



# KING COUNTY AUDITOR'S OFFICE

JULY 9, 2019

TO:

Metropolitan  
King County  
Councilmembers

FROM:

Kymber Waltnunson,  
County Auditor

## West Point Treatment Plant Risks Will Not Be Fully Mitigated for Years

**Since the systems failure and subsequent flooding at the County's West Point Treatment Plant in February 2017, the Wastewater Treatment Division has taken decisive action to improve safety and redundancy in the plant; however, it could do more to mitigate persisting risks to safety and operations until permanent solutions are in place.** Many key efforts remain to mitigate risks at West Point Treatment Plant (West Point) and they will take nearly a decade to fully implement. Further, the Wastewater Treatment Division (WTD) is implementing its initial schedule for completing capital improvements to West Point and WTD needs to finish ongoing consultant evaluations that will inform solutions for the treatment plant.

**EXHIBIT A:** Auditors Office staff assessed risk remaining in four areas of recommendations external parties made to WTD



Yellow recommendation areas are "in progress" and green are "complete".

Source: King County Auditor's Office

### Why oversight is important

**Several system failures at West Point during heavy rainfall on February 9, 2017, led to a significant flooding incident at the facility, which resulted in an estimated 244 million gallons of untreated or partially-treated sewage discharging into Puget Sound and resulted in nearly 8 billion gallons of wastewater receiving only limited primary treatment and disinfection over the next 77 days.<sup>1</sup>** The flood also left \$23 million in damages to the facility and brought to light many shortcomings in the treatment plant, its systems, WTD life safety management, staffing, and training. WTD has taken key steps to address many of these shortcomings and has plans for additional capital and operational improvements to further mitigate risks at West Point. Our independent oversight provides an unbiased view of what work WTD has completed, where risk remains, and whether WTD is taking sufficient steps to mitigate those risks until it can fully implement capital-intensive solutions.



**King County**

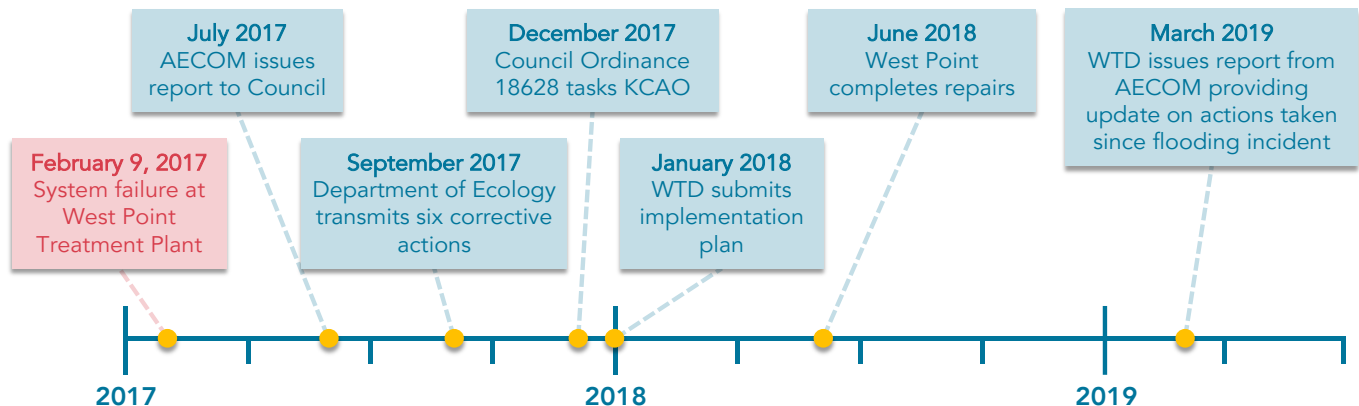
<sup>1</sup> The West Point Treatment Plant is one of three main wastewater treatment facilities that WTD manages for King County. Of these three treatment plants, West Point, handles the largest volume of sewer flows.

## Background, Scope, and Methodology

**In response to the catastrophic flooding event at West Point, the King County Council contracted with AECOM to assess causes and impacts of the February 9 incident and to identify areas of risk and potential solutions for further evaluation.** In July 2017, AECOM delivered its assessment report which proposed 98 recommendations for decreasing the likelihood of future flooding and for solving performance issues at West Point. Separately, in September 2017, the state Department of Ecology (Ecology) concluded that lack of appropriate equipment redundancy and reliability, poor operation, and inadequate maintenance led to the plant's failure, and it issued a \$361,000 fine and an administrative order that included six corrective actions for WTD.

**In December 2017, the County Council passed Ordinance 18628, which tasked the Auditor's Office with conducting oversight of the County Executive's plan for implementing the actions recommended by AECOM and Ecology.** WTD completed facility repairs in June 2018, and subsequently contracted with AECOM to provide an update on recommendation implementation status. WTD issued AECOM's follow up report in March 2019. AECOM noted a few limitations of its report, including that it considered a recommendation "complete" even though the recommendation was not fully implemented—only that WTD had indicated it had plans in place to complete the recommendation. Another limitation stated that "AECOM has relied on third party information and interviews" for the purposes of preparing the follow-up report. Implementation of other facility and operational improvements stemming from the February flood incident are ongoing. See Exhibit B, below, for a timeline of events.

EXHIBIT B: Timeline of events and studies following February 2017 flooding incident at West Point



Source: King County Auditor's Office

**For our oversight of WTD's implementation of recommendations from AECOM and Ecology, we focused on analyzing and understanding the risks that will remain at West Point until WTD fully implements the remaining recommendations.** We conducted interviews with WTD, AECOM, Ecology, and also conducted targeted oversight meetings with WTD in the following four major areas identified for improvement at West Point:

- Capital improvements
- Life safety
- Evaluations and studies

## WTD has not yet fully implemented a quarter of the AECOM recommendations

**Overall, it is our assessment that WTD has completed implementation of 63 out of 98 AECOM recommendations and made progress toward implementing 26.** As noted above, our recommendation status categorization differs from the March 2019 AECOM assessment. AECOM marked recommendations “complete” in two different situations: (1) when WTD indicated it had a plan for implementation, and (2) when WTD had fully implemented a recommendation. Under this dual definition, AECOM’s conclusion was that the 89 recommendations WTD concurred with are complete.<sup>2</sup> In our assessment, we have tried to provide more clarity on which recommendations still require work for full implementation. See Exhibit C for a breakdown of recommendation implementation status, and the Appendix for a full list of the 98 recommendations and their individual status as determined by the Auditor’s Office.

**EXHIBIT C:** Auditor’s Office assessment of implementation status of 98 AECOM recommendations

CATEGORY	COMPLETE	IN PROGRESS	TOTAL
Capital improvements	15	5	20
Life safety	11	14	25
Evaluations and studies	7	6	13
Training and staffing	30	1	31
No plans to implement	-	-	9
	63	26	98 recommendations

Source: King County Auditor’s Office

**WTD has had to delay or defer other county projects in order to prepare to execute more than \$220 million in new investments at West Point.** To budget for these high priority improvements, WTD has identified other capital improvement plan projects that it will delay or defer. Some examples of projects that will be deferred to a future budget cycle include:

- Medina Force Main Odor Control
- Denny Regulator Back-Up Power
- North Beach Outfall Replacement
- North Lake Sammamish Flow Diversion

WTD stated that it considered the risks of delaying these projects relative to other high priority projects and determined that it would be appropriate to defer them.

<sup>2</sup> WTD and AECOM deemed nine recommendations as inappropriate for West Point and we concur with that assessment.

## WTD Has Plans to Make Many Major Capital Improvements to West Point and Implementation Will Take Years



### CAPITAL IMPROVEMENTS

20 RECOMMENDATIONS: 15 COMPLETE, 5 IN PROGRESS

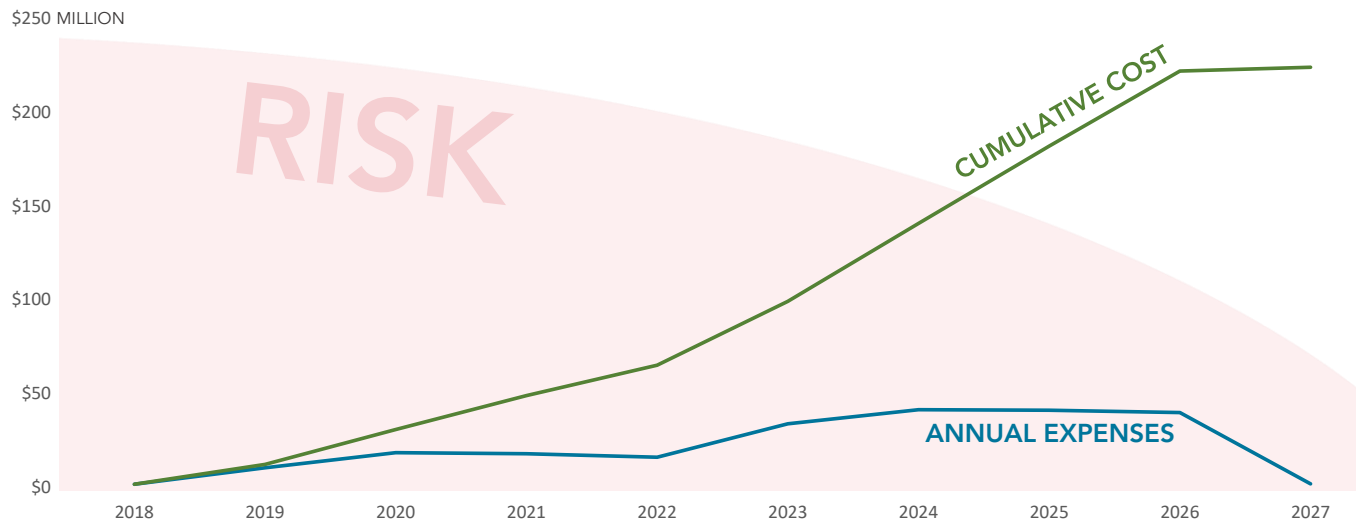
Since AECOM issued its recommendations in July 2017, WTD has acted on 75 percent of the capital recommendations, making over \$800,000 in upgrades to West Point to address the root causes of the flooding event. Most importantly, WTD provided a redundant electrical power supply to all hydraulic power units, maintains a standby diesel-powered hydraulic power unit for the emergency bypass gate and purchased a spare electrical unit for the effluent pump station. These upgrades will give plant staff two modes of backup for effluent pumps, in the event the primary power feed fails—as it did in 2017. WTD also replaced unreliable float switches with reliable modern switches that are essential for remote signaling to the main control room when sewage levels at the plant rise to a warning level.

Based on AECOM's recommendations, WTD has also identified over \$200 million in large, long-term capital projects to improve capacity and redundancy at West Point. WTD plans to complete these projects by 2027, which means some risks will not be fully mitigated for many years. More than three-quarters of the capital investment spending at West Point will go toward replacing raw sewage pumps. WTD estimates it will spend \$177 million between 2019 and 2027 to replace raw sewage pumps at West Point to make sure the plant can functionally handle peak flows of up to 440 million gallons per day (MGD) with one pump out of service.<sup>3</sup> This will be a key improvement to the plant's redundancy. WTD is also planning \$18 million in spending to improve the consistency and reliability of power flow to West Point by installing new switchgear and power line monitors to protect plant equipment from voltage spikes. This investment will also provide plant staff with the ability to monitor the health of the power system and to quickly diagnose power fluctuations. The passive weir project will help make sure West Point is equipped to bypass heavy sewage flows in the event of a power outage, while effluent pump vibration monitors will help WTD to monitor the lifespan and maintenance actions of this critical equipment. See Exhibit D, below, for information on expenditures and risk over time and Exhibit E for a full list of planned capital improvements to West Point.

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<sup>3</sup> WTD estimates that after design work and permitting is finished, only one pump per year can be scheduled for replacement while keeping the treatment plant in continual operation.

**EXHIBIT D:** Risk at West Point will decrease over the next seven years as WTD completes key capital improvements



Source: King County Auditor's Office

**EXHIBIT E:** WTD is planning multiple multi-million-dollar projects for West Point

PROJECT	EST. COST	SCHEDULE	DESCRIPTION
Raw sewage pumps	\$177.0 million	2019-2027	Replace pumps to ensure capacity
Replace switchgear	\$13.8 million*	TBD	Add power surge suppressors
Effluent pump station vibration monitors	\$5.8 million	2019-2020	Monitor lifespan of large effluent pumps
Power line monitors	\$5.0 million	2019-2021	Track consistency of power flow
Passive weir	\$5.0 million	2020-2025	Create gravity bypass system

Source: King County Auditor's Office

\*WTD has applied for a Federal Emergency Management Agency (FEMA) grant for this project.

WTD may not yet have regulatory approval for key projects, which could leave the plant without a key redundancy to prevent plant flooding. WTD has completed a feasibility study to identify that a passive weir is its preferred method for achieving a bypass. Since the ability to handle sewage flows in the event of a power outage is a requirement of the plant's National Pollutant Discharge Elimination System (NPDES) permit, WTD needs approval from Ecology to move forward with a passive weir project. WTD stated that it is in the process of early talks with Ecology about the project. West Point can currently bypass all flows to the plant using the emergency bypass and emergency marine outfall gates. A passive weir will mitigate risks of mechanical and electrical system failures with the bypass gate system. Until Ecology has permitted the project and WTD has constructed the passive weir or another alternative bypass method, plant flooding risks will not be fully mitigated.

### Recommendation 1

**The Wastewater Treatment Division should gain conceptual approval from the state Department of Ecology no later than January 2020 for its passive weir and raw sewage pump capital investments to alleviate the risk of future flooding events at West Point.**

## WTD Must Complete Time-Consuming and Costly Work in Order to Mitigate Life Safety Risks



### LIFE SAFETY

25 RECOMMENDATIONS: 11 COMPLETE, 14 IN PROGRESS

**WTD has taken some key steps to improve life safety at West Point.** Notably, WTD hired a life safety coordinator in 2018, and created a draft life safety management plan during the first quarter of 2019.

The life safety management plan is the culmination of hundreds of hours of workshops and training scenarios conducted over the past year. The plan is intended to be a living document. Other improvements include alarm prioritization work that led WTD to develop a monitor in the control center that uses critical indicators to show plant operators when flow to the plant begins to exceed capacity.

**Most of the recommendations still in progress relate to physical improvements to the plant's control system and it may take years and millions of dollars to complete these improvements, leaving inadequate redundancy at the plant in the meantime.** WTD has requested \$10.15 million via a 2019 supplemental appropriation for capital work related to life safety at West Point. WTD plans to use this money to complete the remaining 14 AECOM recommendations between 2019 and 2025. See Exhibit F for a summary and timeframe of the planned life safety work. Until all new systems are in place, the switching and control systems at West Point lack redundancy and the people who work there face continued risk when emergencies arise. We discuss this further in the training and staffing section of this report.

EXHIBIT F: Life safety projects WTD has not yet completed

PROJECT DESCRIPTION	Cost: \$10.15 M	Schedule: 2019–2025
Flow indicator lights: Design and install lights at tunnels to warn staff		
Hydraulic instrumentation and equipment: Improve monitoring and controlling of plant hydraulics		
Secondary instrumentation: Improve prediction, monitoring, and response to floods		
Control system modifications: Adjust how system responds to high wet well conditions		

Source: King County Auditor's Office

**WTD's current asset management software system is not compatible with the division's new approach to life safety management, which will make implementation of life safety management strategies more challenging.** The existing asset management and work order tracking system at West Point primarily functions as a maintenance management system for routine repairs and monitoring equipment condition history. It does not allow for easy documentation or tracking of incident investigation, risk assessment, hazard reporting, training, or change management actions—all actions that are central to a robust program of life safety management. WTD has identified that an enterprise asset management system (EAMS) would be compatible with life safety process management. The division is in the process of obtaining approval for the EAMS project and estimates it could complete implementation of EAMS in early 2023. In the meantime, WTD will need to make sure that it has other mechanisms in place to track and manage these life safety management tasks.

## Recommendation 2

**The Wastewater Treatment Division should adopt formal mechanisms to track its life safety management activities, until the planned enterprise asset management system is fully implemented.**

## WTD Has Completed Some Key Studies and Evaluations, but Other Work Is Required To Identify All System Needs at West Point



### EVALUATIONS & STUDIES

13 RECOMMENDATIONS: 7 COMPLETE, 6 IN PROGRESS

**WTD has completed the most urgent recommendations for evaluating critical treatment plant capital investments.** In 2018, WTD completed two evaluations to assess alternatives and create cost estimates for replacing raw sewage pumps and building a passive weir at West Point. WTD used these feasibility studies to inform adding these two capital projects to the division's six-year capital improvement plan. WTD is planning to complete two more studies, the first in October 2019, which will provide WTD with information on whether key plant functions are able to handle peak sewage flows. The



flow and loads study, following a firm capacity evaluation, will evaluate projected solids processing capacity and peak hydraulic capacity of West Point. See Exhibit G for a summary of studies and evaluations completed and underway by WTD.

**EXHIBIT G: Engineering evaluations completed and planned by WTD**

EVALUATIONS	EST. COST	SCHEDULE	DESCRIPTION
Raw sewage pumps	\$288,000	Complete	Feasibility and alternative analysis
Passive weir	\$149,500	Complete	Alternative analysis
Firm capacity evaluation	\$36,300	Complete	Evaluate potential flow bottlenecks
Flow and loads*	\$1.1 million	2019	Evaluate wastewater and solids processing
Clean Water plan*	\$7.0 million	2020-2022	Collections system flow capacity

Source: King County Auditor's Office

\*These two evaluations are not unique to West Point. They encompass all three treatment plants and the entire collection system.

**It will be many years before WTD is able to identify and implement additional strategies to truncate peak flows to West Point, meaning risk of future peak flow events at the plant will remain high for many years.** WTD is planning to use its Clean Water Plan to identify opportunities to reduce flows to West Point in the broader wastewater collection system. WTD intends to do this planning work between 2020 and 2022. The set of combined sewer overflow projects WTD plans to implement between 2014 and 2030 is also important for mitigating flows to West Point because it will, in some cases, increase the holding capacity in the system during storm events. In WTD's recent Half-Century Report, the consultant, Brown & Caldwell, suggested that diverting peak flows away from West Point in the future may be an alternative to explore further.

### Recommendation 3

**As part of its comprehensive planning process, the Wastewater Treatment Division should reevaluate its combined sewer overflow program to determine whether there are opportunities to manage or reduce flows to the West Point Treatment Plant within the broader collection system and to document the results of its evaluation.**



## WTD Has Made Excellent Progress in Training and Staffing Improvements at West Point



### TRAINING & STAFFING

31 RECOMMENDATIONS: 30 COMPLETE, 1 IN PROGRESS

**WTD has made key improvements to its staffing and training efforts, including taking steps to create a culture of safety at West Point.** Based on recommendations from AECOM, in 2018 WTD conducted tabletop exercises to improve its understanding of emergency response needs at West Point. Based on lessons learned from the tabletop exercises and input from West Point operators, WTD updated standard operating procedures and emergency response plans at West Point. WTD also made updates to its staffing plan to make sure more operators and maintenance staff will be on duty when heavy rain is in the forecast.

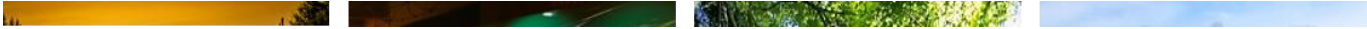
**WTD is in the process of formalizing its training regimen.** A comprehensive program of emergency training and emergency exercises promotes sharing of ideas, leads to documentation of important decisions, helps increase staff comfort levels regarding unusual emergency-only activities through discussion and practice, and ensures that proper protocols are followed. In addition to the staffing and training improvements WTD has already made, WTD is working to develop additional key trainings.

For instance, WTD has begun using a hydraulic model control simulator for operators running the plant with one raw sewage pump out of service during high flow conditions. WTD intends for its senior operators to use this simulator to train less experienced staff. Further, WTD is developing an Operator's Guide Book which will encompass all the training needed to become an experienced plant operator. We concur with AECOM that WTD should build more scenarios which simulate equipment failures in conjunction with high flow conditions using these tools, ultimately progressing toward a comprehensive emergency training and exercise program.

**WTD has not yet documented its future training plans or mechanisms for continuous improvement in safety.** To be effective, training must be recurring and should be regularly updated to encompass changes to procedures and systems. WTD states that it plans to conduct recurring training and to develop new training modules as new systems and capital improvements are completed. However, WTD has not yet documented this in a training plan. Until WTD has completed upgrades to West Point to ensure sufficient capacity and redundancy per AECOM recommendations, the people who work there face risk when emergency situations arise. It is therefore important that WTD proactively plan to conduct extensive training for foreseeable emergency scenarios.

### Recommendation 4

**The Wastewater Treatment Division should develop, document, and implement a training plan that provides information on frequency of recurring training and includes provisions to continuously update trainings to reflect new systems and related procedures as they are implemented.**



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Michael Bowers, Capital Projects Oversight Analyst, and Brooke Leary, Senior Principal Management Auditor, conducted this review. If you have any questions or would like more information, please contact the King County Auditor's Office at [KCAO@kingcounty.gov](mailto:KCAO@kingcounty.gov) or 206-477-1033.

Attachments: Appendix 1-Status of Recommendations (9 pages)  
Appendix 2-Executive Response (4 pages)  
Appendix 3-List of Recommendations & Implementation Schedule (2 pages)

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Christie True, Director, Department of Natural Resources and Parks  
Marc Isaacson, Director, Wastewater Treatment Division  
Melani Pedroza, Clerk of the Council, Metropolitan King County Council  
Elka Peterson Horner, Administrator 1, King County Executive Office

# Appendix 1

## Status of Recommendations

The King County Auditor's Office added two columns to a table that was provided by Wastewater Treatment Division (WTD). The columns "CPO Status" and "AECOM Category" represent our assessment of the status of these recommendations as of May 14, 2019, and the category these recommendations fall into based on the original AECOM report. These categories are (1) Study, (2) Training, (3) Life Safety, and (4) CIP. We validated these categorizations with WTD.

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

STATUS	DESCRIPTION
<b>Complete</b>	The recommendation has been implemented in full and there is no further action required
<b>In progress</b>	Implementation of the recommendation has begun but, due to complexity, resource availability, and/or budget constraints, the work is not yet complete
<b>Ongoing</b>	Implementation of the recommendation has been completed and is systematically and/or programmatically subject to periodic review, updating, and/or continuous improvement
<b>Under evaluation</b>	Evaluation has begun to determine the feasibility of the recommendation and its resource, prioritization, budgetary and scheduling constraints
<b>Implementing alternative</b>	Recommendation was replaced with a more effective, alternative solution that meets the intent of the original recommendation
<b>Not incorporated</b>	After evaluation and consideration, the recommendation will not be implemented because it does not mitigate operation risks

#	CPO Status	AECOM Category	AECOM Recommendations	WTD STATUS	WTD Timeline
1	PROGRESS	STUDY	Evaluate ways to improve control strategies and flow management within the collection system.	UNDER EVALUATION	2020 initial evaluation
2	PROGRESS	STUDY	Evaluate the collection system to identify new areas for storage.	UNDER EVALUATION	2020 initial evaluation
3	PROGRESS	STUDY	Add primary treatment technologies to the collection system.	UNDER EVALUATION	2020 initial evaluation

#	CPO Status	AECOM Category	AECOM Recommendations	WTD STATUS	WTD Timeline
4	PROGRESS	STUDY	Consider implementing passive overflows at key locations.	UNDER EVALUATION	2019-2020 discussion of options with regulators
5	PROGRESS	STUDY	Request that West Point Treatment Plant (West Point) be regulated as a combined sewer overflow outfall.	UNDER EVALUATION	Evaluating as part of WTD system-wide planning
6	DONE	STUDY	Evaluate maximizing flow through the overflow weir by allowing head to build in the Influent Control Structure.	COMPLETE	Capital project to start in 2019
7	DONE	STUDY	Evaluate adding a passive bypass weir.	COMPLETE	Capital project to start in 2019
8	DONE	TRAINING	Avoid overriding controls of the Emergency Bypass gate to keep the gate manually closed.	COMPLETE	Implemented and ongoing
9	DONE	LIFE SAFETY	Add automated Emergency Bypass gate control at the Influent Control Structure.	COMPLETE	Implemented
10	DONE	LIFE SAFETY	Add ability to remotely operate Emergency Bypass gate from Main Control.	COMPLETE	Implemented
11	PROGRESS	LIFE SAFETY	Add ability to control influent gates from Main Control.	IN PROGRESS	2019-2020 implementation
12	PROGRESS	LIFE SAFETY	Add control system programming that closes influent gates automatically when the Emergency Bypass gate is opened.	IN PROGRESS	2019-2020 implementation
13	N/A		Install flow meters on influent lines.	NOT INCORPORATED	N/A
14	DONE	CIP (minor)	Add real-time collection system controls.	COMPLETE	Ongoing
15	DONE	TRAINING	Continuously rake bar screen area during wet-weather events.	COMPLETE	Implemented and ongoing

#	CPO Status	AECOM Category	AECOM Recommendations	WTD STATUS	WTD Timeline
16	DONE	STUDY	Raise the channel height at the bar screen area.	IMPLEMENTING ALTERNATIVE	Alternative capital project to start in 2019
17	DONE	STUDY	Evaluate options to provide 440 MGD firm pumping capacity at raw sewage pumps.	COMPLETE	Capital project to start in 2019
18	DONE	TRAINING	Develop a detailed plan to operate at 330 MGD in preparation for losing a pump.	COMPLETE	Implemented and ongoing
19	N/A	N/A	Install flow meters on influent lines.	NOT INCORPORATED	N/A
20	PROGRESS	LIFE SAFETY	Evaluate incorporating automatic controls through a supervisory control and data acquisition (SCADA) system.	IN PROGRESS	2019-2020 Implementation
21	DONE	TRAINING	Provide additional staff training on operating raw sewage pumps.	COMPLETE	Implemented and ongoing
22	DONE	TRAINING	Update safety procedures on operating the raw sewage pumps during peak-flow conditions.	COMPLETE	Implemented and ongoing
23	PROGRESS	CIP	<p>Replace raw sewage pump engines with electric motors.</p> <p>Evaluate current condition of raw sewage pumps and determine expected life span.</p> <p>Provide backup systems to increase redundancy.</p> <p>Evaluate current condition and determine expected life span of the raw sewage pump station [piping system].</p>	COMPLETE	Capital project to start in 2019
24	PROGRESS	LIFE SAFETY	Modify control strategy to include secondary instruments.	IN PROGRESS	2019-2020 implementation
25	DONE	CIP (minor)	Replace level switches with modern tethered switches that	COMPLETE	Implemented

#	CPO Status	AECOM Category	AECOM Recommendations	WTD STATUS	WTD Timeline
			do not require a stilling well and are less likely to fail.		
26	PROGRESS	LIFE SAFETY	Modify control strategy to include secondary instruments.	IN PROGRESS	2019-2020 implementation
27	PROGRESS	LIFE SAFETY	Incorporate automatic controls through a supervisory control and data acquisition (SCADA) system.	IN PROGRESS	2019-2020 implementation
28	DONE	STUDY	Evaluate feasibility of a passive bypass.	IMPLEMENTING ALTERNATIVE	Alternative capital project to start in 2019
29	N/A	N/A	Evaluate feasibility of connecting east and west primary effluent channels.	NOT INCORPORATED	N/A
30	PROGRESS	STUDY (design)	Evaluate feasibility of a passive bypass.	IMPLEMENTING ALTERNATIVE	Alternative capital project to start in 2019
31	N/A	N/A	Reevaluate control strategy.	NOT INCORPORATED	N/A
32	PROGRESS	CIP	Evaluate feasibility of a passive bypass.	COMPLETE	Capital project to start in 2019
33	DONE	CIP (minor)	Add automated Emergency Marine Outfall gate control at Flow Diversion Structure.	COMPLETE	Implemented and ongoing
34	DONE	LIFE SAFETY	Add ability to remotely operate Emergency Marine Outfall gate at the Flow Diversion Structure from Main Control.	COMPLETE	Complete
35	DONE	CIP	Provide a spare hydraulic unit that can operate with any pump control valve.	COMPLETE	Implemented
36	DONE	CIP	Provide redundant electrical power supply to all hydraulic power units.	COMPLETE	Implemented
37	DONE	CIP	Add pressure relief valves at pump discharge lines.	IMPLEMENTED ALTERNATIVE	Alternative complete

#	CPO Status	AECOM Category	AECOM Recommendations	WTD STATUS	WTD Timeline
38	DONE	CIP	Provide portable ladder platform and hand wheel to manually operate the butterfly control valve.	IMPLEMENTED ALTERNATIVE	Alternative complete
39	PROGRESS	TRAINING	Routinely examine data from vibration monitors to determine trends to help forecast pump maintenance and repairs.	COMPLETE	Implemented and ongoing
40	PROGRESS	CIP	Update vibration monitors.	IN PROGRESS	1st quarter 2020 Substantial completion
41	DONE	STUDY	Evaluate the current condition of the Effluent Pumping System and determine its expected life span.	COMPLETE	Implemented and ongoing
42	DONE	CIP	Provide backup systems to increase redundancy.	COMPLETE	Implemented and ongoing
43	DONE	TRAINING	Provide good maintenance, closely monitor systems, and stock critical spare parts.	COMPLETE	Implemented and ongoing
44	N/A	N/A	Use a differential pressure sensor across the pump to estimate flow rate.	NOT INCORPORATED	N/A
45	N/A	N/A	Provide controls that allow the Effluent Pump Station to operate at constant speed.	NOT INCORPORATED	N/A
46	N/A	N/A	Incorporate automatic transfer of switchgear main and tie breakers upon power loss.	NOT INCORPORATED	N/A
47	DONE	TRAINING & STAFFING	Staff at least two electricians during high-flow events.	COMPLETE	Implemented and ongoing
48	DONE	CIP	Provide additional permanently connected hydraulic power unit on the B side.	COMPLETE	Implemented
49	DONE	CIP	Power Effluent Pump Station discharge valve controls from individual variable-frequency drives.	IMPLEMENTED ALTERNATIVE	Alternative complete



#	CPO Status	AECOM Category	AECOM Recommendations	WTD STATUS	WTD Timeline
50	DONE	STUDY	Analyze single points of failure for all components.	IN PROGRESS	2019-2020 implementation
51	PROGRESS	CIP	Add surge suppressors.	COMPLETE	Implemented
52	PROGRESS	CIP	Install power line monitors with transient waveform capture feature on each substation's main breaker.	IN PROGRESS	Capital project to start in 2019
53	DONE	CIP (minor)	Conduct the remainder of testing related to the main switchgear 722-MSG01 circuit breaker ground fault 52-3 trip.	COMPLETE	Implemented
54	DONE	TRAINING	Update standard operating procedure for Effluent Pump Station restart after ground fault.	COMPLETE	Implemented
55	PROGRESS	LIFE SAFETY	Add an "Interlock Active" indication light to the local control panels.	IN PROGRESS	2019-2020 implementation
56	N/A	N/A	Add a supervisory control and data acquisition (SCADA) system bypass switch to bypass the interlock.	NOT INCORPORATED	N/A
57	N/A	N/A	Prevent interlock from being activated during high-plant-flow scenarios.	NOT INCORPORATED	N/A
58	PROGRESS	LIFE SAFETY	Remove the requirement to use both the High and high-high switches to activate the interlock.	IN PROGRESS	2019-2020 recommendation
59	PROGRESS	LIFE SAFETY	Add an Ovation-level high-high signal to the hardwired interlock.	IN PROGRESS	2019-2020 recommendation
60	DONE	CIP (minor)	Add remote start/stop pump controls to the Main Control room through the Ovation system.	IMPLEMENTING ALTERNATIVE	Alternative complete
61	DONE	LIFE SAFETY	Add a hard-wired emergency stop push button not controlled through Ovation.	IN PROGRESS	2019-2020 implementation

#	CPO Status	AECOM Category	AECOM Recommendations	WTD STATUS	WTD Timeline
62	DONE	CIP (minor)	Add remote start/stop pump controls to the Main Control room through the Ovation system.	IMPLEMENTING ALTERNATIVE	Alternative complete
63	PROGRESS	LIFE SAFETY	Remove the requirement to use both the High and high-high switches to activate the interlock.	IN PROGRESS	2019-2020 Evaluation
64	PROGRESS	LIFE SAFETY	Add an Ovation-level high-high signal to the hardwired interlock.	IN PROGRESS	2019-2020 recommendation
65	DONE	LIFE SAFETY	Add remote open/close gate controls to the Main Control room through the Ovation system.	IMPLEMENTING ALTERNATIVE	Alternative complete
66	DONE	LIFE SAFETY	Conduct an alarm management review workshop to properly prioritize alarms and remove or condition alarms.	IN PROGRESS	2018-2019 implementation
67	DONE	TRAINING & STAFFING	Develop incentive programs to retain staff at West Point.	ONGOING	Ongoing
68	DONE	TRAINING & STAFFING	Extend aspects of the Operator-in-Training program to existing staff.	COMPLETE	Implemented and ongoing
69	DONE	TRAINING	Create an Emergency Bypass standard operating procedure.	COMPLETE	Implemented and ongoing
70	DONE	TRAINING	Change the "no bypass" philosophy.	COMPLETE	Implemented and ongoing
71	DONE	TRAINING		COMPLETE	Implemented and ongoing
72	DONE	LIFE SAFETY	Add an Emergency Bypass override button at the Main Control room.	IN PROGRESS	2019-2020 implementation
73	DONE	TRAINING	Provide hands-on Emergency Response Plan training.	COMPLETE	Implemented and ongoing
74	DONE	TRAINING	Run the hydraulic simulation model so operators know narrow	COMPLETE	Implemented and ongoing

#	CPO Status	AECOM Category	AECOM Recommendations	WTD STATUS	WTD Timeline
			time margins and potential consequences.		
75	DONE	LIFE SAFETY	Implement a Life Safety Management system.	COMPLETE	Implemented and ongoing
76	DONE	TRAINING	Add an automated call program to contact on-call personnel.	IMPLEMENTED ALTERNATIVE	Alternative implemented and ongoing
77	DONE	TRAINING	Increase the number of staff on duty in Main Control during wet-weather events.	COMPLETE	Implemented and ongoing
78	DONE	TRAINING	Conduct an alarm management review workshop to properly prioritize alarms and remove or condition alarms.	IN PROGRESS	2018-2019 implementation
79	PROGRESS	LIFE SAFETY	Add a visual beacon/strobe-type alarm in the control room.	IN PROGRESS	2019-2020 implementation
80	DONE	TRAINING	Provide Emergency Communications training.	COMPLETE	Implemented and ongoing
81	DONE	TRAINING	Practice standard operating procedures for Effluent Pump Station restart.	COMPLETE	Implemented and ongoing
82	DONE	TRAINING	Create a designated emergency evacuation path.	COMPLETE	Implemented and ongoing
83	DONE	TRAINING	Develop standard operating procedure for tunnel entry.	COMPLETE	Implemented and ongoing
84	DONE	TRAINING	Review operator training program.	COMPLETE	Implemented and ongoing
85	DONE	TRAINING	Increase number of operators on duty.	COMPLETE	Implemented and ongoing
86	DONE	TRAINING	Provide hands-on Emergency Response Plan training.	COMPLETE	Implemented and ongoing
87	DONE	CIP (minor)	Add waterproof lighting in the basement.	IMPLEMENTED ALTERNATIVE	Alternative complete
88	DONE	CIP	Have two permanent skids hooked up at all times.	COMPLETE	Implemented
89	DONE	CIP (minor)	Secure walkway covers.	COMPLETE	Implemented

#	CPO Status	AECOM Category	AECOM Recommendations	WTD STATUS	WTD Timeline
90	DONE	TRAINING	Revise standard operating procedure for annual plant hydraulic safety.	COMPLETE	Implemented and ongoing
91	PROGRESS	LIFE SAFETY	Implement a Life Safety Management system.	COMPLETE	Implemented and ongoing
92	DONE	TRAINING	Develop a dynamic computer model to simulate plant hydraulic conditions.	COMPLETE	Implemented and ongoing
93	DONE	TRAINING	Implement routine testing of the Primary Effluent gate interlock indicator in Area Control Center 1.	COMPLETE	Implemented and ongoing
94	PROGRESS	LIFE SAFETY	Conduct an alarm management review workshop to properly prioritize alarms and remove or condition alarms.	IN PROGRESS	2018-2019 Implementation
95	DONE	TRAINING	Revise standard operating procedure for Effluent Pump Station reset.	COMPLETE	Implemented and ongoing
96	DONE	LIFE SAFETY	Implement a Life Safety Management approach to all maintenance not included in Process Safety Management.	COMPLETE	Implemented and ongoing
97	DONE	LIFE SAFETY		COMPLETE	Implemented and ongoing
98	DONE	LIFE SAFETY		COMPLETE	Implemented and ongoing

# Executive Response

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## King County

### Dow Constantine

King County Executive

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June 27, 2019

KING COUNTY  
AUDITOR'S OFFICE

Kymber Waltnunson  
King County Auditor  
Room 1033  
COURTHOUSE

JUNE 27, 2019

**RECEIVED**

Dear Ms. Waltnunson:

Thank you for the opportunity to review and comment on the proposed final report on the Department of Natural Resources and Parks (DNRP), Wastewater Treatment Division (WTD) Capital Project Oversight Office Oversight of the West Point Treatment Plant.

Because of the system failure at West Point on February 9, 2017, the Council commissioned an independent assessment of circumstances leading to the event, and identification of appropriate recommendations for mitigating further risk of damage to West Point. In December 2017, through Ordinance 18628 the Council directed your office to conduct oversight of the WTD's implementation of the report recommendations. The WTD also conducted an independent analysis of its own progress, which was an important step in holding WTD accountable. I appreciate the collaborative process and due diligence used by your staff while working with the WTD to gather information for your report.

I concur with the recommendations made by the Capital Project Oversight analyst in the report; recognizing the WTD has taken proactive and decisive actions to improve safety and system redundancy at West Point. I appreciate, overall, the recommendations made in the audit and acknowledge the sense of urgency by which they are made.

I concur with recommendation one and recognize the WTD has taken measures to ensure that capital projects for West Point have been prioritized to meet improved system redundancy and safety. I also understand the reality of the time required to plan, design, gain regulatory approval (when required) and construct these important capital projects while the plant remains in operation.

I strongly support and concur with the importance of the recommendation for improved life safety and asset management integration. I am proud of the WTDs "Safety First" approach in all its operations. Immediate improvements to the Life Safety Management system have been implemented with a long-term vision of continuous monitoring, improvement and updates as lessons are learned and conditions change. A project to implement an Enterprise Asset



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KyMBER WalTMunson  
June 27, 2019  
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Management System will integrate Life Safety Management and Asset Management. Until that project is complete, the WTD has developed work around systems to ensure integrated management of its priorities for Life Safety Management with its ongoing Asset Management program.

I concur with the recommendation made for the WTD to re-evaluate its combined sewer overflow program to determine opportunities to divert or reduce flows to West Point. The program is governed by a federal consent decree (CD) with specific milestones. The CD cannot be modified without formal approval by the regulatory agencies and ultimately, a federal court. The system-wide planning effort, known as the Clean Water Plan, will evaluate combined sewer overflow investments with the intent of working with the regulators about how to ensure the best water quality outcomes for Puget Sound.


I strongly support and concur with the need to have a comprehensive training program. The WTD's efforts to implement and improve a robust training program and, to further enforce a culture of Safety First at West Point have been admirable. Using lessons learned, and a continuous improvement approach, WTD is proactively reviewing, revising and documenting its plan for a training program that will be monitored and updated to ensure proper training and safety procedures for personnel at West Point. This effort has been organized with a spirit of inclusion and buy-in by those who do the important work of keeping our plants in full operation.

I am committed to ensuring the recommendations made in your report are fully implemented. Following the recommended actions will help the WTD ensure enhanced safety and system redundancy at West Point.

Thank you for your review of the West Point independent assessment, recommendations and continued oversight. If you have any questions regarding our report responses, please feel free to contact Mark Isaacson, Division Director of the Wastewater Treatment Division in the Department of Natural Resources and Parks, at 206-477-4601.

Sincerely,



 Dow Constantine  
King County Executive

Enclosure

cc: Casey Sixkiller, Chief Operating Officer, King County Executive Office (KCEO)  
Rachel Smith, Deputy County Executive and Chief of Staff, KCEO  
Dwight Dively, Director, Office of Performance, Strategy and Budget, KCEO  
Christie True, Director, Department of Natural Resources and Parks (DNRP)  
Mark Isaacson, Director, Wastewater Treatment Division, DNRP

**Recommendation 1**

The Wastewater Treatment Division should gain conceptual approval from the state Department of Ecology no later than January 2020 for its passive weir and raw sewage pump capital investments to alleviate the risk of future flooding events at West Point.

**Agency Response**

Concurrence	<b>Concur</b>
Implementation date	01/31/2020
Responsible agency	WTD
Comment	WTD will seek conceptual approval of the project, in conjunction with update to the NPDES permit, from Department of Ecology with stipulations to ensure that the design will ultimately meet their requirements for approval.

**Recommendation 2**

The Wastewater Treatment Division should adopt formal mechanisms to track its life safety management activities, until the planned enterprise asset management system is fully implemented.

**Agency Response**

Concurrence	<b>Concur</b>
Implementation date	3/31/2023
Responsible agency	<b>WTD</b>
Comment	A SharePoint site and chain of custody routing forms are currently in place. WTD and King County IT are working on a joint Enterprise Asset Management System (EAMS). This is a multi-faceted project with a large number of ancillary software systems that will require integration with a system wide EAMS, and KCIT coordination and oversight.

**Recommendation 3**

As part of its comprehensive planning process, the Wastewater Treatment Division should reevaluate its combined sewer overflow program to determine whether there are opportunities to manage or reduce flows to the West Point Treatment Plant within the broader collection system and to document the results of its evaluation.

**Agency Response**

Concurrence	<b>Concur</b>
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Implementation date	12/31/2022
Responsible agency	<b>WTD</b>
Comment	Information from our flows and loads study and the long term control plan will be used to determine the feasibility of reducing flows and whether regulatory agencies will approve a different CSO management strategy.

#### Recommendation 4

The Wastewater Treatment Division should develop, document, and implement a training plan that provides information on frequency of recurring training and includes provisions to continuously update trainings to reflect new systems and related procedures as they are implemented.

#### Agency Response

Concurrence	<b>Concur</b>
Implementation date	12/31/2020
Responsible agency	<b>WTD</b>
Comment	West Point has implemented weekly training, standard operating procedure review and an information sharing process led by senior operators, shift supervisors and subject matter experts titled IVY or Investing In You. These meetings are a forum for reviewing training selections and gathering edits to be incorporated in training resources. New procedures are developed and implemented as new systems are brought on-line. Documentation is forwarded to IVY for use in weekly training sessions. These processes are being implemented and fully integrated with Safety office policies and procedures.



# List of Recommendations & Implementation Schedule

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## Recommendation 1

**The Wastewater Treatment Division should gain conceptual approval from the state Department of Ecology no later than January 2020 for its passive weir and raw sewage pump capital investments to alleviate the risk of future flooding events at West Point.**

IMPLEMENTATION DATE: 1/31/2020

ESTIMATE OF IMPACT: By gaining conceptual approval from the state Department of Ecology for these projects, the Wastewater Treatment Division can quickly begin design work to meet its capital program timelines while complying with state permits.

## Recommendation 2

**The Wastewater Treatment Division should adopt formal mechanisms to track its life safety management activities, until the planned enterprise asset management system is fully implemented.**

IMPLEMENTATION DATE: 3/31/2023

ESTIMATE OF IMPACT: By adopting formal mechanisms to track its life safety management activities, the Wastewater Treatment Division can help ensure that information gathered, risk analysis performed, and decisions made can be applied by West Point staff before a new enterprise asset management system can be brought online.

## Recommendation 3

**As part of its comprehensive planning process, the Wastewater Treatment Division should reevaluate its combined sewer overflow program to determine whether there are opportunities to manage or reduce flows to the West Point Treatment Plant within the broader collection system and to document the results of its evaluation.**

IMPLEMENTATION DATE: 12/31/2022

ESTIMATE OF IMPACT: By reevaluating its combined sewer overflow program to determine whether there are opportunities to manage or reduce flows to the West Point Treatment Plant, and documenting its findings, the Wastewater Treatment Division can understand whether changes to the broader wastewater collection system would help mitigate long-term risk at West Point.

## Recommendation 4

**The Wastewater Treatment Division should develop, document, and implement a training plan that provides information on frequency of recurring training and includes provisions to continuously update trainings to reflect new systems and related procedures as they are implemented.**

IMPLEMENTATION DATE: 12/31/2020

ESTIMATE OF IMPACT: By developing, documenting, and implementing a training plan, the Wastewater Treatment Division can ensure that training is updated continuously and new information is provided to staff in a timely manner.



# KING COUNTY AUDITOR'S OFFICE

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## Advancing Performance & Accountability

KYMBER WALTMUNSON, KING COUNTY AUDITOR

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NON-  
AUDIT

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