both can be heated and mixed via interconnected piping and valves. Normal operations is for one unit to be heated and mixed and the other unit is used for separation of decant and concentration of the solids. Volatile solids are reduced by the anaerobic bacteria resulting in the production of methane gas, carbon dioxide and water.

Each tank is 55 feet in diameter and features a vertical SWD of 26 feet with a lower cone section of 4.5 feet in depth. Volume is approximately 66,500 cubic feet or approximately 497,500 gallons per tank.

Sludge is regularly removed from the secondary digester by an outside contractor and dewatered by belt press on site. Dewatered sludge cake is then transported off site for permitted disposal. The City intends on cleaning both of the digesters in late 2017.

3.3. Treatment Plant Performance

Twice a week (Tuesday and Thursday), the WWTP analyzes influent and effluent 24-composite samples for BOD_5 and Total Suspended Solids (TSS). Annual averages from 2015-2016 plant data are summarized in Table 3 below, along with

2004-2007 data from a 2007 Study completed by Malcolm Pirnie/D&B. A few conclusions could be drawn when comparing these parameters and average daily flow.

Table 3 - WWTP Performance Summary

Parameter	Year					
	2004*	2005*	2006*	2007*	2015	2016
Average Daily Flow (MGD)	5.35	5.76	5.15	4.48	4.12	4.27
Avg. BOD5 – Inf. (mg/L)	114	110	116	126	128	122
Avg. BOD5 – Eff. (mg/L)	21	15	16	23	18	11
Avg. % BOD5 Removal	81.5%	85.4%	85.7%	82.2%	86%	90%
Avg. TSS – Inf. (mg/L)	104	137	120	106	161	155
Avg. TSS– Eff. (mg/L)	11	11	11	10	23	23
Avg. % TSS Removal	89.5%	91.6%	90.6%	90.6%	85%	83%

***From Malcolm Pirnie/D&B Consolidation Report, 2007**

The average daily flow decreased approximately 20% while influent concentrations increased from 2004 to 2016. This could be attributed to a combination of the City's efforts to rectify some of the Infiltration and Inflow (I/I) contributions to the City's gravity sewer system as well as the installation of water saving devices in new construction and buildings rehabilitated from the damage of Superstorm Sandy. New flow meter is providing more accurate data on incoming flows.

Valves for influent and effluent BOD (2015-2016) is provided in Figure 5 and valves for influent and effluent TSS (2015-2016) is provided in Figure 6.

Average daily flow valves for 2015-2016 is provided in Figure 7

Figure 5 – BOD_5 Concentrations, 2015-2016 – City of Long Beach, NY

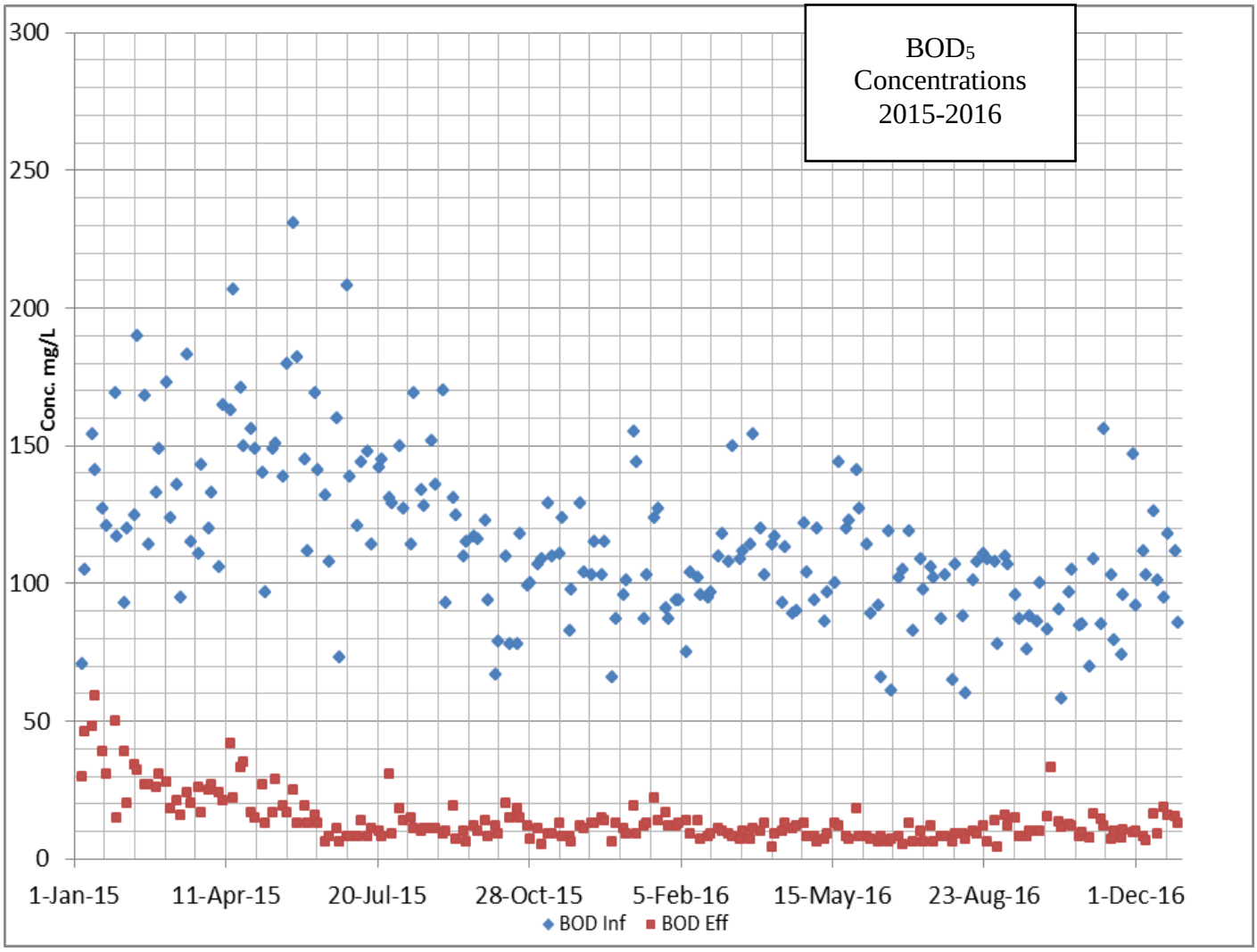


Figure 6 – TSS Concentrations, 2015-2016 – City of Long Beach, NY

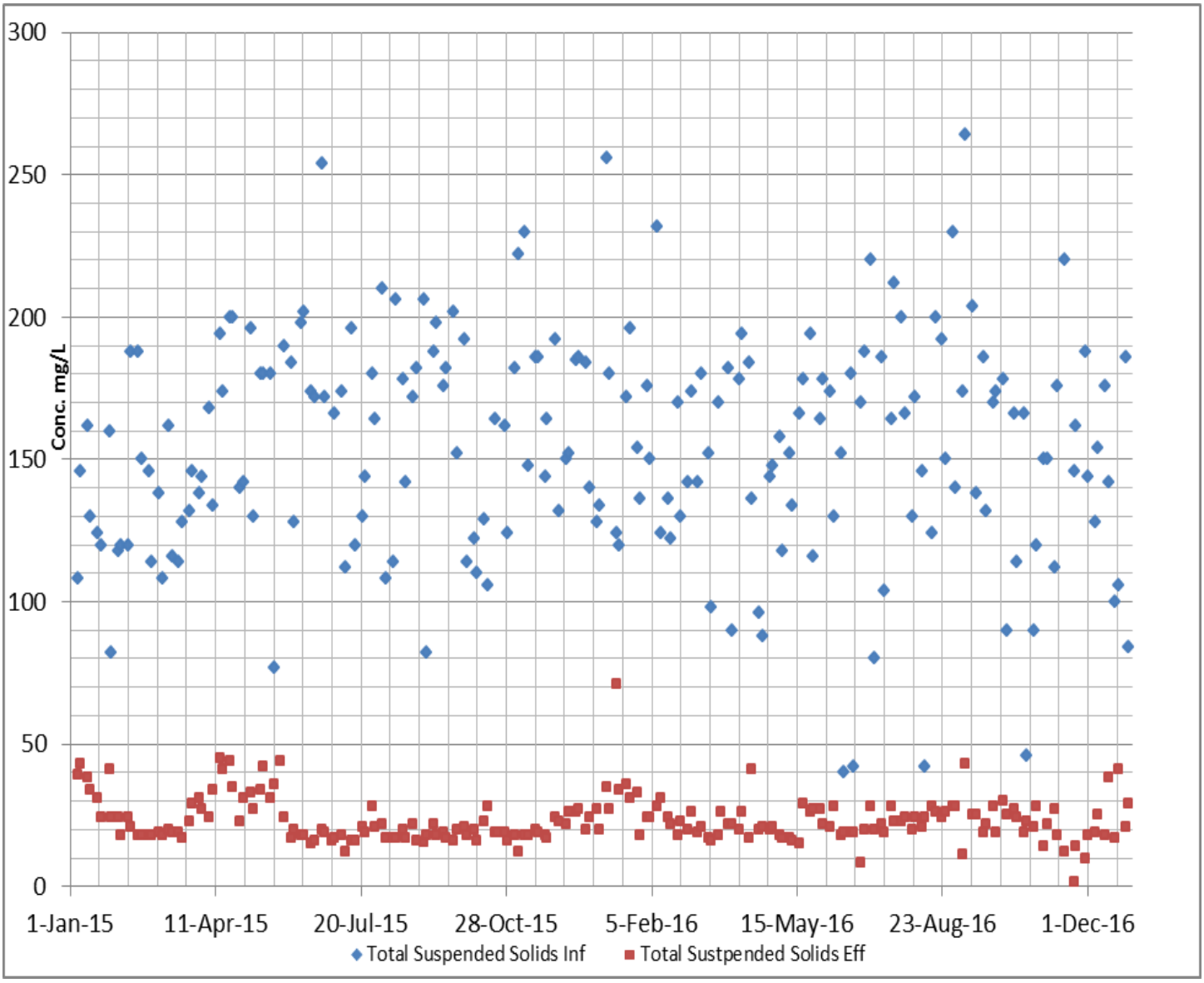
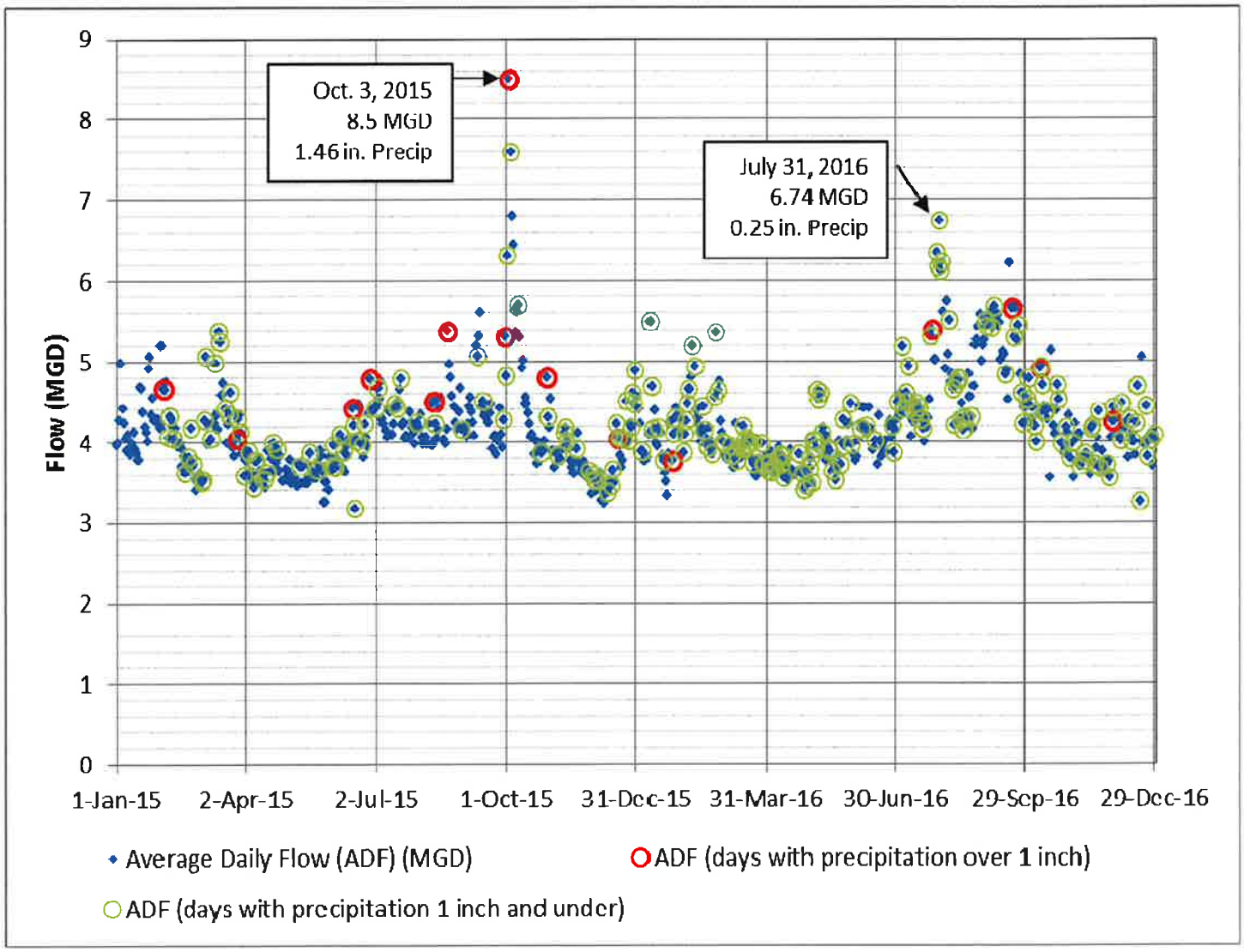


Figure 7 –Average Daily Flow and Precipitation Data, 2015-2016 – City of Long Beach, NY



For the years 2015-2016, an analysis of overall treatment plant performance would appear to be satisfactory. However, there have been a number of exceedances over the past several years and with respect to the ammonia limitation, there has been limited compliance with the interim limitation at 23 mg/l. For these reasons, the NYSDEC and the City of Long Beach have entered into an Order on Consent addressing necessary measures to achieve compliance An executed copy of the Order on Consent is provided in Appendix E.

3.4. Order on Consent

The New York State Department of Environmental Conservation (DEC) is responsible for enforcement of the State's Environmental Conservation Law (ECL) Title 6 of the Official Compilation of the Codes, Rules and Regulations of the State of New York. The DEC is responsible for the monitoring and enforcement of holders of SPDES permits including wastewater treatment facilities such as the City of Long Beach's WWTP that discharge into the waters of the State. The City's WWTP discharges its treated effluent into Reynolds Channel a Class SB water whose best usage is contact recreation and fishing. The DEC and the City have executed an Order on Consent (DEC Case No. CO 1-20151020-142) for resolution of violations that include Effluent Violations, Water Quality Standards Violations and failure to comply with previously approved Schedules of Compliance.

The Order on Consent clearly establishes the DEC's responsibilities and duties to establish and enforce the rules and regulations as delineated in the permits issued to dischargers such as the City of Long Beach. The Order on Consent provides detail of the violations associated with the discharge from the City's WWTP. These include:

Effluent Violations

- Exceedances for Total Suspended Solids (TSS) including Monthly percent removal, 7 day AVG for both loading and concentration, 30 day AVG (concentration)
- Ammonia – total, Monthly AVG and concentration
- BOD – 7 day AVG, concentration, Monthly AVG concentration and Monthly percent removal

Water Quality Standards Violations

- Discharge of Ammonia (ECL-17-05051) to waters of the State
- Discharge of Nitrogen (ECL-17-05051) to waters of the State

SPDES Permit Violations

- Submission of plans and specifications for facility improvements not in accordance with approved Engineering Report, the plans and specifications did not include nitrogen reduction.

Additionally, the Order on Consent identifies a number of structural and equipment deficiencies at the City's WWTP that will be required to be addressed by the completion date established and noted in a Corrective Action Plan (CAP). The resolution of these deficiencies by completion of the CAP does not address either the current or future discharge of excess nitrogen (ammonia) into Reynolds Channel. The Corrective Action Plan (CAP) identifying specific repairs and improvements will be part of the negotiated Order on Consent. Preliminarily, it is estimated that the repair items will cost approximately $1.5 Million-$2 Million to implement.

The Order on Consent discusses the impacts of Super Storm Sandy on the City's WWTP and resultant discharges of raw wastewater, the connection between the City's WWTP's discharge and increased growth of macro-algae (*Ulva*) and its contribution to the deterioration of the Western Bays and the overall negative impact of excess nitrogen on the marshlands leading to destabilization and the degradation of these vital wetlands. The Order on Consent establishes the amount of civil penalties that it is seeking from the City for the violations noted above.

The Order on Consent clearly states that there are two (2) alternatives available to the City for addressing all of the deficiencies of its WWT; the first is to implement improvements that can achieve nitrogen reduction to the limits of available technology, or the second is to divert wastewater to the mainland for treatment at the Bay Park STP in East Rockaway. The second option required the execution of an Inter-municipal Agreement (IMA) between the County and the City. These options for gaining SPDES permit compliance are discussed in the following section.

4. Alternatives

4.1. Alternatives Overview

There are three (3) options that the City will consider for implementation to achieve compliance with current ammonia limitations. These include:

- No. 1 - No Action option
- No. 2 - Upgrade the Plant to gain compliance with current ammonia limitation of 9.3 mg/l
- No. 3 - Convert Plant into a pump station with associated force main to mainland for transfer of sewage to the Bay Park Sewage Treatment Plant

Under alternatives No. 2 and No. 3 the City would be required to harden the site to prevent damage from a future storm of similar or greater magnitude as Superstorm Sandy. Hardening could be in the form of protecting individual buildings and processes or on a site-wide basis.

4.1.1. Option No. 1 – No Action

This alternative is listed for SEQRA purposes to assess the impacts on the environment of taking no action. In this alternative, the City would harden the site to protect the WWTP while not upgrading the process to achieve ammonia reduction. This is not a viable alternative, as the Plant would continue to violate its SPDES permit, leaving the City vulnerable to the NYSDEC (or others, such as United State Environmental Protection Agency [EPA] or citizens utilizing the Citizen Suit provisions of the Clean Water Act) initiating enforcement actions and assessing associated penalties, leading to continued degradation of local receiving waters due to excessive nitrogen loading. This alternative would fail to advance the current situation in any measurable or beneficial manner and, therefore, is removed from consideration. There is no further discussion or detailing of this alternative in this report.

4.1.2. Option No. 2 – Upgrade for Ammonia Reduction

The Plant's SPDES permit (NY0020567) was modified in 2008 by the NYSDEC in accordance with its Environmental Benefits Permit Strategy. The modification by the NYSDEC came after the adoption of amendments to 6 NYCRR Parts 700-704. These amendments pertained to new water quality standards for ammonia promulgated by the EPA for discharges to marine waters, later adopted by the State of New York. The new effluent limitations set for the City's Plant in September 2008 included an interim ammonia concentration of 23 mg/l with the final effluent limitation of 9.5 mg/l to be achieved by September 2016. Additionally, new effluent limitations of 0.5 mg/l were established for total residual chlorine (TRC) and 2.0 mg/l for dissolved oxygen (DO). As noted earlier, the City, through construction of a new dechlorination system, achieved compliance with the TRC and DO limitations at the end of 2016. The date for compliance with these modified effluent limitations, similar to the ammonia limitation, was set for 8 years after the effective date of the permit modification or September of 2016. As a result of Superstorm Sandy, implementation of improvements to meet the ammonia limit as detailed in the approved engineering report (2011) were suspended while the City dealt with making emergency repairs to the facility to restore reliable treatment capabilities.

The current configuration of the trickling filters is set for parallel flow. Primary effluent flow is typically split evenly to each of the trickling filters. Flow can be sent to only one filter if one filter is off line for scheduled or unscheduled maintenance. Recirculation flow from trickling filter effluent is returned by fixed rate pumps back to a location upstream of the filters, where it is combined with the primary effluent flow. Recirculation flow is adjustable by operators by utilizing 1 or more fixed rate motor and shaft driven centrifugal pumps. The trickling filters have a diameter of 96 feet and a media depth of

5 feet, equaling approximately 36,173 cubic feet of media per filter (72,346 cf total). The filters' plastic media has a surface area of 30 square feet per cubic foot for a total of 2.17M square feet of surface area. The efficiency of the trickling filters has been determined to be on the order 73% using the NRC equation that is well within the acceptable range of efficiency. Overall plant removal efficiency for BOD is greater than the permitted requirement of 85%. This percentage of efficiency is at the upper level for the trickling filter process.

Because the trickling filters operate in parallel flow, the BOD loading is split between the two (2) units. Recently the plant has experienced inconsistent reduction of ammonia concentration and therefore has difficulty in achieving the interim effluent limitation of 23 mg/l. This is in part due to one (1) of the primary clarifiers being off line and a resultant excess organic (BOD) loading to the trickling filters. Once the necessary repairs are completed to the primary clarifiers, it is expected that the interim ammonia limitation would be achieved.

Under this Alternative, the trickling filters would be modified (increase in wall height) to accept a greater volume of media and would be configured for both series and parallel operation. The upgrade would be designed to not only achieve the ammonia limitation of 9.5 mg/l but to allow for complete nitrification to prepare the facility for a future total nitrogen limitation. Improvements would include raising the walls of the existing trickling filters, installing additional high surface area/volume media, installation of a forced ventilation system, constructing a new intermediate pump station and various yard piping and valving installations. As total nitrification is not required at this time, the need for alkalinity adjustment may not be required initially but should be anticipated in the future. This could be further analyzed in the detailed design phase. A derivative of this ammonia reduction option was recommended in the 2011 Engineering Report (Dvirka & Bartilucci).

There are a number of disadvantages associated with this option:

- Loss of one (1) of the trickling filters for maintenance or repairs could mean loss of nitrification and exceedance of effluent limitation for ammonia and assessment of fines and penalties – this would result in violations and enforcement actions.
- Conversion of ammonia-nitrogen to nitrate-nitrogen would only marginally reduce overall total nitrogen loading to Reynolds Channel – the improvement to the receiving water would be insignificant.
- Limited improvement to marine waters by the reduction of oxygen demand due to oxidation of ammonia to nitrate
- Should nitrogen reduction be required due to a future SPDES permit modification, a new denitrification process would need to be designed and constructed at a significant capital cost
- Interim SPDES effluent limitations would need to be requested to cover loss of plant efficiency during the construction period
- Leaves City exposed to further nitrogen reduction requirements with bulk of plant still featuring antiquated technology and equipment.

The advantages to this alternative:

- Modifications to trickling filters to allow for nitrification could be designed, permitted and constructed within a relatively reasonable time frame
- Would allow for achieving compliance with ammonia limitation of 9.5 mg/l.

In Option No. 2 the design engineer should seek to achieve complete nitrification of the ammonia to nitrate-nitrogen. While the current effluent limitation for ammonia is 9.5 mg/l, the improvements would be designed and constructed for future nitrogen reduction requirements. The additional volume and surface area of the additional media would be sized to match the requirement for total nitrification of the primary effluent. Alkalinity addition would have to be planned for as the nitrification process consumes 7.14 mg/l

of alkalinity for each 1 mg/l of ammonia oxidized to nitrate. With nitrification being accomplished by the trickling filters, should a future total nitrogen limitation be imposed, a new separate denitrification process would have to be established on the site. This could either be a post denitrification process such as deep bed sand filter with supplemental carbon feed or a suspended growth process such as a Sequence Batch Reactor (SBR), where anoxic conditions could be established. Both of these technologies would require significant capital and space to implement.

The City's DEC-approved 2011 engineering report identified and detailed a total of six (6) process alternatives for nitrification (ammonia reduction) and one diversion option. These included:

Alternative 1 – Modification of Trickling Filters (TF) for BOD and Nitrification

Alternative 2 – New TFs for Nitrification

Alternative 3 – Combination of new TF and modified existing TF (BOD & Nitrification)

Alternative 4 – Moving Bed Biofilm Reactor (MBBR) for Nitrification

Alternative 5 - MBBR at existing TFs for BOD and Nitrification

Alternative 6 – Biofor Filters (BAF) for Nitrification

Alternative 7 – Diversion to Bay Park

Detailed descriptions, including design and cost projections, were provided for each of the alternatives with respect to the sizing and capacity of the respective process tankage and equipment needed to achieve nitrification to meet the ammonia limitation of 9.5 mg/l. Additionally annual operations and maintenance costs were provided for each option, except for Alternative 7 - Diversion to Bay Park. At the time of the development of the 2011 engineering report, Nassau County was in the midst of planning upgrades at the Bay Park STP and was not accepting additional sewage flows. The report stated that discussions should continue in the future as the option was considered viable. As stated earlier, this report predated Super Storm Sandy, which changed the basic calculus.

The capital cost (2011 dollars) of the various alternatives ranged from a low of $18 Million for Alternative 1 to a high of $28 Million for Alternative 3. Yearly additional O&M costs to be associated with the alternatives over base yearly O&M costs ranged from a low of $200 K for Alternative 2 to a high of $580 K for Alternative 5.

Alternative 1 in the 2011 report was identified as the recommended alternative, and was focused on maintaining the existing trickling filter technology while increasing the sidewalls to accommodate the necessary volume of media to provide for the fixed biomass to allow for conversion of ammonia to nitrate. The capital cost was estimated at $18 Million (2011 dollars) with an additional annual O&M cost estimated at $225 K/year (2011 dollars). Applying an annual escalator of 3% to these cost estimates would revise the 2011 figures to an estimated **$21.5 Million for the capital cost** and **$269 K/year additional O&M costs**. As stated earlier, no costs for hardening were provided as this was not an issue in 2011. Hardening was estimated by Arcadis/Hazen & Sawyer in 2014 to be on the order of **$43 Million.** Thus, adjusting the 2011 costs for inflation, along with the addition of the 2014-estimated costs of hardening and an appropriate escalator factor of 3% per year for the intervening years (2014-2017) results in a very conservative estimate of **$47 Million**.

4.1.3. Option No. 3 – Flow Diversion

This alternative would feature the conversion of the existing influent pump building into a new flow diversion pump station. Following completion of that work and connection to Bay Park STP, the balance of the wastewater treatment plant would be decommissioned, demolished and the land made available for appropriate reuse by the City.

The flow diversion pump station would be designed to repurpose the existing headworks and influent pump station at the WWTP. Repurposing and

hardening of the existing structure would present a lower cost option than constructing a new pump station. This will be revisited in the detailed design phase, when a more thorough analysis of the building structure is undertaken.

The new flow diversion pump station would be designed in accordance with Nassau County Department of Public Works and Ten State Standards. The existing WWTP would remain in service during construction of the improvements to the existing building, including the installation of new pumping units (total of 4), including upgrading existing screening equipment and force main piping from the existing influent pumping area to the connection point on the mainland.

The flow diversion pump station building would require hardening to provide necessary protection from future storm events. The County's 406 Hazard Mitigation Proposal (2014) provides an extensive review and analysis of the required hardening measure in "Part II: "Flood Risk, Vulnerability Assessment and Design Criteria." In this section of the document, several analyses are carefully described and references provided. The summary of these analysis define the critical criteria:

FEMA 500 year flood elevation	13.1 elevation
Wave height at PS location	3.6 feet
Sea Level rise (50 years)	2.93 feet

This results in a recommendation to harden the existing influent pump building to elevation 20.0. The existing building currently sits at elevation +/- 10.0 so the hardening measures would be installed to an elevation approximately 10 feet above existing grade.

In addition to requiring the hardening of the existing influent pump station building, a new force main will be required to transfer the City's wastewater to the mainland where it will enter the County's sewage collection system

that carries sewage to the County's Bay Park STP. This force main will be approximately 17,500 to 18,000 lineal feet in length and will be constructed of a combination of high density polyethylene (HDPE) pipe and ductile iron pipe. The ductile iron force main will initiate at the site of the existing influent pump building and will traverse in a northeasterly direction to the corner of the WWTP site. Here it will be installed underneath the LIRR tracks using the jacked pipe method where a host pipe is first installed under the tracks and then the force main pipe is installed within the host pipe. This method eliminates disturbance to the LIRR tracks and operations and provides for an additional level of protection of the force main pipe. The force main will continue eastward on Park Place to a City owned lot where the entrance pit for crossing underneath Reynolds Channel will be installed. Dual force main pipes will be installed underneath Reynolds Channel using the horizontal directional drilling (HDD) method. This allows for trenchless approach to installing the force main piping manufactured of HDPE underneath the bottom of the channel in one continuous pipe to the opposite shore where it will emerge at a location on Austin Boulevard. From here, the force main returns to ductile iron and is installed using the open trench method. The force main will traverse northward up Austin Boulevard continuing up Long Beach Road to the designated connection point on West Cortland Road.

5. Recommended Option – Flow Diversion

5.1. Flow Diversion Pump Station Building

As previously stated in the *Alternatives Overview*, the only viable option other than constructing improvements to meet nitrogen reduction to the limits of technology is to divert the City's sewage to the County's Bay Park STP in East Rockaway. As with Option No. 2 *Upgrading for Nitrogen Reduction*, it would be necessary to harden the pump station to withstand a future storm event. Unlike Option No. 2

where the entire site would have to be hardened by a perimeter flood wall or berm to protect the individual buildings, unit processes and equipment, hardening would be limited to the pump station area. As discussed in the *Alternatives Overview* section, the hardening would require either the existing Administration/Influent Pump Building to be hardened (flood proofed) to elevation 20.0 (NAVD 88) feet or to consider the construction of a new flow diversion pump station building designed with hardening features to the same 20.0 foot (NAVD 88) elevation, the Design Flood Elevation (DFE). Hardening of the pump station has two (2) options; a flood wall around the perimeter of the existing building or flood proofing the existing building by the construction of a new structural reinforced exterior wall attached to the existing building and relocating building openings (except for doorways) such as vents, windows, hatches etc. to a location about the Design Flood Elevation.

The existing Administration/Influent Pump Building houses the influent screens, the wet well, the dry well with four (4) pumping units, electrical distribution and pump controls, and administrative offices including an employee lunchroom, laboratory and office area. The overall size of the existing building is larger than required but could be remodeled to fit the requirements of the proposed flow diversion pump station. The building appears to be in good structural condition and the influent wastewater piping currently is tied into the existing wet well that is part of the building. The existing 18” diameter discharge piping from the dry well pumping header would be connected to the new 24” diameter force main that would be constructed on the east side of the dry well and would be connected to the first length of the new force main that would be installed on the site within the boundary roadway. The existing building would have to be hardened in accordance with FEMA Publication P-936 “Flood proofing of Non Residential Buildings”, 2013 to the prescribed elevation by either hardening the existing exterior walls by constructing a new reinforced concrete wall to the DFE or by constructing a perimeter flood wall around the building to the prescribed DFE. Under the first option, all penetrations,

windows, vents, located on the exterior of the building walls would have to be either sealed and relocated to an elevation equal to or greater than the DFE. Flood doors designed to withstand the hydraulic forces would need to be incorporated into the hardened exterior wall.

The perimeter flood wall option would feature a flood wall constructed on sheeting, slurry walls and concrete to the DFE. Watertight gates for access and egress would be installed in the flood wall. Pump stations for removal of water entering the site between the new flood wall and the flow diversion pump station building would be provided to pump any infiltrating water to the external side of the flood wall at the DFE. In the detailed design phase, an analysis of the uplift forces exerted on the lower pump level floor would be conducted to determine if the floor requires hardening to overcome any forces exerted by groundwater during a storm event featuring tidal surge across the site. The building itself would be subjected to installation of new elements such as energy efficient windows, doors, LED lighting and new membrane roof as well as other interior treatments required to address deficiencies and code issues.

If after a more detailed examination and evaluation that the re-purposing of the existing pump station building is not possible or economically feasible, the construction of a new flow diversion pump station on the site would be required. As with the hardening of the existing pump station, the new flow diversion pump station structure would feature flood proof doors, capable of withstanding the hydraulic pressure to the DFE with all penetrations located above the DFE.

5.2. Flow Diversion Pump Station Equipment

The modified existing influent pump station or the new flow diversion pump station would feature key pieces of equipment. The minimal new equipment would include:

- Influent Screens
- Screenings dewatering and compaction unit

- Transfer conveyors
- Influent pumping units
- Pump controls
- New emergency standby generator
- Ancillary systems; hoists, lighting, HVAC, electrical upgrades
- Flow metering (reuse existing meter)

5.2.1. Influent Screens

The influent screens that protect downstream pumping equipment would be replaced with new self-cleaning units of the appropriate flow rated capacity. The units would be rated for a minimum of 10 MGD each. A bypass channel would be provided for maintenance events. These units would remove materials greater than 3/8" diameter and transfer them off the bar racks to container for disposal. A typical screen used by municipalities is the Duperon unit. Information is provided in Appendix E.

5.2.2. Dewatering & Compaction

Due to requirements for off-site disposal, the material would be conveyed to and processed in a dewatering/compactor device prior to discharge to the disposal container. A typical unit as manufactured by Duperon. Information on the unit is provide in Appendix E.

5.2.3. Pumping Units

The existing dry well area is of sufficient space to accommodate four (4) new pumping units for transfer of the raw sewage to the mainland. These units will be of the submersible dry pit style sized to handle the range of flows as noted in Table 1. The following hydraulic characteristics:

- Daily Average Flow today 4.2 MGD
- Daily Average Flow future 4.7 MGD
- Peak Flow 6813 gpm, 9.5 MGD
- Storm Flow 17 MGD

Due to the range of flows and the high head of the force main, the pumps required for the application are high horsepower units.

The pumps will be controlled by variable speed controllers. Present pump selection would have one pump handling daily average flow (4.7 MGD), two (2) pumps handling average daily peaks (9.8 MGD) and three (3) pumps handling the instantaneous peaks (storm flows) of 17 MGD. The fourth pump would be the spare pump. The flow diversion pump station will feature new dry pit submersible units. The units are Flygt featuring the N style impeller that has proven effective in passing solids. The four (4) units will be the Model NT 3312/835. Manufacturer's information on the pumps is provide in Appendix E.

Basis of design for the pump station and force main is presented below:

I. *Pump Station Design Parameters:*

A. *Estimated Average Daily Flow*: 4.2 MGD (2,917 gpm)

B. *Peak Flow Factor:* 2.34

C. *Peak Design Flow:* 9.828 MGD (6,825 gpm)

D. *Peak Storm Flow:* 17.0 MGD (11,800 gpm)

E. *Pump System*: The proposed pumping configuration consists of four dry pit submersible pumps. Three of the four pumps will operate to convey the peak flow. A spare pump will be stored at the pump station.

F. *TDH at Peak Storm Flow*: 169 feet

G. *Pump Type:* Submersible dry-pit type, Flygt Model NT 3312/835

H. *Pump Motor:* 385 HP, 460 V, 3 phase, 1190 RPM

I. *Emergency Power:* A standby power generator will be provided to operate pump station upon loss of power.

J. Pump Control: Soft starters and ultrasonic level indicator.

K. *Wet Well Electrical Classification*: NEC Class 1, Group D, Division 1

L. *Alarm System:* Autodialer type and SCADA to notify owner of power failure, pump failure, engine failure and high water level.

M. *Pump Handling:* An overhead hoist with electric winch will be provided for moving pumps within building.

II. *Force Main Design Parameters:*

A) *Pipe Material:* CLDI, Class 350, 24-inch diameter.

B) *Pipe Material for Directionally Drilled Pipe under Reynolds Channel:* DR-11 HDPE, 30-inch diameter (25.833-inch ID)

C) *Velocity at 2,917 gpm (ADF) in 24-inch dia.*: 1.92 fps
Velocity at 6,825 gpm (peak) in 24-inch dia.: 4.48 fps
Velocity at 11,800 *gpm (storm) in 24-inch dia.*: 7.75 fps
Velocity at 2,917 gpm (ADF) in 30-inch dia. HDPE: 1.79 fps
Velocity at 6,825 gpm (peak) in 24-inch dia. HDPE: 4.18 fps
Velocity at 11,800 *gpm (storm) in 24-inch dia. HDPE*: 7.22 fps

D) *Hazen Williams C-factors:* 120 for CLDI and 130 for HDPE

E) *Force main length:* Approximately 15,560 feet CLDI and approximately 1,850 feet HDPE.

F) *Static Head:* 5 feet

F) *Emergency Pumping Capability:* Force main connection for portable pump on pump header.

5.2.4. Standby Generator

A new emergency standby generator sized at approximately 1750kw would be required to handle the new load from the flow diversion pump station. The new generator would be located at the DFE to protect it from future storm events. The unit would be housed in a sound proof enclosure.

5.3. Proposed Force Main Piping

Ductile iron pipe (DIP) is a flexible conduit that is centrifugally cast from molten ductile iron and is designated as a “pressure class” product, which means that the wall thickness is calculated taking into account both the working and surge pressures that the pipeline will experience. For example, “Pressure Class 350 DIP” has a wall thickness that is calculated using a working pressure of 350 psi and an additional surge pressure of 100 psi with a nominal safety factor of 2.0, resulting in a design pressure of 900 psi.

DIP is manufactured in 18 or 20 foot nominal laying lengths and 3 to 64 inch diameters, in a range of standard pressure classes and nominal wall thicknesses. The interior of the pipe is typically furnished with a ceramic epoxy lining to prevent internal corrosion and to maintain a hydraulically smooth flow surface. Furthermore, the pipe exterior is supplied with an asphaltic coating for corrosion protection from aggressive soil conditions, and is often wrapped with a polyethylene (PE) encasement for further protection.

Due to the potential for high pressures in the proposed force main and consistent with Nassau County Department of Public Works (SCDPW) standards, Class 350 (minimum) ductile iron pipe is recommended for the proposed force main piping system material. The most common range of working pressure for ductile iron pipelines is 60 psi to 100 psi or 140’ to 230’ of water. This range should provide for sufficient buffer from manufacturing defects, pipeline installation and related considerations.

High Density Polyethylene (HDPE) pipe is known for its large strength-to-density ratio. Standard laying lengths of HDPE pressure pipe is 40/50 foot lengths. Pipe sizes under 6” may be coiled at continuous longer lengths. HDPE pipe is manufactured from PE4710 resin as listed with the Plastic Pipe Institute (PPI).

The resin material meets the specifications of ASTM D 3350. HDPE pipe and fittings shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification as the raw material.

HDPE products are homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.

HDPE pipe and fittings shall be butt fused and made of the same minimum material designation code of PE4710. A fusion joined pipeline can be thought of as a continuous pipeline without joints. Fittings shall have a minimum pressure rating equal to or greater than the pipe to which they are joined unless otherwise specified in the design. All fittings shall meet the requirements of AWWA C901 or C906.

The force main piping system design shall be consistent with Ten States Standards as follows:

- Cleansing velocity of at least 2 ft/sec.
- Minimum 4-inch diameter piping
- Minimum 4'-0" cover to prevent freezing
- Minimum pressure class of 350 for pipe, fittings and valves
- Provisions for drain manhole at low points
- Provisions for air relief chamber at high points

The proposed force main piping system provides for approximately 18,000 lf of force main pipe. A 24-inch diameter force main is proposed to convey raw wastewater from the Long Beach WWTP to the existing gravity sewer interceptor on Cortland Avenue, Oceanside, NY. A velocity dissipater manhole will be provided immediately upstream and adjacent to the existing gravity sewer interceptor manhole on Cortland Avenue and prior to discharge to the existing gravity sewer interceptor. Sanitary wastewater will flow from there by gravity to the existing Bay Park WWTP.

A 24-inch diameter force main was selected to accommodate the projected range of flows from the Long Beach WWTP. A 24-inch diameter force main was selected in order to maintain suitable minimum and maximum flow velocities and pressures for the projected wastewater flow rates. It should be noted that Ten States Standards, Section 11.24 - Hydraulic Capacity, the proposed pump station must provide for a minimum velocity of 2 ft/sec for peak hourly flow conditions.

The proposed force main will be provided with a 4'-0" minimum cover. Drain and air release manholes are also anticipated at low and high points, respectively, along the force main route. Following installation, the force main will be pressure tested in accordance with AWWA Standards. Suitable thrust blocking and/or mechanically restrained joints shall be provided at 45-degree or larger bends in the pipeline.

5.4. Proposed Force Main Routing

5.4.1. Force Main Route

The total length of the proposed force main route is approximately 17,610 lf. The proposed force main routing is presented on Figures 8, 9, 10, and 11. As shown, the force main route commences at the existing
City of Long Beach WWTP located at 700 National Boulevard, Long Beach, NY. The forcemain route will ultimately discharge to an existing gravity sewer interceptor manhole located on West Cortland Avenue, Oceanside, NY. Based on a windshield survey, a description and approximate length of the proposed force main route is cross-referenced with the segments and described below. In addition, still photos from the windshield survey obtained from Google Maps have been provided for convenience.

5.4.1.1. Long Beach Segment (approximately 4,310 lf)

Beginning at the existing City of Long Beach WWTP Influent Building, the proposed force main route will run east/northeast and adjacent to the Long Island Railroad (LIRR) tracks ROW and within the existing City of Long Beach WWTP property boundary. At the east perimeter of the City of Long Beach WWTP property, the force main will turn southeast and will be pipe jacked beneath the LIRR tracks (refer to Photo 6). A steel casing pipe will be pipe jacked to house the force main (carrier) pipe. The length of this pipe jack is estimated to be approximately 200 lf at this time.

Photo 6 – Approximate Location of Jacking Pit on Park Place
(Courtesy Google Maps)

Figure 8 – Overall Force Main Routing

CITY OF LONG BEACH WWTP
PROPOSED FORCE MAIN ROUTE
ALL SEGMENTS
Legend
Long Beach Road Segment
Austin Blvd. Segment
Long Beach Segment
Elec. Crossing
Gas Crossing
Oceanside Canal
North Meadow
Pearsalls Hassock
Mill River
East Meadow
West Meadow
Island Park
Island Park
Island Park

Figure 9 – Long Beach Segment

Figure 10 – Austin Boulevard Segment

Figure 11 – Long Beach Road Segment

CITY OF LONG BEACH WWTP
PROPOSED FORCE MAIN ROUTE
LONG BEACH ROAD SEGMENT

Following the pipe jack, the force main route will travel east on Park Place (refer to Photo 7), a two (2) lane roadway with on-street parking on both sides and owned by the City of Long Beach. The force main route will continue on Park Place to the intersection with Riverside Boulevard. At Riverside Boulevard, the force main will enter a City of Long Beach owned parcel located at the southeast corner of Park Place and Riverside Boulevard (refer to Photo 8). Dual force mains (primary and backup) will be directionally drilled from this parcel and in a northeasterly direction and beneath Reynolds Channel to the center median of Austin Boulevard, Island Park, NY (refer to Photo 9).

Photo 7 – Park Place Looking East
(Courtesy Google Maps)

Photo 8 – City of Long Beach Owned Parcel at Intersection of Park Place and Riverside Boulevard
(Courtesy Google Maps)

Photo 9 – Approximate Location of directional Drill Receiving Pit
(Courtesy Google Maps)

5.4.1.2. Austin Boulevard Segment (Approximately 7,800 lf)

Austin Boulevard is a six (6) lane north-south County-owned roadway with three (3) travel lanes in each direction, a center turning lane and, parking shoulders and sidewalks on each sides of the roadway (refer to Photo 10). Installation of the force main piping system will be within the Austin Boulevard Right-of-Way (ROW) with the alignment varied to avoid existing utilities.

Most of Austin Boulevard is lined on both sides by retail and commercial/industrial establishments and restaurants. There are several signalized intersection including Marina Path, California Place, Traymore Boulevard, Kingston Boulevard, Audubon Boulevard, Trafalgar Boulevard, Saratoga Boulevard, Georgia Avenue and Long Beach Road. The roadway can experience the potential for heavy traffic volumes with posted speed limits at 40 mph. There are overhead utilities and street lighting that run parallel to the roadway with overhead utilities crossing over the roadway.

Photo 10 – Austin Boulevard, Island Park, NY Looking North
(Courtesy Google Maps)

5.4.1.3. Long Beach Road Segment (Approximately 5,500 lf)

Long Beach Road from the Barnum Bridge to Mott Street is a six (6) lane north-south County-owned roadway with three (3) travel lanes in each direction and a center grass median. The former Oceanside Landfill is bordered on the east side of the roadway and a tidal wetland and adjacent shopping plaza is bordered on the west side of the roadway (refer to Photo 11).

Photo 11 – Long Beach Road, Oceanside, NY
(Courtesy Google Maps)

North of Mott Street, Long Beach Road becomes a four (4) lane north-south County-owned roadway with two (2) travel lanes in each direction, a center turning lane and, parking shoulders and sidewalks on each sides of the roadway (refer to Photo 12). Installation of the force main piping system will be within the Long Beach Road Right-of-Way (ROW) with the alignment varied to avoid existing utilities.

Photo 12 – Long Beach Road, Oceanside, NY
(Courtesy Google Maps)

Most of Long Beach Road is lined on both sides by retail, commercial/industrial establishments and restaurants. There are several signalized intersection including the entrance at the former Oceanside Landfill, Daly Boulevard, Mott Street, Henrietta Avenue, Waukena Avenue, West Waukena Avenue, Cortland Avenue and at the entrances to several retail strip malls along the route. Photo 13 identifies Bay Park Connection Point at Intersection of Long Beach Road and Cortland Avenue.

Long Beach Road experiences the potential for heavy traffic volumes with posted speed limits at 40 mph. There are overhead utilities and street lighting that run parallel to the roadway with overhead utilities crossing over the roadway.

Photo 13 – Bay Park Connection Point at Intersection of Long Beach Road and Cortland Avenue
(Courtesy Google Maps)

5.4.2. Force Main Route Evaluation

The force main routing was evaluated for constructability, community disturbance, traffic disturbance, cost and miscellaneous factors described as follows:

5.4.2.1. Constructability

A force main construction project will involve excavation, sheeting, dewatering, installation of piping and valves, construction of vaults and other support structures. Force main construction projects require opening of road pavements, closure of traffic, creation of lay-down area(s) and the potential for relocating existing utilities.

5.4.2.2. Community Disturbance

Most construction projects create a level of inconvenience to local residences and businesses located along, near or adjacent to the construction area. Force main construction typically involves: roadway excavation utilizing heavy equipment (i.e., trackhoe, dozer, backhoe, etc.); installation of sheeting and shoring systems (where applicable); provisions for dewatering systems (as necessary) and; installation of the force main piping system. In addition, local roadway closures may be necessary and will likely impact local businesses.

5.4.2.3. Traffic Impacts

The assessment of traffic impacts can be directly related to traffic volume, number of major cross streets, road type and function and sensitive crossings. The Long Beach Segment of the force main route includes Park Place and Riverside Boulevard. These are relatively light traffic roadways with a majority of traffic concerns occurring during normal business hours due to the commercial/industrial activities.

The Austin Boulevard and Long Beach Road Segments of the force main route have the potential for significant traffic related issues during the peak rush hours, but more importantly, during emergency evacuations, as this roadway serves as a major artery from Long Beach Island. In addition, Austin Boulevard is lined with retail and commercial/industrial establishments and restaurants with a posted speed limit is 40 mph.

5.4.2.4. Cost

Cost for the installation of a force main will increase with length, depth, presence of groundwater and/or environmental concerns. In addition, the more constrained the working area, the higher the installation and maintenance and protection of traffic costs during construction. For the proposed force main route, depth (requiring tight sheeting) and presence of groundwater (relatively shallow) will likely be significant factors that will increase the cost for this installation.

5.4.2.5. Miscellaneous

The condition of the existing roadway along the force main route is also a factor of the force main route. If the roadway is in good condition, it will require extensive restoration as a result of the force main installation. Additional items included schedule and permitting, as they will likely be less effected under County jurisdiction.

5.5. Horizontal Directional Drilling (HDD) and Pipe Jacking

Horizontal directional drilling (HDD) and pipe jacking are the recommended methods to install the proposed force main route beneath Reynolds Channel and the Long Island Railroad (LIRR) tracks, respectively. Both installation techniques are proven technologies and are essentially the most feasible installation alternatives for these crossings. Force main installation via pipe jacking beneath the LIRR tracks is the LIRR's preferable alternative. HDD and/or pipe jacking is also recommended in high traffic areas, areas with shallow groundwater, areas with significant utility crossings and areas where restoration is difficult.

Figure 8 identified the proposed HDD and piping jacking locations for installation of the proposed force main piping system.

Advantages of HDD and/or pipe jacking include:

- Minor environmental and construction impacts
- Offers maximum depth of cover
- Avoids utility impacts
- Minimal groundwater impact
- Possible to drill bore hole on a predetermined radius of curvature
- Reduces excavation and shoring costs

Disadvantages of HDD and/or pipe jacking include:

- Typically higher construction costs
- Requires staging area for drill rig and equipment
- Use of ductile iron pipe may limit the length of HDD

The HDD and pipe jacking industry has experienced exponential growth in the past several years and has become commonplace as a method of force main piping installation.

5.5.1. HDD

HDD has been used extensively in drilling through many different types of soil conditions. HDD is defined as a steerable system for the installation of pipe, conduits, and cables using a surface launched drilling rig. HDD utilizes guided drilling along a pre-determined bore plan for drilling long distances such as under railroad tracks, highways, rivers, lagoons and urbanized areas.

Basic components of an HDD system include:

- Drilling rig/unit
- Guidance system
- Drill pipe and downhole tools (i.e., bits and back reamers)
- Drilling fluid mixing/recycling system

The HDD process involves: 1) drilling of a pilot hole; 2) pilot hole enlargement (reaming) and; 3) pullback installation of the carrier pipe. Figure 11 below illustrates the HDD Process. Step 1 includes drilling of a pilot hole from entry point to exit point and following a pre-designed plan and profile.

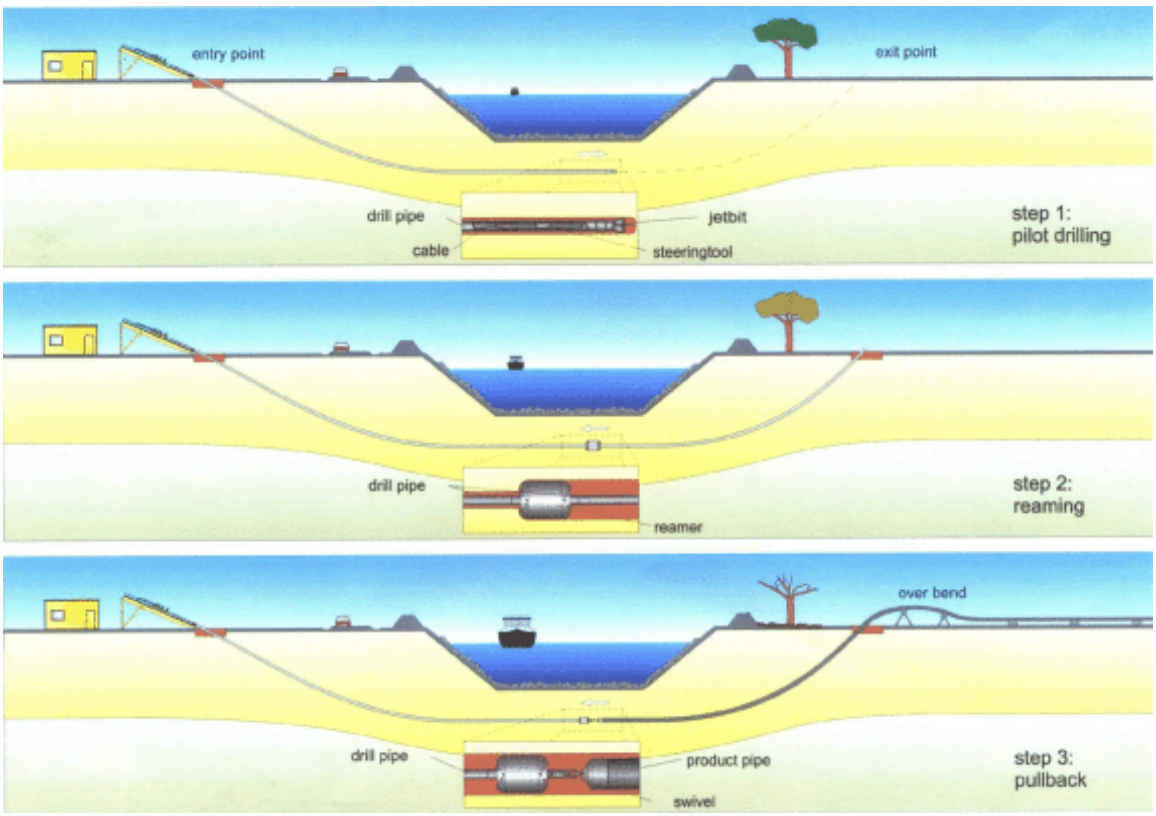
The position of the drill head is monitored by an electronic tracking system, which also provides the information necessary to make steering adjustments as the drilling operation proceeds.

Step 2 illustrates back reaming to enlarge the borehole to a sufficient size to accommodate the pipe diameter. Typically, the reamer is attached to the drill string at the pipe side and pulled back into the pilot hole. Generally, the final size of the bore is at least fifty percent (50%) larger than the outside diameter of the pipe.

Once the back reaming is complete and the drilled hole is enlarged, pull back of the product pipeline is conducted through the borehole (refer to Step 3 in

Figure 11). A reamer is attached to the drill string and connected to the pipeline pull head via a swivel, which prevents any translation of the reamer's rotation into the pipeline string allowing for a smooth pull into the drilled hole. Drilling mud fills the annular space between the pipe and the ground.

Figure 12 – HDD Process



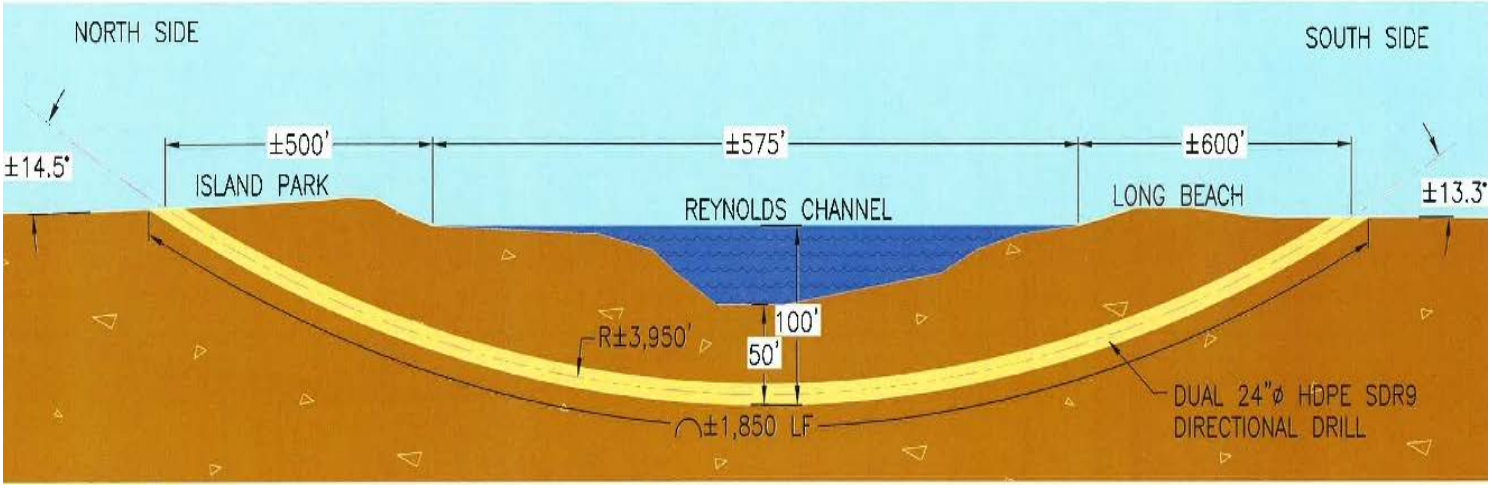
Following pull back of the product pipeline, the pull head is disconnected, the drill rig is removed and the pipeline tie-ins are completed.

Costs for HDD are primarily dependent on project size, pipe diameter, bore length, location, surface and subsurface conditions and soil characteristics. Bid factors can also influence the relationship between total cost and the project parameters. Other parameters can also include community type, product type, soil conditions, and geographical region.

Costs for HDD can range from $700 to over $1,500 per linear foot. When possible dewatering, utility relocation, restoration and traffic maintenance are included in the construction activities, HDD costs can become more competitive to other installation means and methods (i.e., "open cut" construction).

Figure 12 below provides for a preliminary profile of the proposed HDD beneath Reynolds Channel. The length of the proposed HDD is estimated to be approximately 1,850 lf and to a depth of approximately 50 feet below the Channel bottom or 100 feet below the Channel surface. The proposed entry and exit angles are approximately 13 degrees and 14.5 degrees, respectively. A typical range for entry/exit angles is between 8 degrees and 20 degrees. The proposed entry/exit angles represent an approximate 3,950 foot radius of curvature. A typical minimum radius of curvature for HDPE piping is 40 times the nominal diameter of the pipe. As a result, the entry and exit angles and radius of curvature are within the limits for the HDD of a 24-inch diameter SDR9 or SDR11 HDPE pipe.

Figure 13 – Proposed HDD Profile



5.5.2. Pipe Jacking

The pipe jacking process begins by constructing jacking and receiving pits. These pits can vary in size based on the size of the pipe jacking operation. A thrust wall is constructed in the jacking pit to provide force against which a jacked pipe can be jacked. Hydraulics are utilized to thrust the jacked pipe from the jacking pit through the subsurface soils to the receiving pit at the same time as excavation is taking place. The lead section of a jacked pipe is usually equipped with a cutting shield. Subsequent sections of pipe are joined together as the pipe is jacked. Figure 13 and Photo 14 illustrate a typical pipe jacking operation.

Typical jacked pipe sizes range from 6 to 60 inches and are fabricated from reinforced concrete, fiberglass or steel. Other options can include polymer concrete, clay, and ductile iron. Any of these can be installed as a primary pipe or carrier pipe.

Figure 14 – Typical Pipe Jacking Operation

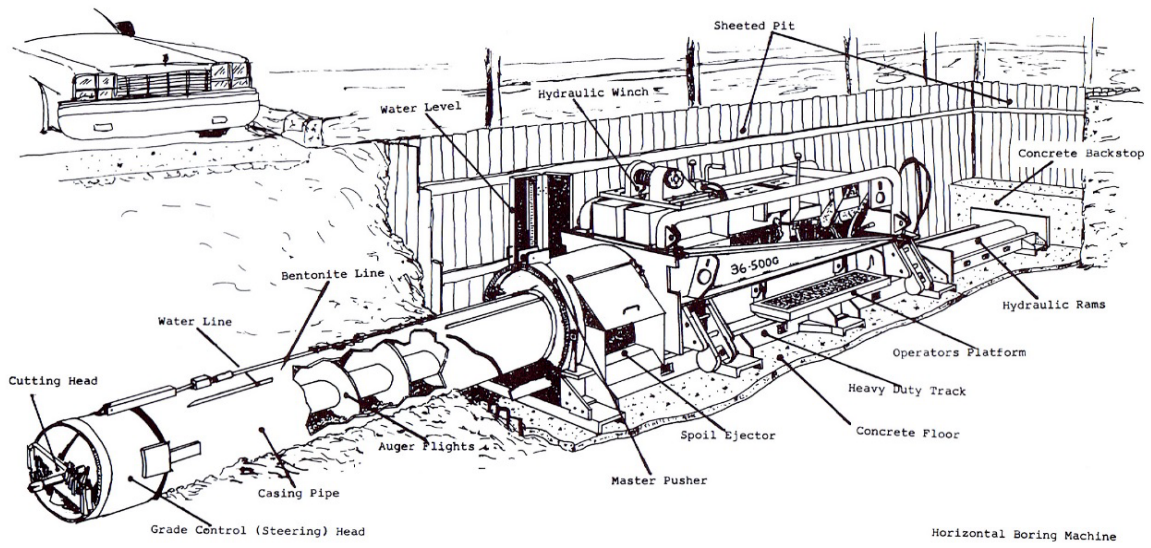


Photo 14 – Typical Pipe Jacking Operation

5.6. Plant Decommissioning

Upon completion of the new flow diversion pump station and all of the force main piping segments, the new pump station will be started up and tested. At some point, and this could be anyway from a several months to more than a year, the need for having the existing WWTP for an emergency backup option will no longer be necessary. At that time, the existing facility would need to be decommissioned, all tanks cleaned of residual material and the structures demolished. The site would be restored to an open vegetative field unless an alternate use has been determined. The cost of the decommissioning and demolition is estimated at $3.0 Million in 2017 dollars.

5.7. Scheduling and Phasing

The flow diversion project is a regional project of regional significance and features a technical challenge of directional drilling dual force main underneath Reynolds

Channel that will impact schedule. Additionally the project requires significant capital outlay from the City if it is undertaking the project on its own. Applying for and acquiring the necessary financing instruments will require some time as well. For the purposes of this report, the following tasks and time frames are projected with the caveat that financing is in place and a design engineer is under contract.

Task	Time to Complete
• Field Investigations	3 months
• Engineering Detailed Design	12 months
• Prepare and Submit Permits	3 months
• Obtain Regulatory Approvals	3 months
• Bid and Contract Award Process	6 months
• Construction (two contracts)	24 months
• Decommissioning and Demolition	6 months

This would have the total project schedule being 57 months. This is not an unrealistic time frame given the parameters. If permit applications can be submitted and obtained during the detailed design phase, it is possible that a few months could be shaved off the schedule.

Phasing

Due to the overall cost of the project as discussed in the next section, it is likely that the City will seek to implement the project in a phased approach. This will allow for smaller capital outlays for specific elements of the project. The City will be under a phased approach, the City would undertake portions of the project. Presently, in discussions with the County of Nassau, the County would proceed to engage a design consultant to perform the detailed engineering of the project using a recently obtained combination grant/loan of $3.727 Million from NYSEFC. This would allow for the design to be initiated. Additionally, a segment of the force main piping (Austin Boulevard) has almost been completed. It is possible that the County would proceed to install that section of piping while the design of the balance of the project progresses.

The City will be submitting applications for several grant opportunities from New York State such as the Consolidated Funding Application, Water Quality Improvement Project Program and Water Infrastructure Improvement Act (WIIA) program. This is discussed further in Section 6.5.

6. Cost and Financing Considerations

The following sections identify and detail costs associated with short term facility repairs and the long term alternatives for achieving compliance with current and future SPDES permit limitations.

6.1. Short Term Repairs

The WWTP currently has structural and process equipment deficiencies that need to be addressed independent of implementation of the selected long term alternative. The Order on Consent that is currently being negotiated will require that these deficiencies be remedied within a reasonable time frame. This time frame will be further defined in the Order on Consent in a Compliance Schedule.

Specific repair items include:

1. East Primary Clarifier; longitudinal collector, chains and flights
2. Concrete repairs to primary clarifier deck
3. Grit removal equipment and concrete repairs
4. One chlorine contact tank spiral lift pump
5. One secondary clarifier collector drive
6. Cleanout of primary and secondary Digesters

The City has authorized a contract for the engineering services for the preparation of contract documents for the repair items and the construction phase services to administer and oversee the contractor activities. The engineering costs are $329,000. Presently, the estimated cost estimate for the six (6) items is $2 Million. Total cost for short term facility repairs is therefore $2.33 Million.

6.2. Option No. 2 Upgrade for Ammonia Reduction

The cost of this option depends if only the minimum requirement (Base Project) of Ammonia Reduction is undertaken or if optional phases are considered and undertaken either simultaneously or at a future date. The Base Option and optional projects are:

- Design and construction of Ammonia reduction only (Base Project)
- Design and construction of Site Hardening
- Design and construction of Nitrogen Reduction treatment systems

The estimated capital costs including engineering are estimated as follows:

Project	Cost	Reference
Upgrade for Ammonia Reduction	$21.5 M	Engineering Report (D&B) (2011)
Harden Site	$43 M	406 HMGP, H&S/Arcadis (2014)
Upgrade Code and N Reduction	$195 M	Technical Memo, H&S/Arcadis (2014)

As the upgrade for ammonia detailed in the 2011 Engineering Report preceded Superstorm Sandy, there were no provisions or necessity at that time to consider hardening the site from storm events. The 406 Hazard Mitigation Grant Program assessment prepared by the team of Hazen & Sawyer/Arcadis in October of 2014 pegged the upgrade of the Long Beach WWTP to include addressing code issues and installing technology to achieve nitrogen reduction to an effluent concentration of 8 mg/l at $138 Million (*Technical Memorandum – June 25, 2014*). Hardening the entire WWTP site to elevation 20 by installing a perimeter flood wall was estimated at that time to cost an additional $43 Million.

As previously discussed in this report, an upgrade for ammonia reduction would likely only provide for short term compliance with the Ammonia limitation. Due to anticipated further regulatory actions being implemented to protect the Western Bays, additional nitrogen reduction will be required of point dischargers including the City of Long Beach. Lastly, the site is still subject to flooding from future storm events of the magnitude of Superstorm Sandy. Therefore undertaking long term

improvements would require some level of hardening to protect the capital investment and provide for continued effluent compliance. For these reasons, the Base Project of Ammonia reduction without the optional projects would only constitute a short term project. Should the City continue to operate and maintain a treatment plant at the existing site, the capital cost in 2017 dollars is estimated to be well above $200 Million and could be as high as $230 Million.

6.3. Option 3 – Flow Diversion to Bay Park

Option 3 as previously detailed in prior sections resolves several issues. Elimination of the discharge to Reynolds Channel effectively would retire the existing SPDES permit and all current and future effluent limitation requirements. There will be no need to harden the entire site from future storm events and O&M costs are reduced as treatment occurs at a larger regional facility (Bay Park STP). Major cost items for this Option include the new Flow Diversion Pump Station and the Force Main from Long Beach to Oceanside. Tables below detail the cost of these two (2) projects.

Flow Diversion Pump Station

Components of the new Flow Diversion Pump Station include:

- Harden influent pump building – perimeter wall with access gates
- Improvements to building- doors, windows, lighting, HVAC, security
- New screening equipment
- New pumping units
- Overhead rail hoist
- Contingency-15%
- Engineering Costs at 20%

Total capital cost for the Flow Diversion Pump Station is therefore estimated at $8.5 Million in 2017 dollars. Detailed Cost Table provided in Appendix F.

Components of the Force Main include:

- Segment 1 – plant site to HDD entrance shaft

- Segment 2 – HDD from LB side to Island Park
- Segment 3 – Austin Boulevard to Long Beach Road
- Segment 4 – Long Beach Road to Connection Point
- Contingency of 15%
- Engineering at 20%

Total capital cost for the Force Main is therefore estimated at $30.1 Million in 2017 dollars. Detailed Cost Table provided in Appendix F.

Total project costs for Option 3 including capital and engineering costs is therefore estimated at $42.12 Million in 2017 dollars. Table 4 below provides a summary of the project costs.

Table 4 – Summary of Project Costs

Design Phase	Item	Capital	Footage**	7% Design	7% CM	Total Design	Construct Phase	Total
1*	FM - Austin Boulevard	$7,000,000	7750	$490,000	$490,000	$ 980,000	1	$7,980,000
1	Long Beach Road	$5,750,000	6000	$402,500	$402,500	$805,000	2	$6,555,000
1**	FM-HDD pit to Mainland	$7,000,000	3500	$490,000	$490,000	$980,000	3	$7,980,000
1	Pump Station	$7,500,000		$525,000	$525,000	$1,050,000	4	$8,550,000
1	FM-PS to HDD pit	$2,400,000	2000	$168,000	$168,000	$336,000	4	$2,736,000
5	Decommissioning of WWTP	$3,000,000	7750	$210,000	$210,000	$420,000	5	$3,420,000
							SUB TOTAL	**$37,221,000**
	TOTALS	**$32,650,000**	**19250**	**$2,285,500**	**$2,285,500**	**$4,571,000**		**$37,221,000**
Construction Phase								
	CONTINGENCY	15%	$4,897,500					
	SUB TOTAL		**$37,547,500**	**$2,285,500**	**$2,285,500**	**$42,118,500**		**$42,118,500**
	ENGINEERING COST		$4,571,000					
	TOTAL PROJECT COST		**$42,118,500**					
*DESIGN COMPLETED								
**DUAL FORCE MAIN UNDER CHANNEL								

6.4. O&M Costs

6.4.1. Option 2

Current annual O&M costs at the WWTP are approximately $1.6 Million independent of the sewer collection system. The options for either upgrading the WWTP at the current site or the preferred option of flow diversion to the Bay Park STP would not impact the annual O&M cost for the collection system.

Option 2 as detailed in the 2011 engineering report, the recommended Ammonia Reduction option was expected to cost an additional $269,000 in O&M. Escalating these costs at 3% per year would result in an annual increase in the annual O&M to approximately $285,000. Total O&M for the WWTP with Option 2 implemented would therefore be projected at $1.9 Million per years.

6.4.2. Option 3

The flow diversion option has significantly lower O&M costs. The pump station would require part time staffing for daily checks on equipment and scheduling of screenings removal. The pump station would be connected to a Supervisory Control and Data Acquisition (SCADA) system that would provide for remote monitoring of the station. Maintenance of pumping systems, standby generator and ancillary systems would be in line with current costs. Major cost would be associated with electrical consumption.

Yearly O&M costs are projected to be $743,000 in 2017 dollars. This represents a 50% reduction in O&M costs over current WWTP operating costs.

Table 5 – O&M for Flow Diversion Pump Station

PUMP STATION O&M COSTS			
			Annual Cost
*	Electrical	Pumps	$636,000
		Miscellaneous Equipment	$25,000
	Gas		$5,000
	Water		$1,000
	Supplies		$2,500
	Spare Parts		$3,000
	Contracted Services		$25,000
**	Personnel (2 hr/day)		$36,500
	Communications		$1,500
	Landscaping		$2,500
	Snow Removal		$5,000
		TOTAL	**$743,000**
Notes			
*	1 pump at 24 hr/day, 1 pump at 8hr/day		
**	operator at $50/hr include benefits		

6.5. Financing

For the City to undertake a $42 Million project is a financial challenge. The City will be pursuing number of grant opportunities and low cost financing. Outright procurement of grants would assist in defraying the balance of project costs. Grants and loan opportunities include:

6.5.1. Grants

- New York State Environmental Facilities Corp (NYSEFC)
  Clean Water Infrastructure Act (WIIA) of 2017 - $112.5 M available for clean water (wastewater) infrastructure projects to assist in overall funding of projects to gain compliance with related environmental and public health laws. Grants available for up to 25% of eligible project costs with a $5 Million maximum grant. These grants are issued through the Consolidated Funding Application administered by the Regional Economic Development Council (REDC).

- New York State Environmental Facilities Corp (NYSEFC)
  Inter-municipal Grant (IMG) Program -$30 Million available Statewide and targeted for those projects involving two (2) or more municipalities working together to repair shared water quality infrastructure to gain compliance with related environmental and public health laws. Requires that an inter-municipal agreement (IMA) between the municipalities to be in place. Up to 40% of eligible project costs with a maximum of a $10 Million grant. The City and Nassau County have executed an IMA that states the cooperation of implementing Option No. 3 Flow Diversion.
- FEMA Hazard Mitigation Grant Program (HMGP)
  The City has previously secured approval of a Project Worksheet (PW) for hardening of the WWTP site. The PW is for $5 Million and must be directed towards the hardening of the WWTP from future storm events. It may be possible to secure the PW and apply it towards the hardening of the proposed Flow Diversion Pump Station building.

It should be noted that New York State has recently allocated up to $10 Billion for future water quality projects including both clean water (wastewater) and drinking water projects. The specifics of how these funds will be applied are being developed but it is believed that the above grant programs will be in place for a minimum of 5 years with additional grant programs being introduced for improvement of water quality and consolidation of infrastructure projects.

6.5.2. Loans

- New York State Environmental Facilities Corp

  State Revolving Loan Fund (SRF) Program. The SRF program offers long term low interest financing for wastewater projects. The subsidized interest rate can result in the savings of millions of dollars over a 20-30 construction loan payback period. The City as part of applying for the above noted NYSEFC grants will be registered on the Intended Use Plan (IUP) allowing the City to participate in the SRF program.
- Other Potential Sources of Financing
  - Seek funds through traditional municipal bonding process
  - Nassau County funding of project design
  - Local Economic Development Council
  - Discretionary funds from State Assembly and State Senate members directed to the specific legislative districts that would benefit from the project.

7. Permits and Authorizations

Both Alternatives for achieving compliance with the NYSDEC Order on Consent will require the City to prepare, submit and obtain permits for the construction work. For Option No.2 Upgrading of the WWTP to achieve nitrogen reduction the amount of permitting is limited as the construction work would be occurring within the boundaries of the existing facility. As the facility is located on the waterfront and adjacent to tidal wetlands and navigable waters, there is the need to submit and obtain approval for the following permits and or authorizations:

- NYSDEC - Article 25 Tidal Wetlands
- Joint Application – NYSDEC, Department of State, Army Corp of Engineers
- NYSDEC – dewatering
- NYSDEC – SPDES permit modification

For Alternative No.3 the Recommended Option, Diversion of Flow to Bay Park STP, the amount of permits and authorizations significantly increases. There will be a requirement to prepare and submit for the following permits and authorizations:

- Town of Hempstead
  - Installation of force main piping in bottom of Reynolds Channel
  - Local road opening permits
  - Construction easements on Town property
  - Permanent maintenance easement
- Nassau County Department of Public Works
  - Road opening permits
  - Maintenance and Protection of Traffic
  - Traffic signals
  - Acceptance of sewage at Bay Park
  - Construction easements
- Village of Island Park
  - Local Village road opening permits (if required)
- NYSDEC
  - Joint Permit Application
  - Approval of Design and Contract Documents
  - Tidal Wetlands
  - Dewatering – along force main route
  - Bay Park STP SPDES – for acceptance of City wastewater
  - Decommissioning and closure of City's WWTP
- Army Corp of Engineers
  - Joint Permit Application
  - Construction permits for waterways construction
  - Tidal Wetlands
- Department of State
  - Waterfront development plan consistency
  - Coordination of multi-agency waterfront activities

- United States Coast Guard
  - Construction permit in navigable waters
- State Office of Parks, Recreation and Historic Preservation
  - Archeological and historic preservation
  - Coordination of site investigations (if required)
- City of Long Beach
  - Road opening permits
  - Construction easements for jacking pits and HDD pits
- LIRR
  - Work permits for jacking underneath tracks
  - Construction and maintenance easements
- Utility Coordination
  - PSEG – electric
  - Nat Grid – gas
  - Nassau County – sewer and storm water systems
  - Verizon – communications
  - Cablevision – cable and fiber optics
  - Hempstead Water

There may be additional permits and authorizations required, these may be identified during the detailed design phase. Coordination with the utility owners would occur early in the design phase by request for information (FOIL) and utility workshops. This would allow utility owners to anticipate construction along the force main route and participate in the location of said utilities and possibly upgrade or relocate their respective utility if necessary. Anticipated utility owners that would be contacted during the design phase through the FOIL process would include:

- National Grid
- PSEG
- Cablevision
- Horizon
- City of Long Beach – water, sewer and drainage

- Nassau County – sewer and drainage
- Town of Hempstead – drainage
- American Water – water mains

Utility coordination meetings will be conducted during the design phase to determine if test pitting or other investigative measures need to be undertaken to potential conflicts exist so that the design of the force main can be adjusted or the utility(ies) relocated.

8. SEQRA

8.1. Procedures

In New York State (NYS), most projects or activities proposed by a state agency or unit of local government (*e.g.*, Suffolk County) require an environmental impact assessment as described by the State Environmental Quality Review Act (SEQRA) under NYS Environmental Conservation Law (ECL) and regulations under NYCRR § 617 (Part 617). Specifically, "*No agency involved in an action may undertake, fund or approve the action until it has complied with the provisions of SEQRA. A project sponsor may not commence any physical alteration related to an [agency] action until the provisions of SEQRA have been compiled with.*"

There are three categories of actions, Type 1, Type II and Unlisted. A Type I action is likely to have a significant negative impact on the environment and would likely require preparation of an Environmental Impact Statement (EIS). A Type II action is not likely to have a significant impact on the environment and would be exempt from environmental review. An Unlisted action does not meet the Type I threshold but would be subject to review by the lead agency to determine whether it may cause significant adverse environmental impacts. Transferring the City's sewage to Bay Park STP for treatment would under most circumstances be an Unlisted Action having no adverse environmental impact. As the City has negotiated an Order on Consent with the NYSDEC directing the City to proceed with this alternative, this project is a Type II action. This is discussed further within this section.

For upgrading or converting the WWTP to a flow diversion pump station, the City would be required to complete a Full Environmental Assessment Form (EAF) to determine if there would be environmental impacts from the proposed Action. The EAF is a checklist identifying areas of significant environmental impacts. A properly completed EAF must contain enough information to describe the proposed action, its location, purpose, and potential impacts to the environment. The completed EAF also identifies the project or the 'Action.' The Lead Agency (City or Nassau County if a joint project) would review the completed EAF and if appropriate, circulate the completed EAF to interested and involved agencies for comment. It is anticipated that The Lead Agency would likely make a 'Negative Declaration' that the proposed Action would not have significant adverse impacts on the environment and would therefore not require the preparation of an Environmental Impact Statement (EIS). The Negative Declaration would be submitted in writing to all involved and interested parties. The issuance of the Negative Declaration would end the SEQRA process.

As the City and the NYSDEC have executed an Order on Consent directing the City to proceed with this alternative, the project is a SEQRA Type II action pursuant to 6 NYCRR 617.5(c)(29). The process will be that the City as Lead Agency would prepare a short form EAF and then prepare a Negative Declaration finding statement. In referencing 6 NYCRR 617.5(c)(29). 6 NYCRR 617.5(c)(29), states in relevant part the following:

> *617.5 Type II actions.*
> *(a) Actions or classes of actions identified in subdivision (c) of this section are not subject to review under this Part. These actions have been determined not to have a significant impact on the environment or are otherwise precluded from environmental review under Environmental Conservation Law, article 8. The actions identified in subdivision (c) of this section apply to all agencies.*

(b) Each agency may adopt its own list of Type II actions to supplement the actions in subdivision (c) of this section. No agency is bound by an action on another agency's Type II list. An agency that identifies an action as not requiring any determination or procedure under this Part is not an involved agency. Each of the actions on an agency Type II list must:
(1) in no case, have a significant adverse impact on the environment based on the criteria contained in section 617.7(c) of this Part; and
(2) not be a Type I action as defined in section 617.4 of this Part.

(c) The following actions are not subject to review under this Part:
(29) civil or criminal enforcement proceedings, whether administrative or judicial, including a particular course of action specifically required to be undertaken pursuant to a judgment or order, or the exercise of prosecutorial discretion;(emphasis added)

9. Project Schedule

9.1. Option 3

Flow Diversion to Bay Park STP is a large regional project that will take several years to implement. Similar projects undertaken by the Nassau County Department of Public Works include the consolidation of the Villages of Lawrence and Cedarhurst wastewater infrastructure and the current flow diversion project for flow diversion of Village of Hempstead sewage to the County's Cedar Creek WPCP. Typical tasks and time frames are as follows:

Task	Required Time
Procure Design Engineer	6 months
Field Investications	3 months
Detailed Design (Plans & Specs)	12 months
Complete Financing and Approvals	6 months
Bid Process – Award Contracts	6 months
Construction of Infrastructure	24 months
Plant Decommissioning	6 months

This would have the total project timeline being 63 months.

9.2. Phasing

As the project is currently projected to require $42 Million (2017 dollars) the ability of the City to finance all or a portion of the project has not been defined. The City as noted in Section 6.5 is applying for several grants that are available. The flow diversion project fits several of the grants that pertain to water quality improvement and intermunicipal cooperation in resolving long standing environmental issues. If the City is unable to finance the entire project at one time, it may be possible to consider constructing the project in phases. The phases would be developed based on both technical and financial conditions. As previously noted, the grant programs are expected to continue in the coming years and may be able to be tied to a phased construction approach. Phases could be as follows:

9.2.1. Phase 1 – Design of Project

In this first phase, the City/County would issue a Request For Proposals (RFP) to bring a design team on board to perform the detailed design for the entire project. In this phase specific tasks would be undertaken including:

- field investigations including soil borings and topographic survey
- detailed design of pump station hardening and new equipment
- detailed design of force main piping
- development of Contract Documents (Plans & Specifications)
- Permit Applications
- Financing applications
- SEQRA and NEPA
- Initiate the Bid Process for Phase 2 construction work

9.2.2. Phase 2 – Austin Boulevard Force Main Segment

This portion of the force main piping is already in design with a completion date of late summer of 2017. The County is contemplating installing this section of force main piping as they will be constructing Austin Boulevard later in the year. If it is determined that the City and the County are joining to undertake this project, then this phase could be undertaken concurrent with bringing on a design team for the balance of the flow diversion improvements (Phase 1).

9.2.3. Phase 3 – Long Beach Road Force Main Segment

As it will be necessary to establish the connection to the County's Sewer Collection District No. 2 prior to any diversion occurring, it is reasonable that the continuation of the force main piping from Austin Boulevard would continue north on to Long Beach Road to the proposed connection point on West Cortland Road in Oceanside.

9.2.4. Phase 4 – Reynolds Channel Force Main Crossing

This segment of the force main piping is the most challenging. The force main piping on the mainland is expected to be installed using the more standard open cut methods with sheeting and dewatering. As the force main must traverse underneath Reynolds Channel, it will require the use of less conventional techniques such as micro tunneling or horizontal directional drilling (HDD). At this time it is envisioned that HDD will be used to install the force main underneath the channel from a point commencing on Long Beach to a point terminating on the mainland at the southern terminus of Austin Boulevard. This phase would also include the last piece of force main segment from the flow diversion pump station under the LIRR and connecting to the Long Beach side of the HDD entrance pit.

9.2.5. Phase 4 – Flow Diversion Pump Station

Phase 4 would include the hardening of the flow diversion pump station using either a perimeter flood wall or hardening of the building itself. All new flow diversion equipment including pumps and screening equipment would be installed. Building improvements including new roofs, windows, doors, lighting, HVAC etc would be undertaken. Maintenance of existing treatment plant operations would need to continue while the changeover to flow diversion is initiated. It is expected that the startup and changeover would take 60 days to complete.

9.2.6. Phase 5 – Decommissioning of WWTP

Upon completion of Phase 4, the flow diversion pump station would be coming on line and the ability to divert back to the existing WWTP will remain in place for a prescribed period of time. At a point where the flow diversion pump station has demonstrated its reliability and no backup is required, the decision will made to decommission the existing WWTP in accordance with NYSDEC requirements. This will include the removal of all residuals; grit and biosolids, removal of yard piping, process equipment and buildings. As the site is adjoining waterfront, it is possible that an RFP would be issued for the demolition and restoration of the site.

APPENDIX A

Engineers Certification

Appendix C: Engineering Report Certification (required)

Engineering Report Certification

To Be Provided by the Professional Engineer Preparing the Report

During the preparation of this Engineering Report, I have studied and evaluated the cost and effectiveness of the processes, materials, techniques, and technologies for carrying out the proposed project or activity for which assistance is being sought from the New York State Clean Water State Revolving Fund. In my professional opinion, I have recommended for selection, to the maximum extent practicable, a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation, and energy conservation, taking into account the cost of constructing the project or activity, the cost of operating and maintaining the project or activity over the life of the project or activity, and the cost of replacing the project and activity.

Title of Engineering Report: CITY OF LONG BEACH FLOW DIVERSION PUMP STATION & FORCE MAIN (DRAFT)

Date of Report: June 2017

Professional Engineer's Name:

Signature:

Date: 6/21/17

APPENDIX B

City of Long Beach SPDES Permit

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)
DISCHARGE PERMIT

Flrsl3,99

Industrial Code:	**4952**	SPDES Number:	**NY- 0020567**
Discharge Class (CL):	**05**	DEC Number:	**1-2809-00045/00001**
Toxic Class (TX):	**N**	Effective Date (EDP):	**9/1/2004**
Major Drainage Basin:	**17**	Expiration Date (ExDP):	**9/1/2009**
Sub Drainage Basin:	**02**	Modification Dates:(EDPM)	**8/20/2008, 1/12/2009**
Water Index Number:	**MDB-RC (portion)**		
Compact Area:	**IEC**		

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. §1251 et.seq.)(hereinafter referred to as "the Act").

PERMITTEE NAME AND ADDRESS

Name: **City of Long Beach** Attention: **Commissioner Robert Raab**
Street: **1 West Chester Street**
City: **Long Beach** State: **NY** Zip Code: **11561**
is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name: **Long Beach Water Pollution Control Facility**
Location (C,T,V): **Long Beach (C)** County: **Nassau**
Facility Address: **National Blvd. And Bay Dr.**
City: **Long Beach** State: **NY** Zip Code:
NYTM -E: NYTM - N: 4
From Outfall No.: **001** at Latitude: **40 ° 35 ′ 38 ″** & Longitude: **73 ° 39 ′ 59 ″**
into receiving waters known as: **Reynold's Channel** Class: **SB**
and; (list other Outfalls, Receiving Waters & Water Classifications)

in accordance with: effluent limitations; monitoring and reporting requirements; other provisions and conditions set forth this permit; and 6 NYCRR Part 750-1.2(a) and 750-2.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS

Mailing Name: **Long Beach Water Pollution Control**
Street: **1 West Chester Street**
City: **Long Beach** State: **NY** Zip Code: **11561**
Responsible Official or Agent: **William Notholt, Chief Operator** Phone: **(516) 431-5691**

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

DISTRIBUTION:

CO BWP - Permit Coordinator
RWE 1
RPA
EPA Region II - Michelle Josilo
NYSEFC
IEC
BWC

Deputy Chief Permit Administrator: Stuart M. Fox	
Address: Division of Environmental Permits 625 Broadway Albany, NY 12233-1750	
Signature: Stuart M. Fox	Date: 12 / 31 / 08

PERMIT LIMITS, LEVELS AND MONITORING DEFINITIONS

OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
	This cell describes the type of wastewater authorized for discharge. Examples include process or sanitary wastewater, storm water, non-contact cooling water.	This cell lists classified waters of the state to which the listed outfall discharges.	The date this page starts in effect. (e.g. EDP or EDPM)	The date this page is no longer in effect. (e.g. ExDP)

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQ.	SAMPLE TYPE
e.g. pH, TRC, Temperature, D.O.	The minimum level that must be maintained at all instants in time.	The maximum level that may not be exceeded at any instant in time.	SU, °F, mg/l, etc.		

PARA-METER	EFFLUENT LIMIT	PRACTICAL QUANTITATION LIMIT (PQL)	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE
	Limit types are defined below in Note 1. The effluent limit is developed based on the more stringent of technology-based standards, required under the Clean Water Act, or New York State water quality standards. The limit has been derived based on existing assumptions and rules. These assumptions include receiving water hardness, pH and temperature; rates of this and other discharges to the receiving stream; etc. If assumptions or rules change the limit may, after due process and modification of this permit, change.	For the purposes of compliance assessment, the analytical method specified in the permit shall be used to monitor the amount of the pollutant in the outfall to this level, provided that the laboratory analyst has complied with the specified quality assurance/quality control procedures in the relevant method. Monitoring results that are lower than this level must be reported, but shall not be used to determine compliance with the calculated limit. This PQL can be neither lowered nor raised without a modification of this permit.	Type I or Type II Action Levels are monitoring requirements, as defined below in Note 2, that trigger additional monitoring and permit review when exceeded.	This can include units of flow, pH, mass, Temperature, concentration. Examples include µg/l, lbs/d, etc.	Examples include Daily, 3/week, weekly, 2/month, monthly, quarterly, 2/yr and yearly.	Examples include grab, 24 hour composite and 3 grab samples collected over a 6 hour period.

Note 1: DAILY DISCHARGE: The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for the purposes of sampling. For pollutants expressed in units of mass, the 'daily discharge' is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the 'daily discharge' is calculated as the average measurement of the pollutant over the day. DAILY MAX: The highest allowable daily discharge. DAILY MIN: The lowest allowable daily discharge. MONTHLY AVG (daily avg): The highest allowable average of daily discharges over a calendar month, calculated as the sum of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. RANGE: The minimum and maximum instantaneous measurements for the reporting period must remain between the two values shown. 7 DAY ARITHMETIC MEAN (7 day average): The highest allowable average of daily discharges over a calendar week. 12 MRA (twelve month rolling avg): The average of the most recent twelve month's monthly averages. 30 DAY GEOMETRIC MEAN (30 d geo mean): The highest allowable geometric mean of daily discharges over a calendar month, calculated as the antilog of : the sum of the log of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. 7 DAY GEOMETRIC MEAN (7 d geo mean): The highest allowable geometric mean of daily discharges over a calendar week.

Note 2: ACTION LEVELS: Routine Action Level monitoring results, if not provided for on the Discharge Monitoring Report (DMR) form, shall be appended to the DMR for the period during which the sampling was conducted. If the additional monitoring requirement is triggered as noted below, the permittee shall undertake a short-term, high-intensity monitoring program for the parameter(s). Samples identical to those required for routine monitoring purposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both concentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was triggered. Results may be appended to the DMR or transmitted under separate cover to the same address. If levels higher than the Action Levels are confirmed, the permit may be reopened by the Department for consideration of revised Action Levels or effluent limits. The permittee is not authorized to discharge any of the listed parameters at levels which may cause or contribute to a violation of water quality standards. TYPE I : The additional monitoring requirement is triggered upon receipt by the permittee of any monitoring results in excess of the stated Action Level. TYPE II: The additional monitoring requirement is triggered upon receipt by the permittee of any monitoring results that show the stated action level exceeded for four of six consecutive samples, or for two of six consecutive samples by 20 % or more, or for any one sample by 50 % or more.

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL No.	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	All year unless otherwise noted	Reynold's Channel	1/12/09	9/1/09

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Location Inf.	Location Eff.	
Flow	Monthly Avg	7.5	mgd			Continuous	recorder		x	
BOD_5	Monthly Avg	30	mg/l	1900	lbs/d	2/week	24 hr. comp.	x	x	(1)
BOD_5	7 Day Avg	45	mg/l	2800	lbs/d	2/week	24 hr. comp.		x	
BOD_5	6 Consec Hourly Mean	50	mg/l			2/week	24 hr. comp.		x	(2)
Solids, Suspended	Monthly Avg	30	mg/l	1900	lbs/d	2/week	24 hr. comp.	x	x	(1)
Solids, Suspended	7 Day Avg	45	mg/l	2800	lbs/d	2/week	24 hr. comp.		x	
Solids, Suspended	6 Consec Hourly Mean	50	mg/l			2/week	24 hr. comp.		x	(2)
Solids, Settleable	Daily Max	0.3	ml/l			3/day	Grab		x	
pH	Range	6.0 - 9.0	SU			3/day	Grab		x	
Nitrogen, Ammonia (total $NH_3 + NH_4$)	Monthly Avg	9.5	mg/l			2/week	24 hr. comp.	x	x	(3)
Nitrogen, TKN (as N)	Daily Max	Monitor	mg/l			1/quarter	24 hr. comp.	x	x	
Nitrite (as N)	Daily Max	Monitor	mg/l			1/quarter	24 hr. comp.	x	x	
Nitrate (as N)	Daily Max	Monitor	mg/l			1/quarter	24 hr. comp.	x	x	
Phosphorus, Total (as P)	Daily Max	Monitor	mg/l			1/quarter	24 hr. comp.	x	x	
Orthophosphate (as P)	Daily Max	Monitor	mg/l			1/quarter	24 hr. comp.	x	x	
Temperature	Daily Max	Monitor	Deg_F_			3/day	Grab		x	
Iron	Daily Max	Monitor	mg/l			1/quarter	Grab		x	(5)
Effluent Disinfection required: [X] All Year [ ] Seasonal from _____ to _____										
Coliform, Fecal	30 Day Geometric Mean	200	No./ 100 ml			2/week	Grab		x	(8,9, 10)
Coliform, Fecal	7 Day Geometric Mean	400	No./ 100 ml			2/week	Grab		x	(8,9, 10)
Coliform, Fecal	6 Consec. Hourly Mean	800	No./100 ml			2/week	Grab		x	(2)
Coliform, Fecal	Individual Sample	2400	No./100 ml			2/week	Grab		x	(2)
Coliform, Total	Monthly Median	700	No./100 ml			2/week	Grab		x	(8,9, 10)
Chlorine, Total Residual	Daily Max	0.5	mg/l			3/day	Grab		x	(4)

FOOTNOTES ON NEXT PAGE

ACTION LEVELS AND MONITORING

OUTFALL NUMBER	LEVELS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	All year unless otherwise noted	Reynold's Channel	1/12/09	9/1/09

PARAMETER	EFFLUENT LIMIT		PQL mg/L	MONITORING ACTION LEVEL		UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	Monthly Avg.	Daily Max.	Daily Max.	TYPE I	TYPE II				
Toluene		Monitor				lbs/day	1/quarter	Grab	(6,7)
Chloroform		Monitor				lbs/day	1/quarter	Grab	(6,7)
Methylene Chloride		Monitor				lbs/day	1/quarter	Grab	(6,7)

FOOTNOTES:

(1) Effluent shall not exceed 23 % and 15 % of influent concentration values for BOD_5 & TSS respectively.

(2) This is an Interstate Environmental Commission (IEC) requirement. The permittee is not required to perform this sampling but shall be required to meet the permit limit at all times. EPA, DEC or IEC may perform the sampling.

(3) An interim limit of 23 mg/l shall be effective until a nitrification system is installed to meet the final effluent limit of 9.5 mg/L in accordance with the Schedule of Compliance on page 9 of this permit.

(4) An interim Total Residual Chlorine limit of 3.0 mg/l is in effect until the disinfection system is upgraded to meet the final effluent limit of 0.5 mg/l in accordance with the Schedule of compliance on page 9 of this permit.

(5) Grab samples shall be taken during periods of normally high iron concentrations, at the outfall 001 final effluent sampling location, and when the conveyance of iron sludge discharge from the municipal water supply into the outfall 001, the sampling location shall be the point of admixture of iron sludge.

(6) Composite samples for volatile organic compounds shall be collected in accordance with 6 NYCRR 750-2.5(a)(2)(iii).

(7) The Permittee shall report both the mass loading (lbs/day) and the concentration of toluene, chloroform and methylene chloride (μg/l) to the Department.

(8) Additional Coliform Limitations and requirements:

- i. The multiple tube fermentation is the only approved fecal and total coliform testing procedure.
- ii. Facilities may regularly sample on a more frequent schedule than the minimum required by this permit.
- iii. For facilities sampling less than ten (10) times per month, the estimated 90th percentile of total coliform readings shall not exceed an MPN of 3,300/100 ml for the 3 tube per decimal dilution MPN test, nor an MPN of 2,300/100 ml for the 5 tube per decimal dilution MPN test. The estimated 90th percentile is calculated using the Guideline in the National Shellfish Sanitation Program Manual of Operations, 1989 revision, page APF-3 or the method found at www.cfsan.fda.gov/~nss2-42g.html.
- iv. For facilities sampling ten (10) or more times per month, no more than 10 percent of the total coliform readings shall exceed an MPN of 3,300/100 ml for the 3 tube per decimal dilution MPN test, nor an MPN of 2,300/100 ml for the 5 tube per decimal dilution MPN test.

(9) Grab samples shall be taken during the periods which include normally high effluent flow.

(10) Additional sampling to assure adequacy and consistency of disinfection for the protection of shellfish harvesting; each April and August. Permittee shall analyze Fecal and Total coliform grab samples:

- i. Taken every two hours, for one day.
- ii. Taken twice on each of seven consecutive days.
- iii. Report the above results in a addendum to the applicable Discharge Monitoring Report.
- iv. Include the above results in applicable Discharge Monitoring Report calculations.

APPENDIX C

Technical Memorandum 2014

Technical Memorandum

Prepared For: Nassau County Department of Public Works

Prepared By: Joseph Husband, P.E.

Date: June 24, 2014

Subject: Conceptual Cost Estimates for TN Removal at Long Beach WPCP

The purpose of this memorandum is provide an AAEE Class 4 Cost Estimate (which is typically associated with feasibility studies and based on parametric models) for the construction cost and additional O&M cost to implement nitrogen removal at the Long Beach WWTP to achieve an effluent total nitrogen of 8 mg/l, 4 mg/l or 2 mg/l. This evaluation was based on information concerning the existing plant performance and facilities provided in Dvirka and Bartilucci, Consulting Engineers (D&B) report entitled "Nitrification Upgrade and Sewage Treatment Plant improvements Engineering Report" (Report) dated July 2011. Subsequent analysis performed by ARCADIS was based on engineering experience and previous work at facilities similar in size and nutrient upgrading needs. Specifically, the analysis of the Port Chester WWTP in Port Chester NY which was required evaluated and options were developed to achieve an effluent TN of ~ 4 mg/l.

Background

The Long Beach STP is a 7.5 mgd treatment facility consists of screening, grit removal, primary clarifiers, secondary treatment via trickling filter (plastic media), final clarifiers, sand filters and hypochlorite disinfection. The site is relatively small with no significant open space for additional facilities (see Figure 1). In 2008, NYSDEC issued a new permit requiring an effluent ammonia concentration limit of 9.5 mg/l which needs to be implemented by January 2017. Subsequently, D&B was retained and produced a report that evaluated six alternatives to achieve an ammonia limit of 9.5 mg/l. Information concerning the existing facility was taken from this Report.

Figure 1 – Long Beach WWTP

The existing facility consists of the following major process components:

- Influent pump station with a firm capacity of 21.2 mgd.
- Grit Tanks – two units designed to remove 95% of 100 mesh grit at 7.5 mgd.
- Primary Settling – two units sized - 811 gpd/sf at 7.5 mgd.
- Trickling Filters – two units – 96 ft diameter with 5 ft of plastic media.
- Secondary Clarifiers – three units – 627 gpd/sf at 7.5 MGD
- Sand Filters – two traveling bridge units rated for 5.2 mgd (2 gpm/sf) and peak flow of 10.4 mgd

- Disinfection – Hypochlorite – 17 min detention time at peak flow
- Sludge Digestion - two anaerobic digester
- Belt Filter Press

Plant Performance

Effluent quality reported in D&B report (page 2-14 through 2-19), the plant average effluent quality from 2006 through June 2010 is shown in Table 1.

Table 1
Long Beach STP – 2006 though 2010

	Influent	Effluent
Flow, MGD		
- Average	4.91	-
- Max Day	6.8	-
- Peak Hour	11.2	-
- Instantaneous	17	-
BOD, mg/l	118	16.5 (86% removal)
TSS, mg/l	130	12.5 (91% removal)
TKN, mg/l	27.7	19.7
NH3-N, mg/l	19.4	17

As per D&B design, the treatment process was designed to accommodate the following flow range

- Average Flow = 7.5 mgd
- Peak hourly flow = 11.5 mgd
- Peak Wet Weather Flow = 20 mgd

Design Criteria used in the D&B study are shown in Table 2.

Table 2
D&B Design criteria for Ammonia Reduction Evaluation

	Current (2006)	Design
	Maximum Month	Maximum Month
Parameter		
Flow, average mgd	4.91	7.5
BOD, - mg/l - lbs/d	 144 5887	 144 9011
TSS, - mg/l - lbs/d	 175 7132	 175 10916
TKN, - mg/l - lbs/d	 36 1474	 36 2256
NH3-N, - mg/l - lbs/d	 22 855	 22/30[1] 1355/1848
Temp., °C - Minimum	 10.7	 10.7

[1] Primary effluent ammonia concentration inclusive of filtrate nitrogen

Primary Effluent Quality Estimated

Design for the BNR process will be based on the estimate by D&B of primary effluent as shown in Table 3.

Table 3
Evaluation Design Criteria for Primary Effluent

	Maximum Month
Parameter	
Flow, average mgd	7.5
BOD, mg/l	108
TSS, mg/l	87
NH3-N, mg/l	30
Temperature, C Minimum	10.7

D&B examined 6 alternatives with the most cost effective process being to increase the height of the existing trickling filters and modifying the type of plastic media in the trickling filters. All other options required additional structures and required demolition of existing buildings. Accordingly, expanding to achieve a TN of 8 mg/l, will be extremely challenging and would require the use of high rate treatment processes without removing the existing trickling filters and replacing these units.

Total Nitrogen Goal and Alternative Assessment

As requested, the challenge is to define the order of magnitude capital construction and O&M costs to implement total nitrogen removal at the Long Beach STP to achieve an effluent total nitrogen of 8, 4 or 2 mg/l on an annual basis.

Add on Nitrification and Denitrification Facilities

Since the existing tricking filter facility was designed to achieve secondary treatment, the natural TN removal process would be added after the existing final settling tanks and prior to the effluent sand filters to reduce ammonia to < 0.5 mg/l and reduce nitrate to the appropriate level as:

- < 6 mg/l for TN of 8 mg/l
- < 2 mg/l for TN of 4 mg/l
- < 0.5 mg/l for TN of 2 mg/l.

For this application with the tight space constraints for these process units, biological active filters (BAF) were considered as the appropriate process. Similar to deep bed sand filters, these processes are designed to allow for biological reactions to take place in the media. These units can remove BOD, oxidize ammonia and achieve denitrification (oxidized nitrogen to nitrogen gas) using microorganisms that grow on the media.

Similarities to Port Chester WWTP Conceptual Design

A similar challenge was presented for the Port Chester WWTP which had very little/no space available to achieve TN removal. Port Chester WWTP has primary treatment, rotating biological contactors (RBC) units, and final clarifiers. The facility was designed to treat 7.9 mgd with 13.4 mgd as the peak flow through the biological treatment process with all flow > 13.4 mgd up to 18 mgd treated through the primary clarifiers. The maximum month flow was 9.25 mgd. The number of RBC units would be reduced but still achieve an effluent BOD/TSS concentration in the order of 40 mg/l following clarification. It was estimated that a two

stage BAF system could be installed to achieve an effluent TN of 4 mg/l. These stages consisted of two stages:

- Stage 1 – Nitrification BAF units
- Stage 2 – Denitrification BAF units

The design criteria for a two stage system Nitrification and Denitrification following the RBC units were:
Biofor N cells - Nitrification Unit

- 6 – units at 600 sf per unit
- Dimensions of 20.17 ft. by 29.75 ft. with a depth of 12.1 ft.
- Media Volume = 43,557 cf
- Ammonia Loading = 26.4 lbs ammonia/1000 cf-d

Biofor DN cells

- 4 units at 427 sf per unit
- Dimensions of 18.17 by 23.5 ft with a media depth of 9.51 ft
- Media Volume – 16240 cf
- Nitrate Loading = 70.8 lbs NOx-N / 1000 cf-d

The total space for the BAF units and storage tanks was 95 ft. by 131 ft. = 12,500 sf plus a 60 ft. by 40 ft. - two story building for mechanical equipment and a secondary effluent pump station.

The estimated construction cost for the Port Chester conversion of a TN of 4 mg/l was $50 million in 2005 without escalation and contingency. The total estimated cost including escalation and contingency was $78 million. This considered all of the ancillary equipment, tankage, channels and maintenance of plant operation as the RBC units were demolished and existing facilities modified to accommodate additional equipment.

To bring the dollars to 2014, the ENR constructing index was used, thus 9800 (June 2014) / 7446 (June 2005) * $78 million = $103 million (2014) to achieve an effluent TN of 4 mg/l.

Long Beach BAF Two Stage Nitrification/Denitrification

We will assume that the current system will remain with all flow going through the trickling filter and secondary clarifiers. Secondary effluent flow in excess of 13.4 mgd (note the peak hour flow for Long Beach is 11.5 mgd), will bypass the nitrification/denitrification process.

Table 4 shows the comparison of the Port Chester and Long Beach STP loadings following secondary treatment.

Table 4 Comparison of Long Beach STP versus Port Chester Loadings		
	Long Beach[1]	Port Chester
Parameter	Maximum Month	Maximum Month
Flow, average mgd	7.5	9.5
BOD, - mg/l - lbs/d	 25 1560	 30 2380
TSS, - mg/l - lbs/d	 37 2314	 30 2380
TKN, - mg/l - lbs/d	 35 2190	 20.8 1650
NH3-N, - mg/l - lbs/d	 30 1880	 14.5 1150
Temperature, C Minimum	 10.7	 10

[1] D&B Page 6-29

As shown above, the nitrogen loading rate is much higher than in the Long Beach Facility and will require additional units. Therefore a rough, order of magnitude cost capital cost to install a BAF system capable of achieving a TN of 4 mg/l (same as Port Chester) would be approximately pro-rated by the ammonia loading on the system.

Scaling Port Chester to Long Beach Application

Since the first alternative is to maintain the existing system and install a nitrification and denitrification process between the final clarifiers and existing sand filters, based on the above loadings, a simple process estimate for Long Beach would be to increase the number of units by the ration of influent ammonia loading on the BAF units. Therefore

Nitrification: Long Beach (1880 lbs NH3-N/Port Chester 1150 lbs NH3-N) * 6 Biofor N units = 9.8 – say 10 Biofor N units.

Denitrification: (1880/1150) * 4 Biofor DN = 6.5 – say 7 DN units.

Accordingly, compared to the Port Chester Facility, the rough sizing of the BAF units would be approximately 17 BAF units (2-stage of N and DN) at Long Beach versus 10 units at Port Chester (3-stage C, N and DN). Therefore, the total area requirement would be increased by approximately 30% to 16,000 sf for the BAF units and the 2,400 sf for the Equipment Building is assumed to be the same. If sufficient space is available, the order of magnitude cost estimate for implementing TN removal to achieve 4 mg/l TN would be $103 million (2014) + an additional $22 million for the additional BAF units to $125 million (2014).

Based on the work by D&B and examining the existing site plan, it will be difficult, to fit these units on the existing site. It will require demolition of the maintenance building (South east portion of the site) and locating facilities throughout the existing site. Accordingly, the cost for implementing TN removal may be higher but would require significant additional analysis.

Cost for 8 mg/l TN and 2 mg/l TN

The capital cost to achieve a monthly TN of 8 mg/l would be less since the number of BAF units could be reduced, particularly the nitrification and denitrification reactors and still achieve 8 mg/l TN. Based on experience, the total cost could be discounted by 30%. As to achieving a TN of 2 mg/l, this would require increasing the redundancy of the number of nitrifying and denitrifying BAF units since there is no "cushion" if a unit were out of service. Accordingly the cost would increase by a factor of 30%. It should be noted that O&M costs would be different due to the lower methanol requirement to achieve 8 mg/l TN versus 4 mg/l or 2 mg/l TN.

In summary, an order of magnitude cost estimate to install a BAF treatment process to achieve total nitrogen limits of 2, 4, or 8 mg/l are shown in Table 5.

Table 5
Construction Cost Order of Magnitude Estimate

Effluent TN mg/l	Construction Cost (2014) $ million
2	$162
4	$125
8	$88

O&M Costs

The additional O&M costs were projected to accomplish the various levels of total nitrogen. Table 6, 7 and 8 shows the estimated costs for the additional O&M associated with going from secondary treatment to a TN of 8, 4, 2 mg/l.

Table 6
O&M Estimate for TN 8 mg/l

Description	Quantity	Unit	Unit Cost	Annual Cost
Labor	2	EMP	$90,000	$180,000
Equipment Maintenance	1	LS	1,100,000	$1,100,000
Electric	630,000	kW-hr	$0.1	$63,000
Chemicals Methanol Caustic	274,000	 Gallons/year Gallons/year	 $2/gallon $0.8	 $548,000 $120,000
Sludge Handling	445	Dry tons/year	$225/dry ton	$100,000
Total				$2,211,000

Table 7

O&M Estimate for TN 4 mg/l				
Description	Quantity	Unit	Unit Cost	Annual Cost
Labor	2	EMP	$90,000	$ 180,000
Equipment Maintenance	1	LS	1,200,000	$1,200,000
Electric	700,000	kW-hr	$0.1	$70,000
Chemicals Methanol Caustic	 320,000 150,000	 Gallons/year Gallons/year	 $2/gallon $0.8	 $640,000 $120,000
Sludge Handling	490	Dry tons/year	$225/dry ton	$110,000
Total				$2,320,000

Table 8 O&M Estimate for TN 2 mg/l				
Description	Quantity	Unit	Unit Cost	Annual Cost
Labor	2	EMP	$90,000	$ 180,000
Equipment Maintenance	1	LS	1,300,000	$1,300,000
Electric	770,000	kW-hr	$0.1	$77,000
Chemicals Methanol Caustic	 340,000	 Gallons/year Gallons/year	 $2/gallon $0.8	 $680,000 $120,000
Sludge Handling	514	Dry tons/year	$225/dry ton	$116,000
Total				$2,473,000

Summary

As requested an AAEE Class 4 Cost Estimate to install treatment processes that would achieve an effluent total nitrogen limit of 8, 4, or 2 mg/l was developed. This estimate was based on a conceptual design for a similar facility with space constraints. The costs are summarized in Table 9.

Table 9 Order-of-Magnitude Construction and O&M Cost to Achieve TN removal at the Long Beach STP				
		TN = 8 mg/l	TN = 4 mg/l	TN = 2 mg/l
Capital Cost	$ million	88	125	162
O&M Cost	$ million/annum	2.2	2.3	2.5

APPENDIX D

Process Calculations

PROCESS FORMULAS

Equation 1: Ten States Standards (2014), Peak Hourly Flow Rate Peaking Factor, PF

$$PF = \frac{18 + \sqrt{P}}{4 + \sqrt{P}} \text{ , where } P \text{ is population in thousands}$$

Equation 2: Detention Time, DT

$$DT(hrs) = \frac{Volume\ (gal)}{Flow\ Rate\ (gpd)} \times 24\ hrs$$

Equation 3: Surface Settling Rate, SSR

$$SSR\left(\frac{gpd}{sf}\right) = \frac{Flow\ Rate\ (gpd)}{Total\ Surface\ Area\ (sf)}$$

Equation 4: Pipe Velocity, V

$$Velocity\ (fps) = \frac{Flow\ (gpm)}{Pipe\ Area\ (sf)} \times \frac{1\ min}{60\ sec} \times \frac{0.13368\ cf}{1\ gal}$$

Equation 5: Friction Headloss, h_f

$$h_f = f\left(\frac{Length\ (ft)}{Diameter\ (ft)}\right)\frac{V^2}{2g} + k\left(\frac{Velocity\ (fps)^2}{2g}\right)$$

DETENTION TIMES AND SURFACE SETTLING RATES

Detention Time

$$DT(hrs) = \frac{Volume\ (gal)}{Flow\ Rate\ (gpd)} \times 24\ hrs$$

	Volume (gallons)	Detention Time (hr)			
		Flow Rate (MGD)			
		4.2	7.5	8.0	13.0
Grit Chamber	14,960.00	0.085	0.048	0.045	0.028
Primary Settling	830,100.48	4.743	2.656	2.490	1.532
Secondary Settling	850,588.20	4.861	2.722	2.552	1.570

	Volume (gallons)	Detention Time (min)			
		Flow Rate (MGD)			
		4.2	7.5	8.0	13.0
Grit Chamber	14,960.00	5.129	2.872	2.693	1.657
Primary Settling	830,100.48	284.606	159.379	149.418	91.950
Secondary Settling	850,588.20	291.630	163.313	153.106	94.219

Surface Settling Rate

$$SSR\left(\frac{gpd}{sf}\right) = \frac{Flow\ Rate\ (gpd)}{Total\ Surface\ Area\ (sf)}$$

	Total Surface Area (sf)	Surface Settline Rate (gpd/sf)			
		Flow Rate (MGD)			
		4.2	7.5	8.0	13.0
Primary Clarifier	9,248.00	454.152	810.986	865.052	1405.709
Secondary Clarifier	11,970.00	350.877	626.566	668.338	1086.048

TRICKLING FILTER PERFORMANCE

Number of Filters in Parallel	2					
Flowrate	7.5	MGD				
Flowrate Split to each filter	3.75	MGD				
Recirculation Rate	8	MGD				
Recirculation Rate to each filter	4	MGD				
Recirculation Ratio, R	1.066667		$R = \frac{Q_R}{Q}$	$F = \frac{1+R}{(1+R/10)^2}$		
Recirculation Factor, F	1.687473					
Each Filter						
Diameter	96	ft	Hydraulic Loading to Each Filter			
Depth, D	5	ft	1070.74 gal/ft d			
Filter Surface Area	7238	sf	43.63 m^3/m^2 d	Check hydraulic loading between	10 -	75
Volume of Plastic Media	36191	cf	Is loading within typical limits?	TRUE		
Volume of Plastic Media	1025	m^3				
Cross Sectional Area	480	sf				
Cross Sectional Area	44.6	m^2				
BOD_5 Conc at Plant-Influent	125	mg/L				
BOD_5 Conc at Plant-Effluent	14.0	mg/L				
Assume Removal from Primary Clarifiers	30%		Organic Loading Rate to Each Filter			
BOD conc at Inf to Trickling Filter, S_i	87.5	mg/L	1.210732 kg BOD/m^3 d	Check organic loading between	0.6 -	3.2
BOD Loading to Trickling Filter	2737	lb/d	Is loading within typical limits?	TRUE		
BOD Loading to Trickling Filter	1241	kg/d	75.62654 lb BOD/day/1,000 cf	Check organic loading between	12 -	181
				TRUE		
National Research Council (NRC) For a single stage filter	72.71	% BOD Removal Efficiency		$E_1 = \frac{100}{1+0.4432\sqrt{\frac{W_1}{VF}}}$		

		BOD Inf	BOD Eff
Total:	Average	125.4	14.2
	Minimum	58.4	4.0
	Maximum	2150.0	59.0
2015	Average	128.4	17.8
	Min	66.0	5.0
	Max	231.0	59.0
2016	Average	122.4	10.6
	Min	58.4	4.0
	Max	2150.0	33.3

APPENDIX E

Copy of Order on Consent

TATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

----------X

In the Matter of the Alleged Violations of Article 17 of the Environmental Conservation Law of the State of New York, and Part 750 et seq. of the Official Compilation of Codes, Rules and Regulations of the State of New York, and SPDES Permit # NY0020567

- by -

City of Long Beach,

Respondent.

----------X

ORDER ON CONSENT

DEC CASE NO:
CO 1-20151020-142

WHEREAS:

1. The New York State Department of Environmental Conservation, under its Commissioner, is a department of the State of New York ("DEC" or "Department") with jurisdiction to enforce the environmental laws of the State, pursuant to the Environmental Conservation Law ("ECL"), Title 6 of the Official Compilation of the Codes, Rules and Regulations of the State of New York ("NYCRR"), and orders and permits issued thereunder;

2. The City of Long Beach has offices at One West Chester Street, Long Beach, New York 11561 ("City" or "City of Long Beach" or "Respondent"), and owns the City of Long Beach's municipal wastewater treatment plant at National Blvd and Bay Drive, Long Beach, County of Nassau, New York ("WWTP"), and operates it under New York State Pollutant Discharge Elimination System ("SPDES") permit # NY0020567, which was issued by the Department. The WWTP discharges to Reynolds Channel a body of water located in the bay area north of Long Beach Island. Reynolds Channel is adjacent to and co-mingles with other bodies of water, including Hempstead Bay, Middle Bay, East Bay, Hog Island Channel, East Rockaway Inlet and Jones Inlet (collectively referred to as "Western Bays");

3. Nassau County owns and is responsible for its municipal wastewater treatment plants, including the sewage treatment facility at Bay Park ("Bay Park WWTP");

4. Respondent and the Department execute this Order on Consent ("2017 Order") to resolve Respondent's violations arising from the discharge of wastewater from the WWTP to the Western Bays, by implementing a plan to divert the flow of wastewater from the WWTP to the Bay Park WWTP for treatment and discharge

("Diversion Project"). This project will eliminate the need to repair and upgrade the WWTP to comply with the SPDES Permit requirements related to ammonia, and is estimated to cost significantly less than the project to upgrade the WWTP so that it complies with the SPDES Permit. This diversion of wastewater will also limit the significant costs to Respondent to abate excess nitrogen discharges that cause and/or contribute to violations of water quality standards;

5. DEC has jurisdiction over the abatement and prevention of pollution to the waters of the State pursuant to Article 17 of the ECL and 6 NYCRR Part 750, et seq. This jurisdiction also authorizes DEC to regulate the discharge of pollutants from point sources into the waters of the State in conformity with the requirements of the federal Clean Water Act ("CWA") 33 U.S.C. Section 1251 et seq., subject to the approval of such authority by the United States Environmental Protection Agency ("EPA") as provided in Sections 318, 402 and 405 of the CWA. EPA approved New York State's request to conduct a State permit program pursuant to the provisions of the National Pollutant Discharge Elimination System ("NPDES") under section 402 of the CWA based on its determination that the requirements of the State's regulatory program, the State Pollutant Discharge Elimination System ("SPDES") permit program, and ECL § 17-0801 et seq., are no less stringent than the requirements of the NPDES permit program as mandated by the CWA;

6. DEC has promulgated standards for the "quality and purity of the waters" of the State, commonly referred to as water quality standards ("WQS"), ECL § 17-0301. DEC has also classified most water bodies in New York, with classifications intended to support the best usage of a water body. See Section 703.2 of Title 6 of NYCRR setting forth the narrative water quality standard for turbidity which is "no increase that will cause a substantial visible contrast to natural conditions"; narrative water quality standard for discharges of suspended, colloidal and settleable solids to Class AA, SA and SB waters is "none from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages"; narrative water quality standard for discharges of phosphorus and nitrogen is "none in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages;"

7. Pursuant to its authority to protect the waters of the State, DEC administers the SPDES permit program. In general, the SPDES program prohibits any discharge of pollutants to the waters of the State without a permit establishing pollutant limitations and treatment requirements. Thus, SPDES permits set certain effluent limitation parameters ("parameters"), determined according to ECL §17-0809 and 6 NYCRR § 750-1.11, in order to avoid contravention of mandated water pollution control requirements and WQS. Those conditions address not only the allowable range of parameters for discharge of pollutants to the waters of the State, but also the manner in which the permittee is to operate, maintain, monitor, and report on its regulated facilities and activities;

8. Pursuant to 6 NYCRR § 750-2.2, a SPDES permit does not authorize any infringement of water quality standards and does not supersede Federal, State or local laws or regulations. Under ECL §17-0501, "(i)t shall be unlawful for any person, directly or indirectly, to throw, drain, run or otherwise discharge into such waters organic or inorganic matter that shall cause or contribute to a condition in contravention" of water quality standards for the receiving water;

9. ECL § 17-0511 prohibits the use of point sources unless in compliance with all standards, criteria, rules and regulations, and limitations. ECL § 17-0803 prohibits the discharge of pollutants to waters of the state from any outlet or point source without a SPDES permit, or in a manner other than as prescribed by such permit. 6 NYCRR Part 750-1.4(a) prohibits the discharge of any pollutant to the waters of the state, unless authorized by a SPDES permit and in accordance with the terms of the permit;

10. ECL §71-1929 provides that a person who fails to perform any duty imposed by Titles 1 through 11 inclusive and Title 19 of Article 17, the rules and regulations promulgated thereunder, or orders or determinations of the Commissioner promulgated thereto, shall be liable for a penalty of not to exceed thirty-seven thousand, five hundred dollars ($37,500) per day for each violation, and may be enjoined from any continuing violation;

Water Quality in the Western Bays

11. The contribution of nitrogen to the mass proliferation of a species of macro-algae known as ulva in the backbay waters north of Long Beach Island caused Hempstead Bay to be placed on the New York List of Impaired Waters (CWA Section 303(d) List) in 2006. The WWTP discharges to Reynolds Channel, which is immediately adjacent to, and intermingled with Hempstead Bay. These bodies of water are a portion of the Western Bays. Studies to date indicate that the WWTP contributes 5% of the total nitrogen load to Reynolds Channel and Hempstead Bay. Nitrogen contained in the WWTP's effluent is discharged into receiving waters that circulate up into the shallower back-bay waters of Hempstead Bay, mixing with such waters and influencing ulva growth. Tides, prevailing winds and currents in turn push large mats of the macro-algae/ulva into adjacent waters from Atlantic Beach to Jones Inlet. Throughout the Western Bays, ulva mats cover surface waters for much of the summer. Eventually the ulva dies and sinks to the bottom of the bays where it consumes oxygen from the waters, or it washes up on shore where it rots, leaving beaches unsuitable for recreation. The loss of dissolved oxygen in the waters due to excessive levels of plant growth and decay causes fish to leave the waters, and shellfish to perish;

12. On May 8, 2014, DEC released a report on the harmful impacts of nitrogen pollution on Long Island's coastal marshlands. The report synthesizes peer-reviewed literature and other scientific data on nitrogen pollution. The report details how coastal marshes and their vegetation provide natural infrastructure that calms storm surges and damaging waves along Long Island's south shore bays including the

Western Bays. Nitrogen pollution contributes to tidal marsh degradation by, among other things, causing grasses to grow taller but produce fewer and less dense roots which de-stabilizes the marsh grasses. The taller grasses with fewer and weaker roots are vulnerable to accelerated erosion from wave and tidal action;

13. As reflected in Schedule 1, the WWTP has periodically discharged effluent which exceeded limits allowed by the SPDES Permit for total suspended solids, ammonia and biological oxygen demand, and has periodically violated ECL §17- 0501 by discharging effluent containing nitrogen in amounts which is causing and/or contributing to a violation of the narrative water quality standards in Reynolds Channel and Hempstead Bay, and in the waters generally referred to as the "Western Bays;"

Super Storm Sandy

14. On October 29, 2012, Super Storm Sandy and the accompanying storm surge caused flooding at the WWTP, rendering the facility inoperable for an extended period. The flooding damaged electrical controllers throughout the plant, resulting in influent pump failures. The bar screen room was flooded, damaging motors and wires. Primary tanks and grit tanks were compromised due to sand inundation. Both sand filters were submerged, rendering them inoperable for some time. Respondent has repaired the sand filters, and they are functioning properly. The secondary clarifier auto wasting valves were also submerged, rendering them inoperable for some time. These facilities have also been repaired, and they are functioning properly. Pump failures in the collection system resulted in overflows and sewage backup into houses in both Long Beach and Lido Beach, and a bypass of the Lido Beach collection system through November 4, 2012, causing a discharge of untreated sewage to the waters of New York State;

15. Following Super Storm Sandy it was apparent that the WWTP could not be fully functional without significant capital investment. Due in large part to the extreme level of damage inflicted by Superstorm Sandy, the compliance actions planned for the WWTP were delayed. Since that occurred, Respondent and Nassau County began discussions focused on consolidating wastewater treatment services. As a result of those discussions, it became clear to Respondent that it may no longer be feasible or cost effective for Respondent to make the kind of capital investments that would be required for the long term use of the WWTP under the SPDES Permit's Schedule of Compliance;

Long Beach WWTP

16. DEC issued SPDES permit No. NY0020567 (SPDES Permit) to Respondent to treat up to 7.5 million gallons per day ("MGD") at the WWTP on December 1, 1984, and since then periodically renewed and modified the SPDES Permit, with the most recent modification effective on January 12, 2009. This was administratively renewed on September 1, 2014. Currently, the WWTP treats an

average of 4.3 MGD and discharges into Reynold's Channel which is part of the Western Bays;

17. The WQS for ammonia, measured as NH3, for Reynolds Channel is 0.89 milligrams per liter (mg/L). The best usage of Class SB waters are primary and secondary contact recreation and fishing. In accordance with Department guidance, the desktop dilution ratio at the WWTP discharge location into Reynolds Channel is 1 part effluent to 9 parts ambient water (10 to 1);

18. Respondent's SPDES Permit Schedule of Compliance required Respondent to submit by September 9, 2013, an approvable final design plan and specifications, as well as a schedule of construction for the facilities described in the Engineering Report, to meet its SPDES Permit effluent limits of 9.5 mg/L for ammonia, 0.5 mg/L for total residual chloride and 2.0 mg/L for dissolved oxygen;

19. Respondent failed to submit an approvable final design plan and specifications on September 9, 2013, and failed to submit a schedule of construction on September 9, 2013. Respondent alleges that it was due to the foregoing events that it failed to meet the requirements in the Schedule of Compliance in its SPDES Permit. Respondent requested a modification of the SPDES Permit on August 15, 2013 to modify the compliance schedule;

20. DEC has inspected the WWTP on a number of occasions since early 2014. Following a January 31, 2014 inspection, Respondent submitted a detailed corrective action plan to address noted deficiencies. DEC conducted additional inspections on June 24, 2014, September 25, 2015, November 20, 2015, March 2, 2016 and July 6, 2016. These inspections noted Respondent's deficiencies at the WWTP that were primarily the result of equipment failure and maintenance issues, many of which are related to the after-effects of Superstorm Sandy. The most recent Corrective Action Plan in Appendix A addresses the repairs needed to remedy these deficiencies at the WWTP;

21. The Corrective Action plan that is required and outlined in Appendix A will bring the WWTP into a state of good repair, but will not improve the facility to the extent needed to achieve compliance with the limits in the SPDES Permit for ammonia and nitrogen. This 2017 Order will bring the facility into compliance by June 2024 by either diverting the WWTP's current flow to the Bay Park WWTP for treatment and disposal, or by upgrading the Respondent's WWTP;

22. On November 8, 2013, Respondent met with the Department to discuss a number of compliance issues and the potential for Respondent to enter into an agreement with Nassau County for consolidation of sewage treatment services;

23. Respondent and Nassau County will consolidate wastewater treatment services which will render the WWTP unnecessary except as a pump station for the conveyance of sanitary waste to the Bay Park WWTP. Respondent and Nassau County

will execute an Inter-municipal Agreement ("IMA") providing for the consolidation of sewer services. In the event Respondent is unable to complete the Diversion Project, Respondent commits in this 2017 Order to upgrade its WWTP based on the limit of technology for nitrogen.

24. On December 10, 2015 the State awarded Nassau County $3.72 million in the form of a 25% grant and 75% loan to pay for the Engineering and Design Report to divert wastewater from the WWTP to the Bay Park STP;

25. This 2017 Order establishes the most effective approach to abate the exceedance of WQS by providing milestones and schedules for Respondent to divert wastewater from the WWTP to the Bay Park STP. In the event that circumstances beyond Respondent's control prevent Respondent from completing the Diversion Project, this 2017 Order will be modified according to its terms to provide the milestones and schedule to construct nitrogen removal facilities based on the limit of technology for nitrogen. Also, this Order shall set forth a deadline for the execution of an inter-municipal agreement ("IMA") between Respondent and the County of Nassau;

26. This 2017 Order, the Intermunicipal Agreement ("IMA") between the City of Long Beach and Nassau County, and the actions and projects that Respondent is required to take under this 2017 Order are Type II actions under ECL 8-0105(5) and 6 NYCRR §617.5 (c) (29); and

27. The parties agree to resolve all outstanding exceedances without further litigation. DEC and Respondent have agreed to the execution of this Order without further litigation and recognize that this 2017 Order is fair, reasonable, and in the public interest.

IT IS ORDERED:

I. BINDING EFFECT OF THIS ORDER ON CONSENT

Respondent and DEC are bound by, and Respondent agrees to follow and comply with, the terms, limits, provisions and requirements set forth in this 2017 Order including Appendices, and any modifications to this 2017 Order or its appendices or documents that will be incorporated herein, pursuant to Article XI Modifications below.

II. IMPLEMENTATION PROJECTS

A. Respondent shall complete the repair and replacement work required under, and in accordance with the terms of Appendix A which is hereby incorporated into the 2017 Order.

B. 1. Respondent shall, acting cooperatively with Nassau County, implement the measures required for the planning, design, construction and operation of a project to divert wastewater from the WWTP to the Bay Park WWTP ("Diversion

Project") for treatment and discharge to waters of the State in accordance with the schedule of compliance contained in Appendix B which is hereby incorporated into the 2017 Order. By October 2017, Respondent shall submit an approvable written report ("October 2017 Report".) The October 2017 Report shall propose:

i. an implementation schedule which shall at a minimum identify as milestones the Diversion Project's dates for Design Start, Design Completion, Notice to Proceed to Construction, and Construction Completion;

ii. estimate the costs associated with the Diversion Project; and

iii. describe potentially significant factors associated with the diversion of the WWTP to the Bay Park STP.

2. Upon approval by DEC, milestones identified in the October 2017 Report shall be incorporated into this 2017 Order as Appendix B, and shall be enforceable herein. Respondent shall certify in writing to DEC that it has complied with each milestone date within thirty (30) days of compliance. All milestone dates shall refer to the last day of the month indicated.

C. Respondent shall meet an interim limit for Ammonia of 23 mg/L until the Diversion Project is complete.

D. On its own initiative or no later than 30 days from receipt of notice by the Department that a modification of this 2017 Order is needed due to the fact that Respondent is unable to complete the Diversion Project, Respondent shall request a modification of this 2017 Order under the provisions of Section XI. (Modification) to propose an approvable revision to the schedule of compliance (Revised Appendix B) to upgrade its WWTP based on the limit of technology for nitrogen removal.

III. CIVIL PENALTY

A. Payable Civil Penalty

In satisfaction of all violations supported by the allegations in this Order and Schedule 1, which is attached to and incorporated into this 2017 Order, Respondent shall pay to DEC the sum of Twenty Thousand Dollars ($20,000) within 60 days of the effective date of this 2017 Order. The DEC case number (CO1-20151020-142) shall appear on the memo line on the face of the check. The civil penalty shall be paid by check, bearing the signature of an authorized representative of Respondent, made payable to the "Department of Environmental Conservation" and forwarded to the attention of the Revenue Department at:

NYS Department of Environmental Conservation
Division of Management and Budget Services

Attn: Revenue Department
625 Broadway, 10th Floor, Albany, NY 12233-4900B.

B. Suspended Penalty

1. A penalty of $4,000 shall be assessed against Respondent, and suspended, provided Respondent complies with all the terms of this Order. Respondent shall pay the amount of $4,000 if Respondent fails to timely comply with the terms of this 2017 Order including the milestones set forth in the attached Appendices.

2. If Respondent fails to comply with a term of this Order, then the Suspended Penalty amount shall become payable by Respondent to DEC as an ordinary civil penalty within 45 days of Respondent receiving written direction from DEC to make payment in accordance with the terms of Section III. A. above.

IV. DEFINITIONS

The following definitions shall apply to the implementation of and compliance with this 2017 Order:

A. Design Completion

1. Design shall be considered complete upon Respondent's submission of approvable plans and specifications to DEC for review. Approval or disapproval of such submission by DEC shall be given in writing by DEC within 60 days of Respondents' submittal. If DEC disapproves Respondent's submittal, Respondent shall be in violation of this 2017 Order. In the event DEC fails to respond in writing within 60 days of receipt, Respondent's submission shall be deemed approved. For purposes of this provision, the date of DEC's written response shall be the actual date of mailing, personal delivery or electronic transmission.

2. All final design documents submitted pursuant to this 2017 Order shall include a preliminary design critical path method ("CPM") analysis of sequential and parallel tasks for the purposes of identifying critical junctions in the project schedule and avoiding conflicts that could lead to delays. The Critical Path Method is a tool which provides a means of determining which jobs or activities, of the many that comprise a project, are "critical" in their effect on total project time, and how best to schedule all jobs in the project in order to meet a target date at minimum cost. To be approvable, the preliminary design CPM shall evaluate Respondent's ability to comply with the milestone dates set forth in the Appendices.

B. Notice to Proceed to Construction ("NTPC")

All contracts consist of 4 elements: "G (general construction)," "P (plumbing)," "E (electrical)," and "H (heating, ventilation and air conditioning)." NTPC milestones shall be met when, at a minimum, the "G" element is noticed to proceed to

construction. The noticing of any and/or all the other elements of a contract shall not be considered compliance with an NTPC milestone, until the "G" element is noticed.

C. Construction Completion

Construction shall be considered complete when all process-related equipment and facilities are constructed in accordance with the approved plans and specifications, and are placed in operation to meet the applicable SPDES permit requirements. In addition to the foregoing, Respondent shall make all best efforts to place in operation all treatment units and associated automatic controls as soon as they are operable up until the time the facility complies with its SPDES Permit requirements. Any dispute regarding Respondent's compliance with the best efforts clause shall be resolved in accordance with the Dispute Resolution procedure set forth in Section XII (Dispute Resolution) below.

V. PROJECT ADMINISTRATION

A. Respondent shall submit quarterly construction reports ("Quarterly Reports") to the DEC. The Quarterly Reports shall describe the actions which have been taken toward achieving compliance with this 2017 Order during the previous three-month period, including:

1. A list of Respondent's construction contracts necessary to fulfill the requirements of this 2017 Order, including compliance with all milestones. This list shall identify, by percentage, the amount of the contract that has been completed;

2. A detailed description of: (a) the work performed pursuant to this 2017 Order during the reporting period, including the status of all milestones; and (b) all anticipated activities for the next three-month period;

3. Information regarding unresolved delays encountered or anticipated that may affect the future schedule for implementation of Respondent's obligations under the 2017 Order, and efforts made to mitigate and/or cure those delays or anticipated delays;

4. A description of community relations activities during the reporting period and the activities anticipated for the next three months;

5. Any changes in key personnel; and

6. Any other issues with the potential to materially affect the projects set forth in this 2017 Order.

B. The Quarterly Reports shall include an executive summary that summarizes the information required by the preceding paragraph. Respondent shall

choose the format for the first executive summary, and shall modify the format in accordance with any subsequent reasonable requests by the DEC.

D. From the effective date of this 2017 Order, up until all requirements of this 2017 Order have been met, Respondent shall submit these Quarterly Reports to the DEC by the 30th day of the month following the end of a quarterly period. The quarterly periods are defined as January 1st- March 31st, April 1st - June 30th, July 1st - September 30th, and October 1st - December 31st.

E. In addition to the Quarterly Reports, representatives of the parties shall hold quarterly progress meetings to discuss and resolve any problems that may arise in the planning, design and construction of the upgrades set forth in this 2017 Order. Respondent shall utilize the Long Beach webpage on which it will post the quarterly reports. As necessary, responsible staff of Respondent involved in an aspect of Respondent's compliance with this 2017 Order shall attend progress meetings.

F. Within 30 days of the effective date of this 2017 Order, Respondent shall designate a Project Manager who reports to an executive officer of Respondent who will be responsible for assuring that the Project proceed as smoothly and efficiently as possible, and that Respondent complies with the terms of this 2017 Order (the "Project Manager"). Respondent shall notify the DEC of such designation. The Project Manager shall have, at a minimum, the following duties:

1. Coordinating Respondent's activities among its departments and agencies in order to expedite compliance with the terms of this 2017 Order;

2. Assisting in the procurement of additional consultants for Respondent;

3. Filing all necessary reports in a timely manner;

4. Detecting problems that might delay Respondent's implementation of this 2017 Order and taking all necessary steps to overcome the effects of such problems, including but not limited to, promptly notifying the DEC; and

5. Submitting to DEC a written certification of compliance, within 30 days after each milestone in the Appendices has been met.

G. <u>Inter-Municipal Agreement ("IMA")</u>

1. There shall be a fully-executed IMA between Respondent and the County of Nassau addressing the diversion of wastewater from the WWTP to the Bay Park WWTP. The IMA shall be enforceable as between the parties, meaning the IMA shall lay out the actions to restore compliance in the event of a breach of the IMA as well as immediate consequences that provide a deterrent effect in the event of a breach.

2. The IMA shall be submitted to the Department within 30 days of the date on which the City of Long Beach and Nassau County reach informal agreement on terms. The IMA must be acceptable to the Department under 6 NYCRR §750-2.9(a) (4). The IMA must address at a minimum, the ownership, operation, maintenance, funding, cost-sharing, indemnity, access, and enforcement provisions necessary to finance and carry out the purpose of the IMA.

VI. STIPULATED PENALTIES

A. Any judgment against Respondent pursuant to this Section shall be due and payable, and may be entered upon forty-five (45) days written notice to Respondent. Such notice shall be made in the form of a DEC Determination issued by the DEC pursuant to Section XII (Dispute Resolution) below. Respondent shall have forty-five (45) days from receipt to challenge a DEC Determination, in accordance with Section XII (Dispute Resolution) below.

B. Major milestones are Notice to Proceed to Construction and Construction Completion. All other milestones are minor milestones. If Respondent fails to meet any of the major milestone dates set forth in Appendix A and B, DEC shall have judgment against Respondent, and Respondent consents to entry of judgment for a stipulated penalty in the amounts set forth below, for each day of violation:

Period of Non-Compliance Penalty Per-Day
1st day through 30th day $500
31stday through 60th day $1,000
Each day beyond the 60th day $2,500

C. If Respondent fails to meet any of the minor milestone dates set forth in Appendix A and B, DEC shall have judgment against Respondent and Respondent consents to entry of judgment for a stipulated penalty in the amounts set forth below, for each day of violation:

Period of Non-Compliance Penalty Per-Day
1st day through 30th day $250
31st day through 60th day $750
Each day beyond the 60th day $1,500

D. If Respondent fails to comply with an interim limit for Ammonia of 23 mg/L until the Diversion Project is complete as set forth in Section II.C. of this 2017 Order, the Department shall have judgment against Respondent and Respondent consents to entry of a judgment for a stipulated penalty in the amount of $1500.00 per day.

E. For all other events of non-compliance with any substantive term of this Order on Consent or its Appendices, DEC shall have a judgment against Respondent

and Respondent consents to entry of a judgment for a stipulated penalty in the amounts set forth below, for each day of violation:

Period of Non-compliance Penalty Per-day
1st day through 30th day $100
31st day through 60th day $200
Each day beyond the 60th day $300

VII. FORCE MAJEURE

A. 1. Respondent shall not be in default of the provisions of this 2017 Order to the extent that its non-compliance is directly attributable to an Act of God, war, terrorism, insurrection, strike, judicial injunction, material default by contractor or supplier, failure of a federal or state agency or authority to issue any necessary permit or approval in a timely fashion where, in accordance with applicable law or regulations, Respondent has timely submitted a complete application and all necessary supporting information and is otherwise entitled to such permit or approval, the catastrophic condition or other circumstance is entirely beyond its control, and Respondent has made all good faith efforts to comply with the provisions of this 2017 Order at issue ("force majeure"). If such a force majeure event occurs, Respondent shall be entitled to an extension of the schedule milestone(s), limited to the period of time that such event placed compliance with a provision of this 2017 Order beyond Respondent's control. Penalties for failure to satisfy any 2017 Order requirement can be excused only under the terms of this decretal paragraph, and only where Respondent shows that it took all steps reasonably necessary to avoid or mitigate the delay, and that it complied with the notice requirements of this paragraph, and that the delay is limited to an amount of time equal to the period of delay directly attributable to the force majeure; and

2. As a condition precedent to obtaining any relief under this provision, Respondent shall notify the State in writing that a force majeure event has occurred no later than 20 days after the date Respondent knew or should have known of the occurrence of any force majeure event. Respondent shall include in such notice the measures taken and to be taken by Respondent to prevent or minimize any compliance delays and shall request an appropriate extension or modification of the applicable deadlines under this 2017 Order. Failure to give such notice within such 30-day period will not constitute a waiver of the ability to invoke force majeure as a defense to stipulated penalties; and

3. Whenever a milestone is missed, pursuant to a force majeure event or otherwise, Respondent shall exercise its best efforts to recoup all lost time, including where appropriate, the payment of extraordinary expenses for overtime, double shifts, or additional contractors or consultants, or alternative methods to the extent allowable under local law.

B. In the event that the parties cannot agree whether a force majeure event has occurred, the State shall issue a State Determination, as defined in Section XII

(Dispute Resolution), holding Respondent in violation of the 2017 Order. Respondent may only dispute the State Determination pursuant to the provisions in Section XIV (Dispute Resolution), below.

VIII. RESERVATION OF RIGHTS

A. Nothing contained in this 2017 Order shall be construed as a release or waiver by the State of its rights to: (1) seek injunctive relief to abate any violation of law, , or any violation of this 2017 Order, unless otherwise specifically provided for in this 2017 Order; (2) seek stipulated penalties and entry of judgment in the Supreme Court for the County of Nassau as provided in Section VI (Stipulated Penalties) above; (3) seek penalties and other relief for any violations of law or other orders and/or permits, except to the extent that this 2017 Order supplants those orders or permits; (4) reallege the violations listed in this Order to obtain injunctive relief or damages in support of natural resource damage claims; (5) seek penalties and other relief for any criminal liability for any violations listed in this 2017 Order; or (6) seek to modify, suspend, or revoke any DEC-issued permit.

B. Except as expressly set forth herein, nothing contained in this 2017 Order shall be construed as a release or waiver of Respondent's right to oppose and defend against injunctive relief, imposition of penalties, damages, or any other imposition of liability by DEC or the State. Nothing contained in this 2017 Order shall be construed as a waiver by Respondent of its right to seek a modification of any permit or order.

C. The State reserves all such rights as it has to require Respondent to take any additional measures required to protect human health or the environment, including, but not limited to, the right of the DEC Commissioner or his/her designee to exercise any summary abatement powers, whether at common law, or granted pursuant to statute or regulation, against Respondent or any other party. Nothing in this 2017 Order limits or restricts Respondent's obligation to address emergency conditions nor does it limit or restrict the authority of the State to require Respondent to abate such emergency conditions and to pay for such abatement.

D. Except as expressly set forth herein, nothing set forth in this 2017 Order shall be read as relieving Respondent of any of its obligations pursuant to any permits, orders on consent, consent decrees, or other binding orders to which it is subject.

IX. INDEMNITY

Respondent shall indemnify and hold harmless the State, DEC, EFC and any of their employees or contractors for any and all claims, actions, damages, and costs resulting from Respondent's acts, or from actions taken by the State, DEC, EFC or any of their employees or contractors in fulfillment or attempted fulfillment of the provisions of this 2017 Order to the extent that they are not caused by intentional, negligent or reckless acts of the State, DEC, EFC or any of their employees or contractors.

X. ACCESS

For the purpose of ensuring compliance with this 2017 Order, Respondent shall allow duly authorized representatives of the State, DEC and/or EFC, with proper identification, full access to Respondent's water pollution control plants, sewers and sewer outfalls and other relevant facilities without prior notice in order for the State, DEC, and/or EFC to inspect and determine the status of Respondent's compliance with this 2017 Order. Upon the arrival of the State, DEC, and/or EFC's authorized representative, he or she shall contact the facility's superintendent or his/her designee and shall allow the facility's superintendent or his/her designee to accompany him or her on the inspection so long as that request does not delay the commencement of the inspection or otherwise interfere with such inspection.

XI. MODIFICATION

A. The parties agree that each shall give due consideration in good faith to any request by the other for a modification of this 2017 Order. The Department recognizes that Respondent does not control all the lands that may be required to fulfill the obligations of this Order; and may not be able to compel Nassau County to perform all of the work necessary to complete this Diversion Project in the required timeframes. Accordingly, if Respondent desires that any provisions, terms or conditions of this 2017 Modified Order be changed, and in particular Section II. B. 1. Respondent shall make timely written application setting forth the grounds for the relief sought to the individuals listed in Section XIV. F. (General Provisions) below. DEC shall not unreasonably withhold approval for any timely and reasonably made application by the Respondent. If the parties agree to any revisions to this Order, this may be so stipulated in a writing by both parties.

B. If one party seeks a revision, and the other party does not agree to the change, then either party may seek appropriate relief by invoking the dispute resolution provisions in Section XII (Dispute Resolution).

C. This 2017 Order, its annexed appendices, and any document that is incorporated herein by operation of this 2017 Order shall constitute the entire agreement of the parties, with respect to the subject matter hereof. No obligation of the State or Respondent shall be deemed to have been waived or otherwise modified without the express written consent of the State or Respondent, respectively.

XII. DISPUTE RESOLUTION

A. DEC and Respondent recognize that in the course of complying with the terms and conditions of this 2017 Order, disputes may arise between the parties regarding the appropriateness of any disapproval by the DEC of a required submittal by Respondents, conditions attached to DEC's approval of a required submittal, whether DEC has appropriately rejected a modification requested by Respondent pursuant to Section XI (Modification) above, whether a force majeure event has in fact occurred,

any other determination by DEC under this 2017 Order, or Respondent's compliance with any other the terms of this 2017 Order. In the event such a dispute arises, it shall be resolved pursuant to the provisions of this section.

B. If DEC disapproves a submittal required by Respondent under this 2017 Order, approves a required submittal with conditions that Respondent deems unacceptable, makes any other determination that Respondent has violated this 2017 Order, declines to agree to a modification requested by Respondent pursuant to XI (Modification) above, then DEC shall issue a written determination ("DEC Determination") to Respondent setting forth the basis for disapproval of the submittal, conditional approval of the submittal, other basis for determining that Respondent has violated this 2017 Order, or basis for not agreeing to a requested 2017 Order modification. If Respondent disputes the DEC Determination, Respondent may seek to resolve the dispute by requesting informal negotiations with DEC. Upon such a written request by Respondent, DEC and Respondent shall make reasonable efforts to resolve the dispute through informal negotiations. DEC shall make all good faith efforts to meet with and/or discuss the dispute in question with Respondent, as soon as practicable, and the parties shall make reasonable efforts to resolve the dispute through informal negotiations. Unless both parties agree in writing otherwise, the time to conclude informal negotiations shall terminate 45 days from the day Respondent receives the DEC Determination that is the subject of dispute.

C. Respondent shall also have the right to challenge a disputed DEC Determination by filing a proceeding pursuant to Article 78 of the New York Civil Procedure Law seeking appropriate relief before the Nassau County Supreme Court within four (4) months of receiving the DEC Determination. If Respondent does not file the requisite pleading, including all supporting papers, within four (4) months of receiving the DEC Determination, then Respondent shall waive the right to challenge that Determination and the assessment of any penalties associated with that Determination. The parties may agree, in writing and on a case-by-case basis, to extend the four (4) month period within which the Respondent must file the requisite motion papers to challenge a particular DEC Determination. The 45-day period for informal negotiation and for Respondent to file a motion disputing the DEC Determination shall run concurrently. Respondent's remedies for dispute resolution under this 2017 Order shall be limited to the procedures set forth above. Respondent shall have no right to any formal administrative review of a DEC Determination.

D. If, in the case of Respondent's challenge to a DEC Determination disapproving a submittal required under this 2017 Order or approving a required submittal with conditions that Respondent considers unacceptable, the submittal is found to have been approvable as submitted, then no penalties or interest may be assessed and subsequent milestone dates shall be extended appropriately, as agreed upon by Respondent and DEC. If the submittal is found to have been properly disapproved, then penalties and interest shall be assessed from 14 business days after the date DEC sent the DEC Determination to Respondent. Notwithstanding the provisions of Section XI (Modifications) above, subsequent milestone dates shall not be

extended, unless otherwise agreed upon by the State and Respondent in writing, or ordered by the Court, for good cause shown by Respondent.

E. In any proceeding brought by Respondent arising from a dispute in which Respondent asserts a claim of force majeure as a defense to a DEC Determination assessing liability, or challenging a DEC Determination rejecting a force majeure claim in response to Respondent's demand for such a determination, then Respondent shall bear the burden of proving that DEC's rejection of the claim was arbitrary and capricious. If, in any such case, DEC Determination is found to be arbitrary and capricious, then no penalties or interest may be assessed, and subsequent milestone dates shall be extended appropriately, as agreed upon by Respondent and DEC, or as otherwise determined by the reviewing Court, if Respondent demonstrates that the force majeure materially affects Respondent's ability to meet subsequent milestones. If Respondent does not demonstrate that the force majeure materially affects Respondent's ability to meet subsequent milestones, then no subsequent milestone shall be extended, regardless of whether the DEC Determination is found to be arbitrary and capricious. If Respondent's claim of force majeure is rejected, then penalties and interest shall be assessed from 14 business days after the date that the violation at issue occurred. Subsequent milestone dates shall not be extended.

F. In the case of any other challenge by Respondent to a determination by DEC issued hereunder, if the DEC Determination is upheld then penalties and interest shall be assessed from 14 business days after the date that the violation that is the subject of Respondent's challenge occurred. Regardless of whether or not the DEC Determination is upheld, the bringing by motion of such a challenge by Respondent, pursuant to this paragraph, shall in no way result in an extension of any milestone dates under this 2017 Order.

G. The State shall have the right to enforce the terms and conditions of this 2017 Order against Respondent by motion before the Nassau County Supreme Court.

XIII. TERMINATION

This 2017 Order shall be deemed completely satisfied and shall terminate when each of the following conditions has been fully satisfied: (A) Respondent has paid any civil penalties due under Section III (Civil Penalty above), (B) Respondent has paid any stipulated penalties due under Section VI (Stipulated Penalties) above, (C) Respondent has provided to the State written certification of timely completion of each compliance action required in the Appendix, and the State has provided to Respondent written confirmation for each certification of timely completion that it accepts the certification as accurate; and (D) if applicable, the final nitrogen effluent limits are effective in the County Respondent's SPDES permit.

XIV. GENERAL PROVISIONS

A. All references to days herein are to calendar days unless otherwise specified.

B. The paragraph or section headings set forth in this 2017 Order are included for convenience of reference only and shall be disregarded in the construction and interpretation of any of the provisions of this Order.

C. To comply with any milestone set forth in this 2017 Order, its appendices, and any document that is incorporated herein by operation of this 2017 Order, all documents must be submitted by Respondent by the required milestone dates and in final form.

D. This 2017 Order, its annexed appendices, and any document that is incorporated herein by operation of this 2017 Order shall apply to, and be binding upon the parties, their officers, agents, servants, employees, successors and assigns, and each of them, and upon all persons, firms and corporations acting under, through or for, in active concert or participation with, the parties.

E. No communication by the State shall constitute the State's agreement to modify, approve or alter any obligation of, or required conduct by, Respondent under this 2017 Order, other than a formal written communication expressly identified by the State author as such.

F. 1. All technical submittals to the State required by this 2017 Order shall be provided as follows:

DEC
Division of Water
Compliance Bureau Director
625 Broadway, 4th Floor
Albany, NY 12233-3506

Regional Water Engineer
DEC Region 1
50 Circle Road
Stony Brook, NY 11790

Environmental Facilities Corporation
625 Broadway
Albany NY 12207
Attn: Chief Engineer

2. All communications and modification requests to the State under this 2017 Order, other than technical submittals, shall be made to the above parties and to:

DEC Office of General Counsel
General Enforcement Bureau Director
625 Broadway
Albany, NY 12233-5500

3. The State reserves the right, upon written notice to Respondent, to designate additional or different individuals or addressees for communication or to request that technical submissions be additionally made to additional DEC staff; and

4. All responses to submittals, and any other correspondence regarding technical issues that are sent to Respondent, shall be provided to:

John Mirando
Commissioner of Public Works
City Hall Room 404
1 W. Chester Street,
Long Beach, NY 11561

G. A transmittal shall be deemed to have been received on the first business day after transmission if sent electronically or by hand delivery, on the second business day after transmission if sent by overnight delivery service, and on the first business day after the fifth day after mailing if sent by regular mail.

H. All referenced provisions of law or regulation shall include any successor law or regulation that may replace the referenced law or regulation during the life of this 2017 Order.

XV. RELEASE

Subject to Section VIII (Reservation of Rights) above, upon completion by Respondent of all work, and payment of all funds, required under this 2017 Order, the State releases Respondent for all violations set forth in paragraphs 13, 19 and 20, and Schedule 1 of this 2017 Order.

XVI. EFFECTIVE DATE

The effective date of this 2017 Order is the date it is signed by the Commissioner of the Department of Environmental Conservation.

Dated: Albany, New York
June 22, 2017

Basil Seggos
Commissioner
New York State
Department of Environmental Conservation

CONSENT BY RESPONDENT

The City of Long Beach hereby consents to the issuance and entry of the foregoing 2017 Order and waives its right to a hearing as provided by law, and agrees to be bound by the provisions, terms and conditions contained herein.

The City of Long Beach

_____, City Manager

_____, Corporation Counsel

Date

ACKNOWLEDGEMENT

State of New York)
) ss:
County of)

On the 22nd day of June, 2017, before me personally came Jack Schnirman & Robert Agostisi to me known, who being by me duly sworn did depose and say that he/she was duly authorized to execute the foregoing instrument and did so on behalf of the Respondent.

_____

NOTARY PUBLIC

ERASMIA AMOROSA
Notary Public, State of New York
No. 01AM6070030
Qualified in Nassau County
Commission Expires Feb. 19, 2018

SCHEDULE 1Permit Effluent Exceedances at the City of Long Beach WWTP

Outfall	Parameter	Monitoring Period End Date	Percent Exceedance
001A	Solids, suspended percent removal, MO AVG MN	01/31/2014	33
001A	Solids, suspended percent removal, MO AVG MN	02/28/2014	13
001A	Solids, suspended percent removal, MO AVG MN	04/30/2014	47
001A	Solids, total suspended, 7Day-AVG, Loading	04/30/2014	43
001A	Solids, total suspended, 7Day-AVG, Concentration	04/30/2014	22
001A	Solids, total suspended, MO AVG, Concentration	04/30/2014	30
001A	Solids, total suspended, 7Day-AVG, Loading	05/31/2014	105
001A	Solids, total suspended, 7Day-AVG, Concentration	05/31/2014	84
001A	Solids, total suspended, MO AVG, Concentration	05/31/2014	20
001A	Solids, suspended percent removal, MO AVG MN	06/30/2014	13
001A	Solids, suspended percent removal, MO AVG	08/31/2014	33
001A	Ammonia - total, MO AVG, Concentration	09/30/2014	5
001A	Solids, suspended percent removal, MO AVG MN	12/31/2014	20
001A	BOD, 5-day, 20 deg. C, 7Day-AVG, Concentration	01/31/2015	20
001A	BOD, 5-day, 20 deg. C, MO AVG, Concentration	01/31/2015	30
001A	BOD, 5-day, percent removal, MO AVG MN	01/31/2015	39
001A	Solids, suspended percent removal, MO AVG MN	01/31/2015	80
001A	Solids, total suspended, MO AVG, Concentration	01/31/2015	13
001A	Solids, suspended percent removal, MO AVG MN	03/31/2015	13
001A	Ammonia - total, MO AVG, Concentration	04/30/2015	10
001A	Solids, suspended percent removal, MO AVG MN	04/30/2015	33
001A	Solids, total suspended, MO AVG, Concentration	04/30/2015	13
001A	Solids, suspended percent removal, MO AVG MN	05/31/2015	20
001A	Solids, total suspended, MO AVG, Concentration	05/31/2015	10
001A	Solids, suspended percent removal, MO AVG MN	01/31/2016	40
001A	Solids, total suspended, 7Day-AVG, Concentration	01/31/2016	16
001A	Solids, total suspended, MO AVG, Concentration	01/31/2016	17
001A	Solids, suspended percent removal, MO AVG MN	04/30/2016	7
001A	Solids, suspended percent removal, MO AVG MN	04/30/2016	7
001A	Ammonia - total, MO AVG, Concentration	07/31/2016	18
001A	Ammonia - total, MO AVG, Concentration	08/31/2016	8
001A	Solids, suspended percent removal, MO AVG MN	08/31/2016	4
001A	Ammonia - total, MO AVG, Concentration	09/30/2016	15
001A	Ammonia - total, MO AVG, Concentration	10/31/2016	13

001A	Solids, suspended percent removal, MO AVG MN	10/31/2016	33
001A	Ammonia - total, MO AVG, Concentration	11/30/2016	24
001A	Ammonia - total, MO AVG, Concentration	12/31/2016	4
001A	Solids, suspended percent removal, MO AVG MN	12/31/2016	20
001A	Ammonia - total, MO AVG, Concentration	01/31/2017	100
001A	Ammonia - total, MO AVG, Concentration	02/28/2017	79
001A	Ammonia - total, MO AVG, Concentration	03/31/2017	91

Water Quality Standards Exceedances

Date	Exceedance
Continuous 9/2013 - present	ECL 17-0501: Numerical water quality standard exceedance for discharge of Ammonia to waters of the State.
Continuous 9/2013 - present	ECL 17-0501: Narrative water quality standard exceedance for discharge of Nitrogen to water of the State.

SPDES Permit Exceedances

Due Date	Schedule Item	Status
9/9/13	Submit approvable final design plans and specifications, as well as a schedule of construction, for the facilities described in the approved Engineering Report.	Received 6/29/15

APPENDIX A

Corrective Action Plan Long Beach WWTP

Respondent: City of Long Beach
Site or Facility: Long Beach Water Pollution Control Facility
DEC Case No.: CO1-20151020-142

CITY OF LONG BEACH IS REQUIRED TO SELF CERTIFY TIMELY COMPLETION OF EACH OF THE ACTIVITIES REQUIRED BY THIS SCHEDULE.

Deficiencies	Description of Work	Completion Date
Effluent Screw Pumps: One of the four effluent screw pumps is out of service	Repair East Screw Pump	6/30/2018
Grit Tank: The grit tank decking is cracked	Construction Completion of assessed repairs: Cracks to be grouted and sealed	6/30/2018
Primary Settling Tank: Flight drive need to be replaced	Construction Completion: Installation of New East Flight Gear Drive	6/30/2018
Primary Settling Tank: The primary settling tank is cracked and concrete bridge is deteriorating	Construction Completion of assessed repairs: Corroded reinforcement to be cleaned and recoated and cracked and broken concrete to be grouted and sealed	6/30/2018
Final Clarifier Flight drives need to be replaced	Construction Completion: New Middle and South Flight Gear Drive	6/30/2018
Primary and Secondary Digesters: Cleanout is needed	Perform needed cleanout	6/30/2018
Sand Filters: Both Sand Filters are inoperable	Construction Completion: Rebuild of both Sand Filters	12/30/2016

APPENDIX B

Schedule for Diversion to Bay Park WWTP

Description of Work	Completion Date
Diversion Project Report	October 2017
Design Start	TBD (upon approval of Diversion Project Report
Fully Executed Inter-Municipal Agreement (IMA)	Within 30 days of informal agreement between Respondent and Nassau County
Design Completion	TBD (upon approval of Diversion Project Report)
Notice to Proceed to Construction	TBD (upon approval of Diversion Project Report)
Construction Completion and Commence Diversion of Influent Wastewater from Long Beach WWTP to Bay Park WWTP	June 2024
Complete Decommissioning of Long Beach WWTP in accordance with Part 750-2.11	TBD (upon approval of Diversion Project Report)

APPENDIX F

Vendor Information

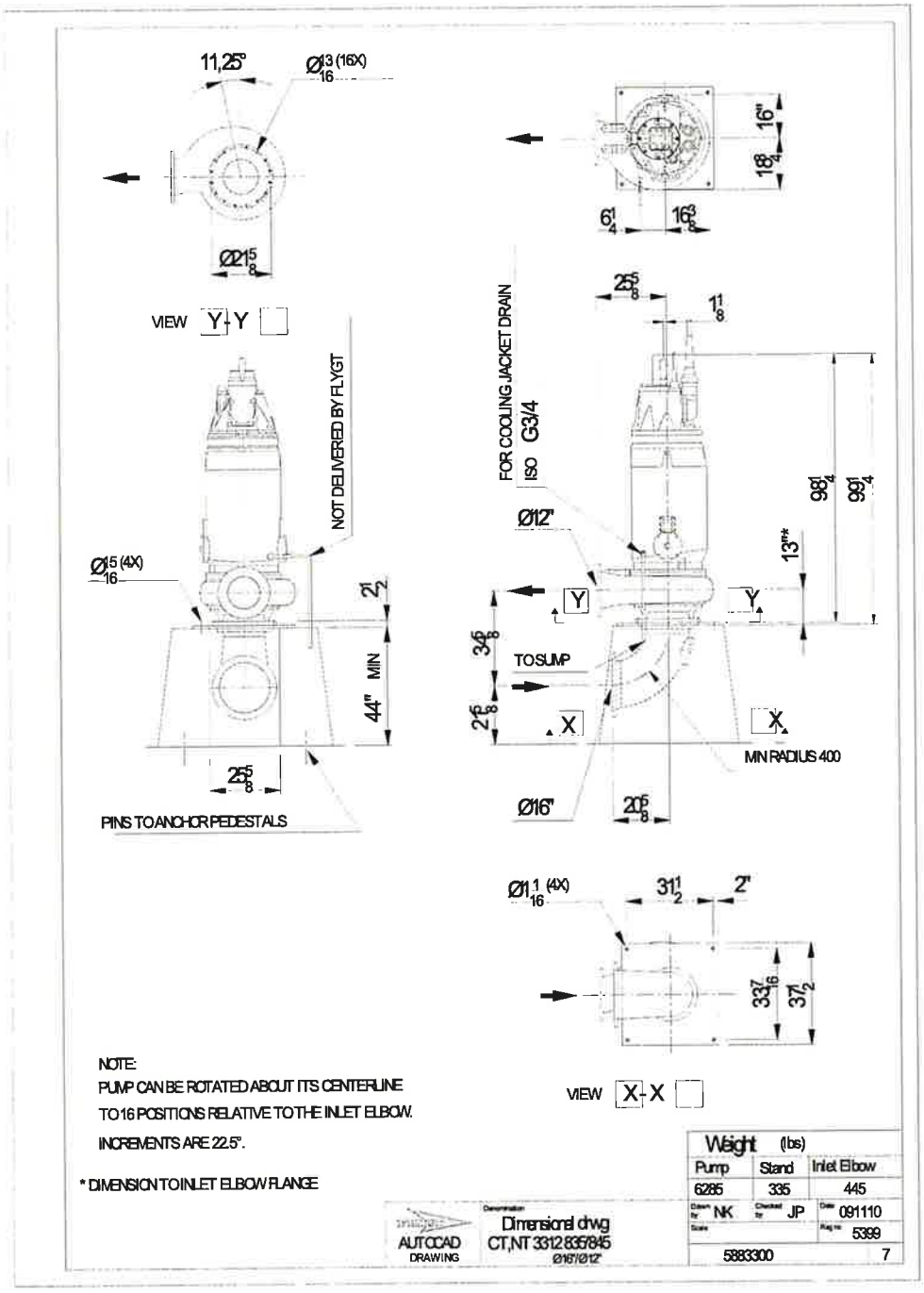
- Pump
- Screen
- Compactor

Pump

xylem

NT 3312/835 3~ 670

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
	Long Beach PS 3 + 1	Peter Pastore	6/14/2017	6/14/2017

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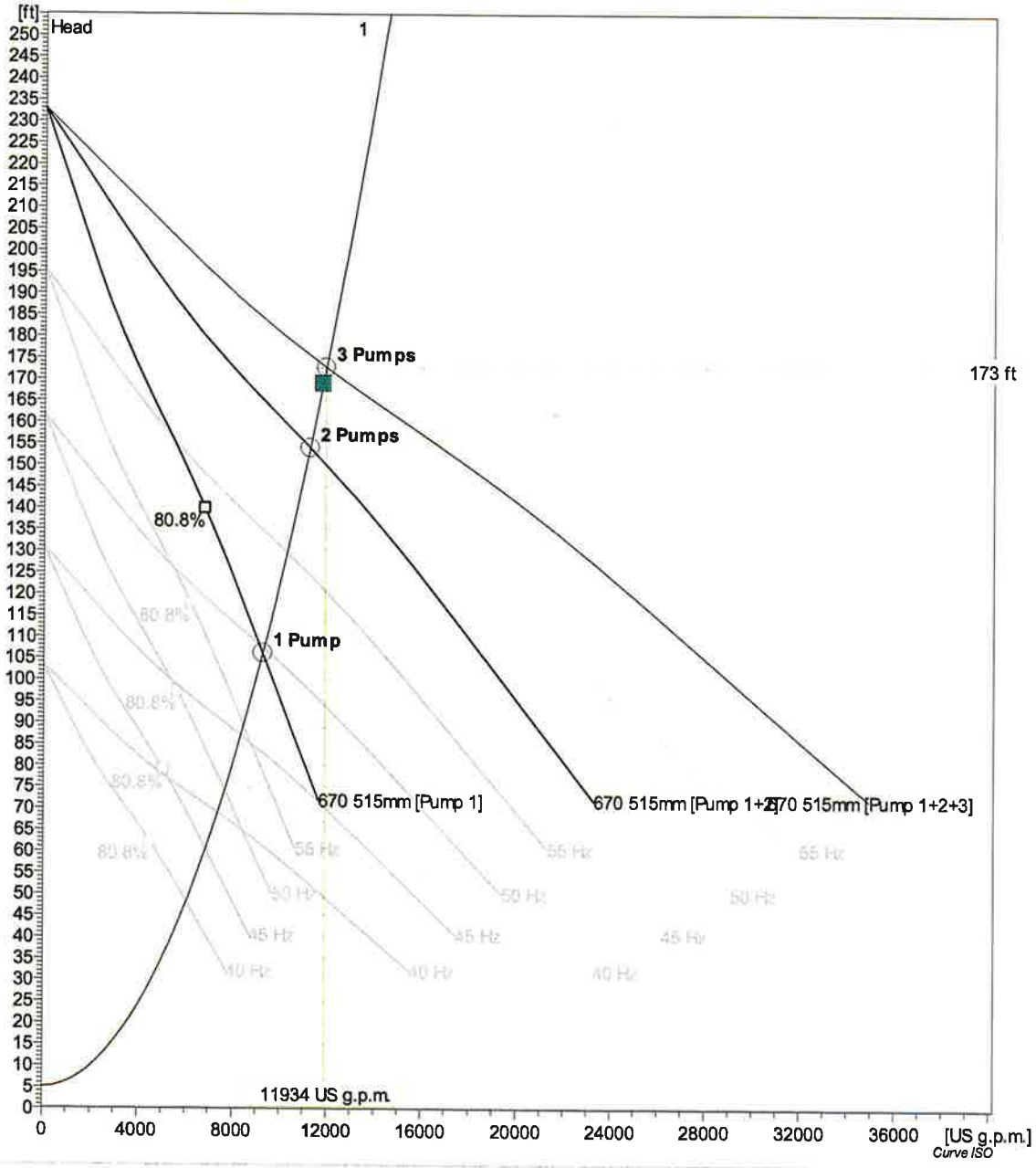
NT 3312/835 3~ 670

VFD Analysis

FLYGT



Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
3 / 1	60 Hz	3980 US g.p.m.	173 ft	245 hp	11900 US g.p.m.	173 ft	734 hp	71.1 %	813 kWh/US MG	18.7 ft
3 / 1	55 Hz	3640 US g.p.m.	145 ft	188 hp	10900 US g.p.m.	145 ft	565 hp	71 %	691 kWh/US MG	16.3 ft
3 / 1	50 Hz	3300 US g.p.m.	120 ft	141 hp	9890 US g.p.m.	120 ft	424 hp	70.9 %	580 kWh/US MG	14 ft
3 / 1	45 Hz	2950 US g.p.m.	97.4 ft	103 hp	8860 US g.p.m.	97.4 ft	309 hp	70.8 %	482 kWh/US MG	11.8 ft
3 / 1	40 Hz	2610 US g.p.m.	77.1 ft	72.1 hp	7830 US g.p.m.	77.1 ft	216 hp	70.6 %	396 kWh/US MG	9.78 ft
2 / 1	60 Hz	5620 US g.p.m.	154 ft	277 hp	11200 US g.p.m.	154 ft	554 hp	79.2 %	651 kWh/US MG	19.1 ft
2 / 1	55 Hz	5140 US g.p.m.	130 ft	213 hp	10300 US g.p.m.	130 ft	426 hp	79.1 %	553 kWh/US MG	16.6 ft
2 / 1	50 Hz	4660 US g.p.m.	107 ft	160 hp	9320 US g.p.m.	107 ft	320 hp	79.1 %	465 kWh/US MG	14.2 ft
2 / 1	45 Hz	4170 US g.p.m.	87 ft	116 hp	8350 US g.p.m.	87 ft	233 hp	79 %	386 kWh/US MG	12 ft
2 / 1	40 Hz	3680 US g.p.m.	69 ft	81.5 hp	7370 US g.p.m.	69 ft	163 hp	78.9 %	318 kWh/US MG	9.94 ft
1 / 1	60 Hz	9270 US g.p.m.	106 ft	331 hp	9270 US g.p.m.	106 ft	331 hp	75.1 %	473 kWh/US MG	35.6 ft
1 / 1	55 Hz	8470 US g.p.m.	89.5 ft	255 hp	8470 US g.p.m.	89.5 ft	255 hp	75.2 %	403 kWh/US MG	30.8 ft
1 / 1	50 Hz	7670 US g.p.m.	74.3 ft	191 hp	7670 US g.p.m.	74.3 ft	191 hp	75.4 %	339 kWh/US MG	26.2 ft
1 / 1	45 Hz	6870 US g.p.m.	60.6 ft	139 hp	6870 US g.p.m.	60.6 ft	139 hp	75.6 %	282 kWh/US MG	21.9 ft
1 / 1	40 Hz	6060 US g.p.m.	48.3 ft	97.7 hp	6060 US g.p.m.	48.3 ft	97.7 hp	75.8 %	233 kWh/US MG	17.8 ft

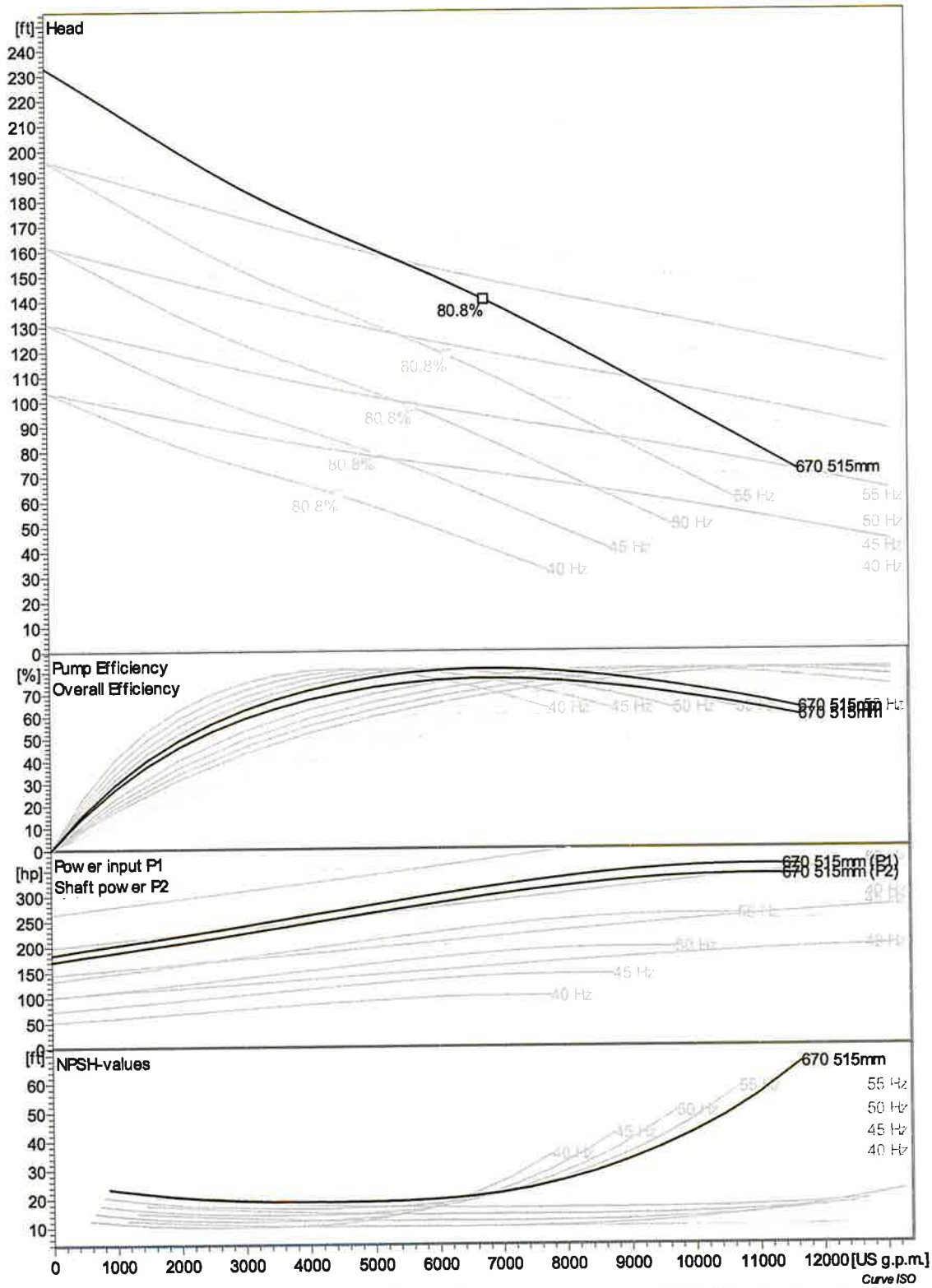
Project	Project ID	Created by	Created on	Last update
	Long Beach PS 3 + 1	Peter Pastore	6/14/2017	6/14/2017

xylem

FLYGT

NT 3312/835 3~ 670

VFD Curve



Project	Project ID	Created by	Created on	Last update
	Long Beach PS 3 + 1	Peter Pastore	6/14/2017	6/14/2017

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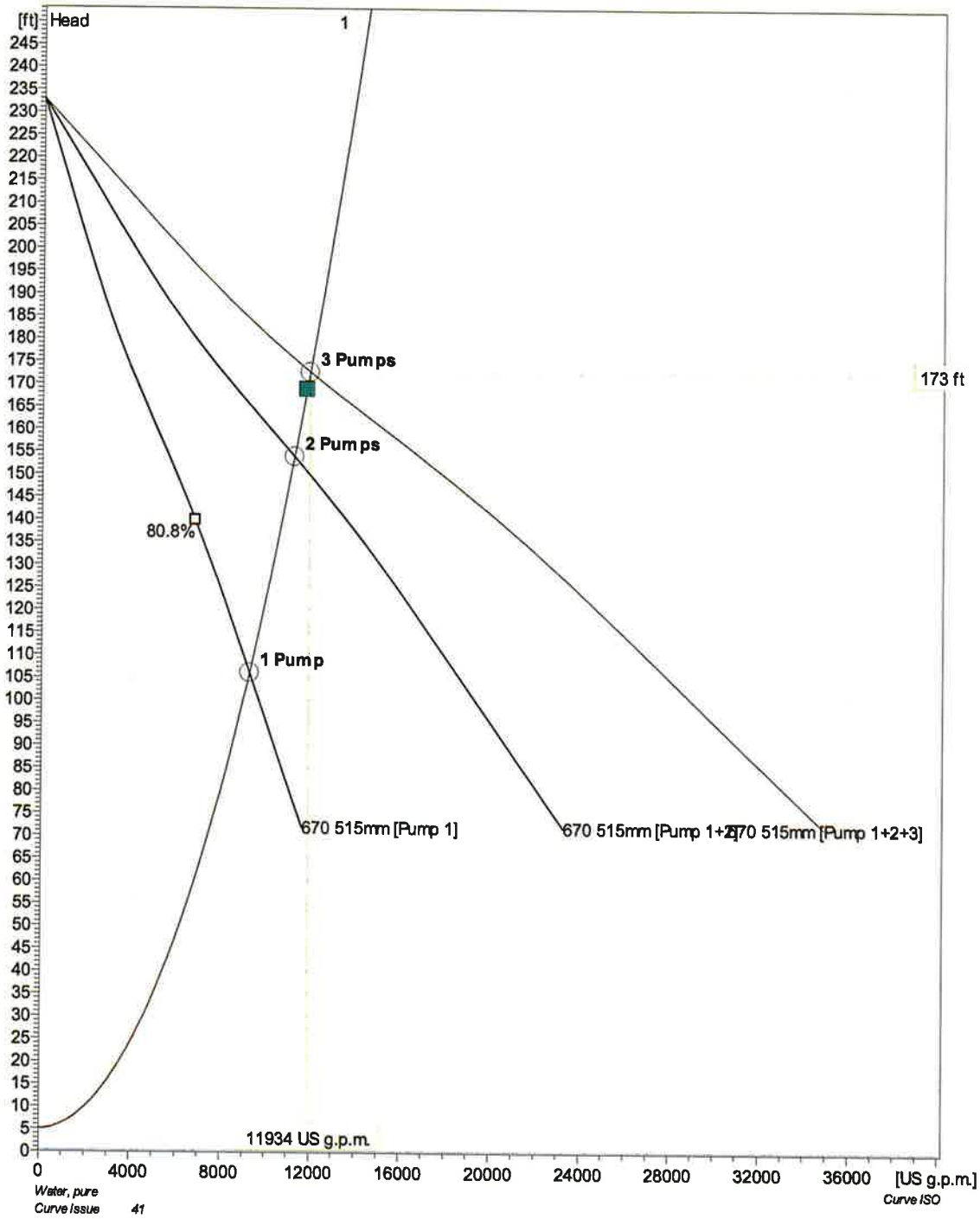
NT 3312/835 3~ 670

Duty Analysis

FLYGT



Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
3 / 1	3980 US g.p.m.	173 ft	245 hp	11900 US g.p.m.	173 ft	734 hp	71.1 %	813 kWh/US MG	18.7 ft
2 / 1	5620 US g.p.m.	154 ft	277 hp	11200 US g.p.m.	154 ft	554 hp	79.2 %	651 kWh/US MG	19.1 ft
1 / 1	9270 US g.p.m.	106 ft	331 hp	9270 US g.p.m.	106 ft	331 hp	75.1 %	473 kWh/US MG	35.6 ft

Project	Project ID	Created by	Created on	Last update
	Long Beach PS 3 + 1	Peter Pastore	6/14/2017	6/14/2017

xylem

NT 3312/835 3~ 670

FLYGT

Performance curve

Pump

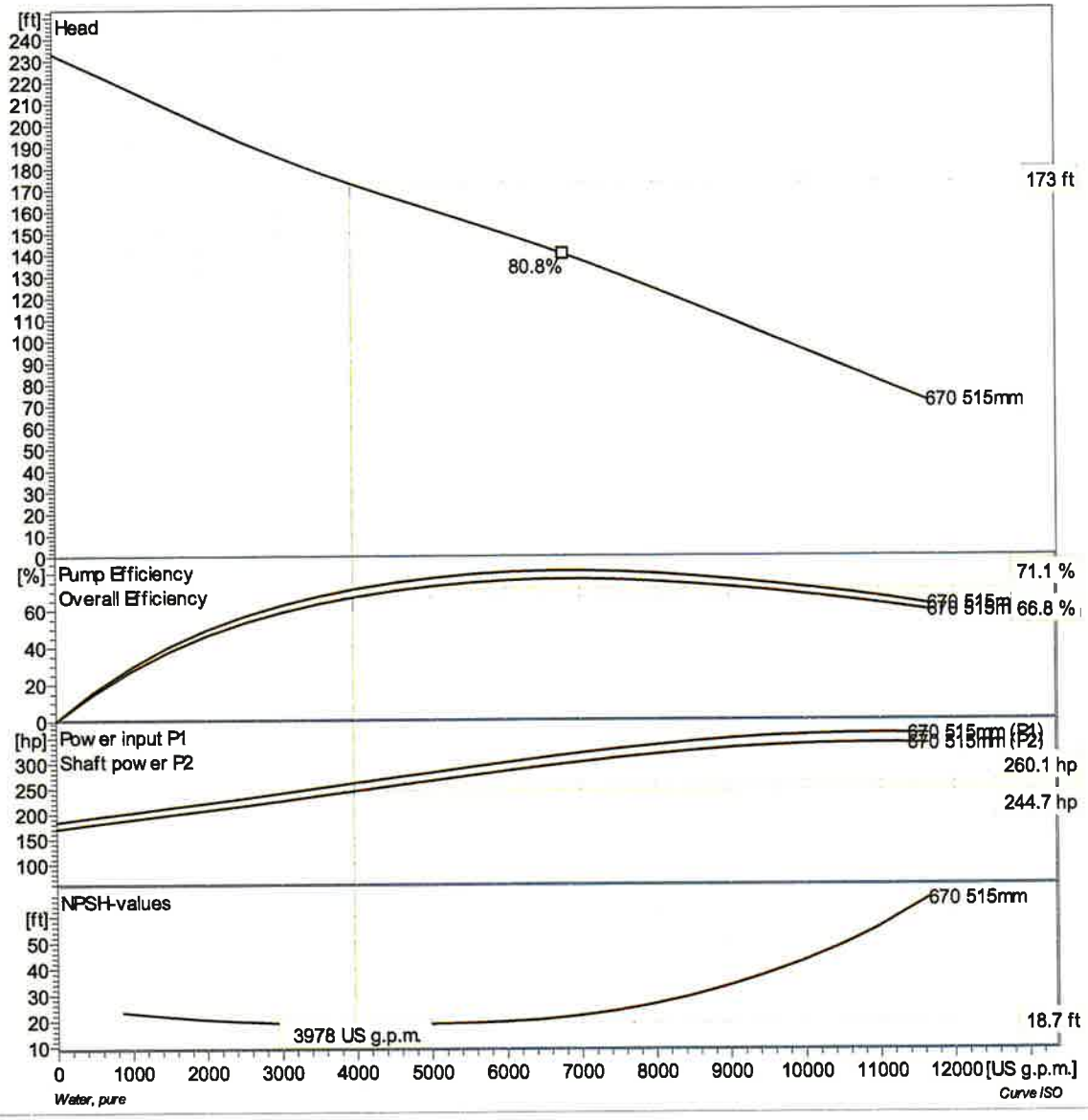
Discharge Flange Diameter	11 13/16 inch
Suction Flange Diameter	350 mm
Impeller diameter	20¼"
Number of blades	3

Motor

Motor #	N0835.000 54-52-6AA-D 385hp
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	6
Phases	3~
Rated power	385 hp
Rated current	455 A
Starting current	2670 A
Rated speed	1190 rpm

Power factor	
1/1 Load	0.84
3/4 Load	0.80
1/2 Load	0.71

Motor efficiency	
1/1 Load	94.5 %
3/4 Load	94.5 %
1/2 Load	93.5 %



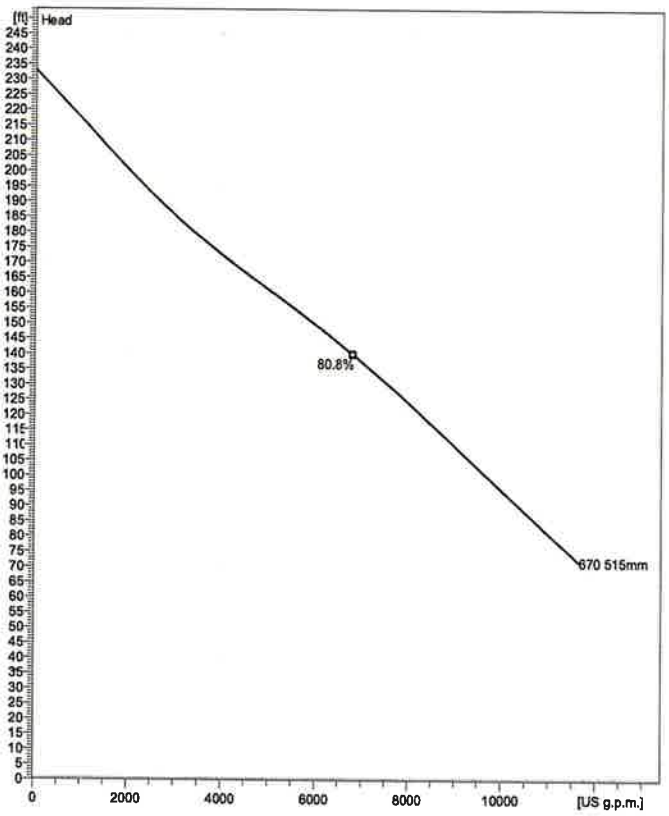
Duty point		Guarantee	
Flow	Head	ISO:1999	Grade
3930 US g.p.m.	169 ft	No	

Project	Project ID	Created by	Created on	Last update
	Long Beach PS 3 + 1	Peter Pastore	6/14/2017	6/14/2017

xylem

NT 3312/835 3~ 670

Technical specification



Water, pure

Curve ISO

Note: Picture might not correspond to the current configuration.

General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

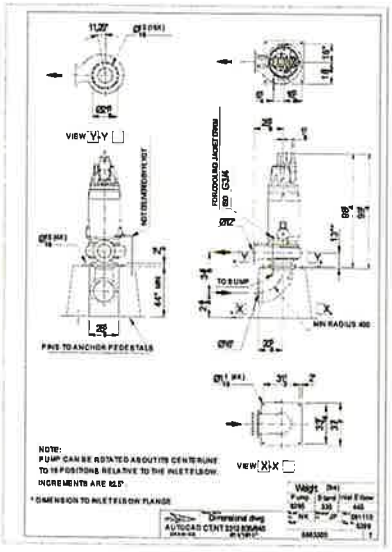
Impeller

Impeller material	Hard-Iron ™
Discharge Flange Diameter	11 13/16 inch
Suction Flange Diameter	13 3/4 inch
Impeller diameter	515 mm
Number of blades	3

Motor

Motor #	N0835.000 54-52-6AA-D 385hp Standard
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	6
Phases	3~
Rated power	385 hp
Rated current	455 A
Starting current	2670 A
Rated speed	1190 rpm
Power factor	
1/1 Load	0.84
3/4 Load	0.80
1/2 Load	0.71
Motor efficiency	
1/1 Load	94.5 %
3/4 Load	94.5 %
1/2 Load	93.5 %

Installation: T - Vertical Permanent, Dry



Configuration

Project	Project ID	Created by	Created on	Last update
	Long Beach PS 3 + 1	Peter Pastore	6/14/2017	6/14/2017

Screen

Duperon ADAPTIVE TECHNOLOGY™
Let's Build a System that Works for You™

Date: June 14, 2017

Project: City of Long Beach NY **Proposal Number:** 9394

PRELIMINARY BUDGET EQUIPMENT SCOPE

To: City of Long Beach NY

From: **Your Duperon® Team**
Mike Olvera
Lead Sales Project Manager
(989) 754-8800
molvera@duperon.com

Rep: Syd Harris
Koester Associates, Inc.
syd@koesterassociates.com

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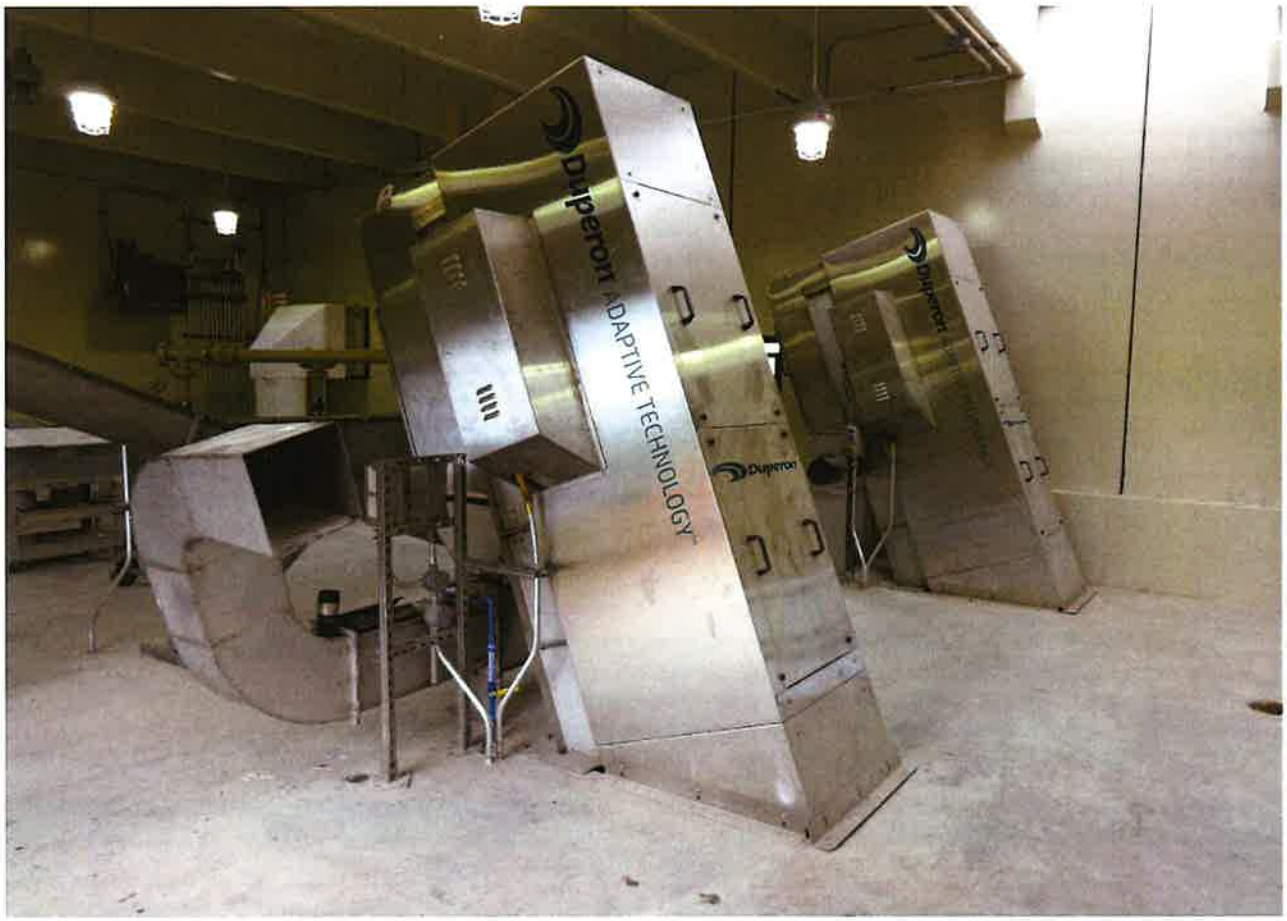


Duperon ADAPTIVE TECHNOLOGY™
Let's Build a System that Works for You℠

Date: June 14, 2017

Project: City of Long Beach NY **Proposal Number:** 9394

PRELIMINARY BUDGET EQUIPMENT SCOPE

Thank you for considering **Duperon**℠ system solutions for your project. We appreciate the opportunity to provide you with a **Preliminary Budget Equipment Scope**. Please do not hesitate to contact your **Duperon® Team** with any questions as we work with you through the design process and ensure a successful project.

Equipment Scope

SCREENS: Assumptions made for missing information

QTY	UNIT	DESCRIPTION		
2	EA	**Duperon℠ FlexRake℠ - Front Clean Front-Return**		
		Model:	FPFS - Full Penetration, Fine Screen	
Notes: Channel size based on peak flow of 10 MGD. Average and min flows and water levels will be required for final sizing of the channel. Channel height is 4 ft deep		* Enclosure (& Material):	Fully Enclosed (304)	
		* Nom Width x Length:	4 ft wide x 14 ft long screen	
		* Clear Opening Size:	0.25 in	
		* Angle of Installation:	30	Deg. from Vertical
		* Material Construction:	304	SSTL

Screenings Processing

QTY	UNIT	DESCRIPTION		
2	EA		**Duperon® Washer Compactor**	
		* Model:	WC3.A2.5	
Notes:		Appx Footprint:	2 ft wide x 7 ft long	
		Motor HP:	0.75 HP	
		Chute Allowance:	10 ft long w/ 1 bend (customizable)	
		* Material Construction:	304	SSTL

CONTROLS

QTY	UNIT		
0	EA	**Main Control Panel:**	**2 FPFS 2 WC**
		* Power:	480V/3ph/60hz
Notes: 2 Panels have been quoted		Panel Rating:	NEMA 4X
		PLC/Relay Based:	Relay
		Screen Instrumentation:	Dual Mechanical Float
		Local Pushbutton Station(s):	Three Button (E-Stop/Run/Jog Rev)

TECH/FREIGHT

QTY	UNIT	DESCRIPTION		
1	LOT	**On-Site Technical Assistance**		
		Number of Trips:	1	Trip(s)
		Days On-Site per Trip:	1	8-hour man-day(s)
1	LOT	**Freight**		
		FOB Factory, Full Freight Allowed		

Clarifications:

- This is not a fully designed project; preliminary pricing may be affected by scope change/project development
- Operational, structural, wind, or seismic calculations are not included
- Scope is based on models and assumptions widely utilized in the industry
- Scope does not convey an offer to sell; installation and taxes are not included
- **For reference only:** Standard Delivery Schedule: Submittals 4-6 week from PO - Delivery 8-12 weeks from approval

PRELIMINARY BUDGET PRICING: **$395,000.00**

Duperon ADAPTIVE TECHNOLOGY™
Let's Build a System that Works for You™

Date: June 14, 2017

Project: City of Long Beach NY **Proposal Number:** 9394

OPTIONAL EQUIPMENT AND ACCESSORIES

Thank you for considering **Duperon®** system solutions for your project. We appreciate the opportunity to provide you with a **Preliminary Budget Equipment Scope**. Please do not hesitate to contact your **Duperon® Team** with any questions as we work with you through the design process and ensure a successful project.

Optional Equipment

Conveyor

QTY	UNIT	DESCRIPTION			
1	EA	**Conveyor**	**Shaftless Screw Conveyor**		
		Appx Footprint:	2 ft wide	x	10 ft long
Notes:		Motor HP:	1 HP		
		Material Construction:	304	SSTL	
		ADD PRICE (EA):	**$18,000.00**		

Optional Accessories

Bar Screen Deadplate Heat Pad
24" x 24" heat pad (power by others)
Thermostat

ADD PRICE (EA): $3,000

Bar Screen Deadplate Heat Pad
12" x 12" heat pad (power by others)
Thermostat

ADD PRICE (EA): $1,800

Washer Compactor Chute Extension
10 ft extension beyond the 10 ft supplied
Includes 1 support leg for extension
(Additional support legs $600 ea)

ADD PRICE (EA): $2,100

Washer Compactor Elephant Drop Sleeve
Solid canvas flexible tube
10 ft overall length
Attaches directly to discharge chute

ADD PRICE (EA): $1,575

Washer Compactor Heat Trace & Blanket Kit
Required in applications where freezing temperature are possible
Teflon heat blanket (weather-proof) construction
Thermostat (NEXA 4X) with remote probe for temperature reading
Components are CLASS I DIVISION I rated

ADD PRICE (EA): $5,000

Washer Compactor Bagging System
Longofill cassette holder - SSTL & ABS plastic
Longopac PE continuous bagger cassette, 230 ft (80 m)

ADD PRICE (EA): $3,400

Washer Compactor Caster Frame System
304SSTL frame structure
4 highly durable casters

ADD PRICE (EA): $3,855

Washer Compactor Open Channel Support Frame
304SSTL frame structure
Custom built to span open channels

ADD PRICE (EA): $1,770

Duperon ADAPTIVE TECHNOLOGY™
Let's Build a System that Works for You™

Date: June 14, 2017
Project: City of Long Beach NY
Number: 9394

HYDRAULIC CALCULATIONS

Notes: 10 MGD per screen (4 ft wide x 4 ft deep channel)

INPUT: Channel Physics

Flow in MGD	10.00	MGD
Upstream water level	3.50	ft
Channel width	4.00	ft
Channel depth	4.00	ft
Degree of blinding	25%	

INPUT: Screen Physics

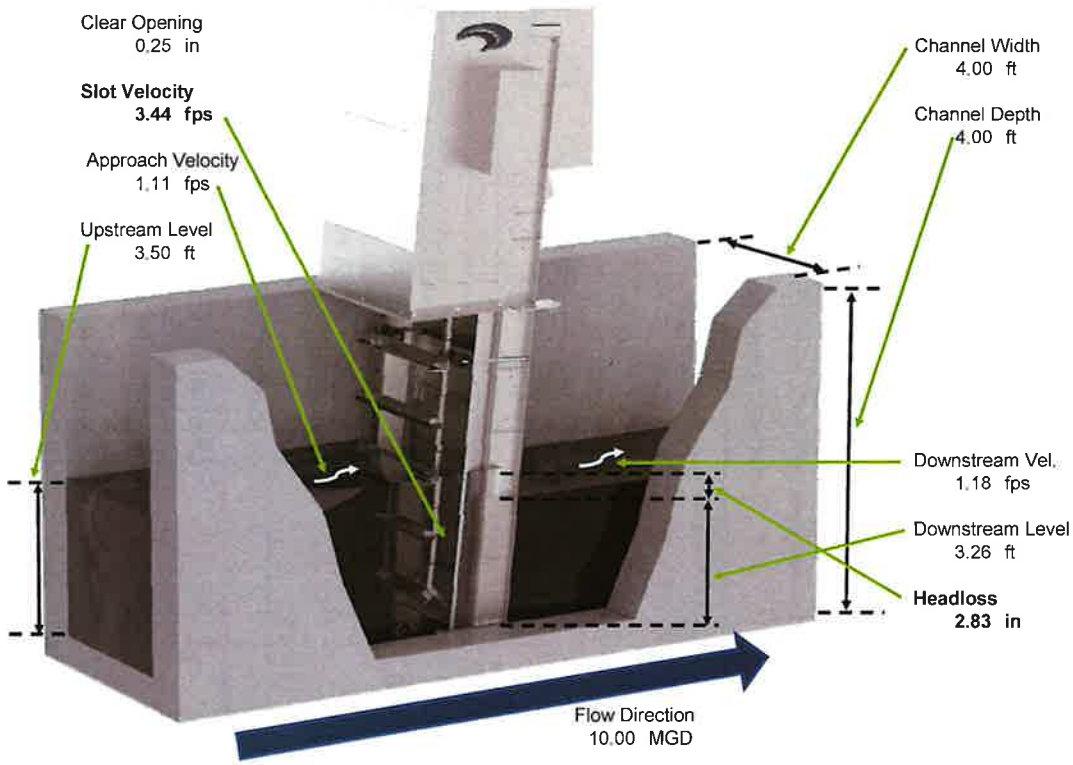
Clear Opening	0.25	in
Bar thickness	0.25	in
Thickness of side fab and closeout (2)	0.58	ft

Calculations

Side fab & closeout area	2.03	sft
Flow area between side fab & closeouts	11.97	sft
Number of bars	82.00	ea
Flow area taken up by bars	5.98	sft
Total Channel flow without screen	14.00	sft
Flow area after screen area and blinding taken out	4.49	sft
Approach Velocity	1.11	fps
Slot Velocity	3.44	fps
Downstream Velocity	1.18	fps
Downstream Depth	3.26	ft
Head Loss	2.83	in

Bernoulli Calculations

Velocity thru bar scren	3.44	fps
Velocity upstream of bar screen	1.11	fps
Gravitational acceleration (constant)	32.20	fps
Frictional coefficient (constant)	1.43	c
Headloss	0.24	ft
Headloss	2.83	inches



These calculations are an estimation based upon the information available. Flow channel hydraulics are highly dependent on water levels and the degree of blinding. The calculations above are a snapshot of only one condition. To fully analyze the hydraulics please contact your local Duperon representative.
Duperon recommends a minimum of 1.00 ft water depth when the unit is in operation to keep the SSTL FlexLinks lubricated and ensure an optimal amount of screening area.

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Full-Range Flexibility and Maximum Capture with Thru-Bar™ Cleaning; Adapts Automatically to Wide Variations in Debris

FlexRake® FPFS

Thru-Bar™ Cleaning Fine Screen

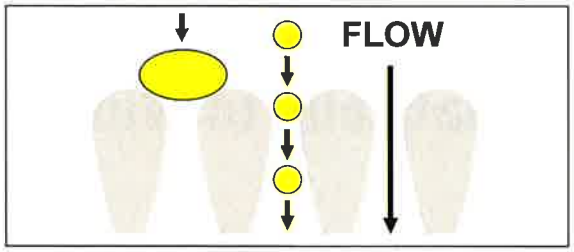
Simple front cleaning, front return Duperon® FlexRake® technology. Utilizes stainless steel tear-shaped bars with 1/4 inch, 3/8 inch or 1/2 inch openings.

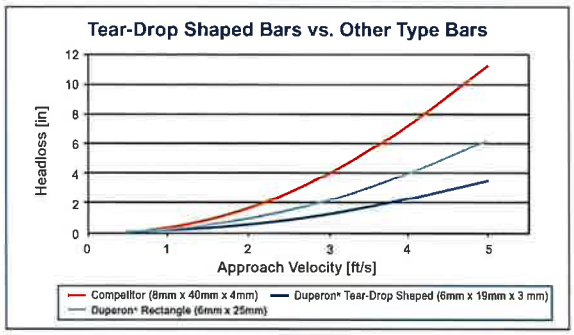
- No Lower Sprockets, Bearings or Tracks to Foul or Jam
- Adapts to Debris Variations; Full-Range Flexibility
- High Capture Thru-Bar™ Stainless Steel Scrapers
- Low Horsepower, Energy Efficient Drive System
- Tear-Drop Shaped Bars Provide Increased Flow Rate
- Five-Year Warranty for Wastewater Applications

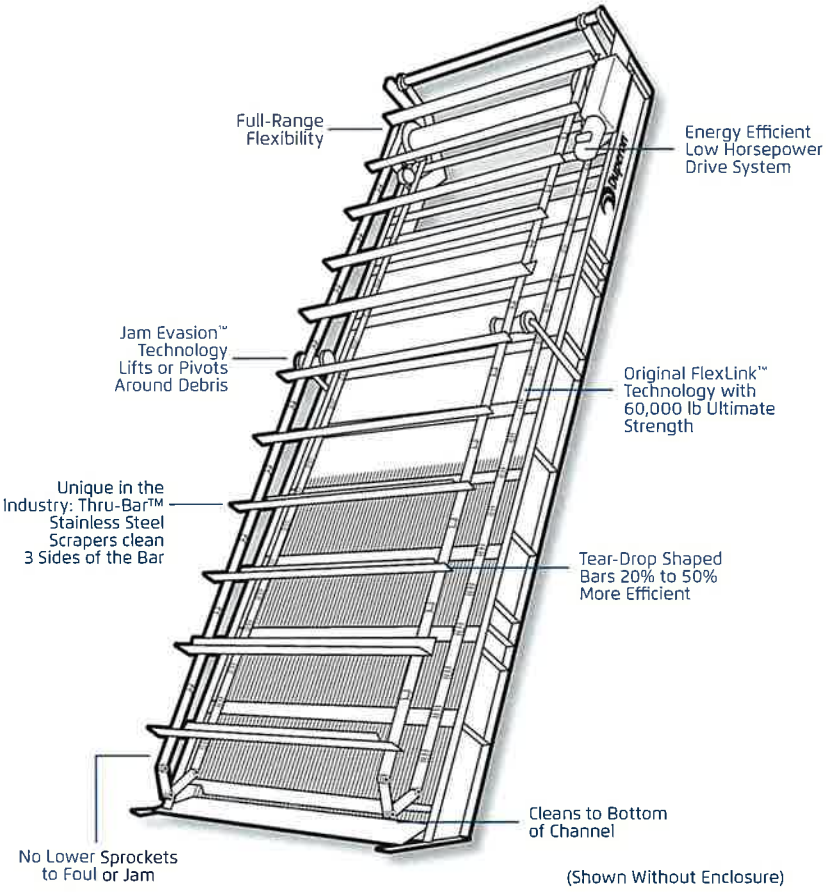
Duperon® ADAPTIVE TECHNOLOGY™

The Duperon® FlexRake® FPFS

TEAR-DROP SHAPED BARS ARE THE MOST EFFICIENT BARS IN THE INDUSTRY







TYPICAL APPLICATIONS

Wastewater, combined sewer overflows and prison applications. Also used in pulp/paper mills, raw water intakes, and other applications where debris is highly variable or difficult to capture.

UNIT WIDTH

- 2 feet to 12 feet
- Single Strand FlexRake® configuration available for channel widths of 18 inches to 24 inches

UNIT LENGTH

10 feet to 100 feet

ANGLE OF INSTALLATION

Range from 10 degrees to 45 degrees.

STANDARD MATERIALS OF CONSTRUCTION

- Standard: 304 Stainless Steel
- Available in: 316 Stainless Steel

BAR OPENING

1/4 inch, 3/8 inch and 1/2 inch

STANDARD SCRAPER SPACING

Every 2nd link (21 inches)

SCRAPER CONFIGURATION

- 3:1 UHMW-PE staging scraper/stainless steel Thru-Bar™ teeth ratio

TYPICAL MOTOR

1/2 HP, 1 PH/3 PH explosion proof inverter-duty motor

STANDARD OPERATING SPEED

- 0.5 RPM
- Can be increased to 2.2 RPM in high flow conditions
- 1 discharge/minute on low; 4 discharges/minute on high
- Scrapers move 28 inches/minute

SHIPPING DATA

Ships fully assembled or can be provided in modular form.

STANDARD CONTROLS OPTIONS

Packages range from simple start/stop to sophisticated automation. Motor overload protection provided. Contact Duperon® for further details and assistance in selecting the perfect package for your site.

OPERATION OPTIONS

- Continuous/Manual
- Automatic with timer, float, SCADA, differential/high level sensing options with I/O as needed

To Learn more about Duperon® Adaptive Technology,™ scan this QR code or visit www.duperon.com

Duperon® ADAPTIVE TECHNOLOGY™
Let's Build a System that Works for You™

1200 Leon Scott Court | Saginaw, MI 48601 | P 989.754.8800 | F 989.754.2175 | TF 800.383.8479 | www.duperon.com

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3011/3/16/OM

Self-Regulating Compaction Provides a Reliable, Hassle-Free Way to Reduce Landfill Costs

Washer Compactor

Positive Displacement, Dual-Auger System

Robustly simple, high-efficiency, non-batching process machine that cleans and compacts screenings up to 4 inches. Standard discharge lengths up to 20 feet.

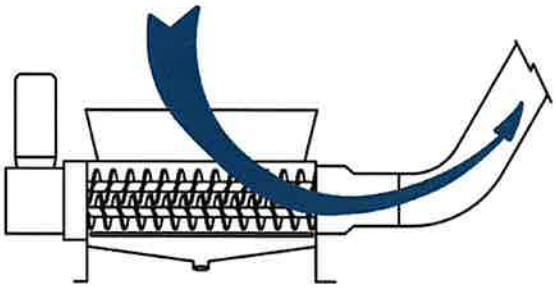
- Consistent Compaction Regardless of Debris Size or Volume (Using Proprietary Compaction Zone*)
- Positive Displacement: What Goes In Comes Out
- Up To 84% Volume Reduction, Up To 60% Dry Solids; Reduces Landfill Costs
- Accepts Non-Standard Wastewater Debris (Rocks, Clothing, Concrete, Metal) up to 4 inches
- Immediate Debris Processing: Low Odor
- Self-Cleaning Strainer: No Brushes Needed

Duperon® ADAPTIVE TECHNOLOGY™

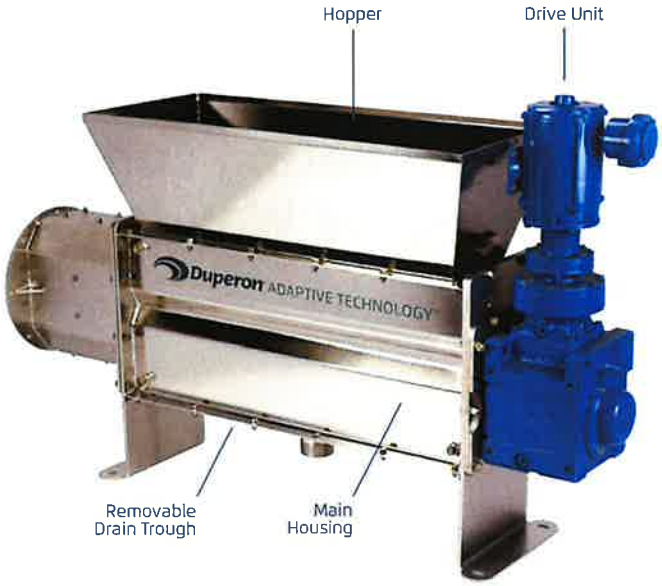
*Patent Pending

The Duperon® Washer Compactor

- Housing Geometry Controls Potential for "Slip Flow" When Processing Grease, Septage and Similar Debris
- Self-Centering Dual Augers Mean No Debris Wrapping
- Non-Clogging Flood Wash Port—Ideal for Non-Potable Water
- Removable Drain Trough Provides Simple Access to Strainer



Non-Batch Operation



Washer Compactor shown without Compaction Housing for use with Discharge Extension Option

WATER
- Utilizes filtered effluent or municipal water
- Washer consumes 3-10 gallons per minute
- Requires 40 PSI-60 PSI
- Drain connection 3" NPT
- Supply connection 1/2" NPT

UTILITY
- 120/240 volt, single phase
- 240/480 volt, three phase (0.6 kW/2.3 kW/3.8kW)

DRIVE
3/4 HP, 3 HP, 5 HP inverter duty motors available

HOPPER
Available in 27", 43" and 67" widths

DISCHARGE CHUTE
Chutes of up to 20' available

MATERIALS OF CONSTRUCTION
- 304 SSTL or 316 SSTL
- SSTL spur gears (17 - 4 PH)

TYPICAL PERFORMANCE
- 30% - 60% dry solids
- 60% - 70% weight reduction
- Significantly decreases odor and fecal content

CAPACITY
Available from: 30 ft^3/hour to 150 ft^3/hour

MAINTENANCE
Application Specific:
Refer to Duperon® Life Cycle Cost Sheet

DISCHARGE EXTENSION OPTION
Transports debris up to 40' in any direction, without the use of a conveyor

To Learn more about Duperon® Adaptive Technology,™ scan this QR code or visit www.duperon.com

Duperon® ADAPTIVE TECHNOLOGY™
PRELIMINARY LIQUIDS/SOLIDS SEPARATION SYSTEMS

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3122/1/17/0M

NOTE:

THIS TEMPLATE DRAWING IS SUBJECT TO CHANGE PENDING SITE VERIFICATIONS AND PER THE INFORMATION MADE AVAILABLE AT THE TIME IT WAS CREATED. DRAWING MAY BE IMPACTED BY FUTURE SPECIFICATIONS, SCOPE, AND OTHER UPDATES PER REQUIREMENTS.

SITE SPECIFIC DRAWING IS AVAILABLE FROM DUPERON CORPORATION UPON REQUEST.

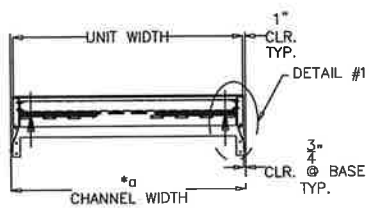
REV	DESCRIPTION	DATE	REVISED	APPROVED
1	ADDED LOGO	9/27/10	JKL	
2	ADDED VERIFICATION NOTES, DECK ANCHOR OPTION	1/30/12	JKL	
3	ADDED DIMENSIONS	5/26/16	JKL	

NOTE:

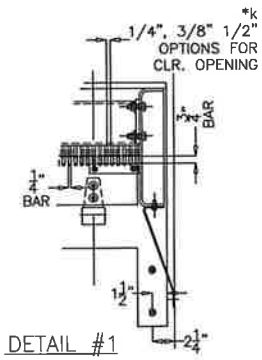
CUSTOMER IS RESPONSIBLE FOR VERIFYING THAT THE PROPOSED INSTALLATION IS SUITED TO EXISTING SITE.

SPECIFICALLY, CUSTOMER TO VERIFY THE FOLLOWING AND NOTES COMMENTS ON THE PRE-SUBMITTAL VERIFICATION FORM:

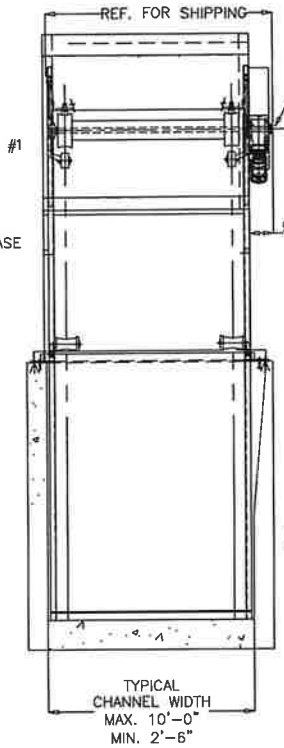
a. VERIFY EXISTING CHANNEL WIDTH DIMENSION, FULL HT. OF CHANNEL. (1) PLACE.
b. VERIFY MOTOR LOCATION ON RIGHT SIDE OF UNIT AND NOTE POWER REQUIREMENTS AT SITE. (i.e. PHASE).
c. VERIFY EXISTING CHANNEL; OPENING DIMENSION FROM DECK EDGE UPSTREAM TO FIRST OBSTRUCTION (1) PLACE.
d. VERIFY EXISTING CHANNEL HEIGHT DIMENSIONS (1) PLACE.
e. VERIFY MAXIMUM WATER HEIGHT.
f. VERIFY NORMAL WATER HEIGHT.
g. VERIFY DEBRIS CONTAINMENT HEIGHT AND NOTE LOCATION AND WIDTH- SHOWN (3) PLACES TO ASSURE SCREENING EQUIPMENT INTERACTION.
h. CUSTOMER TO NOTE ANY SITE CONSTRAINTS (I.E. CEILING HEIGHT, ETC.)
j. VERIFY IF ANY INSTALLATION CONSTRAINTS EXIST. (I.E. ACCESS DOOR OPENINGS, DECK OPENING, ETC.).
k. VERIFY REQUIRED SCREEN CLEAR OPENING.
l. VERIFY IF INTERIOR OR EXTERIOR INSTALLTION. IF EXTERIOR VERIFY IF FREEZING CONDIDTIONS ARE PRESENT.
m. VERIFY UNIT ANGLE OF INSTALLATION.
n. VERIFY IF EXISTING CHANNEL WALL OR FLOOR VOIDS EXIST? IF YES MUST BE FILLED w/ INTEGRAL STRUCTURAL FILL (BY OTHERS).



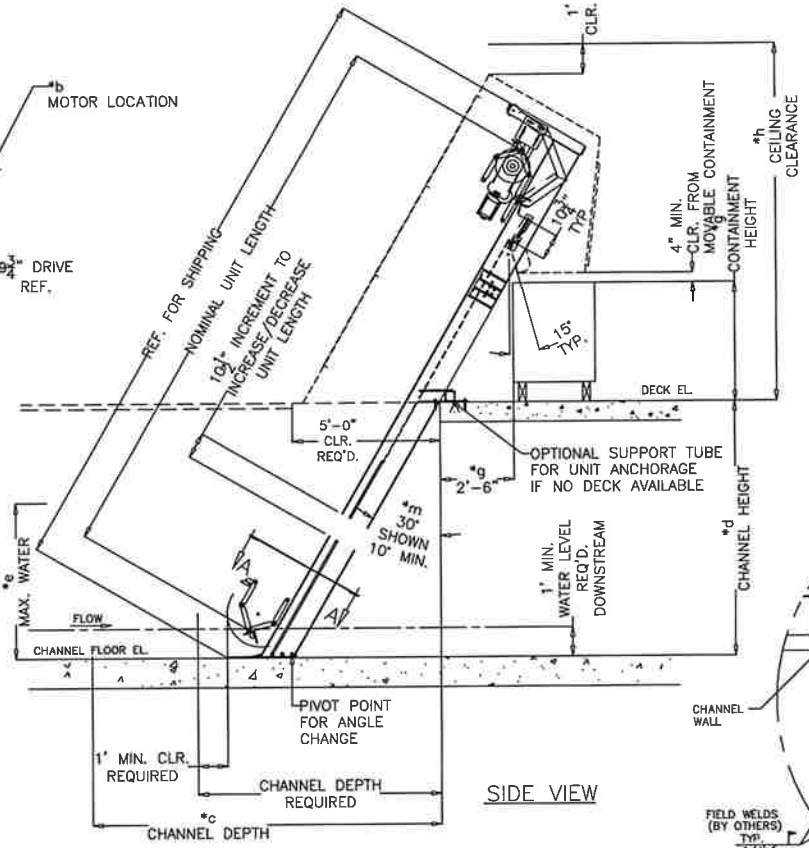
SECTION VIEW A-A



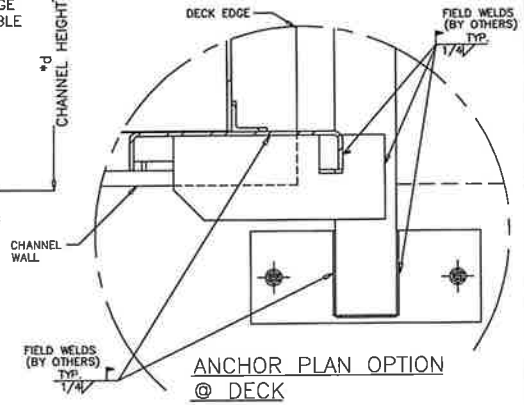
DETAIL #1



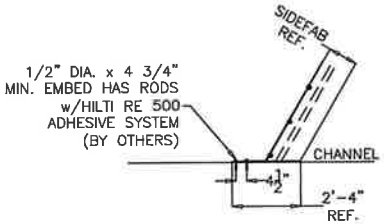
FRONT VIEW



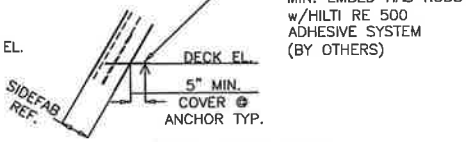
SIDE VIEW



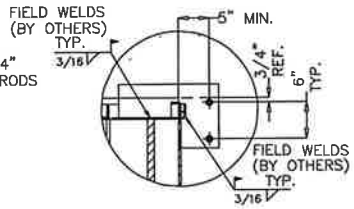
ANCHOR PLAN OPTION @ DECK



SIDE VIEW @ UNIT BASE TYP. EACH SIDE



TYP. SIDE VIEW @ DECK



ANCHOR PLAN @ DECK

CONCEPTUAL

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PROPRIETARY

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DIMENSIONING & TOLERANCING IN ACCORDANCE WITH ANSI Y14.5M-1982

TOLERANCES - UNLESS OTHERWISE SPECIFIED

.X	= ±0.03
.XX	= ±0.01
.XXX	= ±0.005
.XXXX	= ±0.0005
ANGULAR	= ±0.5°

		DATE
DRAWN	JKL	04/20/10
CHECKED		DATE
APPROVED		DATE
APPROVED		DATE
APPROVED		DATE

FPFS PRELIMINARY

Duperon®
Saginaw, Michigan 48603
TF 800.363.8479

SHEET TITLE
DUPERON CORPORATION FlexRake®

PART NAME
TEMPLATE

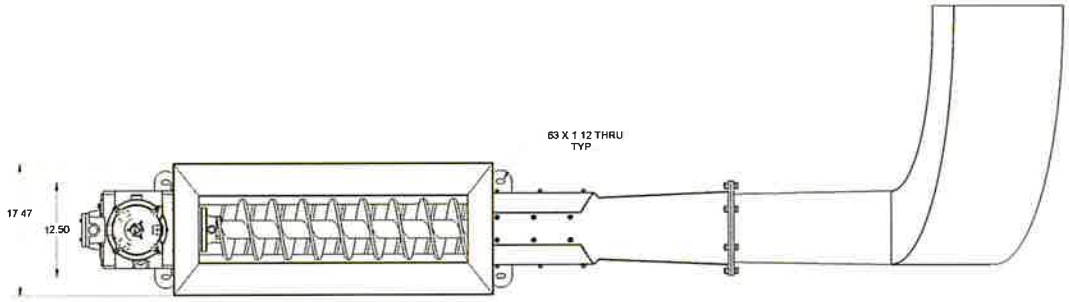
SIZE	FINISH NO.	DWG. NO.	REV
D		PROPOSAL NO.	3

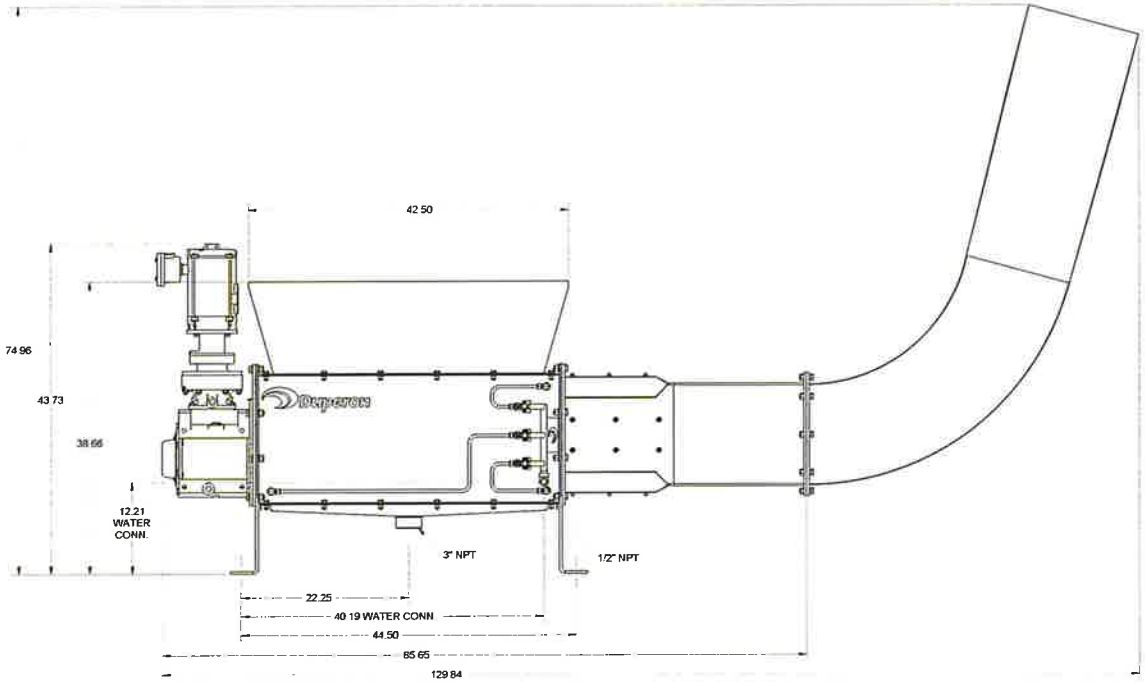
SCALE 1:50 SHEET

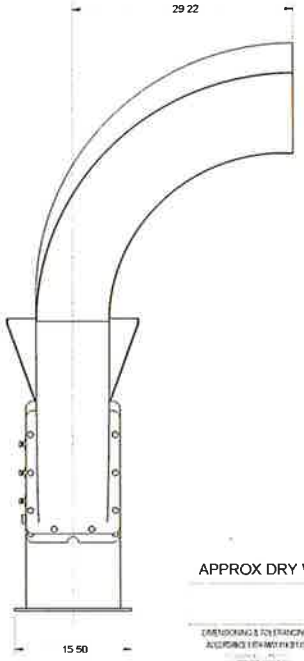
Compactor

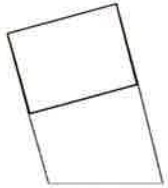
REVISIONS			
REV	DESCRIPTION	DATE	REVISED APPROVED

DUPERON
WASHER COMPACTOR
WC.A2.X.XXX
SALES TEMPLATE DRAWING
FOR REFERENCE ONLY









APPROX DRY WEIGHT: 828 lbs

MAIN LAYOUT

*SHOWN WITH A TYPICAL DISCHARGE CHUTE.
OTHER CHUTE CONFIGURATIONS ARE AVALABLE.
CONSULT DUPERON PRODUCT ENGINEERING.

PROPRIETARY

DRAWN DJB	DATE 2/22/2017
CHECKED	DATE
APPROVED	DATE

DUPERON CORPORATION WASHER/COMPACTOR*

MAIN LAYOUT

SIZE D | DRAWING NO WC.A2.X.X.XXX | REV 1

SCALE 1 8 | SHEET 3 OF 7

APPENDIX G

Detailed Cost Estimates

- **Force Main Piping**
- **Pump Station Building**

Force Main Piping

Nassau County Department of Public Works
Long Beach WPCP Diversion

PRELIMINARY DRAFT FORCE MAIN CONSTRUCTION COST ESTIMATE

Date: 6/22/2017

Item Description	Unit	Qty	Material $ Unit $	Material $ Total $	Labor $ Unit $	Labor $ Total $	Total $
Gen. Cond., Mob/Demob, Temp. Fac., etc.	ls	1	-	-	-	-	$ 548,489
Unforeseen Field Conditions Allowance	ls	1	-	-	-	-	$ 548,489
Relocate Utilities and Traffic Loops	ls	1	-	-	-	-	$ 548,489
Maintenance and Protection of Traffic	ls	1	-	-	-	-	$ 1,919,711
Excavation	cy	41,339	-	-	$ 45	$ 1,860,245	$ 1,860,245
Backfilling/Compaction	cy	27,483	-	-	$ 35	$ 961,900	$ 961,900
Removal of Unsuitable Material	cy	12,402	-	-	$ 45	$ 558,073	$ 558,073
Dewatering	days	311	$ 1,400	$ 435,680	$ 3,500	$ 1,089,200	$ 1,524,880
Sheeting/Shoring	sf	180,310	$ 7	$ 1,273,439	$ 16	$ 2,794,805	$ 4,068,244
Sawcuttting	lf	31,120	-	-	$ 4	$ 124,480	$ 124,480
Pipe Jacking	lf	200	-	-	$ 1,500	$ 300,000	$ 300,000
Jacking/Receiving Pits	ls	1	-	-	$ 400,000	$ 400,000	$ 400,000
Two (2) Horizontal Directional Drills (HDD)	lf	3,700	-	-	$ 1,700	$ 6,290,000	$ 6,290,000
HDD Entry/Receiving Pits	ls	1	-	-	$ 400,000	$ 400,000	$ 400,000
HDD HDPE Pipe - 24" Diameter SDR9	lf	3,700	$ 100	$ 370,000	$ 150	$ 555,000	$ 925,000
Air Release MH (10' deep)	ea	8	$ 12,000	$ 96,000	$ 12,000	$ 96,000	$ 192,000
Drain MH (12' deep)	ea	2	$ 15,000	$ 30,000	$ 15,000	$ 30,000	$ 60,000
Drain MH (14' deep)	ea	6	$ 20,000	$ 120,000	$ 20,000	$ 120,000	$ 240,000
Drain MH (18' deep)	ea	2	$ 25,000	$ 50,000	$ 25,000	$ 50,000	$ 100,000
Aggregate Base Course (6" subbase + 5.5" base)	cy	3,350	$ 50	$ 167,500	$ 30	$ 100,500	$ 268,000
Asphalt Binder Course (2.5")	tons	1,490	$ 60	$ 89,400	$ 60	$ 89,400	$ 178,800
Asphalt Top Course (1.5")	sy	10,470	$ 20	$ 209,400	$ 10	$ 104,700	$ 314,100
Temporary Pavement	sy	10,470	$ 6	$ 62,820	$ 5	$ 52,350	$ 115,170
Pavement Markings	lf	15,560	$ 3	$ 38,900	$ 3	$ 38,900	$ 77,800
Ductile Iron Pipe - 24" Diameter Force Main (0-8 ft. deep)	lf	3,078	$ 100	$ 307,815	$ 150	$ 461,723	$ 769,538
Ductile Iron Pipe - 24" Diameter Force Main (8-12 ft. deep)	lf	10,517	$ 100	$ 1,051,669	$ 150	$ 1,577,503	$ 2,629,172
Ductile Iron Pipe - 24" Diameter Force Main (>12 ft. deep)	lf	1,965	$ 100	$ 196,516	$ 150	$ 294,774	$ 491,290
						Subtotal	$ 26,413,870
						+ 15% Contingency	$ 3,962,080.5

Total Preliminary Draft Force Main Construction Cost Estimate (2017) = $ 30,375,951

Approx. cost / linear foot = $ 1,725

$4,556,393

$34,932,343

Pump Station Building

PRELIMINARY DRAFT FLOOD PROOFING OF PUMP STATION CONSTRUCTION COST ESTIMATE

Date: 6/22/2017

			Material $		Labor $		
Item Description	**Unit**	**Qty**	**Unit $**	**Total $**	**Unit $**	**Total $**	**Total $**
Gen. Cond., Mob/Demob, Temp. Fac., etc.	ls	1	-	-	-	-	$99,757.78
Engineering, Legal, Administation, Permitting	ls	1	-	-	-	-	$399,031.11
Unforeseen Field Conditions Allowance	ls	1	-	-	-	-	$199,515.56
Process Equipment:							
Dry Pit Submersible Pumping Units	ea	4	$100,000.00	$400,000.00	$50,000.00	$200,000.00	$600,000.00
VFD's	ea	4	$30,000.00	$120,000.00	$15,000.00	$60,000.00	$180,000.00
Screening Units	ea	2	$100,000.00	$200,000.00	$50,000.00	$100,000.00	$300,000.00
Emergency Generator	ea	1	$200,000.00	$200,000.00	$100,000.00	$100,000.00	$300,000.00
ATS	ea	1	$50,000.00	$50,000.00	$25,000.00	$25,000.00	$75,000.00
General Building Improvements:							
Windows	ea	11	$400.00	$4,400.00	$200.00	$2,200.00	$6,600.00
Flood-Proof Doors	ea	3	$25,000.00	$75,000.00	$25,000.00	$75,000.00	$150,000.00
HVAC Systems	ls	1	-	-	-	-	$25,000.00
Hardware	ls	1	-	-	-	-	$10,000.00
Electrical Upgrades	ls	1	-	-	-	-	$150,000.00
Interior Lighting	ls	1	-	-	-	-	$25,000.00
Roof	sf	3,375	$12.00	$40,500.00	$12.00	$40,500.00	$81,000.00
Site Improvements:							
Asphalt Paving	sy	1,464	$20.00	$29,277.78	$20.00	$29,277.78	$58,555.56
Site Lighting	ls	1	-	-	-	-	$25,000.00
Curbing	lf	600	$5.00	$3,000.00	$10.00	$6,000.00	$9,000.00

Subtotal $2,693,460.00

+ 20% Contingency $538,692.00

Total Preliminary Draft Pump Station Hardening Construction Cost Estimate (2017) = $3,232,152.00

APPENDIX H

EFC Smart Growth Form

NEW YORK STATE OF OPPORTUNITY. | Environmental Facilities Corporation

Smart Growth Assessment Form
New York State Revolving Funds (CWSRF & DWSRF)

This form should be completed by the applicant's project engineer or other design professional.[1] Please refer to EFC's "Smart Growth Guidance".[2]

Applicant Information

SRF Applicant: City of Long Beach SRF No.: C1-5146

Project Name: Flow Diversion Pump Station and Force Main

Is project construction complete? ☐ Yes, date:_____ ☑ No

Project Summary: (provide a short project summary in plain language including the location of the area the project serves)

City of Long Beach proposes to convert a portion of existing WWTP into a PS with a 17,500 lineal ft. FM to transfer sewage from the City of LB (on barrier island) to the mainland (Oceanside) for treatment of regional STP. The project wi

Section 1- Screening Questions

1. Prior Approvals

1A. Has the project been previously approved for SRF financing? Yes ☑ No ☐

1B. If so, what was the SRF project number(s) for the prior approval(s)? SRF No.: C1-5146

Is the scope of the project substantially the same as that which was approved? Yes ☑ No ☐

IF THE PROJECT WAS PREVIOUSLY APPROVED BY EFC'S BOARD AND THE SCOPE OF THE PROJECT HAS NOT MATERIALLY CHANGED, THE PROJECT IS **NOT** SUBJECT TO SMART GROWTH REVIEW. SKIP TO SIGNATURE BLOCK.

2. New or Expanded Infrastructure

2A. Does the project add new wastewater collection/new water mains or a new wastewater treatment system/water treatment plant? Yes ☑ No ☐

Note: A new infrastructure project adds wastewater collection/water mains or a wastewater treatment/water treatment plant where none existed previously

2B. Will the project result in either: Yes ☐ No ☑

An increase of the State Pollution Discharge Elimination System (SPDES) permitted flow capacity for an existing treatment system;

OR

An increase such that a NYSDEC water withdrawal permit will need to be obtained or modified, or result in the NYSDOH approving an increase in the capacity of the water treatment plant?

Note: An expanded infrastructure project results in an increase of the SPDES permitted flow capacity for the wastewater treatment system, or an increase of the permitted water withdrawal or the permitted flow capacity for the water treatment system.

[1] If project construction is complete and the project was not previously financed through the SRF, an authorized municipal representative may complete and sign this assessment.

[2] Available at the Smart Growth Website

IF THE ANSWER IS "NO" TO BOTH "2A" AND "2B" ON THE PREVIOUS PAGE, THE PROJECT IS NOT SUBJECT TO FURTHER SMART GROWTH REVIEW. SKIP TO SIGNATURE BLOCK.

3. Court or Administrative Consent Orders

3A. Is the project expressly required by a court or administrative consent order? Yes ☑ No ☐

3B. If so, have you previously submitted the order to NYS EFC or DOH? If not, please attach. Yes ☐ No ☑

Section 2- Additional Information Needed for Relevant Smart Growth Criteria

EFC has determined that the following smart growth criteria are relevant for SRF projects and that projects must meet each of these criteria to the extent practicable:

1. Uses or Improves Existing Infrastructure

1A. Does the project use or improve existing infrastructure? Yes ☑ No ☐

Please Describe:

Existing influent pump station at WWTP to be hardened and converted to flow diversion pump station to transfer sewage to mainland. Balance of existing antiquated WWTP to be decommissioned and demolished.

2. Serves a Municipal Center

Projects must serve an area in either 2A, 2B or 2C to the extent practicable.

2A. Does the project serve an area **limited** to one or more of the following municipal centers?

i.	A city or incorporated village	Yes ☐	No ☑
ii.	A central business district	Yes ☐	No ☑
iii.	A main street	Yes ☐	No ☑
iv.	A downtown area	Yes ☐	No ☑
v.	A Brownfield Opportunity Area (for more information, go to the Department of State Website & search "Brownfield")	Yes ☐	No ☑
vi.	A downtown area of a Local Waterfront Revitalization Program Area (for more information, go to the Department of State Website & search "Waterfront Revitalization")	Yes ☐	No ☑
vii.	An area of transit-oriented development	Yes ☐	No ☑
viii.	An Environmental Justice Area (for more information, go to DEC'S Page of County Environmental Justice Area Maps)	Yes ☐	No ☑
ix.	A Hardship/Poverty Area	Yes ☐	No ☑

Please Describe All Selections:

The City of Long Beach is one of only two cities on Long Island. Its WWTP serves its downtown including commercial establishments as well as residential dwellings, both single- and multi-family. An environmental justice area is adjacent to the existing WWTP. The LIRR station is within walking distance to the WWTP, City Hall and Main Street. Additionally, the WWTP receives sewage from the unincorporated town of Hempstead community of Lido Beach.

2B. If the project serves an area located outside of a municipal center, does it serve an area located adjacent to a municipal center which has clearly defined borders, designated for concentrated development in a municipal or regional comprehensive plan and exhibit strong land use, transportation, infrastructure and economic connections to an existing municipal center?

Yes ☐ No ☑

Please Describe:

NA

2C. If the project is not located in a municipal center as defined above, is the area designated by a comprehensive plan and identified in zoning ordinance as a future municipal center?

Yes ☐ No ☑

Please describe and reference applicable plans:

3. Resiliency Criteria

3A. Was there consideration of future physical climate risk due to sea-level rise, storm surge, and/or flooding during the planning of this project?

Yes ☑ No ☐

Please Describe:

Existing site of the WWTP was inundated by storm surge during Superstorm Sandy. Proposed flow diversion project will harden the pump station to elevation 20. This elevation accounts for 500 year flood event (13.1 elevation), plus wave action (3.6 feet), plus climate change (2.93 feet). Flow diversion eliminates hardening of entire site, resulting in significant savings to the community.

Signature Block: By entering your name in the box below, you agree that you are authorized to act on behalf of the applicant and that the information contained in this Smart Growth Assessment is true, correct and complete to the best of your knowledge and belief.

Applicant Name: City of Long Beach

Phone Number: (516) 431-1001

Name & Title of Project Engineer or Design Professional or Authorized Municipal Representative:
Jack Schnirman, City Manager

Signature: _____

Date: 06/23/17