

TECHNICAL MEMORANDUM

**JAMAICA PLAN DEIS
WPCP AND CSO IMPACT ANALYSIS**

Prepared for

NEW YORK CITY DEPARTMENT OF CITY PLANNING

**NEW YORK CITY ECONOMIC DEVELOPMENT
CORPORATION**

**NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL
PROTECTION**

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Jamaica Plan DEIS WPCP and CSO Impact Analysis January 2007

I. Introduction

This document has been prepared in support of the Jamaica Plan Draft Generic Environmental Impact Statement (DGEIS) and in accordance with the *City Environmental Quality Review (CEQR) Technical Manual*. It presents calculations regarding the annual loads to Jamaica Bay for total nitrogen (TN), fecal coliform, and Biochemical Oxygen Demand (BOD-5) for the existing conditions, future conditions without the project (future no build), and future conditions with the project (future build). The estimates of these pollutant loads, as provided in the results table in Section IV, are intended for comparative use in the DGEIS Chapter 13 - Infrastructure, Sections B, C, and D, titled Existing Conditions, Future Without the Proposed Actions (No Build), and Future With the Proposed Actions (Build), respectively.

The loads for the parameters of concern have been developed for the three CEQR conditions by summing the calculated loads from the three major sources in each of the water pollution control plant (WPCP) drainage areas tributary to Jamaica Bay. The WPCP drainage areas include those of the 26th Ward, Coney Island, Jamaica, and Rockaway WPCPs. The major loading sources to the Bay for each drainage area include WPCP effluent, combined sewer overflow (CSO), and non-CSO stormwater.

The loading calculations are based on applying concentrations of TN and BOD-5 and fecal coliform counts per unit volume to flows for each of the three major loading sources. In each case, concentrations were based on calendar year 2005 information provided by the New York City Department of Environmental Protection (NYCDEP) in its annual Process Engineering Reports. Likewise, WPCP effluent flows for the existing conditions were determined based on NYCDEP calendar year 2005 information. Future build and no build condition WPCP flows were based on NYCDEP projections, and, in the case of the Jamaica WPCP, the future build and no build condition flows were based on the information provided in the August 2, 2006 AKRF draft of the DGEIS infrastructure chapter. For the CSO and stormwater loads, these base WPCP flows have been used along with the concentrations, tidal, and precipitation data as inputs into the computer models of the City sewer system (i.e., InfoWorks and RAINMAN) for the purposes of calculating flows and loads. More detailed descriptions of the basis of analysis and calculation methods are described below.

The results of the analysis show that the future no build and future build conditions tend to be from 2 to 6 percent greater than the existing conditions with respect to TN and BOD-5 loading to Jamaica Bay. Fecal coliform loadings are estimated to be on the order of 12 percent less than existing conditions due to the completion of the Paerdegat CSO Retention Facility prior to 2015. However, the increases in loadings of the future build condition relative to the future no build condition tend to be less than one percent.

Relative to the Jamaica WPCP drainage area and loading sources, the future no build and build conditions tend to be from 7 to 12 percent greater than the existing conditions with respect to TN, BOD-5, and fecal coliform loads. However, the increases in loadings of the future build relative to the future no build conditions tend to be 2 percent or less.

Based on the analysis results as described herein, it is concluded that the proposed action would not result in significant adverse impacts on the water quality of Jamaica Bay.

More comprehensive results are provided in Section IV.

II. Basis of Analysis

A. Time Frames

Existing conditions were based on data from calendar year 2005. Future build and no build conditions were based on projections for 2015. These time frames were selected to maintain consistency with the August 2, 2006 AKRF draft of the DGEIS Chapter 13 – Infrastructure.

B. Assumptions

All of the Jamaica Plan area is in the drainage area of the Jamaica Bay WPCP and therefore the proposed action is assumed to impact only the Jamaica WPCP drainage area from a landside perspective. However, in order to accurately reflect future conditions in Jamaica Bay, which is affected by all four WPCP drainage areas tributary to the Bay, all four were included in the analysis.

It has been assumed for this analysis that pollutant concentrations for future build and no build conditions will remain at current levels. This represents a conservative approach as NYCDEP will be upgrading facilities and adopting new best management practices that are expected to reduce pollutant concentrations. However, adequate information to predict the concentration reductions is not available. Therefore, existing concentrations have been used for future conditions.

It has also been assumed that except for the Jamaica WPCP drainage area, 2015 stormwater inputs to WPCP daily flow averages will remain at calendar year 2005 levels (i.e., the difference between 2015 daily dry weather flow averages and 2015 daily flow averages will reflect those same differences in the 2005 data).

The net changes in impervious land cover were assumed to be negligible between the existing, no-build and build conditions per the AKRF draft DGEIS infrastructure chapter. The proposed action consists largely of redeveloping existing developed areas with little change in open space, streets, and pervious cover.

A significant change between the existing condition and the future conditions that has been included in the analysis is the Paerdegat CSO Retention Facility, currently under construction and due to be operational prior to 2015. This is most obviously manifested in the reduction of estimated CSO pollutant loadings in the Coney Island WPCP drainage area in 2015 relative to 2005.

Precipitation recorded at John F. Kennedy airport in 1988 is used to perform the annual model simulations. Use of this rainfall record is consistent with other projection studies being performed in the NYC area, such as the New York City CSO Long Term Control Program (LTCP) being conducted in accordance with federal Clean Water Act and New York State Pollutant Discharge Elimination System (SPDES) permit requirements. Tidal patterns from the same time period are also input into the model to accurately simulate the hydraulics at the outfalls. Rainfall and tidal data was obtained from National Oceanic and Atmospheric Administration (NOAA).

C. Conservative Factors

The analysis performed for this technical memorandum has an inherent conservative bias due the exclusion of several important considerations that will likely reduce the 2015 pollutant loading impacts from the study area to Jamaica Bay relative to 2005 conditions. The following considerations were excluded because ongoing planning and design processes and comprehensive pollutant load reduction analyses are not yet complete.

- Green Building Practices/Requirements – Although not quantified herein, the construction that results from the proposed action will likely include onsite stormwater detention, enhanced water conservation practices, and possibly other sustainable water supply and wastewater and stormwater management techniques that will reduce flows relative to the future conditions used in this analysis. Some practices like onsite stormwater detention would be imposed by the NYCDEP when applicants apply for sewer connection permits. Others may originate from changes in regulations relative to Best Management Practices (BMPs) and Low Impact Development (LIDs) practices (i.e., “green building” techniques) that could be the result of the ongoing Jamaica Bay Watershed Protection Plan mandated by the City Council. These potential “green building” practices have not been included in this analysis, adding a measure of conservatism to the analytical approach.
- Jamaica Bay Comprehensive Plan – NYCDEP has been required by the Nitrogen Consent Order to submit a comprehensive plan to the NYSDEC in October 2006 that will address the impacts of excess nitrogen on compliance with dissolved oxygen water quality standards in Jamaica Bay. This plan will likely result in infrastructure that will reduce WPCP effluent BOD and nitrogen concentrations. The most likely alternative will involve ongoing nitrogen load improvements (known as the Contract 12 upgrades) to the 26th Ward WPCP and implementation of level 2 BNR at the Jamaica WPCP. Rough estimates of TN load reductions for these two projects are provided in Table 1 below (but are not included in Section IV – Results).

Table 1 – Jamaica Bay Comprehensive Plan Improvements

Infrastructure Improvements	Existing TN Concentration (mg/L)	Potential TN Concentration (mg/L)	Reduction in TN Load (lbs/yr)
26th Ward Continued Nitrogen Load Reduction (Contract 12 Upgrades)	13.82	10.52	593,000
Jamaica Level 2 BNR	20.85	13.27	1,986,000
Total	na	na	2,579,000
Percent Reduction (Relative to Existing Conditions in Jamaica & 26th Ward WPCP Drainage Areas)	26th Ward Jamaica Total		24% 36% 32%

Notes:

Pollutant load reductions are relative to 2005 Existing Conditions in the Jamaica and 26th Ward WPCP drainage areas.

Pollutant load reductions are approximate and are based on applying potential Jamaica Bay Comprehensive Plan TN concentrations to 2005 Existing Conditions flows.

These estimates have not been included in Section IV – Results.

- CSO Facility Plans and Long Term CSO Control Plans – NYC DEP has submitted CSO Water Quality Facility Plans to the NYSDEC that will result in construction of infrastructure that will reduce CSO pathogens, BOD and nitrogen. Examples include the expansion of the wet weather treatment capacity of the 26th Ward WPCP by 50 MGD and the construction of high level storm sewers in the Laurelton section of Queens. Gross estimates of pollutant load reductions for these two projects are provided in Table 2 below (but are not included in Section IV – Results).

Table 2 – CSO Facility Plan & CSO LTCP Estimated Pollutant Load Reductions

Infrastructure Improvements	Reduction in CSO Flow (MG/yr)	Reduction in TN Load (lbs/yr)	Reduction in BOD Load (lbs/yr)	Reduction in Fecal Coliform Load (billion count/yr)
26th Ward 50 MGD Expansion	144	3,000	20,000	2,882,000
Laurelton High Level Storm Sewer Separation	829	6,000	28,000	3,631,000
Total	973	9,000	48,000	6,513,000
Percent Reduction (Relative to Existing Conditions in Jamaica & 26 th Ward WPCP Drainage Areas)	15%	5%	6%	13%

Notes:

Flow and pollutant load reductions are relative to 2005 Existing Conditions in the Jamaica and 26th Ward WPCP drainage areas.

Pollutant load reductions are approximate and account for CSO flow reductions and stormwater flow increases.

These estimates have not been included in Section IV – Results.

The above described NYCDEP sewer system infrastructure projects will be initiated in the study area and many may be completed prior to the build year of 2015, representing significant changes in the pollutant loadings over time. These changes will reduce the difference between existing conditions and future conditions. The exclusion of these anticipated benefits from this analysis represents a conservative bias in the analysis, and the pollutant loads estimated in this report as presented in Section IV may be arguably viewed as an upper limit of pollutant loading from CSOs, stormwater, and WPCPs (i.e., the actual

pollutant loads in the future build and future no build conditions will be lower than estimated herein).

D. Reference sources for base flows, concentrations, and model inputs

The base data from which flows and concentrations were developed were obtained from the sources listed in the reference matrix below (Table 3). Check marks associate the loading sources and conditions with the base data from which it was developed.

Table 3: Reference Matrix

Variable	Data Source	Loading Source				Condition	
		WPCP	CSO	Storm-water	Existing	Future No Build	Future Build
WPCP daily dry weather flow average per month and year	NYCDEP Process Engineering Report	✓	✓		✓		
WPCP daily flow average per month and year (dry weather plus wet weather)	NYCDEP Process Engineering Report	✓	✓		✓		
WPCP Average TN concentration per month (effluent)	NYCDEP Process Engineering Report	✓			✓	✓	✓
WPCP Average BOD-5 concentration per month (effluent)	NYCDEP Process Engineering Report	✓			✓	✓	✓
WPCP Average fecal coliform count per month (effluent)	NYCDEP Process Engineering Report	✓			✓	✓	✓
CSO TN concentration [WPCP Average TN concentration per month (influent)]	NYCDEP Process Engineering Report		✓		✓	✓	✓
CSO BOD-5 concentration	NYCDEP Process Engineering Report		✓		✓	✓	✓
CSO fecal coliform count per month	NYC CSO LTCP		✓		✓	✓	✓
STORMWATER TN concentration	NYC CSO LTCP		✓	✓	✓	✓	✓
STORMWATER BOD-5 concentration	NYC CSO LTCP		✓	✓	✓	✓	✓
STORMWATER fecal coliform count per month	NYC CSO LTCP		✓	✓	✓	✓	✓
Projected Future No Build WPCP daily dry	NYC CSO LTCP	✓	✓			✓	

Variable	Data Source	Loading Source			Existing	Condition	Future Build
		WPCP	CSO	Storm-water		Future No Build	
weather flow average per year (26 th Ward, Coney Island, and Rockaway WPCPs) Projected Future Build WPCP daily dry weather flow average per year (26 th Ward, Coney Island, and Rockaway WPCPs)	NYC CSO LTCP	✓	✓				✓
Projected Future No Build WPCP daily dry weather flow average per year (Jamaica WPCP)	AKRF DGEIS	✓	✓			✓	
Projected Future Build WPCP daily dry weather flow average per year (Jamaica WPCP)	AKRF DGEIS	✓	✓				✓
Rainfall Conditions	NOAA		✓	✓	✓	✓	✓
Sewer System Characteristics	NYC CSO LTCP		✓	✓	✓	✓	✓

Data Source Key

NYCDEP Process Engineering Report *New York City Department of Environmental Protection, Bureau of Wastewater Treatment, Process Engineering Section Operating Data Fiscal Year 2005, November 2005, and Fiscal Year 2006, November 2006.¹*

NOAA *National Oceanic and Atmospheric Administration., <http://www.noaa.gov/>*

NYC CSO LTCP *Sewer system characteristics are based on comprehensive information compiled as part of the New York City Department of Environmental Protection Combined Sewer Overflow Long Term Control Plan (NYCDEP CSO LTCP). Base information includes NYC sewer system Inflow and Infiltration maps, engineering drawings and as-builts, facility plans, and field work inspection reports.*
Projected future build and no build flow averages for the WPCPs are based on the projection analyses and calculations performed as part of the NYCDEP CSO LTCP.

AKRF DGEIS *AKRF, Jamaica Plan Draft DGEIS Chapter 13 – Infrastructure, Section C – The Future Without the Proposed Actions (No Build) and Section D – The Future With the Proposed Actions (Build)*

E. Sewer System Computer Modeling

A computer model – InfoWorks – was used to simulate the amount of combined sewage that overflows into Jamaica Bay from three of the four combined sewer (CS) tributary areas, namely Jamaica, 26th Ward, and Rockaway. The model simulated the amount of dry weather

¹ Fiscal Year 2006 process engineering preliminary draft data was provided to HydroQual ahead of official publication. Final checks of data were performed upon receipt of fiscal year 2006 final process engineering report. Inconsequential differences existed, mainly due to rounding, therefore changes were not made to this analysis.

sewage and the pollutant (i.e., TN, BOD-5, and fecal coliform) concentrations of that sewage for each sub-area of the study area tributary to Jamaica Bay. The model also simulated the amount of runoff and the pollutant concentrations of that runoff for each of the sub-areas. The model mixed the dry weather sewage and the wet weather runoff during rainfall events and included the CS regulator control decision-making rules that divert some of the wet weather flow to the WPCPs with the remainder being diverted to Jamaica Bay. Wet weather combined sewage not captured and diverted into the WPCP was calculated in the model as combined sewer overflow. Stormwater that runs off directly into Jamaica Bay was also simulated with the model.

InfoWorks comes from a suite of models that are commercially available from Wallingford Software. The model is one of among a variety of high-end computer models developed for uses on desktop PC computers by European research/consulting organizations.

For the Coney Island CS drainage area, the RAINMAN sewer system computer model was utilized. The RAINMAN model has been chosen to simulate conditions in the Coney Island drainage area in both the NYC Long Term Control Plan and Use and Standards Attainability studies. RAINMAN was developed by HydroQual, Inc. and is a FORTRAN program that uses the rationale formula to compute impervious surface runoff, and the model simulates the performance of regulators and interceptors to perform a flow balance around a given WPCP drainage area. Individual outfall overflows are calculated hourly as is the flow to the WPCP. Inputs to the model are similar to those in the InfoWorks framework including daily dry weather flow volumes and diurnal patterns, rainfall, and pollutant concentrations. As noted above, the RAINMAN model also includes regulator capacities to determine flows that are diverted as an overflow when the WPCP is beyond capacity.

A number of factors are required as inputs for the sewer system models for the computation of the pollutant loadings for each of the sewer districts. Some of these model inputs represent features of the sewer system that have been developed over the past several decades and are independent of the simulation period. These are fixed features such as the number of and location of combined sewer regulators, the number of and location of CSO points, the drainage areas connected to the regulators, the regulator capacities, the sewer piping configuration, etc. Each of these physical features remains relatively constant from year to year and has been established over time through the construction, calibration, and refinement of the sewer system models. As such, they do not need to be modified each year before using the models to develop the pollutant loadings from CSOs and stormwater in Jamaica Bay.

Elements that are required in the model to develop the loads accurately that could possibly change from year to year or month to month are listed below.

- Rainfall
- WPCP wastewater flows
- Dry weather sewage pollutant concentrations
- Runoff/stormwater pollutant concentrations

General procedures for computing the monthly pollutant loadings are summarized as follows.

1. Develop model inputs for rainfall, dry weather and wet weather WPCP wastewater flows, dry weather sewage pollutant concentrations, and runoff/stormwater pollutant concentrations.
2. Set-up the hydraulic model for each of the 26th Ward, Coney Island, Jamaica, and Rockaway drainage areas with the hourly rainfall data, dry weather sewage pollutant concentrations and stormwater pollutant concentrations.
3. Adjust model parameters to obtain agreement between the summed total dry weather sewage flow from each regulator drainage area and the daily average dry weather flow received at the individual WPCPs for the time period of interest.
4. Set the WPCP hydraulic capacity based on the annual average capacity provided by NYCDEP.
5. Execute the models to calculate the hourly CSO and stormwater overflow volumes for each hour of the year for each outfall within the WPCP drainage area.
6. For CSOs, calculate the portion of sanitary flow and runoff comprising combined sewage for each hour during the overflow events. Multiply the appropriate pollutant concentration to the sanitary and stormwater volumes. For stormwater overflows, multiply the total volume by the appropriate stormwater pollutant concentration.
7. Sum the individual hourly pollutant mass loadings at each outfall in the study area for a specified time period (e.g., month, day, year) depending upon need.
8. Sum the mass pollutant loading for all outfalls in the study area for the given time period of concern.

III. Calculation methods for loads

A. WPCP Effluent Loads

WPCP effluent loads were calculated by multiplying pollutant concentrations (see Table 4 below) by the average flows for each WPCP for each of the three conditions. Daily averages were converted to yearly flows and loads by multiplying by 365 days per year.

2005 calendar year WPCP average daily flow data provided by the NYCDEP was used to represent the existing conditions.

Projected dry weather flows for the 26th Ward, Coney Island, and Rockaway WPCPs were also provided by NYCDEP and were used for the future build and no build conditions. 2015 projected daily average flows for future build and no build conditions were developed by adding the difference between 2005 average daily dry weather flows and 2005 average daily flows to the 2015 projected daily dry weather flow averages for each WPCP.

For the Jamaica WPCP, future build and no build condition flows were based on projected dry weather flows from the AKRF DGEIS documentation. Daily average flows were created

by adding the difference between 2005 average daily dry weather flows and 2005 average daily flows to the 2015 projected daily dry weather flow averages for each WPCP.

Table 4: WPCP Effluent Load Base Data: Pollutant Concentrations

WPCP	TN (mg/L, WPCP effluent)	BOD-5 (mg/L, WPCP effluent)	Fecal Coliform (count/100ml, WPCP effluent)
26 th Ward	13.8	7.1	43
Coney Island	18.1	7.8	23
Jamaica	20.9	8.9	28
Rockaway	13.4	4.7	4.

B. CSO Loads

The models produce the percentages of sanitary flows and stormwater flows that comprise the CSO event at each outfall in each WPCP drainage area on an hourly basis. These flows are summed over the year to obtain the annual volumes of sanitary and stormwater flows discharging from each outfall. The CSO loads are then calculated by multiplying the annual sanitary and stormwater volumes by the appropriate sanitary and stormwater pollutant concentrations (see Table 5). The pollutant loads can then be summed based on WPCP drainage area.

The sanitary TN and BOD concentrations were obtained from the NYCDEP Process Engineering reports. The concentration of TN and BOD within stormwater volumes were consistent with concentrations utilized in the Long Term Control Plan projects. The fecal coliform sanitary and stormwater concentrations were also obtained from the Long Term Control Plan projects.

Table 5: CSO Load Base Data: Sanitary and Stormwater Pollutant Concentrations

WPCP Drainage Area	TN	BOD	FC
	(mg/L, WPCP influent)	(mg/L, WPCP influent)	(#/100mL, WPCP influent)
Sanitary			
26 Ward	21.2	126.	4,000,000
Coney Island	32.0	124.	4,000,000
Jamaica	29.3	148.	4,000,000
Rockaway	19.3	82.	4,000,000
Location	TN (mg/L)	BOD (mg/L)	FC (#/100mL)
Stormwater			
26 Ward	2.1	9.4	120,000
Coney Island	2.1	9.4	120,000
Jamaica	2.1	9.4	35,000
Rockaway	2.1	9.4	35,000

C. Stormwater Loads

Stormwater loads were calculated by multiplying the stormwater overflow volume by the appropriate pollutant stormwater concentration (see Table 5 above) at each outfall for each WPCP drainage area.

D. Total Loads

Total loads were developed by adding the loads from all sources in each WPCP drainage area for each condition.

IV. Results²

Table 6 shows the results of the load calculations for all three conditions (existing, future no build, and future build). The loads have been categorized per all four WPCPs tributary to Jamaica Bay (26th Ward, Coney Island, Jamaica, and Rockaway) and per pollutant (TN, BOD-5, and fecal coliform). Background calculations and relevant data have been provided in tabular form in Appendix 1.

A. WPCP Pollutant Loadings

As shown in Table 6, TN, BOD, and fecal coliform future condition loadings increase relative to the existing conditions for the WPCPs. Loadings from the 26th Ward, Coney Island, and Rockaway WPCPs do not differ between future build and future no build conditions. However, the project-related changes are apparent in the future build and future no build condition loadings from the Jamaica WPCP. Overall, the cumulative WPCP average daily flows increase from roughly 241 MGD (existing conditions) to 253 MGD (future no build conditions, 5% increase) to 255 MGD (future build conditions, 6% increase over the existing conditions). These increased flows translate to increased TN loads of roughly 38,100, 40,100 (5%), and 40,400 (6%) pounds per day respectively for each successive condition (approximate percentage increases relative to existing conditions are contained in parentheses). However, the TN loading increases between future build and future no build conditions are less than one percent. For BOD, the increased flows relate to loadings of roughly 16,700, 17,600 (5%), and 17,700 (6%) pounds per day. This BOD loading increase between future build and future no build conditions is also less than one percent. Fecal coliform loadings also increase for the WPCPs, from approximately 9.85E+13 counts per year to 1.03E+14 (4.5%) to 1.04E+14 (5.2%) counts per year for each successive condition. Fecal coliform loading differences between the future no build and future build conditions are also less than one percent.

Table 6 also shows the differences between each condition for the Jamaica WPCP. In this case, average daily flows increase from the existing conditions (86 MGD) to the future no build conditions (94 MGD, an approximate 10% increase relative to existing conditions) to the future build conditions (96 MGD, an approximate 12% increase relative to existing

² Results descriptions in the text express approximate, round numbers. Table 6 expresses results to two decimal places. Differences between the text and the table are due to rounding.

conditions). These flows to the Jamaica WPCP translate to increased TN loads to Jamaica Bay of roughly 15,000, 16,400 (10%), and 16,700 (12%) pounds per day respectively for each successive condition (approximate percentage increases relative to existing conditions are contained in parentheses). The TN loading increase between future build and future no build conditions is just under two percent. For BOD, the flows for each condition relate to loadings of roughly 6,400, 7,000 (10%), and 7,100 (12%) pounds per day. For BOD also, loading increases between future build and future no build conditions are just under two percent. Fecal coliform loadings also increase for the Jamaica WPCP, from approximately $3.28E+13$ counts per year to $3.60E+13$ (10%) to $3.66E+13$ (12%) counts per year for each successive condition. For fecal coliform also, the loading differences between the future no build and future build conditions are also just under two percent.

B. CSO Pollutant Loadings

CSO pollutant loadings show different patterns than the WPCP pollutant loadings across the WPCPs and between existing and future conditions. This is largely due to the effect of the Paerdegat Basin CSO Retention Facility, which is expected to commence operations by 2015 and reduce total annual CSO discharges to Jamaica Bay by approximately 11% (roughly 45% within the Coney Island WPCP drainage area). The patterns tend to show significant decreases (from 12 to 18%) in pollutants from the existing conditions to both future conditions, with negligible increases in CSO related pollutant loads between the future no build and future build conditions. Again, for the 26th Ward and Coney Island WPCPs, the CSO pollutant loadings do not differ between the future no build and future build conditions. The Rockaway WPCP has no CSO loadings due to its separate sewer system characteristics.

Overall, the CSO annual flows decrease from roughly 8,600 MG (existing conditions) to approximately 7,700 MG for both future no build and future conditions, representing an 11% decrease. The increase in CSO flows from future no build to future build due to sanitary flow increases is less than 1 MG, or less than 0.1%. These decreased flows translate to a 14% decrease in TN loads between the existing and both future conditions, roughly 680 vs. 580 pounds per day, respectively. The TN loading increase between future build and future no build conditions is less than 0.1%. BOD and fecal coliform loadings mirror the TN loadings, as follows. Existing BOD loads are roughly 3,100 pounds per day, and the future conditions are expected to be approximately 2,700 pounds per day, with less than 1 pound per day difference between future no build and future build conditions. Existing fecal coliform loadings are roughly $8.56E+16$ counts per year, with future no build and future build conditions fecal coliform counts per year of $7.04E+16$ and $7.05E+16$, respectively, a 12% decrease relative to existing conditions and a negligible 0.04% increase between the successive future conditions.

Within the Jamaica WPCP drainage area, CSO annual flows increase among the successive conditions, with 5,760 MG for the existing conditions and roughly 5,810 MG (a 0.8% increase) for both future conditions. The flow increase between future conditions is less than 1 MG and is attributable for an increase in sanitary flows. Pollutant loadings are as follows. TN increases from 380 pounds per day under existing conditions to roughly 400 pounds per day under both future conditions (an increase of approximately 5%). The difference

between future conditions is negligible, less than one pound per day. BOD roughly increases from 1,770 to 1,860 pounds per day (approximately 5%) between existing and future conditions. Fecal coliform increases approximately 12% from existing to future conditions ($3.29E+16$ to $3.67E+16$ counts per year). The difference between future no build and future build conditions for all pollutant loadings is negligible, less than 0.1%.

C. Stormwater Pollutant Loadings

Stormwater flows and pollutant loadings remain the same across all conditions (i.e., no change between existing conditions and future conditions) as a result of using 1988 rainfall conditions, a typical rainfall year consistent with NYSDEC-approved modeling parameters, as model inputs for both 2005 and 2015. In addition, due to the project characteristics whereby existing developed areas would be redeveloped with negligible changes in pervious cover and resultant stormwater volumes, no stormwater pollutant loading changes between future no build and future build conditions are evident in this analysis.

Total stormwater pollutant loadings are as follows for each of the conditions. Overall, TN loads are approximately 620 pounds per day, BOD loads are 2,800 pounds per day, and fecal coliform counts are $3.34E+16$ counts per year. For the Jamaica WPCP drainage area, TN loads are approximately 260 pounds per day, BOD loads are roughly 1,190 pounds per day, and fecal coliform counts are approximately $7.30E+15$ counts per year.

D. Total Pollutant Loadings

Total pollutant loadings, as presented in Table 6, represent the sums of pollutant loadings for each of the three pollutant loading categories and each of the WPCP drainage areas. Overall, total flows, including WPCP, CSO, and stormwater discharges increase from roughly 116,000 MG per year under existing conditions to 119,700 MG (3.1%) per year for future no build conditions, and 120,300 MG (3.6%) per year for future build conditions. The difference between future no build and future build conditions is less than one percent. Pollutant loadings are presented below. Of note is the Paerdegat CSO Retention Facility related reduction of fecal coliform counts by roughly 13 percent between existing and future conditions.

TN loadings are calculated to be roughly 39,000 pounds per day for existing conditions, 41,300 pounds per day (5% increase) for future no build conditions, and 41,600 pounds per day (6% increase) for future build conditions. BOD loadings are calculated to be roughly 22,600 pounds per day for existing conditions, 23,100 pounds per day (2%) for future no build conditions, and 23,200 pounds per day (3%) for future build conditions. The difference between future no build and future build conditions is less than one percent for both TN and BOD.

Overall fecal coliform counts decrease roughly 13% from existing conditions ($1.19E+17$ counts per year) to future conditions ($1.04E+17$ counts per year). The difference between future no build and future build conditions is less than 0.1%.

For the Jamaica WPCP drainage area, total annual flows increase from 42,700 MG under existing conditions to 45,800 MG (7% increase) and 46,400 MG (9% increase) for future no build and future build conditions, respectively. The difference in total flows between future build and no build conditions is less than two percent. TN loads are calculated to be roughly 15,600 pounds per day, 17,100 pounds per day (10% increase), and 17,400 pounds per day for each successive condition. The difference in total flows between future build and no build conditions is less than two percent. For BOD, the calculated pollutant loadings are as follows: 9,400 pounds per day for existing conditions, 10,100 pounds per day for future no build conditions, and 10,200 pounds per day for future build conditions. The difference between future no build and build conditions is less than two percent. Fecal coliform counts increase between the existing conditions ($4.02E+16$ counts per year) to the future conditions ($4.40E+16$ counts per year, 9% increase). However, the difference between future no build and build conditions is roughly 0.1 percent.

E. Summary

Based on the calculated pollutant loads for each category of loading source and each WPCP drainage area tributary to Jamaica Bay as presented in Table 6, the majority of pollutant loading increases are due to projected demographic changes between existing 2005 conditions and future 2015 conditions. The increases in total pollutant loadings between future no build and future build conditions tend to be small, generally less than one percent over all WPCP drainage areas and less than two percent within the Jamaica WPCP drainage area. In the case of fecal coliform, the loading to Jamaica Bay declines in the future conditions relative to the existing condition with the full implementation of the Paerdegat CSO Retention Facility. Based on the above calculations and assumptions, it is therefore concluded that the proposed actions would not result in any significant adverse impacts on the water quality of Jamaica Bay.

Also of note, the results displayed in Table 6 are also of a conservative nature, as several infrastructure improvement projects anticipated as part of the LTCP and Jamaica Bay Comprehensive Plan are not included in this analysis.

Table 6. Existing Conditions, Future Build, and Future No Build Pollutant Loadings

Category	Parameter	26 th Ward WPCP Drainage Area			Coney Island WPCP Drainage Area			Jamaica WPCP Drainage Area			Rockaway WPCP Drainage Area			TOTAL		
		Existing Conditions	Future Conditions Without Project	Future Conditions With Project	Existing Conditions	Future Conditions Without Project	Future Conditions With Project	Existing Conditions	Future Conditions Without Project	Future Conditions With Project	Existing Conditions	Future Conditions Without Project	Future Conditions With Project	Existing Conditions	Future Conditions Without Project	Future Conditions With Project and No MS4 Improvements
WPCP	Daily Dry Weather Flow (MGD)	52.00	53.00	53.00	87.00	89.00	89.00	82.00	90.38	92.00	20.00	21.00	21.00	241.00	253.38	255.00
	Average Daily Flow (MGD)	59.00	60.00	60.00	93.00	95.00	95.00	86.00	94.38	96.00	21.00	22.00	22.00	259.00	271.38	273.00
	Annual Dry Weather Flow (MG)	18,980.00	19,345.00	19,345.00	31,755.00	32,485.00	32,485.00	29,930.00	32,988.70	33,580.00	7,300.00	7,665.00	7,665.00	87,965.00	92,483.70	93,075.00
	Annual Total Flow (MG)	21,535.00	21,900.00	21,900.00	33,945.00	34,675.00	34,675.00	31,390.00	34,448.70	35,040.00	7,665.00	8,030.00	8,030.00	94,535.00	99,053.70	99,645.00
	Total Nitrogen (pounds per day)	6,804.67	6,920.00	6,920.00	14,009.00	14,310.27	14,310.27	14,964.13	16,422.26	16,704.14	2,350.15	2,462.06	2,462.06	38,127.94	40,114.58	40,396.47
	Total Nitrogen (pounds per year)	2,483,703.74	2,525,800.42	2,525,800.42	5,113,283.73	5,223,246.82	5,223,246.82	5,461,906.33	5,994,124.64	6,097,011.72	857,803.49	898,651.28	898,651.28	13,916,697.29	14,641,823.16	14,744,710.23
	Fecal Coliform (count per year, billion)	34,833.00	35,423.39	35,423.39	29,656.83	30,294.61	30,294.61	32,771.68	35,965.01	36,582.34	1,233.15	1,291.87	1,291.87	98,494.66	102,974.88	103,592.21
	BOD-5 (pounds per day)	3,476.19	3,535.11	3,535.11	6,014.94	6,144.30	6,144.30	6,401.92	7,025.73	7,146.33	818.43	857.41	857.41	16,711.49	17,562.55	17,683.14
BOD-5 (pounds per year)	1,268,809.58	1,290,314.83	1,290,314.83	2,195,454.23	2,242,668.30	2,242,668.30	2,336,700.45	2,564,392.89	2,608,409.81	298,727.99	312,953.13	312,953.13	6,099,692.26	6,410,329.15	6,454,346.07	
CSO	Annual Total Flow (MG)	638.49	645.86	645.86	2178.23	1199.13	1199.13	5759.86	5806.88	5807.75	0.00	0.00	0.00	8576.58	7651.87	7652.74
	Total Nitrogen (pounds per day)	73.18	75.10	75.10	228.45	111.63	111.63	378.38	396.10	396.25	0.00	0.00	0.00	680.00	582.82	582.97
	Total Nitrogen (pounds per year)	26,710.57	27,411.42	27,411.42	83,383.01	40,744.27	40,744.27	138,107.60	144,575.27	144,629.83	0.00	0.00	0.00	248,201.18	212,730.96	212,785.53
	Fecal Coliform (count per year, billion)	16,098,593.73	16,615,728.02	16,615,728.02	36,683,297.28	17,163,573.83	17,163,573.83	32,861,683.83	36,653,881.51	36,681,108.47	0.00	0.00	0.00	85,643,574.84	70,433,183.35	70,460,410.31
	BOD-5 (pounds per day)	398.60	409.75	409.75	947.09	467.31	467.31	1772.99	1861.86	1862.60	0.00	0.00	0.00	3118.67	2738.93	2739.66
	BOD-5 (pounds per year)	145,487.45	149,558.75	149,558.75	345,687.52	170,569.25	170,569.25	647,141.21	679,580.30	679,849.48	0.00	0.00	0.00	1,138,316.19	999,708.30	999,977.48
Stormwater (non-CSO)	Annual Total Flow (MG)	278.58	278.58	278.58	4760.19	4760.19	4760.19	5518.56	5518.56	5518.56	2459.52	2459.52	2459.52	13016.84	13016.84	13016.84
	Total Nitrogen (pounds per day)	13.23	13.23	13.23	226.10	226.10	226.10	262.12	262.12	262.12	116.82	116.82	116.82	618.27	618.27	618.27
	Total Nitrogen (pounds per year)	4,829.59	4,829.59	4,829.59	82,525.47	82,525.47	82,525.47	95,672.94	95,672.94	95,672.94	42,639.69	42,639.69	42,639.69	225,667.70	225,667.70	225,667.70
	Fecal Coliform (count per year, billion)	1,263,629.81	1,263,629.81	1,263,629.81	21,592,221.84	21,592,221.84	21,592,221.84	7,301,048.27	7,301,048.27	7,301,048.27	3,253,944.96	3,253,944.96	3,253,944.96	33,410,844.87	33,410,844.87	33,410,844.87
	BOD-5 (pounds per day)	59.98	59.98	59.98	1024.85	1024.85	1024.85	1188.12	1188.12	1188.12	529.52	529.52	529.52	2802.46	2802.46	2802.46
	BOD-5 (pounds per year)	21,891.43	21,891.43	21,891.43	374,068.93	374,068.93	374,068.93	433,663.35	433,663.35	433,663.35	193,275.90	193,275.90	193,275.90	1,022,899.61	1,022,899.61	1,022,899.61
Total Loadings	WPCP Daily Dry Weather Flow (MGD)	52.00	53.00	53.00	87.00	89.00	89.00	82.00	90.38	92.00	20.00	21.00	21.00	241.00	253.38	255.00
	WPCP Average Daily Flow (MGD)	59.00	60.00	60.00	93.00	95.00	95.00	86.00	94.38	96.00	21.00	22.00	22.00	259.00	271.38	273.00
	WPCP Annual Dry Weather Flow (MG)	18,980.00	19,345.00	19,345.00	31,755.00	32,485.00	32,485.00	29,930.00	32,988.70	33,580.00	7,300.00	7,665.00	7,665.00	87,965.00	92,483.70	93,075.00
	WPCP Annual Total Flow (MG)	21,535.00	21,900.00	21,900.00	33,945.00	34,675.00	34,675.00	31,390.00	34,448.70	35,040.00	7,665.00	8,030.00	8,030.00	94,535.00	99,053.70	99,645.00
	WPCP + CSO + Stormwater Annual Total Flow (MG)	22,452.06	22,824.44	22,824.44	40,883.42	40,634.32	40,634.32	42,668.42	45,774.14	46,366.31	10,124.52	10,489.52	10,489.52	116,128.42	119,722.41	120,314.58
	Total Nitrogen (pounds per day)	6,891.08	7,008.33	7,008.33	14,463.54	14,647.99	14,647.99	15,604.62	17,080.47	17,362.51	2,466.97	2,578.88	2,578.88	39,426.21	41,315.68	41,597.71
	Total Nitrogen (pounds per year)	2,515,243.90	2,558,041.43	2,558,041.43	5,279,192.22	5,346,516.56	5,346,516.56	5,695,686.86	6,234,372.85	6,337,314.49	900,443.19	941,290.97	941,290.97	14,390,566.17	15,080,221.82	15,183,163.45
	Fecal Coliform (count per year, billion)	17,397,056.54	17,914,781.22	17,914,781.22	58,305,175.95	38,786,090.28	38,786,090.28	40,195,503.77	43,990,894.79	44,018,739.08	3,255,178.11	3,255,236.83	3,255,236.83	119,152,914.37	103,947,003.11	103,974,847.40
	BOD-5 (pounds per day)	3,934.76	4,004.84	4,004.84	7,986.88	7,636.46	7,636.46	9,363.03	10,075.72	10,197.05	1,347.96	1,386.93	1,386.93	22,632.62	23,103.94	23,225.27
	BOD-5 (pounds per year)	1,436,188.47	1,461,765.01	1,461,765.01	2,915,210.68	2,787,306.48	2,787,306.48	3,417,505.02	3,677,636.55	3,721,922.64	492,003.89	506,229.03	506,229.03	8,260,908.05	8,432,937.07	8,477,223.16

Appendix 1

Background Data and Calculations

Category	Parameter	26 th Ward WPCP Drainage Area			Coney Island WPCP Drainage Area			Jamaica WPCP Drainage Area		
		Existing Conditions	Future Conditions Without Project and No MS4 Improvements	Future Conditions With Project and No MS4 Improvements	Existing Conditions	Future Conditions Without Project and No MS4 Improvements	Future Conditions With Project and No MS4 Improvements	Existing Conditions	Future Conditions Without Project and No MS4 Improvements	Future Conditions With Project and No MS4 Improvements
WPCP	Daily Dry Weather Flow (MGD)	0.0%	1.9%	1.9%	0.0%	2.3%	2.3%	0.0%	10.2%	12.2%
	Average Daily Flow (MGD)	0.0%	1.7%	1.7%	0.0%	2.2%	2.2%	0.0%	9.7%	11.6%
	Annual Dry Weather Flow (MG)	0.0%	1.9%	1.9%	0.0%	2.3%	2.3%	0.0%	10.2%	12.2%
	Annual Total Flow (MG)	0.0%	1.7%	1.7%	0.0%	2.2%	2.2%	0.0%	9.7%	11.6%
	Total Nitrogen (pounds per day)	0.0%	1.7%	1.7%	0.0%	2.2%	2.2%	0.0%	9.7%	11.6%
	Total Nitrogen (pounds per year)	0.0%	1.7%	1.7%	0.0%	2.2%	2.2%	0.0%	9.7%	11.6%
	Fecal Coliform (count per year, billion)	0.0%	1.7%	1.7%	0.0%	2.2%	2.2%	0.0%	9.7%	11.6%
	BOD-5 (pounds per day)	0.0%	1.7%	1.7%	0.0%	2.2%	2.2%	0.0%	9.7%	11.6%
	BOD-5 (pounds per year)	0.0%	1.7%	1.7%	0.0%	2.2%	2.2%	0.0%	9.7%	11.6%
CSO	Annual Total Flow (MG)	0.0%	1.2%	1.2%	0.0%	-44.9%	-44.9%	0.0%	0.8%	0.8%
	Total Nitrogen (pounds per day)	0.0%	2.6%	2.6%	0.0%	-51.1%	-51.1%	0.0%	4.7%	4.7%
	Total Nitrogen (pounds per year)	0.0%	2.6%	2.6%	0.0%	-51.1%	-51.1%	0.0%	4.7%	4.7%
	Fecal Coliform (count per year, billion)	0.0%	3.2%	3.2%	0.0%	-53.2%	-53.2%	0.0%	11.5%	11.6%
	BOD-5 (pounds per day)	0.0%	2.8%	2.8%	0.0%	-50.7%	-50.7%	0.0%	5.0%	5.1%
	BOD-5 (pounds per year)	0.0%	2.8%	2.8%	0.0%	-50.7%	-50.7%	0.0%	5.0%	5.1%
Stormwater (non-CSO)	Annual Total Flow (MG)	0	0	0	0	0	0	0	0	0
	Total Nitrogen (pounds per day)	0	0	0	0	0	0	0	0	0
	Total Nitrogen (pounds per year)	0	0	0	0	0	0	0	0	0
	Fecal Coliform (count per year, billion)	0	0	0	0	0	0	0	0	0
	BOD-5 (pounds per day)	0	0	0	0	0	0	0	0	0
	BOD-5 (pounds per year)	0	0	0	0	0	0	0	0	0
Total Loadings	WPCP Daily Dry Weather Flow (MGD)	0.0%	1.9%	1.9%	0.0%	2.3%	2.3%	0.0%	10.2%	12.2%
	WPCP Average Daily Flow (MGD)	0.0%	1.7%	1.7%	0.0%	2.2%	2.2%	0.0%	9.7%	11.6%
	WPCP Annual Dry Weather Flow (MG)	0.0%	1.9%	1.9%	0.0%	2.3%	2.3%	0.0%	10.2%	12.2%
	WPCP Annual Total Flow (MG)	0.0%	1.7%	1.7%	0.0%	2.2%	2.2%	0.0%	9.7%	11.6%
	WPCP + CSO + Stormwater Annual Total Flow (MG)	0.0%	1.7%	1.7%	0.0%	-0.6%	-0.6%	0.0%	7.3%	8.7%
	Total Nitrogen (pounds per day)	0.0%	1.7%	1.7%	0.0%	1.3%	1.3%	0.0%	9.5%	11.3%
	Total Nitrogen (pounds per year)	0.0%	1.7%	1.7%	0.0%	1.3%	1.3%	0.0%	9.5%	11.3%
	Fecal Coliform (count per year, billion)	0.0%	3.0%	3.0%	0.0%	-33.5%	-33.5%	0.0%	9.4%	9.5%
	BOD-5 (pounds per day)	0.0%	1.8%	1.8%	0.0%	-4.4%	-4.4%	0.0%	7.6%	8.9%
BOD-5 (pounds per year)	0.0%	1.8%	1.8%	0.0%	-4.4%	-4.4%	0.0%	7.6%	8.9%	

Category	Rockaway WPCP Drainage Area			TOTAL			total	Jamaica WPCP
	Existing Conditions	Future Conditions Without Project and No MS4 Improvements	Future Conditions With Project and No MS4 Improvements	Existing Conditions	Future Conditions Without Project and No MS4 Improvements	Future Conditions With Project and No MS4 Improvements		
	0.0%	5.0%	5.0%	0.0%	5.1%	5.8%	0.7%	2.0%
WPCP	0.0%	4.8%	4.8%	0.0%	4.8%	5.4%	0.6%	1.9%
	0.0%	5.0%	5.0%	0.0%	5.1%	5.8%	0.7%	2.0%
	0.0%	4.8%	4.8%	0.0%	4.8%	5.4%	0.6%	1.9%
	0.0%	4.8%	4.8%	0.0%	5.2%	5.9%	0.7%	1.9%
	0.0%	4.8%	4.8%	0.0%	5.2%	5.9%	0.7%	1.9%
	0.0%	4.8%	4.8%	0.0%	4.5%	5.2%	0.6%	1.9%
	0.0%	4.8%	4.8%	0.0%	5.1%	5.8%	0.7%	1.9%
	0.0%	4.8%	4.8%	0.0%	5.1%	5.8%	0.7%	1.9%
	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	-10.8%	-10.8%	0.0%	0.000150698
CSO	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	-14.3%	-14.3%	0.0%	0.000395113
	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	-14.3%	-14.3%	0.0%	0.000395113
	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	-17.8%	-17.7%	0.0%	0.000828532
	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	-12.2%	-12.2%	0.0%	0.000415948
	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	-12.2%	-12.2%	0.0%	0.000415948
	0	0	0	0	0	0	0.0%	0
Stormwater (non-CSO)	0	0	0	0	0	0	0.0%	0
	0	0	0	0	0	0	0.0%	0
	0	0	0	0	0	0	0.0%	0
	0	0	0	0	0	0	0.0%	0
	0	0	0	0	0	0	0.0%	0
	0.0%	5.0%	5.0%	0.0%	5.1%	5.8%	0.7%	2.0%
Total Loadings	0.0%	4.8%	4.8%	0.0%	4.8%	5.4%	0.6%	1.9%
	0.0%	5.0%	5.0%	0.0%	5.1%	5.8%	0.7%	2.0%
	0.0%	4.8%	4.8%	0.0%	4.8%	5.4%	0.6%	1.9%
	0.0%	3.6%	3.6%	0.0%	3.1%	3.6%	0.5%	1.4%
	0.0%	4.5%	4.5%	0.0%	4.8%	5.5%	0.7%	1.8%
	0.0%	4.5%	4.5%	0.0%	4.8%	5.5%	0.7%	1.8%
	0.0%	0.0%	0.0%	0.0%	-12.8%	-12.7%	0.0%	0.1%
	0.0%	2.9%	2.9%	0.0%	2.1%	2.6%	0.5%	1.3%
	0.0%	2.9%	2.9%	0.0%	2.1%	2.6%	0.5%	1.3%

TN Loads from Overflows to the Jamaica Bay

Watershed	JAM			26W			CI			ROC		
	TotQ (MG)	frm SW (lb/day)	frm CSO (lb/d)	TotQ (MG)	frm SW (lb/day)	frm CSO (lb/d)	TotQ (MG)	frm SW (lb/day)	frm CSO (lb/d)	TotQ (MG)	frm SW (lb/day)	frm CSO (lb)
2005 CY Existing	11278.4	262.1	378.4	917.1	13.2	73.2	6938.4	226.1	228.4	2459.5	116.8	0
2015 No Build	11325.4	262.1	396.1	924.4	13.2	75.1	5959.3	226.1	111.6	2459.5	116.8	0
2015 Build	11326.3	262.1	396.2	924.4	13.2	75.1	5959.3	226.1	111.6	2459.5	116.8	0

BOD Loads from Overflows to the Jamaica Bay

Watershed	JAM			26W			CI			ROC		
	TotQ (MG)	frm SW (lb/day)	frm CSO (lb/d)	TotQ (MG)	frm SW (lb/day)	frm CSO (lb/d)	TotQ (MG)	frm SW (lb/day)	frm CSO (lb/d)	TotQ (MG)	frm SW (lb/day)	frm CSO (lb)
2005 CY Existing	11278.4	1188.1	1773.0	917.1	60.0	398.6	6938.4	1024.8	947.1	2459.5	529.5	0
2015 No Build	11325.4	1188.1	1861.9	924.4	60.0	409.7	5959.3	1024.8	467.3	2459.5	529.5	0
2015 Build	11326.3	1188.1	1862.6	924.4	60.0	409.7	5959.3	1024.8	467.3	2459.5	529.5	0

Pollutant Concentrations

Location	TN (mg/L)	BOD (mg/L)	Location	FC (#/100mL)
Storm Sewers (all watersheds)	2.08	9.43	Sanitary (all watersheds)	4000000
26 Ward	21.21	126.00	26 Ward	120000
Coney Island	32.03	124.00	Coney Island	120000
Jamaica	29.33	148.00	Jamaica	35000
Rockaway	19.25	82.02	Rockaway	35000

Pollutant Concentrations from the DEP Bible

	Jamaica		26th Ward		Coney Island	
	Total N (mg/L)	BOD (mg/L)	Total N (mg/L)	BOD (mg/L)	Total N (mg/L)	BOD (mg/L)
Jan '05	28.76	153	20.32	126	31.89	118
Feb '05	29.78	141	20.09	110	31.56	136
Mar '05	29.82	155	20.68	137	31.17	137
Apr '05	27.51	144	21.09	125	29.25	113
May '05	29.75	142	22.42	125	33.46	122
Jun '05	30.34	154	22.65	132	34.83	119
Average	29.33	148	21.21	126	32.03	124

Pollutant Concentrations

	TN (mg/L)		BOD (mg/L)	
	LTCP	DEP	LTCP	DEP
Storm Sewers (all watersheds)	2.08	N/A	9.43	N/A
26 Ward	25.72	21.21	121.99	126
Coney Island	22.06	32.03	107.44	124
Jamaica	31.95	29.33	172.38	148

Pollutant Concentrations

Location	TN (mg/L)	BOD (mg/L)	Location	FC (#/100mL)
Storm Sewers (all watersheds)	2.08	9.43	Sanitary (all watersheds)	4000000
26 Ward	25.72	121.99	26 Ward	120000
Coney Island	22.06	107.44	Coney Island	120000
Jamaica	31.95	172.38	Jamaica	35000
Rockaway	19.25	82.02	Rockaway	35000

26W

	CSOs			
	SW (MG)	San (MG)	Storm (MG)	Tot Q (MG)
2005 CY	278.58	98.10	540.39	917.06
2015	278.58	101.69	544.17	924.44

CI

	CSOs			
	SW (MG)	San (MG)	Storm (MG)	Tot Q (MG)
2005 CY	4760.19	182.75	1995.48	6938.42
2015	4760.19	79.94	1119.19	5959.32

JAM

	CSOs			
	SW (MG)	San (MG)	Storm (MG)	Tot Q (MG)
2005 CY	5518.56	168.41	5591.45	11278.42
2015 NB	5518.56	193.30	5613.58	11325.44
2015 Build	5518.56	193.48	5614.28	11326.31

SW (MG)

Rockaway 2005=2015 2459.52

TN Loads from Overflows to the Jamaica Bay

Watershed	JAM			26W			CI			TotQ (MG)
	TotQ (MG)	frm SW (lb)	frm CSO (lb)	TotQ (MG)	frm SW (lb)	frm CSO (lb)	TotQ (MG)	frm SW (lb)	frm CSO (lb)	
2005 CY Existing	11278.4	95672.9	138107.6	917.1	4829.6	26710.6	6938.4	82525.5	83383.0	2459.5
2015 No Build	11325.4	95672.9	144575.3	924.4	4829.6	27411.4	5959.3	82525.5	40744.3	2459.5
2015 Build	11326.3	95672.9	144629.8	924.4	4829.6	27411.4	5959.3	82525.5	40744.3	2459.5

BOD Loads from Overflows to the Jamaica Bay

Watershed	JAM			26W			CI			TotQ (MG)
	TotQ (MG)	frm SW (lb)	frm CSO (lb)	TotQ (MG)	frm SW (lb)	frm CSO (lb)	TotQ (MG)	frm SW (lb)	frm CSO (lb)	
2005 CY Existing	11278.4	433663.4	647141.2	917.1	21891.4	145487.5	6938.4	374068.9	345687.5	2459.5
2015 No Build	11325.4	433663.4	679580.3	924.4	21891.4	149558.7	5959.3	374068.9	170569.2	2459.5
2015 Build	11326.3	433663.4	679849.5	924.4	21891.4	149558.7	5959.3	374068.9	170569.2	2459.5

FC Loads from Overflows to the Jamaica Bay

Watershed	JAM			26W			CI			TotQ (MG)
	TotQ (MG)	frm SW (# billion)	frm CSO (#/billion)	TotQ (MG)	frm SW (# billion)	frm CSO (#/billion)	TotQ (MG)	frm SW (# billion)	frm CSO (#/billion)	
2005 CY Existing	11278.4	7.301E+06	3.286E+07	917.1	1.264E+06	1.610E+07	6938.4	2.159E+07	3.668E+07	2459.5
2015 No Build	11325.4	7.301E+06	3.665E+07	924.4	1.264E+06	1.662E+07	5959.3	2.159E+07	1.716E+07	2459.5
2015 Build	11326.3	7.301E+06	3.668E+07	924.4	1.264E+06	1.662E+07	5959.3	2.159E+07	1.716E+07	2459.5

Pollutant Concentrations

Location	TN (mg/L)	BOD (mg/L)	Location	FC (#/100mL)
Storm Sewers (all watersheds)	2.08	9.43	Sanitary (all watersheds)	400000
26 Ward	21.21	126.00	26 Ward	120000
Coney Island	32.03	124.00	Coney Island	120000
Jamaica	29.33	148.00	Jamaica	35000
Rockaway	19.25	82.02	Rockaway	35000

Pollutant Concentrations from the DEP Bible

	Jamaica		26th Ward		Coney Island	
	Total N (mg/L)	BOD (mg/L)	Total N (mg/L)	BOD (mg/L)	Total N (mg/L)	BOD (mg/L)
Jan '05	28.76	153	20.32	126	31.89	118
Feb '05	29.78	141	20.09	110	31.56	136
Mar '05	29.82	155	20.68	137	31.17	137
Apr '05	27.51	144	21.09	125	29.25	113
May '05	29.75	142	22.42	125	33.46	122
Jun '05	30.34	154	22.65	132	34.83	119
Average	29.33	148	21.21	126	32.03	124

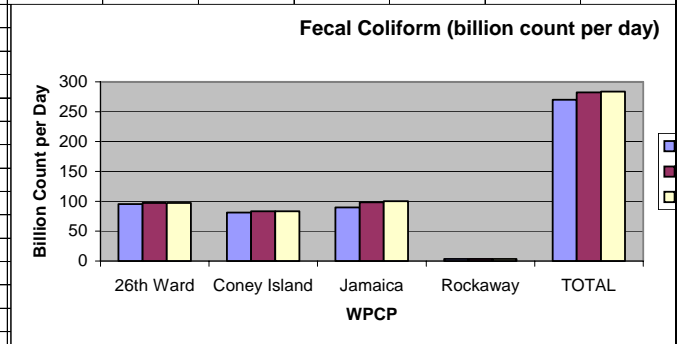
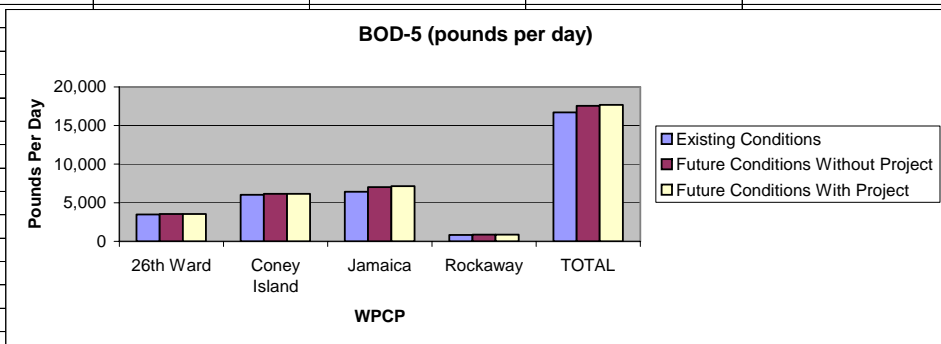
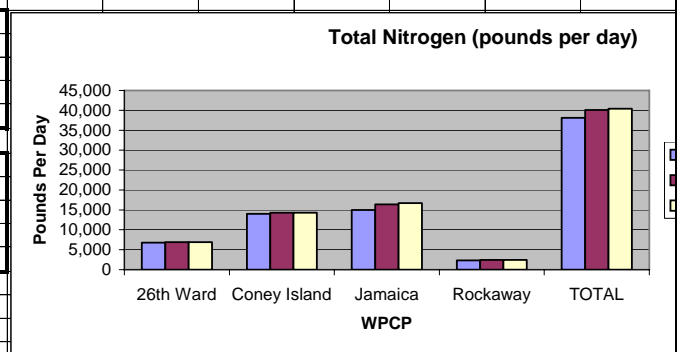
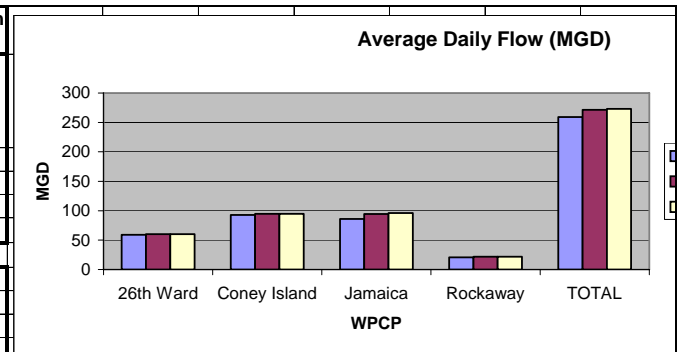
Pollutant Concentrations

	TN (mg/L)		BOD (mg/L)	
	LTCP	DEP	LTCP	DEP
Storm Sewers (all watersheds)	2.08	N/A	9.43	N/A
26 Ward	25.72	21.21	121.99	126
Coney Island	22.06	32.03	107.44	124
Jamaica	31.95	29.33	172.38	148

Pollutant Concentrations

Location	TN (mg/L)	BOD (mg/L)	Location	FC (#/100mL)
Storm Sewers (all watersheds)	2.08	9.43	Sanitary (all watersheds)	400000
26 Ward	25.72	121.99	26 Ward	120000
Coney Island	22.06	107.44	Coney Island	120000
Jamaica	31.95	172.38	Jamaica	35000
Rockaway	19.25	82.02	Rockaway	35000

Parameter	WPCP	Existing Conditions	Future Conditions Without Project	Future Conditions With Project
Average Daily Flow (Dry Weather & Wet Weather) (MGD)	26th Ward	59	60	60
	Coney Island	93	95	95
	Jamaica	86	94	96
	Rockaway	21	22	22
	TOTAL	259	271	273
Total Nitrogen (pounds per day)	26th Ward	6,805	6,920	6,920
	Coney Island	14,009	14,310	14,310
	Jamaica	14,964	16,422	16,704
	Rockaway	2,350	2,462	2,462
	TOTAL	38,128	40,115	40,396
Fecal Coliform (billion count per day)	26th Ward	95	97	97
	Coney Island	81	83	83
	Jamaica	90	99	100
	Rockaway	3	4	4
	TOTAL	270	282	284
BOD-5 (pounds per day)	26th Ward	3,476	3,535	3,535
	Coney Island	6,015	6,144	6,144
	Jamaica	6,402	7,026	7,146
	Rockaway	818	857	857
	TOTAL	16,711	17,563	17,683



Load Per Day		EXISTING CONDITIONS								
Lookup #		4	5	11			12	13		
	WPCP (CY 2005)	Average Daily Dry Weather Flow (MGD)	Average Daily Flow (Dry Weather & Wet Weather) (MGD)	Total Nitrogen Load (mg/day)	Total Nitrogen Load (pounds/day)	Total Nitrogen Load (tons/day)	Fecal Coliform Load (billion count / day)	BOD-5 Load (mg / day)	BOD-5 Load (pounds / day)	BOD-5 Load (tons / day)
13	26th Ward	52.00	59.00	3,086,549,060.44	6,804.67	3.40	95.43	1,576,775,424.51	3,476.19	1.74
27	Coney Island	87.00	93.00	6,354,381,491.21	14,009.00	7.00	81.25	2,728,335,543.32	6,014.94	3.01
41	Jamaica	82.00	86.00	6,787,621,869.89	14,964.13	7.48	89.79	2,903,865,087.74	6,401.92	3.20
55	Rockaway	20.00	21.00	1,066,009,812.49	2,350.15	1.18	3.38	371,235,333.66	818.43	0.41
	TOTAL	241.00	259.00	17,294,562,234.03	38,127.94	19.06	269.85	7,580,211,389.22	16,711.49	8.36
Load Per Year		EXISTING CONDITIONS								
Lookup #										
	WPCP (CY 2005)	Average Daily Dry Weather Flow (MG/Year)	Average Daily Flow (Dry Weather & Wet Weather) (MG/Year)	Total Nitrogen Load (mg/year)	Total Nitrogen Load (pounds/year)	Total Nitrogen Load (tons/year)	Fecal Coliform Load (billion count / year)	BOD-5 Load (mg / year)	BOD-5 Load (pounds / year)	BOD-5 Load (tons / year)
13	26th Ward	18,980	21,535	1,126,590,407,059.84	2,483,703.74	1,241.85	34,833.00	575,523,029,945.19	1,268,809.58	634.40
27	Coney Island	31,755	33,945	2,319,349,244,292.23	5,113,283.73	2,556.64	29,656.83	995,842,473,311.07	2,195,454.23	1,097.73
41	Jamaica	29,930	31,390	2,477,481,982,510.00	5,461,906.33	2,730.95	32,771.68	1,059,910,757,025.86	2,336,700.45	1,168.35
55	Rockaway	7,300	7,665	389,093,581,559.67	857,803.49	428.90	1,233.15	135,500,896,784.76	298,727.99	149.36
	TOTAL	87,965.00	94,535.00	6,312,515,215,421.74	13,916,697.29	6,958.35	98,494.66	2,766,777,157,066.88	6,099,692.26	3,049.85

Load Per Year	FUTURE CONDITIONS WITHOUT PROJECT									
Lookup #										
	WPCP (CY 2005)	Average Daily Dry Weather Flow (MG/Year)	Average Daily Flow (Dry Weather & Wet Weather) (MG/Year)	Total Nitrogen Load (mg/year)	Total Nitrogen Load (pounds/year)	Total Nitrogen Load (tons/year)	Fecal Coliform Load (billion count / year)	BOD-5 Load (mg / year)	BOD-5 Load (pounds / year)	BOD-5 Load tons / year)
13	26th Ward	19,345	21,900	1,145,685,159,721.87	2,525,800.42	1,262.90	35,423.39	585,277,657,571.38	1,290,314.83	645.16
27	Coney Island	32,485	34,675	2,369,227,722,664.11	5,223,246.82	2,611.62	30,294.61	1,017,258,440,479.05	2,242,668.30	1,121.33
41	Jamaica	32,989	34,449	2,718,892,436,154.57	5,994,124.64	2,997.06	35,965.01	1,163,190,433,117.45	2,564,392.89	1,282.20
55	Rockaway	7,665	8,030	407,621,847,348.22	898,651.28	449.33	1,291.87	141,953,320,441.18	312,953.13	156.48
	TOTAL	92,483.70	99,053.70	6,641,427,165,888.78	14,641,823.16	7,320.91	102,974.88	2,907,679,851,609.05	6,410,329.15	3,205.16

Load Per Day		FUTURE CONDITIONS WITH PROJECT								
Lookup #		4	5	11			12	13		
	WPCP (CY 2005)	Average Daily Dry Weather Flow (MGD)	Average Daily Flow (Dry Weather & Wet Weather) (MGD)	Total Nitrogen Load (mg/day)	Total Nitrogen Load (pounds/day)	Total Nitrogen Load (tons/day)	Fecal Coliform Load (billion count / day)	BOD-5 Load (mg / day)	BOD-5 Load (pounds / day)	BOD-5 Load (tons / day)
13	26th Ward	53.00	60.00	3,138,863,451.29	6,920.00	3.46	97.05	1,603,500,431.70	3,535.11	1.77
27	Coney Island	89.00	95.00	6,491,034,856.61	14,310.27	7.16	83.00	2,787,009,425.97	6,144.30	3.07
41	Jamaica	92.00	96.00	7,576,880,226.85	16,704.14	8.35	100.23	3,241,523,818.87	7,146.33	3.57
55	Rockaway	21.00	22.00	1,116,772,184.52	2,462.06	1.23	3.54	388,913,206.69	857.41	0.43
	TOTAL	255.00	273.00	18,323,550,719.28	40,396.47	20.20	283.81	8,020,946,883.24	17,683.14	8.84
Load Per Year		FUTURE CONDITIONS WITH PROJECT								
Lookup #										
	WPCP (CY 2005)	Average Daily Dry Weather Flow (MG/Year)	Average Daily Flow (Dry Weather & Wet Weather) (MG/Year)	Total Nitrogen Load (mg/year)	Total Nitrogen Load (pounds/year)	Total Nitrogen Load (tons/year)	Fecal Coliform Load (billion count / year)	BOD-5 Load (mg / year)	BOD-5 Load (pounds / year)	BOD-5 Load (tons / year)
13	26th Ward	19,345	21,900	1,145,685,159,721.87	2,525,800.42	1,262.90	35,423.39	585,277,657,571.38	1,290,314.83	645.16
27	Coney Island	32,485	34,675	2,369,227,722,664.11	5,223,246.82	2,611.62	30,294.61	1,017,258,440,479.05	2,242,668.30	1,121.33
41	Jamaica	33,580	35,040	2,765,561,282,801.86	6,097,011.72	3,048.51	36,582.34	1,183,156,193,889.33	2,608,409.81	1,304.20
55	Rockaway	7,665	8,030	407,621,847,348.22	898,651.28	449.33	1,291.87	141,953,320,441.18	312,953.13	156.48
	TOTAL	93,075.00	99,645.00	6,688,096,012,536.06	14,744,710.23	7,372.36	103,592.21	2,927,645,612,380.94	6,454,346.07	3,227.17

Lookup #	2	3	4	5	6	7	8	9	10	11	12	13
	WPCP	Month (CY 2005)	Average Daily Dry Weather Flow (MGD)	Average Daily Flow (Dry Weather & Wet Weather) (MGD)	NH3 (mg/L)	Organic N (mg/L)	TKN (mg/L)	NO3 (mg/L)	NO2 (mg/L)	Total Nitrogen (TN=TKN+NO2+NO3, mg/L)	Fecal Coliform Load (table 5) (count / 100 ml)	BOD-5 Load (plant effluent total Carbonaceous BOD, table 4) (mg/L)
1	26th Ward	Jan-05	57.00	63.00	6.70	2.90	9.60	7.40	0.90	17.90	36.00	7.00
2		Feb-05	55.00	59.00	7.90	3.20	11.10	3.44	0.91	15.45	9.00	7.00
3		Mar-05	53.00	60.00	7.00	3.20	10.20	3.66	2.59	16.45	9.00	8.00
4		Apr-05	50.00	61.00	5.90	3.10	9.00	3.95	0.78	13.73	13.00	9.00
5		May-05	48.00	52.00	9.20	3.20	12.40	2.38	0.76	15.54	74.00	6.00
6		Jun-05	51.00	55.00	9.10	3.50	12.60	0.60	0.80	14.00	59.00	8.00
7		Jul-05	51.00	57.00	7.55	not in spreadsheets	11.02	0.19	0.79	12.00	102.00	7.50
8		Aug-05	49.00	51.00	7.90		11.39	0.32	0.86	12.57	48.00	7.22
9		Sep-05	52.00	53.00	9.00		12.91	0.31	0.82	14.04		6.30
10		Oct-05	51.00	71.00	5.58		9.09	0.79	0.67	10.55	55.00	5.39
11		Nov-05	54.00	62.00	6.20		9.98	0.55	1.32	11.85	31.00	7.90
12		Dec-05	51.00	59.00	4.17		7.45	2.29	2.04	11.78	34.00	5.45
13	AVERAGE (rounded)		52.00	59.00	7.18	3.18	10.56	2.16	1.10	13.82	42.73	7.06
14												
15	Coney Island	Jan-05	86.00	90.00	15.20	4.50	19.70	0.39	0.22	20.31	60.00	7.00
16		Feb-05	86.00	92.00	15.10	5.10	20.20	0.19	0.13	20.52	27.00	10.00
17		Mar-05	84.00	91.00	15.80	4.70	20.50	0.13	0.12	20.75	29.00	12.00
18		Apr-05	87.00	95.00	14.70	3.50	18.20	0.34	0.15	18.69	46.00	9.00
19		May-05	86.00	90.00	15.00	4.10	19.10	0.47	0.16	19.73	21.00	8.00
20		Jun-05	86.00	92.00	13.60	4.60	18.20	0.58	0.77	19.55	30.00	8.00
21		Jul-05	86.00	92.00	8.00	not in spreadsheets	10.80	2.45	1.31	14.56	4.00	7.00
22		Aug-05	84.00	85.00	8.10		11.20	1.43	2.35	14.98	1.00	5.00
23		Sep-05	85.00	87.00	12.40		16.30	0.74	0.93	17.97	4.00	7.00
24		Oct-05	93.00	114.00	9.80		13.10	0.58	1.47	15.15	24.00	7.00
25		Nov-05	90.00	96.00	9.60		13.30	1.84	1.35	16.49	15.00	5.00
26		Dec-05	87.00	93.00	10.70		14.30	2.00	1.57	17.87	16.00	8.00
27	AVERAGE (rounded)		87.00	93.00	12.33	4.42	16.24	0.93	0.88	18.05	23.08	7.75
28												
29	Jamaica	Jan-05	79.00	83.00	13.40	4.30	17.70	3.44	0.67	21.81	41.00	10.00
30		Feb-05	79.00	82.00	15.30	4.50	19.80	2.17	0.43	22.40	39.00	11.00
31		Mar-05	78.00	83.00	16.60	5.60	22.20	0.36	0.24	22.80	39.00	13.00
32		Apr-05	83.00	90.00	15.80	5.00	20.80	0.28	0.27	21.35	24.00	10.00
33		May-05	82.00	84.00	15.40	4.80	20.20	1.08	0.60	21.88	24.00	9.00
34		Jun-05	82.00	85.00	14.60	4.70	19.30	1.07	0.72	21.09	25.00	8.00
35		Jul-05	84.00	86.00	14.30	not in spreadsheets	18.60	1.47	0.77	20.84	11.00	9.00
36		Aug-05	82.00	83.00	13.90		17.60	1.57	1.11	20.28	8.00	8.00
37		Sep-05	79.00	80.00	11.80		16.30	2.91	1.24	20.45	5.00	7.00
38		Oct-05	87.00	103.00	9.20		13.40	3.00	0.99	17.39	26.00	7.00
39		Nov-05	85.00	90.00	10.30		14.40	4.23	0.86	19.49	63.00	8.00
40		Dec-05	82.00	88.00	10.30		14.70	5.00	0.66	20.36	26.00	7.00
41	AVERAGE (rounded)		82.00	86.00	13.41	4.82	17.92	2.22	0.71	20.85	27.58	8.92
42												
43	Rockaway	Jan-05	19.00	20.00	3.00	3.30	6.30	7.12	0.67	14.09	4.00	11.00
44		Feb-05	19.00	19.00	9.60	4.50	14.10	1.82	0.37	16.29	3.00	5.00
45		Mar-05	18.00	19.00	11.80	3.00	14.80	0.70	0.45	15.95	2.00	4.00
46		Apr-05	20.00	21.00	5.20	2.30	7.50	5.22	0.97	13.69	2.00	4.00
47		May-05	20.00	21.00	4.00	1.90	5.90	7.47	0.98	14.35	2.00	4.00
48		Jun-05	20.00	21.00	4.50	2.40	6.90	5.59	1.25	13.74	3.00	3.00
49		Jul-05	21.00	22.00	3.75	not in spreadsheets	5.62	4.27	1.48	11.37	5.00	4.00
50		Aug-05	20.00	20.00	2.20		4.95	5.12	2.58	12.65	6.00	4.00
51		Sep-05	19.00	19.00	3.92		5.86	5.81	1.85	13.52	4.00	4.00
52		Oct-05	22.00	27.00	1.81		3.66	4.29	1.48	9.43	13.00	4.00
53		Nov-05	21.00	21.00	4.35		6.39	4.08	1.20	11.67	2.00	3.00
54		Dec-05	20.00	21.00	9.73		12.38	1.13	0.66	14.17	5.00	6.00
55	AVERAGE (rounded)		20.00	21.00	5.32	2.90	7.86	4.39	1.16	13.41	4.25	4.67
56												

“not in spreadsheets” designation indicates that Organic Nitrogen data was not quantified separately in the NYCDEP database as a component of TKN or TN, but was included in TKN and TN.

Lookup #	2	3	5										
	Infrastructure Improvement	Description	Existing CSO Flow (MG/year)	Project CSO Flow (MG/year)	CSO Flow Reduction / Increase (incremental stormwater increase, MG/year)	CSO TN (lbs/MG)	CSO BOD (lbs/MG)	CSO Fecal Coliform (billion count / MG)	Stormwater TN (lbs/MG)	Stormwater BOD (lbs/MG)	Stormwater Fecal Coliform (billion count / MG)		
Flows and Concentrations	Laurleton High Level Storm Sewer Separation	Reduced CSO flows to Thurston	904.00	75.40	828.60	23.98	112.35	5,705.29	17.34	78.58	1,323.00		
	26th Ward Expansion (Fresh)	Reduced CSO flows to Fresh Creek (WPCP flows from 170 MGD to 220 MGD)	324.00	192.00	132.00	41.83	227.86	25,213.70	17.34	78.58	4,536.00		
	26th Ward Expansion (Hendrix)	Reduced CSO flows to Hendrix Creek (WPCP flows from 170 MGD to 220 MGD)	33.00	0.00	33.00	41.83	227.86	25,213.70	17.34	78.58	4,536.00		
	26th Ward Expansion (Spring Creek)	Increased CSO flows to Spring Creek (WPCP flows from 170 MGD to 220 MGD)	249.00	270.00	-21.00	41.83	227.86	25,213.70	17.34	78.58	4,536.00		
	Total (Laurleton + 26th Ward Improvements)		1,510.00	537.40	972.60	na	na	na	na	na	na		
Loads Per Year			TN Existing CSO Load (lbs/year)	TN Project CSO Load (lbs/year)	TN Project Incremental Stormwater Load (lbs/year)	TN Total Project Load (lbs/year)	TN Total Project Reduction (lbs/year)	BOD Existing CSO Load (lbs/year)	BOD Project CSO Load (lbs/year)	BOD Project Incremental Stormwater Load (lbs/year)	BOD Total Project Load (lbs/year)	BOD Total Project Reduction (lbs/year)	
	Laurleton High Level Storm Sewer Separation	Reduced CSO flows to Thurston	21,675.74	1,807.91	14,365.10	16,173.01	5,502.73	101,567.63	8,471.46	65,113.69	73,585.15	27,982.49	
	26th Ward Expansion (Fresh)	Reduced CSO flows to Fresh Creek (WPCP flows from 170 MGD to 220 MGD)	13,554.29	8,032.17	2,288.43	10,320.60	3,233.69	73,827.67	43,749.73	10,372.93	54,122.66	19,705.01	
	26th Ward Expansion (Hendrix)	Reduced CSO flows to Hendrix Creek (WPCP flows from 170 MGD to 220 MGD)	1,380.53	0.00	572.11	572.11	808.42	7,519.49	0.00	2,593.23	2,593.23	4,926.25	
	26th Ward Expansion (Spring Creek)	Increased CSO flows to Spring Creek (WPCP flows from 170 MGD to 220 MGD)	10,416.72	11,295.24	0.00	11,295.24	-878.52	56,737.93	61,523.06	0.00	61,523.06	-4,785.13	
	Total (Laurleton + 26th Ward Improvements)		47,027.28	21,135.32	17,225.64	38,360.96	8,666.32	239,652.72	113,744.25	78,079.84	191,824.09	47,828.63	

