



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

August 3, 2007

Sent via Hand Delivery

Mr. Ted Henefin, General Manager
Hampton Roads Sanitation District
1436 Air Rail Avenue
Virginia Beach, Virginia 23455

Re: Administrative Order and Information Request
Docket No. CWA-03-CWA-03-2007-0277

Dear Mr. Henefin:

Please find enclosed an Administrative Order and Information Request issued to the Hampton Roads Sanitation District pursuant to Sections 308 and 309 of the Clean Water Act. The United States Environmental Protection Agency ("EPA" or "the Agency") is issuing this Order and Request to require the collection of data and the development and submission of plans necessary for the elimination of sanitary sewer overflows in the regional collection and treatment system.

As provided in the Order, if you wish to meet to discuss this matter, please contact Judy Hykel, the Region III attorney assigned to this matter. Ms. Hykel can be reached as follows:

U.S. Environmental Protection Agency, Region III
Mail Code (3RC20)
1650 Arch Street
Philadelphia, PA 19103-2029

Sincerely,

A handwritten signature in black ink, appearing to read "Jon M. Capacasa".

Jon M. Capacasa, Director
Water Protection Division
EPA Region III

Enclosures

cc: David Paylor, Director
VADEQ (w/encls)

**BEFORE THE UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103**

In The Matter of:	:	
	:	Docket No.: CWA-03-2007-0277
Hampton Roads Sanitation District	:	
1436 Air Rail Avenue	:	
Virginia Beach, Virginia 23455,	:	
	:	
Respondent.	:	
	:	ORDER FOR COMPLIANCE
	:	AND REQUIREMENT TO SUBMIT
	:	INFORMATION
	:	
	:	Proceeding Under Sections 308(a) and
	:	309(a)(3) of the Clean Water Act, as
	:	amended 33 U.S.C. §§ 1318(a) and
	:	1319(a)(3).

I. STATUTORY AUTHORITY

1. The following Findings are made and this Order for Compliance and requirement to submit information ("Order") is issued pursuant to the authority vested in the Administrator of the United States Environmental Protection Agency ("EPA") under Sections 308(a) and 309(a) of the Clean Water Act, as amended, 33 U.S.C. §§ 1318(a) and 1319(a) ("CWA" or "the Act"). The Administrator has delegated these authorities to the Regional Administrator of EPA Region III who in turn has redelegated them to the Director of the Water Protection Division of Region III.

II. STATUTORY AND REGULATORY BACKGROUND

2. Section 301(a) of the Act, 33 U.S.C. § 1311(a), prohibits the discharge of any pollutant (other than dredged or fill material) from a point source into waters of the United States except in compliance inter alia with a permit issued pursuant to the National Pollutant Discharge Elimination System ("NPDES") program under Section 402 of the Act, 33 U.S.C. § 1342 and 40 C.F.R. Part 122.
3. Section 502(6) of the Act, 33 U.S.C. § 1362(6), defines "pollutant" to include, inter alia, sewage, sewage sludge, biological material and industrial, municipal and agricultural

waste.

4. Section 502(12) of the Act, 33 U.S.C. § 1362(12), defines "discharge of a pollutant" to include "any addition of any pollutant to navigable waters from any point source."
5. Section 502(14) of the Act, 33 U.S.C. § 1362(14) defines "point source" as "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well [or] discrete fissure"
6. 40 C.F.R. § 232.2 defines "waters of the United States" to include: (i) all waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce; (ii) all interstate waters; (iii) tributaries to such waters; and (iv) wetlands adjacent to such waters or their tributaries.

III. FINDINGS

7. The Hampton Roads Sanitation District ("HRSD" or "Respondent") is a political subdivision of the Commonwealth of Virginia and is a "person" within the meaning of Section 502(5) of the CWA, 33 U.S.C. § 1362(5).
8. HRSD owns and operates the HRSD Sanitary Sewer ("SS") System and thirteen Sewage Treatment Plants, of which nine are addressed in this Order.
9. The HRSD SS System includes pipes, force mains, sanitary sewer lines, pump stations, manholes, and other real and personal property and appurtenances thereto designed to convey sanitary wastewater (including sewage).
10. HRSD serves a geographic area of 3,100 square miles and a population of approximately 1.6 million, owns and operates over 500 miles of interceptor pipes, with a combined treatment capacity of up to 231 million gallons of wastewater per day.
11. The HRSD SS System and the nine Sewage Treatment Plants included in this Order ("STP") accept and treat sewage from the cities of Chesapeake, Hampton, Newport News, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg; the counties of Gloucester, Isle of Wight, James City, and York; and the town of Smithfield ("the Localities"), as well as Norfolk.
12. Each of the Localities collect sewage in their own Sanitary Sewer Systems and send it to the HRSD SS System for conveyance to the HRSD STPs.
13. The collective geographic area served collectively by the Localities is also served by HRSD.

14. The Virginia Department of Environmental Quality issued National Pollutant Discharge Elimination System ("NPDES") permits to HRSD pursuant to Section 402 of the Clean Water Act, 33 U.S.C. § 1342, for the following nine Sewage Treatment Plants owned and operated by HRSD and are addressed by this Order:

Atlantic STP: NPDES permit number VA0081248 was reissued to HRSD on August 3, 2000 and was scheduled to expire on August 3, 2005. The plant is located at 645 Firefall Drive, Virginia Beach, Virginia. The effluent from the Atlantic plant discharges into the Atlantic Ocean.

Army Base STP: NPDES permit number VA0081230 was reissued to HRSD for the Army Base STP on August 3, 2000 and was scheduled to expire on August 3, 2005. The plant is located at 500 Shasta Drive, Norfolk, Virginia. The effluent from the Army Base STP discharges into the Elizabeth River.

Chesapeake-Elizabeth STP: NPDES permit number VA0081264 was reissued on November 1, 1999 and was scheduled to expire on November 1, 2004. The plant is located at 5332 Shore Drive, Virginia Beach, Virginia. The effluent from the Chesapeake-Elizabeth plant discharges to the Little Creek, a tributary to the Chesapeake Bay.

Virginia Initiative STP: NPDES permit number VA0081281 was reissued on August 6, 2000 and expired on August 6, 2005. The plant is located at 4201 Powhatan Avenue, Norfolk, Virginia. The effluent from the plant discharges to the Elizabeth River.

Nansemond STP: NPDES permit VA0081299 was reissued on July 21, 1999 and expired on July 21, 2004. The plant is located 6900 College Drive, Suffolk, Virginia. The effluent from the Nansemond STP discharges to the Hampton Road Harbor in the James River.

Boat Harbor STP: NPDES permit VA0081256 was reissued on August 3, 2000 and expired on August 3, 2005. The plant is located at 300 Terminal Avenue, Newport News, Virginia. The effluent from the Boat Harbor plant discharges to the Hampton Roads Harbor in the James River.

James River STP: NPDES permit VA0081272 was reissued on August 3, 2000 and expired on August 3, 2005. The plant is located at 111 City Farm Road Terminal Avenue, Newport News, Virginia.

Williamsburg STP: NPDES permit VA0081302 was reissued on August 3, 2000 and expired on August 3, 2005. The plant is located at 300 Ron Springs Road, Williamsburg, Virginia. The effluent from the Williamsburg STP discharges to the James River.

York River STP: NPDES permit VA0081311 was reissued on August 3, 2000 and expired on August 3, 2005. The plant is located at 515 Back Creek Road, Seaford, Virginia. The effluent from the York River STP discharges into the York River.

15. Each of the NPDES permits for the STPs listed above, although expired, have been administratively extended because HRSD timely filed an application for renewal. For each STP, the current permit will remain in effect until a new permit is issued. See 40 C.F.R. § 122.6.
16. Pursuant to Part II.G of each of the NPDES Permits for the STPs listed above, HRSD must report discharges of sewage into or upon state waters that are in violation of Part II.F of the Permits.
17. Part II.F of the Permits provide as follows:

Unauthorized Discharges

Except in compliance with this permit, or another permit issued by the Board, it shall be unlawful for any person to:
 - a. Discharge into state waters sewage, industrial waste, other wastes, or any noxious or deleterious substances; or
 - b. Otherwise alter the physical, chemical or biological properties of such state waters and make them detrimental to the public health, or to animal or aquatic life, or to the use of such waters for domestic or industrial consumption, or for recreation, or for other uses.
18. HRSD submitted reports to the Virginia Department of Environmental Quality (“VADEQ”) that document SSO events that occurred from the HRSD SS System between July 11, 1999 and January 23, 2007. These SSO events are summarized in two spreadsheets prepared by VADEQ and provided as Attachments 1 and 2. Attachment 1 identifies the receiving waters of the HRSD discharges.
19. In or about December 2006 EPA sent an information request letter pursuant to Section 308 of the CWA, 33 U.S.C. § 1318, to HRSD to obtain information regarding its SSOs.
20. HRSD responded to EPA’s information request letter in a series of four letters dated December 21, 2006, December 27, 2006 January 11, 2007 and March 1, 2007.
21. In response to EPA’s information request letter HRSD submitted to EPA a summary of sanitary sewer overflows from its pump stations and identified the waters that received those discharges. [Attachment 3]. According to the HRSD summary in Attachment 3,

during the period from January 2002 to December 2006, 159 pump station related sanitary sewer overflows occurred.

22. The VADEQ spreadsheets in Attachments 1 and 2 include the pump station related sanitary sewer overflows identified by HRSD in Attachment 3 as well as non-pump station related SSOs.
23. As shown on Attachments 1 and 2, HRSD has discharged raw sewage and other wastes from its sewer system in violation of the Permits and Section 301(a) of the Clean Water Act.
24. Part II.Q of the NPDES permits issued to HRSD contain the following Operation and Maintenance provision:

Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes effective plant performance, adequate funding, adequate staffing, and adequate laboratory and process controls including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by the permittee only when the operation is necessary to achieve compliance with the conditions of this permit.

25. The HRSD SSOs identified in Attachments 1, 2, and 3 may be caused by HRSD's failure to comply with the Operation and Maintenance requirements in the permits.
26. Most of the HRSD SS System operates under hydraulic pressure. Consequently, excessively high pressure in the HRSD SS System can cause or contribute to SSOs in the Localities' SS Systems.
27. EPA in its December 2006 information request letter sought from HRSD documentation to evaluate whether elevated pressures in the HRSD SS System may be causing or contributing to SSOs in the Localities SS System. EPA requested information related to HRSD's pump station pressures and HRSD's exceedance of its maximum hydraulic gradeline standard. In response, HRSD stated that this information is currently unavailable.
28. HRSD's operational protocols include maintenance of a Maximum Hydraulic Energy Gradeline ("MHEG") (equivalent to STP elevation plus 65 feet) through the operation of pressure reducing stations throughout those portions of the HRSD Sanitary Sewer System that operate under pressure. HRSD has directed the Localities to ensure adequate

pumping capacity to overcome this pressure level at points of connection to the HRSD Sanitary Sewer System. Improper maintenance of appropriate MHEG at each point of connection to the HRSD SS System may cause or contribute to sanitary sewer overflows prior to or at the points of connection to the HRSD SS System.

29. EPA understands that the Localities may be gathering information related to their Sanitary Sewer System SSOs that may be utilized by HRSD pursuant to this Order.
30. As shown on Attachments 1 and 2, HRSD has discharged raw sewage and other wastes from its sewer system to the Atlantic Ocean, to tributaries to the Chesapeake Bay, and to the James and Elizabeth Rivers, and to other waters.
31. Attachments 1, 2, and 3 provide information related to volume of sanitary sewer overflows for some, but not all, of the SSO events reported. The total volume of sanitary sewer overflows reported on those attachments for the most recent five years is at least 24,000,000 gallons.
32. The Atlantic Ocean, the tributaries to the Chesapeake Bay, the James and Elizabeth Rivers, and other waters identified on Attachments 1 and 2 are "waters of the United States," within the meaning of Section 502 of the CWA, and 40 C.F.R. § 122.2 and/or state waters.
33. EPA and VADEQ are working in partnership on this matter to consistently and jointly achieve the goal of eliminating all SSOs from the Regional SS System and bypasses from the STPs. This Order requiring HRSD to conduct an initial investigation and study of the Regional SS System and STPs is being issued by EPA in coordination with VADEQ and its issuance of a Special Order on Consent ("VADEQ Order"). The VADEQ Order will also require an initial investigation and study of the Regional SS System, and is scheduled to be publicly noticed on August 6, 2007.
34. EPA contemplates that the requirements of this Order and implementation of measures identified through the work required by this Order and the VADEQ Order will be embodied in a future judicial action against HRSD that will be brought jointly by the United States and the Commonwealth of Virginia.

IV. DEFINITIONS

35. Terms used in this Order that are defined in the Act or in regulations promulgated pursuant to the Act shall have the meanings assigned to them in the Act or such regulations, unless otherwise provided in this Order. Whenever the terms set forth below are used in this Order, the following definitions shall apply:

“Backups” or “Building/Private Property Backups” shall mean Sanitary System Overflows in the form of wastewater releases or backups into a building or onto private property that is caused by blockages, flow conditions, or other malfunctions in the Regional Sanitary Sewer System. A wastewater backup or release that is caused by blockages, flow conditions, or other malfunctions of a Private Lateral is not a Backup or Building/Private Property Backup for purposes of this Order.

“Baseflow” or “dry weather flow” shall mean sewage flow and dry weather infiltration. Sewage flow is the sewage produced by individuals and commercial, industrial, and military entities connected to the collection system.

“Bypass” as defined by 40 C.F.R. § 122.41(m) shall mean the intentional diversion of waste streams from any portion of a treatment facility.

“Capacity and Condition Assessment Report” or “CCA Report” shall mean the report described in Section VIII (Capacity and Condition Assessment Plan) in which HRSD satisfies the requirements contained in that Section: (1) to evaluate the capacity and condition of the HRSD SS System and STPs and certain portions of the Regional SS System to accept flows from the Localities at the Design Flow Rate(s) and Design Operating Pressure(s) and convey them for treatment to the STPs, without SSOs and Bypasses; and (2) to evaluate the condition of the HRSD SS System and its appurtenances.

“Day” shall mean a calendar day unless expressly stated to be a business day. In computing any period of time under this Order, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the close of business of the next business day;

“Design Flow Rate(s)” shall mean the rate(s) to be established pursuant to Section VIII (Capacity and Condition Assessment Plan), Subparagraph A.

“Design Operating Pressure(s)” shall mean the pressure(s) to be established pursuant to Section VIII (Capacity and Condition Assessment Plan), Subparagraph A.

“DWP” shall mean dry weather infiltration.

“Force Main” shall mean any pipe that receives and conveys, under pressure, wastewater from the discharge side of a pump. A Force Main is intended to convey wastewater under pressure.

“FPRMRS” shall mean Flow, Pressure, and Rainfall Monitoring and Reporting System, which is the system set forth in Section VI (Flow Monitoring Program) of this Order.

“Gravity Line” shall mean a sewer pipe that receives, contains and conveys wastewater in which flow is not normally under pressure, but rather is intended to flow unassisted under the influence of gravity. Gravity sewers are typically not intended to flow full under normal operating conditions.

“HRPDC” shall mean the Hampton Roads Planning District Commission.

“Hampton Roads Sanitation District” or “HRSD” shall mean the political subdivision of the Commonwealth of Virginia that owns and operates the force mains and gravity lines, as well as 13 sewage treatment plants, that receive flows from the Localities’ collection systems and conveys them to a sewage treatment plant for treatment.

“HRSD SS System” or “HRSD Sanitary Sewer System” shall mean the wastewater collection and transmission systems, including all pipes, Force Mains, Gravity Sewer Lines, lift stations, Pumping Stations, pressure reducing stations, manholes, and any other appurtenances thereto, which are owned or operated by HRSD.

“Infiltration” as defined by 40 C.F.R. § 35.2005(b)(20) shall mean water other than wastewater that enters a sewer system (including sewer service connections and foundation drains) from the ground through such means as defective pipes, pipe joints, connections, or manholes.

“Inflow” as defined by 40 C.F.R. § 35.2005(b)(21) shall mean water other than wastewater that enters a sewer system (including sewer service connections) from sources such as, but not limited to, roof leaders, cellar drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm water, surface runoff, street wash waters, or drainage.

“I/P” shall mean the total quantity of water entering the system from Infiltration and Inflow without distinguishing the source.

“Localities” shall mean the cities of Chesapeake, Hampton, Newport News, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg; the counties of Gloucester, Isle of Wight, James City, and York; and the town of Smithfield.

“Locality” means one of the Localities.

“Locality Overflow Point” shall mean a manhole or other structure at which more than one capacity-related overflow known to the Locality or HRSD has occurred in the past 5 years.

“Minimum Peak Flow Scenarios” shall mean those scenarios that, at a minimum, HRSD shall analyze as provided in this Order, including for the Regional Wet Weather Management Plan set forth in Section X (Regional Wet Weather Management Plan), and are:

- 2-year peak flow recurrence and 2030 population
- 5-year peak flow recurrence and 2030 population
- 10-year peak flow recurrence and 2030 population

In each scenario, “peak flow recurrence” means the wet weather event which produces the highest instantaneous peak flow within the Regional (or, if specified, the HRSD) Sanitary Sewer System within the average period of time specified (i.e. 2, 5, or 10 years).

“MOM Program” shall mean Management, Operation and Maintenance Program and is the program addressed by Section IX (Management Operation and Maintenance Program).

“Paragraph” shall mean a portion of this Order identified by an arabic numeral.

“Permits” or “NPDES Permits” shall mean the National Pollutant Discharge Elimination System (“NPDES”) permits issued to HRSD pursuant to Section 402 of the Clean Water Act, 33 U.S.C. § 1342, for the Sewage Treatment Plants: Numbers VA0081248 (Atlantic STP); VA 0081230 (Army Base STP); VA 0081264 (Chesapeake-Elizabeth STP); VA 0081281 (Virginia Initiative STP); VA 0081299 (Nansemond STP); VA00081256 (Boat Harbor STP); VA 0081272 (James River STP); VA0081302 (Williamsburg STP); and VA0081311 (York River STP); and any future extended, modified or reissued permits.

“Pressure Reducing Station” or “PRS” shall mean the facilities in the HRSD SS System which receive flow directly from a force main, and serve to reduce pressures in that downstream force main, and increase the effective capacity of that force main.

“Private Lateral” shall mean that portion of the collection systems or sanitary sewer systems not owned by HRSD or the Localities, used to convey wastewater from a building or buildings to that portion of the Regional Sanitary Sewer System owned by a Locality or HRSD.

“Prohibited Bypass” shall mean a Bypass within the meaning of 40 C.F.R. § 122.41(m)(4).

“Pumping Station” shall mean facilities comprised of pumps which lift wastewater to a higher hydraulic elevation, including all related electrical, mechanical, and structural systems necessary to the operation of that pumping station.

“Rainfall Derived Inflow and Infiltration” or “RDII” shall mean infiltration which behaves similarly to Inflow. Like Inflow, RDII occurs during and after rainfall. RDII is the result of rainfall percolating down through the soils into defects in the Sanitary Sewer System or lateral line leading into the Sanitary Sewer System which generally lie near the surface.

“Regional Hydraulic Model” shall mean the computer model for the Regional Sanitary Sewer System that is capable of modeling alternatives to eliminate SSOs, to model flows through the System(s) to identify capacity deficiencies, and that is more fully described in Section VII (Regional Hydraulic Model and Hydraulic Assessment) of this Order.

“Regional Sanitary Sewer System” or “Regional SS System” shall mean all of the wastewater collection and transmission systems, including all pipes, Force Mains, Gravity Sewer Lines, Pumping Stations, manholes and appurtenances thereto, which are owned or operated by the Localities as well as the HRSD SS System. Regional SS System therefore refers to all portions of the individual Locality and HRSD collection and transmission systems and appurtenances thereto. Sewer laterals from buildings are not considered part of the Regional Sanitary Sewer System.

“Regional Wet Weather Management Plan” or “RWWM Plan” shall mean the plan developed pursuant to Section X (Regional Wet Weather Management Plan) of this Order to develop and evaluate alternatives for the elimination of SSOs in the Regional SS System.

“Sanitary Sewer Overflow” or “SSO” shall mean an overflow, spill, diversion, or release of wastewater from or caused by the Regional SS System. This term shall include: (i) discharges to waters of the State or United States from the Regional SS System and (ii) any release of wastewater from Regional SS System to public or private property that does not reach waters of the United States or the State, including Building/Private Property Backups.

“Sanitary Sewer Discharge” shall mean any discharge to waters of the State or the United States from the HRSD SS System through a point source not authorized in any NPDES Permit.

“SCADA system” shall mean a supervisory control and data acquisition computer system for remote monitoring of Pump Stations and Pressure Reducing Stations and for gathering and analyzing real time data.

“Section” shall mean a portion of this Order identified by a roman numeral.

“SSES” shall mean a Sewer System Evaluation Survey which is a systematic examination of a sanitary sewer system to assess its condition, identify I/I sources, and determine feasible methods of rehabilitation, repair or replacement.

“Sewage Treatment Plant” or “STP” shall mean a sewage treatment plant operated by HRSD and all components of such sewage treatment plant. The STPs in this action are the Atlantic River STP, the Army Base STP, the Chesapeake-Elizabeth STP, the Virginia Initiative STP, the Nansemond STP, the Boat Harbor STP, the James River STP, the Williamsburg STP, and the York River STP.

“State” shall mean the Commonwealth of Virginia.

“VADEQ” shall mean the Virginia Department of Environmental Quality.

V. ORDER FOR COMPLIANCE

Therefore, this 1st day of August, 2007, Respondent is hereby ORDERED, pursuant to Sections 308(a) and 309(a) of the Clean Water Act, 33 U.S.C. § 1318(a) and 1319(a), to conduct the following activities:

36. HRSD shall carry out assessments and engineering analyses necessary to identify all measures needed to ensure that the HRSD SS System and specified portions of the Regional SS System comply with the requirements of the Clean Water Act, the regulations promulgated thereunder, and NPDES Permits for the HRSD STPs.
37. HRSD, in fulfilling the obligations set forth in this Order, shall consult and coordinate with the Localities and with HRPDC. HRSD shall set forth standardized formats and data requirements for the Localities and shall ensure proper management of flows within the Regional Sanitary Sewer System by establishing and using as a design basis Design Flow Rate(s) and Design Operating Pressure(s) as set forth in this Order in planning future capital and other measures.

VI. FLOW MONITORING PROGRAM

A. Flow, Pressure and Rainfall Monitoring and Reporting System (FPRMRS) Plan.

38. On or before October 1, 2007, following consultation with the Localities, HRSD shall submit to the EPA for review, comment and approval in accordance with Section XVII (Submissions Requiring Agency Approval) of this Order a Flow Pressure and Rainfall Monitoring and Reporting System Plan and schedule that shall provide for HRSD’s installation of flow and pressure meters and rainfall gauges throughout the Regional SS System. HRSD shall ensure in the Plan that the FPRMRS is designed to:

- a. Measure sewage flow rates and total amounts of wastewater conveyed from each of the Hampton Roads Localities to the HRSD SS System;
 - b. Measure flow rates and total amounts of wastewater flow throughout HRSD's force mains and in Locality force mains downstream of Locality Overflow Points;
 - c. Measure flow rates and hydraulic grade lines (i.e., surcharge) throughout HRSD's gravity sewers and in Locality gravity sewers downstream of Locality Overflow Points;
 - d. Characterize the performance of HRSD's pump stations and pressure reducing stations;
 - e. Measure pressure conditions in HRSD's force mains and in Locality force mains downstream of Locality Overflow Points;
 - f. Measure the rates and volumes of wastewater discharged from Locality Overflow Points, SSOs at points of connection to the HRSD SS System and from the HRSD SS System; and
 - g. Measure rainfall rates and total rainfall amounts so as to adequately characterize spacial and temporal variations in rainfall across the entire HRSD service area.
39. HRSD shall include in the FPRMRS Plan data collection of sufficient amount, scope and quality to support HRSD's development, calibration and verification of the Regional Hydraulic Model as required by Section VII (Regional Hydraulic Model and Hydraulic Assessment), HRSD's assessment of Regional SS System capacity as required by Section VIII (Capacity and Condition Assessment Plan), and HRSD's development of the Regional Wet Weather Management Plan as required by Section X (Regional Wet Weather Management Plan). The number and location of rainfall, flow and pressure meters shall be sufficient to allow HRSD to calibrate all portions of the Regional SS System included in the Regional Hydraulic Model. The duration, amount and quality of the monitoring shall be sufficient to allow the collection of (i) sufficient dry weather data to facilitate adequate dry weather model calibration and validation activities, and (ii) a sufficient number and appropriate range of wet weather events to facilitate adequate wet weather model calibration and validation activities.
40. As described in Sections XIV (Coordination With Localities) and XV (Public Participation), HRSD shall coordinate the development of its FPRMRS Plan with any similar plans being developed by the Localities, such that together the Localities' plans and the FPRMRS Plan will generate all data necessary for HRSD to develop an appropriate Regional Wet Weather Management Plan, as required by Section X (Regional Wet weather Management Plan).
41. HRSD shall conduct all flow, pressure, and rainfall monitoring, data analysis, data quality assurance, and data reporting in accordance with current good industry practices and in accordance with Appendix I to this document.

42. The FPRMRS Plan shall describe in detail how HRSD's proposed FPRMRS shall satisfy the above requirements, and shall specifically provide:
- a. Maps and schematics illustrating the location of all proposed rainfall, flow and pressure monitoring locations;
 - b. Discussion of how the proposed monitoring locations will adequately support model development, calibration and validation (under both dry and wet weather conditions);
 - c. A description of the measures taken by HRSD, including inquiries made to each Locality, to identify all Locality Overflow Points, and summary information about each of the Locality Overflow Points so identified by HRSD.
 - d. Descriptions of the specific rain gauges, flow meters and pressure meters to be used;
 - e. A Quality Assurance Program Plan ("QAPP") that is consistent with the following EPA QAPP guidance: "EPA Requirements for QA Project Plans (QA/R-5)," May 2001; "Guidance for Quality Assurance Project Plans (QA/G-5)," December 2002; and "Uniform Federal Policy for Quality Assurance Project Plans; Part I: UFP-QAPP Manual," March 2005. See, <http://www.epa.gov/epahome/publications.htm>. The QAPP shall address:
 - (1) Metering location selection and acceptability criteria,
 - (2) Rain gauge, flow meter and pressure meter calibration and installation;
 - (3) Meter and gauge in-place calibration checks and maintenance activities;
 - (4) Data review and QA procedures;
 - (5) Data quality objectives; and
 - (6) Measures to be taken to address problems such as insufficient rainfall, instrument failures, inappropriate monitoring locations, and the need to "qualify" specific data.

43. HRSD shall include in the FPRMRS Plan a schedule for HRSD's implementation of the FPRMRS that is as expeditious as possible, and shall provide that the flow and rainfall monitoring and reporting system shall be installed, operational, and data shall begin to be made available to the HRSD Localities as soon as is practicable, but in no case later than fifteen (15) months after EPA approval of the FPRMRS Plan. HRSD shall make the data available to the Localities via a secure internet web site. The approved FPRMRS Plan and schedule shall be incorporated into this Order.

B. Implementation of the FPRMRS Plan.

44. Flow, Pressure, and Rainfall Monitoring and Reporting System (FPRMRS) Report.
- a. Upon approval by EPA of the FPRMRS Plan, HRSD shall implement the Plan and shall collect pressure, rainfall and flow data for twelve months, unless EPA determines that that period is so abnormally dry that additional data is required.

- b. In the event that HRSD experiences any problems obtaining access to the systems of the Localities in connection with implementation of the FPRMRS Plan, HRSD promptly shall advise EPA of such access problems pursuant to Section XIV (Coordination with Localities).
- c. HRSD shall provide an interim report summarizing the first quarter of data collection, and EPA reserves the right to seek quarterly reports if it perceives issues with the data or information contained in that interim report. Within ninety (90) Days from the end of the twelve (12) month period of monitoring, HRSD shall submit to EPA for review, comment and approval in accordance with Section XVII (Submissions Requiring Agency Approval) of this Order a final report describing its implementation of the approved FPRMRS Plan.
- d. The interim report, any other quarterly reports, and the final report shall provide:
 - (1) Summaries of the data collected at each monitoring location;
 - (2) Descriptions of all substantive deviations from the approved FPRMRS Plan, including any changed, deleted or additional monitoring locations;
 - (3) For each monitoring point, a summary of monitoring equipment operational status history (in-service, out-of service, and any operational/accuracy issues) during the monitoring period;
 - (4) For each monitoring point, a summary of the results of data Quality Assurance/Quality Control reviews that shall specifically identify and characterize all data for which quality issues were identified; and
 - (5) A discussion of whether the collected data is sufficient to satisfy all of the requirements of Subsection A. above.
- e. If HRSD concludes in the FPRMRS Report (interim, quarterly, or final) that the data collected is not sufficient in quantity, quality or scope to support the achievement of the objectives listed in Subsection A. above, then HRSD shall include in the Report:
 - (1) A plan and schedule for additional proposed monitoring that will support the achievement of those objectives as expeditiously as possible; and
 - (2) A description of the anticipated impact the additional flow and rainfall monitoring shall have on the implementation schedule for all other remedial measures required by this Order.

VII. REGIONAL HYDRAULIC MODEL AND HYDRAULIC ASSESSMENT

A. Minimum Capabilities of the Regional Hydraulic Model.

- 45. On or before one hundred twenty (120) Days after the effective date of this Order, HRSD shall, following consultation with the Localities, submit to EPA for review, comment and approval in accordance with Section XVII (Submissions Requiring Agency Approval) of this Order a Regional Hydraulic Model Plan pursuant to which HRSD shall develop and implement a Regional Hydraulic Model. The Regional Hydraulic Model shall have the following capabilities:

- a. Adequately characterize flow rates and pressure (or hydraulic grade line, as appropriate) throughout the HRSD SS System and specified portions of the Regional SS System as described in Paragraph 50 under an appropriate range of dry and wet weather conditions;
 - b. Adequately simulate the capacities and operating characteristics of all pump stations and Pressure Reducing Stations within the HRSD SS System and specified portions of the Regional SS System as described in Paragraph 50 under an appropriate range of dry and wet weather conditions;
 - c. Incorporate, interface with and utilize output from individual Locality models;
 - d. Support the assessment of existing HRSD SS System conveyance capacity, and the identification of specific portions of the HRSD SS System having inadequate capacity;
 - e. Support the evaluation of alternative remedial measures to address any identified capacity inadequacies; and
 - f. Support the Regional Wet Weather Management Plan and the analysis of various alternatives and scenarios.
46. Capacity Assessment. Utilizing the Regional Hydraulic Model, HRSD shall conduct a capacity assessment to estimate the performance of specified portions of the existing Regional SS System under an appropriate range of conditions, including the Minimum Peak Flow Scenarios. Utilizing the Regional Hydraulic Model HRSD shall:
- a. Identify pumping stations, sewers and other appurtenances that do not have adequate capacity to convey the peak flow under the above defined conditions, and in accordance with the established Design Flow Rate(s) and Design Operating Pressure(s);
 - b. Determine the probable cause of identified pumping station, sewer and other appurtenance capacity limitations;
 - c. Evaluate causes of known unresolved capacity related overflows;
 - d. Predict locations and extent of potential SSOs in the HRSD SS System and specified portions of the Regional SS System as described in Paragraph 50;
 - e. Predict locations and extent of potential sanitary sewer system surcharges that may result in SSOs or impaired system performance; and
 - f. Assess and identify the need for reduction of I/I or other remedial measures.
47. Regional Wet Weather Management Plan: The Regional Hydraulic Model shall be sufficient for HRSD to use to develop the Regional Wet Weather Management Plan described in Section X (Regional Wet weather Management Plan) below. The Regional Hydraulic Model shall have the capability to analyze capital and operating alternatives to improve system performance and address capacity limitations in the Regional SS System. HRSD shall develop the Regional Hydraulic Model for use by HRSD as a tool for evaluating capacity enhancement projects, including the following activities:

- a. Estimating the impacts of I/I reduction projects, based upon reasonable engineering estimates of the anticipated effectiveness of rehabilitation in reducing peak flows;
 - b. Evaluating capital improvements which increase the capacity of the Regional Sanitary Sewer System, including pipe replacements, pumping station capacity improvements, and flow equalization facilities;
 - c. Quantifying the effectiveness and estimated system performance for each alternative or groups of alternatives; and
 - d. Testing of various scenarios to optimize operation of the Regional SS System under both the short term and long term operating plans to maximize available capacity in the system, such as diversion of wastewater flow to alternate downstream or parallel facilities (i.e. pumping stations, interceptors or wastewater treatment plants) or activation of flow equalization/attenuation facilities.
48. Model Capabilities: The software used by HRSD to develop the Regional Hydraulic Model shall be capable of the following:
- a. Fully dynamic hydraulic routing of flow (i.e. modeling time-varying flows and depths/HGLs/pressures in a manner representing the true nature of flow attenuation and translation);
 - b. Exhibiting minimal volume balance errors and numerical instabilities;
 - c. Modeling both gravity (i.e., open channel) and pressurized flows simultaneously, and accurately representing negative pressures and siphons;
 - d. Simulating transitions between gravity and pressurized flows in a representative, stable and robust manner;
 - e. Simulating pump controls including pump curves, switch on/off controls, variable speed pumps and real time control capabilities, in a stable and representative manner;
 - f. Effectively modeling surcharged manholes with either surface storage of any volume surcharged out of the manhole lids and/or discharge of flow depth in excess of the manhole rim elevation; and
 - g. Accepting diurnal base flow curves and event-specific hydrographs as flow input.
- B. Coordination with HRPDC and Localities.
49. HRSD shall coordinate development of the Regional Hydraulic Model with the HRPDC and the Localities. HRSD shall maintain the Regional Hydraulic Model and shall seek to ensure that any Locality modeling is compatible with the Regional Hydraulic Model and that data regarding the Regional SS System are adequate and complete. HRSD will obtain the necessary pumping station and pipeline information from the Localities to construct the Regional Hydraulic Model, as well as sewer flow hydrographs for the Minimum Peak Flow Scenarios as inputs to the Regional Hydraulic Model. In the event such information is not provided, HRSD shall notify EPA.

50. At a minimum, the Regional Hydraulic Model shall include:
- a. All HRSD pipes (including Force Mains and Gravity Lines), HRSD pumping stations, and HRSD pressure reducing stations, in the Regional SS System;
 - b. For the capacity assessment pursuant to Section VIII (Capacity and Condition Assessment Plan), Subsection B, all Locality Overflow Points, all pipes, pump stations and other structures downstream of those Locality Overflow Points, and any other pipes, pump stations or other structures within the Localities' SS Systems the inclusion of which is needed to allow adequate simulation of SSOs from those Locality Overflow Points that must be assessed so as to allow a technically sound evaluation of the causes of all SSOs in the Regional SS System, including Backups, Bypasses and/or overloading at the STPs.
51. HRSD shall provide to the Localities as it becomes available information regarding the development, calibration and validation of the Regional Hydraulic Model, as well as the results of the simulations run in support of the Capacity Assessment required by Section VIII (Capacity and Condition Assessment Plan), Subsection B, and the development of the Regional Wet Weather Management Plan required by Section X (Regional Wet Weather Management Plan). The downstream boundary conditions of the Localities' models will be provided by HRSD based on the results of the Regional Hydraulic Model.

C. Data Collection.

52. HRSD will obtain data to be used in the development, calibration and validation of the model as described in this Section (Regional Hydraulic Model and Hydraulic Assessment) and ensure that it is of appropriate quality and quantity for the Regional Hydraulic Model to satisfy the requirements of this Order. If HRSD is not able to obtain data of sufficient accuracy, quality or comprehensiveness from the Localities, it shall notify EPA in accordance with Section XIV (Coordination With Localities).
53. Appendix II sets forth the categories of data to be used in the Regional Hydraulic Model.

D. Model Development.

54. The Regional Hydraulic Model Plan shall identify the software or model that HRSD plans to use and describe how the Regional Hydraulic Model shall be developed so as to fulfill the purposes and capabilities of Subparagraph A of this Section (Regional Hydraulic Model and Hydraulic Assessment).
55. The software computer model shall be one that was developed and/or approved by EPA, or one that HRSD can demonstrate is widely accepted and used by municipalities to model sewer systems.

56. The Regional Hydraulic Model Plan shall specifically address:
 - a. Model configuration and HRSD SS System attribute data adequacy;
 - b. Model calibration and verification, including anticipated application of the numeric criteria described in Paragraph 15 and 16 of Appendix II – the +/- calibration standards; and
 - c. Coordination with the Localities, to assure compatibility with hydraulic models that the Localities are using.
57. Development of the Regional Hydraulic Model shall include physical data entry, sub-basin delineation, baseflow estimation, and rainfall derived inflow and infiltration (RDII) generation, as further set forth below.
58. Physical data may be entered directly from GIS or from other database formats. HRSD shall ensure that network connectivity and attributes are correctly represented in the Regional Hydraulic Model.
59. Flow from tributary areas shall be allocated in a manner that represents the Regional Sanitary Sewer System's characteristics.
60. Total observed sewer flow shall be separated into baseflow and RDII using the following procedures:
 - a. Separate periods of dry and wet-weather flow with respect to rainfall data;
 - b. Establish a typical 24-hour, dry-weather sewer hydrograph;
 - c. Extract RDII by subtracting the dry-weather flow hydrograph from the wet-weather hydrograph for the event or events of interest.
61. Baseflows shall be estimated by calculating sewage flow and Dry Weather Infiltration. Sewage flow shall be predicted based on population and per capita unit flow rates. For industrial flows, which are variable, industry specific information or flow monitoring should be used to assist with estimating a suitable value based on engineering judgment. DWI should be calculated by applying a constant DWI rate above the population-based sewage flow.
62. Daily or seasonal variations in baseflows shall be accounted for using diurnal curves and development of hydrographs, using accepted modeling techniques.
63. HRSD, in consultation with the Localities, shall describe in its Regional Hydraulic Model Plan, the techniques or approaches to be used to estimate RDII generation. Methods may include synthetic unit hydrographs, rainfall/flow regressions, or hydrologic methods, and/or RDII prediction components of modeling software.
64. The modeler shall use sound engineering judgment when projecting RDII for future conditions. This assessment shall be made based on pipe age, condition, projected future

extent of sanitary sewer system, and experience. Where RDII flow is generated from models calibrated using a relatively short history of rainfall and flow records (i.e. less than the requirements in Section VI (Flow Monitoring)), additional data shall be collected to confirm the model results.

E. Model Calibration and Verification.

65. HRSD shall include in its Regional Hydraulic Model Plan, addressed in Subparagraph A above, the process for calibration and verification of the Regional Hydraulic Model in accordance with accepted engineering practices and modeling techniques. HRSD shall calibrate and verify the Regional Hydraulic Model according to the principles and criteria set forth in Appendix II to this Order.

F. Long Term Flow Simulations.

66. HRSD shall set forth in the Regional Hydraulic Model Plan the method for simulating long-term flows once the Regional Hydraulic Model is calibrated and verified, to determine the recurrence interval for various peak flow events.
67. HRSD, in consultation with the Localities, shall use historical rainfall data from the Norfolk International Airport for the South Shore portion of the Regional SS System – i.e., for that portion south of the James River. For that portion of the Regional SS System north of the James River (the North Shore) the Regional Hydraulic Model shall use historic rainfall data from the Newport News/Williamsburg International Airport.
68. HRSD, in coordination with the Localities, shall evaluate the entire periods of record for the two rain gauges described in the preceding Paragraph. This statistical evaluation shall identify rainfall events that generate peak flows having the return frequencies corresponding to the Minimum Peak Flow Scenarios, and any other return frequency scenarios considered by HRSD in carrying out the Capacity Assessment required by Section VIII (Capacity and Condition Assessment Plan) Subsection B of this Order and in developing the Regional Wet Weather Management Plan required by Section X (Regional Wet Weather Management Plan) of this Order. These two rain gauges shall not be the only rain gauges used to collect rainfall data as required by Section VI (Flow Monitoring Program) of this Order; instead a network of rain gauges having sufficient density and placement so as to allow the adequate characterization of spatial and temporal variations across the entire HRSD service area shall be employed for that purpose.

G. Documentation.

69. HRSD's Regional Hydraulic Model Plan shall further specify the record-keeping and documentation to be used in developing and implementing the Regional Hydraulic Model.

H. Implementation of the Regional Hydraulic Model Plan.

70. HRSD shall conduct the modeling and implement the EPA approved Regional Hydraulic Model Plan according to the schedule contained therein, and develop, calibrate, verify, and use the Regional Hydraulic Model for the purposes set forth in this Section (Regional Hydraulic Model and Hydraulic Assessment).

I. Regional Hydraulic Model Report.

71. No later than twenty-four (24) months from the date of EPA approval of the Regional Hydraulic Model Plan, HRSD shall submit a Regional Hydraulic Model Report to EPA for review and approval that shall:
- a. Identify the portions of the system included in the model;
 - b. Provide schematic(s) of the model;
 - c. Provide attribute and input data for the model in tabular summaries;
 - d. Provide a discussion and summary of model calibration and validation results that includes tables summarizing all calibration parameters' initial and final values, and comparing those values to typical ranges found in the literature;
 - e. Provide graphical flow, hydraulic grade line and pressure calibration; and
 - f. To the extent that HRSD and the Localities integrate their models, describe how they are integrating them.

VIII. CAPACITY AND CONDITION ASSESSMENT PLAN

A. Submission of Capacity and Condition Assessment Plan.

72. Within one hundred twenty (120) Days after the effective date of this Order, HRSD shall provide a Capacity and Condition Assessment Plan in accordance with this Section VIII (Capacity and Condition Assessment Plan) to EPA pursuant to Section XVII (Submission Requiring Agency Approval) that describes how HRSD will assess (1) the capacity of the HRSD SS System and STPs and the portions of the Regional SS System to the Locality Overflow Points, and identify locations with insufficient capacity to receive, transport and treat wastewater flows from the Locality Overflow Points; and (2) inspect and evaluate the condition of the main components of the HRSD SS System to fulfill the requirements set forth in this Section VIII (Capacity and Condition Assessment Plan). HRSD shall use the information it is required to develop pursuant to this Section (Capacity and Condition Assessment Plan) to assess existing and long-term capacity of the HRSD SS System, specified portions of the Regional SS System and STPs to transmit peak flows at the Design Flow Rate(s) and Design Operating Pressure(s) predicted for the Regional SS System and STPs.

- 73. The Capacity and Condition Assessment shall include and extend to:
 - a. The entire HRSD system, including STPs, all Pumping Stations, all Pressure Reducing Stations, all Gravity Lines, all Force Mains and syphons and their respective related appurtenances; and
 - b. For the capacity assessment pursuant to Subsection B, all Locality Overflow Points, all pipes, pump stations and other structures downstream of those Locality Overflow Points, and any other pipes, pump stations or other structures within the Localities' SS Systems the inclusion of which is needed to allow adequate simulation of SSOs from those Locality Overflow Points that must be assessed so as to allow a technically sound evaluation of the causes of all SSOs in the Regional SS System, including Backups, Bypasses and/or overloading at the STPs.

74. The Capacity and Condition Assessment Plan shall describe HRSD's methodology for establishing Design Flow Rate(s) and Design Operating Pressure(s). This description shall include the technical basis for these standards, including how flow rates are allocated per locality, per capita, and per equivalent domestic unit ("EDU"), and the degree to which Design Flow Rate(s) and Design Operating Pressure(s) will accommodate peak instantaneous, hourly, and daily flows during dry weather and wet weather.

75. The Capacity and Condition Assessment Plan shall include a schedule for completion of the Capacity and Condition Assessments no later than thirty-six (36) months from EPA's approval of the Capacity and Condition Plan.

B. Capacity Assessment.

- 76. In conducting its evaluation of the capacity of the HRSD SS System and STPs and the specified portions of the Regional SS System, HRSD shall utilize the calibrated and validated Regional Hydraulic Model and the data collected in the FPRMRS and consider the following conditions and information:
 - a. High groundwater dry weather conditions;
 - b. Minimum Peak Flow Scenarios;
 - c. The current capacity of STPs;
 - d. The future capacity of STPs;
 - e. Gravity Lines' and Force Mains' condition, capacity and configuration;
 - f. Anticipated effluent limits that HRSD may need to meet, including but not limited to, nutrients;
 - g. Pump station and PRS evaluations;
 - h. Existing and peak flows that comply with the Design Flow Rate(s) and Design Operating Pressure(s);
 - i. Anticipated flows associated with locality build-out plans; and

- j. Any available information obtained by the Localities as a result of recent or ongoing Sewer System Evaluation Survey (“SSES”) work performed by the Localities.
77. The Capacity Assessment shall specifically identify, at a minimum, the hydraulic capacities of the HRSD SS System and STPs, and the portion of the Regional SS System included in the Regional Hydraulic Model, and compare those capacities to the Design Flow Rate(s) and Design Operating Pressure(s). This assessment shall identify those portions of the Regional SS System that are expected to cause or contribute to SSOs, Backups, Bypasses and/or overloading at the STPs, and the degree to which those portions experience or cause, under the conditions specified above, SSOs, Bypasses and/or overloading at the STPs, or cause an exceedance of the Design Operating Pressure(s) at any PRS or elsewhere in the HRSD SS System.

C. Force Main Condition Assessment.

78. Objectives. For the HRSD SS System, HRSD shall:
- a. Conduct assessments of all of its Force Mains for the purpose of locating conditions that present a material risk of failure (which shall include pipe leakage or interruption of service) that warrant priority repair, rehabilitation or replacement; and to prioritize maintenance for the remaining Force Mains.
 - b. Conduct inspections of all accessible valves, fittings, and appurtenances for the purpose of locating conditions that may cause a material risk of failure (including pipe leakage or interruption of service.)
 - c. Document the findings of inspections and any material risk of failure found.
 - d. Provide a plan and schedule to prevent failures of Force Mains presenting a material risk of failure and to address the conditions creating that risk.
79. Force Main Screening and Preliminary Risk Assessment. HRSD shall identify and provide a schedule for implementing screening and assessment methods for the Force Mains in the HRSD SS System in the Capacity and Condition Assessment Plan. Such methods shall include at a minimum the following actions.
- a. History of Failures: HRSD shall evaluate the history of Force Main failures, determine the likelihood of repeat failures, and identify portions of the Force Mains at risk for a repeat failure.
 - b. Prior Condition Assessments: HRSD shall evaluate past condition assessments and identify portions of the Force Mains at risk of failure or in need of further assessment.
 - c. High Risk Pipe Configuration: HRSD shall review Force Main plans to identify piping configurations at increased risk of failure including connections, joints and bends for each Force Main.
 - d. Identify Corrosion Risks: HRSD shall identify locations along each pipeline that are at risk for corrosion of the internal or external pipe walls. HRSD shall employ

the best available screening methods suitable for each Force Main including, but not limited to, the following:

- (1) Identification of pipeline high points.
 - (2) Identification of locations with failed cathodic protection, if installed.
 - (3) Measurements of pipe-to-soil electrical potential.
 - (4) Soil resistivity testing.
- e. Right-Of-Way Inspection: HRSD shall inspect pipeline right-of-ways to look for signs of pipe damage or physical changes that may affect the condition of each Force Main. HRSD's right-of-way inspections shall include, but not be limited to, the following:
- (1) Examination of soils adjacent to pipelines to look for wet spots, unusual vegetation growth or other indications of leakage.
 - (2) Observations of recent construction or road repairs that may have affected the structural integrity of the Force Main.
 - (3) Observations of land movements (slides, rock falls, sink holes, settling) that may have affected the structural integrity of the Force Main.
 - (4) Observations of other conditions, such as unusual surface loads, that may have affected the structural integrity of the Force Main.
- f. Remaining service life and age of the Force Main.

80. Where HRSD can demonstrate that it performed an assessment or study of any of HRSD's force mains in the past five years, and the assessment was of a comparable scope, then it will not be necessary to repeat the assessment for purposes of this Order. The results of any such assessments shall be included in the Capacity and Condition Assessment Reports required below, and to the extent any actions were required as a result of the assessment, but not implemented, HRSD shall implement those actions pursuant to this Order.

81. After EPA approves the Capacity and Condition Assessment Plan, HRSD shall perform the screening and preliminary assessment of its Force Main in accordance with the EPA approved Plan and schedule contained in the Plan. Following completion of the Screening/Preliminary Assessment Phase of the Force Main Condition Assessment Process, HRSD shall submit to EPA an Interim Force Main Assessment Report in which it describes the results of the screening/preliminary risk assessments that HRSD conducted, including a listing of all of the Force Mains that it screened and whether any Force Mains presented a material risk of failure. HRSD shall conduct a more detailed assessment of each Force Main for which HRSD finds there is a material risk of failure, using the procedures and criteria in Appendix III.

D. Pumping Station and Pressure Reducing Station Assessment.

82. Pursuant to the schedule and methods set forth in the EPA approved Capacity and Condition Assessment Plan, HRSD shall carry out an evaluation of the design capacity,

current effective capacity, equipment condition and operational redundancy in its Pumping Stations and Pressure Reducing Stations, except for those that are exempted as recently assessed as set forth below. This evaluation shall include the following criteria:

- a. Adequacy of station capacity, as described in the "Pumping Systems" chapter of the most current version of WEF's Manual of Practice FD-4, "Design of Wastewater and Stormwater Pumping Stations";
- b. For Pumping Stations, critical response time, defined as the time interval between activation of the high wet well level alarm and the first SSO upstream of that Pumping Station, whether the SSO is in the HRSD SS System or in the Regional SS System, under peak flow conditions;
- c. Adequacy of station condition, based upon both physical inspection and recent operating and mechanical failure history during at least the past five years. HRSD shall visually inspect the interior, exterior and roof of the building for physical or structural problems and record defects that may lead to SSOs;
- d. Adequacy of station design and equipment, including redundancy of pumps and electrical power supply, and other equipment installed, based upon Chapter 40, "Wastewater Pumping Stations" of the most recent edition of "Recommended Standards for Wastewater Facilities" by the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (commonly known as the "Ten State Standards");
 - (1) Pumps and Motors: From the manufacturer's data plates and any up-to-date maintenance information, HRSD shall record the pump head in feet, the capacity in gallons per minute and the impeller diameter in inches for each pump. It shall record the horsepower and listed RPM for the motors; observe the pumps and motors for vibrations, sounds, temperature and odor; review the operating logs; and consult with the operations staff to determine under what conditions and how long all pumps operate at the same time.
 - (2) For Pumping Stations, Wet Well: HRSD shall inspect the wet well in a dewatered state to ensure a complete and proper visual inspection. When the wet well is drained for the inspection HRSD shall remove accumulation of debris and grease buildup. The walls shall be observed for coating condition, spalling or softness of concrete, erosion of concrete and the condition of bottom fillets.
 - (3) Corrosion of Ancillary Equipment: While the wet well is in a dewatered state and after cleaning, HRSD shall inspect the ventilation system ducts and fans, access hatch, interior railing, access ladder and platforms, pump control system, pump rails, and interior piping for corrosion.
 - (4) Dry Well: HRSD shall inspect the dry well for structural conditions of concern.
 - (5) Piping: HRSD shall visually inspect the piping, valves (check, isolation, surge relief and air relief) and other fittings for corrosion, leakage, coating system condition, and proper operation.

- e. Emergency Generator/Pump: HRSD shall observe the generator/pump while running to verify its operation, noting excessive noise, dark exhaust, and ease of generator/pump starting. HRSD shall test to ensure that the device will automatically start upon loss of power and will operate with full station load.
- f. Pump draw-down tests that measure the volumetric change in the wet-well due to pump action. Include with this test, temporary flow measurement on the influent sewer to account for the effects of incoming flow; and
- g. The ability of maintenance personnel to take corrective action within the critical response time calculated for each Pumping Station.

83. HRSD shall include in its evaluation of its Pumping Stations and PRSs an analysis of the adequacy of its current Pumping Station and PRS backup power and emergency pumping capabilities. These capabilities may be achieved via emergency generators, emergency pumping capabilities, or separate power feeds from separate substations.

84. Where HRSD can demonstrate that it performed an assessment or study of any of HRSD's Pumping Station or PRS in the past five years, and the assessment was of a comparable scope, then it will not be necessary to repeat the assessment for purposes of this Order. The results of any such assessments shall be included in the Capacity and Condition Assessment Reports required below, and to the extent any actions were required as a result of the assessment, but not implemented, HRSD shall implement those actions pursuant to this Order.

E. Gravity Lines.

85. HRSD shall conduct an assessment of the condition of its Gravity Lines as set forth in Appendix IV to ascertain whether any of the lines present a material risk of failure.

F. SCADA Systems.

86. HRSD shall evaluate and assess its existing SCADA system to determine whether, for each Pump Station and PRS, the SCADA system is able to continuously poll, report, and transmit, at a minimum, the following parameters, where the referenced attributes are present:

- a. Wet well high level and low level alarms;
- b. Dry well flood alarms;
- c. Dry well sump pumping failure, where available;
- d. Flow (instantaneous and average) determined from a flow meter;
- e. Failure of any one of the following parameters (as a single alarm);
 - (1) Loss of three-phase power;
 - (2) single phase condition;
 - (3) Phase reversal;
 - (4) over-voltage and under-voltage;

- (5) use of standby power;
- (6) failure of standby power; and
- (7) second power source;
- f. Pump failure (for each pump);
- g. Pump running times;
- h. Pump starts; and
- i. Remote signal failure alarms.

87. With respect to all Pump Stations and PRSs, system monitoring data of wet well levels shall be stored in an archival data base for a period of five years. In addition, the Pump Station operating hours for each pump shall be recorded monthly and entered into an archival data base. HRSD shall retain for each month all the flow data, and shall in addition identify and calculate the 24-hour maximum and the monthly average flow data for each Pump Station and PRS in accordance with Section XVIII (Information Collection and Retention).

G. Capacity and Condition Assessment Reports and Action Plans.

88. HRSD shall implement the EPA approved Capacity and Condition Assessment Plan pursuant to the schedule contained in the approved Plan and provide the results to EPA in the Capacity and Condition Assessment (“CCA”) Report no later than sixty (60) Days from the date of completion of the Capacity and Condition Assessment. The Capacity and Condition Assessment Report shall describe, inter alia, how the assessments were performed and how the requirements of this Section were met.
89. Capacity. In the Capacity and Condition Assessment Report, HRSD shall describe the method and extent of its assessment conducted under this Section and its findings concerning the capacity of the existing HRSD SS System and the portion of the Regional SS System to accept flows at the Design Flow Rate(s) and the Design Operating Pressure(s).
90. HRSD Force Mains. HRSD shall list the Force Mains, if any, that it identified as having a material risk of failure (including pipe leakage or interruption of service) based on corrosion potential, history of repair, and the other criteria used in the screening set forth in Subsection C, above, and describe the basis for its conclusion.
91. HRSD shall summarize the results of the more detailed inspections or assessment that it performed on the force mains identified as having a material risk of failure, in accordance with Appendix III and:
- a. Describe the results of its assessments of valve, fitting and appurtenance inspections; cathodic protection evaluations; external and internal pipe inspections; operating pressure evaluations and/or leak detection tests.

- b. Identify and quantify (where practicable) observed or measured conditions that constitute a material risk of failure. In describing such conditions, it shall characterize the nature of the risk of failure associated with the condition, the likelihood and imminence (to the extent practicable) of the failure risk and the consequences should such a failure occur. The conditions to be addressed in the Capacity and Condition Assessment Report respecting Force Mains may include:
 - (1) Pipe conditions: cracks, holes, corrosion, erosion, coating de-lamination, joint deflections, pipe deformation and debris accumulation;
 - (2) Valve, fitting and appurtenance conditions;
 - (3) Cathodic protection system conditions; and
 - (4) Leaks.

- 92. Follow-up Action Plan. For each Force Main that presents a material risk of failure, HRSD shall set forth a plan and schedule to address the conditions and prevent the failure or service interruption. The action plan shall include, a schedule for design and construction of repairs, rehabilitation, improvements or replacement as applicable. It shall also provide cost estimates for the measures proposed.

- 93. Upon approval by the EPA, HRSD shall implement the actions in its Force Main Assessment Report to address the conditions in the priority Force Mains that present a material risk of failure.

- 94. With respect to all other Force Mains that HRSD screened but which it determined did not present a material risk of failure, HRSD shall summarize the information concerning each Force Main and identify its age and projected remaining service life. HRSD shall prioritize maintenance of those Force Mains and modify its existing MOM Program to address them systematically.

- 95. Pump Station and PRS Assessment. HRSD shall include in the CCA Report detailed information regarding the assessment specified in Subsection D above for each of HRSD's Pumping Stations and PRS. In particular, the CCA Report shall:
 - a. Describe each station;
 - b. Provide detailed information regarding the results of the evaluation of each Pumping Station and PRS;
 - c. Provide detailed information about its backup power and emergency pumping capability at each of its Pumping Stations and PRSs;
 - d. Provide information regarding lightning strike protection equipment at each Pumping Station and PRS;
 - e. Provide detailed descriptions of the history of all pump station and PRS failures, including power-loss-related and lightning strike-related SSOs during the past 5 years;

- f. Identify all measures necessary to correct all identified deficiencies, including all appropriate additional backup power and lightning strike-protection measures necessary to minimize power-loss related SSOs; and
 - g. Present a schedule that is as expeditious as possible for the implementation of all identified measures, and provide estimates of the capital and operating costs associated with each identified corrective measure.
 - h. Upon approval of the assessment and schedule, HRSD shall implement the proposed measures in accordance with the approved schedules.
96. Gravity Lines Assessment. In the Capacity and Condition Assessment Plan, HRSD shall report the results of its assessment of Gravity Lines and identify any Gravity Lines that present a material risk of failure. For Gravity Lines that present a material risk of failure, or which are a significant source of I/I, HRSD shall propose an action plan and proposed schedule to address the conditions giving rise to the risk. Upon approval by EPA, HRSD shall implement the action plan in accordance with the approved schedules. HRSD shall modify its existing MOM Program to systematically address the remaining Gravity Lines.
97. SCADA Assessment. In the Capacity and Condition Assessment Plan, HRSD shall report the results of its assessment of its SCADA system. To the extent the existing system cannot fulfill the listed functions, HRSD shall propose measures to upgrade the system to fulfill the functions and a schedule for their implementation. Upon approval by EPA, HRSD shall implement its proposed measures pursuant to the schedule.

IX. MANAGEMENT, OPERATIONS, AND MAINTENANCE PROGRAM

98. Management, Operations and Maintenance (“MOM”) Program. Within one hundred twenty (120) days from the effective date of this Order HRSD shall provide to EPA for review and comment a copy of its most recent MOM Program and with respect to that Program, the following information:
- a. Whether HRSD is fully implementing its MOM Program;
 - b. Identify any parts of the MOM Program that are not being implemented;
 - c. Explain why those parts listed in Paragraph 98.b. are not being implemented;
 - d. Describe any mechanism in place for evaluating or measuring the effectiveness of the Program; and
 - e. All supporting documentation for your answers in Paragraphs 98.a through d.
99. Within thirty (30) Days of receipt of EPA’s comments on HRSD’s MOM Program, HRSD shall modify the Program according to such comments and implement the modified Program. To the extent that HRSD is able to obtain SSES information from the Localities, HRSD shall use such information in developing the RWWM Plan.

X. REGIONAL WET WEATHER MANAGEMENT PLAN

A. Submission of Regional Wet Weather Management Plan.

100. Within fifteen (15) months of the latter date of approval of (1) the HRSD Capacity and Condition Assessment Report performed pursuant to Section VIII (Capacity and Condition Assessment Plan) of this Order and (2) the Regional Hydraulic Model Report performed pursuant to Section VII (Regional Hydraulic Model and Hydraulic Assessment), HRSD, in consultation with HRPDC and the Localities, shall develop and submit to EPA for review and approval pursuant to Section XVII (Submissions Requiring Agency Approval), a Regional Wet Weather Management Plan ("RWWM Plan") with specific measures and schedules that, when implemented, will result in adequate capacity to eliminate SSOs in the Regional SS System. The RWWM Plan shall be developed in coordination with the HRPDC and the Localities. The RWWM Plan shall identify the measures to be implemented, both in the HRSD SS System and in the Regional SS System, that under current and future conditions will eliminate throughout the Regional SS System SSOs, Building and Private Property Backups, Bypasses, any capacity-related STP NPDES permit noncompliance, and any overloading at the STPs.
101. The RWWM Plan shall identify all measures necessary to achieve adequate capacity. Adequate capacity is that capacity needed to collect, convey and treat anticipated peak wet weather flows, without SSOs, Backups, Bypasses and/or overloading at any STP. At a minimum, peak wet weather flows that the RWWM Plan shall address shall include the Minimum Peak Flow Scenarios. If insufficient capacity to accommodate projected peak wet weather flows exists in any portion of the HRSD SS System, including at the Sewage Treatment Plant(s), HRSD shall identify and propose measures to provide adequate capacity to eliminate wet weather Bypasses, Backups, and SSOs.
102. Design Criteria. HRSD shall provide adequate capacity to accommodate, and shall use as a design criteria pending completion of the RWWM Plan, the Design Flow Rate(s) and the Design Operating Pressure(s). HRSD shall provide at least that much capacity for flows from the Localities.
103. Alternatives Analysis. HRSD in the RWWM Plan, in consultation with HRPDC and the Localities, shall develop and analyze alternatives to eliminate SSOs, Backups, Bypasses, and any overloading of the STPs leading to NPDES Permit non-compliance, throughout the Regional SS System, in light of the Design Flow Rate(s) and Design Operating Pressure(s). These alternatives shall consider approaches such as removal of RDII, providing additional hydraulic capacity to convey and treat peak flows, storage options, and operational schemes. These approaches can be used alone and/or in combination. The life cycle costs, feasibility of construction, operations and maintenance impacts, water quality benefits, and other relevant factors shall be described in the RWWM Plan.

104. If HRSD determines that one or more Localities cannot, or does not intend to, reduce peak flows to the Design Flow Rate(s), HRSD shall identify the higher flows, and assess the anticipated impacts of the higher flows on HRSD's ability to meet its design criteria and on the ability of the Plan to eliminate SSOs/bypasses and noncompliance. HRSD, in consultation with HRPDC and the Localities, shall identify in the RWWM Plan alternatives to address the anticipated impacts.
105. In the Regional Wet Weather Management Plan HRSD shall compare and evaluate the alternatives and propose a final approach to include:
 - a. All STP upgrades and repair measures necessary to achieve STP compliance with all NPDES permit limitations and requirements and to eliminate Bypasses.
 - b. Specific remedial measures to address capacity limitations in the HRSD SS System, which may include increases in Pumping Station, PRS, and sewer capacity in the HRSD SS System, construction of storage or equalization basin facilities, improvements to Force Mains, sewer mains and interceptors, or increases in STP capacity.
 - c. The degree to which sources of Infiltration and Inflow are expected to be removed by each Locality, and the degree to which I/I removal is expected to alleviate capacity constraints. Anticipated I/I removal rates used in the development of the RWWM Plan shall reflect current industry practice and local experience, as well as each Locality's stated intentions. Where the necessary I/I removal rates exceed those deemed feasible under current industry practice and local experience, HRSD shall evaluate alternatives, in consultation with the HRPDC and the Localities, and recommend other measures.
106. Schedule: HRSD, in consultation with HRPDC and the Localities, shall develop a schedule for implementation of the RWWM Plan to be included in the RWWM Plan.
 - a. HRSD, in consultation with HRPDC and the Localities, may evaluate affordability in devising its schedule. The affordability analysis shall use a multifaceted approach which describes affordability in terms of such factors as total annual wastewater costs as a function of median household income, the Localities' financial capability, and other appropriate factors. The affordability analysis shall specifically consider the median household income of the entire service area for the Regional SS System and the full population within that area.
 - b. The RWWM Plan and schedule shall contain specific schedules for each of the measures identified in the Plan and shall prioritize the remedial measures in the Plan based upon: (i) relative likely human health and environmental impact risks; (ii) likely reduction of SSO frequencies of activation and total annual SSO volumes, either in the Localities' system or HRSD SS System; (iii) amount of capacity increased; and similar factors.
107. The RWWM Plan shall be developed by HRSD in conjunction and collaboration with the HRPDC and the Localities. It shall be subject to public participation and coordination

with the Localities pursuant to Sections XIV (Coordination With Localities) and XV (Public Participation) and shall include at a minimum:

- a. A public meeting at the beginning of evaluation of alternatives;
 - b. Public notice of the draft plan;
 - c. Provision of the draft plan to EPA;
 - d. A public meeting concerning the draft plan;
 - e. A comment period of at least 45 Days;
 - f. A written response to comments.
108. The anticipated general format of the RWWM Plan is set forth in Appendix V as a guideline for its development.
109. After public comment, HRSD shall submit the RWWM Plan to EPA for review and approval pursuant to Section XVII (Submissions Requiring Agency Approval).

XI. SHORT TERM WET WEATHER OPERATIONAL PLAN

- A. Submission of Short Term Wet Weather Operational Plan.
110. No later than ninety (90) Days from the effective date of this Order, HRSD shall submit to EPA pursuant to Section XVII (Submission Requiring Agency Approval) a Short Term Wet Weather Operational Plan to assess how to optimize the performance of its existing Sanitary Sewer System and Sewage Treatment Plants during wet weather in order to avoid or reduce capacity-related SSOs in the Regional SS System until such time as the Regional Wet Weather Management Plan is implemented.
111. The Short Term Wet Weather Operational Plan shall describe HRSD's approach, in consultation with the Localities and HRPDC, to:
- a. Evaluate and develop wet weather procedures (1) that maximize conveyance of flows throughout the existing HRSD SS System and transmission of such flows to the STP and (2) that reduce SSOs in the Regional Sewer System to the maximum extent feasible;
 - b. Determine the degree to which such procedures are being implemented at the present time;
 - c. Devise measures to improve wet weather procedures and to implement the optimal wet weather procedures for the existing HRSD SS System and STPs.
112. HRSD shall analyze pursuant to the Short Term Wet Weather Operational Plan:
- a. Operating procedures for the existing pump stations and strategies to accept a maximum amount of wet weather flows from the Localities and to convey such flows to an STP;
 - b. Pressure protocols and procedures and the impact of alternative strategies on SSO reduction in the Regional SS System; and

- c. The balancing and transmission of flows throughout the existing HRSD SS System during wet weather events;
113. The Short Term Wet Weather Operational Plan also shall address optimal methods to respond to small, intense storms and wet weather that contribute high flows only to a portion of the Regional SS System or to a single or few Localities, as well as optimal methods to respond to large, system-wide wet weather events or storms.
 114. HRSD shall upon completion of the Short Term Wet Weather Operational Plan, immediately implement it by performing the evaluation, assessment and other measures set forth in the Plan.

B. Submission of Short Term Wet Weather Operational Report.

115. HRSD shall in consultation with the Localities and HRPDC, include in each Annual Report submitted pursuant to Section XVII (Submissions Requiring Agency Approval) a summary of the work performed to implement the Short Term Wet Weather Operational Plan and HRSD's findings and conclusions concerning optimization of the HRSD SS System and STPs.
116. If EPA provides comments to HRSD on the Short Term Wet Weather Operational Reporting HRSD shall incorporate or respond to them within thirty (30) Days of HRSD's receipt of such comments.

XII. SSO EMERGENCY RESPONSE PLAN

117. Within sixty (60) Days from the effective date of this Order, HRSD shall provide to EPA for review and comment HRSD's current SSO Emergency Response Plan ("Emergency Response Plan") and with respect to that Plan, provide the following information:
 - a. Explain whether and how the HRSD addresses SSOs that occur in the Localities SS Systems that are, or may be, attributable to failures or problems in the HRSD SS System, including, but not limited to, Force Main failures, Pump Station outages or failures, or Pressure Reducing Station outages or failures and
 - b. Describe HRSD's procedures for maintaining records of SSO response activities.
118. HRSD shall continue to use its SSO Emergency Response Plan.
119. HRSD shall maintain a copy of any written reports prepared pursuant to its internal procedures for responding to SSOs in accordance with Section XVIII (Information Collection and Retention), below.

120. Within thirty (30) days of receipt of EPA's comments on the Emergency Response Plan, HRSD shall modify the Plan according to such comments and implement the modified Plan.

XIII. OVERFLOW AND PRESSURE REPORTING AND RECORD KEEPING

A. SSO Reporting and Documentation Procedures

121. Within one hundred twenty (120) HRSD shall submit to EPA for review and comment a detailed description of its operating procedures for reporting and maintaining records of SSOs and pressures for the HRSD SS System and the STPs.
122. HRSD shall continue to use its operating procedures for reporting and maintaining records of SSOs and pressures for the HRSD SS System and the STPs.
123. HRSD shall maintain a copy of any written reports prepared pursuant to its internal procedures for reporting SSOs and pressures within the HRSD SS System and STPs in accordance with Section XVIII (Information Collection and Retention), below.
124. Within thirty (30) days of receipt of EPA's comments on HRSD's SSO reporting procedures, HRSD shall modify the Procedures according to such comments and implement the modified Procedures.

XIV. COORDINATION WITH LOCALITIES

A. Process for Seeking Access or Information from Localities

125. In developing the Regional Wet Weather Management Plan and in carrying out the other requirements of this Order, HRSD shall seek to obtain from the Localities, as more specifically set forth below, the information described in this Section or the access that it needs in order to fulfill the requirements of Section VI (Flow Monitoring Program).
 - a. HRSD shall first request that the Locality provide the information or access within sixty (60) Days of its initial request.
 - b. If the Locality fails to provide some or all of the information or access requested within this sixty (60) Day-period, then HRSD shall within fifteen (15) Days of such failure, notify EPA and HRPDC.
 - c. When a Locality provides the requested information to HRSD, and where such information is relevant to the requirements of this Order, HRSD shall assess the reliability of the information and, where it is found to be sufficiently reliable using sound engineering practices, HRSD shall utilize that information as needed.
 - d. If (i) HRSD ultimately has less than the full information or access that it requested pursuant to this Paragraph, and forty-five (45) Days have elapsed since HRSD notified EPA and HRPDC pursuant to this Subsection A, whichever is the last

notice provided, and the Locality has not provided the requested information or access in response to a request by EPA, or if (ii) HRSD establishes to EPA that the information provided by a Locality is not sufficiently reliable using established engineering practices, then HRSD shall make reasonable assumptions (with supporting documentation), where such information is needed, in order to complete the relevant Order requirements.

126. Information HRSD is to Seek from Localities. HRSD shall request from each of the Localities, and consider in developing its RWWMP Plan if relevant to such plan, the following information:
- a. Within ninety (90) Days from the effective date of this Order the most recent maps of the Regional SS System (or portions thereof) developed by or for the Locality;
 - b. Within thirty-four (34) months from the effective date of this Order all physical surveys of the Localities' sewer system that provide the final conveyance from the Locality to the HRSD SS system, and the results of closed circuit television inspections of these portions of the Regional SS System developed by or for the Locality;
 - c. Within ninety (90) Days from the effective date of this Order, the location of all Locality Overflow Points, and available mapping and all physical surveys of all pipes, pump stations and other structures downstream of those Locality Overflow Points, and of any other pipes, pump stations or other structures within the Regional SS System the inclusion of which is needed to allow adequate simulation of SSOs from those Locality Overflow Points;
 - d. Within ninety (90) Days from the effective date of this Order, access to the portions of the Regional SS System owned or operated by the Localities as necessary to implement and fulfill the requirements of Section VI (Flow Monitoring Program).
 - e. Within eighteen (18) months from the effective date of this Order, any and all flow monitoring data collected by the Localities, including any available data on flows for each connection to the HRSD SS System that may assist HRSD in characterizing, for the Regional Hydraulic Model, flow volumes generated by the Locality (including hydrographs), overflow volumes at all Locality Overflow Points, and flow volumes routed to the Regional SS System;
 - f. Within thirty (30) months from the effective date of this Order, any and all hydraulic capacity evaluations and system hydraulic characterizations of the Regional SS System (or portions thereof) developed by or for the Locality;
 - g. Within forty-five (45) Days from the effective date of this Order, all Sanitary Sewer Overflow response plans developed by or for the Locality that at a minimum apply to those portions of the Regional SS System from the Locality Overflow Points to the connection(s) to the HRSD SS System;
 - h. Within thirty-four (34) months of the effective date of this Order, any and all SSES performed by the Localities;

130. Locality Input on Managing Sewer System Flow. As part of the evaluation of remedial controls and remedial activities that HRSD shall undertake in developing the RWWM Plan, HRSD shall solicit input from each Locality on the following:
- a. The forecasts of total flow (in gallons per day and, if available, in gallons-per-day-per-inch-mile of sewer line), that each Point of Connection will contribute to the HRSD SS System upon implementation of the RWWM Plan, and the total service population for each Point of Connection, both existing and in 2030;
 - b. A characterization of the flows from the Localities' Sanitary Sewer System at each Point of Connection, a description of how each such characterization was prepared, and a description of how such flows will be managed and/or maintained at each Point of Connection; and
 - c. A program for managing contributions from the Locality so that such contributions to the HRSD SS System do not result in exceedance of system capacity or do not preclude compliance with the requirements of the Clean Water Act.

XV. PUBLIC PARTICIPATION

131. Public Participation Plan. Within six (6) months from the effective date of this Order, HRSD shall develop a "Public Participation Plan" to ensure that the public served by the Regional SS System is actively involved in the development of the RWWM Plan. HRSD shall address the requirements of this Section (Public Participation) in the Public Participation Plan.
132. Content of Public Participation Plan. HRSD shall include in its Public Participation Plan proposed activities for providing the public with notice and information regarding the development of the RWWM Plan, including (a) the goals of the RWWM Plan, (b) the types of remedial controls and remedial activities available and being considered in the RWWM Plan to meet the requirements of the Clean Water Act and this Order, (c) the process for evaluating the various remedial controls and remedial activities in the RWWM Plan, and (d) opportunities to comment upon the various remedial controls and remedial activities under consideration for the RWWM Plan.
133. Locality Advisory Committee. HRSD shall arrange and attend a meeting with the Regional Capacity Team, or similar advisory committee comprised of representatives of the Localities' and HRPDC, at least quarterly to discuss (a) the status and coordination of studies and work in progress and (b) the development of the RWWM Plan and municipal comments on the RWWM Plan and related issues, which HRSD shall consider in developing its RWWM Plan.
134. Informational Newsletters and Meetings. After the effective date of this Order, HRSD shall, on a quarterly basis, produce and distribute informational newsletters to each of the Localities and to any persons or organizations requesting such information.

135. On at least an annual basis, HRSD, after providing reasonable notice on its webpage and in a newspaper of general circulation to the public, shall hold an annual informational meeting open to the Localities and the public.
136. In the newsletters and meetings, HRSD shall convey information on the status of the RWWM Plan, HRSD-Locality cooperation, and steps that citizens within the Localities may take to protect the receiving waters. In lieu of publishing some or all of its own quarterly newsletters, HRSD may provide this information through newsletters published by third parties.
137. Public Outreach Regarding Overflows. HRSD shall implement a public educational outreach program to inform the public of the location of any SSO Outfalls within the Regional SS System, the possible health and environmental effects of SSOs, and that recreational activities, such as swimming or boating, should be limited as a result of such SSOs.

XVI. REPORTING REQUIREMENTS

A. Quarterly Reports.

138. Beginning with the first quarter following the effective date of this Order, and each quarter thereafter until the work required in this Order is completed, HRSD shall submit in writing to EPA a quarterly status report on the twenty-eighth Day of each month following the end of the quarter. The quarterly status report shall contain a summary of the status and progress of all projects and programs required by Sections V through XI of this Order, including, but not limited to:
 - a. Activities undertaken pursuant to Sections V (Order For Compliance) through XI (Short Term Wet Weather Operational Plan), including a statement as to whether specific scheduled milestone dates were met during that quarter. Upon completion of specific projects, HRSD shall submit a certification as provided in Subsection C of this Section that the specified work has been completed, including the following documentation of the completed work to EPA;
 - (1) For work performed by a private contractor: an inspection report by HRSD utilities personnel of the completed project and certification by the HRSD Engineer that the specified work has been completed.
 - (2) For work performed by HRSD personnel: a copy of the work order for the project verified by the HRSD Engineer as having been completed.
 - b. The status of all direct discharges and cross connections in the HRSD SS System, including information regarding direct discharges or cross connections discovered or eliminated during the preceding quarter, and the location of any new cross connections or direct discharges discovered during the quarter, together with a description of what was done to eliminate them.

- c. A summary of any non-compliance, including failures to meet deadlines in the Order or milestones in Plans that are incorporated into this Order requirements, or delays that may lead to such failures, and an explanation of the causes of the failures or delay and measures to correct them.
- d. All information required to be submitted under its NPDES Permit in accordance with the requirements of the permit.
- e. A listing of all Prohibited Bypasses and SSOs that occurred in the HRSD SS System and STPs during the quarter. For each Prohibited Bypass and SSO, this report shall contain the following information where applicable:
 - (1) The specific (and general) location (*i.e.*, street address and specific basin or geographic area of HRSD SS System)
 - (2) The best estimate (unless monitored) of the duration (including the beginning and end dates and times);
 - (3) The best estimate (unless monitored) of the volume, including actual flow metering data, where applicable;
 - (4) Results from any sampling carried out in satisfying any of the requirements of this Order;
 - (5) if applicable, the waterbody into which the wastewater was released;
 - (6) The specific cause(s);
 - (7) Any and all measures taken by HRSD to minimize the duration and/or impacts (including actions taken to cleanup and disinfect the site);
 - (8) The specific measures HRSD intends to use to prevent recurrence; and
 - (9) The date and time a repair crew arrived on-site and overall response time for each event.
- f. A list of all known exceedances of the MHEG, including, for each exceedance, the location, duration, cause, and a determination as to whether the exceedance caused or contributed to an SSO.
- g. A list of all NPDES violations that have occurred at its Sewage Treatment Plants within the past quarter. This tabular listing may be in an electronic format upon approval by EPA and shall include the date of the violation, the parameter exceeded, the permit limit, the reported amount, and any additional relevant information included on the Discharge Monitoring Report ("DMR") or in its cover letter (*i.e.*, claim of upset, etc.)

B. Annual Reports.

139. Beginning on August 1, 2008 and every twelve (12) months thereafter until the work required in this Order is completed, HRSD shall submit to EPA an Annual Report containing a summary of compliance with and activities related to the projects scheduled under Sections V (Order For Compliance) through XI (Short Term Wet Weather Operational Plan) of this Order. This shall include information identifying specific pipe segments which were inspected, cleaned, repaired or replaced, number and location of manhole inspections, a summary of all Force Main preventive maintenance activities for

the year, and any other non-SSES or non-capacity assurance related activity. Where available, maps shall be submitted documenting the information provided in the report.

140. Information provided pursuant to this Order may be used by EPA in any proceeding to enforce this Order or the Act.

C. Certification.

141. All reports required to be submitted in this Section shall contain a certification signed by a responsible official of HRSD. The certification shall read as follows:
“I certify that the information contained in or accompanying this (submission/document) is true, accurate and complete. As to (the/those) identified portion(s) of this (submission/document) for which I cannot personally verify (its/their) truth and accuracy, I certify as the official having supervisory responsibility for the person(s) who, acting under my direct instructions, made the verification, that this is true, accurate and complete.”

XVII. SUBMISSIONS REQUIRING AGENCY APPROVAL

A. EPA Review.

142. After review of any plan, report or other item that HRSD is required to submit for approval to EPA pursuant to this Order, EPA shall: (1) approve the submission, in whole or in part; (2) approve the submission upon specified conditions; (3) disapprove, in whole or in part, the submission, directing HRSD to modify the submission; or (4) any combination of the above. If EPA disapproves the submission, in whole or in part, EPA shall notify HRSD in writing of those portions of the submission that EPA disapproves. If portions of the submission are approved, EPA similarly will identify which portions are approved.

B. HRSD's Obligations Upon EPA Approval.

143. In the event of approval, or approval upon conditions by EPA, HRSD shall proceed to take any action required by the plan, report or other item as approved by EPA.
144. HRSD's obligations upon EPA disapproval: Upon receipt of notice of disapproval pursuant to Subsection A(3) of this Section, HRSD shall within thirty (30) Days, if no other time frame is specified in the notice, correct the deficiencies in the plan, report or other item and resubmit the plan, report or other item for approval. Notwithstanding the receipt of a disapproval notice pursuant to Subsection A of this Section, HRSD shall proceed, at the direction of EPA, to take any action required by any non-deficient portion of the submission.

145. Procedures for Resubmitted Plans: In the event that EPA disapproves a resubmitted plan, report or other item, or portion thereof, EPA may again require HRSD to correct the deficiencies and resubmit the plan within thirty (30) Days of receipt of the disapproval, if no other time frame is specified in the notice, and/or EPA may modify the submittal. HRSD within ten (10) Days shall proceed with any action required pursuant to the modification by EPA or an approved resubmitted plan, or the decision of EPA.
146. All plans, reports, and other items required to be submitted to EPA under this Order, upon approval or modification by EPA, shall be incorporated into and enforceable under this Order. In the event EPA approves or modifies a portion of a plan, report or other item required to be submitted to EPA under this Order, the approved or modified portion shall be enforceable under this Order.

XVIII. INFORMATION COLLECTION AND RETENTION

147. The EPA and its representatives, including attorneys, contractors, and consultants, shall have the right of entry into any facility covered by this Order, at all reasonable times, upon presentation of credentials, to:
- a. monitor the progress of activities required under this Order;
 - b. verify any data or information submitted to EPA in accordance with the terms of this Order;
 - c. obtain samples and, upon request, splits of any samples taken by HRSD or its representatives, contractors, or consultants;
 - d. obtain documentary evidence, including photographs and similar data; and
 - e. assess HRSD's compliance with this Order.
148. Upon request, HRSD shall provide EPA or its authorized representatives splits of any samples taken by HRSD. Upon request, EPA shall provide HRSD splits of any samples taken by EPA.
149. For five years after the work required in this Order is completed, HRSD shall retain, and shall instruct its contractors and agents to preserve, all non-identical copies of all documents, records, or other information (including documents, records, or other information in electronic form) in its or its contractors' or agents' possession or control, or that come into its or its contractors' or agents' possession or control, and that relate in any manner to HRSD's performance of its obligations under this Order. This information-retention requirement shall apply regardless of any contrary corporate or institutional policies or procedures. At any time during this information-retention period, upon request by EPA, HRSD shall provide copies of any documents, records, or other information required to be maintained under this Paragraph.
150. At the conclusion of the information-retention period provided in the preceding Paragraph, HRSD shall notify EPA at least ninety (90) Days prior to the destruction of any

documents, records, or other information subject to the requirements of the preceding Paragraph and, upon request by EPA, HRSD shall deliver any such documents, records, or other information to EPA. HRSD may assert that certain documents, records, or other information is privileged under the attorney-client privilege or any other privilege recognized by federal law. If HRSD asserts such a privilege, it shall provide the following: (1) the title of the document, record, or information; (2) the date of the document, record, or information; (3) the name and title of each author of the document, record, or information; (4) the name and title of each addressee and recipient; (5) a description of the subject of the document, record, or information; and (6) the privilege asserted by HRSD. However, no documents, records, or other information created or generated pursuant to the requirements of this Order shall be withheld on grounds of privilege.

151. HRSD may also assert that information required to be provided under this Section is protected as Confidential Business Information ("CBI") in accordance with 40 C.F.R. Part 2. As to any information that HRSD seeks to protect as CBI, HRSD shall follow the procedures set forth in 40 C.F.R. Part 2.
152. This Order in no way limits or affects any right of entry and inspection, or any right to obtain information, held by EPA pursuant to applicable federal or state laws, regulations, or permits, nor does it limit or affect any duty or obligation of HRSD to maintain documents, records, or other information imposed by applicable federal or state laws, regulations, or permits.
153. Respondent's failure to fully implement all work in connection with this Order in the manner and time period therein shall be deemed a violation of this Order.
154. All submissions to EPA required by this Order shall be sent to:

Lisa Trakis
NPDES Enforcement Branch (3WP42)
United States Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029

XIX. GENERAL PROVISIONS

155. Issuance of this Order shall not be deemed an election by EPA to forego any administrative, civil, or criminal action to seek penalties, fines, injunctive relief, or any other appropriate relief under the Act for the violations cited herein. EPA reserves the right to seek any remedy available under the law that it deems appropriate for the violations cited.
156. Respondent shall permit EPA or its authorized representative to inspect the Site at any time upon reasonable advance notice to Respondent to confirm that the work required herein is being or has been implemented in conformity with the representations made herein, that Respondent is in compliance with its NPDES permits, and that Respondent is in compliance with this Order.
157. If a criminal judicial action is initiated by the United States Department of Justice, and Respondent is convicted of a criminal offense under Section 309(c) of the Act, Respondent may be subject to a monetary fine and/or imprisonment, and may become ineligible for certain contracts, grants, or loans under Section 508 of the Act.
158. Respondent's compliance with the terms of this Order shall not constitute compliance with the Clean Water Act or any other Federal, State or local law or regulation. Nor does this Order constitute a waiver or modification of the terms or conditions of any issued permit.
159. Violation of the terms of this Order may result in EPA enforcement action including, but not limited to, initiation of judicial proceedings that allow for civil penalties of up to \$32,500 per day, 33 U.S.C. §§ 1319(b) and (d), for each day of violation, 40 C.F.R. Part 19, and/or for the criminal sanctions of imprisonment and fines of up to \$50,000 per day, 33 U.S.C. § 1319(c).

XX. OPPORTUNITY TO CONFER AND NOTICE OF INTENT TO COMPLY

160. Not later than thirty (30) days from the effective date of this Order, Respondent may confer with EPA to discuss the scope and applicability of this Order, the findings upon which this Order is based, the appropriateness of any action or activity required to be undertaken by this Order, or other issues directly relevant to issuance of this Order. Any request for a conference within the prescribed time frame shall be made to:

Judith R. Hykel
Senior Assistant Regional Counsel
United States Environmental Protection Agency

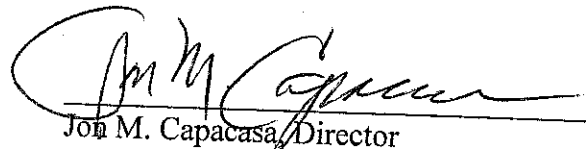
Region III (3RC 20)
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029
(215) 814-2646

161. No later than thirty (30) Days after the effective date of this Order, Respondent shall provide notice in writing to the individual identified in the preceding Paragraph, stating whether Respondent intends to comply with the terms of this Order.

XXI. EFFECTIVE DATE

162. The effective date of this Order shall be the date it is received by Respondent by any means, including but not limited to facsimile, electronic mail, United States Mail, or delivery.

August 1, 2007
Date


Jon M. Capacasa, Director
Water Protection Division
U.S. Environmental Protection Agency,
Region III

APPENDIX I
TECHNICAL STANDARDS FOR FLOW, PRESSURE AND RAINFALL MONITORING

1. As described in Section VI (Flow Monitoring), HRSD shall, following consultation with the Hampton Roads Localities, carry out a flow, pressure and rainfall monitoring program of sufficient scope and duration, and that will provide data of sufficient quality, so as to support the development, calibration and verification of the Regional Hydraulic Model as required by Section VII (Regional Hydraulic Model and Hydraulic Assessment), and the assessment of HRSD SS System capacity as required by Section VIII (Capacity and Condition Assessment Plan).

2. Flow monitoring shall be conducted to characterize the flow regime in the entire HRSD SS System and in all portions of the Regional SS System that must be evaluated to characterize discharges from Locality Overflow Points. The objectives of the flow-monitoring program shall be as follows:
 - a. Measure sewage flow rates and total amounts of wastewater conveyed from each of the Localities to the HRSD SS System under both dry weather and a sufficient range of wet weather conditions to allow the development of the Regional Wet Weather Management Plan as required by Section X (Regional Wet Weather Management Plan);
 - b. Measure discharges from all Locality Overflow Points under a sufficient range of wet weather conditions to allow the development of the Regional Wet Weather Management Plan as required by Section X (Regional Wet Weather Management Plan);
 - c. Measure flow rates and total amounts of wastewater flow, and pressures throughout HRSD's Force Mains and in Regional Force Mains downstream of Locality Overflow Points under both dry weather and a sufficient range of wet weather conditions to allow the development of the Regional Wet Weather Management Plan as required by Section X (Regional Wet Weather Management Plan);
 - d. Measure flow rates and hydraulic grade lines (i.e., surcharge) throughout HRSD's Gravity Lines and in Regional Gravity Lines downstream of Locality Overflow Points under both dry weather and a sufficient range of wet weather conditions to allow the development of the Regional Wet Weather Management Plan as required by Section X (Regional Wet Weather Management Plan);
 - e. Characterize the performance of HRSD's Pump Stations and Pressure Reducing Stations and in Regional Pump Stations and Pressure Reducing Stations downstream of Locality Overflow Points under both dry weather and a sufficient range of wet weather conditions to allow the development of the Regional Wet Weather Management Plan as required by Section X;
 - f. Measure the rates and volumes of wastewater discharged from SSOs at points of connection to the HRSD SS System and from the HRSD SS System under a sufficient range of wet weather conditions to allow the development of the

- Regional Wet Weather Management Plan as required by Section X (Regional Wet Weather Management Plan); and
- g. Measure rainfall rates and total rainfall amounts so as to characterize spacial and temporal variations in rainfall across the entire HRSD service area to the degree necessary to allow adequate characterization of the Regional SS System's response to a sufficient range of wet weather conditions to allow the development of the Regional Wet Weather Management Plan as required by Section X (Regional Wet Weather Management Plan).
3. HRSD shall develop its flow, pressure and rainfall monitoring program such that its scope is sufficient to meet the program objectives. Flow, pressure and rainfall data that has been collected five (5) years prior to the effective date of this Order and which meets standard QAPP procedures, as set forth in Section VI, may be used to supplement data collected in this program. Before defining the scope of its flow, pressure and rainfall monitoring program, HRSD shall determine:
 - a. The adequacy of existing HRSD and Locality data from prior studies;
 - b. The extent that pump station data can be used to accurately quantify flows;
 - c. Appropriate monitoring equipment types and availability;
 - d. Locations at which flow and pressure data is needed to meet the objectives stated above, and the degree to which coordination with HRSD Locality monitoring efforts is appropriate;
 - e. The need to account for seasonal variations of flow within the Regional SS System, if significant; and
 - f. HRSD rainfall and groundwater level monitoring needs, and the degree to which data generated by Locality rain gauges and groundwater monitoring may be used by HRSD to supplement rainfall data and groundwater level data collected by HRSD.
 4. Flow and pressure meters shall be located so as to allow calibration and validation of the Regional Hydraulic Model as required by Section VII (Regional Hydraulic Model and Hydraulic Assessment) and Appendix II. In particular, HRSD shall monitor flow and pressure at the following locations:
 - a. HRSD/Locality points of connection;
 - b. HRSD Pressure Reducing Stations and Locality Pressure Reducing Stations that impact Locality Overflow Points (pressure both upstream and downstream, and flow either upstream or downstream);
 - c. Other HRSD Pump Stations and Locality Pump Stations that impact Locality Overflow Points;
 - d. Structures within the HRSD SS System at which flow is split or may be diverted and such structures within the Locality Sanitary Sewer Systems that impact Locality Overflow Points; and
 - e. Any chronic capacity-related overflow points within the HRSD SS System; and Locality Overflow Points.

5. Flow, rainfall and pressure monitoring shall be carried out in accordance with current good industry practices, and shall generally be in accordance with widely used industry guidance such as WRC's "A Guide to Short Term Flow Surveys of Sewer Systems", WEF's MOP FD-6 "Existing Sewer Evaluation and Rehabilitation," and NASSCO's "Manual of Practices."
6. Flow and pressure metering sites shall be carefully chosen so as to be compatible with the minimum site requirements of the flow monitoring equipment manufacturer relative to physical site constraints. Flow metering sites should be chosen so as to avoid the effects of structures, elbows, drops, points of diversion, connection points, etc.
7. HRSD shall utilize sound engineering judgment in the selection of flow monitoring methods and the application of the resulting data. The strengths and limitations of each flow monitoring method shall be evaluated considering the characteristics of the flow to be measured at each identified monitoring location, and the physical and hydraulic constraints of each identified location.
8. Acceptable means of measuring and recording flow may include:
 - a. Open channel flow monitors with recording capability;
 - b. For pressure pipe (force main) flow monitoring, magnetic flow meters or ultrasonic meters shall be used, and pressure shall also be measured and recorded at all force main flow monitoring locations;
 - c. All metering equipment shall be capable of achieving an accuracy of +/- (5) percent under factory calibration conditions;
 - d. For monitoring flow in Gravity Lines, all metering equipment used shall be capable of accurately measuring and recording both water level/hydraulic grade line and flow under both anticipated low flow and surcharged conditions;
 - e. The continuous recording flow meters and rain gauges shall have built-in temperature correction;
 - f. Flow meters shall continuously monitor average flow between sample periods and provide maximum and minimum values at 15 minute intervals; however, flow meters shall be capable of collecting and reporting data at five (5) minute intervals when the percent change in flow is greater than ten percent (10%) in any fifteen (15) minute interval; and
 - g. Pressure meters shall be capable of collecting and reporting data at five minute intervals; and
 - h. SCADA-generated data (pump run times and volumetric data) capable of computing flow, which meets the following criteria:
 - i. All pumps in the station are single speed pumps;
 - ii. Pumping rates versus wet well level have been established across the normal operating range of wet well levels by appropriate wet well draw down testing; and

- iii. Where pumping rates vary by more than 10% across the normal operating range of wet well levels, pumping rate curves which takes into account wet well levels are utilized;
9. HRSD shall specifically take into consideration the inherent limitations of the pump station volumetric method of determining flow rate. This method is not reliable for conditions where wet well levels surcharge into the incoming sewer lines, or where variable speed drive units are in place. In general, it shall only be used for Pump Stations with constant speed pumps that discharge to gravity sewers.
10. Duration of Flow and Pressure Monitoring - For the purposes of model calibration and the characterization of the HRSD SS System's response to wet weather events, temporary flow and pressure monitoring shall be conducted for a duration that satisfies the following minimum criteria:
 - a. Rainfall, flow and pressure monitoring shall be carried out for a minimum of twelve months, such that it provides data that adequately characterizes seasonal variations and captures peak seasonal sanitary sewer flows;
 - b. Flow and pressure monitoring shall capture a minimum of three (3) individual wet-weather flow events of greater than one (1) inch of accumulation, including at least one (1) event with a duration of at least two hours and at least a one year recurrence interval, or if a one year recurrence interval event is not captured, there is at least one event where the total 24 hour rainfall exceeds 1.5 inches. These events shall capture system response under a variety of antecedent rainfall and groundwater conditions. During these events data collection success shall meet the criteria described in Paragraph 14 below;
11. Flow monitoring for Sewer System Evaluation and Survey ("SSES") purposes shall be conducted in all HRSD gravity sewers which have not been assessed for condition and I/I characterization within the past (5) years. The duration of flow monitoring carried out only for SSES purposes shall be consistent with the SSES methodology.
12. Flow and pressure monitoring data shall be reviewed for conformance with the criteria for model calibration and verification, as well as SSES evaluations (if applicable). If the review of the monitoring data indicates the criteria have been fully satisfied, temporary metering may be discontinued after a minimum monitoring period of twelve months. Otherwise flow and pressure monitoring at all locations shall continue until adequate data are obtained. HRSD shall specifically assure that sufficient appropriate events are monitored so as to provide independent data sets for model calibration and verification.
13. Data Accuracy Specifications - Flow monitoring accuracies will be based on typical accuracies for the type of equipment used. Prior to installation of any meter and/or gauge, the device shall be calibrated according to the manufacturer's recommendations, and shall meet the manufacturer's stated minimum expected accuracy standard. Calibration records

shall be included in the flow evaluation report to demonstrate that the equipment was properly calibrated. Any recalibration required during the monitoring period shall be noted and also included in the report.

14. All flow and pressure meters shall be maintained in a manner that shall provide for a minimum of:
 - a. Seventy-five percent (75%) data reliability for each individual meter during each monthly monitoring period; and
 - b. Ninety percent (90%) data reliability for all data for each type of monitoring (i.e., rainfall, flow and pressure) should be maintained during qualifying rain events as described in Paragraph 10, above.

15. **Rainfall Monitoring:** HRSD shall assure, through consultation with the HRSD Localities, that sufficient rainfall monitoring is carried out by HRSD and the HRSD Localities to obtain the data needed to compare wet weather sewer flow to rainfall volume, duration and intensity, and to support the development of appropriate hydrographs for the specific return frequency events included in the Capacity and Condition Assessment required by Section VIII. The relationship between peak sewer flow and rainfall shall be used during the evaluation of the HRSD SS System (and the portion of the Regional SS System for which HRSD will conduct FPRMRS under Section VI and perform modeling under Section VII) performance and the prediction of rainfall derived inflow/infiltration (RDI). Rainfall gauges shall be of the continuous recording type. HRSD shall, in coordination with the HRSD Localities, assure that rain gauges are distributed throughout the area covered by the Regional SS System on a minimum of one gauge every 10 square miles. To the extent required by Section VI, HRSD shall install at least one rain gauge in any Locality that has a total area covered by the sanitary sewer system of less than 10 square miles. That density should provide reasonable coverage and representation of variations in rainfall intensity, duration and accumulation throughout the sewer system. Rainfall gauges shall be capable of recording rainfall at 0.1 inch intervals or less. Rain data can be supplemented by data from gauges maintained by United States Geologic Survey (USGS) and/or the National Oceanic and Atmospheric Administration (NOAA). Should the HRSD Localities fail to provide the rain gauge placements and densities specified herein, HRSD shall supplement the collected data with data from additional gauges placed by HRSD or with data derived from radar information that is calibrated with rain gauges maintained by the USGS, NOAA, and the Localities.

16. Ground Water Monitoring - HRSD shall either utilize available information regarding seasonal groundwater level fluctuations, or shall monitor groundwater levels to establish the likely seasonal variations in the potential for ground water infiltration into the sewer system. Groundwater data can be used in conjunction with flow data to analyze infiltration based on the relationship between the groundwater table level and the elevation of the sewers.

17. Metering Equipment Maintenance - Metering equipment operation shall be checked and

serviced in accordance with the manufacturer's requirements and recommendations at each data download, as described in the following Paragraph. For equipment with telemetry, metering equipment shall be checked after the first week of operation. Gravity sewer flow meters with telemetry shall be checked at least once per month and after each major rainfall event. Force main flow meters and pressure meters shall be checked as is appropriate to the particular installation and type of equipment; meters in physically vulnerable or challenging installations shall be checked at least once per month to reduce the chance of data loss. Problems with the instrument shall be corrected as soon as is feasible by recalibration, repair or replacement as needed upon identification of a problem so as to sustain data collection at the highest possible level.

18. Data Collection - Sewer flow, force main pressure, and rainfall information shall be collected (downloaded) from meters without telemetry at one week intervals until adequate meter operation is established via data review as described below, and at periodic intervals not to exceed 2 weeks for the duration of the monitoring period. In cases where area-velocity meters without telemetry are used to monitor flow in gravity sewers, a site visit shall be carried out after each major storm event to confirm meter conditions and to download the meter data. Data logging of the sensor readings shall be as described in Paragraph 8, above. Electronic transmission or collection of data for flow monitoring and rainfall gauging sites shall be used as widely as feasible and appropriate, as it allows more frequent review of data and identification of meter problems.
19. Data Reviews - Downloaded data and data retrieved via telemetry shall be promptly reviewed by qualified staff familiar with such reviews, so as to identify data quality issues promptly and allow timely meter re-calibration, repair or replacement. These reviews should include identifying loss of data, apparent meter drift, and the use of graphical data analysis tools such as scatter plotting of gravity flow data, and time plotting of both gravity and pressure flow data, and shall conform to the review activities identified in HRSD FPRMR Plan.
20. Data Summaries - Flow data summaries to be provided to HRPDC and the Localities and to EPA included in the flow evaluation report shall present the flow data and observed flow conditions supported by graphical and tabular presentations of flow, wet well level, velocity, and pressure in the context of the rain events. Each summary shall include the following information:
 - a. Graphical representation of data;
 - b. A graphical time-series plot (hydrograph) of flow rate vs. time data, as well as associated recorded rainfall data, should be presented for each specific flow monitoring method below. Additional data summaries are for various flow monitoring methods to be included are:
 - i. Open Channel Flow Meters: Graphs (scatter graph) of flow depth versus velocity;
 - ii. Force Main Flow Meters: Graphs of flow rate and associated system

- pressure versus time; and
 - iii. Volumetric Flow Calculation: Graphs of wet well levels and calculated flow rate.
 - c. Tabular data - A tabulation of daily average, maximum, minimum, and peak hour flow rate recorded during the flow monitoring period shall be presented. The following data shall be tabulated for each specific flow metering method:
 - i. Open Channel Flow Meters: time, flow depth, velocity, flow rate
 - ii. Force Main Flow Meters: time, flow rate, pressure, pump run status
 - iii. Volumetric Flow Calculation: time, wet well levels, pump run status, pump run times, flow rate calculation, pressures, where available
 - d. Installation report - A summary of the installation details associated with each meter location, including a sketch or photographs of the manhole, wet well and/or force main configuration details and identifying related installation information.
21. Data Storage Format and Warehousing - The metered data shall be stored in an open data format that can easily be accessed in an ODBC (Open data base connectivity) compliant format. Data for each meter shall be uniquely identified and shall be distinguishable from the data from other meters. Further, the data shall be labeled and stored in a manner that will allow ease of site location identification and determination of the dates on which the data were collected.

APPENDIX II
CATEGORIES OF DATA TO BE USED IN THE REGIONAL HYDRAULIC MODEL
AND CALIBRATION AND VERIFICATION OF THE REGIONAL HYDRAULIC
MODEL

A. Categories of Data to be Used in the Regional Hydraulic Model.

1. Physical data: HRSD shall configure the Regional Hydraulic Model using adequate, accurate and sufficiently current physical data to describe the physical components of the Regional Sanitary Sewer System. It shall field verify a statistically significant portion of the physical data or ensure that the Localities have done so, and it shall also verify any data that, upon a review of the documentation and any other checks available from the model, appear to be inconsistent with other data or modeling. HRSD shall ensure that the physical system data are sufficiently detailed to satisfy the foregoing capabilities and purposes of the Regional Hydraulic Model.
2. Pipe Data. HRSD shall use following data pertaining to pipes in the development of the hydraulic model, or shall seek to ensure that the Localities provide such data:
 - a. Network connectivity (i.e., the pipe data record must include unique identification numbers for manholes or other structures at both ends of the pipe)
 - b. Pipe size (nominal diameter)
 - c. Length between manholes and/or junction structures and pumping stations
 - d. Invert elevations (upstream and downstream)
 - e. Material
 - f. Pipe condition
 - g. Force main or gravity sewer
 - h. The selection of a pipe roughness coefficient shall be made following an evaluation of the pipe diameter, material, and condition using engineering judgment. Appropriate coefficients from industry recognized sources shall be used for modeling. Consideration shall also be given to pipe roughness conditions where known heavy silt, debris, or slimes are found in the system. In the absence of pipe material or condition information, engineering judgment may shall be used for the selection of an appropriate roughness coefficient; however HRSD shall, to the greatest degree possible, base selection of roughness coefficients on information about pipe material and condition.
3. Manholes and Junction Structures. Manholes and junction structures are structures that connect segments of pipe in the system. The following data shall be used in the development of the Regional Hydraulic Model:
 - a. Manhole ID
 - b. Diameter/size
 - c. Locations
 - d. Invert elevation

- e. Rim elevation
 - f. Ground elevation
 - g. Sealed or unsealed lid
 - h. Manhole inserts or similar devices
 - i. As appropriate, information needed to characterize manhole entry and exit head losses. For example, trunk and interceptor manholes having significant changes (i.e. > 45 degrees) in flow direction may produce atypically high head losses.
4. Pumping Stations. The following information shall be used in the development of the Regional Hydraulic Model:
- a. Wet-well physical attributes (i.e. dimensions)
 - b. Pumping performance and capacity (i.e. pump performance curves, draw down test results)
 - c. Number of pumps
 - d. Type of drive (i.e. Variable speed or constant speed pumps)
 - e. Control logic (i.e. wet well elevations at which each pump turns on and/or reaches full speed, and turns off; for Pressure Reducing Stations, how suction and discharge pressures are used to regulate station operation)
 - f. Piping details
 - g. Flow equalization/storage physical attributes and control strategy (in-line or off-line storage)
 - h. Bypass pump information, if such pumps were used during the flow monitoring period used for calibration
 - i. The Model/ Regional Hydraulic Model shall accurately represent the physical attributes of the pumping station and shall be programmed with the same control logic used to operate the station so as to simulate the actual pumping in a sufficiently representative manner. Control logic includes triggers for turning the pumps on or off and/or for changing the pump speed when variable speed pumps are used. HRSD shall obtain, for pumping stations equipped with off-line flow equalization structures, additional data regarding the dimensions and elevations of storage, as well as the control logic and facilities that divert flow to, and return flow from, storage.
5. Other Boundary Conditions. Other boundary conditions that shall be considered include:
- a. Sewage treatment plant (STP) headworks characteristics: The Regional Hydraulic Model shall quantify the headworks conditions of each HRSD STP. As the HRSD STPs are the downstream boundaries for the Regional Hydraulic Models, the STP headworks establish the primary outlet conditions for the model. The headworks may include pumping equipment and associated controls similar to a pumping station. Outfall condition shall be developed in the model in sufficient detail to provide an accurate representation of field conditions.
 - b. Weirs: If present, weirs within the HRSD and Regional SS System provide a method for controlling flow within the HRSD and Regional SS System.

Generally, weirs are located in manholes that join pipes between parallel sewers. These devices may not be conspicuous on sewer system maps or record drawings. When preparing the Regional Hydraulic Model, HRSD shall carefully examine all available records to identify the locations of weirs and connections between systems, such as short pieces of pipes between nearby manholes, which serve a similar purpose to weirs.

- c. Pumping station records including flow, discharge pressure and wet well elevation
 - d. Pressure Reducing Stations
 - e. Other flow controls such as high pipes in manholes
 - f. Control gates and valves: As much of HRSD's system is a pressure network, it is important that any control structures within that network be accurately represented, both in terms of configuration and control strategies
 - g. Siphons: Inverted siphons present the situation where the flow depth is affected by the construction details of the structure. The elevations and sizes of all barrels of the siphon must be known for an accurate simulation. If flow to multiple barrels is controlled by weirs, the elevation of the weir crests must be known. Significant volumes of sediment can accumulate in siphons and any model must take such accumulation into account.
 - h. Downstream discharge conditions
6. Population, Demographic, and Land Use Data. The Regional Hydraulic Model shall use population data to estimate existing and future sewer baseflows. Transportation Analysis Zones (TAZ) data shall be used as the primary source for population data. In situations where the study area is too small to effectively use these data, engineering judgment shall be used in conjunction with other population data sources to derive appropriate population data. TAZ data will not necessarily be used as the basis for final design of system improvements.
7. In instances where modeling of areas smaller than those of TAZ areas are necessary, other, more granular data and engineering judgment shall be used to develop population estimates and projections. This data shall be verified for consistency with the TAZ population data. Other appropriate sources may include census data, land use planning and zoning data, and parcel data as follows.
- a. Census Data. Detailed population data may be obtained (in GIS format) for census tracts and blocks that may provide finer coverage than TAZ data. These data are available for each Locality through the United States Census Bureau. These data do not generally provide a convenient breakdown of population into categories (i.e. residential, employment, industrial) or population projections. However, these data do provide spatial, baseline population data that may be used in conjunction with other data sources to estimate current and future populations.
 - b. Land Use Plans and Zoning. Land Use and Zoning Plans are maintained by the Localities to guide growth and development. These plans generally include future land use which indicates the adopted zoning districts and land uses for current and

future development.

- c. Parcel Data. Parcels refer to individual pieces of property. Where available in GIS format, parcel mapping is organized spatially and contains information regarding the land use of the specific property. Parcel data may be used for developing highly detailed models of small areas, beyond the granularity available from other population data sources. These data provide spatial, baseline population data that may be used in conjunction with other data sources to estimate current and future populations.
8. Geographic Information System (GIS) Data: Readily available GIS data may be used to support the data capture effort during the model building process. Specific uses of GIS include delineating sub-catchments, validating ground elevations, and identifying areas of flooding. Information of this type may include:
 - a. Topographic mapping/digital terrain model
 - b. Stream and hydrologic mapping
 - c. Flood maps
 - d. Sewer system maps (service areas, connectivity, accounts/billing information)
 - e. Parcel information
 - f. Land use information: This information is available from multiple sources including sewer system mapping, FEMA flood maps, and topographic maps that are maintained by various Localities.
 9. Water Use Records. Water use data obtained from each Locality may be used to validate baseflows calculated using population data.
 10. Rainfall Data Records. Rainfall data shall be used to estimate rainfall derived inflow and infiltration (RDII). The Regional Hydraulic Model shall use rain gauge data from both the U. S. Geographical Survey and efforts undertaken during the flow-monitoring phase. The Regional Hydraulic Model shall use hydraulic rainfall data having a resolution of 1-hour or less. 15 minute data shall be used to accurately model actual system response to intense, short duration rain events. All data shall be reviewed for quality issues such as periods of missing data, or data from a defective rain gauge, before being used in hydraulic modeling. HRSD shall use, or ensure the Localities use, rainfall data that coincide spatially and temporally with the sewer flow data used to develop the model, as set forth in Section VI. HRSD shall use the rainfall data collected during the monitoring program to calibrate and validate the Regional Hydraulic Model. The long term data will then be used to identify events that match the designated return frequency.
 11. Sewer Flow Monitoring Records. The Regional Hydraulic Model shall use flow monitoring data collected in accordance with this Attachment and such data shall meet the requirements presented in Section VI (Flow Monitoring).
 12. The following locations shall be considered in the development of the flow-monitoring

program:

- a. Regional and HRSD sanitary sewer system outlet points;
 - b. Areas experiencing performance problems where modeling accuracy of such areas is important;
 - c. Specific points of concern such as siphons or weirs, where modeling accuracy of such points is important;
 - d. Points where ownership of sewer lines changes between HRSD and Localities.
13. A series of data management activities are required to process and validate the flow, depth, velocity, and reaction to rainfall. These following activities support the model's calibration and validation:
- a. Preparation of a GIS layer, or alternative map, depicting flow meter locations;
 - b. Identification of the appropriate model node for each flow meter;
 - c. Conversion of the observed flow data into the model's flow data format.
14. Operational Information. Operational records provide important qualitative and quantitative data about the performance of a sewer system. These data may be used during calibration to fine tune the Regional Hydraulic Model. The primary sources for these data are interviews with operation staff, SSO databases and maintenance logs. This data may also include records of pumping station discharge pressures. Operational criteria to consider include changes in system operation such as pump replacement, weir adjustments, surcharge, SSO volume, and frequency.

B. Calibration and Verification of the Regional Hydraulic Model.

The following principles shall be incorporated.

15. Calibration: Calibrated models shall meet the following statistical standards for dry and wet weather flows:
- a. Dry weather flows: In addition to matching general hydrograph shape, these statistical standards shall be met for at least 2 dry-weather days.
 - (1) Predicted time of peaks and troughs shall be within 1 hour of the observed flow
 - (2) Predicted peak flowrate shall be within +/- 10 percent of the observed flow data
 - (3) Predicted volume of flow over 24-hours shall be within +/- 10 percent of observed flow
 - b. For wet weather flow, in addition to matching general hydrograph shape, these statistical standards shall be met for the wet weather flows to be analyzed in the Regional Hydraulic Model:
 - (1) Predicted time of peaks and troughs shall be within 1 hour of the observed flow
 - (2) Predicted peak flow rates shall be within -15 percent and +25 percent of

the observed flow

- (3) Predicted volume of the wet-weather event shall be within +20 percent and -10 percent of the observed flow
- (4) Predicted pump discharge pressure within +/- 10% of observed pressures
- (5) Predicted surcharge depth in manholes or other structures shall be within +1.5 feet and -0.3 feet of the observed depth
- (6) Predicted non-surcharged water surface elevations shall be within +/- 0.3 feet of the observed depth

c. Other parameters may be assessed to calibrate RDII, as follows:

- (1) Reasonable agreement between predicted and actual pumping station wet well level and discharge
- (2) Accurate prediction of known overflow location and volume
- (3) Accurate prediction of observed discharge pressure in force mains
- (4) Accurate prediction of duration and volume of flow equalization/storage systems
- (5) Representative performance of flow control structures such as weirs
- (6) Adjustment of C-factors and roughness coefficients (Not parameters to assess calibration; instead these are parameters that are adjusted to effect calibration.)

16. Verification: HRSD shall verify the calibrated model by running it with different rainfall data than were used to calibrate the Regional Hydraulic Model, and then comparing the results to corresponding actual, real-time flow data. Verification of the model shall meet the same statistical standards as those set forth above for calibration. In the event the model does not meet verification criteria, HRSD shall review the cause of the problem and address it through inclusion of additional flow monitoring data in the analysis, field studies to determine system anomalies (e.g., heavy sediment accumulations) not included in the model, or revisiting the data input.

**APPENDIX III
FORCE MAIN ASSESSMENT**

1. As provided in Section VIII of the Order, HRSD shall perform a more detailed assessment of the Force Mains which the preliminary screening revealed present a material risk of failure. It shall also perform a detailed assessment pursuant to its MOM on a systematic basis for the other Force Mains for which the screening did not show a material risk of failure.
2. The contents of the more detailed assessment of Force Mains is set forth in this Appendix, and, as stated above, is to be performed on Force Mains presenting a material risk of failure following the preliminary screening set forth in Section VIII or as part of maintenance in a MOM program under Section IX.
3. Assessment of Force Main Appurtenances. Valves, Fittings and Appurtenances – HRSD shall inspect and conduct functional analyses of, to the extent practicable, all valves, air-relief valves, drains, connections, fittings and appurtenances associated with each Force Main. HRSD shall identify each valve, fitting or appurtenance that is not fully functional or functioning as intended and identify conditions that present a material risk of pipe failure or interruption of service for each Force Main.
4. Cathodic Protection – HRSD shall evaluate the integrity and adequacy of all installed cathodic protection systems. HRSD shall identify each location where the protection has failed or where protection is inadequate. If cathodic protection is not installed on a Force Main pipe, HRSD shall evaluate whether conditions warrant the installation of cathodic protection.
5. External Pipe Inspections
 - a. Locations – HRSD shall inspect the exterior of each Force Main at:
 - i. Each location where the pipe is exposed; and
 - ii. Each location determined to present a material risk of failure or interruption of service based on the screening analyses described in Section IX, Subsection C (excavation may be necessary to reach these locations).
 - b. Inspection Methods
 - i. At each location identified pursuant to Section IX, Subsection C above, HRSD shall visually inspect the pipe exterior for structural damage and the integrity of protective coatings.
 - ii. HRSD shall conduct additional inspections as needed to locate and assess pipe conditions that present a material risk of pipe failure or interruption of service. HRSD shall focus special attention on locations determined, pursuant to Section IX, Subsection C, to present a material risk of pipe corrosion.

- iii. HRSD shall inspect visually the exterior of each force main inspection and/or the best proven technology that is suitable to the particular pipe to identify conditions such as cracks, corrosion, erosion, or coating damage/delamination that pose a material risk of pipe failure or interruption of service. Best proven technology may include ultrasonic examination of pipe walls or pipe wall samples, or other methods for determining the extent of pipe corrosion.
6. Internal Pipe Inspections – For internal pipe inspections, HRSD shall utilize the best proven inspection technology that is suitable to the particular pipe to identify conditions, such as cracks, corrosion, erosion, coating delamination, joint deflections, pipe deformation and debris accumulation, that pose a material risk of pipe failure or interruption of service. HRSD shall conduct internal force main inspections on the length of pipe that is practically accessible with the selected inspection method. At a minimum, HRSD shall inspect the portions of pipe necessary to identify or characterize conditions that pose a material risk of pipe failure or interruption of service, including, but not limited to, all high points in the pipes, to the extent practicable. Where practicable, HRSD shall conduct evaluations in the vicinity of all access points (air relief valves, discharge manholes and other valves and fittings that provide access). If any portion of a Force Main is not subjected to complete internal inspection, HRSD shall provide an explanation in the HRSD Capacity and Condition Report.
7. Operating Pressure Evaluations – HRSD shall evaluate the operating and transient pressure for each Force Main. The purpose of the evaluation shall be to determine whether the design, construction, and materials are sufficient to withstand the maximum predicted transient pressures that may be expected to occur under normal, peak flow and emergency (shut-down and start-up) conditions. In this evaluation, HRSD shall include, but not necessarily be limited to, a review of available pressure sensor data (SCADA and strip chart) to evaluate normal operating pressures, and an evaluation, using transient pressure models or actual pressure measurements, of the transient pressures that occur during the range of anticipated operating conditions. Any actual pressure measurements shall be limited to the range of operating conditions that is both prudent and practicable.
8. Leak Detection - HRSD shall follow up on observed conditions that are likely to be the source of leakage. HRSD shall employ the methodologies appropriate to the type of condition and location of the suspected leakage.

**APPENDIX IV
GRAVITY LINE ASSESSMENT**

1. HRSD shall conduct field inspections of its Gravity Lines as follows:
2. Manhole Inspections - HRSD shall inspect manholes to determine manhole conditions and to observe sewer flow conditions, including indications of unacceptable surcharging. HRSD shall conduct manhole inspections in accordance with NASSCO standards.
3. In conjunction with manhole inspection activities, HRSD shall inspect manholes and clean outs in areas subject to flooding, ponding, or submerged tidal conditions to determine whether the cleanout is broken or the manhole cover allows ponded water to enter the manhole.
4. HRSD shall conduct a topside (or non-entry) manhole inspection to determine overall structural condition of the manhole. During the manhole inspection, HRSD shall observe the surrounding area to determine whether the manhole is located in an area that is conducive to flooding over the top of the manhole. HRSD shall reinspect manholes found to be surcharged during a lower flow period. If a topside manhole observation provides evidence of the manhole being a significant I/I source, HRSD shall perform an internal manhole observation (i.e., pole camera or manhole entry) to specifically determine what defects exist in the manhole and its connecting pipes. HRSD shall use this information to identify measures necessary to correct the observed deficiencies.
5. HRSD shall assign to each manhole inspected a unique identifier. HRSD shall collect the information and condition ratings on the manhole cover, frame, adjustment rings, cone, steps, wall, bench and channel as well as connecting influent and effluent pipelines.
6. CCTV Inspections - HRSD shall use CCTV inspection to assess the condition of sewer lines by identifying structural problems, points of inflow and infiltration, capacity issues, and system blockages. The data collected shall be compatible with and easily integrated by the Utilities' Information Management System. HRSD shall conduct and record CCTV inspection results in accordance with NASSCO PACP© standards.
7. Smoke Testing - HRSD shall conduct smoke and/or dye testing as part of the sewer system evaluation in HRSD Gravity Lines that are suspected to have inflow problems. HRSD shall use CCTV inspections in conjunction with smoke testing to verify the location of cross connections and inflow sources that are identified.
8. HRSD shall perform smoke testing during non-peak flows to minimize the potential for full pipe flow conditions. HRSD shall not use smoke testing for sewers suspected of having flooded sags because this will prevent the smoke from getting through the line, thereby providing false results.

9. HRSD shall visually inspect the entire section being tested by walking along the route to sewer line to observe the location of smoke leaks. The location of smoke leaks shall be marked, noted, numbered and photographed by HRSD. HRSD shall record the photograph number corresponding to each leak location. Cleanouts and failures that are observed to produce smoke should also be noted if they are in an area subject flooding.
10. Dye Testing - HRSD shall use dyed water testing to verify connectivity, direction of flow, source of I/I, and illicit connections to the system. Dye testing may be used to complement smoke testing to verify these sources.
11. Prior to dye testing, HRSD shall clean the line to be tested. HRSD shall monitor the down stream manhole to observe dyed water that may pass through the system and to estimate the quantity of the dyed water. If sufficient dye water passes through the downstream manhole, a CCTV inspection may be performed to identify the location and magnitude of the source of flow.
12. Standards - HRSD shall use the following standards for Its Gravity Sewer System:
 - a. National Association of Sewer Service Companies (NASSCO) standards for all defect coding.
 - b. The Pipeline Assessment Certification Program (PACP) standards for the assessment of sewer mains using information obtained through CCTV inspections to assess, evaluate and categorize gravity mains within the sanitary sewer systems.
 - c. The Manhole Assessment Certification Program (MACP) defect coding system found in the PACP to assess, evaluate and categorize manholes within the sanitary sewer systems.

APPENDIX V

FORMAT FOR REGIONAL WET WEATHER MANAGEMENT PLAN

The following is a preliminary outline describing the anticipated content of the RWWM Plan. This outline is intended to provide general guidance for the preparation of the RWWM Plan. It is anticipated that some deviation from this outline will occur in the development of the RWWM Plan.

1. Introduction
 - 1.1 Background
 - 1.2 Purpose and Format of Regional Wet Weather Management Plan
2. EPA Administrative Order Requirements
3. Public Participation and Agency Coordination
4. Characterization Report
 - 4.1 Sanitary Sewer System
 - 4.1.1 Localities Sanitary Sewer Systems
 - 4.1.2 HRSD Sanitary Sewer System
 - 4.1.3 Service Areas
 - 4.1.4 Historical Wastewater Flow Projections
 - 4.2 HRSD Wastewater Treatment Works
 - 4.2.1 North Shore Facilities
 - 4.2.2 South Shore Facilities
5. Planning Process
 - 5.1 Methodology
 - 5.1.1 Large Scale Strategies
 - 5.1.2 SSES Basins
 - 5.1.3 Wastewater Treatment Plant Wet Weather Optimization
 - 5.2 Sewer System Capacity Definitions
6. Population Forecasts
 - 6.1 Planning Horizon (We suggest 20 to 30 years)
 - 6.2 Population and Employment Forecasts
7. System Evaluation
 - 7.1 Model Framework
 - 7.1.1 Dry Weather Flow
 - 7.1.2 Wet Weather Flow
 - 7.1.3 Peak Flow Reductions Expected from Localities' Rehabilitation Plans
 - 7.1.4 Capacity Deficiencies

- 7.1.4.1 Deficiencies in the Regional Sanitary Sewer System
 - 7.1.4.2 Deficiencies at the STPs
 - 7.1.5 Modeled Conditions
 - 7.2 Evaluation of Pump Stations, Pressure Reducing Stations, Force Mains, Main Trunk Sewers and Interceptors
 - 7.2.1 Pump Stations, Pressure Reducing Stations, Main Trunk Sewers/Interceptors Studied
 - 7.2.2 Level of Service Evaluation
 - 7.2.3 Peak Flow Events
 - 7.2.4 Methodology
 - 7.2.5 Identification of Hydraulic Deficiencies
 - 7.3 Wastewater Treatment Plants
 - 7.3.1 Historical Flow Data
 - 7.3.2 Evaluation for Extreme Events
 - 7.3.2.1 Selection of Historical Events
 - 7.3.2.2 Projecting to Future Conditions
 - 7.3.2.3 Recurrence Frequency Analysis
 - 7.4 SSES Basins Not Meeting Peak Flow Threshold
 - 7.4.1 Methodology
 - 7.4.2 Evaluation
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- 8: Development and Evaluation of Capacity Enhancement Solutions
 - 8.1 Large Scale Strategy Alternatives Evaluation and Selection
 - 8.1.1 North Shore
 - 8.1.2 South Shore
 - 8.2 Pump Stations, Main Trunk Sewers/Interceptors
 - 8.2.1 Analysis of 2, 5 and 10 year LOS
 - 8.2.2 Identification of LOS Needed to Eliminate SSOs, Bypasses and Capacity-related NPDES Non-compliance
 - 8.3 SSES Basins Not Meeting Peak Flow Threshold
 - 8.3.1 Mitigation Options
 - 8.3.1.1 RDII Abatement Options
 - 8.3.1.2 Operational Alternatives
 - 8.3.1.3 Conveyance Options
 - 8.3.1.4 Storage Options
 - 8.3.2 Alternatives Analysis and Plan Selection

- 9. Wastewater Treatment Plant Alternatives
 - 9.1 Hydraulic Assessment
 - 9.1.1 North Shore
 - 9.1.2 South Shore
 - 9.2 Process Assessment
 - 9.2.1 North Shore
 - 9.2.2 South Shore

- 10. Optimization of Wet Weather Improvements
 - 10.1 Description of Large Scale Strategy Alternatives
 - 10.2 Sizing the Alternatives
 - 10.3 Scoring Alternatives
 - 10.3.1 Cost
 - 10.3.2 Constructability
 - 10.3.3 Operations and Maintenance

 - 10.4 Selection of the Preferred Alternatives

- 11. Summary of Wet Weather Management Plan Components
 - 11.1 Overview
 - 11.2 Capital Improvement Plans
 - 11.3 Operating Plans
 - 11.4 Program Summary

- 12. Cost Analysis and Implementation Schedule
 - 12.1 Program Overview
 - 12.2 Feasibility Analysis
 - 12.3 Prioritization of Improvements
 - 12.3 Implementation Schedule
 - 12.4 Operating Plans