

## Clarks Creek TMDL Implementation Plan - 2021 Update Response to Ecology's Comments - Pierce County Edits

**DATE:** July 15, 2002

**FROM:** Tim Hagan, Pierce County, Surface Water Management

**TO:** Sheila Marco, SWRO Supervisor, Watershed Resources Unit

*Ecology provided the following comments on the County's 2021 Clarks Creek TMDL Implementation Plan. The following revisions have been organized to show how each section of the Plan was edited to respond to each of Ecology's comments. Each response or offered edit is presented in the same order the question was written.*

### **Ecology Comment:**

The 2021 Plan says, "After conducting a series of draft document reviews and technical negotiations, the County received three separate letters dated March 2, 2017, June 11, 2019, and July 15, 2019, stating the Plan had been accepted by the State" (p. 1).

**Ecology Recommended Edit (Plan pg. 1):** "After conducting a series of draft document reviews and technical negotiations, the County received three separate letters dated March 2, 2017, June 11, 2019, and July 15, 2019, stating the March 2, 2017, Plan had been accepted by the State, with the understanding that Ecology would review future iterations of this Plan in accordance with the Phase 1 permit requirements".

**County Response:** *After conducting a series of draft document reviews and technical negotiations, the County received three separate letters from Ecology dated March 2, 2017, June 11th, 2019, and July 15, 2019, respectfully. Each successive letter indicated increasing levels of conditional approval by the State. The third and final letter of July 15, 2019 confirmed the March 2, 2017 Plan had been accepted, with the understanding Ecology would review future updated versions of the Plan in accordance with the County's Phase 1, Appendix 2 Permit requirements.*

### **Ecology provides these comments on the County's 2021 Clarks Creek Plan:**

The 2021 Plan says, "...The remaining six appendices provide a record of correspondence and project actions to afford a closer examination of how the Plan was reviewed, adjusted and approved by Ecology" (p. 15).

**Ecology Response:** Ecology approved the County's March 2, 2017, Plan subject to the conditions included in Rich's June 11, 2019, and July 15, 2019, letters. Appendices F-H (The 5-year reassessment memo, QAPP, and data acceptability report) are outside the scope of Ecology's Phase 1 Permit required Plan review.

**Ecology Recommended Edit (Plan pg. 15):** "...The remaining six appendices provide a record of correspondence and project actions to afford a closer examination of this Plan."

**County Response:** *Ten (10) appendices have been made available in a separate volume to help support the readers understanding of the Plan. Appendices F, G and H are technical documents explaining the implementation of the 5-Year Reassessment. Appendices A, B, C, D, E and I provide a record of*

correspondence and project actions to offer a closer look at how the March 2, 2017 Plan was prepared, reviewed, adjusted and implemented prior to the July 15, 2019, approval letter.

**Ecology provides these comments on Appendix B - Technical Memorandum:**

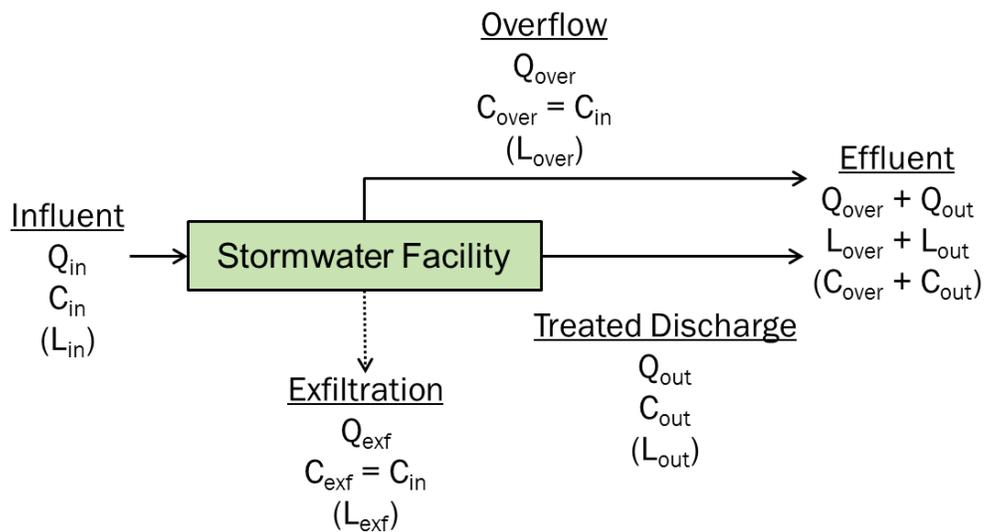
Appendix B of the 2021 Plan was not updated to include the treatment wetland that replaced the 104th Street E pond.

**Ecology Recommended Edit (Appendix B, pg. 39):** Please update Appendix B to reflect this replacement of the 104th Street E pond with a treatment wetland. Please describe the method for crediting this treatment wetland in Appendix B. Tables 6 and 7 in Appendix B still refer to the 104 Street E Pond.

**Pierce County Response (Appendix B, starting pg. 39):**

### Section 3 Methods for Estimating Load Reductions

**County Response: Swales and Treatment Wetlands.** The two bioswales, Canyon Creek PDD-east basin and Wysteria Condominiums, were designed for runoff treatment but not detention. For those 2 projects, a rating table was developed that included a calculation of Hydraulic Residence Time (HRT) for increasing volumes, flow rates, and velocities through the swale or wetland. Ecology standards require a minimum HRT of 9 minutes for effective treatment in swales and wetlands (SWMMWW Volume V, Ecology 2014a). At each time step, the rating table was used as a lookup table, where HRT was interpolated from looking up the inflow flow rate and compared to the 9-minute threshold.



#### 3.1.2 Ecology’s Basic Treatment Standard

Brown and Caldwell reviewed the drainage reports and engineering plans for all the County’s existing (post-2003) and proposed structural stormwater control projects. The engineering reports indicated that all the County facilities were designed to meet the Basic Treatment standard except the existing pond near Woodland Avenue and 128th Street E. No drainage report was available for the Woodland Avenue and 128th Street E pond but it was assumed that this facility was designed consistent with the SWMMWW. The existing privately-owned facilities

*were also assumed to be designed consistent with the Basic Treatment design criteria as required by County's Stormwater Manual.*

*Ecology describes Basic Treatment as the ability for a Structural Stormwater Control (BMP) to reliably provide 80 percent TSS removal based on an influent concentration range of 100 milligrams per liter (mg/L) to 200 mg/L. For influent concentrations less than 100 mg/L, the effluent removal goal is 20 mg/L TSS (Ecology 2014a). SWMMWW design guidance for structural stormwater controls such as wet-pool facilities (ponds), biofiltration swales and treatment wetlands meet the Basic Treatment standard. Proprietary designs, such as StormFilters, and Filterras passed the Technology Assessment Protocol – Ecology (TAPE) where they were shown to meet the Basic Treatment standard and were awarded the General Use Level Designation (GULD). TAPE testing on the StormFilter cartridges has shown effluent concentrations of less than 20 mg/L TSS in some studies (Ecology 2014b). The results presented in this Technical Memorandum are based on the Basic Treatment standards with 20 mg/L as the minimum effluent concentration. Credit for TSS reduction with the existing StormFilters assumes the cartridges are cleaned or replaced once per year to maintain their sediment-filtering capacity.*

*The County and Brown and Caldwell assumed all structural stormwater control facilities in the Clarks Creek watershed were designed to meet the Basic Treatment standard. Sediment load reductions were calculated relative to the water quality volume or water quality flow rate of each facility. The process subtracted 80 percent of the influent sediment concentration to a minimum of 20 mg/L, and then applied the remaining concentration to the treated volume, providing a calculation of the treated effluent TSS load reduction. It was assumed that 100 percent of the TSS load in the volume infiltrated was removed. The volume that overflows was considered untreated effluent which maintained the influent concentration and received no TSS load reduction credit.*

**Ecology Comment (Appendix B):** Section 3.1.7 of Appendix B is called Discount Factor for Maintenance.

Is the County implementing this discount factor for maintenance method? The Discount Factor for maintenance method described in Appendix B differs from the annual facility/BMP crediting method described in Sections 3.4-3.4.4.

Section 3.4.1 describes an “all or none” approach to annual crediting of facilities/BMPs based on if the facility/BMP is operational.

**Ecology Recommended Edit:** Can you elaborate on what “operational” means? Does it mean the stormwater facility/BMP is providing its designed pollutant removal or close to it?

Can you provide “performance threshold” examples for a couple facilities/BMPs? (See Section 3.4.4) If the Discount Factor for Maintenance text is no longer applicable, we recommend the County either remove it from Appendix B or acknowledge this fact.

**County Response:** *No, the inspection and maintenance credit determination is 100% or 0% based on guidance issued from Chris Montague-Breakwell prior to the July 15, 2019 approval letter. Inspections protocols are based on NPDES Permit requirements. It was agreed that a*

graduated credit discount rate based on BMP performance decay was too complex and variable to justify based on the existing inspection data. It was also determined that the existing “all or nothing” crediting approach was more conservative, and it incentivized the County to more rigorously maintain its facilities to assure their annual credit eligibility.

**The following are the Appendix B (Technical Memorandum) Edits**

**3.1.7 Inspection and Maintenance Requirements for Annual Crediting**

**County Response:** *Inadequate maintenance can reduce the efficiency of stormwater treatment facilities. Therefore, the pollutant load reduction estimation method considers maintenance levels as a corroborating prerequisite for crediting. Brown and Caldwell estimated the impacts of maintenance on pollutant removal. The determination of operability is based on how the inspection reveals the facility had been adequately maintained to meet the Basic Treatment requirements the facility’s design assures. Sediment removal credit is only awarded when the facility was rated by the inspector as having no significant structural or functional deficiencies. Any rating by the inspector indicating the facility was less than fully functional (operational) receives no credit if the required maintenance was not performed within the same year.*

*The County’s Surface Water Management Division and Road Operations Division inspect all of the existing public and private facilities listed in this Plan. The County does not maintain privately-owned facilities, but it does perform annual inspections and has a progressive compliance and enforcement program to assure standards are being met and maintained. Table 1 lists the maintenance ratings and credit award based on the County’s NPDES inspection scoring protocols. The County’s inspection records are summarized in the annual Credit Reporting Ledger to provide a record of the year-to-year operational (i.e., functioning as designed) status for each BMP. The ledger reports each facility eligible for crediting and reports whether it has been inspected and maintained to confirm Basic Treatment is intact and occurring. Each structural stormwater facility (BMP) listed in this Plan was designed consistent with the County’s Stormwater Manual and the Stormwater Management Manual for Western WA.*

Table 1. Inspection and Maintenance Requirements for Annual Crediting			
Inspection Division	Maintenance Rating	Credit	Rationale
Pierce County Surface Water Management <sup>a</sup>	5 – Facility BMP implementation exceeds requirements.	100%	Structures and features are meeting design based inspection standards.
	4 – Facility BMP implementation meets requirements.	100%	No significant deficiencies: system is functioning and has been properly maintained; not at risk of failure.
	3 – Facility BMP implementation has minor departure from requirements.	0%	System in-place and functioning, but maintenance is overdue; or difficulty locating structures on site; not at risk of failure.
	2 – Facility BMP implementation has major departure from requirements.	0%	System substantially impaired and at risk for failure or bypass.
	1 – Facility BMP implementation has gross neglect of requirements.	0%	System in failure or bypass; or at least three of the following: clear evidence of lack of facility maintenance, excessive sediment, trash, debris or

**Table 1. Inspection and Maintenance Requirements for Annual Crediting**

Inspection Division	Maintenance Rating	Credit	Rationale
			vegetation; lack of willingness to correct deficiencies.
Pierce County Road Operations <sup>b</sup>	0 – Facility needs no maintenance, no sediment buildup.	100%	No maintenance needed, no sediment.
	3 – Facility needs no maintenance, minimal sediment buildup.	100%	No maintenance needed; sediment threshold not exceeded.
	6 – Facility needs maintenance to avoid failure or bypass.	0%	Still functioning effectively but needs maintenance to avoid bypass.
	9 – Facility needs immediate maintenance, threshold of sediment exceeded, and other structures affected.	0%	Facility is in failure or bypass and/or downstream structures are affected.

a. Pierce County 2012

b. Pierce County 2015

### 3.1.8 Average Annual Sediment Reduction

**County Response:** *The HSPF simulated influent TSS concentration associated with inflows to calculate the influent fine sediment load being routed through a structural stormwater control (BMP). This information was further processed using an Excel macro spreadsheet specifically developed to calculate the average annual sediment load reduction based on the HSPF 50-year rainfall-runoff simulation and the Basic Treatment assumptions for the BMP being evaluated. For each hourly time step, the TSS load reduction was calculated for only that portion of the stormwater influent being routed through the water quality orifice or lost through infiltration. Only that portion of the October 21, 2003 storm event volume routed through the BMP was credited as having achieved the Basic Treatment. The remaining volume diverted around the BMP and not through the orifice was considered overflow in-bypass and was not given credit because it did not receive Basic Treatment. This was particularly meaningful when running the large volume of stormwater runoff generated by a 50-year storm like the Critical Condition (October 21, 2003 storm event) through a structural stormwater control (BMP) designed to accommodate the 6-month, 24-hour storm (or 91st percentile, 24-hour runoff volume). This conservative computational approach reveals the limited level of treatment (TSS reduction) which could be credited by a structural stormwater control when evaluating a disproportionately large storm event like the selected critical condition. The sediment reduction for each time-step was tallied to calculate the total TSS reduction provided by the BMP, which was then divided by 50 years to calculate the average annual TSS load reduction.*

**Ecology Comment:** Ecology provided initial comments to Pierce County on your draft street sweeping QAPP on November 23, 2020. Ecology never received a revised QAPP from the County for our review. Does Pierce County still intend to submit this revised QAPP to Ecology? The Phase 1 permit language says the County “can only include sediment reduction credit for its street sweeping program under an Ecology-approved QAPP.” Pierce County does not have this Ecology-approved QAPP. Your 2021 Plan includes statements about taking sediment reduction credit for street sweeping; this is not allowed by your Permit unless Ecology approves your QAPP.

Does Pierce County still intend to submit this revised QAPP to Ecology? If yes, when will you submit it? Please edit your 2021 Plan to clarify your intent regarding street sweeping credit. Ecology and the City of Puyallup had multiple communications about revisions to the City’s street sweeping study QAPP before Ecology approved it.

**County Response:** *The County has removed any mention of an emerging Street Sweeping program from the Plan. The role and utility of street sweeping to provide water quality benefit might be discussed during the 5-Year Reassessment, and then again with the follow-up discussions that will precede the development of the second 5-Year Implementation Plan.*

The following depicts the Appendix B Edits

### 3.3 Sediment Reduction Methods for Street-Sweeping

**County Response:** *The County has removed any mention of an emerging Street Sweeping program from the Plan. The role and utility of street sweeping to provide water quality benefit might be discussed during the 5-Year Reassessment, and then again with the follow-up discussions that will precede the development of the second 5-Year Implementation Plan.*

### 3.4 Future Program Credit Development for the Street-Sweeping Program

**County Response:** *The County has removed any mention of an emerging Street Sweeping program from the Plan. The role and utility of street sweeping to provide water quality benefit might be discussed during the 5-Year Reassessment, and then again with the follow-up discussions that will precede the development of the second 5-Year Implementation Plan.*

## Section 4 Pollutant Load Estimation Results

### 4.1.1 Volume Removed or Treated for October 20-21, 2003 Storm Event

**County Response:** *Table 2 lists the estimated stormwater volume treated for the October 20–21, 2003, storm event for each of the County’s existing and proposed stormwater facilities. To facilitate comparison, the table also lists the tributary area, simulated inflow volume, assumed infiltration rate, and water quality volume or design flow rate for each facility.*

Table 2. Estimated Stormwater Volume Treated and Removed for October 20-21, 2003, Storm Event								
Existing Facilities	Facility Type	Tributary Area (acres)	Tributary Percent Impervious (%)	Influent Volume (MG)	Facility Water Quality Volume (cf)	Facility Water Quality Orifice Flow Capacity (cfs) <sup>a</sup>	Infiltration Rate (in/hr)	Volume Treated and Removed (MG) <sup>b</sup>
Woodland Ave and 128th St E	Pond	14.8	54%	0.77	66,600	0.08	-	0.33
112th St E Pond 1	Pond	6.1	76%	0.45	70,400	0.09	0.05	0.45 (0.02)
112th St E Pond 2	Pond	21.2	48%	1.08	145,600	0.17	-	0.95
Cassidy's Landing	Pond	11.4	3%	0.10	53,400	0.05	-	0.10
112th St E and 78th Ave E	Pond	23.4	49%	1.23	123,800	0.34	2	1.23 (0.88)

**Table 2. Estimated Stormwater Volume Treated and Removed for October 20-21, 2003, Storm Event**

Existing Facilities	Facility Type	Tributary Area (acres)	Tributary Percent Impervious (%)	Influent Volume (MG)	Facility Water Quality Volume (cf)	Facility Water Quality Orifice Flow Capacity (cfs) <sup>a</sup>	Infiltration Rate (in/hr)	Volume Treated and Removed (MG) <sup>b</sup>
Rody Pond Treatment Cell Retrofit	Pond	30.6	84%	2.34	10,700	-	0.4	0.35 (0.33)
59th Ave Ct E	StormFilter	0.59	65%	0.038	-	0.10	-	0.038
72nd St E at Rody Creek	StormFilter	11.7	76%	1.00	-	1.10	-	0.65
86th St E	Boxless Filterra	3.87	44%	0.20	-	0.24	(<0.01)	0.14 (<0.01)
87th St E	Filterra	0.62	76%	0.055	-	0.11	-	0.045
Wysteria Condominiums	Swale	14.3	12%	0.23	-	2.43	-	0.23
Canyon Creek PDD	Pond & Swale	4.08	38%	0.15	3,100	0.53	-	0.14
Courtney Ridge Condos	Pond	6.20	68%	0.47	21,200	0.55	-	0.40
O'Connor	Pond	11.5	6%	0.10	18,000	-	12	0.10 (0.10)
Total				8.21				5.15 (1.32)
<b>New Facilities</b>								
104th Street E Wetland	Pond	445	21%	11.17	496,800	-	-	6.0

#### 4.1.2 Long-term Average Annual Sediment Load Reduction

**County Response:** *Table 3 lists the estimated average annual sediment reduction for the County's existing and proposed stormwater facilities for the 50-year HSPF simulation period (1960-2010).*

**Table 3. Estimated Long-term (1960-2010) Average Annual Sediment Load Reduction**

Existing Facilities	Facility Type	Tributary Area (acres)	Tributary Percent Impervious (%)	Average Influent Sediment Load (tons/yr)	Facility Water Quality Volume (cf)	Facility Water Quality Orifice Flow Capacity (cfs) <sup>a</sup>	Infiltration Rate (in/hr.)	Long-term Annual Average Sediment Load Reduced (tons/yr.)
Woodland Ave and 128th St E	Pond	14.8	54%	1.9	66,600	0.08	-	1.0
112th St E Pond 1	Pond	6.1	76%	1.1	70,400	0.09	0.05	0.9
112th St E Pond 2	Pond	21.2	48%	2.5	145,600	0.17	-	1.9
Cassidy's Landing	Pond	11.4	3%	0.3	53,400	0.05	-	0.2
112th St E and 78th Ave E	Pond	23.4	49%	3.3	123,800	0.34	2	3.3
Rody Pond Treatment Cell Retrofit	Pond	30.6	84%	5.7	10,700	-	0.4	3.3
59th Ave Ct E	StormFilter	0.59	65%	0.1	-	0.10	-	0.1
72nd St E at Rody Creek	StormFilter	11.7	76%	2.2	-	1.10	-	1.4

**Table 3. Estimated Long-term (1960-2010) Average Annual Sediment Load Reduction**

86th St E	Boxless Filterra	3.87	44%	0.4	-	0.24	<0.01	0.3
87th St E	Filterra	0.62	76%	0.1	-	0.11	-	0.1
Wysteria Condominiums	Swale	14.3	12%	0.5	-	2.43	-	0.4
Canyon Creek PDD	Pond & Swale	4.08	38%	0.4	3,100	0.53	-	0.2
Courtney Ridge Condos	Pond	6.20	68%	1.2	21,200	0.55	-	0.8
O'Connor	Pond	11.5	6%	0.3	18,000	-	12	0.3
Total				20.0				14.2
<b>New Facilities</b>								
104th Street E Wetland	Treatment Wetland	445	21%	27.4	496,800	-	-	14.6
64th Ave Court E WQ Vault	StormFilter	9.1	28%	0.6	-	0.29	-	0.4
67th Ave E WQ Vault	StormFilter	12.8	30%	1.0	-	0.15	-	0.5
84th Street E WQ Vault	StormFilter	77.3	82%	17.6	-	1.81	-	9.1
Total				46.6				26.2

a. Flow capacity for ponds shows discharge capacity at water quality volume. The Rody Pond Treatment Cell Retrofit, O'Conner Plat, and 104th Street E Pond are not designed with outlets other than overflow, so no discharge capacity is shown.

The sediment load reduction for ponds and treatment wetlands are calculated based to the influent volume and TSS concentration the facility is modeled to receive using the original HSPF model. In general, treatment efficiency decreases as influent concentrations decrease, and consequently 71 percent of the influent TSS concentrations were modeled to be below 100 mg/L. However, the HSPF model also indicated that some other stormwater treatment ponds with more impervious tributary area did receive influent with higher TSS concentrations, which provided more opportunity for sediment reduction. The Treatment Wetland at 104th Street E has 445 acres of tributary area including 92 acres of impervious area with 30 acres of it routing to other intermediate stormwater treatment facilities (please refer to Response to Comment 3, Appendix G). These 30 acres were excluded from the pollutant load reduction calculations for this facility. The design of the Woodland Ave and 104th Street E Stormwater Treatment Wetland follows the Pierce County Stormwater and Site Development Manual (Volume V 9-16) and is consistent with the BMP T10.30 design requirements found in the Stormwater Management Manual for Western WA. The project design consistency with the SMMWW presumptively assures Basic Treatment is being provided by this treatment wetland. Using the original HSPF model, the project was estimated to treat 6 million gallons of stormwater based on the October 21, 2003 storm event. Additionally, the computation of the Hydraulic Residence Time and Hydraulic Load Removal Rate confirmed an annual average TSS load reduction of 14.6 tons of sediment per year.

**Ecology Comment (Plan Pg. 3):** Please revise the following text (and related text) on TSS credit for street sweeping where applicable: (Communicate in your revisions if the County will submit

a revised QAPP to Ecology.) “The County has submitted a Quality Assurance Project Plan (QAPP) to Ecology to guide the development of a road deposited sediment pick-up rate to calculate the sediment load reduction credits earned per mile swept. calculate [sic] the 4 recovered fine sediment material from the hoppers of the street sweepers and submit those records as a basis for its annual sediment reduction credit” (p. 3).

*County Response: The County has removed any mention of an emerging Street Sweeping program from the Plan. The role and utility of street sweeping to provide water quality benefit might be discussed during the 5-Year Reassessment, and then again with the follow-up discussions that will precede the development of the second 5-Year Implementation Plan.*

**Ecology Comment (Plan pg. 50): Section 3.3.3.3 Advanced Street Sweeping and Performance and Credits** “...With this understanding, the County is proposing to claim street sweeping credit for TSS (particles <500 µm) it actually recovers from the street sweepers working in the Clarks Creek watershed each year. The County has developed a QAPP that describes an ongoing sampling program to measure the particle size distribution, organic carbon fraction and dry mass weight of the recovered material found in the hopper of the regenerative air vacuum sweeper...” (p. 50).

*County Response: The County has removed any mention of an emerging Street Sweeping program from the Plan. The role and utility of street sweeping to provide water quality benefit might be discussed during the 5-Year Reassessment, and then again with the follow-up discussions that will precede the development of the second 5-Year Implementation Plan.*

**Ecology Comment (Plan pg. 61):** “The County has received comments from Ecology on its draft QAPP [sic] is currently in the process of making adjustments to the proposed program prior to its resubmittal”

**County Response (Plan Pg. 61):**

## **4.4 Enhanced Road Operations for Water Quality**

*County Response: The County has removed any mention of an emerging Street Sweeping program from the Plan. The role and utility of street sweeping to provide water quality benefit might be discussed during the 5-Year Reassessment, and then again with the follow-up discussions that will precede the development of the second 5-Year Implementation Plan.*

### **4.1.1 Regenerative-Air Street Sweeping Program Goals**

*County Response: The County has removed any mention of an emerging Street Sweeping program from the Plan. The role and utility of street sweeping to provide water quality benefit might be discussed during the 5-Year Reassessment, and then again with the follow-up discussions that will precede the development of the second 5-Year Implementation Plan.*

### **4.4.2 Future Sweeping Program Credit Development**

*County Response: The County has removed any mention of an emerging Street Sweeping program from the Plan. The role and utility of street sweeping to provide water quality benefit*

*might be discussed during the 5-Year Reassessment, and then again with the follow-up discussions that will precede the development of the second 5-Year Implementation Plan.*

#### **4.4.3 Future Program Monitoring to Support TSS Load Reduction Credits**

**County Response:** *The County has removed any mention of an emerging Street Sweeping program from the Plan. The role and utility of street sweeping to provide water quality benefit might be discussed during the 5-Year Reassessment, and then again with the follow-up discussions that will precede the development of the second 5-Year Implementation Plan.*

**Ecology Comment (Plan pg. 98):** After the County's draft street sweeping QAPP has been accepted by Ecology, the County will tabulate the annual arterial and residential curb-miles swept and the sweeping frequency of each regenerative air street sweeper for each USC they operate in..."

**County Response:** *The County has removed any mention of an emerging Street Sweeping program from the Plan. The role and utility of street sweeping to provide water quality benefit might be discussed during the 5-Year Reassessment, and then again with the follow-up discussions that will precede the development of the second 5-Year Implementation Plan.*

**Ecology Comment (Plan pg. 73):** The 5 -Year Reassessment QAPP: a. Page 73 of your 2021 Plan (Section 5 – The 5-Year Reassessment) says, "A second document, the Quality Assurance Project Plan (QAPP) was approved by Ecology in 2020.

**County Response:** *The County sponsored and conducted the 5-Year Reassessment with Ecology as an active co-participant. The County has communicated with its TAC (Ecology, EPA and PTI) during the first 2 phases of the Project. The TAC members provided important guidance and input throughout the process. The 5-Year Reassessment began in 2017 with the scoping of the project to perform three (3) sequential phases of work. In 2018, the project's study design was described in the Modeling Approach and Data Requirements Memorandum. In 2020, the study's field and laboratory methods were described in the Quality Assurance Project Plan (QAPP), and in 2021 the Data Acceptability Report was finalized. All three documents went through multiple rounds of adjustment based on the comments and responses from Ecology staff as part of their peer-review process.*