

Implementation Plan for AECOM Recommendations Q2 2022

August 2022



King County

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II. Ordinance Text

Ordinance 18628¹ is attached in full as Appendix A.

SECTION 2. The executive shall prepare and transmit quarterly reports describing progress in implementing the West Point Treatment Plant Independent Assessment Final Report Implementation Plan and the requirements of the administrative order against King County wastewater treatment division issued on September 12, 2017, by the Washington state Department of Ecology. The reports shall address both the summary recommendations and the mitigation strategies of the independent assessment; they shall also address the corrective action requirements of the Washington state Department of Ecology administrative order. The executive shall prepare and transmit an implementation plan by February 15, 2018, with quarterly reports transmitted no later than forty-five days after the close of each fiscal quarter thereafter, through the date that the implementation plan timeline required by section I of this ordinance indicates completion of accomplishment of recommendations.

III. Executive Summary

As of the second quarter (Q2) 2022, 67 of the AECOM West Point Independent Assessment Report's proposed 98 recommendations are now complete and five are in progress.² The remaining 26 recommendations will not be implemented because they have either been evaluated as infeasible or will be addressed through a different course of action than proposed in the initial recommendation.

Status of the implementation of the AECOM recommendations is detailed in Appendix B and the Wastewater Treatment Division (WTD) continues to make good progress toward completion of the remaining recommendations. The items below highlight progress made during Q2 2022:

- In response to the first requirement of implementing a Life Safety Management System (LSM), Instructor-facilitated LSM training has concluded. LSM training is transitioning to online only and is expected to be available in Q3 2022.
- WTD completed the recruitment process for the Operator-in-Training (OIT) 2022 recruitment and hiring. This process resulted in the selection and hiring of 20 OIT positions.

IV. Background

Department Overview: The King County Department of Natural Resources and Parks (DNRP) works in support of sustainable and livable communities and a clean and healthy natural environment. Its mission is to foster environmental stewardship and strengthen communities by providing regional parks, protecting the region's water, air, land and natural habitats, and reducing, safely disposing of and creating resources from wastewater and solid waste.

¹ [Link to Ordinance 18628](#)

² [Link to AECOM West Point Assessment](#)

The Wastewater Treatment Division (WTD) of DNRP protects public health and enhances the environment by collecting and treating wastewater while recycling valuable resources for the Puget Sound region.

Key Historical Context: On February 9, 2017, a severe flood occurred at the West Point Treatment Plant. The flooding inundated electrical and mechanical equipment resulting in emergency bypasses of sewage through the emergency outfall and discharge of partially treated sewage through the offshore outfall.

At the direction of the King County Council, the West Point Independent Assessment Report, dated July 18, 2017, was prepared by AECOM following the flood event. The report proposed 98 recommendations to minimize the likelihood of future flooding and performance issues at the plant. Ordinance 18628 requires an Implementation Plan for the AECOM Recommendations that specifically addresses each of the 98 recommendations.

On November 15, 2017, the Washington State Department of Ecology (Ecology) issued an Amended Administrative Order #15480, which required WTD to complete six corrective actions related to the flooding event. In addition, Ordinance 18628 requires an Implementation Plan that addresses each of these required corrective actions. As of February 2019, all six corrective actions were completed.

Key Current Context: WTD staff continue efforts to address the AECOM report recommendations. This is being done through capital projects, training, and operational procedural evaluations and improvements, as well as modifications to document control practices.

As reported in Q4 2021, performance data from the newly installed West Point Flood Risk Reduction Systems (FRRS) was to be evaluated through Q3/Q4 2021 to determine how to best address recommendation items 58, 59, 63 and 64 shown in Appendix B.³ Starting in Q1 2022, DNRP worked with a consultant to develop a solution to protect the plant from flooding due to high-level conditions. The original recommendation from AECOM would have reduced a life safety system to rely on a single instrument, which increases the risk of false activation that can lead to inadvertent bypasses or fail to activate and cause the plant to flood. The new solution will be a fully hardwired system with instrument redundancy for status confirmation. The system will protect the plant from flooding due to high-level conditions and avoids reliance on single instrument activation. This work will address the underlying concern over instrumentation and control identified by AECOM. As indicated in the Q1 report, this work is on-going and will be completed in Q3 2023.

This report furthers the King County Strategic Plan goal of an efficient, accountable regional and local government by providing an open and transparent update on the implementation of AECOM's recommendations to ensure the event that occurred at West Point on February 9, 2017, does not occur in the future. This report also furthers the Strategic Climate Action Plan goal of preparing for climate change by describing WTD actions to prepare West Point to manage the effects of increasingly severe storms.

Report Methodology: On April 24, 2017, the King County Council commissioned AECOM to perform an independent assessment of the event that occurred at West Point on February 9, 2017. AECOM staff

³ The FRRS is a second independent series of float switches installed throughout the plant to provide redundancy to the primary float system. It provides redundant high-water level alarms, automated gate controls and pumping system shutdowns to prevent plant flooding.

worked closely with the Council and WTD engineering and plant operations staff to complete its assessment. AECOM developed a systematic approach based on its experience from similar work, customized to the specific needs of this project. The approach consisted of the following steps:

1. Data collection
 - a. Collection of existing documents
 - b. Field visits and interviews
2. Data review and analyses
 - a. Data Analyses and initial assessment of failure mechanisms
 - b. Hazard and operability (HAZOP) workshop
 - c. Refinement of failure mechanisms and development of recommendations

AECOM's independent assessment report, completed in July 2017, proposed 98 potential mitigation strategies to minimize the likelihood of future flooding and performance issues at the plant. WTD had completed or had already begun implementing several of the recommendations prior to completion of the report. Upon receipt of the July 2017 report, WTD began work in earnest to review and implement the 98 potential mitigation strategies.

WTD developed a table (Appendix B) to track the implementation status of each of the 98 mitigation strategies. The table is updated quarterly.

WTD engaged AECOM in early 2018 to conduct an independent review of WTD's responses, action plans, and progress of each strategy, and to provide WTD with an independent opinion on the implementation status of each strategy. The AECOM technical team completed its assessment in March 2018⁴ and concluded that WTD had fully evaluated all 98 mitigation strategies and had completed, or were making progress on, the applicable or feasible strategies.

Through a combination of internal subject matter experts and engineering consultants, WTD continues to track and make progress on the outstanding mitigation strategies. WTD is also engaging with Ecology on several mitigation strategies that have potential National Pollutant Discharge Elimination Permit (NPDES) impacts, such as the Raw Sewage Pump Improvement and Passive Bypass Weir projects.

V. Report Requirements

Ordinance 18628 requires an Implementation Plan for the AECOM Recommendations that specifically addresses each of the 98 strategies. Specifically, the Ordinance requires the report to address:

- A. Implementation of a Life Safety Management System;*
- B. Development, implementation and continuous improvement of more comprehensive emergency/wet weather training;*
- C. Assessment of strategies to address plant constraints and improve redundancy;*
- D. Evaluation and prioritization of potential capital improvement projects to increase redundancy and minimize the risk of flooding.*

⁴ [Link to March 2018 AECOM Report](#)

Table 1 lists the categories of recommended strategies and summarizes their current accomplishment status. The full list of 98 recommendations can be found in Appendix B, where updates since the Q4 2021 report are shown in bold.

Table 1 – Recommended Strategies by Category

Category	Total # of Recommendations	Adopted		Not Incorporated
		In Progress / Under Evaluation	Completed	
Plant Hydraulics	6	3	1	2
Influent Control Structure	8	0	7	1
Preliminary Treatment	2	0	1	1
Raw Sewage Pump Station	8	1	6	1
Pre-aeration and Sedimentation Tanks	7	0	3	4
Flow Diversion Structure	3	0	3	0
Effluent Pump Station	11	0	7	4
Electrical	9	0	7	2
Instrumentation and Control	12	1	2	9
Staffing	2	0	2	0
Operators	13	0	12	1
Training	5	0	5	0
Equipment and System Testing	9	0	8	1
Maintenance Procedures	3	0	3	0
Totals	98	5	67	26

Starting in Q1 2022, DNRP worked with a consultant to develop a solution to protect the plant from flooding due to high-level conditions. The original recommendation from AECOM would have required a life safety system to rely on a single instrument, which increases the risk of false activation that can lead to inadvertent bypasses or fail to activate and cause the plant to flood. The new solution will be a fully hardwired system with instrument redundancy for status confirmation. The system will protect the plant from flooding due to high-level conditions and avoids reliance on single instrument activation. This work will address the underlying concern over instrumentation and control identified by AECOM. Work on the design of a new solution continued in Q2 2022 and is scheduled to be implemented in Q3 2023.

A. Implementation of a Life Safety Management System (LSM)

LSM is a rigorous system of identifying hydraulic, electrical, and gas equipment that present a risk for WTD staff and establishing strong protocols for making any equipment changes to incorporate safety requirements. WTD manages these changes to ensure the culture of protecting employee safety remains paramount. WTD is committed to the expansion and improvement of the overall LSM program at the West Point Treatment Plant into a sustainable and long-term program starting with its adoption of process safety management elements. The program team concluded instructor facilitated LSM training workshops in Q2 and is transitioning to online only platform which is expected to be available to employees in Q3 2022.

In Q2 2022, staff continued the effort to digitize training manuals and project documents. However, the work is currently on hold for the remainder of 2022, due to lack of staff availability and will resume in Q1 2023. Staff will continue refining the draft LSM operating manual and workflows.

B. Development, implementation, and continuous improvement of more comprehensive emergency/wet weather training.

During Q2 2022, WTD completed the recruitment process for the 2022 Operator in Training (OIT) program. This process resulted in the selection and hire of 20 OIT positions, which is an increase of six positions from 2021.

C. Assessment of strategies to address plant constraints and improve redundancy.

Review and improvement of plant operational procedures is a continuous improvement process which will continue through Q4 2022.

D. Evaluation and prioritization of potential capital improvement projects to increase redundancy and minimize the risk of flooding.

The West Point Raw Sewage Pump Replacement Project pre-design activities are progressing as scheduled with budget and schedule baseline projected for the end of Q2 2022.

The recommended alternative for the warning systems upgrade project, which will provide visual and auditory alarm warnings that alert personnel to hazardous conditions in various spaces, is proceeding with design on the recommended alternative.

VI. Conclusion/Next Steps

Staff and a consultant will continue to evaluate the alternative solution for recommendations 58, 59, 63, and 64 with potential implementation in Q3 2023.

Instructor facilitated LSM trainings began in Q1 2022 and concluded in Q2 2022. Online video training will be available to employees in Q3 2022. The 20 OIT positions hired during Q2 2022 started their training in May 2022.

WTD is committed to evaluating and, where appropriate, implementing AECOM's recommendations and mitigation strategies. Appendix B to this report provides details on WTD's progress on the 98 AECOM recommendations. Specifically, it provides the timelines for completion of each of the remaining five recommendations, resolution of the 67 completed recommendations, and identifies those 26 recommendations that are either infeasible or have been addressed through an alternative action.

VII. Appendices

Appendix A – Ordinance 18628

Appendix B – AECOM Recommended Responses



KING COUNTY

1200 King County Courthouse
516 Third Avenue
Seattle, WA 98104

Signature Report

December 12, 2017

Ordinance 18628

Proposed No. 2017-0429.2

Sponsors Kohl-Welles and Lambert

1 AN ORDINANCE providing for an implementation plan
 2 and reports related to implementation of recommendations
 3 of the West Point Treatment Plant Independent Assessment
 4 Final Report and the administrative order of the
 5 Washington state Department of Ecology, and requiring
 6 capital project oversight of the execution of the
 7 implementation plan.

8 STATEMENT OF FACTS:

- 9 1. In response to the February 9, 2017, system failure event at the West
 10 Point Treatment Plant, the council passed Motion 14826, commissioning
 11 an independent assessment of circumstances leading to the event, and
 12 identification of appropriate responses.
- 13 2. AECOM Technical Services, the selected consultant, delivered the
 14 West Point Treatment Plant Independent Assessment Final Report on July
 15 18, 2017.
- 16 3. The executive was consulted extensively in preparation of the report,
 17 and the development of recommendations. The executive has indicated
 18 support of the report's recommendations.
- 19 4. There were several concerns and recommendations that the report

20 emphasized, including:

21 a. The need for systems redundancy. Major West Point Treatment Plant
22 systems, such as influent and effluent pumping, sedimentation tanks,
23 contact channels, weir gates and other systems, operate with little or no
24 margin for error during major storms. If an operational unit of one of
25 these systems fails, the hydraulic processing capacity of the larger plant
26 can be significantly impacted, requiring that staff either attempt to quickly
27 restore the system or to initiate emergency bypass. The federal
28 Environmental Protection Agency encourages building in a safety margin
29 through system redundancy in wastewater treatment facilities. The report
30 recommends significantly strengthened redundancy throughout the plant;

31 b. Strengthened emergency response training. The report found
32 shortcomings in the training provided to staff, noting that current training
33 does not clearly define when emergency bypass is appropriate, and further
34 noting that current emergency response training does not anticipate the
35 kind of event that occurred on February 9, 2017. The report recommends
36 strengthened emergency response training; and

37 c. Management of complexity. The report notes that, as demands have
38 increased, the West Point Treatment Plant has grown to be a large,
39 complex treatment facility with numerous complex mechanical, chemical,
40 biological and electrical systems. In such systems, the report notes that
41 the impact of single plant elements on overall operability is not readily
42 apparent and that interdependency between systems and communications

43 between operating teams is critical. The report recommends a thorough,
44 systemic evaluation of the function, performance and safety of plant
45 systems, to improve vertical and horizontal communications regarding
46 plant risks, strengthen decision documentation and improve maintenance
47 levels. This recommendation is based on approaches used in the chemical
48 industry, and is referred to in the report as life safety management.

49 5. The recommendations are presented in two formats:

50 a. Summary recommendations:

51 (1) Implement a life safety management system;

52 (2) Conduct comprehensive emergency response training; and

53 (3) Conduct an integrated evaluation to address plant constraints and
54 improve redundancy.

55 (4) Optimize a capital improvement plan to maximize redundancy; and

56 b. System evaluation recommendations: potential failure mechanisms
57 and mitigation strategies:

58 (1) Plant hydraulics;

59 (2) Process and mechanical;

60 (3) Preliminary treatment;

61 (4) Raw sewage pump station;

62 (5) Preaeration and primary sedimentation tanks;

63 (6) Flow diversion structure;

64 (7) Effluent pump station;

65 (8) Electrical;

- 66 (9) Instrumentation and control;
- 67 (10) Operations;
- 68 (11) Staffing;
- 69 (12) Operator performance;
- 70 (13) Operator training;
- 71 (14) Equipment and systems testing procedures; and
- 72 (15) Maintenance procedures.

73 6. On September 12, 2017, the Washington state Department of Ecology
74 issued an administrative order, WDOE Administrative Order Docket No.
75 15325, requiring King County to comply with specified provisions of the
76 Revised Code of Washington, the Washington Administrative Code and
77 National Pollution Discharge Elimination System Permit No.
78 WA0029181. The order includes findings regarding the February 9, 2017,
79 system failure event.

80 7. The council's oversight and accountability function requires that, for
81 major system failure events such as the February 9 West Point Treatment
82 Plant event, a comprehensive monitoring and reporting process,
83 addressing progress in implementing corrective recommendations, be
84 instituted. Motion 14826 provides that the council, by subsequent council
85 action, is to provide for reporting on the implementation of the
86 recommendations of the independent assessment.

87 BE IT ORDAINED BY THE COUNCIL OF KING COUNTY:

88 SECTION 1. The executive shall develop an implementation plan addressing the

89 recommendations of the West Point Treatment Plant Independent Assessment Final
90 Report, including both the Summary Recommendations and the Mitigation Strategies
91 provided in the final report as well as the requirements of the administrative order against
92 King County wastewater treatment division issued on September 12, 2017, by the
93 Washington state Department of Ecology. The plan shall include a timeline for
94 accomplishment of the recommendations and the requirements of the administrative
95 order. If the executive believes that a given recommendation is impractical or
96 inappropriate, the plan shall so indicate and shall provide an explanation supporting the
97 executive's reasoning.

98 SECTION 2. The executive shall prepare and transmit quarterly reports
99 describing progress in implementing the West Point Treatment Plant Independent
100 Assessment Final Report Implementation Plan and the requirements of the administrative
101 order against King County wastewater treatment division issued on September 12, 2017,
102 by the Washington state Department of Ecology. The reports shall address both the
103 summary recommendations and the mitigation strategies of the independent assessment;
104 they shall also address the corrective action requirements of the Washington state
105 Department of Ecology administrative order. The executive shall prepare and transmit an
106 implementation plan by February 15, 2018, with quarterly reports transmitted no later
107 than forty-five days after the close of each fiscal quarter thereafter, through the date that
108 the implementation plan timeline required by section 1 of this ordinance indicates
109 completion of accomplishment of recommendations.

110 SECTION 3. The reports and plan required under sections 1 and 2 of this
111 ordinance, respectively, may be combined with the quarterly reports required by Motion

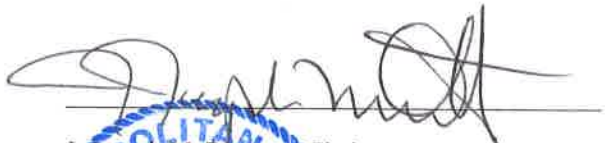
112 14813, through the end of the reporting period required by that motion. Following that
113 date, the quarterly reports shall separately continue through the end of the timeline for
114 accomplishment required by section 1 of this ordinance.

115 SECTION 4. The county auditor shall conduct oversight of the executive's
116 execution of the implementation plan required by section 1 of this ordinance, and prepare
117 a report describing the results of this oversight. The report shall be provided to the
118 council by March 1, 2019.

119 SECTION 5. The plan and reports required by section 1, section 2 and section 4
120 of this ordinance shall be transmitted in the form of a paper original and an electronic
121 copy to the clerk of the council, who shall retain the original and provide an electronic
122 copy to all councilmembers, the council chief of staff and the lead staff for the

123 transportation, economy and environment committee and regional water quality
124 committee, or their successors.
125

KING COUNTY COUNCIL
KING COUNTY, WASHINGTON

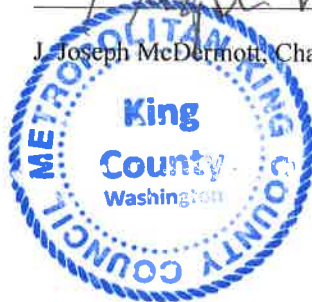


J. Joseph McDermott, Chair

ATTEST:



Melani Pedroza, Clerk of the Council



RECEIVED
2017 DEC 21 PM 3:52
KING COUNTY COUNCIL
CLERK

APPROVED this 21st day of DECEMBER, 2017



Dow Constantine, County Executive

Attachments: None


The following descriptions apply to the status assigned to the recommendations:


Status	Description
Complete	The recommendations have been implemented in full and there is no further action required.
In Progress	Implementation of the recommendations has begun but, due to complexity, resource availability, and/or budget constraints, the work is not yet completed.
Ongoing	Implementation of the recommendations has been completed and they are now systematically and/or programmatically subject to periodic review, updating, and/or continuous improvement.
Under Evaluation	Evaluation has begun to determine the feasibility of recommendations and their resource, prioritization, budgetary and scheduling constraints.
Implementing Alternative	Recommendations that were replaced with more effective, alternative solutions that meet the intent of the original recommendations.
Not Incorporated	After evaluation and consideration, the recommendations will not be implemented because they do not mitigate operation risks.

#	AECOM Table #	AECOM Recommendations	AECOM Comments	Status	Timeline	WTD Response
1	Table 10 Plant Hydraulics	Evaluate ways to improve control strategies and flow management within the collection system.	Help delay peak flows to West Point.	Under evaluation	2020 Initial Evaluation	WTD regularly considers collection system (pipeline) storage and control strategies when determining how to best manage flows. Storage is typically considered as an option when addressing collection system capacity constraints and is one of the control strategies to be evaluated in the Combined Sewer Overflow (CSO) planning work.
2	Table 10 Plant Hydraulics	Evaluate the collection system to identify new areas for storage.	For example, the Old Fort Lawton Tunnel.	Under evaluation	2020 Initial Evaluation	WTD regularly considers collection system (pipeline) storage and control strategies when determining how to best manage flows. Storage is typically considered as an option when addressing collection system capacity constraints and is one of the control strategies to be evaluated in the CSO planning work.
3	Table 10 Plant Hydraulics	Add primary treatment technologies to the collection system.	Relieve West Point during high flows.	Under evaluation	2020 Initial Evaluation	Adding treatment to the collection system has been and will continue to be considered as part of WTD's future long-term planning efforts. For example, the Georgetown Wet Weather Station that is currently under construction will add primary treatment technology to the collection system. Where appropriate, projects with primary treatment technologies, will be submitted and considered as part of WTD's Six-Year Capital Improvement Plan.

Changes made in Q2 2022 are bolded.


 = 'Under evaluation'


 = Almost done - 'in progress'


 = Done - includes 'complete', 'not incorporated', 'implementing alternative' 'ongoing'

#	AECOM Table #	AECOM Recommendations	AECOM Comments	Status	Timeline	WTD Response
4	Table 10 Plant Hydraulics	Consider implementing passive overflows at key locations.	Passive overflows that do not rely on equipment and controls provide the most failsafe mechanism to protect the plant and workforce.	Not incorporated	N/A	WTD has focused resources on eliminating flooding, overflows, and bypasses of the plant. This recommendation works against that effort as it may unnecessarily result in additional discharges to Puget Sound. WTD is proceeding with implementing the passive weir per recommendation 7, as it is a modification to provide redundancy for the plant's existing bypass system. Additional passive overflow systems to facilities are not a favored approach given other planned system improvements underway and the potential for additional sediment and water quality impacts.
5	Table 10 Plant Hydraulics	Request that West Point Treatment Plant (West Point) be regulated as a combined sewer overflow outfall.	Currently able to discharge to outfalls at other locations. This would require coordination with Department of Ecology.	Not incorporated	N/A	WTD has focused resources on eliminating flooding, overflows, and bypasses of the plant. This recommendation works against that effort as it would result in additional discharges to Puget. Preliminary inquiries with Ecology indicate that re-designating the plant as a CSO location would not be supportable under current state regulations. Additionally, flow into the plant can be regulated at various CSO treatment locations, such as Elliott West, Alki, and Carkeek along with various CSO locations.
6	Table 10 Plant Hydraulics	Evaluate maximizing flow through the overflow weir by allowing head to build in the Influent Control Structure.	There is some freeboard above the weir, but flow is limited because of the elevation of the high-high level alarm, triggering the Emergency Bypass gate to open. Increasing the water level in the Influent Control Structure can negatively influence downstream (bar screens) and upstream (Ballard weir) systems.	Complete	Capital project started in 2019	WTD completed a project that evaluated the viability and options to construct a passive weir. As a result, a project to construct the weir part of WTD's Six-Year Capital Improvement Plan. This project will need Ecology approval prior to implementation.
7	Table 11 Influent Control Structure	Evaluate adding a passive bypass weir.	Possibility of using the 84-inch Old Fort Lawton Tunnel to back flow to the Marine Outfall Gate at the Flow Diversion Structure. Utilize upstream storage, if any.	Complete	Capital project started in 2019	WTD completed a project that evaluated the viability and options to construct a passive weir. As a result, a project to construct the weir is part of WTD's Six-Year Capital Improvement Plan. This project will need Ecology approval prior to implementation.
8	Table 11 Influent Control Structure	Avoid overriding controls of the Emergency Bypass gate to keep the gate manually closed.	None.	Complete	Implemented and ongoing	Standard operating procedures have been revised to ensure controls on the Emergency Bypass gate are not overridden except during maintenance. Implemented a

Changes made in Q2 2022 are bolded.

 = 'Under evaluation'


 = Almost done - 'in progress'


 = Done - includes 'complete', 'not incorporated', 'implementing alternative' 'ongoing'

#	AECOM Table #	AECOM Recommendations	AECOM Comments	Status	Timeline	WTD Response
						new protocol designed to reduce non-emergency bypass events. Use of the new protocol prevented 3 non-emergency bypass events during the 2021 construction season.
9	Table 11 Influent Control Structure	Add automated Emergency Bypass gate control at the Influent Control Structure.	Consider adding a second solenoid alarm for redundancy and switching from hardwired interlock controls to control from the Ovation system.	Complete	Implemented	Equipment has been installed to allow for an emergency open of both the Emergency bypass and Emergency Marine Outflow gates.
10	Table 11 Influent Control Structure	Add ability to remotely operate Emergency Bypass gate from Main Control.	Provides rapid response without putting operators in harm's way	Complete	Implemented	Operations staff now have the ability to open the Emergency Bypass gate remotely from the main control room.
11	Table 11 Influent Control Structure	Add ability to control influent gates from Main Control.	Clogged bar screens could cause water to back up in the Influent Control Structure and trigger the Emergency Bypass gate to open but would not close the influent gates.	Complete	Implemented	Operations staff now have the ability to control influent gates from Main Control.
12	Table 11 Influent Control Structure	Add control system programming that closes influent gates automatically when the Emergency Bypass gate is opened.	Clogged bar screens could cause water to back up in the Influent Control Structure and trigger the Emergency Bypass gate to open but would not close the influent gates.	Complete but under further evaluation	Implemented and ongoing. Complete Q2 2022.	Performance data collected through Q3 2021 showed some Flood Risk Reduction System (FRRS) vulnerabilities that will be addressed during the 2022 dry season. Working with a consultant for on-going system evaluation. Corrective actions may require engineering design prior to implementation.
13	Table 11 Influent Control Structure	Install flow meters on influent lines.		Not incorporated	N/A	WTD considered whether a flow meter would provide additional information to reduce operational risk and determined it would not reduce risk or improve overall plant control. West Point has a small footprint and relies on lift stations to pump wastewater through the treatment process. This means that West Point relies on level, not flow for overall plant control.
14	Table 11 Influent Control Structure	Add real-time collection system controls.	Incorporate historical collection system and watershed data into control strategies.	Complete	Ongoing	WTD considered this recommendation and confirmed that our offsite control system already incorporates real-time control of the collection system. As new collection system facilities come online, WTD will update our real-time control strategies.
15	Table 12 Preliminary Treatment	Continuously rake bar screen area during wet-weather events.	This is opposed to using a differential-level trigger. WTD has made this change.	Complete	Implemented and ongoing	West Point has updated its bar screen standard operating procedures to incorporate this recommendation.

Changes made in Q2 2022 are bolded.

 = 'Under evaluation'

 = Almost done - 'in progress'

 = Done - includes 'complete', 'not incorporated', 'implementing alternative' 'ongoing'

#	AECOM Table #	AECOM Recommendations	AECOM Comments	Status	Timeline	WTD Response
16	Table 12 Preliminary Treatment	Raise the channel height at the bar screen area.	Provides surge protection and increased head in the Influent Control Structure for flow over the passive bypass weir.	Not incorporated (Implementing alternative)	Capital project started in 2019	WTD completed a project that evaluated the viability and options to construct a passive weir. The evaluation showed that an upstream passive weir (see #6 & #7 above) would best prevent flooding without the need to raise the channel height.
17	Table 13 Raw Sewage Pump Station	Evaluate options to provide 440 mgd firm pumping capacity at raw sewage pumps.	Options and study items could include: 1. Adding a new pump. 2. Replacing existing pumps with new/larger capacity pumps. 3. Increasing the speed of the existing pumps. 4. Changing impellers to provide more flow. This may require a larger engine and modifications to the right-angle gearbox. 5. Controlling and limiting collection system flow to the plant at 330 mgd. 6. Considering providing more on-site and/or off-site CSO storage volume.	Complete	Capital project started in 2019	WTD evaluated all recommendations related to the raw sewage pumps as one single evaluation, including options to increase the capacity of the raw sewage pumps. Changes to the collection system will be evaluated as part of the CSO planning work. A Raw Sewage Pump Improvement project is part of WTD's Six-Year Capital Improvement Plan.
18	Table 13 Raw Sewage Pump Station	Develop a detailed plan to operate at 330 mgd in preparation for losing a pump.	Not enough firm capacity at raw sewage pumps.	Complete	Implemented and ongoing	West Point Operations is implementing this recommendation as part of a larger Operator training improvement effort. That larger effort includes creating new, and modifying existing, training modules and standard operating procedures.
19	Table 13 Raw Sewage Pump Station	Install flow meters on influent lines.	Provides instantaneous influent flow for faster reaction times during high-flow events (compared to calculating influent flows from the effluent discharge).	Not incorporated	N/A	WTD considered whether a flow meter would provide additional information to reduce operational risk and determined it would not reduce risk or improve overall plant control. West Point has a small footprint and relies on lift stations to pump wastewater through the treatment process. This means that West Point relies on level, not flow for overall plant control.
20	Table 13 Raw Sewage Pump Station	Evaluate incorporating automatic controls through a supervisory control and data acquisition (SCADA) system.	Automatically stop pumps based on critical plant high-high water level set points to help prevent flooding.	Complete, but under further evaluation	Implemented and ongoing. Complete Q2 2022.	Performance data collected through Q3 2021 showed some FRRS vulnerabilities that will be addressed during the 2022 dry season. Working with a consultant for ongoing system evaluation. Corrective actions may require engineering design prior to implementation.

Changes made in Q2 2022 are bolded.

= 'Under evaluation'

= Almost done - 'in progress'

= Done - includes 'complete', 'not incorporated', 'implementing alternative' 'ongoing'

#	AECOM Table #	AECOM Recommendations	AECOM Comments	Status	Timeline	WTD Response
21	Table 13 Raw Sewage Pump Station	Provide additional staff training on operating raw sewage pumps.	During peak-flow events and various failure events, more training is needed.	Complete	Implemented and ongoing	West Point Operations is implementing this recommendation as part of a larger Operator training improvement effort. That larger effort includes creating new, and modifying existing, training modules and standard operating procedures as well as implementing an Operator Training Simulator. This recommendation also addresses corrective action #4 required by Department of Ecology's Administrative Order.
22	Table 13 Raw Sewage Pump Station	Update safety procedures on operating the raw sewage pumps during peak-flow conditions.	Not enough firm capacity at raw sewage pumps.	Complete	Implemented and ongoing	See the response to #21 above.
23	Table 13 Raw Sewage Pump Station	Replace raw sewage pump engines with electric motors. Evaluate current condition of raw sewage pumps and determine expected life span. Provide backup systems to increase redundancy. Evaluate current condition and determine expected life span of the raw sewage pump station [piping system].	Electric motors are more reliable and less expensive to maintain (high initial cost). Plan/budget for equipment maintenance, updates, and replacements. Redundancy reduces opportunity for failure. Estimate pressure capacity and incorporate corrosion inspections and durability to withstand earthquakes.	In progress	Implementation 2030	A Raw Sewage Pump Improvement project began implementation in 2019 with commissioning planned for 2030. Alternatives Analysis is underway. The Department of Ecology has provided conceptual approval of the Pump Replacement project. WTD will forward the engineering report to Ecology for approval when complete.
24	Table 13 Raw Sewage Pump Station	Modify control strategy to include secondary instruments.	Redundancy reduces opportunities for failure. Automatically stop pumps based on critical plant high-high water level set points to help prevent flooding.	Complete, but under further evaluation	Implemented and ongoing. Complete Q2 2022.	Performance data collected through Q3 2021 showed some FRRS vulnerabilities that will be addressed during the 2022 dry season. Working with a consultant for on-going system evaluation. Corrective actions may require engineering design prior to implementation.
25	Table 14 Preaeration and Sedimentation Tanks	Replace level switches with modern tethered switches that do not require a stilling well and are less likely to fail.	WTD has already done this.	Complete	Implemented	Tethered switches were installed during the restoration work at West Point immediately following the February 9 flooding event. These floats have demonstrated greater reliability in industrial settings and can be tested without possibility of damage.

Changes made in Q2 2022 are bolded.

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
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#	AECOM Table #	AECOM Recommendations	AECOM Comments	Status	Timeline	WTD Response
26	Table 14 Preaeration and Sedimentation Tanks	Modify control strategy to include secondary instruments.	Redundancy reduces opportunities for failure.	Complete, but under further evaluation	Implemented and ongoing. Complete Q2 2022.	Performance data collected through Q3 2021 showed some FRRS vulnerabilities that will be addressed during the 2022 dry season. Working with a consultant for ongoing system evaluation. Corrective actions may require engineering design prior to implementation.
27	Table 14 Preaeration and Sedimentation Tanks	Incorporate automatic controls through a supervisory control and data acquisition (SCADA) system.	Multilayered control system is not limited to a single interlock control.	Complete, but under further evaluation	Implemented and ongoing. Complete Q2 2022.	Performance data collected through Q3 2021 showed some FRRS vulnerabilities that will be addressed during the 2022 dry season. Working with a consultant for ongoing system evaluation. Corrective actions may require engineering design prior to implementation.
28	Table 14 Preaeration and Sedimentation Tanks	Evaluate feasibility of a passive bypass.	Effluent can be diverted to the Emergency Bypass Outfall within the Flow Diversion Structure.	Not incorporated (Implementing alternative)	Capital project started in 2019	This recommendation would provide roughly 30 million gallons of diversion, which would not provide significant relief. Diversion opportunities are being considered at head works as part of the passive weir project and through the development of West Point's life safety system.
29	Table 14 Preaeration and Sedimentation Tanks	Evaluate feasibility of connecting east and west primary effluent channels.	If one gate fails, near-full utilization of both primary sedimentation basins can continue.	Not incorporated	N/A	Connecting the primary effluent channels would allow primary effluent to flow over one or both gates. The failure of a gate would still result in a capacity reduction and loss of redundancy regardless of which gate failed. Alternatively, construction of a common channel is considered impractical given the existing plant design and site limitations.
30	Table 14 Preaeration and Sedimentation Tanks	Evaluate feasibility of a passive bypass.	Primary Effluent can be diverted to the Emergency Bypass Outfall and 3x3 vent within the Flow Diversion Structure.	Not incorporated (Implementing alternative)	Capital project started in 2019	This recommendation would provide roughly 30 million gallons of diversion, which would not provide significant relief. Diversion opportunities are being considered at head works as part of the passive weir project and through the development of West Point's life safety system.

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#	AECOM Table #	AECOM Recommendations	AECOM Comments	Status	Timeline	WTD Response
31	Table 14 Preaeration and Sedimentation Tanks	Reevaluate control strategy.	The control strategy can be based primarily on influent flow measurement, not a series of cascading system levels.	Not incorporated	N/A	WTD considered whether a flow meter would provide additional information to reduce operational risk and determined it would not reduce risk or improve overall plant control. West Point has a small footprint and relies on lift stations to pump wastewater through the treatment process. This means that West Point relies on level, not flow for overall plant control.
32	Table 15 Flow Diversion Structure	Evaluate feasibility of a passive bypass.	Options include creating a bypass from the Old Fort Lawton Tunnel or directing primary effluent to the Emergency Bypass Outfall pipe.	Complete	Capital project started in 2019	WTD completed a project that evaluated the viability and options to construct a passive weir. A project began implementation as part of WTD's Six-Year Capital Improvement Plan.
33	Table 15 Flow Diversion Structure	Add automated Emergency Marine Outfall gate control at Flow Diversion Structure.	Previous practice was to manually override controls at low flow (<250 MGD). The Emergency Bypass gate is now always valved in.	Complete	Implemented and ongoing	Standard operating procedures have been revised to ensure controls on the Emergency Bypass (aka CSO Flow Diversion Gate) and the Emergency Marine Outfall. These gates cannot be overridden except during maintenance.
34	Table 15 Flow Diversion Structure	Add ability to remotely operate Emergency Marine Outfall gate at the Flow Diversion Structure from Main Control.	Provides rapid response without putting operators in harm's way.	Complete	Implemented	As part of the implementation of West Point's life safety system a manual push button was installed in Main Control to allow remote, emergency opening of the Emergency Bypass and Emergency Marine Outfall gates.
35	Table 16 Effluent Pump Station	Provide a spare hydraulic unit that can operate with any pump control valve.	Redundancy reduces opportunity for failure.	Complete	Implemented	One spare hydraulic power unit was added to one series of effluent pump station pumps. A capital project installed a hydraulic power unit on the other series. This recommendation also addresses corrective action #1 required by Department of Ecology's Administrative Order.
36	Table 16 Effluent Pump Station	Provide redundant electrical power supply to all hydraulic power units.	Redundancy reduces opportunity for failure.	Complete	Implemented	Automatic transfer switches, to provide redundant power, were installed in mid-2017. This recommendation also addresses corrective action #1 required by Department of Ecology's Administrative Order.

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#	AECOM Table #	AECOM Recommendations	AECOM Comments	Status	Timeline	WTD Response
37	Table 16 Effluent Pump Station	Add pressure relief valves at pump discharge lines.	Prevents pump from operating at zero flow/shut-off head conditions if control valve is closed while pump is operating. Discharge flow from pressure relief valves to gravity or pump discharge pipeline.	Not incorporated (Implementing alternative)	N/A	This recommendation is not being implemented because it does not address the root cause of the Effluent Pump Station failure nor improve reliability. As an alternative, West Point installed additional hydraulic power units to each Effluent Pump Station pump series.
38	Table 16 Effluent Pump Station	Provide portable ladder platform and hand wheel to manually operate the butterfly control valve.		Not incorporated (Implementing alternative)	N/A	This recommendation is not being implemented because a hand wheel would take 30-60 minutes to adjust the valves that need to be opened and closed in seconds for successful operation. As an alternative, WTD installed a secondary hydraulic power unit on a separate electrical power source to address the root cause of failure that resulted in this recommendation.
39	Table 16 Effluent Pump Station	Routinely examine data from vibration monitors to determine trends to help forecast pump maintenance and repairs.	None.	Complete	Implemented and ongoing	WTD procured a vibration monitoring vendor, purchased a mobile vibration monitoring system, trained maintenance staff on how to use the system, and implemented a vibration monitoring program. The vibration monitors and variable frequency drives have been replaced for all Effluent Pump Station pumps.
40	Table 16 Effluent Pump Station	Update vibration monitors.	None.	Complete	Implemented	All pump vibration monitors and variable frequency drives have been replaced.
41	Table 16 Effluent Pump Station	Evaluate the current condition of the Effluent Pumping System and determine its expected life span.	Plan/budget for spare parts and equipment maintenance, updates, and replacements.	Complete	Implemented and ongoing	WTD's current asset management practices accomplish this function by assessing, tracking and reporting condition and the end-of-life date for all West Point effluent pumping system equipment.
42	Table 16 Effluent Pump Station	Provide backup systems to increase redundancy.	Redundancy reduces opportunity for failure.	Complete	Implemented and ongoing	Redundancy is being added to critical Effluent Pump Station systems. Staff regularly evaluate current maintenance best practices and will adjust as needed to reduce the risk of equipment and system failures.

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
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43	Table 16 Effluent Pump Station	Provide good maintenance, closely monitor systems, and stock critical spare parts.		Complete	Implemented and ongoing	WTD's current asset management practices require maintenance tracking and system monitoring. WTD's asset management and maintenance best practices accurately predict the critical parts, which WTD keeps in stock for the effluent pump station.
44	Table 16 Effluent Pump Station	Use a differential pressure sensor across the pump to estimate flow rate.	An algorithm would be developed that considers pump head/flow curve, pump speed, and pump differential pressure reading. The algorithm can be calibrated using information from the existing effluent flow meter.	Not incorporated	N/A	WTD considered whether developing and calibrating an algorithm would reduce risk or improve overall plant control. We determined this would not provide any additional information beyond what we already receive from the effluent flow meter and would not reduce operational risks.
45	Table 16 Effluent Pump Station	Provide controls that allow the Effluent Pump Station to operate at constant speed.	As a backup, provide controls that allow the pump to operate at constant speed while using the control valve to throttle discharge flow and maintain the wet-well water level set points. This would require adding single-speed starters.	Not incorporated	N/A	This recommendation is not being implemented as it is intended to allow the pumps to operate if the variable frequency drives fail but does not address the root cause of the failure or improve reliability. West Point has existing equipment redundancy to maintain treatment at full capacity in the event of a variable frequency drive failure.
46	Table 17 Electrical	Incorporate automatic transfer of switchgear main and tie breakers upon power loss.	Provides rapid response for substations that require faster response time than what personnel can provide.	Not incorporated	N/A	This recommendation is not being implemented because the plant's current, comprehensive procedure is required for safety reasons regardless of whether an automatic transfer system was in place. In addition, implementing this recommendation would be complicated, requiring additional structures at a site where space is limited.
47	Table 17 Electrical	Staff at least two electricians during high-flow events.	Two electricians are required for life-safety reasons.	Complete	Implemented and ongoing	WTD now requires instrumentation technicians, electricians, and mechanics on standby during weekday evenings and weekends to ensure sufficient coverage during high-flow events.
48	Table 17 Electrical	Provide additional permanently connected hydraulic power unit on the B side.	Include provisions for either unit to power all discharge valves.	Complete	Implemented	One spare hydraulic power unit was added to one series of Effluent Pump Station pumps. A capital project installed a hydraulic power unit on the other series. This recommendation also addresses corrective action #4 required by Department of Ecology's Administrative Order.

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49	Table 17 Electrical	Power Effluent Pump Station discharge valve controls from individual variable-frequency drives.	This is rather than powering from the hydraulic power units.	Not incorporated (Implementing alternative)	N/A	As an alternative to this recommendation, WTD improved reliability at the Effluent Pump Station by installing permanent hydraulic power units for each of the two sets of pumps, valves and variable frequency drives.
50	Table 17 Electrical	Analyze single points of failure for all components.	For example, a breaker that would feed control power to all Effluent Pump Station pump controllers or both primary and backup Ovation system controllers.	Complete	Implemented	During a recent interview, AECOM clarified this recommendation relates to the Ovation control system. AECOM considers this item fully addressed.
51	Table 17 Electrical	Add surge suppressors.	Medium-voltage transient surge suppressors on both sides of the main 15 kV switchgear.	Complete	Implemented	Medium Voltage transient surge suppressors are installed on both sides of the 15 kV switchgear.
52	Table 17 Electrical	Install power line monitors with transient waveform capture feature on each substation's main breaker.	A maintenance tool to help analyze power system health and forensic analysis of failures.	Complete	Capital project started in 2019	This project is part of WTD's Six-Year Capital Improvement Plan.
53	Table 17 Electrical	Conduct the remainder of testing related to the main switchgear 722-MSG01 circuit breaker ground fault 52-3 trip.	As soon as a plant shutdown is feasible.	Complete	Implemented	WTD completed the testing and changed the ground trip settings based on new, more accurate, modeling information.
54	Table 17 Electrical	Update standard operating procedure for Effluent Pump Station restart after ground fault.	Locally reset Effluent Pump Station vibration panels, variable-frequency drives, and pump local control panels upon a fault.	Complete	Implemented	West Point staff updated the standard operating procedures for the Effluent Pump Station.
55	Table 19 Instrumentation and Control	Add an "Interlock Active" indication light to the local control panels.	Alert the operators when the interlock is engaged (help with troubleshooting).	In progress	Implementation 2022	A project to install indication lights at the local control panels has been started with completion planned for Q4 2022.
56	Table 19 Instrumentation and Control	Add a supervisory control and data acquisition (SCADA) system bypass switch to bypass the interlock.	This should be available only to the supervisors.	Not incorporated	N/A	The existing interlock is in place for safety reasons, and it is unsafe to bypass at any time during regular plant operations. The risk and consequence of another potential flooding event is being reduced by implementing other recommendations.
57	Table 19 Instrumentation and Control	Prevent interlock from being activated during high-plant-flow scenarios.	High-flow events pose a life-safety risk.	Not incorporated	N/A	See the response to #56 above.
58	Table 19 Instrumentation and Control	Remove the requirement to use both the High and high-high switches to activate the interlock.	Only the high-high switch would be required.	Not incorporated (Implementing alternative)	Q3 2023	The recommendation results in a life safety system that relies on a single instrument. This increases the risk of false activation that can lead to inadvertent bypasses. WTD has been working with a consultant to develop an alternative solution that will be implemented to protect the plant from

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						flooding due to high-level conditions and avoids reliance on single instrument activation. The solution will be a fully hardwired system with instrument redundancy.
59	Table 19 Instrumentation and Control	Add an Ovation-level high-high signal to the hardwired interlock.	The Ovation signal should be set to activate before the float switches.	Not incorporated (Implementing alternative)	Q3 2023	The recommendation adds interaction between the Ovation and independent hardwired interlock system. WTD best practice is to maintain separation of software and hardwired systems. WTD has been working with a consultant to develop an alternative solution that will be implemented to protect the plant from flooding due to high-level conditions and avoids reliance on single instrument activation. The solution will be a fully hardwired system with instrument redundancy.
60	Table 19 Instrumentation and Control	Add remote start/stop pump controls to the Main Control room through the Ovation system.	Provides rapid response without putting operators in harm's way.	Not incorporated (Implementing alternative)	N/A	The existing engines cannot be restarted remotely. Remote start will be considered as part of a future raw sewage pump replacement project. Remote stop capability has been implemented (see response to #61 below).
61	Table 19 Instrumentation and Control	Add a hard-wired emergency stop push button not controlled through Ovation.	Provides rapid response without putting operators in harm's way.	Complete	Implemented	A manual push button has been installed in Main Control to allow remote, emergency stop of all four raw sewage pumps.
62	Table 19 Instrumentation and Control	Add remote start/stop pump controls to the Main Control room through the Ovation system.	Operations must send operators to the raw-sewage wet-well area to locally open/close the gates, taking time and potentially placing operators in harm's way.	Not incorporated (Implementing alternative)	N/A	See the response to #60 above.
63	Table 19 Instrumentation and Control	Remove the requirement to use both the High and high-high switches to activate the interlock.	Only the high-high switch would be required.	Not incorporated (Implementing alternative)	Q3 2023	See the response to #58 above.
64	Table 19 Instrumentation and Control	Add an Ovation-level high-high signal to the hardwired interlock.	The Ovation signal should be set to activate before the float switches.	Not incorporated (Implementing alternative)	Q3 2023	See the response to #59 above.
65	Table 19 Instrumentation and Control	Add remote open/close gate controls to the Main Control room through the Ovation system.	Make these controls highly visible to respond in emergencies.	Not incorporated (Implementing alternative)	N/A	As part of the implementation of West Point's life safety system a manual push button has been installed in Main Control to allow remote, emergency opening of the Emergency Bypass and Emergency Marine Outfall gates. Gates will not be allowed to

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						close remotely. Operations staff is required to physically inspect equipment before gates are closed and equipment is restarted.
66	Table 19 Instrumentation and Control	Conduct an alarm management review workshop to properly prioritize alarms and remove or condition alarms.	The system is not optimized to prioritize alarms	Complete	Implemented and ongoing	WTD held an alarm management review workshop and implemented an alarm management improvement process. Plant staff reduced the number of nuisance alarms and will continue to review priorities and improve alarm procedures as part of ongoing operations and maintenance. This recommendation, in addition to #78 and #94, also address corrective action #2 required by Department of Ecology's Administrative Order.
67	Table 21 Staffing	Develop incentive programs to retain staff at West Point.	It is difficult to retain employees at West Point.	Complete	Implemented and ongoing	Attempts to negotiate incentive pay for new employees at West Point through the 925 bargaining process was unsuccessful in Fall 2017. WTD provided more detail on its ongoing staff retention efforts as part of this West Point Quarterly Report transmitted to the Council in February 2018.
68	Table 21 Staffing	Extend aspects of the Operator-in-Training program to existing staff.	Currently the Operator-in-Training Program is only for new hires with no previous wastewater treatment plant experience.	Complete	Implemented and ongoing	WTD-reviewed and updated its standard operating procedures. Operations staff now have 1-on-1 training and more formal communications between crews. This recommendation also addresses corrective action #4 required by Department of Ecology's Administrative Order.
69	Table 22 Operators	Create an Emergency Bypass standard operating procedure.	If a standardized process is in place, the operators could operate the plant as it is designed.	Complete	Implemented and ongoing	WTD implemented standard operating procedures on use of the Emergency Bypass gate. These procedures will continue to be improved as part of a larger Operator training improvement effort. Also, see response to #21.

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70	Table 22 Operators	Change the “no bypass” philosophy.	This is important to protect life safety and equipment and to reduce the amount of time the plant is in bypass mode.	Complete	Implemented and ongoing	WTD management has clearly communicated that the Emergency Bypass gate is a tool to be used as required. Operations also instituted new guidelines regarding the appropriate use of the Emergency Bypass gate. Operators are being trained using desktop exercises and scenario-based discussions to train on emergency response procedures. These exercises will be part of the new simulator training referred to in recommendation #92.
71	Table 22 Operators		Important to keep the environmental protection mission of the organization.	Complete	Implemented and ongoing	See response to #70 above.
72	Table 22 Operators	Add an Emergency Bypass override button at the Main Control room.	Currently this is embedded in the control strategy.	Complete	Implemented	WTD installed equipment in Main Control to allow remote, emergency opening of the Emergency Bypass and Emergency Marine Outfall gates.
73	Table 22 Operators	Provide hands-on Emergency Response Plan training.	None.	Complete	Implemented and ongoing	Emergency Response training sessions have been increased from one per year to two. This recommendation also addresses corrective action #4 required by Department of Ecology's Administrative Order.
74	Table 22 Operators	Run the hydraulic simulation model so operators know narrow time margins and potential consequences.	None.	Complete	Implemented and ongoing	WTD developed and deployed a computer model (simulator). This recommendation also addresses corrective action #4 required by Department of Ecology's Administrative Order.
75	Table 22 Operators	Implement a Life Safety Management system.	An aspect of this type of process is that it focuses on the process rather than the individual worker to avoid scapegoating and to effectively reduce risk.	Complete	Implemented and ongoing	WTD hired a Life Safety Coordinator who completed an initial Life Safety Evaluation. That evaluation, which will be continuously refined, provides a framework of recommendations that the West Point employees will implement and maintain.
76	Table 22 Operators	Add an automated call program to contact on-call personnel.	None.	Not incorporated (Implementing alternative)	N/A	As an alternative, WTD implemented a two-way communication protocol that is required to confirm contact between personnel. A secondary operator is responsible for making calls while the lead operator manages control of the plant.
77	Table 22 Operators	Increase the number of staff on duty in Main Control during wet-weather events.	None.	Complete	Implemented and ongoing	When weather predictions indicate heavy rainfall, the minimum amount of emergency/wet weather staffing has been

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
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						increased to comply with new high flow protocols and procedures.
78	Table 22 Operators	Conduct an alarm management review workshop to properly prioritize alarms and remove or condition alarms.	The system is not optimized to prioritize alarms.	Complete	Implemented and ongoing	WTD held an alarm management review workshop and implemented an alarm management improvement process. Plant staff reduced the number of nuisance alarms and will continue to review priorities and improve alarm procedures as part of ongoing operations and maintenance. This recommendation, in addition to #66 and #94, also address corrective action #2 required by Department of Ecology's Administrative Order.
79	Table 22 Operators	Add a visual beacon/strobe-type alarm in the control room.	To warn the operators in the control room that flooding was imminent unless action is taken.	Complete	Implemented	Completed during installation of the FRRS system. A light and audible alarm were installed in the control room to warn operators of potential flooding conditions.
80	Table 22 Operators	Provide Emergency Communications training.	Should be part of Emergency Response Plan training.	Complete	Implemented and ongoing	Operations staff have been trained and Emergency Communications training has been incorporated into the West Point Emergency Response Plan. This recommendation also addresses corrective action #4 required by Department of Ecology's Administrative Order.
81	Table 22 Operators	Practice standard operating procedures for Effluent Pump Station restart.	This was listed as a step to be checked on the standard operating procedure for Effluent Pump Station restart. Recent issues with EPS pumps have been related to vibration, and based on this previous experience, the operators did not expect power to the valves to be an issue.	Complete	Implemented and ongoing	WTD updated its standard operating procedures and Operations staff have been trained using those updated materials.
82	Table 25 Training	Create a designated emergency evacuation path.	Train often on designated emergency evacuation path.	Complete	Implemented and ongoing	A designated emergency evacuation path exists, and this has been reinforced and emphasized in the Emergency Response Plan.
83	Table 25 Training	Develop standard operating procedure for tunnel entry.	Develop a standard operating procedure for tunnel entry, particularly to avoid entering at high flows.	Complete	Implemented and ongoing	Immediately following the flood event, WTD implemented standard operating procedures to limit, and closely monitor, tunnel entry by employees during periods of high flows.

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84	Table 25 Training	Review operator training program.	Need to assess the appropriateness and amount of training provided.	Complete	Implemented and ongoing	West Point implemented weekly training with a technical trainer and updated training materials. In addition, Operation staff conduct daily training and lessons learned sessions within and between crews. This recommendation also addresses corrective action #5 required by Department of Ecology's Administrative Order.
85	Table 25 Training	Increase number of operators on duty.	Operators need time on nonemergency shifts to gain on-the-job training across the plant.	Complete	Implemented and ongoing	Operations vacancies have been filled. WTD also expanded its existing training program to improve the number and quality of candidates for future vacancies. This was done by hiring 15 additional operator-in-training and term-limited temporary (TLT) staff who will be trained and competitive for hire into career service positions. Additionally, West Point updated standard operating procedures and increased the type and frequency of operator training. West Point employees continue to evaluate how to improve all training, especially emergency response, and will implement training improvements as they are developed.
86	Table 25 Training	Provide hands-on Emergency Response Plan training.		Complete	Implemented and ongoing	Emergency Response training sessions have been increased from one per year to two. This recommendation also addresses corrective action #4 required by Department of Ecology's Administrative Order.
87	Table 26 Equipment and Systems Testing	Add waterproof lighting in the basement.		Not incorporated (Implementing alternative)	N/A	As an alternative to this recommendation, WTD implemented revised standard operating procedures that limit and monitor tunnel entry during periods of high flow.
88	Table 26 Equipment and Systems Testing	Have two permanent skids hooked up at all times.	Have online but connected.	Complete	Implemented	One spare hydraulic power unit was added to one series of Effluent Pump Station pumps. A capital project replaced the temporary installation for the one on the other series of pumps. This recommendation also addresses corrective action #1 required by Department of Ecology's Administrative Order.

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89	Table 26 Equipment and Systems Testing	Secure walkway covers.	Fixed.	Complete	Implemented	Walkway covers have been bolted down.
90	Table 26 Equipment and Systems Testing	Revise standard operating procedure for annual plant hydraulic safety.	It was done this way because of multiple tank leaks experienced when water levels are above normal. This has been fixed.	Complete	Implemented and ongoing	A review and update of standard operating procedures has been completed and float testing is scheduled for twice a year.
91	Table 26 Equipment and Systems Testing	Implement a Life Safety Management system.	A Life Safety Management system should be developed and implemented to reduce risks and improve safety for the staff at the plant, protect the equipment, and reduce the duration of bypass events.	Complete	Implemented and ongoing	A Life Safety Coordinator has been hired and an initial Life Safety Evaluation was completed. That evaluation, which will be continuously refined, provides a framework of recommendations that the West Point employees will implement and maintain. WTD and King County IT are working on a joint Enterprise Asset Management System (EAMS) that will integrate with LSM functions. Until the EAMS is in place, WTD implemented an LSM SharePoint site and chain of custody routing forms.
92	Table 26 Equipment and Systems Testing	Develop a dynamic computer model to simulate plant hydraulic conditions.		Complete	Implemented and ongoing	A computer model (simulator) has been developed and deployed. This recommendation also addresses corrective action #4 required by Department of Ecology's Administrative Order.
93	Table 26 Equipment and Systems Testing	Implement routine testing of the Primary Effluent gate interlock indicator in Area Control Center 1.		Complete	Implemented and ongoing	West Point Maintenance employees will conduct an interlock test as part of their annual float testing procedure.
94	Table 26 Equipment and Systems Testing	Conduct an alarm management review workshop to properly prioritize alarms and remove or condition alarms.	Alarm criticality ratings should be reviewed. Only life-safety/hydraulic protection-related alarms should be classified as criticality level 1. These alarms should remain visible until cleared.	Complete	Implemented	WTD has completed an initial alarm management workshop on all Priority 1, 2 and 3 alarms. In addition, WTD has established a WP Alarm Steering Committee that meets regularly with stakeholders to further identify nuisance alarms and refine alarm priority levels. Alarms are now being compiled and tracked on a dashboard to provide tracking and visibility of overall frequency levels and to identify alarms that do not meet standards. A second alarm management workshop was completed in February 2021. to further eliminate potential alarm flood conditions and apply strategic measures to mitigate

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
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#	AECOM Table #	AECOM Recommendations	AECOM Comments	Status	Timeline	WTD Response
						nuisance behaviors. This recommendation, in addition to #66 and #78 also address corrective action #2 required by Department of Ecology's Administrative Order.
95	Table 26 Equipment and Systems Testing	Revise standard operating procedure for Effluent Pump Station reset.	Need to specify the amount of time operators have during different flow conditions. Standard operating procedure specifies 2 attempts for restart.	Complete	Implemented and ongoing	WTD implemented a standard operating procedure for the Effluent Pump Station that specifies two restart attempts and updated training also emphasizes that procedure.
96	Table 27 Maintenance Procedures	Implement a Life Safety Management approach to all maintenance not included in Process Safety Management.	Implement a Life Safety Management approach to all maintenance not included in Process Safety Management.	Complete	Implemented and ongoing	WTD hired a Life Safety Coordinator who completed an initial Life Safety Evaluation. That evaluation, which will be continuously refined, provides a framework of recommendations that the West Point employees will implement and maintain.
97	Table 27 Maintenance Procedures		Maintenance may negatively affect component performance if the execution is incorrect, insufficient, delayed, or excessive.	Complete	Implemented and ongoing	WTD hired a Life Safety Coordinator who completed an initial Life Safety Evaluation. That evaluation, which will be continuously refined, provides a framework of recommendations that the West Point employees will implement and maintain.
98	Table 27 Maintenance Procedures		Organized communication is a component of a Life Safety Management system.	Complete	Implemented and ongoing	WTD hired a Life Safety Coordinator who completed an initial Life Safety Evaluation. That evaluation, which will be continuously refined, provides a framework of recommendations that the West Point employees will implement and maintain.

Changes made in Q2 2022 are bolded.

 = 'Under evaluation'

 = Almost done - 'in progress'

 = Done - includes 'complete', 'not incorporated', 'implementing alternative' 'ongoing'