

Green City, Clean Waters

Facility Concept Plan For the Southwest Water Pollution Control Plant

Consent Order & Agreement

Deliverable IV - c

City of Philadelphia Combined Sewer Overflow Long Term Control Plan Update

Submitted to

**The Commonwealth of Pennsylvania
Department of Environmental Protection**

By The Philadelphia Water Department

June 1, 2013

1. Introduction

In August 2008, the Philadelphia Water Department (Water Department) entered into a Consent Order and Agreement (COA) with the Pennsylvania Department of Environmental Protection (PADEP) which specifies the process for development of an update to the Water Department's Long Term Control Plan commitments as originally included in National Pollutant Discharge Elimination System (NPDES) permit of 2007. On September 1, 2009, a Long Term Control Plan Update (LTCPU) was submitted to PADEP and on June 1, 2011, the Water Department entered into a COA with the PADEP which enforces the implementation of LTCPU and its supplements. Pursuant to Paragraph 3.a.iv, pertaining to Compliance Requirement Deliverables, a Facility Concept Plan for each of the three Water Pollution Control Plants (WPCPs) must be submitted within 24 months of the agreement date. Appendix G of the COA requires the Facility Concept Plans to describe the specific engineering and construction activities proposed to increase the maximum wet weather flow into each water pollution control plant facility and thereby increase the capture rate of combined sewage. The Facility Concept Plans will provide design and construction performance standards for the five-year, ten-year and fifteen year milestone periods with the completion deadline at the end of a twenty year period.

The Water Departments 's implementation approach to the 2009 LTCPU has been developed to integrate the management of Philadelphia's watersheds into a larger context such that the program is designed to provide multiple benefits beyond the reduction of combined sewer overflows (CSOs), so that every dollar spent provides a maximum return in benefits to the public and the environment. In a similar approach, the Facility Concept Plans look beyond infrastructure improvements and consider modifications to facility operations as well as collection system optimization to address wet weather flow delivery to the treatment plants.

2. Goals of Facility Concept Plans

The stated goal and commitment of the *Green City, Clean Waters* program for CSOs is to reduce water quality impact due to CSOs on the receiving waters through: green stormwater infrastructure, stream corridor restoration and preservation, and wet weather treatment plant upgrades. The Facility Concept Plans provide details of the City's treatment plant upgrade strategy to achieve CSO reduction of approximately 1.75 billion gallons annually through:

- Wastewater plant capacity increases,
- Collector system modifications to increase wet weather capture and transmission of wet weather flows,
- Potential operational changes of the existing wastewater plants to ensure sustained treatment capacity,
- Continued study and investigation of strategies and technologies for implementation at the treatment plants to achieve CSO reductions.

All treatment plant and collector system modifications will be completed within the 20 year timeframe as stated in the LTCPU. The Facility Concept Plans represent the current best plans and approach for work to be performed by the Water Department necessary to meet CSO reductions. In addition, the Water Department is committed to continuing research and studying study new technologies and improvements to the collection system and treatment plants to increase CSO capture and wet weather treatment. Additional projects may be constructed if studies conclusively show operational advantages.

This Facility Concept Plan is the basis for the development of a comprehensive Wet Weather Facility Plan, which will provide details including schedule, cost and anticipated performance for each project presented in this plan. The Wet Weather Facility Plan will be a document, revisited regularly to evaluate if regulations, technologies, community needs or other criteria require a change to the plan. This ensures the Water Department is responsive to the commitment to increase CSO capture in the drainage district and at the treatment plant in the years ahead.

3. SW WPCP Permit Modifications

As per Appendix G of the 2011 COA, the performance standards of the Facility Concept Plan will become permit requirements by being incorporated into future versions of the NPDES permit for each treatment plant. Under the 2009 LTCPU, as described on page 10-52, the Water Department committed to the expansion of the Southwest WPCP (SW WPCP) secondary treatment capacity by 60 million gallons/day. This includes a 60 million gallon/day redundant effluent pump for the treatment of additional wet weather flow which will be reflected in future modifications to the NPDES permit as presented in Table 1:

Table 1: Current and Future SW WPCP Permitted Capacity

	2007-2012 NPDES Permit	Future (2031)
Facility Design Flow Rate (Q)	200 MGD	200 MGD
NPDES Maximum Daily Flow	300 MGD	300 MGD
NPDES Peak Instantaneous Flow	400 MGD	460 MGD

To treat the maximum flow rates delivered to the plant, several plant upgrades have been proposed and the planning process has been initiated.

4. Implementation Approach for the SW WPCP Drainage District

The Water Department is taking a comprehensive approach to achieving increased peak wet weather capacity and reduced CSO volume. The Water Department has prioritized work performed on the Northeast WPCP drainage district since the improvements to this single district will allow the City to meet the majority of the city-wide wet weather targets that are derived from traditional infrastructure improvements (i.e. not derived from Green Stormwater Infrastructure). In addition, the City has the capacity to treat NPDES peak instantaneous flow of 460 MGD at the SW WPCP through the treatment of an additional 60 MGD, and will meet an operational commitment to treat a peak wet weather flow of 490 MGD.

As part of the LTCPU, six improvements for plant modifications were considered for the SW WPCP to increase CSO capture through increased wet weather flow of 490 MGD at the facility. These projects were presented in Table 8-4 of the LTCPU. Table 2 presents the LTCPU improvement options along with a status resulting from planning studies and analysis performed to date.

Table 2: Current status of LTCPU Improvement projects for the Southwest WPCP

2009 LTCPU Improvement #	2009 LTCPU Improvement Description	2013 Improvement Project Status
1	Replace caulking on secondary clarifier launders to improve flow distribution	Completed
2	Provide preliminary treatment for the BRC (Biosolids Recycling Center) centrate that is recycled to the plant	Not required to achieve 490 MGD
3	Modify existing RAS system in the secondary clarifiers	Not required to achieve 490MGD
4	Provide four gravity thickener for thickening of primary sludge (tentative location west of Final Sedimentation Tanks)	Not required to achieve 490MGD
5	Resolve hydraulic limitation between primary clarifier and aeration basin	Not required to achieve 490MGD
6	Provide an additional effluent pump at the effluent pump station	In design

The 2001 Stress Test listed options to increase plant capacity to 540 MGD and these options were incorporated in the 2009 LTCPU as improvements to achieve a peak wet weather flow of 540 MGD, as the plant has demonstrated the ability to treat flows in excess of 460 MGD, in alignment with the Nine Minimum Controls requirement to maximize flow to the wastewater treatment facilities. As documented in 2009, the SW WPCP has experienced sustained flows over 12 hours of 466 MGD and an instantaneous peak flow of 489 MGD. For all alternatives considered in the LTCPU, simulated plant flows in the typical year never exceeded 490 MGD.

Therefore, the Water Department's operational commitment is to treat a wet weather flow of 490 MGD to achieve the CSO control goals as stated in the LTCPU and its supplements.

The caulking project described in LTCPU Improvement #1 has been completed. The Water Department made operational changes at the Biosolids Recycling Center, including centrifuge upgrades that have improved centrate quality and eliminated the need for providing pretreatment of the centrate at the SW WPCP (LTCPU Improvement 2). Additionally, the centrifuge operation was recently changed from 5 to 7 days per week, eliminating interruptions in dewatering activities. LTCPU Improvements 3 through 5 are not required to achieve flows of 490 MGD. An additional effluent pump (LTCPU Improvement #6) will provide the system reliability to process flows up to 490 MGD.

4.1 SW WPCP Facility Improvements

4.1.1 Completed SW WPCP Facility Improvements

To increase operational reliability for meeting the peak wet weather capacity at all times, the following capital project has been completed:

Caulking on Secondary Clarifier Launderers

All secondary clarifier effluent weirs were replaced and sealed to prevent short circuiting and improve flow distribution (LTCPU Improvement 2). The Water Department has observed improved performance of the secondary clarifiers as a result of this capital investment.

4.1.2 Future SW WPCP Facility Improvements

To ensure unit operation redundancy in the future, the following capital project has been identified:

Effluent Pumping Redundancy

As the result of the investigations conducted to date, as well as observations made by SW WPCP Operations staff during August and September 2011 wet weather events, the Water Department has determined that an additional effluent pump is required (2009 LTCPU Improvement 6). Currently the SW plant has five effluent pumps, each rated at 115 MGD which provides redundancy at 460 MGD. However, the 6th pump would allow for one pump to be out of service and still meet peak instantaneous flows of over 460 MGD. The Water Department has begun design for installation of an additional pump, to be located within available space inside the existing effluent pump station.

4.2 Collection System Improvements in the SW WPCP

Drainage District

Studies to identify collection system improvements in the SW Drainage District are underway and discussed in Section 4.4.

4.3 Operational Improvements at the SW WPCP

At this time, no operational improvements at the SW WPCP are planned.

4.4 Continuing Studies for the SW WPCP Drainage District

Studies are underway for balancing CSO regulator treatment capacities for the SW Drainage District.

Balancing CSO Regulator Wet Weather Treatment Capacities

Numerous combinations of regulator chamber improvements will be evaluated to seek optimum combinations that can achieve overflow reduction volume in a balanced manner. Examples include rebuilding regulating chambers with increased overflow weir elevations and increased weir lengths to meet flood protection requirements; increasing orifice sizes increasing connector pipe sizes; adding stop logs or “bricks and mortar” improvements to raise weir elevations and others.

5. Design and Implementation Schedule

The design and implementation schedule below (Table 3) presents the design and construction performance standards for the proposed capital project in terms of percent complete for the five-year, ten-year, and fifteen-year milestone periods for the SW WPCP and collection systems expansion. Specific detail for each of the currently proposed capital projects in terms of percent complete for the five-year, ten-year, fifteen-year and twenty-year milestone periods for the SW WPCP is included within Table 4 below.

Table 3: Design and Implementation Schedule for SW WPCP Drainage District

Southwest WPCP and Drainage District Upgrades	2016	2021	2026	2031
Design Schedule	0%	100%		
Construction Schedule	0%	0%	100%	

Table 4: Anticipated Design and Implementation Schedule for Identified SW WPCP Drainage District Projects

Southwest WPCP and Drainage District Upgrades	Construction Completion Schedule			
	2016	2021	2026	2031
Facility Improvements				
Add Redundant Effluent Pump	0%	0%	100%	
Collection System Improvements				
Pending Results of Studies	--	--	--	--
Operational Improvements				
None Identified to Date	--	--	--	--

The Water Department will submit a comprehensive Wet Weather Facility Plan prior to the next milestone date of 2016, which will provide details including schedule and cost for the project presented in this plan. The Wet Weather Facility Plan will also provide an update on any new concepts being developed by the Water Department to increase flow and CSO capture in the SW WPCP and Drainage District. The studies include:

- Development of a SW WPCP Wet Weather Facility Plan
- Balancing CSO Regulator Wet Weather Treatment Capacities

Projects identified by studies conducted by the Water Department will be implemented by 2031 to achieve CSO capture and wet weather flow treatment as required by the 2011 COA and NPDES permit modification.