APPENDIX I

OPERATIONS GUIDELINES

ONONDAGA LAKE
SEDIMENT MANAGEMENT
OPERATIONS GUIDELINES

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LIST OF ACRONYMS

I/O	input/output
Metro	Onondaga County Metropolitan Wastewater Treatment Plant
SCA	sediment consolidation area
SVOC	semi-volatile organic compounds
TSS	total suspended solids
VGAC	vapor phase granular activated carbon
VOC	volatile organic compounds
WTP	wastewater treatment plant

SECTION 1

INTRODUCTION

Sediments dredged from Onondaga Lake will be pumped hydraulically from the dredge head through an in-water (floating or submerged) pipeline to the lakeshore. Upon reaching shore, the pipeline will be routed on land, and use a series of booster pumps to convey the slurry to the sediment processing area located adjacent to the Sediment Consolidation Area (SCA).

Once at the SCA, the dredge slurry will be passed through a screening process, which is designed to enhance the geotextile tube dewatering process, the primary method of sediment dewatering. Following the screening step, the slurry will undergo polymer injection, which will precondition the slurry for dewatering within the tubes.

Next, the dredged sediment will be discharged into geotextile tubes for final dewatering. The geotextile tubes will be managed within the lined SCA, which will collect and manage water discharged from the geotextile tubes.

The geotextile tube filtrate and water coming into contact with filling tubes or dredged sediment will be collected and routed to the water treatment plant (WTP) for treatment (metals, volatile organic compound [VOC]/semi-volatile organic compound [SVOC]/total suspended solids [TSS] removal) prior to discharge to Onondaga County Metropolitan Wastewater Treatment Plant (Metro), for ammonia removal.

This section describes how the sediment management system, from the lakeshore to the WTP, will be controlled. The system will be controlled by two primary control systems. The first system is responsible for the control of dredge as well as the booster pump stations. The second system will control all systems relating to the sediment processing area. The sediment processing control system will have the ability to monitor input/output (I/O) and system information from the dredge and booster pump stations. In addition, several components of the system will have local control and several components will be manually controlled. The sediment processing control system will be staffed by a full-time operator at a terminal to be located at the WTP. There will also be field operators at several locations. Communications cable will connect most portions of the systems to each other. Wireless telemetry will connect the dredge to the wired communications system. Radio communication will also be implemented for all operators.

These operations guidelines are divided into two sections: normal operations and contingency measures. Section 2, Normal Operations, describes how the sediment management system will be operated under normal conditions, which is when all equipment is working as designed. Section 2, Contingency Measures, describes measures that will be taken when the conditions are not normal.

SECTION 2

NORMAL OPERATIONS

2.1 DREDGE AND BOOSTER PUMPS

Each booster pump station will consist of the booster pump, a containment berm with a sump and associated sump pump, a seal water system, and an automated, pneumatically-actuated valve system. This section will describe the operational guidelines that will control the operation of the booster pump stations.

2.1.1 Staffing and Controls

Each booster pump will have a local control system which will control each booster pump's routine operation. There will be a full-time booster pump operator who will monitor performance of all four pumps, inspect the booster pump stations on a regular basis, inspect the slurry pipeline, and perform routine maintenance. The booster pump skids will be equipped with a local control panel for manual starts, stops and adjustments. Monitoring and remote control of the booster pump skids will be possible from the dredge. Additionally, monitoring will also be available from the sediment processing control system.

2.1.2 Slurry Pumping Operations

The dredge and slurry transport system will be operated so that the slurry velocity is maintained within the design parameters and so that slurry density is maximized to the extent possible. The design parameters of the slurry velocity are set so that the solids do not settle in the pipeline and so that pressure in the pipeline stays below the equipment's ratings. The density of the slurry will vary throughout the dredge cycle. The goal of the dredge operation is to keep the density as high as possible because this produces the maximum dredge production. The maximum density will be limited to prevent excessive head loss in the pipeline, which would lead to excessive pressures in the pipe and low flow.

2.1.2.1 Dredge Control

The slurry velocity will be maintained primarily by controlling the speed of the dredge pump. The dredge pump speed will be adjusted by either the dredge control system or the dredge operator to reach the design velocity, as measured by the flow meter on the dredge.

The slurry density will be controlled primarily by the thickness of the dredge cut and the speed of the dredge swing. The dredge operator will monitor the density and dredge discharge pressure to ensure that the pressure is within the desired range. The dredge is equipped with a lake water inlet valve, which is normally closed. This valve can be opened if necessary to reduce the slurry density.

2.1.2.2 Booster Pump Speed Control

The dredge control described above will regulate the slurry velocity and density. The booster pump's local control system will automatically adjust each booster pump's speed to maintain set pressures at the suction and discharge sides of each pump. Controlling the speed of the booster pump in this manner will automatically match the pump speed to the rate of slurry flow.

When operating in the automatic local control mode, a booster pump will start when the pressure in the suction line rises to the start-up set point. The pump speed will be controlled to maintain a pre-set pressure in the discharge line. The discharge pressure set point will be set to achieve a net positive suction head at the next downstream booster pump and will be modified based on the observed performance of the dredge system during operation. The local control will stop the pumps when the discharge pressure drops below a shut-down set point.

In addition to the automated controls, the pumps will be equipped with controls for manual starts, stops, and adjustments by either an operator at the local control panel or a remote operator located at the dredge. Suction and discharge pressure and pump run status will be communicated to the sediment processing control system.

2.1.3 Normal Stop

Normal stops will be required for pre-planned shutdowns, such as weekends. The normal procedure for stopping the dredge and booster pump system will be to pump enough clear lake water through the system to remove enough solids to prevent plug formation (anticipated to be equivalent to one pipe volume). Once sufficient solids have been removed, the dredge pump and booster pumps will be shut-down by the dredge operator and the valves on the discharge side of each booster pump will be closed to prevent back-flow in the pipeline and back-flow through the dredge pump.

In the event that a start is anticipated shortly after the stop, the amount of water pumped prior to the stop may be reduced. Additional water will be pumped at the start to accomplish the necessary flushing.

2.1.4 Normal Start

During normal start, there will be water in the slurry pipeline. The dredge operator will ensure that the valves on the dredge suction line are open and activate dredge pump. Each booster pump will be started by its local control system when the pressure on the pump suction rises to the set point.

2.1.5 Booster Pump Station Sump Pumps

Each booster pump will be surrounded by a containment berm. Inside the containment berm is a sump with an associated sump pump that will collect precipitation and any leaks. The sump pump will discharge the collected water into the suction line of the booster pump. The sump pump will be constant-speed pumps controlled by level switches in the sumps. The pumps will start at a high level set point and stop at a low level set point. The sump pump will also be equipped to be started and stopped locally. Sump water level and sump pump run status will be communicated to the sediment processing control system for monitoring.

2.1.6 Seal Water System

Each booster pump will have a seal water system that will re-use slurry as seal water for the booster pump. In automatic mode, the seal water pump will start and stop at the same time as the booster pump. The seal water pump will also be equipped to be started and stopped locally or remotely by the dredge operator. Seal water pressures and pump run status will be communicated to the sediment processing control system.

2.1.7 Pneumatic Valve System

Automated, pneumatically-actuated knife-gate valves will be installed on the suction line, the discharge line, and the bypass line at each booster pump. These valves will be opened and closed by the local control system based on pressure readings at the pump suction and discharge. During normal operation, the values on the pump suction and discharge lines will be open, and the valve in the bypass lines will be shut. Valve position will be communicated to the sediment processing control system for monitoring. The dredge control system will be programmed so that the valves close and/or open in a variety of contingency events as described in Section 3. Manual operation of these valves will be available through the booster pump stations or dredge control system.

2.2 SCREENS

The slurry processing system will include two screen systems with slurry tanks with augers, wash water systems, conveyors, and vapor phase granular activated carbon (VGAC) adsorption system. Each screen system is designed to handle the design slurry flow. Wash water will be directed at each screen to enhance the screen operation. Automated, pneumatically-actuated knife-gate valves are located on the inlet piping to each screen. The screens and slurry tanks will be fitted with an enclosure to minimize volatile and odor emissions from the screening operation. Air flow will be drawn from within the enclosure to maintain an inward gradient, and the air will be passed though a VGAC system to remove chemical constituents in the airstream.

2.2.1 Staffing and Controls

The slurry processing area, where the screens are located, will be staffed by at least one operator in the field. The screen shakers, augers, conveyors, wash water system, and VGAC system will be operated at a constant rate while slurry is flowing. The liquid level in the screen tanks and the position of the valves will be transmitted to the dredge and sediment processing control system. Descriptions of actions to be implemented if the tank levels reach the high levels are discussed in Section 3.3.

2.2.2 Sequence of Screen Use

Under normal conditions, the flow will be directed to one screen and the second screen will provide back-up. However, the system is designed so that the two screens can be used in parallel, if necessary. Both screens will be used on an alternating basis and the flows will be switched during planned shut-down of dredge operations. This will allow time for maintenance of the screen and slurry tank that is not in use.

2.2.3 Start and Stop

The screen shaker motors, auger motors, wash water system, conveyors, and VGAC system will be manually started when there is flow to the screens. All motors are single speed and will be started by a local operator. The system components will continue to run until there is no flow and no dredged materials on the screens. The augers will be permitted to run as long as the geotextile feed pumps are operating.

2.2.4 Wash Water Sources and Control

The primary source for screen wash water is the geotextile tube filtrate and stormwater in the SCA basin sumps. The water will be supplied by the screen wash water pump located near the SCA basin. The field operator will manually open the valves in the line connected to each individual screen on the screen system.

2.3 GEOTEXTILE TUBE FEED PUMPS

There are three geotextile tube feed pumps – two will be needed to provide the design flow and one will be a spare. Manual valves will be installed in the suction and discharge lines to each pump.

2.3.1 Staffing and Controls

The slurry processing area, where the geotextile tube feed pumps are located, will be staffed by at least one operator in the field. The geotextile tube feed pump's speed will be directly controlled by the operator of the sediment processing control system to maintain the level of the screen tanks within the specified operating range. Pressure at the geotextile tube discharge will be communicated to the sediment processing control system. Start and stop of the geotextile tube feed pumps will also be controllable by manual operation locally or via the sediment processing control system.

2.3.2 Sequence of Pump Use

A manifold system is designed so that any two of the three pumps can be used with either screen tank or both tanks. Use of the pumps will be rotated periodically. Manual valves will be used to divert flow to the desired pumps.

2.3.3 Start and Stop

The field operator will use the local control panel to designate which pump is the stand-by pump and close the appropriate valves to isolate the stand-by pump. The two active pumps will be started and stopped based on the liquid level in the screen tanks.

2.3.4 Seal Water System

Each geotextile tube feed pump will have a seal water system that will use WTP effluent or potable water from local public utilities (as a backup). In automatic mode, the sediment processing control system will start and stop the seal water pump at the same time as the geotextile tube feed pump. Seal water pumps will be stopped when water is not available in the water storage tank (i.e., low level). The seal water pump may also be started and stopped locally or remotely by the sediment processing control system.

2.4 DRY POLYMER MIXING AND AGING

The dry polymer mixing and aging system consists of pumps, tanks, and mixing equipment sufficient to mix dry polymer with water to make the polymer solution and to provide storage for aging. Water will be sourced from WTP effluent and potable water pipeline (as a backup source). Polymer will be provided in bulk bags.

2.4.1 Staffing and Controls

A field crew will staff the polymer and aging system as well as the polymer injection system. Instrumentation on the system includes level measuring devices in the tanks and flow meters on the input water lines. The local field crew will use the input from these instruments to manually control the polymer mixing and aging operation. The data from the meters, as well as pump run status, will be communicated to the sediment processing control system. There are no special considerations associated with starting and stopping of this system.

2.4.2 Dry Polymer Mixing

Dry polymer will be mixed with water by pumping water at a controlled rate into a make-up unit, to which dry polymer will also be added. The speed of the pumps that add water to the make-up unit will be controlled to provide the desired flow rate of water. The flow rate will depend on the rate of dry polymer addition and the desired concentration of the resulting polymer solution. The polymer solution will flow from the make-up unit into mixing tanks, in which the materials will be mixed and aged. After the aging period is complete, the solution will be pumped to the polymer injection system.

The primary water source will be WTP effluent. Water will be transferred from the WTP to a storage tank that will supply water to the polymer make-up water pumps. The back-up water source will be potable water.

2.4.3 Polymer Aging

The polymer mixing operation will function in batch mode to provide sufficient time for the polymer mixing and aging steps to be completed prior to injecting into the dredge slurry. Based on the anticipated polymer injection rate, and time needed for the mixing and aging steps, several tanks will be utilized to store the polymer solution during the mixing/aging process. These tanks will be used sequentially, which will ensure that a continuous supply of appropriately mixed and aged polymer solution is available to inject into the slurry.

Planned shutdown periods will be considered in the polymer makeup process, to minimize the quantity of polymer left in the tanks for an extended period of time.

2.5 POLYMER INJECTION

Two polymer injection pumps will inject polymer solution from the polymer aging tanks into the slurry pipelines to the geotextile tubes in the SCA, with a polymer injection pump feeding each line.

2.5.1 Staffing and Controls

A field crew will staff the polymer and aging system as well as the polymer injection system. Instrumentation on the system includes flow meters and density meters on the polymer injection lines and on the slurry lines. These meters will be used by a local control system to determine the rate of polymer injection. The data from the meters, as well as pump run status, will be communicated to the sediment processing control system. The polymer injection pumps will be operating when the geotextile tube feed pumps are pumping slurry. There are no special considerations associated with starting and stopping of this system.

2.5.2 Pump Speed Control

The speed of the polymer injection pumps (and the resulting rate of polymer injection rate) will be determined by the mass transfer rate of dry solids in the slurry pipe to the SCA. The mass transfer rate will be calculated by the local control system, based on measurements from density meters and flow meters in the discharge line from the geotextile tube feed pumps.

The polymer application rate will be initially based on the result of the bench-scale testing done during design. The application rate will be adjusted during operations based on the rate of geotextile tube dewatering and the filtrate quality.

2.6 COAGULANT INJECTION

Two coagulant injection pumps will inject coagulant solution into the slurry pipelines to the geotextile tubes in the SCA, with a coagulant injection pump feeding each line.

2.6.1 Staffing and Controls

A field crew will staff the polymer and aging system as well as the coagulant injection system. Instrumentation on the system includes flow meters and density meters on the coagulant injection lines and on the slurry lines. These meters will be used by a local control system to determine the rate of coagulant injection. The data from the meters, as well as pump run status, will be communicated to the sediment processing control system. The coagulant injection pumps will be operating when the geotextile tube feed pumps are pumping slurry. There are no special considerations associated with starting and stopping of this system.

2.6.2 Pump Speed Control

The speed of the coagulant injection pumps (and the resulting rate of coagulant injection rate) will be determined by the mass transfer rate of dry solids in the slurry pipe to the SCA. The mass transfer rate will be calculated by the local control system based on measurements from density meters and flow meters in the discharge line from the geotextile tube feed pumps.

The coagulant application rate will be initially based on the result of the bench-scale testing done during design. The application rate will be adjusted during operations based on the rate of geotextile tube dewatering and filtrate quality.

2.7 GEOTEXTILE TUBE FILLING

The slurry from the sediment processing area will be directed to the geotextile tubes located within the SCA. Multiple tubes will be kept online concurrently, and the tube operators will be managing the bags through various fill/rest phases. Tube placement sequencing within the SCA will be developed as part of a contractor submittal.

2.7.1 Staffing and Controls

A field crew will staff the geotextile tube filling operation. Controls on the system will be primarily visual inspection with some sampling and analysis of filtrate. Stopping slurry flow will not be a routine operation from the geotextile tube filing operation. Standby goetextile tubes will be connected to the piping so that in the event that slurry flow needs to stop in an area of the SCA, it can be diverted to these standby tubes.

2.7.2 Fill Height

Geotextile tubes are filled in phases, with periods of “rest” between each phase to allow injected sediments to dewater and create enough capacity within the tube for the next phase. The primary method for monitoring the utilized capacity of a tube is the design fill height of the tube. Tube height is continuously monitored during filling operations. Once the design fill height has been reached, flow to that tube will be diverted until it has sufficiently dewatered for the next phase of filling, or it is determined that the bag is full.

2.7.3 Sediment Level Control

The level of sediment in each tube will be manually and visually monitored by the technicians in the field. The fill pipe will be moved between fill ports as needed to distribute the sediment evenly along the length of each tube.

2.7.4 Filtrate Quality Monitoring

The primary method for assessing filtrate quality is TSS. This will be monitored visually as the filtrate flows off the tubes, and using samples which will be collected on a regular basis and tested in the laboratory. In addition, the real-time turbidity will be monitored in the WTP influent.

2.8 SCA INTERIOR SUMP PUMPS

Each interior sump will have four constant-speed pumps, which will provide the ability to match a wide range of inflow rates. The inflow rate will vary during the duration of the project, as the filling sequence of the tubes will continuously redistribute the balance of filling tubes filling on the eastern and western portions of the SCA. The interior sump pumps will discharge to the SCA basin sumps.

2.8.1 Staffing and Controls

The SCA interior sump pumps will be staffed by a field operator (who will also oversee the SCA transfer pump operations). The SCA interior sump pumps will be primarily be automatically controlled by the level switches in the sumps. Levels in the sumps, as well as pump run status, will be communicated to the sediment processing control system. Each of the four pumps will start in sequential order based on the set point for each pump. Manual override of the automatic settings will be possible both locally and remotely by the sediment processing control system. There are no special considerations associated with starting and stopping of this system.

2.9 SCA TRANSFER PUMPS

The SCA transfer pumps are designed to accommodate a wide range of flow conditions, including all the flow diverted to either the east or west side of the SCA. Each of the SCA basin sumps includes two pumps designed to operate in parallel. The pumps in the western SCA basin sump will discharge to the eastern SCA basin sump. The eastern SCA basin sump will discharge to the WTP. Water level sensors will be located in each sump.

2.9.1 Staffing and Controls

The SCA transfer pumps will be staffed by a field operator (who will also oversee the SCA interior sump pump operations). The SCA transfer pumps will be primarily be controlled by the operator of the sediment processing control system. The pumps speed will be adjusted based on the water levels in the sumps. In addition to the pump status, water levels in the sumps will be communicated to the sediment processing control system. The maximum flow from the east sump will be limited to the capacity of the WTP. The flow to the WTP will be measured by a flow meter between the east pumps and the WTP. The sediment processing control system operator will coordinate the flows with the WTP operator.

2.9.2 Start and Stop

Start and stop of the SCA transfer pumps will be coordinated with the operator of the WTP. There are not other special considerations associated with start and stop of the SCA transfer pumps.

2.9.3 Sequence of Pump Use

The pumps will be started and stopped based on water level in the sumps. One pump will be set to start first and its speed will be increased to 100 percent before the second pump is started.

2.10 STORMWATER SUMPS AND PUMPS

Stormwater from the WTP area and the slurry processing area will flow to catch basins and from those catch basins to stormwater pumping stations via gravity piping. There are two stormwater sumps, one dedicated for the WTP area (SWPS#1) and one for the slurry processing area (SWPS#2). The two sumps are co-located in the slurry processing area, but not hydraulically connected. Pumps in those pumps stations will pump the water to dedicated geotubes. Backup discharge points are the SCA gravel area and screen tanks. Controls include level sensors in the stormwater pumping stations and pump run status indications. Data will be communicated to the sediment processing control system.

2.10.1 Staffing and Controls

The SCA stormwater sump pumps will be staffed by a field operator. The SCA stormwater sump pumps will primarily be automatically controlled by the level switches in the sumps. Manual override of the automatic settings will be possible both locally and remotely by the sediment processing control system.

2.10.2 Start and Stop

Start and stop of the stormwater pumps will be coordinated with the geotextile tube crew. There are no other special considerations associated with start and stop of the stormwater pumps.

SECTION 3

CONTINGENCY MEASURES

This section of the operations guidelines describes those actions that will be taken in the event of disruptions to normal operations.

3.1 WTP DISCHARGE SHUTDOWN CONTINGENCY

Since the WTP plant discharge to Metro must be stopped when the sewage flows are high, the dredging operations will be prepared to stop accordingly. During precipitation events, WTP operators will be in contact with Metro to gauge when/if the discharge will need to be terminated. Once direction from Metro is received to terminate the discharge flow, the dredging operation will stop. During this period, filtrate and precipitation will flow into the SCA and SCA Basins. When WTP discharge can resume, this water will be pumped out.

3.2 DREDGE AND BOOSTER PUMP CONTINGENCY MEASURES

3.2.1 Emergency Stop

The dredge pump and booster pumps will not normally be stopped when there is dredge slurry in the pipeline. However, there are stops built into the logic of the dredge control system and there will be emergency shut-down switches on the local control panel at each booster pump station and at the dredge. Additionally, there will be a shutdown button available on the sediment processing control system terminal screen. Emergency stops consist of closing valves on the suction and discharge of each booster pump and stopping the pumps. The dredge control system will implement stops when:

- zero pressure is detected in the suction or discharge of a booster pumps; and
- high level in a booster pump containment area is detected.

3.2.2 Pipeline Plugging

Reductions in slurry flow, which may be caused by partial plugging, will be indicated by increasing pressures on the discharge side of the booster pumps and a difference in flow leaving the dredge and arriving at the screens. The dredge operator and the sediment processing control system operators will be monitoring the performance of the booster pumps, and will note any significant changes in flow or pump performance. In the event of a significant change in flow or operating pressure, dredging will be temporarily stopped, the cause and location of the slurry flow reduction will be investigated, and corrective actions to eliminate any partial plugs will be taken.

In the event that the pipeline becomes completely plugged (indicated by no flow to the screen and high pressures in the pipeline), the dredge operator will immediately stop dredging sediment, and the booster stations will be shut down. Corrective actions to locate the plugged section of pipeline and unplug the line will be taken. Potential methods to locate plugged or partially plugged sections of the pipeline include video inspection and other highly specialized listening and plug detection equipment.

3.2.3 Pipeline Leak

The on-land portions of the slurry pipeline will be double-contained. Two systems will be in place to monitor for pipeline leaks. The first system will be a leak detection system that will detect fluid in the annular space between the carrier pipe and containment pipe. The second system will consist of monitoring the suction and discharge pressures of each booster pump.

If any fluid is detected by the leak detection system, the fluid will be withdrawn from observation ports in the pipe to determine the nature of the liquid. If it is determined that the liquid is accumulated condensation, the water will be drained and operations continued. If it is determined that accumulated liquid is dredge slurry, additional steps will be taken to locate the leak. Potential methods to locate leaks include video inspection and other highly specialized listening and leak detection equipment. Once the location of the leak has been located and assessed, the leak will be repaired, which may entail replacement of pipe sections, or re-welding of existing pipe sections. It will be determined, based on the nature of the leak, whether dredging operations will need to be immediately halted to repair the leak, or if it can be repaired during a subsequent planned down-time.

If zero suction or discharge pressures are detected at any booster pump (beyond a designated delay period), an emergency shutdown of the booster pump system will implemented, which will consist of stopping each booster pumps and closing the discharge valves at each booster pump.

3.2.4 Dredge Pump Stops Operating

If the dredge pump stops operating due to mechanical or electrical failure, the system will detect a decrease in pressure on the suction side of booster #1. The system includes an alternate suction from Onondaga Lake to booster #1, which will allow clean water to be pumped through the system to clear solids from the pipeline. This alternate suction will be implemented via manual activation of the pneumatically-actuated valves on the two suction lines. Once sufficient solids have been removed from the pipeline to avoid plugging (estimated at one pipe volume), the system will be shut down until operating issues with the dredge have been resolved, or until one of the secondary dredges can be brought on-line.

3.2.5 Booster Pump Stops Operating

If a booster pump stops operating, the dredge control system will detect a low pressure differential across the suction and discharge of a booster pump and implement a bypass of this booster pump. The valves on the failed pump’s suction and discharge lines will close and the bypass line around the down pump will open. As described in the Design Report, the system is designed with the capability to operate with one booster pump shut down. Once operating in bypass mode, the dredge operator will increase the speed of the upstream pumps (dredge pump and/or upstream boosters) to provide the pressure necessary to operate in by-pass mode.

3.2.6 Loss of Electric Power

The booster pump stations will be supplied with electric power from Solvay Electric or National Grid, depending on their location. If electric power is lost to a booster pump station, the pump will stop. The downed booster will be bypassed, as described in Section 3.2.5. The air compressor receiver tank will have sufficient volume to operate the automated, pneumatically-actuated valves without power.

If electric power is lost to more than one booster pump station, the dredge control system will activate a bypass of those down pump stations. However, since the system is designed for pump through of only one down booster, dredging will need to stop. Water will be pumped through the pipeline to reduce the amount of solids in the line.

3.2.7 Loss of Wireless Data Link Between Dredge and Booster #1

In the event of a loss of wireless connection between the dredge and booster #1, dredging operations will continue. Until the wireless data link is restored, the booster pump station operator and sediment processing system control system operators will more actively monitor the performance of the boosters and remain in constant radio communication with the dredge operator to ensure proper operation of the transport system. In addition, the operators will be able to communicate by radio.

3.2.8 Loss of Data Link

If the data link between the boosters and the sediment processing control system is not operational, dredging will continue with enhanced monitoring by the operators as described in Section 3.2.7. The booster pumps will continue to be controlled by their respective local control systems. In addition, the operators will be able to communicate by radio.

3.2.9 Seal Water System Not Operational

Seal water is necessary for long-term pump performance; however, the booster pumps can operate safely for a short period of time without seal water. If the seal water system is not operational, dredge operations will continue and repairs will be initiated during the next planned shutdown.

3.2.10 Pneumatic System Not Operational

The air supply system is needed to operate the automated, pneumatically-actuated knife-gate valves. The compressed air tank will be sized to provide sufficient air to operate all the valves at a pump station. If there is an alarm for the air compressor, a booster pump operator will be sent to repair the compressor. Dredge operations will continue as long as there is an adequate supply of compressed air contained in the tank.

3.2.11 Gear Oil System Not Operational

If the booster pump gear oil temperature is above the level recommended by the pump suppler, an alarm will be sent to the dredge and the sediment processing control system and a booster pump operator will be immediately sent to investigate and repair.

The pump will be operated as long as possible, based on specific criteria provided by the pump supplier. If the temperature reaches a critical level, then the pump will be stopped to prevent damage. The bypass valve will be opened, so that dredging can continue with one booster pump not in operation.

3.3 SCREEN

3.3.1 Emergency Stop

There are no stops for the screen equipment built into the logic of the sediment processing control system, however there will be emergency shut-down switches on the local control panel at the screens. Emergency stops of the screens would consist of stopping all moving machinery (the shakers, auger, and conveyors).

In the event of an emergency stop of the screens, slurry flow through the screens would be continued for a short period until either the screens are re-started or a normal stop procedure of the dredge could be performed (which includes pumping water through the slurry pipeline to clean solids could be performed).

If high level is reached at one of the screens, the sediment processing control system will automatically close the automated, pneumatic-actuated valves in the input line to that screen and open the input line to the other screen. If the high level is reached in both screens, both input line valves will be closed, which will cause a shutdown on the dredge. The dredge operator and sediment processing control system operator will be notified and the dredge will stop removing sediment. The operators will immediately investigate the cause of high levels and take corrective actions.

If the high levels cannot be reduced quickly, then the pneumatically-actuated knife-gate by-pass valve to the geotextile tube will be directed to open. This will allow dredging to continue or give time for a normal stop.

3.3.2 Screen Clogging

If the screens become clogged, the operator will divert flow to the second screen and the clogs will be manually removed. The cause of the clogging will be investigated to determine if modifications to the screening process should be implemented to optimize the performance of the screening operation. Modifications may include adjusting the screen opening size(s) utilized. The screen system is designed so that the screen panel can easily be removed and replaced with screens of different opening size. The size of the openings can be varied from ¼ inch to 2 inches.

The size may be adjusted during the duration of the project to provide the most efficient operation.

3.3.3 Loss of Electric Power

If electric power is lost to the screens, but not the booster pumps or geotextile feed pumps, operations will continue and alarms will be sent to the dredge and WTP control station. Without the shaker motors and auger motors, there is a risk that the screens will become clogged and that solids will clog the screen tank so that slurry flow to the geotextile feed pumps will be reduced or stopped. If power is not restored within a short time, a normal dredge shut down will be initiated.

3.3.4 Valves Not Operational

If the pneumatically-actuated valves in the slurry inlet to the screens are not operational and in the open position, dredging will continue and the dredge operation and WTP control station will be notified. Operators will prepare to implement a shutdown of flow to the screen by other methods, such as closing valves at booster pumps. Repair procedures will be initiated at the next planned shutdown. If the valves are stuck shut, then dredging will be stopped, and the valves will be repaired.

3.3.5 Wash Water System Not Operational

If the wash water system is not operational, dredging will continue and the dredge operator and sediment processing control system operator will be notified. Loss of wash water should not result in an immediate problem but could result in screen clogging eventually. Contingency measures in the event of screen clogging are discussed in section 3.3.2.

3.3.6 Conveyor Not Operational

If one conveyor is not operational, the slurry will be diverted to the second screen system and repairs will be initiated.

3.3.7 Loss of Data Link

In the event of a loss of data between the screen and the sediment processing control system, dredging operations will continue. Until the data link is restored, the operators will more actively monitor the performance of the screens and remain in constant radio communication with the dredge operator to ensure proper operation of the transport system. In addition, the operators will be able to communicate by radio.

3.4 GEOTEXTILE TUBE FEED PUMPS

3.4.1 Emergency Stop

The geotextile tube feed pumps will not normally be stopped when there is dredge slurry in the pipeline. However, there are stops built into the logic of the sediment processing control system and there will be emergency shut-down switches on the local control panel at each the geotextile tube feed pumps and at the dredge and sediment processing control system terminal.

Emergency stops consist of stopping the geotextile tube feed pumps. The sediment processing control system will implement stops when upon low level in the screen tanks.

3.4.2 Pipeline Plugging

Since most of the piping from the geotextile tube feed pumps is located in the geotextile tube area, plugging of this piping is discussed in Section 3.8.1

3.4.3 Pipe Leak

The geotextile tube feed pumps are in an area with secondary containment, so any leak would be contained. If a leak is detected, it will be investigated immediately. If possible, that section of pipe will be taken out of service and repaired while normal operations continue.

If there is a major leak that cannot be isolated, the pumps will be stopped and dredging will be stopped.

3.4.4 One Pump Not Operational

The system has been designed so that two geotextile tube feed pumps are continuously operating, with a third as an online stand-by. In the event that one of the pumps stop, the field operator would be notified and would immediately open the manual valves on the suction and discharge site of the stand-by pump and start the stand-by pump. Once two pumps were running, the system would be in normal operation mode.

3.4.5 Loss of Electric Power

If power is lost to the geotextile tube feed pumps, the pumps will stop. Slurry flow will accumulate in the screen tanks until the automated, pneumatically-actuated valves on the screen inlet piping close. Closure of these valves will cause the dredge and boosters to shut down.

3.4.6 Valves Not Operational

If the manual valves on the geotextile tube feed pump suction or discharge lines are stuck or do not seal when shut, the geotextile tube feed pumps will continue to operate as long as there is no backflow and the pumps do not cavitate. There are check valves on the discharge side of each pump which will prevent backflow through the stand-by pump, even in the valve in the discharge line leaks. There are manual valves at the slurry outlet of each screen tank that could be closed to prevent loss of suction.

3.4.7 Seal Water System

Seal water is necessary for long-term pump performance; however, the geotextile pumps can operate safely for a short period of time without seal water. If the seal water system is not operational, dredge operations will continue and repairs will be initiated during the next planned shutdown.

3.4.8 Loss of Data Link

In the event of a loss of data between the screen and the geotextile tube feed pumps, dredging operations will continue. Until the data link is restored, the operators will more actively monitor the performance of the geotextile tube feed pumps and remain in constant radio communication with the dredge operator to ensure proper operation of the transport system. In addition, the operators will be able to communicate by radio.

3.5 DRY POLYMER MIXING AND AGING

3.5.1 Emergency Stop

There are no stops for the dry polymer mixing and aging equipment built into the logic of the sediment processing control system, however there will be emergency shut-down switches on the local control system and at the sediment processing control system terminal. Emergency stops of the dry polymer mixing and aging equipment would consist of stopping all moving machinery (the pumps and mixers). There is no other immediate impact to other components of the system.

3.5.2 Pipeline Plugging or Leak

The polymer mixing and aging activities will be performed in an area with secondary containment, so any leak would be contained. If a plug or leak is detected, it will be investigated immediately. If possible, that section of pipe will be taken out of service and repaired while normal operations continue. If there is a major leak that cannot be isolated, the pumps will be stopped and dredging will be stopped.

3.5.3 Equipment Not Operational

Since the polymer make-up and aging will be done in batch modes, a short-term shut-down of the mixing equipment, whether due to mechanical issues or loss of power, would not impact dredging or slurry dewatering operations because it is likely that some storage of polymer solution would be available. The aging tanks will contain sufficient polymer solution for several hours of operation.

If all the mixing equipment was not operational for more than a few hours, dredging, and slurry dewatering operations would have to be stopped.

3.5.4 Loss of Data Link

The equipment in the polymer mixing and aging area will have a local control system. In addition, the operators will be able to communicate by radio. Therefore, if the data links are lost, dredging operations will continue and the equipment will be manually monitored until the data links are restored.

3.6 POLYMER INJECTION

3.6.1 Emergency Stop

There are no stops for the polymer injection equipment built into the logic of the sediment processing control system, however, there will be emergency shut-down switches on the local control system and at the sediment processing control system terminal. Emergency stops of the polymer injection equipment would consist of stopping all moving machinery (the pumps). There is no other immediate impact to other components of the system.

3.6.2 Pipeline Plugging or Leak

The polymer injection activities will be performed in an area with secondary containment, so any leak would be contained. If a plug or leak is detected, it will be investigated immediately. If possible, that section of pipe will be taken out of service and repaired while normal operations continue. If there is a major leak that cannot be isolated, the pumps will be stopped and dredging will be stopped.

3.6.3 Injection Pump Not Operational

If the polymer injection pumps are not operational, whether due to mechanical problems or loss of power, the slurry sent to the geotextile tubes would not be mixed with the polymer needed for efficient dewatering. Without the addition of polymer, geotextile tube performance (rate of dewatering, quality of filtrate) will be impacted.

If loss of the polymer pumps occurs, a normal shut down of dredging and dewatering operations would be implemented and repair procedures will be initiated.

3.6.4 Density or Flow Meters Not Operational

The impact of density or flow meters not operational could result in an incorrect amount of polymer added to the dredge slurry, if the properties of the slurry significantly vary, which could impact the performance of the tubes (rate of dewatering, quality of filtrate). Loss of the density or flow meters would not require immediate shut down of dredge or dewatering operations, but the polymer system operator will be notified, and repair procedures will be initiated.

3.6.5 Loss of Data Link

The equipment in the polymer mixing, aging, and injection area will have a local control system. In addition, the operators will be able to communicate by radio. Therefore, if the data links are lost, dredging operations will continue and the equipment will be manually monitored until the data links are restored.

3.7 COAGULANT INJECTION

3.7.1 Emergency Stop

There are no stops for the coagulant injection equipment built into the logic of the sediment processing control system, however there will be emergency shut-down switches on the local control system and at the sediment processing control system terminal. Emergency stops of the coagulant injection equipment would consist of stopping all moving machinery (the pumps). There is no other immediate impact to other components of the system.

3.7.2 Pipeline Plugging or Leak

The coagulant injection activities will be performed in an area with secondary containment, so any leak would be contained. If a plug or leak is detected, it will be investigated immediately. If possible, that section of pipe will be taken out of service and repaired while normal operations continue. If there is a major leak that cannot be isolated, the pumps will be stopped and dredging will be stopped.

3.7.3 Injection Pump Not Operational

If the coagulant injection pumps are not operational, whether due to mechanical problems or loss of power, the slurry sent to the geotextile tubes would not be mixed with the coagulant needed for efficient dewatering. For non-ILWD dredging, without the addition of coagulant, geotextile tube performance (rate of dewatering, quality of filtrate) will be impacted.

Loss of the coagulant pumps would not require an immediate shut down of dredging and dewatering operations, but an alarm would be sent to the coagulant system operator, and repair procedures will be initiated.

3.7.4 Density or Flow Meters Not Operational

The impact of density or flow meters not operational could result in an incorrect amount of coagulant added to the dredge slurry, if the properties of the slurry significantly vary, which could impact the performance of the tubes (rate of dewatering, quality of filtrate). Loss of the density or flow meters would not require immediate shut down of dredge or dewatering operations because it is likely that some storage of coagulant solution would be available, but the coagulant system operator will be notified, and repair procedures will be initiated.

3.7.5 Loss of Data Link

The equipment in the coagulant mixing and injection area will have a local control system. In addition, the operators will be able to communicate by radio. Therefore, if the data links are lost, dredging operations will continue and the equipment will be manually monitored until the data links are restored.

3.8 GEOTEXTILE TUBE FILLING

The geotextile tube filling operation will have multiple headers and geotextile tubes attached online and ready to accept slurry at any time. This provides the flexibility to shift slurry flow quickly by opening or closing manual valves in the header pipes around the disposal cell area in the event of an unplanned incident (in lieu of an emergency stop). Slurry to the geotextile tube filling operations will be pumped by the geotextile tube feed pumps. A separate power source is not needed for the geotextile tube filling operations and therefore contingency measures for loss of power in this area are not needed. Information regarding the geotextile tube filling operations will be conveyed via radio communications. Contingency measures for loss of data link is not needed for this area.

3.8.1 Pipeline Plugging

In the event that one of the lines to an individual tube plugs, the flow will be diverted to another tube. If the plug is in one of the header pipes, then the flow will be diverted to another header that is ready to accept slurry. If the plug is in one of the pipes on the perimeter of a cell, flow will be diverted to another area within the disposal cell, if possible.

If rerouting the flow to another tube or header pipe is not viable, flow from the geotextile tube feed pumps, and subsequently the dredge, will be stopped via radio communication until the plug was located and removed.

3.8.2 Pipeline Leak

The tubes and piping are all either within a containment area, or are double-contained pipe, so that if a leak were to occur, the slurry would be contained. If a leak is discovered, the slurry flow will be diverted out of the area that was leaking and repairs would be initiated immediately. Depending on the location and degree of the leak, flow from the geotextile tube feed pump corresponding to the leaking line may be stopped until repairs can be made, or the leaking line can be replaced.

3.8.3 Valves Not Operational

All the valves in the geotextile tube filling area will be manually operated. If a valve cannot be completely closed, the flow will be diverted from non-functional valve, and the valve repaired. Flow will be diverted to separate header system (if necessary) and to separate tubes, to allow dredging to continue.

3.8.4 Tube Leak

If a tube is leaking at a seam or hole in the fabric, flow to the tube will be cut off immediately and no additional slurry will be discharged to the tube. Any sediment spilling into the gravel collection area will be removed to a designated area, so as to not foul the gravel collection system. If necessary, a similarly sized tube may be placed over the ruptured tube and partially filled to achieve the necessary grade to continue stacking tubes.

3.8.5 Unexpected Stability or Settlement

If unexpected stability or settlement is detected by the SCA monitoring system during geotextile tube filling, contingencies will be implemented. Contingencies to be implemented during unexpected stability or settlement are described in the Geotechnical Instrumentation and Monitoring Plan, which is part of the SCA design package.

3.9 SCA INTERIOR SUMP PUMPS

3.9.1 Emergency Stop

The emergency shut-down switch on the local control panel will stop the pumps. There is no other immediate impact to other components of the system.

3.9.2 Pipeline Plugging and Leak

Since the SCA interior sump pumps will be pumping filtrate that has been passed through the geotextile tubes, the potential for plugging is low. The SCA pumps and piping will be contained in the SCA, so leaks would be contained. The pumps will be retrievable from the interior sumps and the piping will be above-grade, so location and repair of plugs or leaks will be feasible in the event that they do occur.

3.9.3 Loss of Electric Power

If power is lost to the interior sumps, filtrate and stormwater might continue to flow by gravity into the sumps and the water level in the sumps would rise. Assuming power is not lost to slurry processing equipment, dredging and dewatering operations will continue for short-term power outages to the sump pumps because the water would be only temporarily contained in the SCA. If the power is lost for an extended period of time, dredging will be stopped, and water would be removed with temporary, portable diesel powered pumps, if determined to be necessary.

3.9.4 One Pump Not Operational

There are four pumps in each sump and total pump capacity is based on the condition that all the filtrate is flowing into one of the two sumps. During most of the project work, filtrate will be flowing into both sumps, so less than four pumps will be needed and the fourth pump will be a standby. Failure of any single pump would have minimal impact because the standby pump could be activated. Failing pumps will be pulled out of the sump and repaired/replaced as necessary.

3.9.5 Loss of Data Link

In the event of loss of data link between the SCA interior sump pumps and the sediment processing control system, the pumps will be monitored by a field operator. The cause of the loss of data link will be ascertained and repaired. If the repair is minor, dredging will continue while the repair is made.

3.10 SCA TRANSFER PUMPS

3.10.1 Emergency Stop

The emergency shut-down switch on the local control panel will stop the SCA transfer pumps. There is no other immediate impact to other components of the system.

3.10.2 Pipeline Plugging and Leak

Since the SCA transfer pumps will be pumping filtrate that has been passed through the geotextile tubes, the potential for plugging is low. The SCA transfer pumps and piping will be contained in the SCA or sleeved in secondary piping between the SCA and the WTP, so leaks would be contained. The pumps will be retrievable from the sumps and the piping will be above-grade, so location and repair of plugs or leaks will be feasible in the event that they do occur.

3.10.3 Loss of Electric Power

If power is lost to the SCA transfer pumps, filtrate and stormwater will continue to flow by gravity into the SCA basin sumps and will continue to be pumped into the SCA basin sumps by the interior sump pumps (in the case that they have power); therefore, the water level in the SCA basin sumps will continue to rise. It will be safe to continue dredge and dewatering operations for a short period of time and let filtrate and stormwater accumulate in the SCA basins. However, if power is lost to the East SCA pumps, there would be no flow to the WTP.

In the event that water cannot be pumped to the WTP, an alarm will be sent to the dredge and sediment processing control system. If the power cannot be restored in a short time, it will be necessary to initiate a routine shut-down of the dredge and booster pumps.

3.10.4 Flow Meter Not Operational

If the flow meter is not operational, the rate of flow to the WTP will be estimated from the pump curves and experience in actual operations. Additionally, data from flow meters in the WTP will be monitored. An alarm will be sent to the sediment processing control system.

3.10.5 One Pump Not Operational

If one of the pumps on the west side is not operational, it would likely have a minor impact because the second pump would be available. This one pump may suffice to remove the amount of flow to this basin. If it is not, some temporary accumulation in the West Basin would be allowed until the problem with the down pump is evaluated.

If one of the pumps on the east side is not operational, the flow to the WTP would be reduced. The WTP would remain in operation, but there could be a build-up of filtrate and water in the SCA, which would flow by gravity into the SCA basins. Therefore, dredging and some temporary accumulation in the East Basin would be allowed while the problem is evaluated.

3.10.6 Loss of Data Link to WTP

The pumps will have local control systems. In addition, the operators will be able to communicate by radio. Therefore, if the data link is lost, dredging and dewatering operations will continue.

In the event of loss of data link between the SCA transfer pumps and the sediment processing control system, the pumps will be monitored by a field operator. The cause of the loss of data link will be ascertained and repaired. If the repair is minor, dredging will continue while the repair is made.

3.11 STORMWATER SUMPS AND PUMPS

If the stormwater sump pumps are stopped, either due to a manual emergency stop or a power outage, any precipitation will continue to flow by gravity into the stormwater pumping stations. Both the WTP area and slurry processing area are designed to self-contain 100-year 24-hour storm without any pumping, so there is no immediate impact to other components of the system.