NY/NJ Harbor and Estuary Program
USEPA Region 2

SUMMARY OF PROGRESS ON COMPLETING A DISSOLVED OXYGEN MANAGEMENT PLAN/TMDL FOR THE NY/NJ HARBOR JULY 2010 TO OCTOBER 2012

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EXECUTIVE SUMMARY

Planning work for the management of dissolved oxygen in NY/NJ Harbor and the promulgation of TMDLs for nitrogen and carbon has been in progress since the early 2000's. The planning and TMDL development effort, for future attainment of various dissolved oxygen standards in NY/NJ Harbor, was led by the Harbor and Estuary Program (HEP) through state agency and stakeholder groups. The 2010 technical report, *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010,* presents a description of a Harbor TMDL plan in terms of modeled carbon and nitrogen load reductions and ambient dissolved oxygen improvements for several Harbor sub-region in terms of highest attainable dissolved oxygen. In addition, several other TMDL planning activities are already completed, but are not reflected in the July 2010 plan document.

Since the completion of *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010 ,* a number of work products have been completed by HDR|HydroQual and USEPA and the States through the direction and coordination of the TMDL Oversight Group. A targeted summary of the results of the July 2010 plan document was produced that highlighted attainment duration for marine dissolved oxygen criteria. Nutrient loading conditions for a model simulation that would include modifications to several elements of the July 2010 plan, forming a revised plan for TMDL purposes, is being developed by USEPA and the States. A scope of work for an investigative effort is under development by Nutrient Work Group membership in consultation with EPA national experts to provide site specific evidence for the public that improvements in Harbor dissolved oxygen will yield biological benefits and further proof that the marine dissolved oxygen criteria are applicable throughout the Harbor.

Although an extensive amount of data collection, data analysis, and modeling was accomplished over the course of more than the past decade in support of promulgating Harbor nutrient TMDLs for attaining highest dissolved oxygen levels, the planning process is not yet fully completed. Future efforts under the auspices of the HEP Management conference expected to take place to attain dissolved oxygen standards attainment through the TMDL process include: developing consensus on the loading reductions to be included in the final plan, completing a final model simulation to test the final loading reductions, and drafting a TMDL technical support document.

SECTION 1

INTRODUCTION

Planning work for the management of dissolved oxygen in NY/NJ Harbor and the promulgation of TMDLs for nitrogen and carbon has been in progress since the early 2000's. The work has been led by the EPA NY/NJ Harbor and Estuary Program (HEP) and the States of New York and New Jersey. Much of the work effort completed to date resulted in the production of the 2010 technical report, *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010*, which details the fundamentals of a plan to reach highest attainable dissolved oxygen endpoints.

To introduce the current status of the Harbor TMDL development planning process, information is presented below describing the planning process, information developed prior to the July 2010 planning document, and key elements of the July 2010 plan. Subsequent sections of the document describe activities completed and in-progress since July 2010 and next steps needed for completing TMDLs.

1.1 PLANNING AND TMDL DEVELOPMENT PROCESS DESCRIPTION

The planning and TMDL development effort, for future attainment of various dissolved oxygen standards in NY/NJ Harbor, was led by HEP through state agency and stakeholder groups. An approach was followed that considered the NY/NJ Harbor estuary as several sub-regions. Measurements and modeling were used to quantify levels of dissolved oxygen standard non-attainment and to predict management actions that would result in future attainment. Prior to working on management actions specific to sub-regions, nutrient reductions likely to be required were calculated on a Harbor-wide basis. The process is further described below in terms of HEP's structure and the technical approach followed.

1.1.1 Harbor and Estuary Program (HEP) Structure

The NY/NJ Harbor and Estuary Program (HEP) has an overall structure known as the "Management Conference" authorized by the Federal Clean Water Act, Section 320. The HEP "Management Conference" provides an open forum for discussion, planning, and action on environmental issues facing the Estuary. Attainment of dissolved oxygen standards and TMDL development for nitrogen and carbon is one example of an environmental issue addressed by HEP. The committees and workgroups comprising the HEP "Management Conference" are made up of government, academic, private, and non-profit groups, as well as individual citizens. Of particular relevance to the development of

Harbor TMDLs for nitrogen and carbon for dissolved oxygen management is the HEP Nutrient Workgroup (NWG).

1.1.2 Nutrient Work Group (NWG)

The overall charge of the Nutrient Work Group is to manage and reduce nutrient inputs to the Estuary. Specific goals of the NWG include:

- To eliminate adverse impacts of eutrophication, including hypoxia, resulting from human activities.
- To better understand the causes of eutrophication and its symptoms including hypoxia, algal blooms, and changes in the abundance and diversity of marine organisms.

An overabundance of both carbon and nitrogen from a variety of sources can lead to low levels of oxygen in the waters of the Harbor. Fish kills and die-offs of bottom-dwelling juvenile and adult organisms can be attributed to low levels of oxygen in the water, particularly in the summertime when warmer waters naturally hold less oxygen. Although the occurrence of hypoxic (low-oxygen) conditions has been more pronounced in Long Island Sound and the Bight than in the Harbor Estuary, there are places in the Harbor Estuary where nutrient enrichment and hypoxia are problematic, particularly for recruitment (survival) of larval organisms.

The Nutrients Work Group focused on the assessment of loadings of both nitrogen and carbon to the Harbor, the impacts those loadings cause, and what management actions can be taken to improve water quality. This has been done primarily through the use of the System-Wide Eutrophication Model (SWEM) and the development of a plan for Total Maximum Daily Loads (TMDLs). Preliminary costs analyses for potential upgrades to waste water treatment plants have also been assembled and will be considered in the future when a TMDL implementation plan is developed. The cost analyses were helpful for planning purposes in defining various levels of attainable effluent quality for nitrogen and carbon.

1.1.3 TMDL Oversight Group (OG)

In addition to the Nutrient Workgroup, the "management conference" structure of HEP allowed for the formation of an Oversight Group. Recognizing that the Clean Water Act empowers states to promulgate water quality standards and TMDLs, it was necessary for HEP to develop a forum for the leadership of both States (i.e., New York and New Jersey) to discuss policy matters with EPA in light of technical information generated by the Nutrient Workgroup, particularly for shared waters of the Harbor. The Oversight Group considered existing standards and federal criteria for dissolved oxygen as compared to measured data and model outputs from the Nutrient Workgroup. Participation in the

TMDL Oversight Group was restricted to EPA and the States. The Oversight Group membership has expertise in water quality standards development, TMDL development, permitting, and public outreach. The Oversight Group provides direction to the Nutrient Workgroup.

1.1.4 Sub-regional "outside in" technical approach

Given the spatial expanse of the Harbor waterways under HEP jurisdiction, the variety of water quality measured throughout the Estuary, and the variety of designated water uses and the spatially varying magnitudes of current dissolved oxygen standards for Harbor waterways, it was necessary to divide the Harbor into several sub-regions for planning and TMDL development purposes. While tracking of water quality occurred at the resolution of individual numerical model computational grid elements and the water use reach designations established by the State standards, the Harbor was more coarsely divided into several sub-regions for planning. A consensus was developed with the Oversight Group that reductions of nitrogen and carbon for dissolved oxygen standards compliance would be calculated first for upstream sub-regions (i.e., the outside of the Harbor) and then for downstream sub-regions (i.e., the inside of the Harbor). In all cases, the connections between the Harbor sub-regions and the carryover of benefits across sub-regions were always taken into account when calculating needed loading reductions for sub-regions.

For example, needed reductions for the second sub-region evaluated were calculated with loading reductions identified for the first sub-region active. Similarly, needed reductions for the third sub-region evaluated were calculated with loading reductions identified for the first and second sub-regions active. When reductions were calculated for the last downstream sub-region with loading reductions active in all upstream sub-regions, there was a checking step to make sure that unnecessary reductions had not been calculated for the upstream sub-regions previously addressed that could have instead been offset by a subsequent downstream reduction. In this way, the estuarine circulation which allows benefits from loading reductions to take place in both the upstream and downstream directions was reflected in the loading reduction calculations.

The approach taken within each sub-region was to account for planned improvements first and then to consider loading reductions at or below Limit of Technology (LOT) levels for point and nonpoint sources of nitrogen and carbon as needed to attain enforceable and/or alternative fishable/swimmable water quality standards and criteria for dissolved oxygen. In situations where the least stringent fishable/swimmable standard or criterion could not be met through LOT loading reductions, and where a fishable/swimmable standard or criterion could not be practically met (i.e., except under regional pastoral loading conditions), an alternative (i.e., meeting fishable/swimmable for at

least some portion of the waterway sub-region at least some of the time) standard was proposed.

1.1.5 Outputs produced prior to July 2010 revised sub-regional plans document

Prior to undertaking the process of calculating loadings reductions for dissolved oxygen standards attainment in Harbor sub-regions, several work elements were completed prior to defining sub-regions. These work elements included regional evaluations which informed and bounded the sub-regional evaluations. These regional evaluations considered: existing conditions, planned improvements, STP and stormwater LOT reductions, pastoral loading conditions, and a "what would it take (to achieve dissolved oxygen criteria)?" analysis.

In addition to embarking on regional evaluations before sub-regional evaluations were initiated, several other efforts were completed that were necessary to identify loading reductions in sub-regional evaluations. These include:

- STP carbon and nitrogen removal technology performance and costing analyses by NJHDG and NYCDEP. These are described in detailed reports prepared by NJHDG and NYCDEP contractors. The application of the performance information for TMDL planning purposes is demonstrated in Section 2.2.
- Best Management Practice (BMP) performance databases and literature review by HDR|HydroQual, EPA, and the States to define LOT carbon and nitrogen reduction percentages for stormwater. The initial review is described in an HDR|HydroQual technical memorandum and yielded limit of technology reductions of 30% for carbon and 40% for nitrogen. As directed by the Nutrient Work Group, assuming that application could occur in at most half of the watershed, the modeled stormwater LOT removal percentages were 15% for carbon and 20% for nitrogen. Further discussion of LOT stormwater reduction percentages for modeling is found in Section 2.2.
- Evaluation of reductions resulting from the existing Municipal Separated Storm Sewer Systems (MS4) program by EPA staff and HDR|HydroQual identified 5% reductions for nitrogen and 10% reductions for carbon as reasonable expectations for the existing MS4 program. The basis for these reductions is an EPA review of the EPA Office of Wastewater Management October 1999 report, *Economic Analysis of the Final Phase II Storm Water Rule* and HydroQual calculations. The EPA review identified TSS removals of 50% (i.e., 20% to 80%). Nitrogen in stormwater is 21% particulate so the reduction for nitrogen becomes 50% x 21% x 1/2 the drainage area, or 5%. Carbon in stormwater is 50%

particulate so the reduction becomes 50% x 50% x 1/2 the drainage area, about 10%.

- HDR|HydroQual review of CSO Long Term Control Plannning (LTCP) reports submitted to EPA by several NJ CSO communities for CSO reductions of nitrogen and carbon attainable by technologies considered in the various LTCPs. Based upon an analysis of influent to effluent removal efficiencies for a number of CSO technologies (CDS process, Swirl Vortex, and ballasted flocculation) extracted from Village of Ridgefield Park, New Jersey, and North Bergen Municipal Utilities Authorities Long Term Control Plan (LTCP) reports and performance criteria contained in Jersey City Municipal Utilities Authority's (JCMUA) report, for the Actiflo process, Densa-Deg process, and CDS Floc-Sep process, a definition of achievable CSO reductions for purposes of SWEM TMDL sub-regional planning simulations was developed. The definition developed for limit of technology reductions was 40% for carbon and 25% for nitrogen. Further discussion of CSO reduction percentages for modeling is found in Section 2.2.

The first efforts to conduct the TMDL development planning, at the sub-regional level, are documented in the May 2009 HDR|HydroQual report, *Nitrogen and Carbon Sub-Regional TMDLs Planning Document*. The initial TMDL development planning is presented in a "fact sheet" style for each sub-region including geographic descriptions of the surface water classifications within each sub-region, descriptions of current dissolved oxygen conditions in each sub-region, and expected future dissolved oxygen conditions in the sub-regions for various regional and sub-regional nitrogen and carbon loading reductions that were modeled.

1.2 DESCRIPTION OF JULY 2010 REVISED SUB-REGIONAL PLANS DOCUMENT

The 2010 technical report*, Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010*, presents a description of the modeled load reductions and results for each Harbor sub-region in terms of highest attainable dissolved oxygen. The July 2010 plan attempted to optimize findings from May 2009 planning effort by eliminating loading reductions that did not yield large benefits based on modeling results. The 2010 report also presents results not previously available in the May 2009 *Nitrogen and Carbon Sub-Regional TMDL Planning Document* including:

- Additional SWEM simulations (POTWs at design/permit flows and existing effluent quality, revised planned improvements, and highest attainable dissolved oxygen loading conditions).

- Evaluations of biological benefits associated with different nutrient loading conditions based on living marine resource metrics previously developed for Long Island Sound.
- Further evaluation of timings of calculated standards non-attainment results.

The highest attainable dissolved oxygen results presented in *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010* are presented here in Table 1-1. Table 1-1 shows for each Harbor sub-region waterway reach the dissolved oxygen concentration levels, both 24-hr average and instantaneous, that could be achieved for the loading reduction conditions tested with modeling.

1.3 LISTING OF WORK COMPLETED SINCE JULY 2010 PLAN DOCUMENT TO BE PRESENTED IN SECTION 2 BELOW AND LISTING OF STEPS FOR COMPLETING TMDLS TO BE PRESENTED IN SECTION 3 BELOW

The activities already completed but not reflected in the July 2010 plan document, to be described in Section 2 below, that will ultimately be incorporated into the Dissolved Oxygen Management Plan/TMDL include:

- Description of July 2010 plan document results in terms of where and when various dissolved oxygen endpoints are attained.
- Partial proposal for modification of the loading reductions presented in July 2010 plan results.
- Initial framing of inputs of final SWEM simulation.
- Work plan for assessing DO impacts to Harbor living marine resources.
- Nutrient Work Group Calls and Meetings.
- Ongoing NJHDG and NYCDEP ambient monitoring.
- NY Bight monitoring completed by EPA.
- NJDEP and EPA Ongoing NY Bight monitoring.
- Hackensack River Monitoring (completed) and Modeling (in progress) for BCUA discharge permit.
- Request letters for additional effluent discharge monitoring (POC and DOC vs. BOD, most recent, etc.).
- Preparation of a narrative discussing historical dissolved oxygen improvements and management actions producing those improvements.

- Tabulations of loadings for: POTWs at design/permit flows and existing effluent quality, revised planned improvements, and highest attainable dissolved oxygen loading conditions.
- Ammonia toxicity evaluation.

The further activities anticipated to be necessary for completion of the Dissolved Oxygen Management Plan/TMDL to be described in Section 3 include:

- Consider new information.
- Develop consensus on loading reductions.
- Complete a final SWEM simulation.
- Develop par values for trading purposes.
- Quantify DO standard attainment vs. non-attainment site specific impacts to biota.
- Plan for future ambient monitoring.
- Draft a TMDL Document.

Table 1-1. Summary of Plan Elements and Highest Attainable Dissolved Oxygen

Waterway/Reach	Sub-Regional Plan Elements	Highest Attainable Dissolved Oxygen
Hackensack River SE1	BCUA & SMUA N+C LOT CSO N+C LOT SW N+C LOT	24-hr average > 2.3 mg/L > 3 mg/L
Hackensack River SE2	BCUA & SMUA N+C LOT CSO N+C LOT SW N+C LOT	24-hr average > 0.4 mg/L > 0.3 mg/L
Hackensack River SE3	BCUA & SMUA N+C LOT CSO N+C LOT SW N+C LOT	24-hr average between 3.0 and 4.8 mg/L per NY chronic standard > 3 mg/L
Passaic River FW2-NT/SE2	Planned Improvements	24-hr average between 3.0 and 4.8 mg/L per NY chronic standard > 4 mg/L
Passaic River/Newark Bay SE3	CSO N+C LOT SW N+C LOT	> 3 mg/L
Raritan River FW2-NT	Planned Improvements	24-hr average > 5.0 mg/L > 4 mg/L
Raritan River SE1	MCUA N LOT CSO N+C LOT SW N+C LOT	24-hr average between 3.0 and 4.8 mg/L per NY chronic standard
Raritan Bay SE1	MCUA N LOT CSO N+C LOT SW N+C LOT	24-hr average between 3.0 and 4.8 mg/L per NY chronic standard
Raritan Bay I	MCUA N LOT CSO N+C LOT SW N+C LOT	> 3mg/L
Raritan Bay SA	MCUA N LOT CSO N+C LOT SW N+C LOT	24-hr average between 3.0 and 4.8 mg/L per NY chronic standard

Table 1-1. Summary of Plan Elements and Highest Attainable Dissolved Oxygen

Waterway/Reach	Sub-Regional Plan Elements	Highest Attainable Dissolved Oxygen
Raritan Bay SB	MCUA N LOT CSO N+C LOT SW N+C LOT	24-hr average between 3.0 and 4.8 mg/L per NY chronic standard
Arthur Kill SD/SE3	LRSA, JMEU, RSA N LOT CSO C & N LOT SW C & N LOT	24-hr average > 2.0 > 1.6
Arthur Kill I/SE2	LRSA, JMEU, RSA N LOT CSO C & N LOT SW C & N LOT	24-hr average > 3.5 > 2.3
Hudson River SE1	PVSC, EMUA, NBMUA, Hoboken (NHSA- Adams Street), West New York (NHSA-River Road), Yonkers, North River, Owls Head "C & N Low N"	24-hr average > 5 mg/L > 4 mg/L
Hudson River SB	Planned Improvements	24-hr average between 3.0 and 4.8 mg/L per NY chronic standard > 4.0 mg/L
Hudson River SE2	PVSC, EMUA, NBMUA, Hoboken (NHSA- Adams Street), West New York (NHSA-River Road), Yonkers, North River, Owls Head "C & N Low N"	24-hr average between 3.0 and 4.8 mg/L per NY chronic standard > 4.0 mg/L
Hudson River I	PVSC, EMUA, NBMUA, Hoboken (NHSA- Adams Street), West New York (NHSA-River Road), Yonkers, North River, Owls Head "C & N Low N"	24-hr average between 3.0 and 4.8 mg/L per NY chronic standard > 4 mg/L

Table 1-1. Summary of Plan Elements and Highest Attainable Dissolved Oxygen

Waterway/Reach	Sub-Regional Plan Elements	Highest Attainable Dissolved Oxygen
Upper Bay SE2	PVSC, EMUA, NBMUA, Hoboken (NHSA- Adams Street), West New York (NHSA-River Road), Yonkers, North River, Owls Head "C & N Low N"	24-hr average between 3.0 and 4.8 mg/L per NY chronic standard > 4mg/L With exceptions
Upper Bay I	PVSC, EMUA, NBMUA, Hoboken (NHSA- Adams Street), West New York (NHSA-River Road), Yonkers, North River, Owls Head "C & N Low N"	24-hr average between 3.0 and 4.8 mg/L per NY chronic standard > 4mg/L With exceptions

Notes:
BCUA=Bergen County Utilities Authority, CSO=combined sewer overflow, EMUA=Edgewater Municipal Utilities Authority, FW2-NT=NJ surface water classification, I=NY surface water classification, JMEU=Loint Meeting Essex and Union Counties, LRSA=Linden-Roselle Sewerage Authority, LOT=Limit of Technology, MCUA=Middlesex County Utilities Authority, NBMUA=North Bergen Municipal Utilities Authority, NHSA=North Hudson Sewerage Authority, PVSC=Passaic Valley Sewerage Commissioners, RSA=Rahway Sewerage Authority, SA/SB/SD=NY surface water classifications, SE1/SE2/SE3=NJ surface water classifications, SMUA=Secaucus Municipal Utilities Authority, SW=storm water

SECTION 2

DESCRIPTION OF COMPLETED WORK SINCE JULY 2010 SUB-REGIONAL PLANS DOCUMENT

Since the completion of *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010* , a number of work products have been completed by HDR|HydroQual and USEPA and the States through the direction and coordination of the TMDL Oversight Group. Each of these is described below.

2.1 DESCRIPTION OF JULY 2010 PLAN DOCUMENT RESULTS IN TERMS OF WHERE AND WHEN VARIOUS DISSOLVED OXYGEN ENDPOINTS ARE ATTAINED

While the July 2010 plan document did much to identify for each Harbor sub-region waterway reach the highest dissolved oxygen concentration levels, both 24-hr average and instantaneous, that could be achieved for the loading reduction conditions tested with modeling, the document didn't emphasize the specific durations over which various dissolved oxygen levels could be attained. With EPA visioning and guidance, a targeted summary of the results of the July 2010 plan document was produced that highlighted attainment duration for marine dissolved oxygen criteria. This targeted summary is provided here as Table 2-1. Table 2-1 describes whether of not the loading conditions tested with modeling in the July 2010 plan achieve current standards (column 2 of Table 2-1), whether or not and for how long the loading conditions tested with modeling in the July 2010 plan achieve standards based on marine dissolved oxygen criteria as represented by NY DO standards for SA/SB/SC waters (column 3 of Table 2-1), and what the highest attainable dissolved oxygen levels are for the loading conditions tested with modeling expressed as 24-hr average and instantaneous concentrations and the survival and recruitment biological endpoints (column 4 of Table 2-1). Table 2-1 was used by EPA and the States as a planning tool to propose modifications to the loading reductions presented in the July 2010 plan.

2.2 PARTIAL PROPOSAL FOR MODIFICATION OF THE LOADING REDUCTIONS PRESENTED IN JULY 2010 PLAN RESULTS AND INITIAL FRAMING OF INPUTS OF FINAL SWEM SIMULATION

The results of the July 2010 plan have been carefully considered and deliberated by EPA and the States. One outcome of the deliberations is an evolving proposal for a future SWEM simulation that would include modifications to several elements of the July 2010 plan, forming a revised plan for TMDL purposes. The plan revisions now under consideration include:

- Adjusting 16 Harbor STPs to permit/design flows instead of observed flows. Specifically, expressed in MGD, the permit/design flows are: Secaucus 5.12, North Bergen Woodcliff 2.91, Linden Roselle 17, Rahway Valley 40, PVSC 330, Edgewater 6, Middlesex County 147, Bergen County 84.28, Hoboken Adams Street 20.8, West New York River Road 10, Joint Meeting 85, North River 170, Oakwood Beach 40, Port Richmond 60, Owls Head 120, and Yonkers 120.
- Consistent with the July 2010 plan, individual Harbor STPs would have reduced effluent concentrations under the revised plan. These reduced effluent concentrations planned can be characterized as "LOT C and LOT N", "LOT N", and "Low N". The plant specific definitions for these effluent characterizations, based on discharger removal technology performance and costing reports and other current information reviewed by the Oversight Group in November 2011, that are being considered for the revised plan include:

Characterization	STP	Effluent Nitrogen (mg/L)	Effluent CBOD (mg/L)
LOT C and LOT N	Bergen County	4.5	1.5
	Secaucus	4	1.5
LOT N	Middlesex County	4	4
	Linden Roselle	4.5	4
	Joint Meeting	4.5	4
	Rahway Valley	4.5	4
Low N	Woodcliff	15	15
	Hoboken	19	15
	West New York	13	15
	PVSC	20	15
	Edgewater	14	15
	North River	TBD	15
	Owls Head	TBD	15
	Yonkers	TBD	15

TBD = to be determined

- For the revised plan, a modification of CSO reduction included in the July 2010 plan has been discussed. The revised plan is likely to include CSO reductions in

NJ waters that are driven by attainment of standards for pathogen indicator organisms and in NY waters CSO reductions already planned for, including 30% for East River, 5% for Hudson River, and 6% for the Upper Bay CSOs.

- For the revised plan, storm water reductions associated with LOT would likely be relaxed per the request of the States. The revised plan is likely to include Clean Air Interstate Rule (CAIR) related reductions for all stormwater plus additional LOT and municipal separate storm sewer system (MS4) program related reductions for stormwater releases to specific waterways. The waterways targeted for LOT stormwater reductions, to be defined as 15% for carbon and 8% for nitrogen, include the Hackensack, Passaic SE3, Newark Bay, Arthur Kill, Raritan River, and Raritan Bay. Other waterways and reaches would include MS4 program related reduction defined as 10% for carbon and 5% for nitrogen.
- As freshwater TMDL development progresses above the Harbor headwaters of the Passaic and Raritan Rivers, the revised plan for the Harbor will specify loadings for these headwaters based on mass loading rates that NJDEP will provide in Excel files from the most recent upstream TMDL work.

2.3 WORK PLAN FOR ASSESSING DO IMPACTS TO HARBOR LIVING MARINE RESOURCES

Since the development of *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010*, the Nutrient Work Group membership has expressed an interest in being able to have site specific evidence that improvements in Harbor dissolved oxygen will yield biological benefits and further proof that the marine dissolved oxygen criteria are applicable throughout the Harbor. Such information could prove useful for communicating TMDL needs and expected outcomes to the public. In response, HEP will sponsor an investigative effort. A scope of work for an investigative effort has been under development by Nutrient Work Group membership in consultation with EPA national experts. There will likely be desired scope that goes beyond what HEP's investigative effort can support. Going forward, minutes of Nutrient Work Group meetings posted to www.harborestuary.org will be a good way to track progress on the site-specific living marine resources response investigative effort. It is noted that the investigative effort is not a condition for TMDL development and can proceed in parallel with TMDL development.

2.4 NUTRIENT WORK GROUP ACTIVITIES

Since the development of *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010*, the Nutrient Work Group has had the opportunity to review several additional documents including:

- Report and Presentation to Hackensack Model Evaluation Group (May 2011). See Section 2.8 below for further description.
- NY and NJ comments on the draft nutrient plan (Jan/Feb 2011)
- Review of NY/NJ Harbor Nutrient/DO TMDL Plan: Presentation (Nov 2010)
- HydroQual Technical Report: Narrative of Dissolved Oxygen Improvements (Sept 2010). See Section 2.10 below for further description.
- HydroQual Technical Report: Evaluation of Ammonia Toxicity (Sept 2010). See Section 2.12 below for further description.
- HydroQual Tech Memo: Hudson River Flux Calculations and East River BOD (August 2010)
- ORD Nutrient Control Design Manual (August 2010)
- Status of Nutrient TMDL Plan: Presentation (July 2010)
- Nutrient Loading Tables (July 2010). See Section 2.11 below for further description.

Some of these documents that the Nutrient Work Group has considered are further described below as noted above. Nutrient Work Group meeting minutes as well documents available to the Nutrient Work Group are posted to www.harborestuary.org. Going forward, the Nutrient Work Group will continue to support State and EPA efforts to finalize TMDLs related to standards attainment for dissolved oxygen. The Nutrient Work Group holds meetings and conference calls on an as needed basis.

2.5 ONGOING NJHDG AND NYCDEP AMBIENT MONITORING

The City of New York has been collecting water quality data in New York Harbor since 1909. Data collection has been the responsibility of the New York City Department of Environmental Protection (NYCDEP) Marine Sciences Section (MSS) for the past 22 years. The Survey currently consists of 62 stations; 35 stations located throughout the open waters of the Harbor, and more than 27 stations located in smaller tributaries within the City which vary from year to year. 20 water quality parameters are now measured, including dissolved oxygen, nitrogen, chlorophyll a, and BOD. Sampling frequency varies throughout the year and many of the stations include sample collection from both near surface and near bottom. Similarly, in 2003, the New Jersey Harbor Dischargers Group (NJHDG) began a long-term water quality monitoring program for the waters in the New Jersey portion of the NY/NJ Harbor Estuary. Thirty-three locations are monitored weekly from May to September and twice per month from October through April. While most stations are sampled at mid-depth, deep-water sites are sampled at two discrete depths (1 meter below the surface and

meter above the bottom substrate). The NJHDG sampling captures key parameters related to dissolved oxygen and nutrients.

In Harbor waterway reaches where currently enforceable dissolved oxygen standards are specified on a concentration never less than basis, these data have been valuable to the States for assessing compliance and making Clean Water Act Section 303(d) listing decisions. While these monitoring program data are not intended to provide the continuous records of dissolved oxygen required to assess attainment of dissolved oxygen standards based on EPA's marine dissolved oxygen criteria, these data serve the important purposes of documenting long-term trends in dissolved oxygen improvement at a given location as well as providing for contemporaneous comparison of conditions across Harbor locations. In this sense, these data have done much already to help managers to prioritize Harbor waterway reaches based on existing ambient conditions and to track improvements in conditions over time. In the context of a TMDL plan, the continued collection of these data will be important for demonstrating TMDL outcomes and benefits in the future.

One recent use of these data, historical improvement analysis, is further described in Section 2.10 below. Further, the routine monitoring program data, if continued, will be useful for addressing, in part, a need for additional and more modern data identified by the Harbor Nutrient Work Group and discussed below in Sections 3.1 and 3.6.

2.6 NY BIGHT MONITORING COMPLETED BY EPA

For many years, the waters of the NY Bight, particularly off the New Jersey coastline, have been listed as having low levels of dissolved oxygen during the summer. During the summers of 2008, 2009, and 2010, EPA implemented a program to monitor nutrient and dissolved oxygen concentrations in the New York Bight, and to assess hypoxic or potential hypoxic conditions in the Bight. The information collected was used to inform HEP and other stakeholders of potential or actual low oxygen conditions in the Bight. The program also provided water quality data that will be necessary for further assessing the need for dissolved oxygen related TMDLs in the NY Bight once Harbor TMDLs are completed.

Previously, EPA had established a New York Bight Water Quality Monitoring Program in 1974 as part of its mandated responsibilities under the Marine, Protection, Research and Sanctuaries Act of 1972, the Federal Water Pollution Control Act of 1972 (later amended by the Clean Water Act of 1977 and the Water Quality Act of 1987). In response to a 2007 hypoxic event in New Jersey coastal waters, EPA Region 2 revised and refocused the monitoring conducted under the New York Bight Water Quality Monitoring Program during the summertime of 2008 to 2010. The revised monitoring expanded the geographic scope of water quality monitoring and placed emphasis on monitoring conditions that are directly associated with ambient nutrient concentrations and that increase the

potential for widespread low oxygen events (e.g., stratification of the water column). The revised program was also modified to provide data to allow for comparisons to 1994-95 data and outputs of the Bight portion of the System Wide Eutrophication Model (SWEM).

The purpose of the summertime 2008 to 2010 sampling design was to get a qualitative picture of eutrophication status across wide areas of the Bight. The sample design was based on a previous survey conducted in 1995 by NYCDEP, specifically for the initial development and calibration of SWEM. The sampling locations in the 1995 survey and those of the summertime 2008 to 2010 EPA New York Bight Water Quality Monitoring Program were designed to capture data at scales that are relevant for Bight-wide processes.

There is general overall agreement in measured levels of oxygen and nutrients for the years 1994-95, 2008, and 2009. 2008, in particular though, had lower measured dissolved oxygen and greater measured temperature stratification in September than 1994-95 or 2009. August 2009 measurements showed fresher and warmer conditions than other years. The 2008 and 2009 data further document that dissolved oxygen less than 3 mg/L, not supportive of juvenile and adult survival, occurs in the Bight.

In addition to assessing conditions and TMDL needs for the Bight, the 2008 to 2010 summertime data from the Bight will be useful for addressing, in part, a need for additional and more modern data identified by the Harbor Nutrient Work Group and discussed below in Sections 3.1 and 3.6.

2.7 NJDEP AND EPA ONGOING NY BIGHT MONITORING

The New Jersey Department of Environmental Protection (NJDEP), Rutgers University (RU) and the EPA recently deployed a research submersible, known as the Slocum Coastal Electric Glider, in the Bight. The glider, which resembles a yellow torpedo with swept-back wings, zigzags through the water of the Bight and collects "rapid-fire" (i.e., every second) readings of dissolved oxygen, salinity and temperature at various depths. The glider is typically deployed in an area from three to seven miles offshore, and covers depths up to 120 feet. The glider data are being analyzed by scientists and stakeholders to better understand why the Bight tends to have low levels of oxygen, particularly in the summer. The glider data may help to determine to what extent conditions unrelated to nutrients, such as natural upwelling events, water rising from beneath the surface to replace water pushed below, and a lack of mixing of oxygen-poor and oxygen-rich waters, are contributing to low-oxygen conditions in the Bight.

Historically, Bight water sampling was completed by NJDEP and EPA with grab samples taken from boats or helicopters. Weather conditions and other factors limited the number of samples that could be taken, providing only snapshots of actual conditions in the

Bight. The recently deployed glider provides a wealth of real-time data without these limitations.

Glider research results available so far document a great deal of dissolved oxygen depth stratification in the Bight water column. Lower-oxygen waters tended to be found near the ocean floor and better oxygen levels were measured nearer the surface. This observed stratification in dissolved oxygen concentrations over depth may be indicative of nutrient conditions in the Bight, such as cyclical algae die-offs, or physical conditions such as coastal upwelling. Coastal upwelling occurs when wind moves near surface waters away from the coast and surface waters are replaced by water that wells up from below. The cooler bottom waters are rich in nutrients and can cause algae blooms when the water rises to near the surface. This can result in low oxygen conditions when the algae die. The data collected by the glider have documented that vertical mixing in the Bight can vary from month to month or year to year related to wind and other weather patterns influencing mixing.

In addition to assessing TMDL needs for the Bight, the glider data will be useful for addressing, in part, a need for additional and more modern data identified by the Harbor Nutrient Work Group and discussed below in Sections 3.1 and 3.6.

2.8 HACKENSACK RIVER MONITORING (COMPLETED) AND MODELING (IN PROGRESS) FOR BCUA DISCHARGE PERMIT

Under NJDEP oversight, the Bergen County Utilities Authority (BCUA) initiated a monitoring and modeling project for the Hackensack River. Monitoring was completed in 2010. Modeling has been on-going. There is an interest in linking, to some degree, BCUA's model with SWEM at some phase of the TMDL process for the Hackensack River.

In addition to ultimately completing TMDLs for the Hackensack River, the BCUA data will be useful for addressing, in part, a need for additional and more modern data identified by the Harbor Nutrient Work Group and discussed below in Sections 3.1 and 3.6.

2.9 REQUEST LETTERS FOR ADDITIONAL EFFLUENT DISCHARGE MONITORING (POC AND DOC VS. BOD, MORE RECENT INFORMATION, ETC.)

An important consideration in the attainment of dissolved oxygen standards is the forms of nitrogen (ammonia, nitrate and nitrite, organic) and carbon (CBOD5 or BOD5, POC, DOC) entering the Estuary. Monitoring data collected in 1994-95 measured these nutrient forms for STP effluents. For many Harbor STPs, these nutrient forms haven't been measured in effluents since 1994-95. After the development of *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010* , letters were sent by NJDEP to Harbor STPs to work toward

collecting nutrient form specific effluent data. In addition to helping to characterize current effluent nutrient forms, these data will also provide more up to date estimates of total nutrient concentrations. These data can provide greater understanding of the percentage reductions required for meeting calculated TMDLs. Collection of these data is consistent with filling the need for additional and more modern data identified by the Harbor Nutrient Work Group and discussed below in Sections 3.1 and 3.6.

2.10 PREPARATION OF A NARRATIVE DISCUSSING HISTORICAL DISSOLVED OXYGEN IMPROVEMENTS AND MANAGEMENT ACTIONS PRODUCING THOSE IMPROVEMENTS

Improvements in dissolved oxygen concentrations in the NY/NJ Harbor have been on-going for a number of years, independent of a TMDL for nitrogen and carbon loadings. Both historical improvements in dissolved oxygen and the management actions producing those improvements are described in a report prepared by HDR|HydroQual for HEP. The report considers long-term databases documenting dissolved oxygen trends as well as management activities prior to and after the promulgation of the Clean Water Act. In particular, infrastructure improvements and the increased capture of sewage can explain much of the historical dissolved oxygen improvements.

2.11 TABULATIONS OF LOADINGS FOR: POTWS AT DESIGN/PERMIT FLOWS AND EXISTING EFFLUENT QUALITY, REVISED PLANNED IMPROVEMENTS, AND HIGHEST ATTAINABLE DISSOLVED OXYGEN LOADING CONDITIONS

While issuing *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010*, tabulations of loadings for several of the simulations included in the plan document were distributed to Nutrient Work Group members under separate cover. The simulations for which loadings were tabulated include baseline, STPs at permit flows, revised planned improvements, revised sub-regional TMDL plan, and revised pastoral. Tabulations of nitrogen and carbon loadings were presented in standard and English units. The tabulations included a summary for all loading types to each waterway as well as monthly time series of loadings from heads-of-tide, stormwater for each waterway, CSO for each waterway, STPs for each waterway, and atmospheric deposition domain-wide.

2.12 AMMONIA TOXICITY EVALUATION

HDR|HydroQual performed calculations using SWEM outputs and measured pH that project full compliance with States' standards for un-ionized ammonia toxicity under the expected nitrogen concentrations associated with the sub-regional TMDL plans presented in *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010* . It is expected that the promulgation of

Harbor TMDLs for nitrogen and carbon for dissolved oxygen standards attainment will also result in attainment with unionized ammonia standards in HEP waters for average observed pH conditions.

Calculations were performed in a tiered approach considering various assumptions related to prediction of unionized ammonia along a continuum of 100% unionized (absolute worst case) to a realistic prediction of the unionized fraction based on spatially and temporally varying salinity, temperature, and pH. The nature of the approach allowed for an understanding of the effect of pH on unionized ammonia standards attainment.

Based on calculations with both field data and model results, under average observed pH conditions, all Harbor waters should achieve both acute and chronic unionized ammonia standards for the July 2010 sub-regional TMDL plans reduced nitrogen conditions; however, there are some areas of the Harbor having the potential for violating standards under observed elevated pH conditions.

Table 2-1. Review of July 2010 TMDL Plan DO Endpoint Attainment Results

Sub-Region & Reach	Would Attain Current Standards	Would Attain SA/SB/SC NY Standard	Would Attain Other Level All Times & Locations
Hackensack River SE1	No	> 350 days	24-hr avg > 2.5 mg/L Juvenile & adult survival > 0.6 mg/L
Hackensack River SE2	No	> 288 days for mp 11.4 - 3.8 Yes for mp 3.8 – 0.6	24-hr avg > 0.4 mg/L > 0.3 mg/L
Hackensack River SE3	Yes	Yes	
Passaic River FW2-NT/SE2	Yes	Yes	
Passaic River & Newark Bay SE3	Yes	> 337 days for 3 grid cells Yes for other locations	24-hr avg > 2.9 mg/L Juvenile & adult survival > 2.4 mg/L
Raritan River FW2-NY	Yes	Yes	
Raritan River SE1	No	Yes (omit 3 grid cells <0.2 days)	24-hr avg > 3.0 mg/L 24-hr avg < 4.8 mg/L Juvenile & adult survival Larval recruitment >1.5 mg/L
Raritan Bay SE1	No	>342 days (24 grid cells) Yes (34 grid cells)	24-hr avg > 2.7 mg/L Juvenile & adult survival > 0.6 mg/L
Raritan Bay I	No	Yes	
Raritan Bay SA	Yes (almost)	Yes (omit 2 grid cells < 0.5 days)	24-hr avg > 3 mg/L 24-hr avg < 4.8 mg/L Juvenile & adult survival Larval recruitment

Table 2-1. Review of July 2010 TMDL Plan DO Endpoint Attainment Results

Sub-Region & Reach	Would Attain Current Standards	Would Attain SA/SB/SC NY Standard	Would Attain Other Level All Times & Locations
			>2.5 mg/L
Raritan Bay SB	Yes	Yes	
Kill van Kull	Yes	Yes	
Arthur Kill SD/SE3	No	>345 days (mp 15 – 8.3) Yes (mp 8.3 – 4.1)	24-hr avg > 2 mg/L > 1.6 mg/L
Arthur Kill I/SE2	No	Yes (omit 2 grid cells, < 1 day)	24-hr avg > 3 mg/L 24-hr avg < 4.8 mg/L Juvenile & adult survival Larval recruitment >2.3 mg/L
Hudson River SE1	Yes	Yes	
Hudson River SB	Yes	Yes	
Hudson River SE2	Yes	Yes	
Hudson River I	Yes	Yes	
Upper Bay SE2	Yes (almost)	330 days 1 grid cell Yes (all other grid cells)	24-hr avg > 3.6 mg/L Juvenile & adult survival > 3.2 mg/L
Upper Bay I	Yes	Yes	

SECTION 3

EXPECTED NEXT STEPS FOR COMPLETING TMDLS

Although an extensive amount of data collection, data analysis, and modeling was accomplished over the course of more than the past decade in support of promulgating Harbor nutrient TMDLs for attaining highest dissolved oxygen levels, the planning process is not yet fully completed. Future efforts under the auspices of the HEP Management conference expected to take place to attain dissolved oxygen standards attainment through the TMDL process include: consider new information, develop consensus on loading reductions, complete a final SWEM simulation, develop par values for trading purposes, identify DO standard attainment vs. non-attainment site specific impacts to biota, plan for future ambient monitoring, and draft a TMDL document. Each of these needs is further described below.

3.1 CONSIDER NEW INFORMATION

The sub-regional TMDL plans presented in *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010* are based in large part on the results of reduced loading condition projection scenarios performed with the System Wide Eutrophication Model (SWEM). SWEM was calibrated using monitoring data collected specifically for this purpose in 1994-95. The 1994-95 data had a collection and laboratory cost of $5.0 million. SWEM's calibration has been further assessed by comparison to more recent data collected by the ongoing NYCDEP and NJHDG monitoring programs described in Section 2.5.

The 1994-95 data provided simultaneous measurement of loadings and ambient conditions and included a comprehensive list of analytes such as direct measurement of organic carbon. The 1994-95 data covered the Harbor, Bight, and Sound and was inclusive of all four seasons. Given the $5 million cost to obtain the 1994-95 data, it is understandable why such an effort hasn't since been repeated. Nonetheless, the Nutrient Work Group has discussed the advantages for obtaining a second synoptic data set inclusive of ambient conditions and loadings. These advantages potentially include: having information newer than 1994-95, characterizing current loading conditions, sampling for dissolved oxygen on the 24-hr average basis associated with marine dissolved oxygen criteria not anticipated in the 1994-95 sampling, sampling to capture within a day variations in dissolved oxygen not captured in 1994-95 sampling, and potentially capturing a more typical summer condition than the drought that occurred in August 1995.

While it is unlikely that another $5 million effort (in 1994-95 dollars) would be repeated before TMDLs are promulgated, it is likely that the Nutrient Work Group will critically consider ongoing and recently completed monitoring efforts and work toward collecting data to fill gaps in

the recent available information, particularly in the context of TMDL implementation strategy. The recently completed and ongoing data collection efforts to be considered, along with other information that may be identified, for use in TMDL implementation planning are described in Sections 2.3, 2.5, 2.6, 2.7, 2.8, and 2.9. More immediately than TMDL implementation planning, recently available new information could help shape final TMDL plan loading reductions as described in Sections 2.2 and 3.2.

3.2 DEVELOP CONSENSUS ON LOADING REDUCTIONS

As described in Section 2.2, the results of *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010* have been carefully considered and deliberated by EPA and the States. One outcome of the deliberations is an evolving proposal for a future SWEM simulation that would include modifications to several loading reduction elements of the July 2010 plan, forming a revised plan for TMDL purposes. In order to form a revised plan, changes to plan loading reductions need to be agreed to by the Oversight Group before they can be tested with SWEM. Specifically, Oversight Group consensus is needed for finalizing carbon and nitrogen loading reductions for Hudson River and Upper Bay STPs, for finalizing head-of-tide loadings for the Passaic and Raritan Rivers, for defining permit/design flows and loads at STPs, and for defining CSO reductions in New Jersey. Each of these areas of needed consensus is further discussed below.

3.2.1 Options and alternatives to "Low N" carbon and nitrogen reductions for Hudson River/Upper Bay STPs

SWEM results developed as part of the *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010* show that only a modest level of loading reduction is needed at Hudson River and Upper Bay STPs to attain standards. The needed loading reductions are likely less than the "Low N" effluent conditions (as defined in removal technology performance and costing reports prepared by dischargers) and conditions tested with SWEM.

Specifically, the July 2010 plan SWEM testing included the lower of "Low N" or 1994-95 measured nitrogen and carbon effluent concentrations for the Hudson River and Upper Bay STPs in Harbor waters. These previously modeled effluent concentrations, shown here for illustrative purposes only and subject to change in finalizing a TMDL, are:

STP	Effluent Nitrogen (mg/L)	Effluent CBOD (mg/L)
Woodcliff	16.8(15)	8(15)
Hoboken	20.6(19)	8(15)
West New York	14(13)	8(15)

PVSC	20	8(15)
Edgewater	15.8(14)	8(15)
North River	12(?)	15
Owls Head	12(?)	15
Yonkers	18(?)	15

Note: The above effluent concentrations were included in the July 2010 plan, but are expected to be modified in a final TMDL. Expected modifications are noted in parentheses.

As indicated in Section 2.2, the Oversight Group has already agreed to adjust the effluent CBOD concentrations shown above for the NJ STPs from 8 mg/L to 15 mg/L. The explanation for this change is that the NJHDG did two versions of their removal technology performance and costing report. The first version defined effluent CBOD for "Low N" as 8 mg/L and 8 mg/L was therefore used for modeling in the July 2010 plan. The second version, of the NJHDG removal technology performance and costing report, defined effluent CBOD for "Low N" as 15 mg/L. The revised NJHDG definition for "Low N" CBOD of 15 mg/L is consistent with the NYCDEP definition. Including a 15 mg/L effluent CBOD for both NY and NJ Hudson River and Upper Bay STPs in the TMDL and next SWEM simulation is equitable across dischargers and is not unreasonable in light of recent DMR information available to the States.

In addition, as indicated in Section 2.2, per the instructions of the NJDEP based on their review of recent DMR information and discharger removal technology performance and costing reports, the next SWEM simulation to be performed for testing loading reductions for a final TMDL is to include slight adjustments to the previously modeled nitrogen concentrations for Hudson River and Upper Bay STPs.

The remaining decisions pertaining to Hudson River and Upper Bay STPs loadings for the TMDL plan for which Oversight Group consensus is needed include:

- Whether or not the Yonkers STP is included in the loading reductions?
- If the Yonkers STP is included in loading reductions, what is the basis of defining an effluent nitrogen concentration for the TMDL plan since a removal technology performance and costing study doesn't existing for Yonkers? Is 18 mg/L appropriate?
- Is 12 mg/L still an appropriate effluent nitrogen concentration for the North River and Owls Head STPs?

Anticipated changes to loadings other than STPs that the Oversight Group has already agreed to are noted in Section 2.2 and are further discussed in Sections 3.2.2 to 3.2.4 in terms of what information still needs to be finalized.

3.2.2 Finalize head-of-tide loadings for the Passaic and Raritan Rivers based on freshwater TMDLs

TMDL development for nutrient reduction and dissolved oxygen improvement purposes has been ongoing in the New Jersey headwaters to the Harbor on the Passaic and Raritan Rivers. Ideally, the Harbor TMDL should reflect the loading conditions to the Harbor that will result from the upstream freshwater TMDLs. The July 2010 plan attempted to account for these freshwater TMDLs based on then available provisional information. In November 2011, the NJDEP provided updated information for mass loadings at Dundee (Passaic River) and Fieldville (Raritan River) Dams associated with the freshwater TMDLs. A final Harbor TMDL SWEM simulation should be revised to include the most recent headwater information from NJDEP.

3.2.3 Existing vs. permit/design flows at STPs

As indicated in Section 2.2, the TMDL sub-regional plans presented in *Progress as of June 25, 2010 on Completing a Dissolved Oxygen Management Plan/TMDL for the NY/NJ Harbor Attachments Updated July 28, 2010* considered TMDL loadings based on existing STP effluent flows. The Oversight Group has agreed to instead calculate STP effluent loadings to the Harbor based on design/permit flows for the next SWEM simulation and final TMDL development. Permit/design flow values have been tabulated and shared with the States for review.

3.2.4 NJ CSO reductions

As described in Section 2.2, a revised TMDL plan is likely to include CSO reductions in NJ waters that are driven by attainment of standards for pathogen indicator organisms. In NY waters, CSO reductions already planned for, including 30% for East River, 5% for Hudson River, and 6% for the Upper Bay CSOs would continue to be included as part of the TMDL plan. It is not clear whether NJ CSO management planning for pathogen indicator organisms will be completed prior to performing a new SWEM simulation for a revised nutrient and dissolved oxygen TMDL plan. One option that has been discussed is not including NJ CSO reductions in a revised TMDL plan.

3.3 COMPLETE A FINAL SWEM SIMULATION

Once consensus is reached on loadings for the TMDL plan, those loadings will need to form the basis of a SWEM simulation so the level of dissolved oxygen standards attainment associated with the loadings can be calculated. Since October 2011, there has been a running dialogue between HDR|HydroQual, EPA, and the States to reach consensus on the inputs necessary for a final SWEM simulation. Outstanding issues are described in Section 3.2 and partial decisions reached are noted in Section 2.2.

3.4 DEVELOP TRADING OPTIONS

In August 2010, implementation of the TMDL was contemplated in terms of permitting flexibility. As a fundamental principle, EPA and the States are interested in maximizing flexibility in

establishing individual permit requirements when implementing TMDLs. While the final TMDL plan for dissolved oxygen standards attainment and its load and waste load allocations are the datum from which any potential alternative plans proposed would be measured, lower cost, equitable alternatives that produces a dissolved oxygen response that is equal to or better than the TMDL plan response would be considered by EPA and the States.

EPA and the States wanted to account for the fact that a permitted entity, or group of permitted entities, may wish to propose an alternative set of actions for one or more Harbor sub-regions that has a reasonable prospect to produce a dissolved oxygen response that is equal to or better than that produced by the final TMDL plan. Potential alternatives might include trades between nitrogen and carbon requirements for an individual permitted entity or trades among permitted entities for nitrogen and/or carbon requirements.

Alternatives proposed would be evaluated by the involved State(s) in consultation with EPA. Plausible alternatives would proceed to a second step in the evaluation process --- a confirmatory model simulation to be paid for by the permitted entity or group. Proposed alternatives producing a dissolved oxygen response that is equal to or better than the response produced by the final TMDL plan would be approved, and incorporated, for informational purposes, in an update of the approved TMDL. Proposed alternatives that fail this test may be adjusted through an iterative process to gain approval.

While it is not a requirement to have a trading protocol for the promulgation of the TMDL, it is desirable for stakeholders to be informed of implementation options as the TMDL is promulgated. There is a need to establish a metric by which "equal or better" dissolved oxygen would be judged when alternatives, to the final TMDL plan, are evaluated for approval. The metric should address both spatial expanse and duration. One suggested metric is the use of a spatially weighted average of days of non-attainment within the Harbor sub-regions adjacent to the permitted entities involved in the alternative.

3.5 QUANTIFY DO STANDARD ATTAINMENT VS. NON-ATTAINMENT SITE SPECIFIC IMPACTS TO BIOTA

As described in Section 2.3, a work plan is being developed for developing site specific evidence that improvements in Harbor dissolved oxygen will yield biological benefits and further proof that the marine dissolved oxygen criteria are applicable throughout the Harbor. While the additional information on expected biological benefits of the final TMDL plan and site-specific proof of the marine dissolved oxygen criteria will be informative, it is not a condition for TMDL development or promulgation and can proceed in parallel with TMDL development. If available, the site-specific information on expected Harbor biological benefits and further proof of the marine dissolved oxygen criteria can be incorporated into the section of the TMDL document describing applicable water quality standards.

3.6 PLAN FOR FUTURE AMBIENT MONITORING

Section 3.1 describes the importance of collecting and considering new information within the TMDL development process, particularly for loadings. After TMDL promulgation, however, it is equally important to continue to monitor ambient and loading conditions. It is a requirement of a TMDL to provide reasonable assurances that required loading reductions happen, particularly when reductions in sources for which NPDES permits are not required are included. Post-TMDL monitoring can be part of the reasonable assurances by demonstrating actual loading reductions and improvements in ambient water quality.

3.7 DRAFT A TMDL DOCUMENT

Although a multitude of technical reports and presentations have been developed documenting TMDL planning for dissolved oxygen standards attainment, a TMDL must include an articulation of nine required elements. A TMDL document is necessary for presenting the nine required TMDL elements. Further, as TMDLs are typically promulgated by States rather than EPA, it is likely that each State may develop its own TMDL document. EPA has contracting mechanisms in place for the development of a single TMDL document covering the Harbor waters of both States. Development of a Harbor-wide TMDL document is pending finalizing the loading reductions and model projection of highest attainable dissolved oxygen as described in Section 3.3.