Using Western Washington Catch Basin Inspection and Maintenance Data to Predict Maintenance Schedules and Identify Cost-Efficiencies

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King County

Department of Natural Resources and Parks
Water and Land Resources Division
Science and Technical Support Section
King Street Center, KSC-NR-0600
201 South Jackson Street, Suite 600
Seattle, WA 98104
206-477-4800 TTY Relay: 711
www.kingcounty.gov/EnvironmentalScience

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SAM Effectiveness Study – Final Report

Prepared for:

Washington State Department of Ecology
Washington Stormwater Workgroup

Submitted by:

Jenée Colton
King County Water and Land Resources Division
Department of Natural Resources and Parks

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1.0 INTRODUCTION

This project is funded through the Stormwater Action Monitoring Program (SAM) as part of the Effectiveness Studies Component (S8.C). Municipal National Pollutant Discharge Elimination Service (NPDES) Stormwater permits in Washington State require permittees to inspect and maintain catch basins under their jurisdiction on a regular basis. For Phase I permittees, the default inspection frequency is annual. For Phase II permittees, the frequency ranges from two to five years (depending on the calendar year and updated permit requirements). However, the permits allows for an alternative schedule with demonstration that maintenance is needed less frequently. Therefore, this study aims to identify information on cleaning needs that would help permittees direct limited inspection and maintenance resources to provide the greatest environmental benefit. Specifically, this study was designed to evaluate existing catch basin (CB) inspection and maintenance records to identify correlating factors that could be used to predict CB maintenance needs. A secondary goal was to review CB inspection and maintenance program designs and interview stormwater managers among Western Washington jurisdictions to identify cost efficiencies in program implementation.

The effectiveness study question set forth by the Stormwater Work Group (SWG) and addressed by this project follows:

"Analyze/synthesize the catch basin inspection data previously collected by Phase I and some Phase II permittees to help permittees determine individual inspection frequency needs to comply with new permit requirements based on permittees' known areas of concern (and relative unconcern)."

This effectiveness study is part of the SAM and was approved by the SWG.

The following project objectives were defined in the scope of work:

1. Develop an electronic database of available CB inspection and maintenance data for Western Washington,
2. Identify trends and/or correlations in CB inspection and maintenance data that support proposals of alternative inspection schedules to Ecology and/or guide individual jurisdictions' implementation of permit requirements,
3. Identify transferable cost-efficiencies in the design and implementation of the inspection and maintenance programs, and
4. Recommend a list of standard data that should be collected to inform future assessments of sediment accumulation rates in various municipal stormwater system settings.

Although any permittee has the option to analyze their CB inspection data and propose schedules less frequent than the standard one, this project was intended to leverage the collective dataset across the region to evaluate how CB cleaning needs could be predicted. Objective 3 was added to efficiently collect and share feedback while soliciting data from and communicating with municipal permittees about their CB data.

2.0 APPROACH AND GEOGRAPHIC SCOPE

This study was led by a project team from King County. Data solicitation, compilation, and analyses were conducted by the project team with assistance from Osborn Consulting, Inc. (OCI). A Technical Advisory Committee (TAC) was formed with representatives from Everett, Kent, King County, Kitsap County, and Seattle Public Utilities (SPU). This study solicited CB inspection and maintenance data from all Western Washington municipal NPDES stormwater permittees and surveyed them on their program design and costs. This project used only existing data; no new data were generated. Submitted data were compiled, standardized, and screened for quality and completeness by OCI. Data that passed screening were loaded into a Microsoft Access© database for analysis. Interviews were conducted with responsive permittees to clarify their program design, data interpretation, and program costs, as well as inquire on efficiency lessons they have learned through personal experience managing CB programs.

The12-question survey and data request was sent to all (127) of the jurisdictions within Western Washington, including the Washington State Department of Transportation (WSDOT) and secondary permittees. Of those jurisdictions, 39% responded, including WSDOT, four Phase I permittees, five secondary permittees, and 39 Phase II permittees for a total of 49 permittees. A map of the responding jurisdictions and data quality is included in Figure 1.

Inspection and maintenance data were submitted by WSDOT, four Phase I and 23 Phase II jurisdictions for a total of 28 data submissions. Submitted data were screened for completeness, including location, inspection, and maintenance details for each catch basin. Thirteen jurisdictions provided semi-complete data, but only eight submitted all of the critical information necessary for analysis. Information from five jurisdictions was not carried forward because they were either missing cleaning records or had combined inspection and maintenance records that only recorded CB inspection without distinguishing whether it needed to be cleaned. Information for the eight jurisdictions that submitted complete datasets was incorporated into the project database and carried forward:

- City of Everett
- City of Kent
- City of Kirkland
- City of Seattle - SPU
- City of Tacoma
- City of Tumwater
- King County
- WSDOT

Details of the data solicitation and compilation methods are outlined in Appendix A1. Appendix A2 describes how permittee selection for interviews on program designs and costs was completed, as well as the specific interview questions.

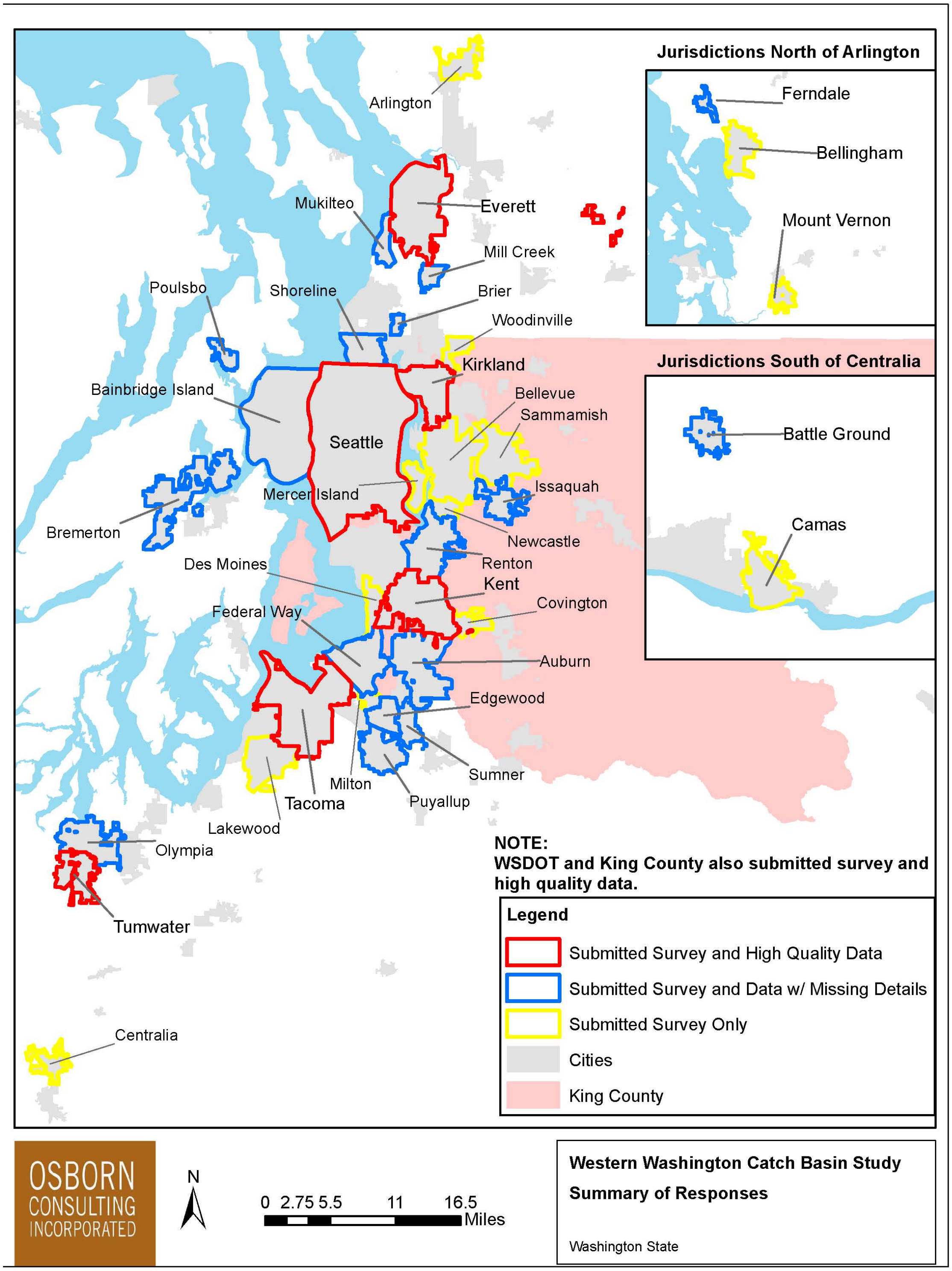

Figure 1. Catch Basin Survey and Data Responses

3.0 KEY FINDINGS AND RECOMMENDATIONS

Key findings from the survey and data analysis follow based on current records, program costs, and clarifications on alternative schedules.

Current Records:

1. Based on survey response, about half of the permittees use paper to record inspection and/or maintenance records.
2. Variable definitions of a catch basin are being used (Figure 2).

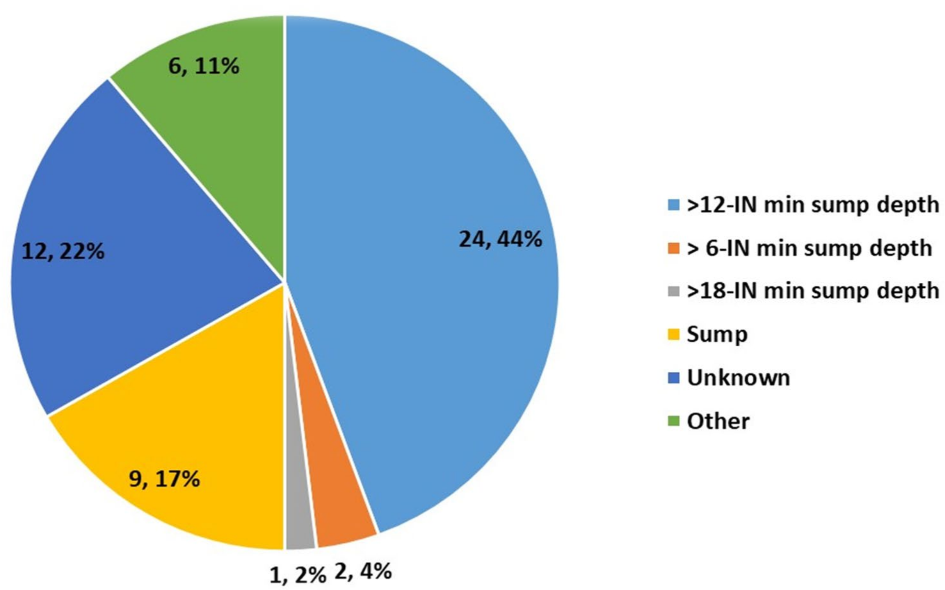

Figure 2. Definitions of catch basins

3. The current catch basin inspection and maintenance records database does not allow for correlation analysis for the following key reasons:
   - Lack of drainage basin delineation.
   - Lack of catch basin or sump dimensions.
   - Irregular and infrequent timing of inspections and cleanings (e.g., some directed at fast accumulators), adding bias to dataset.
4. Substantial data quality issues exist (duplicate records, multiple entries for same date, missing cleaning dates).
5. Substantial CB record errors were identified. Examples are:
   - Multiple sediment depths from same inspection date.

  - Variable sump depths recorded over time for same sump.
  - Missing/erroneous cleaning dates.
6. CB records indicate >80% of CBs do not require more frequent cleaning than the standard inspection schedule for most permittees.
7. Substantial cost reductions have been quantified by transitioning to integrated digital data management such as asset management software.

Catch Basin Inspection and Maintenance Program costs

1. Variable accounting approaches result in incomparable program costs between permittees (i.e., apples versus oranges).
2. Costs for multiple maintenance activities are often mixed together under a cleaning category.
3. Very approximate median annual costs are around $21/CB, regardless of total CB count in jurisdiction.

Alternative schedules

1. Less frequent than standard inspection schedules do not require Ecology approval.
2. Less frequent schedules using CB records are being implemented based on baseline cleaning and sump sediment records by 3 Phase 1 and 6 Phase 2 permittees.

Recommendations to permittees:

1. Implement/tighten quality control (QC) protocols as part of the data management program to improve data quality and consistency (e.g., protocols for data measurement, data entry, periodic QC checks of database).
2. Migrate data collection and management to an integrated digital system to improve cost-efficiency.
3. Using examples provided of alternative schedules (i.e., Marysville and Federal Way), propose a less frequent inspection schedule once enough jurisdiction-specific inspection data are available.
4. Revisit the definition of a circuit to consider if the circuit option will work either alone or in combination with other schedules (Ecology 2013a).

Recommendations to Ecology and the Stormwater Work Group:

1. Standardize the definition of a catch basin across Western Washington to improve use of inspection data.
2. Conduct a modestly priced field study of CB dynamics as a foundation for model development and to allow for long-term, science-based prediction of CB sediment accumulation.

4.0 RESULTS AND DISCUSSION

Results of this study are discussed below and organized by objective. Objectives 1, 2 and 4 are related to CB data and Objective 3 is related to CB program designs and cost efficiencies. Therefore, Objective 3 is discussed in a separate subsection.

4.1 CB Data Compilation and Analysis

Objective 1: Develop electronic database of available CB inspection and maintenance data for Western WA.

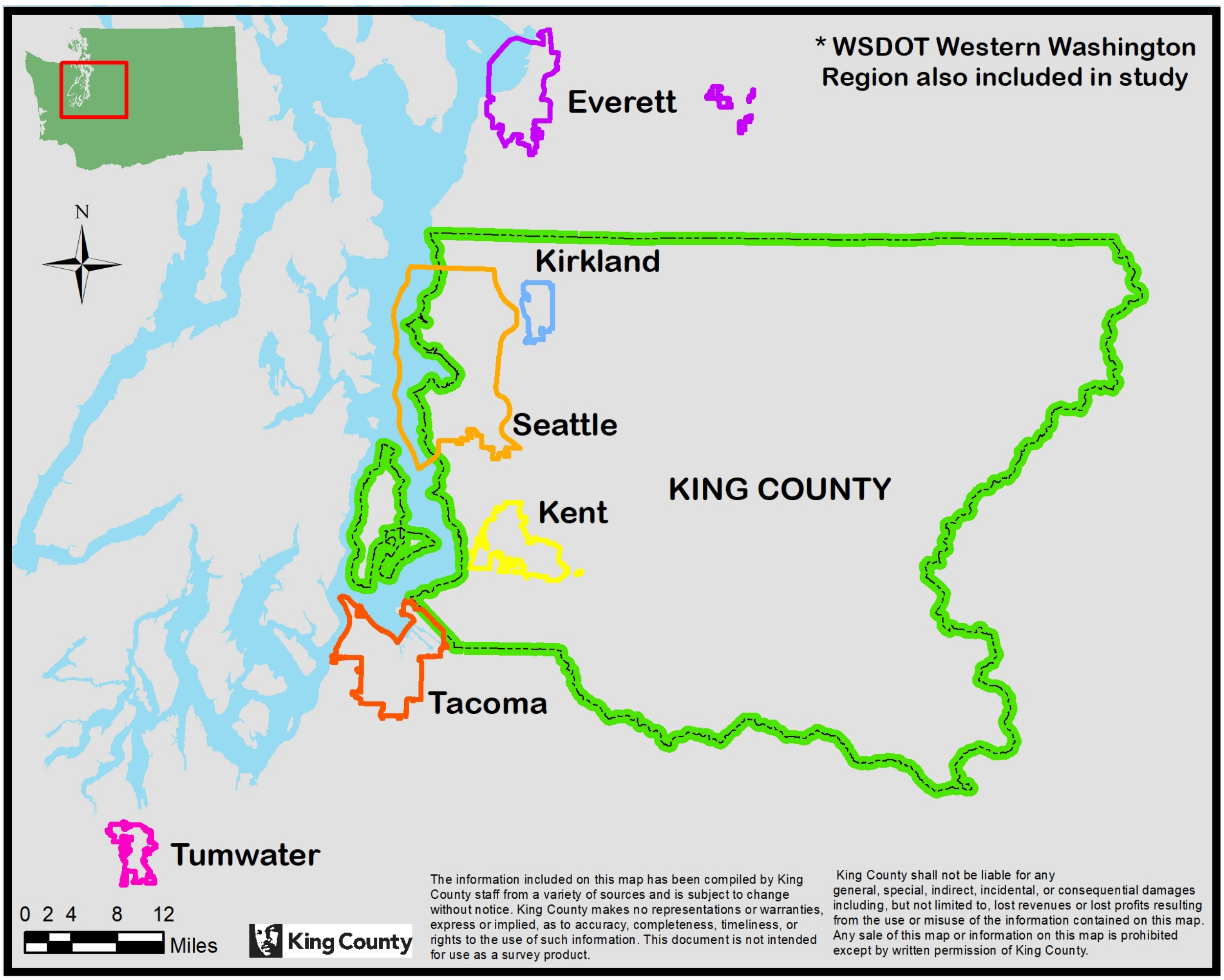

Figure 3. Final Permittees in Catch Basin Database

CB inspection and maintenance data were solicited from Western Washington permittees and screened for minimum completeness. Eight permittees passed the screening for minimum completeness (Figure 3) and their CB inspection and maintenance data, and CB characteristics were standardized and formatted for consistency. These data were uploaded into a relational database (Microsoft Access©) which were delivered to Ecology.

Western Washington permittees were also asked to complete a survey about their CB program. The survey asked questions about the definition of a catch basin, inspection schedules used, data formats used for records, maintenance activities performed, and the drivers of cleaning activities. Notable findings from the survey are highlighted here, but details can be found in Appendix A3.

A key finding is that the definition of a catch basin is highly variable (Figure 4). Almost half (44%) of the permittees who responded to the survey define a catch basin as having a minimum sump depth of 12 inches (in.). A small percentage use a definition based on a minimum of a 6 or 18 in. sump depth. Half of the permittees define a catch basin as having any kind of sump, having an unknown definition, or having another type of definition. Because CB definitions can vary from no sump to a minimum depth of 12 in. or more, inspection data collected across CBs are not comparable. Sediment accumulation may vary merely due to this variable, let alone other variables that can't be controlled, such as rainfall or construction activities. A CB without a sump is not designed to collect solids as are CBs with sumps.

It is recommended that a CB be defined to reflect its purpose to remove solids from stormwater runoff, and not include inlets or other structures without sumps. It is unknown if sediment accumulation dynamics are inherently different in small sumps (e.g. 0-5 in.) relative to larger sumps (>6 or 12 in.). However, addressing this question would require a field study. Until this type of study can be completed, comparability of CB inspection data would be improved if a CB was defined as having a sump. The most common definition of a CB based on the project survey results was a 12-in. minimum sump depth. Therefore, use of this definition would result in the fewest number of permittees needing to change how they currently define a CB.

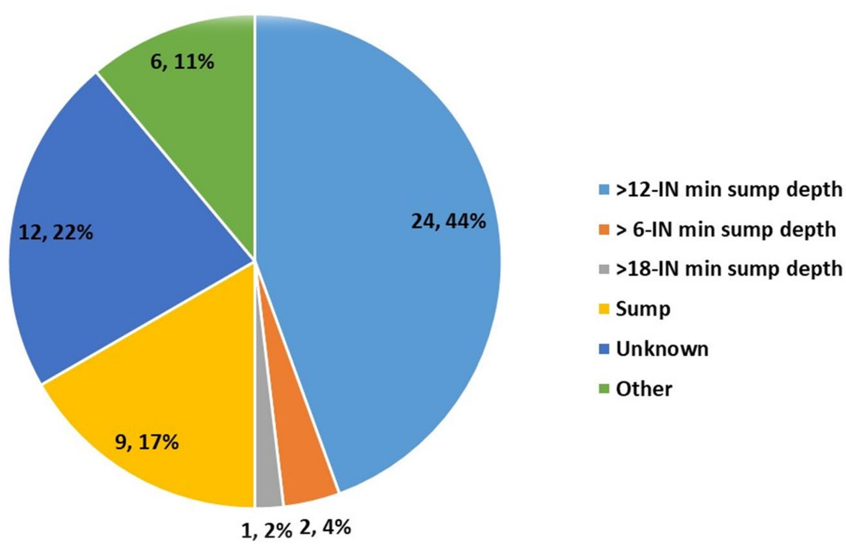

Figure 4. Catch Basin Definitions Used by Permittees. (Number of permittees, % of total permittees)

Another notable finding is that most permittees use the standard inspection schedule (annual for Phase 1 and once by 8/1/17 and biannually for Phase 2 permittees) (Figure 5). Less than half of the permittees responding to the survey use one of the three alternative options provided in the permit(s) for a lower inspection frequency than the standard approach. These three alternatives are:

1. a less frequent schedule based on existing jurisdiction's records over twice the length of the proposed schedule (Alt 1);
2. inspecting 25% of the CBs in each circuit and inlets annually (Alt 2); or
3. cleaning 100% of the CBs, inlets, pipes and ditches within a circuit draining to a single point once during a permit term (Alt 3).

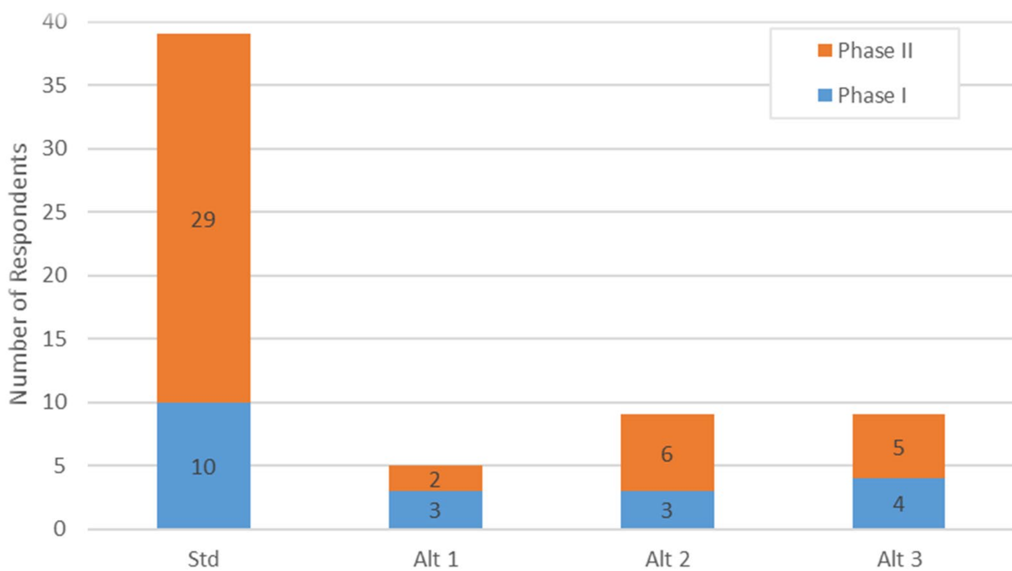

Figure 5. Selected CB Inspection Schedules for Permittees Responding to Survey. Std = standard; Alt 1 = alternative 1; Alt 2 = alternative 2; Alt 3 = alternative 3.

Other survey results indicated that 89% of respondents use Type 2 CBs and all respondents use Type 1 CBs. Type 1 CBs were defined as inline or feeder structures for surface drainage with a grated lid that is typically square or rectangular. Type 2 CBs were defined as an inline structure for surface drainage with a round lid. Seven percent of respondents use other types of structures, such as dry wells and bottomless structures making these relatively rare in this study.

A substantial proportion of respondents use paper records to help track inspections (52%) and cleanings (45%). More than one third, but less than one half of the respondents use Geographic Information System (GIS) to help store inspection and maintenance records. Database software, such as Microsoft Excel or Access, are also used by a third or more of respondents. Regarding cost data, 40% or more respondents are storing these data in a database software program, but almost a third are keeping paper records (31%), at least in part.[1]

Substantial data quality issues were identified in the provided data suggesting quality control (QC) improvements are needed. If data collection is required by permit, it is optimal for permittees to keep high quality records to enable their use. Human error is highest with paper records and data use requires more labor; therefore, a transition to electronic records is recommended and has been found to be cost-effective by other jurisdictions (See Section 4.2).

Objective 2: Identify trends and/or correlations in CB inspection and maintenance data that may support alternative inspection schedule proposals to Ecology and/or guide individual jurisdictions' implementation of permit requirements.

The planned correlation analysis to accomplish this objective could not be conducted because permittees that provided CB records did not include associated CB/circuit drainage basin delineations in GIS or the size of the contributing land area for each CB/circuit (Figure 6). In addition, permittees could not provide any GIS data for the features of interest (e.g., land use, rainfall/runoff volume, street sweeping, snow treatment, construction). Since these features vary across space, it is necessary to know the spatial delineation of land areas contributing runoff to CBs and/or circuits to conduct the intended correlation analysis. For instance, a given CB might have a quarter acre of residential neighborhood with roof drain runoff in its contributing area while another may have 50 acres of highway runoff with winter street sanding. Understanding the characteristics of these contributing areas is critical to examining which features drive sediment accumulation. Although the CB locations could be mapped (coordinates were provided), none of the features of interest for correlation analysis could be associated with them across the landscape.

Therefore, the project's technical team developed questions and a second plan of action to inform permittees on CB maintenance needs based on the available data and remaining project budget (Appendix A4). These questions tested assumptions in the NPDES permit on inspection schedule and the threshold for maintenance (60% full sump). The available data were used to calculate the amount of time for a CB to fail (>60% Full sump), whether sump depths tend to stabilize around 60% full, and whether precipitation rates correlate positively with CB accumulation rates (Appendix A4).

[1] Permittees were allowed to select more than one data format for each data category (inspection, maintenance and cost data) on the survey.

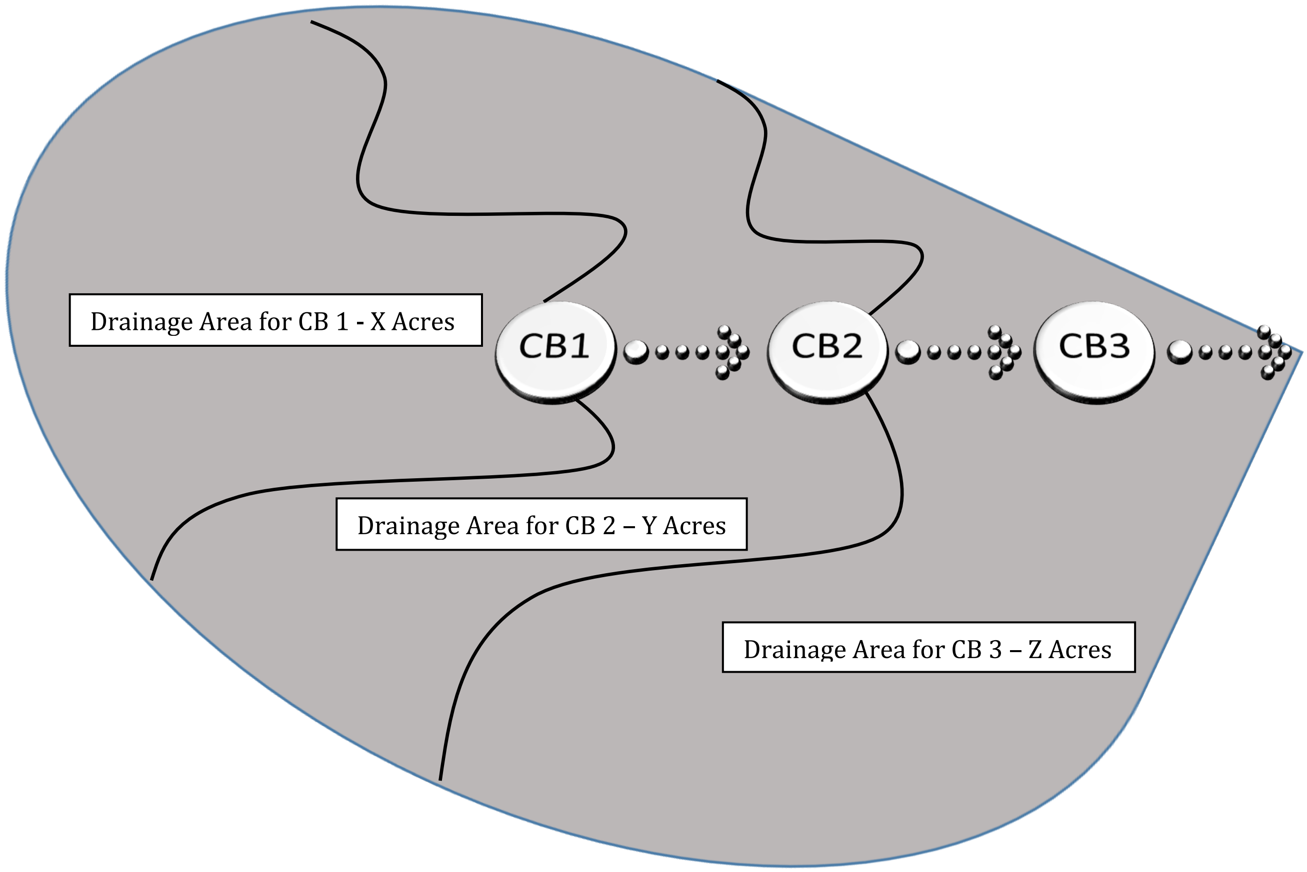

Figure 6. Conceptual Graphic of Catch Basin Drainage Areas in a Circuit.

Based on these analyses, it was apparent that there are many data quality issues between and within CB datasets. Several anomalies were identified, such as:

- Missing events (i.e., inspections, cleanings)
- Multiple sediment measurements for the same date and CB
- Multiple sump depths for a given CB over time

Consideration of the inspection frequency also highlighted the bias inherent in the CB records due to preferred inspection schedules and their low resolution (i.e., often only one inspection a year at most). Given this time-biased sampling design, combined with the extensive number of records impacted by data quality issues (Appendix A4), the compiled database of existing CB data was considered highly uncertain and unreliable to answer the questions developed in Appendix A4. The only notable finding, although uncertain, was that for most permittees, over 80% of CBs do not fail inspection in 2 years suggesting the existing standard schedule frequency is adequate. This finding should be independently confirmed before any decisions are made regarding CB maintenance needs.

While permittees work to improve their data quality processes over time, an independent data collection study is recommended to learn more about the sediment dynamics of CBs. No studies that examine CB sediment accumulation dynamics were identified during this project (i.e., changes in sediment accumulation over time). Without a basic understanding of the sediment dynamics, the scientific drivers behind CB cleaning needs can't be identified.

A field study is needed without time-bias that delineates circuit basins that collects a more comprehensive dataset including sump dimensions, flow volume, and attributes of the land in the drainage basin. While this type of study is not feasible for the whole region, it could be focused on stormwater systems in areas with a variety of land uses and/population densities that have transferability and it could be accomplished under a modest budget (e.g., ~100K). Ideally, a field study would form the foundation of a stormwater runoff model (to be developed) that can predict sump sediment accumulation based on a limited number of significant drivers. Although many potential variables influencing CB sediment accumulation can be listed, it is likely that a smaller subset of parameters are the biggest drivers and may limit the types of data necessary to predict cleaning needs.

Objective 4: Recommend a list of standard data that should be collected to inform future assessments of sediment accumulation rates in various municipal stormwater system settings.

Because the drivers of sediment accumulation could not be identified in Objective 3, a list of the most useful standard inspection data could not be recommended for Objective 4. Until a science-based model is developed to predict CB sediment accumulation rates, it is recommended that permittees continue collecting at least the minimum information needed for their selected inspection schedule(s).

Information was obtained during the project that clarifies how some permittees have successfully implemented a less frequent schedule (Alternative 1) based on their own system data. Based on examples, some permittees have been successful by collecting the following minimum data types after conducting baseline cleaning:

- Annual sediment depth in sump (as exact measurement or category) over 10 years
- CB sump depth
- CB asset ID and date

CB cleaning was then repeated when/if sumps passed the cleaning threshold and then monitoring continued as long as necessary. The number of data collection years needed, according to the permit(s), is double the desired frequency schedule (e.g., 10 years [yr.] for a 5-yr. cycle). Identifying subsections of your jurisdiction with differing maintenance needs, and hence different inspection schedules, is acceptable. Ecology (2013) provides guidance on using jurisdiction-specific data to develop a less frequent inspection schedule. Systems can be split between different alternatives or the standard inspection schedule and some permittees implement this design as well.

4.2 Program Design and Costs

After the project survey results were summarized and the CB data were compiled and screened, OCI worked with the project manager to identify permittees for follow-up interviews. The purpose of these interviews was to obtain additional qualitative information on their program design and identify any lessons learned related to cost efficiencies. Twenty-one permittees were interviewed for this purpose (Figure 7).

Objective 3: Identify transferable cost-efficiencies in the design and implementation of inspection and maintenance programs.

One of the most common cost efficiencies identified was use of updated data management tools built on digital databases to enhance efficiency, analyze trends, and define circuits. Some jurisdictions have implemented GIS-based tracking systems field crews can use to record inspection results, cleanings, and other information in real-time. Pierce County realized a 24-percent savings per CB in cleaning and inspection costs after implementing an asset management system for catch basins (Attachment C).

Street sweeping programs are viewed as one of the most cost-effective ways to keep streets and catch basins free of trash and sediment. A few jurisdictions also reported that having additional BMPs that remove and/or accumulate sediment (i.e., wet vaults, stormwater treatment facilities) allows them to focus their sediment removal effort on fewer structures. However, these observations were qualitative; none of the jurisdictions measured changes in sediment loads or maintenance required in the rest of the system.

A few jurisdictions inspect CBs by measuring for the minimum 12 in. clearance from the sediment surface to the invert of the lowest pipe, instead of measuring sump sediment depths. They found this approach results in fewer sediment accumulation records and more cleanings of CBs. One jurisdiction reported that performing more CB cleanings and jetting pipes have significantly reduced their flooding events over roadways by 80 to 90 percent.

When this SAM effectiveness study was initiated, many stormwater managers expressed confusion regarding how inspection data could be used to demonstrate appropriateness of a less frequent inspection schedule, compared to the standard annual requirement. Upon inquiry with Ecology regarding this question, the Ecology catch basin inspection alternatives guidance was provided (Ecology 2013a). A possibly lesser known definition of "circuit" was identified in the guidance document that is also in the permits. Circuits are "a portion of an MS4 discharging to a single point or serving a discrete area determined by traffic volumes, land use, topography, or the configuration of the MS4" (Ecology 2013b and 2013c). Therefore, CBs for Alternative 1 and 2 schedules do not need to be connected or in-line. They only need to have a similar sediment accumulation rate. Further clarification is provided in Ecology (2013). Jurisdictions that did not believe their systems qualified for an alternative schedule, may want to reconsider an Alternative 1 or 2 option and their cost-effectiveness.

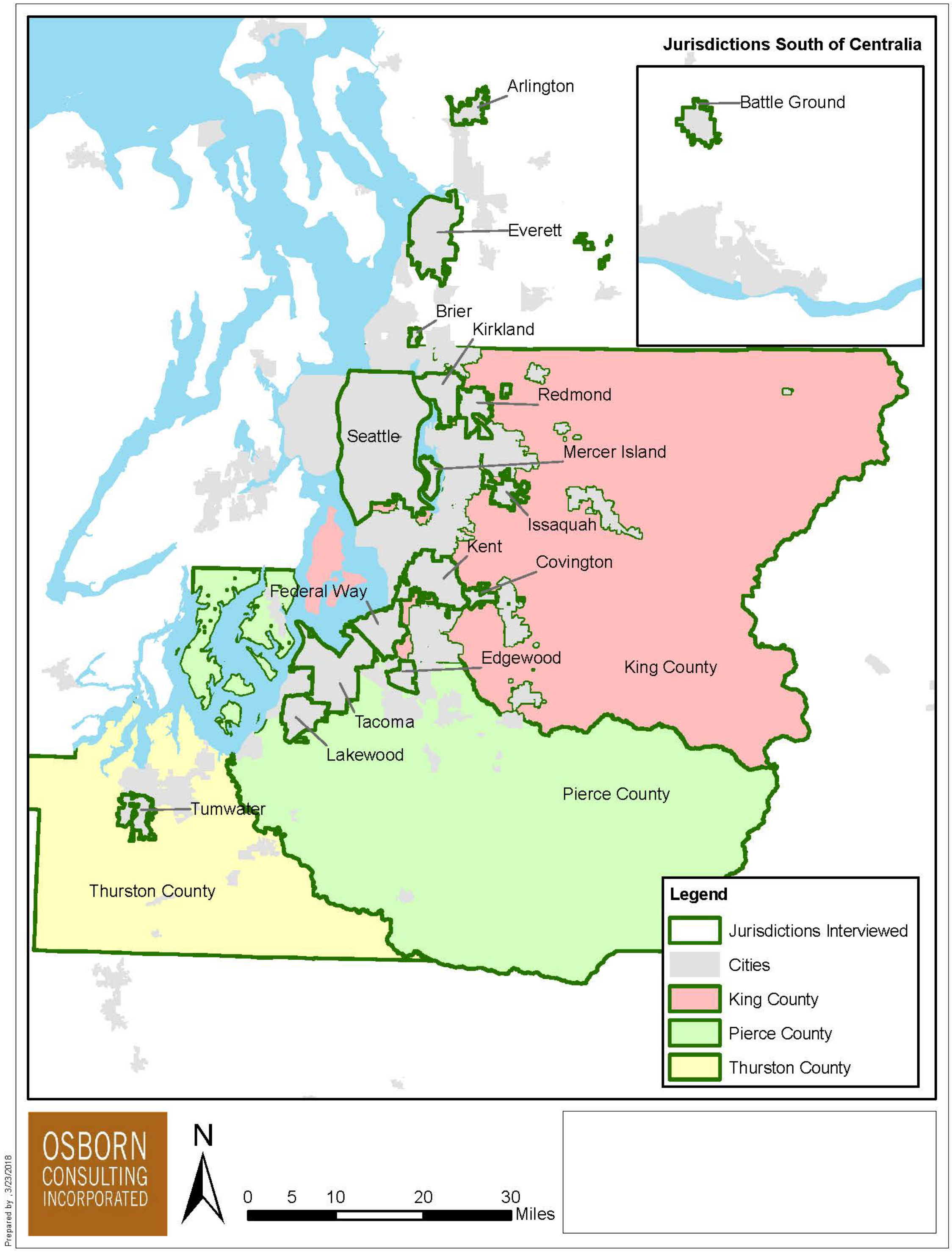

Figure 7. Jurisdictions Interviewed on Program Designs and Cost Efficiencies.

Examples of how Alternative 1 have been implemented came from two permittees (cities of Marysville and Federal Way).

- Marysville delineated subsections of their MS4 system, conducted baseline cleaning, the GIS Utility Maintenance Inspection Tool, and gathered ten years (2007-2017) of annual, categorical sediment depth data to establish maintenance needs. Marysville's alternative cleaning schedule is on a four-year rotation with more frequent cleaning for high-traffic, sanded arterials (Appendix C).
- Federal Way used a similar approach with baseline cleaning, and annual CB sediment depth measurements over 10 years (2002-2012). Federal Way established an alternative 3- to 5-year rotation schedule (Appendix C).

Ecology's catch basin inspection alternatives guidance specifies that Ecology does not require their approval to switch to a less frequent inspection schedule. The only requirement is submittal of documentation that provides justification of the alternative schedule. Permittees expecting a need for Ecology approval may find Alternative 1 more flexible than was previously assumed.

There was wide variation in program cost and inconsistent cost tracking methods between the reporting jurisdictions, which made meaningful analysis difficult. Each jurisdiction tracks their catch basin program in a unique way and includes expenses based on their specific accounting system. Generally, jurisdictions combine costs for inspection and cleaning activities in their accounting system; therefore, a distinction between inspection costs and cleaning costs cannot be made. For example, many jurisdictions include the cost of inspections for structural integrity and repairs to the catch basins in the same accounts that track catch basin inspections and cleanings for permit compliance. Some jurisdictions include equipment costs using an asset depreciation and recovery rate, while others do not include equipment costs. Further description of the cost data from permittees can be found in a technical memo summary (Appendix B of this report).

Variability in annual CB program costs by jurisdiction size is presented in Figure 9 (See Figure 8 for key). The average annual cost per CB across all permittees was $45 but individual permittee estimates ranged from $0.3 to $290. The median cost was similar regardless of jurisdiction size. The average and median costs were higher for Phase 1 than Phase 2 permittees (WSDOT was included with the Phase I permittees) (Figure 10). It is unclear if these comparisons show meaningful differences considering the high variability in which accounting items are in each permittees' cost estimate.

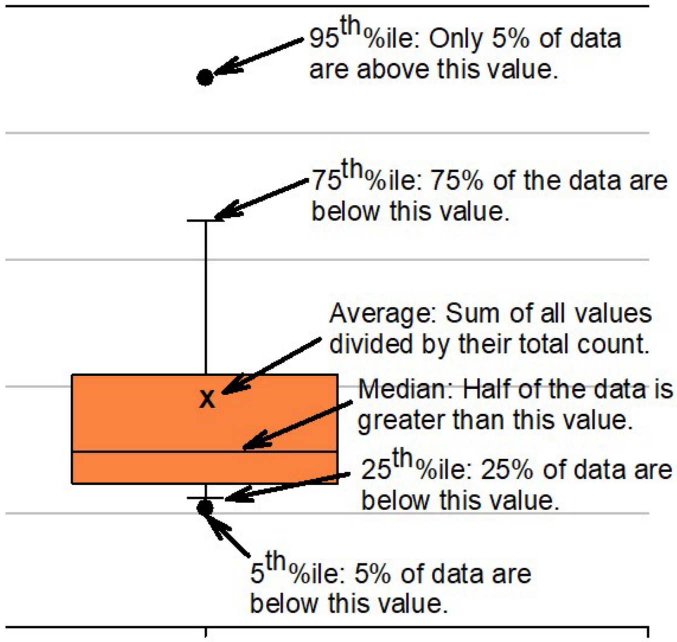

Figure 8. Box and Whisker Plot Key

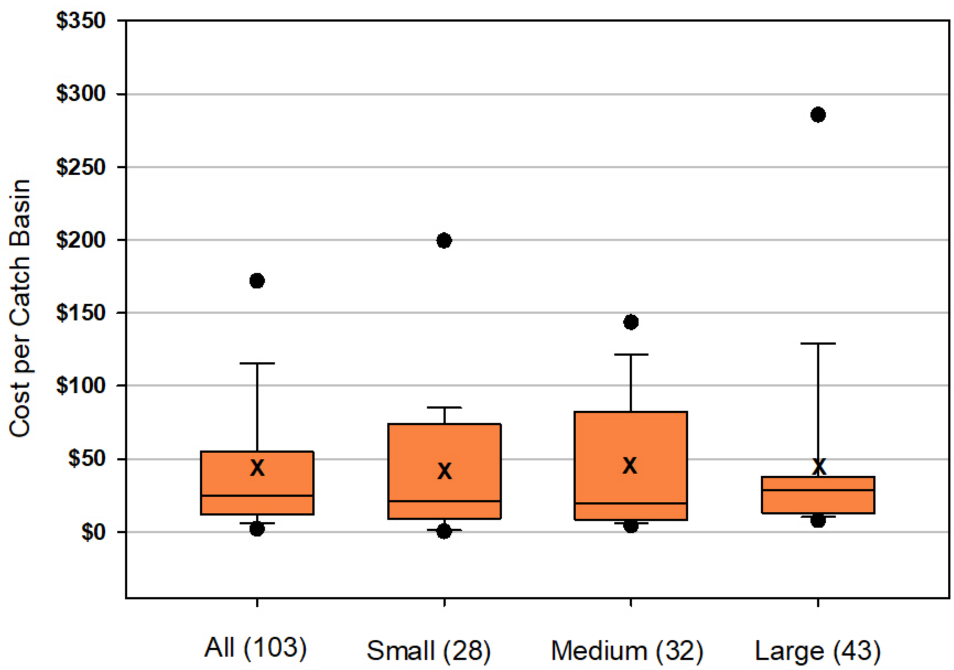

Figure 9. Annual Cost per CB for Inspection and Maintenance by Jurisdiction Size (2008-2017). Small = <2000 CBs; Medium= 2,000 to 10,000 CBs; Large= >10,000 CBs)

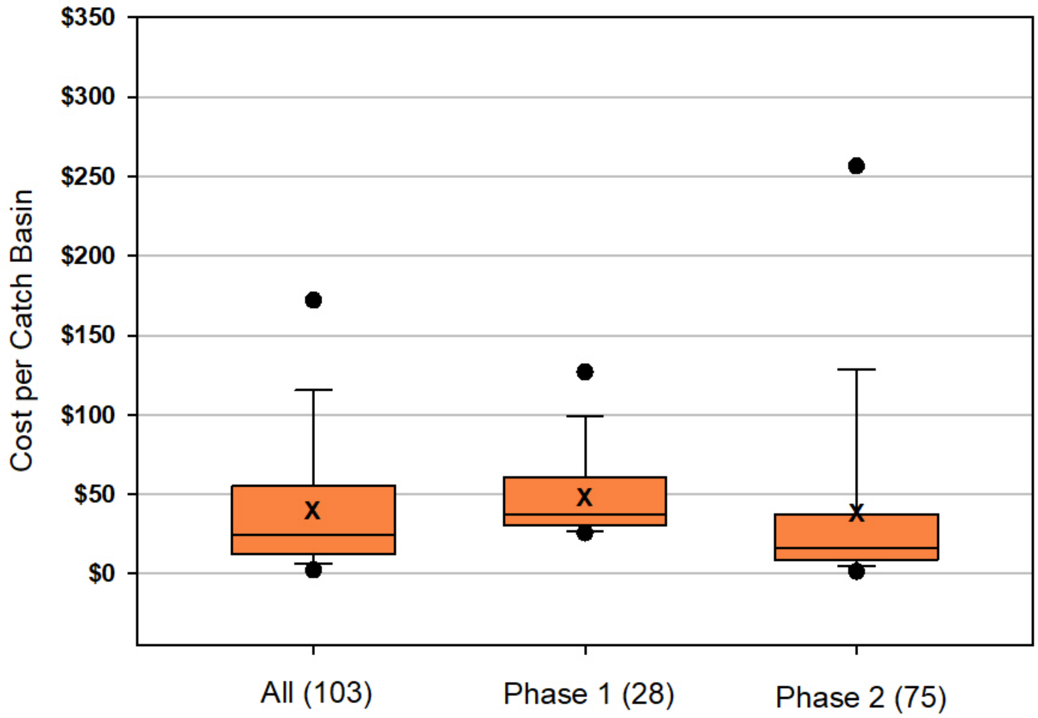

Figure 10. Annual Cost per CB for Inspection and Maintenance by Phase (2008-2017).

5.0 RECOMMENDATIONS

Through the data compilation, standardization, and screening process for this project, several important data-related issues were highlighted: paper records are still widely used, data QC is questionable, and the definition of a catch basin (CB) is highly variable. Following are general recommendations for permittees to address these issues:

- Transition to integrated digital records (e.g., asset management software),
- Implement new or additional quality control measures as part of data management protocols (QC controls and checks),
- Standardize the definition of a CB (at least to include sumps) to improve utility of inspection data.

It is recommended that a CB be defined to reflect its purpose, which is to remove solids from stormwater runoff, and should not include inlets or other structures without sumps. It remains unknown if sediment accumulation dynamics are inherently different in small sumps (e.g. 0-5 in.) versus larger sumps (>6 or 12 in.); a field study will be required to address this question. The most commonly used definition of a CB based on this project's Western Washington permittee survey is the 12-in. minimum sump depth.

In addition to data quality and data management issues, the CB data collected by this project represented an inherently time-biased sampling design with a low inspection frequency that was inadequate to characterize CB sediment accumulation. In addition, important CB information (e.g. sub-basin maps, drainage delineation) necessary to evaluate relationships between influencing variables and sump cleaning needs was not available. Although permittees may believe certain factors (e.g., land use, construction site activity, sanding) drive sediment accumulation more than others, no data analyses have been conducted to date that identify which factor(s) is/are most important.

Ambiguities in Ecology guidance and misinterpretation amongst permittees may have prevented some jurisdictions from pursuing circuit-based alternative inspection schedules or less frequent schedules based on their data records. This report provides some clarification which may change the strategies used by stormwater managers for schedule selection, thereby increasing cost-effectiveness.

Therefore, the following options are recommended to permittees to potentially decrease the costs of CB inspection and maintenance programs:

- Using examples provided of alternative schedules (i.e., Marysville and Federal Way), propose a less frequent inspection schedule using jurisdiction-specific inspection data.
- Revisit the definition of a circuit to consider if the circuit option will work either alone or in combination with other schedules (see Ecology 2013 for guidance).

Recommendations to Ecology and Stormwater Work Group:

- Standardize the definition of a CB across Western Washington to improve use of inspection data.
- Consider funding the development of a scientific model to predict cleaning needs. The first step would be to collect field data by conducting a study of CB dynamics to provide the data necessary for model development. Benefits of an independent field study are:
    - the study design will be much less biased,
    - a high frequency of CB sump sediment depths can be obtained, and
    - key data such as drainage basin boundaries, rainfall, sump and CB dimensions can be collected.

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APPENDICES

Appendix A

Materials and Methods

A1 Data Solicitation and Compilation

A2 Program Costs and Designs

A3 Catch Basin Inspection and Maintenance Data Analysis

A4 Survey and Data Request Results

Appendix A1

Data Solicitation and Compilation

Catch basin (CB) inspection and maintenance data and basic program information were obtained through a survey and follow-up interviews. The first task included preparation of a survey soliciting information from all 127 Phase I and Phase II Western Washington permittees (including secondary permittees), receipt of solicited information, and interviews to obtain program design and cost information. A short online survey (twelve questions) was sent to each Phase I and Phase II jurisdiction about their catch basin programs. A copy of the survey can be found in Appendix A4. . The survey questions were divided into four groups focusing on the definition of a CB, inspection methods, data collection, and cost. Questions 1-3 asked about which permit schedule for routine CB inspection and maintenance was used by the jurisdictions and how the jurisdiction defined their catch basins. Questions 4-6 asked about how the jurisdictions performed their catch basin inspections and how they determined when a catch basin needed to be cleaned. Questions 7-9 inquired about the methods employed to record their inspection and maintenance data. The last three questions asked for information about costs associated with catch basin inspection and maintenance requirements, and requested copies of the field inspection form and the Standard Operating Procedures (SOP) for its catch basin program.

Along with the request to complete the survey, the permittees were asked to submit their catch basin inspection and maintenance records. The data request asked only for existing records and did not require new data collection or analysis efforts. The specific data fields requested and their definitions are included in Table A1-1.

After data submissions were received, the data were screened by Osborn Consulting, Inc. (OCI) for availability of CB details including locations (coordinates or GIS), inspection, and maintenance records. Only thirteen jurisdictions submitted all three types of data (Table A1-2). The data from these thirteen jurisdictions were then mapped to the fields requested by the project team. Jurisdictions missing critical data were contacted for help to fill in the data gaps. Follow-up interviews with participating permittees were performed to clarify accurate data interpretation and/or program design and implementation methods. Based on the data provided by the jurisdictions, five key questions were evaluated to determine if a follow-up interview was needed:

- Did the jurisdiction provide catch basin locations (coordinates or GIS data)?
- Did the jurisdiction provide inspection dates and inspection results such as sediment depth or percent full?
- Did the jurisdiction provide catch basin maintenance dates?
- Did the jurisdiction provide SOP information for field inspection and maintenance?
- Did the jurisdiction provide cost information for its catch basin program?

Table A1-1. Data Fields Requested for Catch Basin Inspection and Maintenance Solicitation

CATEGORY	FIELD NAME	DATA TYPE	FIELD DEFINITION
CATCH BASIN INFORMATION	Type of CB	text	Type I, Type II, inlet, other
	Sump in CB?	Y/N	Is there a sump in the catch basin that collects settleable solids?
	Sump size	number	How large is the sump (volume)?
	CB identification	text/number	Unique ID for structure
	Invert elevation	ft	ft above mean sea level of lowest outflowing pipe from structure
	Rim elevation	ft	ft above mean sea level of rim of structure (typically ground elevation)
	Bottom of sump elevation	ft	ft above mean sea level of bottom of CB sump
	CB location coordinates	latitude/longitude	lat/long of structure, in decimal degrees
	CB location, street	address	closest address to structure
	CB installation date	date	date of original installation of structure
INSPECTION INFORMATION	Inspection dates	date	Date of inspection and associated CB identification
	CB Inspection measurements collected	number	Sediment depth to sump or % full
	CB status from inspection	text	Record of inspection outcome (e.g.,pass/fail, >50%, >60%), however recorded
MAINTENANCE INFORMATION	Maintenance dates	date	dates of maintenance activities by CB, starting 2007
	Maintenance Activity	text	briefly describe maintenance activity by CB for associated date
	Maintenance cost	$$	dollar cost of maintenance as
DRAINAGE BASIN	Contributing area	ha	hectares of contributing surface runoff area to structure
	Groundwater contribution	text	if known, briefly describe groundwater contribution to drainage area
	Pipe diameter_inflow 1	ft	diameter of influent pipe to CBs
	Pipe slope_inflow	%	slope of influent pipe of CBs
	Pipe diameter_outflow	ft	diameter of effluent pipe from CB
	Pipe slope_outflow	%	slope of effluent pipe of CBs
	Land Use percentage 1	%	primary land use of drainage area, percent of drainage area (approximate estimate ok)
	Land Use percentage 2	%	secondary land use of drainage area, percent of drainage area (approximate estimate ok)
	Land Use percentage 3	%	tertiary land use of drainage area, percent of drainage area (approximate estimate ok)
GIS DATA	Digital elevation model (DEM)	raster	GIS layer with DEM for jurisdiction (e.g., LIDAR)
	Roads	lines, vector	GIS layer with lines for roads
	Catch basins	points, vector	GIS layer with points for catch basins
	Flow routing	lines, vector	GIS layer with lines for flow routing
	Drainage basins layer	polygon, vector	GIS layer with polygons for surface drainage basins
	Inspection circuit	lines, vector	GIS layer with lines for inspection routes

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If any questions were answered negatively, an interview was recommended with the jurisdiction. The list of jurisdictions recommended for interview was discussed with the project team and a refined list was developed. The jurisdictions were divided into four priority levels for interviews based on the potential for additional valuable data:

- Level 1 -jurisdictions that indicated on the survey that they might have valuable data in GIS and/or Excel, but did not submit the data, or they submitted data, but key fields were missing (i.e., inspection dates or CB details).
- Level 2 -jurisdictions that may have available inspection data or catch basin details, but the survey results did not specify the level of detail available.
- Level 3 -jurisdictions that did not submit cost or standard operating procedures for their CB inspection and cleaning, but indicated on the survey they intended to submit these data.
- Level 4 -jurisdictions that the team had knowledge of high quality data being collected, but which had not yet submitted data to the study.
- The remaining jurisdictions either submitted data of insufficient quality and/or quantity, or did not submit any data.

The interview results are summarized in Appendix A3. Eight of the thirteen jurisdictions provided all the necessary information and their data were uploaded into the database. Data for five jurisdictions were not carried forward because they were either missing cleaning records or had combined inspection and maintenance records indicating a CB was inspected but did not specify the resulting maintenance needs. King County provided a template database which was used to create the project database. Catch basin inspection and maintenance records were standardized to use the same units of measurement (feet) and the fields were mapped to those planned for use in the project database (Table A1-1).

Table A1-2. Jurisdictions submitting sufficient catch basin data for this study.

Jurisdiction	Provided CB locations, inspection and maintenance details	Provided all critical CB data
City of Auburn	X	
City of Battle Ground	X	
City of Everett	X	X
City of Kent	X	X
City of Kirkland	X	X
City of Poulsbo	X	
City of Puyallup	X	
City of Seattle - Seattle Public Utilities	X	X
City of Tacoma	X	X
City of Tumwater	X	X
Port of Seattle	X	
King County	X	X
Washington State Department of Transportation	X	X

Assumptions

Some assumptions were made by OCI when standardizing data for the project database. Also, missing fields were calculated based on other information provided as shown in Table A1-3. For instance, the structure shape was interpreted as "round" when a diameter was reported greater than 0 for Kent, Kirkland and Tacoma. It was assumed Tacoma CBs had a sump when the sump depth value was greater than 0. The Tacoma source control field values of "0" and "1" were assumed to equate to "No" and "Yes," respectively. The City of Kent initiated inspections in 2010 and included all CB design types. Kent's percent sediment records of "PASS" were interpreted as less than or equal to 60% fill and reported as zero, whereas a "FAIL" record was interpreted as greater than 60% sediment fill. For the City of Tumwater, some CBs were missing an asset ID to associate the CBs with inspection and maintenance records. Ninety-one records in the database did not have GIS coordinates, and no sump depth was provided. As a result, neither sump volume nor percent fill could be calculated, and all sumps were considered CBs. The Washington State Department of Transportation's (WSDOT) data were missing total sump depth, and the second entry for percent fill with the same event ID was reported as the correct value, per communication with the permittee.

Anomalies

The data provided by the permittees contained some anomalies specific to each jurisdiction, and adjustments had to be made to fit the data to a relatable standard. For the City of Everett, 142 records were not found in GIS, with the "Current Status" field listed as "NSR", addresses provided in the CB data were questionable, the Inspection IDs were not unique and the sediment percent fill contained values up to 5000. The City of Kent's catch basins were missing 431 asset IDs and were assigned IDs: UNK001 through UNK431. Kent's submission was also missing sump data which precluded calculation of sediment depth, and only the activities involving "CATCHBASIN PUMP" and "STORM MANHOLE CLEAN" were included in the study. King County resolved discrepancies with asset IDs from the original submission, but some unusually high percent fill measurements were retained. The City of Kirkland's rectangular catch basins, mostly inlets, Type-1 or Type 1-L were missing widths (A & B), and the cover elevation, outlet elevation, sediment depth and sump bottom as well as some inspection and asset IDs were reported as zero. Seattle Public Utilities (SPU) had 20 catch basins with no GIS coordinates, as sump data were not provided percent fill could not be calculated, and some sediment depth values were unusually high (>30'). Tacoma's data did not include sump depth, most diameter data were reported as zero with no width measurements, and the maintenance start and end date was recorded as "Null" if cleaning was not required.

Table A1-3. Fields sometimes calculated based on other information.

Fields calculated	Calculated based on	Jurisdiction(s)
Component	Assumed to be Catch Basin	Everett, Kent, Tumwater, WSDOT
Sump volume	Diameter/width and sump depth	King County, Kirkland, Tacoma
Sump Btm Elevation	Cover elevation and total depth	King County
Percent fill	Sump depth and sediment depth, "PassFail_Clean" for Kent	King County, Kent, Kirkland, SPU, Tacoma
Activity	Maintenance table, cleaning date	King County, Tacoma
Inspection ID	Created when missing	Tacoma
Status	Cleaning date	Tacoma
Maint ID	Created when missing	Tacoma
Cost	Total work order cost	Everett
Structure shape	"Round" for any diameter reported	Kent, Kirkland, Tacoma

Exclusions

For some of the permittees, data was excluded from this analysis based on their perceived usefulness. Many of the permittees included CBs from other jurisdictions, and only those inspected and maintained by that jurisdiction were included for their data in this study. Everett's, Tacoma's, and WSDOT's data contained extraneous duplicates that had to be removed based on feature number. The City of Kirkland defined a catch basin as having a sump depth greater than 12 inches (in.), so all records with a sump depth less than 12 in. were removed from the database, as well as those with a design type of "Other," records not related to sediment cleaning, and data not included in the inspection records. For SPU, inspection data not associated with sediment removal (CB casting worn, CB inlet debris, CB inlet roots, CB outfall debris, etc.) were removed. SPU had 32,000 inspections with the same date; these inspections were removed. When duplicate records were submitted one set was removed.

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Appendix A2

Program Costs and Designs

After reviewing the survey results, the (Technical Advisory Committee) TAC and project team recognized a need to better understand how jurisdictions implement catch basin (CB) inspection and cleaning programs and how they calculate program costs. Follow-up interviews were also needed to solicit information on cost savings experienced from changes in program design and management. Therefore, follow-up interviews were conducted with select jurisdictions. The questions for the follow-up interviews were developed in collaboration with the King County Project Manager and are outlined below.

Questions about the Program Schedule and Management:

- What drives the decision to pursue or not pursue circuit-based inspections?
- If using circuit-based inspections, what is your interpretation/decision tree of when failure in inspection of a catch basin happens?
- Does your jurisdiction have a combined inspection and cleaning program or are they separate events? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from doing a new method?
- Is inspection/maintenance done in-house or contracted out to consultant/contractor? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from changing your method?
- Are there any cost savings you have realized through other changes in your CB Inspection and cleaning program?

Questions about the Program Costs:

- What is the total number of CBs in your jurisdiction?
- What is the total cost of the CB maintenance program including inspections, cleaning, maintenance, sweeping etc.? OR, if not answerable, what activities are included in your maintenance cost total?
- What components are included in your costs for inspections and/or maintenance (e.g., data management, training, office staff, equipment the city owns, disposal fees, etc.)?

Questions about Best Management Practices (BMPs):

- Are there any BMPs you are currently implementing that target sediment removal before capture in CBs, such as street sweeping, wet vaults, socks/filters on CBs, curbs, impervious shoulders, etc.?
- Are there any lessons learned or cost savings from implementing them?

Jurisdictions selected for follow-up interviews were either (1) identified by the members of the TAC (Redmond, Pierce County, Seattle Public Utilities, Lakewood, and Thurston County), (2) screened in and uploaded into the CB database (Everett, Kent, Kirkland, Tacoma, Tumwater, Washington State Department of Transportation, and King County), or (3) provided costs in their responses to the 2017 survey (Arlington, Battle Ground, Brier, Covington, Edgewood, Federal Way, Issaquah, Mercer Island, and Woodinville).

Appendix A3

Final Survey Results Technical Memorandum

OSBORN CONSULTING INCORPORATED
1800 112th Avenue NE Suite 220-E | Bellevue, WA 98004 | P: 425.451.4009 | F: 425.451.4901

DATE JULY 26, 2017

TO JENÉE COLTON, KING COUNTY DEPARTMENT OF NATURAL RESOURCES AND PARKS

FROM DIANA HASEGAN, PE, ENV SP, OSBORN CONSULTING, INC.

SUBJECT WESTERN WASHINGTON CATCH BASIN STUDY – FINAL SURVEY RESULTS TECHNICAL MEMORANDUM

INTRODUCTION

This memorandum presents the methods and results of the survey soliciting information from all Phase I and II Western Washington municipal permittees regarding catch basin (CB) inspection and maintenance effectiveness. The survey was prepared and distributed to jurisdictions by the project team and Technical Advisory Committee (TAC). The receipt and evaluation of the surveys and solicited information as well as interviews with jurisdictions were completed by Osborn Consulting, Inc. (OCI) under contract to Cardno, Inc.

This project is funded through the Regional Stormwater Monitoring Program (RSMP)[1] as part of the Effectiveness Studies Component (S8.C). The municipal Stormwater permit in Washington State requires permittees to inspect and maintain catch basins under their jurisdiction on a regular basis. For Phase I permittees, the default inspection frequency is annual. For Phase II permittees the frequency ranges from two to five years. Since the permit allows for an alternative schedule with demonstration that maintenance is needed less frequently, this study aims to extract important information related to the cleaning threshold that would help permittees direct limited inspection and maintenance resources to provide the greatest environmental benefit.

Therefore, this study was designed to evaluate the existing records for CB inspection and maintenance to identify correlating factors that could be used to predict CB maintenance needs and to examine the program designs among Western Washington jurisdictions to identify cost efficiencies in program implementation. OCI has been tasked with receiving, evaluating, and compiling the data from jurisdictions for use by the project team to perform the study. This memorandum is intended to record the results of the survey and data request and summarize the responses received. The jurisdictions included in the project database have been selected based on the quantity and quality of the data received.

SURVEY AND DATA REQUEST

The first task included the preparation of a survey soliciting information from all 127 Phase I and Phase II Western Washington permittees (including secondary permittees) receipt of solicited information, and interviews for obtaining program design and cost information. A short online survey was sent to each Phase I and Phase II jurisdiction about their catch basin programs. The online survey included twelve questions. The survey questions were divided into four groups focusing on the definition, inspection methods, data collection, and cost. Questions 1-3 asked about which permit schedule for routine CB

[1] RSMP is changing their name to Stormwater Action Monitoring (SAM) in 2017.

inspection and maintenance was used by the jurisdictions and how the jurisdiction defined their catch basins. Questions 4-6 asked about how the jurisdictions performed their catch basin inspections and how they determined when a catch basin needed to be cleaned. Questions 7-9 inquired about the methods employed to record their inspection and maintenance data. The last three questions asked for information about the costs associated with the catch basin inspection and maintenance requirements, and requested copies of the field inspection form and the Standard Operating Procedures (SOP) for its catch basin program. A copy of the survey questions is included in **Attachment A**.

Along with the request to complete the survey, a request for catch basin inspection and maintenance records was also issued. The data request asked only for existing records that do not require new data collection or analysis efforts. The specific data fields being requested and their definition are included in **Attachment A**.

SURVEY RESPONSE RATE

A total of 127 survey requests were sent to Washington State Department of Transportation (WSDOT), Phase I (including secondary permittees), and Phase II permittees in the Western Washington region. The survey was completed by 49 jurisdictions[2], including WSDOT, five Phase I permittees (and five secondary permittees), and 39 Phase II jurisdictions. This represents a 39-percent response rate to the survey request. Among the jurisdictions that completed the survey, WSDOT, four of the Phase I jurisdictions, and 23 of the Phase II jurisdictions submitted data. Pierce County submitted data but did not respond to the survey. King County has multiple agencies responsible for implementing portions of the municipal stormwater permit which differ in their catch basin inspection and maintenance program design[3]. Seven of these agencies responded to the survey but are counted only once in the above statistics. Four of the seven agencies also submitted data. For informational purposes, the survey results of these custodial agencies are incorporated into the following survey results summary. **Attachment B** provides an unprocessed download of the survey responses and all the data received from permittees.

SURVEY RESULTS SUMMARY

The survey questions and responses are summarized in the section below and more detailed tables and figures are provided in **Attachment C**. **Table C-1** provides a summary of all the jurisdictions that submitted survey and/or data. These jurisdictions are shown on a map in **Figure C-1**. The total responsive count (Phase I and II permittees plus secondary permittees and King County's custodial agencies) for the surveys was 54. The total responsive count for data submittals was 34.

CATCH BASIN INSPECTION SCHEDULE

Question 1: Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.

Inspection schedules vary between Phase I and Phase II permittees, and jurisdictions can select from multiple permit schedules choices for their catch basin program.

Phase I permittees can choose from one or more of the following programs:

- Standard approach – to inspect all CBs and inlet annually.

[2] Five secondary permittees (schools and ports) are included in this total.
[3] King County calls these custodial agencies.

- Alternative 1 – to inspect all CBs more or less frequently than annually to meet maintenance standards based on at least two years of CB inspection records.
- Alternative 2 – to inspect all CBs annually on a "circuit basis," whereby 25-percent of CBs and inlets within each circuit are inspected to identify maintenance needs.
- Alternative 3 – to clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term.

Phase II permittees can choose from one or more of the following programs:

- Standard approach – to inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter.
- Alternative 1 – to inspect all CBs more or less frequently than every two years to meet maintenance standards based on at least four years of CB inspection records.
- Alternative 2 – inspect all CBs once by 8/1/17 and every two years thereafter on a "circuit basis," whereby 25-percent of CBs and inlets within each circuit are inspected to identify maintenance needs.
- Alternative 3 – clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term.

Distributions of catch basin inspection schedules are presented in **Figure 1**. Of the 54 survey respondents, about 70-percent of jurisdictions used the standard approach. Approximately 17-percent of the jurisdictions used either Alternative 2 or Alternative 3, and only 9-percent of jurisdictions used Alternative 1 for routine catch basin inspection and maintenance.

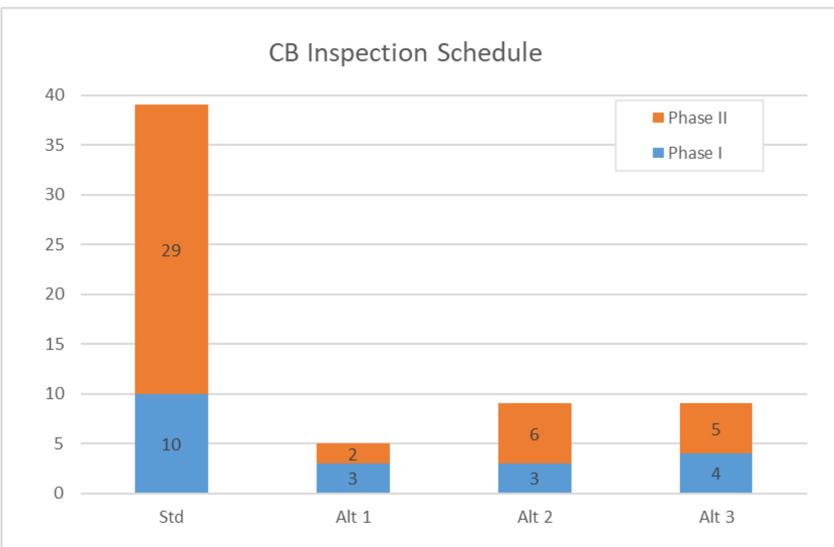


Figure 1: Catch Basin Inspection Schedule

CATCH BASIN DEFINITION

Question 2: What is your jurisdiction's working definition of a CB? King County has adopted Washington State DOT's definition for a catch basin of a 12" minimum sump depth. What differentiates a catch basin from an inlet in your jurisdiction?

From the 54 responders, a plurality (about 44-percent or 24 jurisdictions) used the same catch basin definition as WSDOT. Two jurisdictions (Port of Seattle and City of Bellingham) defined their catch basins with a minimum of 6 inches, and one jurisdiction (City of Battle Ground) defined its catch basins with a minimum of 18 inches. Eight jurisdictions defined a catch basin as a structure with a sump of any kind, and 11 jurisdictions did not have a clear definition of a catch basin. Six jurisdictions defined their catch basins with criteria other than the sump depth.

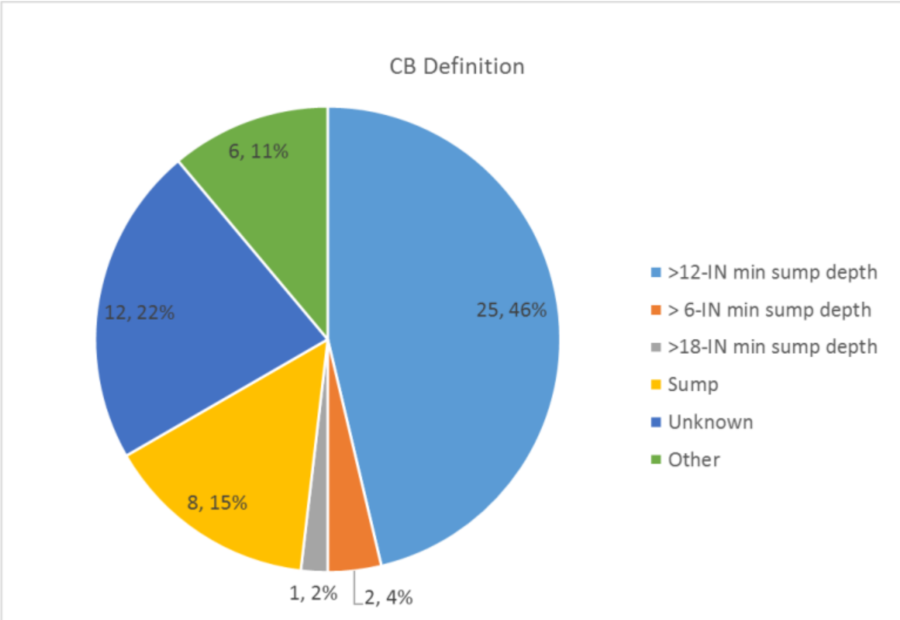


Figure 2: Catch Basin Definitions Distribution

CATCH BASIN TYPES

Question 3: What types of catch basins are in your jurisdiction? There are multiple types of CBs and varying definitions in the industry. We have included definitions below based on King County road standards (http://kingcounty.gov/depts/transportation/roads/road‐standards.aspx). However, if these don't apply in your jurisdiction, please check "Other" and describe CB types that are included in your jurisdiction's CB inspection and maintenance program.

All respondents used Type I catch basins that are defined as inline or feeder structures for surface drainage with a grated lid that is typically square or rectangular. The underground concrete structure is typically square or rectangular. The catch basin may include a sump or may contain a riser outflow pipe in lieu of, or in addition to, a sump. The Type I catch basin is intended to collect runoff both directly from surface flow and via inflow pipe(s) to the catch basin.

Approximately 89-percent of the respondents used Type II CBs, which are defined as an inline structure for surface drainage with a round lid. Sometimes these structures are referred to as a manhole or maintenance hole and may have a lockable lid. The underground concrete structure is typically round and may include a sump. These structures are typically deeper than a Type I CB and include a ladder for access. They are also intended to collect runoff via inflow pipe(s) to the CB only, but not via direct surface runoff. Approximately 85-percent of the respondents used inlets that are defined as feeder structures for surface drainage. Their underground concrete structure is rectangular and typically includes a shallow sump. They are also intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another catch basin, manhole, or ditch. Approximately 7-percent of the respondents used other types of structures such as dry wells and bottomless structures.

Figure 3 summarizes the distribution of catch basin types among the respondents to the survey.

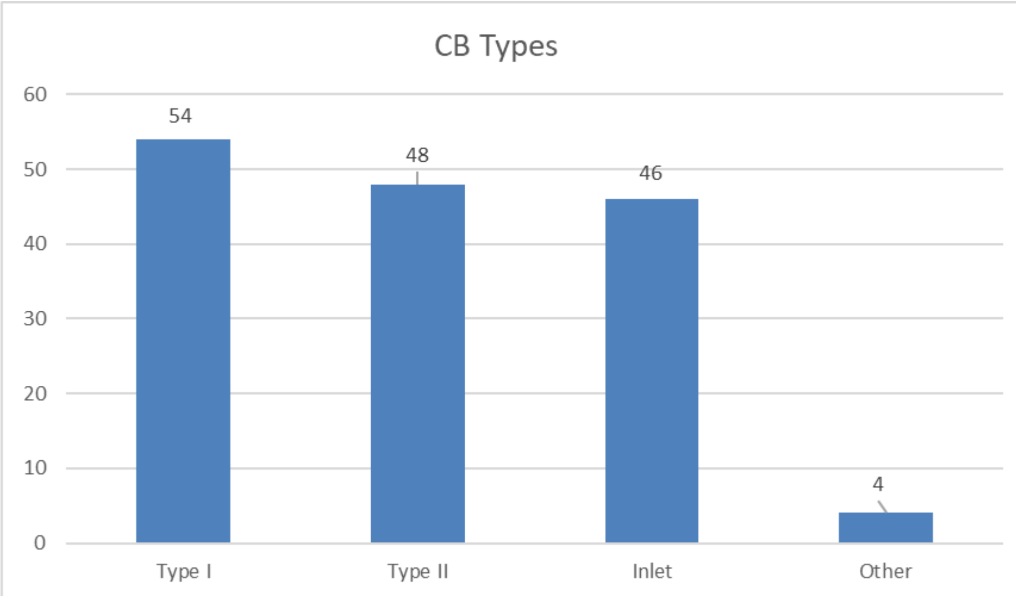


Figure 3: Catch Basin Types Bar Chart

Catch Basin Inspection Activities

Question 4: Which activities may be included in a catch basin inspection your jurisdiction? Check any that apply.

As shown in **Figure 4**, most of the respondents used multiple types of activities for tracking catch basin inspections. The most common inspection activities among respondents were visual/photo inspections and field notes. About 70-percent of the respondents also used Geographic Information Systems (GIS), and 72-percent of jurisdictions measured the depth of accumulated solid in the catch basin with equipment such as sediment rod probes, tape measures and markings on vactor tubes.

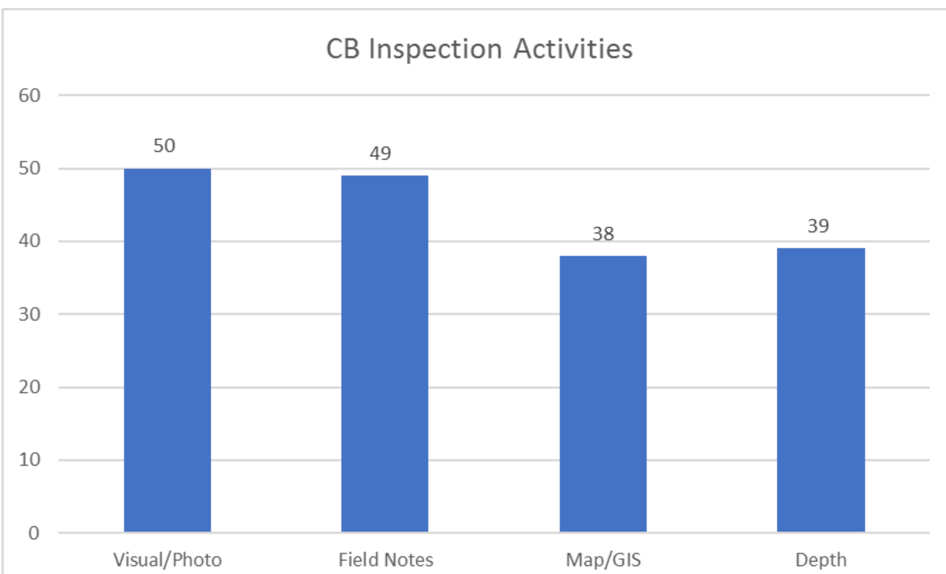


Figure 4: Catch Basin Inspection Activities Bar Chart

Catch Basin Maintenance Activities

Question 5: What types of roads and CB maintenance does your jurisdiction perform? Check any that apply.

As shown in **Figure 5**, respondents performed many different types of road and catch basin maintenance activities. Some key findings from Question 5 include:

- All of the jurisdictions used catch basin cleanout as one of their catch basin maintenance activities.
- 93-percent of the jurisdictions perform sediment/erosion control activities and repair of catch basin grates.
- The least performed road and catch basin maintenance activities were snow/ice control and dust control.

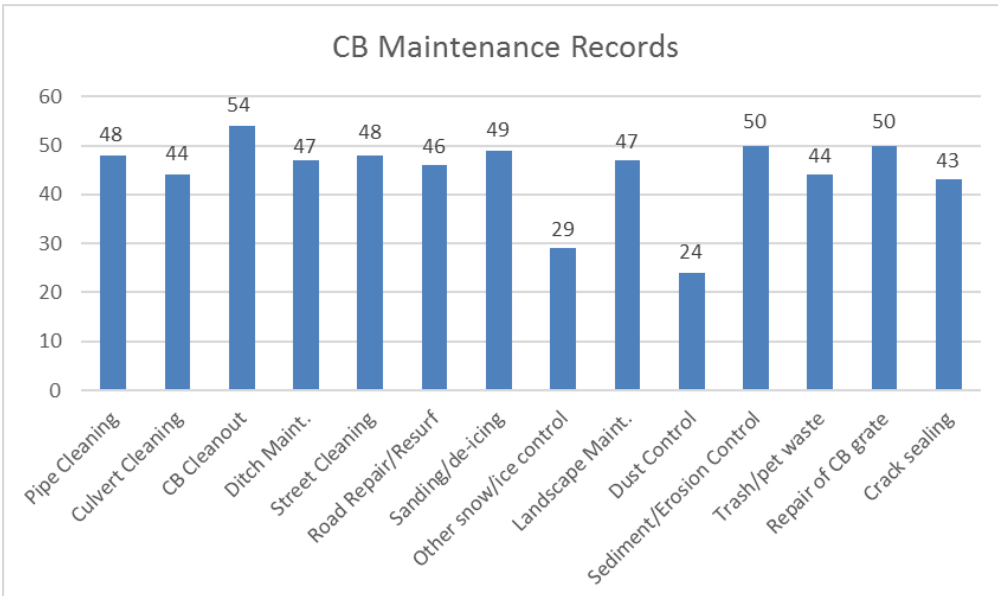


Figure 5: Catch Basin Maintenance Record Bar Chart

Catch Basin Cleaning Decision

Question 6: How does your jurisdiction determine if a catch basin needs to be cleaned out? Check any that apply.

Figure 6 summarizes responses to the Question 6, regarding the basis of the cleaning decision. Some key findings from this question include:

- 85-percent of the respondents decided to perform catch basin cleaning based on the inspection data.
- Approximately 70-percent of respondents perform catch basin cleaning to respond to citizen complaints or occurrence of an emergency such as flooding or combined sewer overflow (CSO) event.
- About half of the respondents perform catch basin maintenance based on a schedule.

- About 20-percent of the respondents incorporate traffic volumes or other road use factors in their decision to clean the catch basins.
- Only 10-percent of respondents clean catch basins at the time of transfer of ownership.

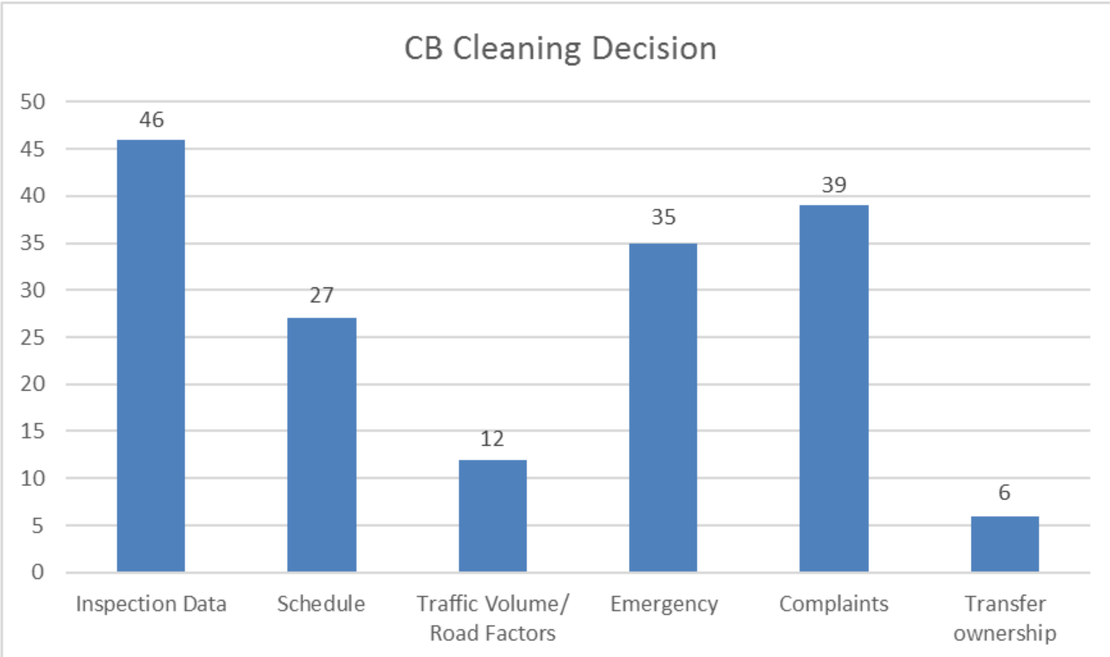


Figure 6: Catch Basin Cleaning Decision

INSPECTION AND MAINTENANCE DATA FORMATS

Question 7: What type of records do you keep for CB inspection and maintenance? Check all that apply in the available format.

Question 7 focused on the format in which inspection and maintenance records and costs are being documented. Jurisdictions may keep these records in multiple formats. While there are a lot of similarities between inspection and maintenance, and some jurisdictions perform these two activities concomitantly, the responses show that there is a difference between the tracking of inspection versus maintenance activities. Questions 8 and 9 inquired about the format of the GIS data available regarding catch basin structures and inspection and maintenance activities.

Figure 7 summarizes the responses to Question 7, regarding the format in which jurisdictions keep records of inspections performed. Key findings from the responses include:

- Most of the respondents (52-percent) use paper records to track their catch basin inspection data.
- About 40-percent use GIS to track catch basin inspection data.
- Only about 35-percent of respondents use Microsoft Excel or another database such as Maximo, Mainsaver, or Microsoft Access.

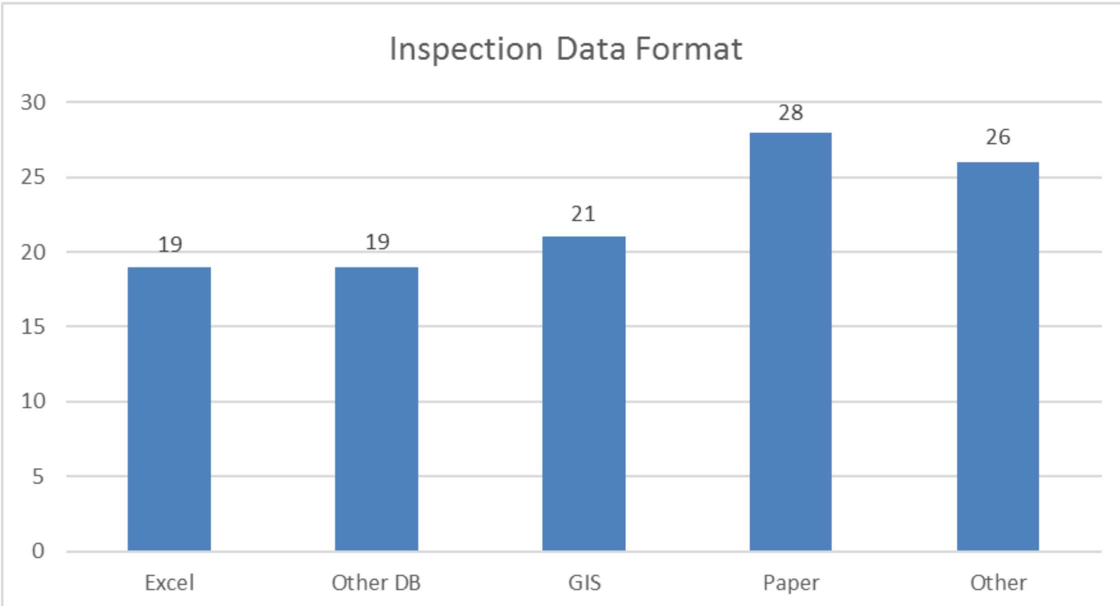


Figure 7: Catch Basin Inspection Data Format

Figure 8 summarizes the responses to question 7 regarding the format in which jurisdictions keep records of maintenance performed. Key findings from the responses include:

- 45-percent of respondents use paper to track their maintenance data inspection data.
- Approximately half of jurisdictions (44%) use other database formats to keep maintenance data such as Maximo, Mainsaver, or Access.
- 35-percent of respondents use GIS to keep maintenance data.
- 32-percent of jurisdictions used Microsoft Excel to store maintenance data.

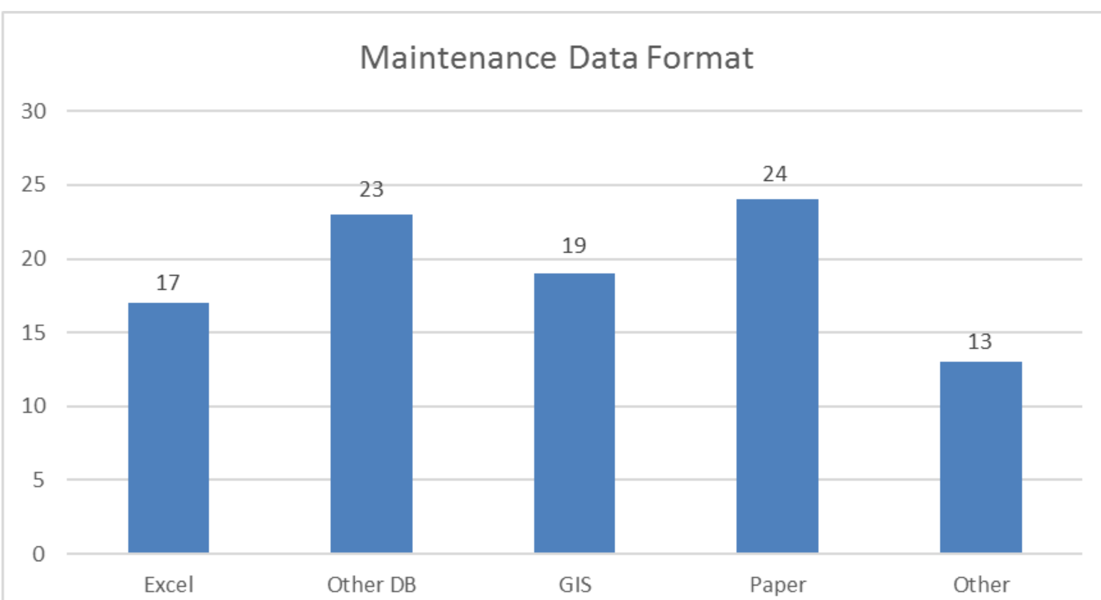


Figure 8: Catch Basin Maintenance Data Format Bar Chart

COST DATA FORMAT

Figure 9 summarizes the responses to question 7 regarding cost data. Key findings about cost data format include:

- About 40-percent of jurisdictions kept their cost data using other databases such as Maximo, Mainsaver, or Access.
- 31-percent of respondents keep their cost data on paper.
- 19-percent of respondents keep their cost data in Microsoft Excel.
- Only one respondent reported using GIS to track cost data.

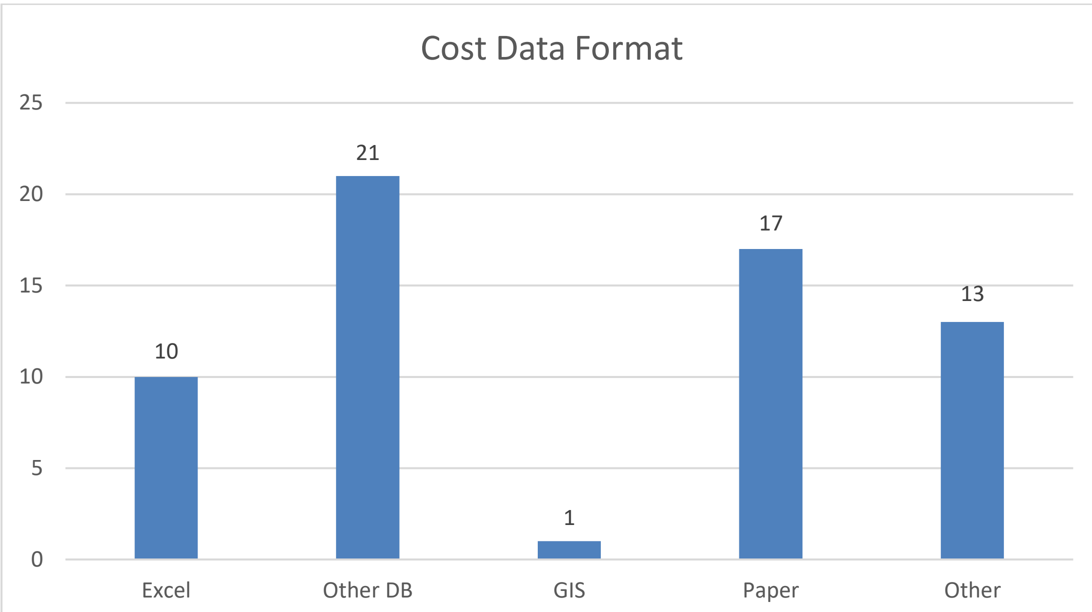


Figure 9: Catch Basin Cost Data Format

Questions 10 focused on cost information for inspection and maintenance activities, questions 11 and 12 inquired about field inspection forms and standard operating procedures, while question 13 was a catch-all for additional information and feedback. Refer to **Table C-2** for more details.

- **Question 10: Please provide the cost of your program for CB inspections and maintenance (not including disposal) on an annual basis or by average cost by catch basin. If this has changed over time since 2007, please indicate how and when cost changed.**
- **Question 11: If available, please send an example field inspection form(s) used by your jurisdiction for catch basin inspection and maintenance.**
- **Question 12: If available, please send your jurisdiction's Standard Operating Procedures (SOP) document(s) for catch basin inspection and maintenance.**
- **Question 13: Do you have any questions, comments or feedback about this survey?**

INTERVIEWS

After data submissions were received and evaluated, follow-up interviews with participating permittees were performed to clarify accurate data interpretation and/ or program design and implementation methods. In addition, permittees were asked to report any cost-efficiencies in program design and implementation methods they had learned through their own program experience. From the data provided by the jurisdictions, five key questions were evaluated to determine if a follow-up interview was needed:

- Did the jurisdiction provide catch basin locations (coordinates or GIS data)?
- Did the jurisdiction provide inspection dates and inspection results such as sediment depth or percent full?
- Did the jurisdiction provide catch basin maintenance dates?
- Did the jurisdiction provide SOP information for field inspection and maintenance?
- Did the jurisdiction provide cost information for its catch basin program?

If any of the questions above were answered negatively, an interview was recommended with the jurisdiction. The list of jurisdictions recommended for interview was discussed with the project team and a refined list was developed. The jurisdictions were divided into four priority levels for interviews based on the potential for additional valuable data:

- Level 1 priority were those jurisdictions that either indicated on the survey they might have valuable data in GIS and/or Excel but did not submit the data or submitted data, but key fields were missing (i.e. inspection dates or catch basin details).
- Level 2 priority were those jurisdictions that may have available inspection data or catch basin details, but it wasn't clear from the survey on the level of detail they had.
- Level 3 priority were those jurisdictions that did not submit cost or standard operating procedures for their catch basin inspection and cleaning, but indicated on the survey they were intending to submit these data.
- Level 4 priority were those jurisdictions that the team had knowledge of good data being collected, but which had not uploaded the data to the study.
- The remaining jurisdiction either submitted data of insufficient quality, quantity, or did not submit data at all.

These jurisdictions and the results of the interviews to date are summarized in **Table C-3**. Data submittals follow-up questions and clarifications were requested from 24 of the jurisdictions. Seven of these jurisdictions were also contacted through phone interviews.

Database Mapping and Data Completeness

The data submitted by jurisdictions were first screened for availability of catch basin details including locations (coordinates or GIS), inspection details and maintenance details. Only thirteen jurisdictions had submitted all three types of data:

- City of Auburn
- City of Battle Ground
- City of Everett
- City of Kent
- City of Kirkland
- City of Poulsbo
- City of Puyallup
- City of Seattle - Seattle Public Utilities
- City of Tacoma
- City of Tumwater
- Port of Seattle
- King County Roads Division
- Washington State Department of Transportation.

The data from these thirteen jurisdictions were then mapped to the fields requested by the project team. **Attachment D** provides a field-by-field assessment of the data provided and whether missing data were critical (Primary Type of Field) or noncritical. The table distinguishes between the fields that contained information and those that were empty. Jurisdictions with missing critical data were contacted to try to fill in the data gaps. Eight out of the thirteen jurisdictions were identified as providing all the critical information needed uploaded into the database. The five jurisdictions that were not carried forward were either missing cleaning records or had combined inspection and maintenance records that only recorded whether the catch basin was inspected without distinguishing whether it needed to be cleaned or not.

The jurisdictions that were processed further and imported into the project database are:

- City of Everett;
- City of Kent;
- City of Kirkland;
- City of Seattle - Seattle Public Utilities;
- City of Tacoma;
- City of Tumwater;
- King County Roads Division;
- Washington State Department of Transportation.

King County provided a template database which was used to create the project database. Catch basin inspection and maintenance records were standardized to use the same units of measurement and the fields were mapped to those planned for use in the project database. Assumptions and notes for each import are captured in a summary page included in **Attachment D**.

Data qualifiers were added into the database to account for data quality issues that may need to be further investigated or handled during the data analysis stage of this work. The following codes were used for the data qualifiers:

- P – the calculated Percent Fill field resulted in a number greater than 100%.[4]
- M – Percent Fill on inspection table, or Sediment Depth on Catch Basin table is not filled in because critical information was missing.[5]
- K – for King County data only, used for older King County data (2011-2014), which doesn't have asset IDs (will need assignment by King County during data analysis prep)[6]
- A – for Kent data only, when 60% fill was assumed.[7]
- S – sump depth equal to zero.[8]

[4] Percent fill is defined as the percent of total sump depth filled with sediment. The field was computed based on sediment depth and sump depth. Data input errors, unit errors or incorrect sump depths could be reasons for these erroneous fields.
[5] Percent fill field was computed based on sediment depth and sump depth. If either of these values were not available from the jurisdiction, the data was qualified with this letter.
[6] King County used a different AssetID system between 2011-2014 and did not provide matching catch basin details.
[7] City of Kent does not record percent fill in their catch basins and therefore an assumed value of 60% was used for those catch basins that required cleaning.
[8] Sump depth in the data provided was filled in with a value of zero. Data with a blank in the sump depth field were not qualified with this letter.

Table 1 below summarizes the inspection and maintenance data imported into the project database and **Attachment E** includes the project database file.

TABLE 1: Summary of Imported Data					
Jurisdiction	**Catch Basin Records Imported**	**Inspection Records Imported**	**Maintenance Records Imported**	**Years of Inspection Data**	**Years of Maintenance Data**
WSDOT	12,480	15,337	575	2000, 2007-2009, 2011-2017	2008, 2012-2016
King County[9]	36,553	16,231	3,583	2011-2015	2011-2017
Seattle - SPU	35,438	246,689	69,972	2008-2016	2008-2016
Tacoma	20,020	38,649	21,500	2001-2003, 2013-2017	2012, 2014-2017
Everett	16,449	23,463	9,246	2010-2017	2010-2017
Kent	16,309	30,613	18,777	2010-2017	2007-2017
Kirkland	469	209	152	2014-2017	2007-2017
Tumwater	3,207	3,131	137	2014-2017	2008-2017

LIST OF ATTACHMENTS

Attachment A: Blank Survey and Request Documents

Attachment B: Unprocessed Survey Results and Data

Attachment C: Survey Results Summary

Attachment D: Database Information

Attachment E: Database Files

[9] Asset IDs resolution for an older data set still needs to be completed by King County. Data were incorporated in the inspection and maintenance records, but are not linked to any catch basin records.

ATTACHMENT A

BLANK SURVEY AND REQUEST DOCUMENTS

RSMP LOGO (under

January 16, 2017

To: NPDES Municipal Stormwater Permittees

Through: Cami Apfelbeck, Stormwater Work Group Chair

From: Brandi Lubliner, Regional Stormwater Monitoring Program Coordinator

Regional Stormwater Monitoring Program (RSMP) Effectiveness Study

By participating in the RSMP you meet your NPDES municipal stormwater permit S8 Monitoring and Assessment requirements. The S8.C Effectiveness Studies component is the largest RSMP component. There are ten studies underway that were identified by you and your colleagues in 2014. The Stormwater Work Group's Pooled Resources Oversight Committee oversees the RSMP and manages your funds to conduct these relevant and important studies for stormwater management.

The Western Washington Catch Basin Cleaning Effectiveness Study was voted #1 of the ten studies in 2014. The goal is to learn the most effective inspection and maintenance schedule for costs, asset protection, and environmental benefit. This study will inform the follow permit sections: Phase I Special Conditions S5.C.9.a & S5.C.9.d, and Phase II Special Conditions S5.C.5.a & S5.C.5.d. You can expect a request for data in the next month.

Your data is critical to this effort. There is no other way to advance a regional understanding of stormwater management without your participation.

All RSMP projects' goals identify ways to increase efficiency, reduce costs, and make recommendations for effective stormwater management strategies. These recommendations are the feedback mechanism for stormwater managers and policy development. Only two of the ten studies require data from permittees; you have already seen the request from the business inspection source control effectiveness study which was voted #3 in 2014.

In order to ensure that your funds are spent well, we strongly encourage you to participate and provide your data for the catch basin cleaning effectiveness study as explained in the attached memo. These studies you are paying for will only be as good as the regional data you and your fellow permittees supply. We recognize pulling this data together will take some staff time. The data request has been designed to minimize your time and gather relevant information determined by the project's technical advisory team.

Please pass this request on to the right staff person in your organization.

Thank you for your time!

Brandi Lubliner, RSMP Coordinator, and this project's team:
Jenée Colton, King County
Luanne Coachman, King County
Blair Scott, King County
Angela Gallardo, Kitsap County
Laura Haren, City of Kent
Grant Moen, City of Everett
Kate Rhoads, City of Seattle

Survey and Data Request of Municipal Catch Basin Maintenance Programs

Submittal Deadline: February 6, 2017

Western Washington Catch Basin Inspection and Maintenance Effectiveness Study

PROJECT GOALS

The western Washington catch basin inspection and maintenance project (the Project) is an effectiveness study of the Regional Stormwater Monitoring Program (RSMP). The Project is intended to gather and evaluate existing records for catch basin (CB) inspection and maintenance. The goals of the Project are to identify factors that could be used to predict CB maintenance needs (informing permit language about schedule) and to examine inspection and maintenance (I&M) programs among western Washington municipal NPDES permittees to identify cost efficiencies in program implementation. A report will be prepared from the results and shared among participants that identifies ways to increase efficiency and reduce costs.

The effectiveness question the Project seeks to address is:

> How can CB program data be used to inform individual inspection frequency needs for permit compliance?

The Project objectives are:

1. Identify trends and/or correlations in CB I&M data that support proposals of alternative inspection schedules to Ecology;
2. Develop an electronic database of available CB I&M data for Western Washington;
3. Identify transferable cost-efficiencies in the design and implementation of the CB I&M programs; and
4. Recommend a list of standard data that should be collected to inform future assessments of sediment accumulation rates.

For reference, project documents and deliverables can be found on the RSMP website: http://www.ecy.wa.gov/programs/wq/stormwater/municipal/rsmp/effective.html. A link to the project scope can be found under the O&M tab and deliverables will be posted under each task as completed.

WHAT WE NEED FROM YOU

1. **Complete a short 11-question online survey – submit by January 30**

   A short online survey is provided to inform us on what type of information is available about your jurisdiction's CB program. Please submit your survey by January 30. Click on this link to take the survey: Online survey link

   Please note that every time you click on the link it will take you to a new version of the survey and you will need to start over. Survey data are not saved until you hit the 'submit' button on the last page. Submit the survey before leaving the webpage (even if you have not finished). You can click the 'edit your response' link at the end to return to the survey that you started and edit or complete your responses. Once you are in 'edit' mode, you can save the link in your browser to return to your survey without having to start over.

2. **CB inspection and maintenance data records, including program costs – submit by February 6.**

After receiving your jurisdiction's completed survey, the project team will send you a link to upload your data records of catch basin inspection and maintenance. This project relies on available CB inspection and maintenance program information from across the region. We are only requesting that you provide existing records. No new data collection or analysis efforts are needed. The specific data fields being requested and their definitions are listed below. You may not have everything we request, but any information in this list will be helpful. If you don't have data exactly as described, please include similar data. If in doubt, including more data than what we request is better than including less.

Follow-up calls and interviews will be conducted with some permittees to fill in data gaps and to better understand their CB programs. The goal is to obtain datasets that can be analyzed across jurisdictions, so completeness of the dataset, the time period, and covering a variety of jurisdiction sizes and diversity in CB maintenance programs are key elements. Success of the study relies on your and others' participation. The most useful product will be derived from data contributed by many permittees.

DATA TRANSFER INSTRUCTIONS

The project team is asking all western Washington municipal NPDES stormwater permittees to please send us your CB inspection and maintenance data after completing the survey. We will send a drop location to the contact listed in your survey and would like to receive your data by February 6, 2016.

Your records are requested for the categories listed in the table below, as available. Please include GIS metadata, data dictionaries, and descriptions of each data layer if available. If providing a GIS contact for your agency is easier, we are happy to receive this and follow up.

The survey asks for e-mail addresses for anyone you would like to have access to the upload site. We will send instructions and a link to the upload site to the provided e-mail addresses. Each entity will be provided a unique upload login so that your data will remain secure. Please do not email files to us due to size limits for file attachments.

QUICK REFERENCE

What is needed:

- Survey (11 questions)
- Information
  - CB inspection and maintenance records since 2007 (see attached table)
  - Limited GIS layers

When:

- Survey: by Jan. 30
- Data Records: by February 6

Western Washington Catch Basin Inspection and Maintenance Effectiveness Study

DATA FIELDS & DEFINITIONS

CATEGORY	FIELD NAME	DATA TYPE	FIELD DEFINITION
CATCH BASIN INFORMATION	Type of CB	text	Type I, Type II, inlet, other
	Sump in CB?	Y/N	Is there a sump in the catch basin that collects settleable solids?
	Sump size	number	How large is the sump (volume)?
	CB identification	text/number	Unique ID for structure
	Invert elevation	ft	ft above mean sea level of lowest outflowing pipe from structure
	Rim elevation	ft	ft above mean sea level of rim of structure (typically ground elevation)
	Bottom of sump elevation	ft	ft above mean sea level of bottom of CB sump
	CB location coordinates	latitude/longitude	lat/long of structure, in decimal degrees
	CB location, street	address	closest address to structure
	CB installation date	date	date of original installation of structure
INSPECTION INFORMATION	Inspection dates	date	Date of inspection and associated CB identification
	CB Inspection measurements collected	number	Sediment depth to sump or % full
	CB status from inspection	text	Record of inspection outcome (e.g.,Pass/fail, >50%, >60%, however recorded)
MAINTENANCE INFORMATION	Maintenance dates	date	dates of maintenance activities by CB, starting 2007
	Maintenance Activity	text	briefly describe maintenance activity by CB for associated date
	Maintenance cost	$$	dollar cost of maintenance
DRAINAGE BASIN	Contributing area	ha	hectares of contributing surface runoff area to structure
	Groundwater contribution	text	if known, briefly describe groundwater contribution to drainage area
	Pipe diameter_inflow	ft	diameter of influent pipe to CBs
	Pipe slope_inflow	%	slope of influent pipe of CBs
	Pipe diameter_outflow	ft	diameter of effluent pipe from CB
	Pipe slope_outflow	%	slope of effluent pipe of CBs
	Land Use percentage 1	%	primary land use of drainage area, percent of drainage area (approximate estimate ok)
	Land Use percentage 2	%	secondary land use of drainage area, percent of drainage area (approximate estimate ok)

CATEGORY	FIELD NAME	DATA TYPE	FIELD DEFINITION
	Land Use percentage 3	%	tertiary land use of drainage area, percent of drainage area (approximate estimate ok)
GIS DATA	Digital elevation model (DEM)	raster	GIS layer with DEM for jurisdiction (e.g., LIDAR)
	Roads	lines, vector	GIS layer with lines for roads
	Catch basins	points, vector	GIS layer with points for catch basins
	Flow routing	lines, vector	GIS layer with lines for flow routing
	Drainage basins layer	polygon, vector	GIS layer with polygons for surface drainage basins
	Inspection circuit	lines, vector	GIS layer with lines for inspection routes

SURVEY of MUNICIPAL CATCH BASIN INSPECTION and MAINTENANCE PROGRAMS

This survey asks questions to assist us in data interpretation and analysis. We do not expect jurisdictions to have all the information or data types provided as options. Nevertheless, your data are still helpful. If you are unsure if you should check a box because the answer is "maybe" or "sometimes", please opt to check the box. If this information becomes important or needs clarification, we can follow up with your contact during the data transfer step. Questions about GIS data are referring to any data that have been linked to or imported into a GIS layer for mapping purposes. You may not have had any need to create these GIS files. We do not necessarily need you to provide us the GIS data listed in this survey. At this point, we only want to know if you have it. See the Data Request instructions for the specific GIS data we are requesting now. For questions about the survey, please contact Jon Ambrose (jon.ambrose@cardno.com).

Jurisdiction/Organization:	
Contact Name:	
Email:	
Zip Code:	**Phone:**

1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.

Phase I Permittees

- ☐ Standard approach for Phase Is: inspect all CBs and inlets annually (permit section S5.C.9.d.i).
- ☐ Alternative 1: inspect all CBs more or less frequently than annually to meet maintenance standards based on at least two years of CB inspection records (S5.C.9.d.i(1)).
- ☐ Alternative 2: inspect all CBs annually on a "circuit basis" whereby 25 percent of CBs and inlets within each circuit are inspected to identify maintenance needs (S5.C.9.d.i(2)).
- ☐ Alternative 3: clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term (S5.C.9.d.i(3)).

☐ Other/Notes: ______________________________

____

Phase II Permittees

- ☐ Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
- ☐ Alternative 1: inspect all CBs more or less frequently than every two years to meet maintenance standards based on at least four years of CB inspection records (S5.C.5.d.i).
- ☐ Alternative 2: inspect all CBs once by 8/1/17 and every two years thereafter on a "circuit basis" whereby 25 percent of CBs and inlets within each circuit are inspected to identify maintenance needs (S5.C.5.d.ii).

☐ Alternative 3: clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term (S5.C.5.d.iii).

☐ Other/Notes: ____________________

____

2. What is your jurisdiction's working definition of a CB? King County has adopted Washington State DOT's definition for a catch basin of a 12" minimum sump depth. What differentiates a catch basin from an inlet in your jurisdiction?

☐ **12" or greater sump depth is a catch basin**

☐ **Other:** ____________________

3. What types of catch basins are in your jurisdiction? There are multiple types of CBs and varying definitions in the industry. We have included definitions below based on King County road standards (http://kingcounty.gov/depts/transportation/roads/road-standards.aspx). However, if these don't apply in your jurisdiction, please check "Other" and describe CB types that are included in your jurisdiction's CB inspection and maintenance program.

☐ **Type I**: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB.

☐ **Type II**: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff.

☐ **Inlet**: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.

☐ **Other:** ____________________

4. Which activities may be included in a catch basin inspection your jurisdiction? Check any that apply.

☐ Visual/photo inspection

☐ Field notes of CB status

☐ Map/GIS updates

☐ Depth measurement of accumulated solids: units_______ precision_______

☐ Other: ____________________

____

5. What types of roads and CB maintenance does your jurisdiction perform? Check any that apply.

   ☐ Pipe cleaning

   ☐ Culvert cleaning

   ☐ CB cleanout

   ☐ Ditch maintenance

   ☐ Street cleaning

   ☐ Road repair and resurfacing

   ☐ Sanding/de-icing

   ☐ Other snow and ice control

   ☐ Roadside landscape maintenance, including vegetation and application of herbicide/pesticide

   ☐ Dust control

   ☐ Sediment and erosion control

   ☐ Trash and pet waste management

   ☐ Repair or replacement of CB grate

   ☐ Sealing cracks in below-ground structure and/or pipes

   ☐ Other: ______________________________

   ____

6. How does your jurisdiction determine if a catch basin needs to be cleaned out? Check any that apply.

   ☐ Based on inspection data

   ☐ Based on a schedule

   ☐ Based on traffic volume or other road use factors

   ☐ Based on occurrence of an emergency, flooding, or CSO event

   ☐ Based on citizen reports/complaints

   ☐ Transfer of ownership

   ☐ Other: ______________________________

7. What type of records do you keep for CB inspection and maintenance? Check all that apply in the available format.

	Inspections	Maintenance	Costs
Microsoft Excel spreadsheet	☐	☐	☐

Non-Excel database	☐	☐	☐
GIS database	☐	☐	☐
Paper files	☐	☐	☐
Other format (type in)			

8. What GIS data do you have for your jurisdiction? Check any that apply.

- ☐ CB type (per definitions in Question 1 above)
- ☐ CB dimensions
- ☐ CB location
- ☐ CB age
- ☐ Pipe sizes into and out of CB
- ☐ CB elevation (rim and pipe invert)
- ☐ System conveyance (e.g., CB connections)
- ☐ Stormwater drainage basins delineations
- ☐ Flow routing through the system
- ☐ Land use
- ☐ Presence/absence of curbs vs. ditches
- ☐ Average annual daily traffic (AADT)
- ☐ Snow removal routes
- ☐ Snow days (avg. number of snow removal days per year)
- ☐ Street surface material (e.g. paved, gravel, etc.)
- ☐ Construction activities in drainage area
- ☐ Local precipitation data

9. What GIS data do you have about CB inspection and maintenance? Check all that apply.

- ☐ Maintenance routes and schedules
- ☐ Inspection dates
- ☐ Maintenance or repair dates
- ☐ Maintenance activities performed
- ☐ Cleaning frequency and dates
- ☐ Cleaning routes
- ☐ Inspection and maintenance records (pre-2007)

☐ Circuits with CBs grouped to meet permit option for inspecting on a “circuit basis”

☐ Street sweeping routes and schedule

☐ Inspection, maintenance, or cleaning costs

10. Please provide the cost of your program for CB inspections and maintenance (not including disposal) on an annual basis or by average cost by catch basin. If this has changed over time since 2007, please indicate how and when cost changed.

Inspections (program cost per year and/or average cost per CB):

2008	
2009	
2010	
2011	
2012	
2013	
2014	
2015	

Maintenance (program cost per year and/or average cost per CB):

2008	
2009	
2010	
2011	
2012	
2013	
2014	
2015	

11. If available, please send an example field inspection form(s) used by your jurisdiction for catch basin inspection and maintenance.

☐ Yes, example field inspection form sent with data transmittal.

☐ No, no field inspection form available.

12. If available, please send your jurisdiction’s Standard Operating Procedures (SOP) document(s) for catch basin inspection and maintenance.

☐ Yes, SOP sent with data transmittal.

☐ No, SOP not available.

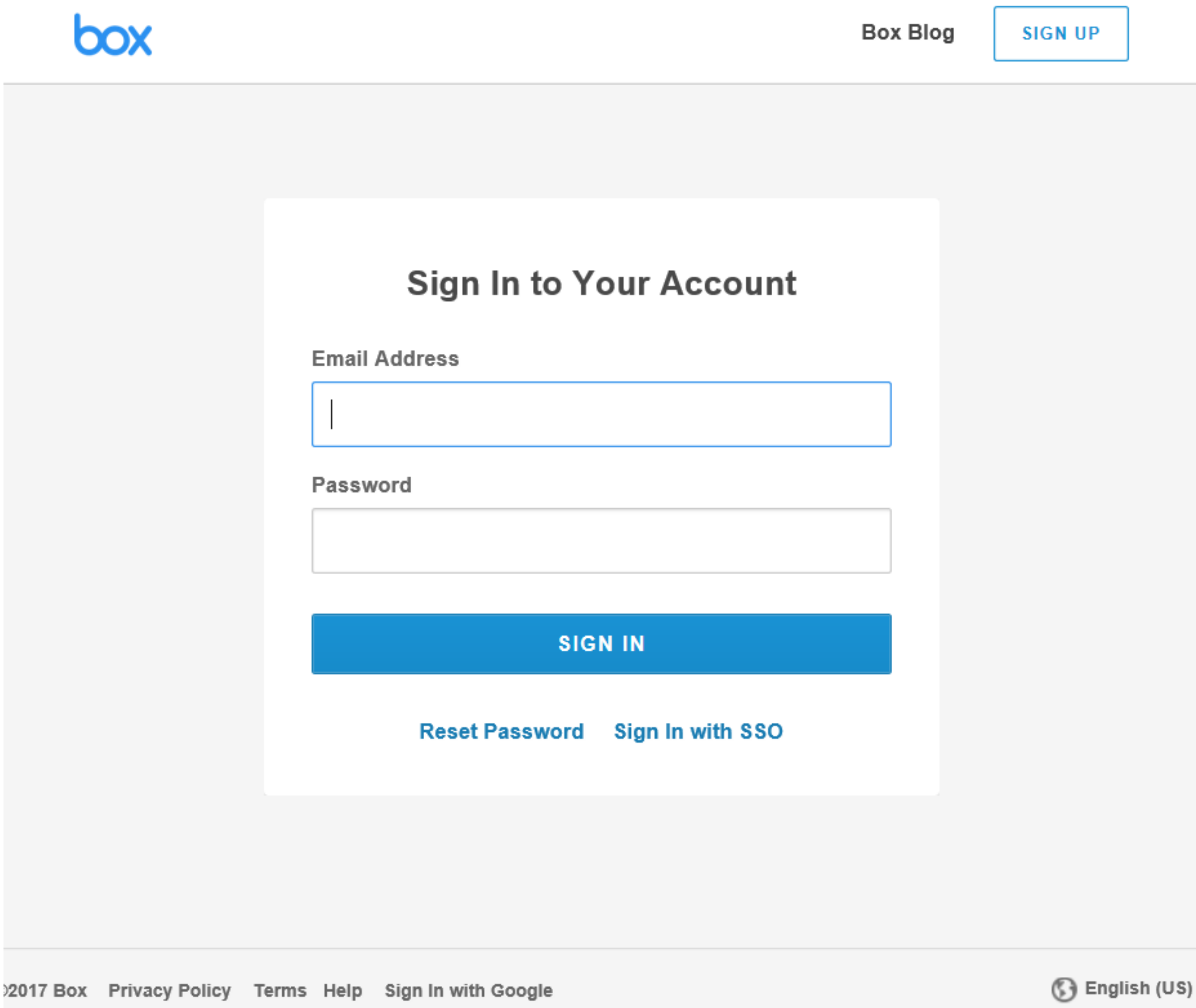
13. Do you have any questions, comments or feedback about this survey?

Thank you for completing the survey! We appreciate your participation.

Upload files for the Catch Basin Study in 5 easy steps

STEP 1: Open the Box Folder by following this link: https://app.box.com/folder/11475654547

The link will take you to a website that looks like this:

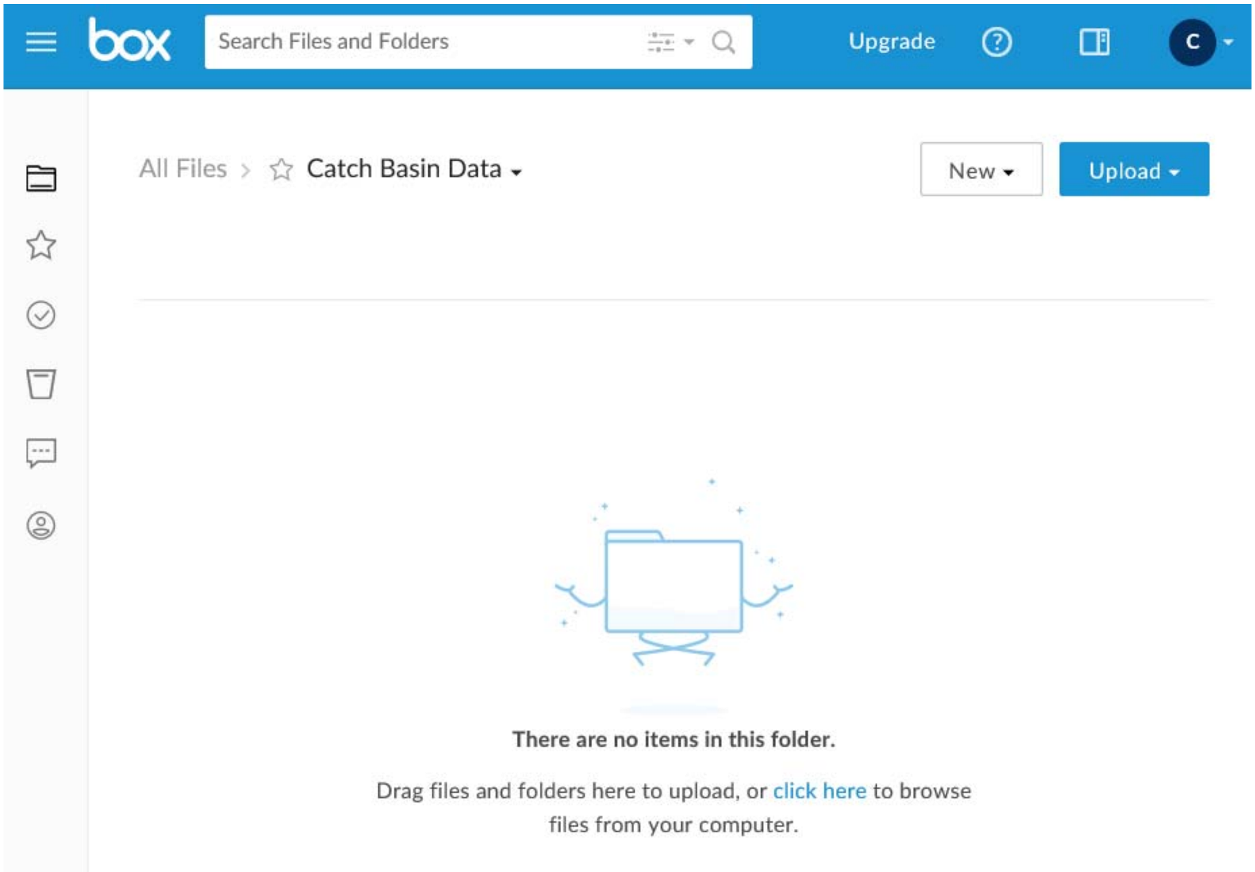


STEP 2: Enter the credentials below to log into the Box folder:

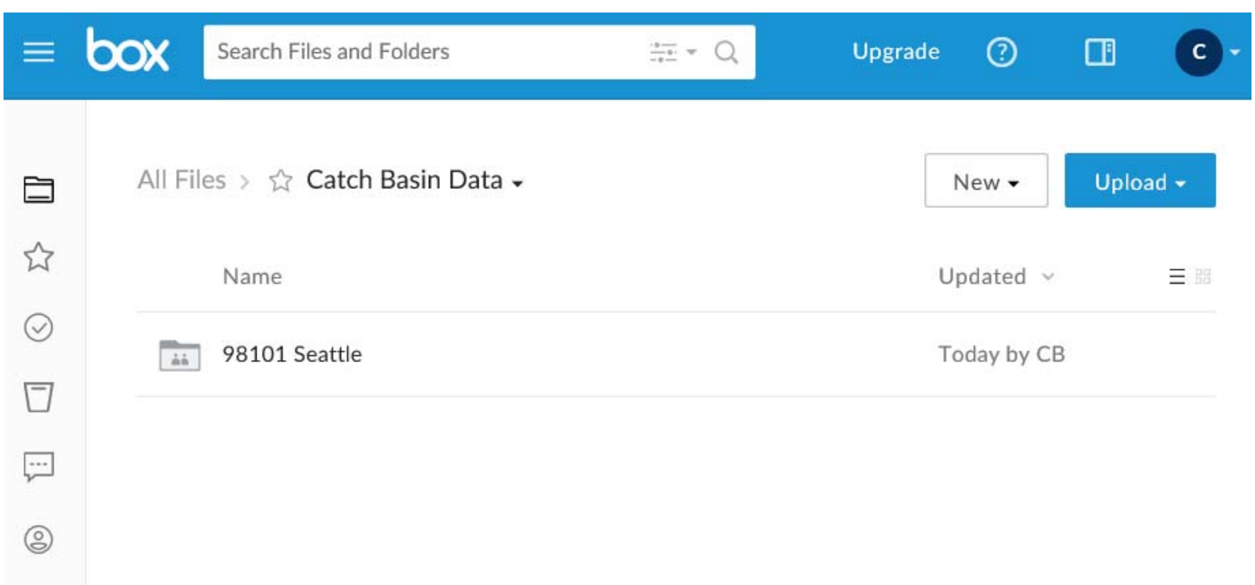
Email address: catchbasinupload@gmail.com

Password: 2017catchbasin

Once you are logged in, the website will look like this:

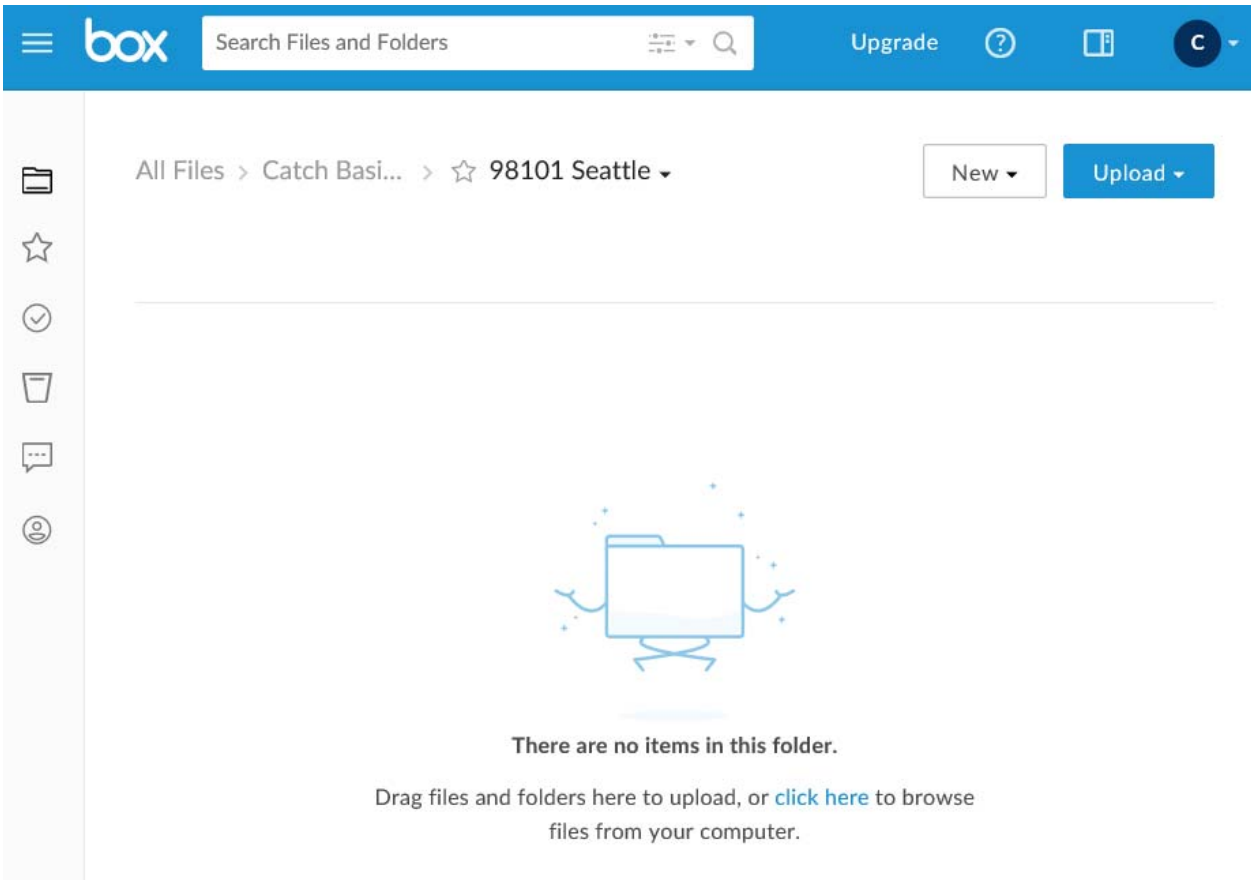


STEP 3: Create a folder with your jurisdiction's main ZIP code and name (i.e. 98101 Kitsap County) by clicking "New" in the top right corner and then selecting "Folder". The zip code selected is not critical as long as you have a unique folder name. Once you are done it should look like this:



NOTE: There may be other folders with data already uploaded in this Box folder. Your upload account is setup to allow only uploading capabilities and therefore it will not grant you access to view previously uploaded content. Although you will be able to see the file names, the content viewing is disabled.

STEP 4: Click on the folder you have just created for your jurisdiction:



STEP 5: You are now ready to drag and drop the files and folders for your jurisdiction or click browse and navigate to the files on your computer.

Should you run into any issues with the uploading to this folder, please do not hesitate to contact Diana Hasegan for support at dianah@osbornconsulting.com | 425.516.7626.

ATTACHMENT B

UNPROCESSED SURVEY RESULTS AND DATA

Timestamp	Jurisdiction/Organization	Contact Name	Title	Email	Phone number	5-digit Zip Code for your office	Permit Phase
1/31/2017 11:30:13	WSDOT	Trett Sutter	Stormwater Compliance Special	suttert@wsdot.wa.gov	360-705-6964	98504	Phase 1
3/15/2017 12:07	King County	Blair Scott	Assistant Municipal NPDES Stormwater Permit Coordinator	blair.scott@kingcounty.gov	206-477-4877	98104	Phase 1
2/17/2017 7:05:16	King County DNRP Parks and Recreation	David Sizemore	Senior Engineer	david.sizemore@kingcounty.gov	206-477-6142	98056	Phase 1
2/23/2017 10:57	King County DOT/Road Services Div/Maintenance Section	Brent Dhoore	Environmental Scientist	brent.dhoore@kingcounty.gov	206-477-2606	98056	Phase 1
3/1/2017 13:59	King County International Airport	Peter Dumaliang	Environmental Scientist/Enginee	peter.dumaliang@kingcounty.gov	2064770212	98108	Phase 1
3/1/2017 17:03	King County Wastewater Treatment Division	Jeff Lafer	NPDES Permit Administrator	jeff.lafer@kingcounty.gov	206-477-6315	98104	Phase 1

Timestamp	Jurisdiction/Organization	Contact Name	Title	Email	Phone number	5-digit Zip Code for your office	Permit Phase
2/28/2017 15:27	King County/Facilities Management Division	Bill Eckel	Water Quality Compliance Mana	bill.eckel@kingcounty.gov	206-477-9357	98104	Phase 1
2/27/2017 14:29	King County/Metro Transit	Talon Swanson	Environmental Scientist	talon.swanson@kingcounty.gov	(206)477-5569	98168	Phase 1
1/26/2017 11:37:27	City Of Tacoma	Michael A. Rose, P.E.	Professional Engineer	Mrose@Cityoftacoma.org	253-502-2264	98421	Phase 1
2/7/2017 14:33:15	Seattle Public Utilities	Kate Rhoads	Municipal Stormwater Specialist	kate.rhoads@seattle.gov	2066848298	98124	Phase 1
1/19/2017 15:22:33	Highline College	Barry Holldorf	Director of Facilities & Operation	bholldorf@highline.edu	206-870-3793	98198	Phase 2
1/30/2017 17:38:46	Port of Seattle	Jane Dewell	Maritime Stormwater Program Manager	dewell.j@portseattle.org	206-787-4668	98121	Phase 1

Timestamp	Jurisdiction/Organization	Contact Name	Title	Email	Phone number	5-digit Zip Code for your office	Permit Phase
1/31/2017 9:51:14	Seattle Public School	Shelly Kerby	Environmental Health and Safety coordinator	shkerby@seattleschools.org	2062520703	98124	Phase 1
2/3/2017 8:05:53	WA Military Department	Rowena Valencia-Gica	Environmental Programs Supervisor	Rowena.Valencia-Gica@mil.wa.gov	253-512-8704	98430	Phase 1
1/30/2017 11:48:09	Western Washington/Lower Columbia College	Jeff Moenck	Facilities Operations Maint. Spec.	jmoenck@lcc.ctc.edu	360-442-2261	98632	Phase 2
2/1/2017 8:54:59	Kitsap County	Angela Gallardo	Stormwater Asset Manager	agallard@co.kitsap.wa.us	360-337-7296	98366	Phase 2
1/23/2017 14:51:42	Thurston County	Ryan Langan	Stormwater Operations Manage	langanr@co.thurston.wa.us	360-867-2099	98502	Phase 2
1/30/2017 15:06:09	Whatcom County	Cathy Craver	Senior Planner	ccraver@co.whatcom.wa.us	360-778-6299	98225	Phase 2

Timestamp	Jurisdiction/Organization	Contact Name	Title	Email	Phone number	5-digit Zip Code for your office	Permit Phase
2/21/2017 15:58:10	City of Algona	Salvador Marez		algonapw@algonawa.gov	253-833-2741	98001	Phase 2
1/23/2017 14:05:12	City of Arlington	Ken Clarke	Stormwater Technician	kclarke@arlingtonwa.gov	360-403-3523	98223	Phase 2
1/17/2017 11:34:39	City of Auburn	Chris Thorn	Water Quality Programs Coordinator	cthorn@auburnwa.gov	(253) 804-5065	98001	Phase 2
1/23/2017 14:42:38	City of Bainbridge Island	Marilyn Guthrie	NPDES Permit Coordinator	mguthrie@bainbridgewa.gov	2067803724	98110	Phase 2
1/27/2017 18:23:26	City of Battle Ground	Kelly Uhacz	Associate Stormwater Engineer	Kelly.Uhacz@cityofbg.org	360-342-5069	98604	Phase 2
2/9/2017 15:50:02	City of Bellevue	Don McQuilliams		DMcQuilliams@bellevuewa.gov	425-452-7865	98004	Phase 2

Timestamp	Jurisdiction/Organization	Contact Name	Title	Email	Phone number	5-digit Zip Code for your office	Permit Phase
1/27/2017 10:41:03	City of Bellingham	Jason Porter	Storm and Surface Water Mana	jporter@cob.org	360-778-7799	98229	Phase 2
1/30/2017 14:28:18	City of Bremerton	Chance Berthiaume	Stormwater Permit Coordinator	chance.berthiaume@ci.bremerton.wa.us	(360) 473-5929	98312	Phase 2
2/9/2017 16:39:03	City of Brier	RICH MAAG		rmaag@ci.brier.wa.us	425-775-5440	98036	Phase 2
1/30/2017 16:02:02	City of Camas	Anita Ashton	Engineer III	aashton@cityofcamas.us	360-817-7231	98607	Phase 2
2/2/2017 7:19:01	City of Centralia	Fred Chapman	Stormwater Tech	fchapman@cityofcentralia.com	3603307512	98531	Phase 2
2/2/2017 9:42:34	City Of Covington	Ben Parrish	Surface Water Management Program Coodinator	bparrish@covingtonwa.gov	253- 480-2465	98042	Phase 2

Timestamp	Jurisdiction/Organization	Contact Name	Title	Email	Phone number	5-digit Zip Code for your office	Permit Phase
1/25/2017 10:52:36	City of Des Moines	Tyler Beekley	Water Quality Specialist	tbeekley@desmoineswa.gov	206-870-6869	98198	Phase 2
1/30/2017 16:45:50	City of Edgewood	Jeremy Metzler	Senior Engineer / Surface Water Program Manager	jeremy@cityofedgewood.org	2539523299	98372	Phase 2
1/30/2017 16:18:32	City of Everett	Grant Moen	Senior Engineer	gmoen@everettwa.gov	425 257 8947	98201	Phase 2
1/30/2017 14:57:09	City of Federal Way	Tony Doucette	Surface Water Management Project Engineer	tony.doucette@cityoffederalway.com	(253) 835-2753	98003	Phase 2
1/27/2017 16:14:27	City of Ferndale	Wendy LaRocque	Stormwater Manager	wendylarocque@cityofferndale.org	360-685-2378	98248	Phase 2
1/23/2017 12:12:13	City of Issaquah	Harvey Walker	Manager of Storm and Sewer Operation	harveyw@issauquahwa.gov	425-837-3480	98027	Phase 2

Timestamp	Jurisdiction/Organization	Contact Name	Title	Email	Phone number	5-digit Zip Code for your office	Permit Phase
1/30/2017 11:05:12	City of Kent	Laura Haren	Environmental Conservation Analyst	lharen@kentwa.gov	253-856-5537	98032	Phase 2
1/31/2017 16:45:08	City of Kirkland	Jenny Gaus	Surface Water Engineering Supervisor	jgaus@kirklandwa.gov	425-587-3850	98033	Phase 2
1/20/2017 14:34:07	City of Lakewood	Greg Vigoren	Surface Water Division Manager	gvigoren@cityoflakewood.us	253-983-7771	98499	Phase 2
1/25/2017 9:59:46	City of Mercer Island	Hartvigson	Right-of-Way Manager	brian.hartvigson@mercergov.org	206275-7809	98040	Phase 2
1/18/2017 7:33:39	City of Mill Creek	Marci Chew	Stormwater Specialist	marcic@cityofmillcreek.com	425-921-5709	98012	Phase 2
1/17/2017 10:38:54	City of Milton	Jamie Carter	Stormwater Compliance Inspector	jcarter@cityofmilton.net	253-517-2708	98354	Phase 2

Timestamp	Jurisdiction/Organization	Contact Name	Title	Email	Phone number	5-digit Zip Code for your office	Permit Phase
1/19/2017 15:54:23	City of Mount Vernon	Blaine Chesterfield	Engineering Manager	blainec@mountvernonwa.gov	360-336-6204	98273	Phase 2
1/17/2017 13:34:29	City of Mukilteo	Jennifer Adams	Surface Water Programs Manager	jadams@mukilteowa.gov	425-263-8083	98275	Phase 2
1/26/2017 12:03:43	City of Newcastle	Audrie Starsy	Surface Water Program Manage	Audries@ci.newcastle.wa.us	(425) 649-4444 ext. 111	98056	Phase 2
1/23/2017 9:24:31	City of Olympia	Sue Barclift	Sr Program Specialist	sbarclif@ci.olympia.wa.us	360-570-3805	98501	Phase 2
2/3/2017 15:18:03	City of Poulsbo	Anja Hart	Stormwater Program Manager	ahart@cityofpoulsbo.com	360-394-9753	98370	Phase 2
1/17/2017 9:59:19	City of Puyallup	Jon Wikander	Public Works Supervisor	jonathanw@ci.puyallup.wa.us	2537703341	98374	Phase 2

Timestamp	Jurisdiction/Organization	Contact Name	Title	Email	Phone number	5-digit Zip Code for your office	Permit Phase
1/30/2017 16:07:16	City of Renton	Kristina Lowthian	Civil Engineer I	klowthian@rentonwa.gov	425-430-7249	98057	Phase 2
2/9/2017 16:30:18	City of Sammamish	Tawni Dalziel		tdalziel@sammamish.us	425-295-0562	98075	Phase 2
1/27/2017 18:25:11	City of Shoreline	Uki Dele	Surface Water and Env. Svs. Manager	udele@shorelinewa.gov	2068012451	98133	Phase 2
1/23/2017 11:58:21	City of Sumner	Robert Wright	Local Source Control Specialist	Robertw@sumnerwa.gov	2532995708	98390	Phase 2
1/20/2017 12:19:10	City of Tumwater	Amy Georgeson	Water Resources Specialist	ageorgeson@ci.tumwater.wa.us	360754-4144	98501	Phase 2
3/23/2017 17:03	City of Woodinville	Brian Meyer	Maintenance Supervisor	brianm@ci.woodinville.wa.us	425-489-2700	98072	Phase 2

Timestamp	Jurisdiction/Organization	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.2
1/31/2017 11:30:13	WSDOT	Standard approach for Phase Is: inspect all CBs and inlets annually (permit section S5.C.9.d.i).	
3/15/2017 12:07	King County	Standard approach for Phase Is: inspect all CBs and inlets annually (permit section S5.C.9.d.i)., Alternative 1: inspect all CBs more or less frequently than annually to meet maintenance standards based on at least two years of CB inspection records (S5.C.9.d.i(1)).	
2/17/2017 7:05:16	King County DNRP Parks and Recreation	Standard approach for Phase Is: inspect all CBs and inlets annually (permit section S5.C.9.d.i).	
2/23/2017 10:57	King County DOT/Road Services Div/Maintenance Section	Alternative 2: inspect all CBs annually on a “circuit basis” whereby 25 percent of CBs and inlets within each circuit are inspected to identify maintenance needs (S5.C.9.d.i(2)).	
3/1/2017 13:59	King County International Airport	Alternative 3: clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term (S5.C.9.d.i(3)).	
3/1/2017 17:03	King County Wastewater Treatment Division	Standard approach for Phase Is: inspect all CBs and inlets annually (permit section S5.C.9.d.i)., Alternative 2: inspect all CBs annually on a “circuit basis” whereby 25 percent of CBs and inlets within each circuit are inspected to identify maintenance needs (S5.C.9.d.i(2))., A combination based on the need of the CBs	

Timestamp	Jurisdiction/Organization	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.2
2/28/2017 15:27	King County/Facilities Management Division	Standard approach for Phase Is: inspect all CBs and inlets annually (permit section S5.C.9.d.i).	
2/27/2017 14:29	King County/Metro Transit	Standard approach for Phase Is: inspect all CBs and inlets annually (permit section S5.C.9.d.i)., Alternative 1: inspect all CBs more or less frequently than annually to meet maintenance standards based on at least two years of CB inspection records (S5.C.9.d.i(1))., Alternative 3: clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term (S5.C.9.d.i(3)).	
1/26/2017 11:37:27	City Of Tacoma	Alternative 2: inspect all CBs annually on a “circuit basis” whereby 25 percent of CBs and inlets within each circuit are inspected to identify maintenance needs (S5.C.9.d.i(2)).	
2/7/2017 14:33:15	Seattle Public Utilities	Standard approach for Phase Is: inspect all CBs and inlets annually (permit section S5.C.9.d.i).	
1/19/2017 15:22:33	Highline College		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/30/2017 17:38:46	Port of Seattle	Standard approach for Phase Is: inspect all CBs and inlets annually (permit section S5.C.9.d.i)., Standard per S6.E.6	

Timestamp	Jurisdiction/Organization	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.2
1/31/2017 9:51:14	Seattle Public School	Standard approach for Phase Is: inspect all CBs and inlets annually (permit section S5.C.9.d.i)., Alternative 3: clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term (S5.C.9.d.i(3)).	
2/3/2017 8:05:53	WA Military Department	Alternative 3: clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term (S5.C.9.d.i(3)).	
1/30/2017 11:48:09	Western Washington/Lower Columbia College		Alternative 1: inspect all CBs more or less frequently than every two years to meet maintenance standards based on at least four years of CB inspection records (S5.C.5.d.i).
2/1/2017 8:54:59	Kitsap County		Inspect/clean all cb's every 2 years and inspect/clean cb's with heavy sediment load annually.
1/23/2017 14:51:42	Thurston County		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/30/2017 15:06:09	Whatcom County		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d)., Annual inspection for TMDL watershed

Timestamp	Jurisdiction/Organization	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.2
2/21/2017 15:58:10	City of Algona		Alternative 1: inspect all CBs more or less frequently than every two years to meet maintenance standards based on at least four years of CB inspection records (S5.C.5.d.i).
1/23/2017 14:05:12	City of Arlington		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/17/2017 11:34:39	City of Auburn		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/23/2017 14:42:38	City of Bainbridge Island		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/27/2017 18:23:26	City of Battle Ground		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
2/9/2017 15:50:02	City of Bellevue		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d)., WE ARE EVALUATING ALTERNATIVE SCHEDULES MOVING FORWARD

Timestamp	Jurisdiction/Organization	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.2
1/27/2017 10:41:03	City of Bellingham		Alternative 2: inspect all CBs once by 8/1/17 and every two years thereafter on a “circuit basis” whereby 25 percent of CBs and inlets within each circuit are inspected to identify maintenance needs (S5.C.5.d.ii).
1/30/2017 14:28:18	City of Bremerton		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
2/9/2017 16:39:03	City of Brier		Alternative 2: inspect all CBs once by 8/1/17 and every two years thereafter on a “circuit basis” whereby 25 percent of CBs and inlets within each circuit are inspected to identify maintenance needs (S5.C.5.d.ii).
1/30/2017 16:02:02	City of Camas		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
2/2/2017 7:19:01	City of Centralia		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
2/2/2017 9:42:34	City Of Covington		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).

Timestamp	Jurisdiction/Organization	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.2
1/25/2017 10:52:36	City of Des Moines		Alternative 2: inspect all CBs once by 8/1/17 and every two years thereafter on a “circuit basis” whereby 25 percent of CBs and inlets within each circuit are inspected to identify maintenance needs (S5.C.5.d.ii).
1/30/2017 16:45:50	City of Edgewood		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/30/2017 16:18:32	City of Everett		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/30/2017 14:57:09	City of Federal Way		Alternative 1: inspect all CBs more or less frequently than every two years to meet maintenance standards based on at least four years of CB inspection records (S5.C.5.d.i).
1/27/2017 16:14:27	City of Ferndale		Alternative 3: clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term (S5.C.5.d.iii).
1/23/2017 12:12:13	City of Issaquah		Alternative 2: inspect all CBs once by 8/1/17 and every two years thereafter on a “circuit basis” whereby 25 percent of CBs and inlets within each circuit are inspected to identify maintenance needs (S5.C.5.d.ii).

Timestamp	Jurisdiction/Organization	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.2
1/30/2017 11:05:12	City of Kent		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/31/2017 16:45:08	City of Kirkland		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/20/2017 14:34:07	City of Lakewood		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/25/2017 9:59:46	City of Mercer Island		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/18/2017 7:33:39	City of Mill Creek		Alternative 3: clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term (S5.C.5.d.iii).
1/17/2017 10:38:54	City of Milton		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).

Timestamp	Jurisdiction/Organization	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.2
1/19/2017 15:54:23	City of Mount Vernon		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/17/2017 13:34:29	City of Mukilteo		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/26/2017 12:03:43	City of Newcastle		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/23/2017 9:24:31	City of Olympia		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
2/3/2017 15:18:03	City of Poulsbo		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/17/2017 9:59:19	City of Puyallup		Alternative 3: clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term (S5.C.5.d.iii).

Timestamp	Jurisdiction/Organization	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.	1. Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.2
1/30/2017 16:07:16	City of Renton		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d)., Alternative 2: inspect all CBs once by 8/1/17 and every two years thereafter on a “circuit basis” whereby 25 percent of CBs and inlets within each circuit are inspected to identify maintenance needs (S5.C.5.d.ii)., Alternative 3: clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term (S5.C.5.d.iii).
2/9/2017 16:30:18	City of Sammamish		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/27/2017 18:25:11	City of Shoreline		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
1/23/2017 11:58:21	City of Sumner		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d)., Alternative 2: inspect all CBs once by 8/1/17 and every two years thereafter on a “circuit basis” whereby 25 percent of CBs and inlets within each circuit are inspected to identify maintenance needs (S5.C.5.d.ii)., Alternative 3: clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term (S5.C.5.d.iii).
1/20/2017 12:19:10	City of Tumwater		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).
3/23/2017 17:03	City of Woodinville		Standard approach for Phase IIs: inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter (permit section S5.C.5.d).

Timestamp	Jurisdiction/Organization	2.What types of catch basins are in your jurisdiction? There are multiple types of CBs and varying definitions in the industry. We have included definitions below based on King County road standards (http://kingcounty.gov/depts/transportation/roads/road-
1/31/2017 11:30:13	WSDOT	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
3/15/2017 12:07	King County	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
2/17/2017 7:05:16	King County DNRP Parks and Recreation	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
2/23/2017 10:57	King County DOT/Road Services Div/Maintenance Section	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
3/1/2017 13:59	King County International Airport	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
3/1/2017 17:03	King County Wastewater Treatment Division	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.

Timestamp	Jurisdiction/Organization	2.What types of catch basins are in your jurisdiction? There are multiple types of CBs and varying definitions in the industry. We have included definitions below based on King County road standards (http://kingcounty.gov/depts/transportation/roads/road-
2/28/2017 15:27	King County/Facilities Management Division	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
2/27/2017 14:29	King County/Metro Transit	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/26/2017 11:37:27	City Of Tacoma	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
2/7/2017 14:33:15	Seattle Public Utilities	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/19/2017 15:22:33	Highline College	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/30/2017 17:38:46	Port of Seattle	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.

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1/31/2017 9:51:14	Seattle Public School	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB.
2/3/2017 8:05:53	WA Military Department	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/30/2017 11:48:09	Western Washington/Lower Columbia College	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff.
2/1/2017 8:54:59	Kitsap County	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/23/2017 14:51:42	Thurston County	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/30/2017 15:06:09	Whatcom County	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff.

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2/21/2017 15:58:10	City of Algona	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/23/2017 14:05:12	City of Arlington	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/17/2017 11:34:39	City of Auburn	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/23/2017 14:42:38	City of Bainbridge Island	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff.
1/27/2017 18:23:26	City of Battle Ground	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
2/9/2017 15:50:02	City of Bellevue	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.

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1/27/2017 10:41:03	City of Bellingham	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch., Bottomless for infiltration.
1/30/2017 14:28:18	City of Bremerton	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch., Curb inlet: rectangular cast iron inlet that collects street runoff and discharges into a type II manhole that has a sump and floatable controls. Typically this discharges into a stormwater system or the sanitary sewer.
2/9/2017 16:39:03	City of Brier	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/30/2017 16:02:02	City of Camas	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
2/2/2017 7:19:01	City of Centralia	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB.
2/2/2017 9:42:34	City Of Covington	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.

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1/25/2017 10:52:36	City of Des Moines	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/30/2017 16:45:50	City of Edgewood	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/30/2017 16:18:32	City of Everett	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/30/2017 14:57:09	City of Federal Way	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch., Water quality and pre-treatment facilities (Filterra, Contech CDS, etc)
1/27/2017 16:14:27	City of Ferndale	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/23/2017 12:12:13	City of Issaquah	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.

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1/30/2017 11:05:12	City of Kent	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/31/2017 16:45:08	City of Kirkland	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/20/2017 14:34:07	City of Lakewood	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch., Dry wells; Type IIs with direct surface runoff
1/25/2017 9:59:46	City of Mercer Island	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/18/2017 7:33:39	City of Mill Creek	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff.
1/17/2017 10:38:54	City of Milton	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.

Timestamp	Jurisdiction/Organization	2.What types of catch basins are in your jurisdiction? There are multiple types of CBs and varying definitions in the industry. We have included definitions below based on King County road standards (http://kingcounty.gov/depts/transportation/roads/road-
1/19/2017 15:54:23	City of Mount Vernon	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/17/2017 13:34:29	City of Mukilteo	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/26/2017 12:03:43	City of Newcastle	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/23/2017 9:24:31	City of Olympia	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
2/3/2017 15:18:03	City of Poulsbo	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/17/2017 9:59:19	City of Puyallup	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.

Timestamp	Jurisdiction/Organization	2.What types of catch basins are in your jurisdiction? There are multiple types of CBs and varying definitions in the industry. We have included definitions below based on King County road standards (http://kingcounty.gov/depts/transportation/roads/road-
1/30/2017 16:07:16	City of Renton	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
2/9/2017 16:30:18	City of Sammamish	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/27/2017 18:25:11	City of Shoreline	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff.
1/23/2017 11:58:21	City of Sumner	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
1/20/2017 12:19:10	City of Tumwater	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff., Inlet: feeder structure for surface drainage. Underground concrete structure is rectangular and typically includes a shallow sump. Intended to collect runoff directly from surface flow without inflowing pipes to the CB and then send runoff to another CB, a manhole, or ditch.
3/23/2017 17:03	City of Woodinville	Type I: inline or feeder structure for surface drainage with a grated lid that is typically square or rectangular. Underground concrete structure is typically square or rectangular. May include a sump or may contain a riser outflow pipe in lieu of or in addition to a sump. Intended to collect runoff both directly from surface flow and via inflow pipe(s) to the CB., Type II: inline structure for surface drainage with round lid. Sometimes referred to as a manhole or maintenance hole and may have a lockable lid. Underground concrete structure is typically round and may include a sump. Deeper than a Type 1 CB and typically includes a ladder for access. Intended to collect runoff via inflow pipe(s) to the CB only but not via direct surface runoff.

Timestamp	Jurisdiction/Organization	3. What is your jurisdiction's working definition of a CB? King County has adopted Washington State DOT's definition for a catch basin (>12" minimum sump depth). What differentiates a catch basin from an inlet in your jurisdiction?	4.Which activities may be part of a catch basin inspection your jurisdiction? Check any that apply.
1/31/2017 11:30:13	WSDOT	A drainage structure with a sump that interrupts the flow of rainwater and allows for settling and collection of sediment, debris, detritus, contaminants, etc., prior to transfer to the outlet pipe. The sump should be greater than 12 inches as measured between the flow line of the lowest pipe in the basin and the basin floor.	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)
3/15/2017 12:07	King County	Inlets are at the top of a system and have a "flow through" and no sump.	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)
2/17/2017 7:05:16	King County DNRP Parks and Recreation	Rectangular basin with a metal grate and a 12" minimum sump depth	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Measure depth of water in sump and then depth of solid in sump
2/23/2017 10:57	King County DOT/Road Services Div/Maintenance Section	See King County Storm water database	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Three measure down measurements taken from top of grate. Sump, outlet pipe invert and sediment level. Calculate sediment % in sump from those three measurements.
3/1/2017 13:59	King County International Airport		Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)
3/1/2017 17:03	King County Wastewater Treatment Division	Same	Field notes of CB status

Timestamp	Jurisdiction/Organization	3. What is your jurisdiction's working definition of a CB? King County has adopted Washington State DOT's definition for a catch basin (>12" minimum sump depth). What differentiates a catch basin from an inlet in your jurisdiction?	4.Which activities may be part of a catch basin inspection your jurisdiction? Check any that apply.
2/28/2017 15:27	King County/Facilities Management Division	Use King County's definition	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), estimated using steel rod probe
2/27/2017 14:29	King County/Metro Transit	We use the standard KC definition of >12" or deeper sump	Visual/photo inspection, Field notes of CB status, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Solids measured using a tape measurer and comparing to a known max depth
1/26/2017 11:37:27	City Of Tacoma	We use the WSDOT definition of catch basins although we do not use a minimum sump depth.	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Tape Measure, Marked Rod, and markings on the vactor tubes
2/7/2017 14:33:15	Seattle Public Utilities	12" sump	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), tenths of a foot
1/19/2017 15:22:33	Highline College		Visual/photo inspection, Field notes of CB status
1/30/2017 17:38:46	Port of Seattle	6" or greater sump depth = catch basin; less than 6" sump = inlet	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of

Timestamp	Jurisdiction/Organization	3. What is your jurisdiction's working definition of a CB? King County has adopted Washington State DOT's definition for a catch basin (>12" minimum sump depth). What differentiates a catch basin from an inlet in your jurisdiction?	4.Which activities may be part of a catch basin inspection your jurisdiction? Check any that apply.
1/31/2017 9:51:14	Seattle Public School	same as King County	Visual/photo inspection
2/3/2017 8:05:53	WA Military Department	Same definition as WA State DOT	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)
1/30/2017 11:48:09	Western Washington/Lower Columbia College	Same	Visual/photo inspection, Field notes of CB status, General note of catch basin needing cleaned no measurement
2/1/2017 8:54:59	Kitsap County	WSDOT's definition	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), IDDE screening/testing if necessary
1/23/2017 14:51:42	Thurston County	Use WSDOT's definition	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), 1/10's of foot
1/30/2017 15:06:09	Whatcom County	We look at everything and only really differentiate between Type 1 and 2's.	Visual/photo inspection, Field notes of CB status, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Probe used to estimate in inches amount of sediment accumulated in sump.

Timestamp	Jurisdiction/Organization	3. What is your jurisdiction's working definition of a CB? King County has adopted Washington State DOT's definition for a catch basin (>12" minimum sump depth). What differentiates a catch basin from an inlet in your jurisdiction?	4.Which activities may be part of a catch basin inspection your jurisdiction? Check any that apply.
2/21/2017 15:58:10	City of Algona	12" or greater sump depth is a catch basin	Visual/photo inspection, Field notes of CB status, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Precision
1/23/2017 14:05:12	City of Arlington	Any catch. (Not defined)	Visual/photo inspection, Photographs of CB, Field notes of CB status
1/17/2017 11:34:39	City of Auburn	Type I or II structure with a grated cover. There is no difference between catch basins and inlets.	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Sediment is probed with pole and sump percentage full estimated.
1/23/2017 14:42:38	City of Bainbridge Island		Visual/photo inspection, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)
1/27/2017 18:23:26	City of Battle Ground	Underground concrete structure to collect stormwater runoff and route it through underground pipes. Typically with and 18" sump.	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Map updates are in Google Earth
2/9/2017 15:50:02	City of Bellevue	12" OR GREATER SUMP DEPTH IS A CATCH BASIN. THE INSPECTOR MAKE A DECISION BASED ON STRUCTURE TYPE.	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), ACCUMULATED SOLIDS IN CB ARE MEASURED IN PERCENTAGE. WE HAVE RECENTLY BEEN USING A MOBILE APPLICATION FOR CB INSPECTION.

Timestamp	Jurisdiction/Organization	3. What is your jurisdiction's working definition of a CB? King County has adopted Washington State DOT's definition for a catch basin (>12" minimum sump depth). What differentiates a catch basin from an inlet in your jurisdiction?	4.Which activities may be part of a catch basin inspection your jurisdiction? Check any that apply.
1/27/2017 10:41:03	City of Bellingham	Any measurable sump within reason, generally 6" or greater sump.	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Document surrounding area, depth of structure, depth of outlet, and cover type.
1/30/2017 14:28:18	City of Bremerton	WADOT is our standard. A stormwater inlet has no sump but discharges into a type II manhole with a sump and floatable controls before entering the stormwater system.	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)
2/9/2017 16:39:03	City of Brier	12" OR GREATER SUMP DEPTH IS A CATCH BASIN	Field notes of CB status, Map/GIS updates
1/30/2017 16:02:02	City of Camas		Visual/photo inspection
2/2/2017 7:19:01	City of Centralia	CB catches sediment. has a sump water flows through.	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)
2/2/2017 9:42:34	City Of Covington	If it has a sump, its a catch basin. if no sump, its an inlet.	Visual/photo inspection, Field notes of CB status, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), measured by "Vactor" contractor at time of cleaning

Timestamp	Jurisdiction/Organization	3. What is your jurisdiction's working definition of a CB? King County has adopted Washington State DOT's definition for a catch basin (>12" minimum sump depth). What differentiates a catch basin from an inlet in your jurisdiction?	4.Which activities may be part of a catch basin inspection your jurisdiction? Check any that apply.
1/25/2017 10:52:36	City of Des Moines	The City would typically refer to the KCSWDM for such definitions and in this case would concur with King County's definition.	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Measured with a sediment rod
1/30/2017 16:45:50	City of Edgewood	Same (Pierce County / WSDOT definition)	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Rod probe
1/30/2017 16:18:32	City of Everett	Stormwater structure with a sump depth greater than 0.6'	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Measure depth from sump bottom
1/30/2017 14:57:09	City of Federal Way	Type I CBs and inlets are essentially synonymous.	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)
1/27/2017 16:14:27	City of Ferndale	SWMMWW definitione	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates
1/23/2017 12:12:13	City of Issaquah	Issaquah adopted Ecology's Stormwater Management Manual so we use the definition the glossary. A chamber or well, usually built at the curb line of a street, for the admission of surface water to a sewer or subdrain, having at its base a sediment sump designed to retain grit and detritus below the point of overflow.	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), The crew uses a probe to determnine the depth of the sediement.

Timestamp	Jurisdiction/Organization	3. What is your jurisdiction's working definition of a CB? King County has adopted Washington State DOT's definition for a catch basin (>12" minimum sump depth). What differentiates a catch basin from an inlet in your jurisdiction?	4.Which activities may be part of a catch basin inspection your jurisdiction? Check any that apply.
1/30/2017 11:05:12	City of Kent	Inlet - A storm structure with NO SUMP (may have any lid type). Catch Basin Type I - A rectangular shaped storm basin WITH SUMP (may have any lid type). Catch Basin Type II - A barrel shaped storm basin WITH SUMP (may have any lid type). Per City of Kent Construction Standards, steps or a ladder are required if the height between the rim and lowest invert is greater than 4ft. Manhole - An access point into a channeled storm line or storm pipe (neither with sump) (may have any lid type). Control - Any storm basin that has a control structure (flow restrictor or FROP) within it. Access to a Detention Tank, Detention Vault, Detention Pipe, or Storm Filter Vault - A distinct access point into a detention vault, detention tank, detention pipe, or storm filter vault (may have any lid type).	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Probe used to measure the percentage of debris in sump.
1/31/2017 16:45:08	City of Kirkland	Generally speaking, a CB has a sump approximately 12" or greater in depth.	Visual/photo inspection, Field notes of CB status, Map/GIS updates
1/20/2017 14:34:07	City of Lakewood	We follow the WSDOT standard for catch basin types, including a concrete inlet (no sump catch basin).	Visual/photo inspection, Photographs of CB, Field notes of CB status, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), note whether cleaned or not based on accumulated solids
1/25/2017 9:59:46	City of Mercer Island	same	Visual/photo inspection, Field notes of CB status, Map/GIS updates
1/18/2017 7:33:39	City of Mill Creek	Type 1, Type 2, or Control Structures	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Every catch basin in public roads are cleaned once every other year
1/17/2017 10:38:54	City of Milton		Visual/photo inspection, Field notes of CB status, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)

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1/19/2017 15:54:23	City of Mount Vernon	Cb has a 12-inch sump. An inlet has no sump or less than a 12 inch sump	Visual/photo inspection, Field notes of CB status, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Visual inspection and measurement
1/17/2017 13:34:29	City of Mukilteo	We have not made a distinction for maintenance purposes	Visual/photo inspection, Field notes of CB status, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), depth measurements for some years
1/26/2017 12:03:43	City of Newcastle		Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)
1/23/2017 9:24:31	City of Olympia	Catch basins have a sump below the pipe invert	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates
2/3/2017 15:18:03	City of Poulsbo	Same as King County	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement o
1/17/2017 9:59:19	City of Puyallup	We consider any structure that is designed, or has the potential, to inlet surface runoff into the stormwater system as an inlet - typically all have sediment sumps. We typically refer to the rest as manholes (maintenance access) and generally provide no benefit other than accessing the system.	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Depth is measured as a percentage of the sumps depth.

Timestamp	Jurisdiction/Organization	3. What is your jurisdiction's working definition of a CB? King County has adopted Washington State DOT's definition for a catch basin (>12" minimum sump depth). What differentiates a catch basin from an inlet in your jurisdiction?	4.Which activities may be part of a catch basin inspection your jurisdiction? Check any that apply.
1/30/2017 16:07:16	City of Renton	From Renton's Surface Water Design Manual, a catch basin is a chamber typically built at the curb line to collect surface water and retain sediment in a sump below the overflow point. An inlet is a connection between the ground surface and a channel or pipe for admission of surface and stormwater runoff. The difference between a catch basin and an inlet is the presence of a sump.	Visual/photo inspection, Photographs of CB, Map/GIS updates, Cleaning
2/9/2017 16:30:18	City of Sammamish	Any structure that provides inlet for storm catchment and/or provides vertical or horizontal directional change in conveyance	We inspect the frame, grate and structural integrity, ladder, cracks, and sediment load. Check to see if there are any other signs of IDDE and map if unknown. Make a work order if maintenance is required
1/27/2017 18:25:11	City of Shoreline		Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)
1/23/2017 11:58:21	City of Sumner	Sump depth	Visual/photo inspection, Photographs of CB, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below), Solids are measured as portion of the Sump. Cb's scheduled for cleaning at 1/3rd depth sediment
1/20/2017 12:19:10	City of Tumwater	Catch basin contains a sump.	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)
3/23/2017 17:03	City of Woodinville	Same as King County's definition.	Visual/photo inspection, Field notes of CB status, Map/GIS updates, Depth measurement of accumulated solids in CB (please describe how the depth of solids is measured in the "Other" box below)

Timestamp	Jurisdiction/Organization	5.What types of roads and CB maintenance does your jurisdiction perform? Check any that apply.	6.How does your jurisdiction determine if a catch basin needs to be cleaned out? Check all that apply.
1/31/2017 11:30:13	WSDOT	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data
3/15/2017 12:07	King County	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on citizen reports/complaints
2/17/2017 7:05:16	King County DNRP Parks and Recreation	Pipe cleaning, CB cleanout, Ditch maintenance, Street cleaning, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
2/23/2017 10:57	King County DOT/Road Services Div/Maintenance Section	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
3/1/2017 13:59	King County International Airport	Pipe cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
3/1/2017 17:03	King County Wastewater Treatment Division	CB cleanout, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide	Based on inspection data, Based on a schedule

Timestamp	Jurisdiction/Organization	5.What types of roads and CB maintenance does your jurisdiction perform? Check any that apply.	6.How does your jurisdiction determine if a catch basin needs to be cleaned out? Check all that apply.
2/28/2017 15:27	King County/Facilities Management Division	CB cleanout, Ditch maintenance, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data
2/27/2017 14:29	King County/Metro Transit	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on occurrence of an emergency, flooding, or CSO event
1/26/2017 11:37:27	City Of Tacoma	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints, Transfer of ownership
2/7/2017 14:33:15	Seattle Public Utilities	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/19/2017 15:22:33	Highline College	Pipe cleaning, CB cleanout, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate	Based on inspection data, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/30/2017 17:38:46	Port of Seattle	Pipe cleaning, CB cleanout, Ditch maintenance, Sanding/de-icing, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes, Sweeping program in place for Port-operated properties; pavement repair and resurfacing; no pesticide landscape management	Based on inspection data, Based on a schedule, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints, Change in tenants

Timestamp	Jurisdiction/Organization	5.What types of roads and CB maintenance does your jurisdiction perform? Check any that apply.	6.How does your jurisdiction determine if a catch basin needs to be cleaned out? Check all that apply.
1/31/2017 9:51:14	Seattle Public School	Pipe cleaning, Culvert cleaning, CB cleanout, Sediment and erosion control	Based on a schedule, Based on citizen reports/complaints
2/3/2017 8:05:53	WA Military Department	CB cleanout, Street cleaning, Sediment and erosion control	Based on inspection data
1/30/2017 11:48:09	Western Washington/Lower Columbia College	CB cleanout, Sanding/de-icing, Other snow and ice control, Sediment and erosion control, Repair or replacement of CB grate	Based on inspection data
2/1/2017 8:54:59	Kitsap County	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/23/2017 14:51:42	Thurston County	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data
1/30/2017 15:06:09	Whatcom County	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on occurrence of an emergency, flooding, or CSO event

Timestamp	Jurisdiction/Organization	5.What types of roads and CB maintenance does your jurisdiction perform? Check any that apply.	6.How does your jurisdiction determine if a catch basin needs to be cleaned out? Check all that apply.
2/21/2017 15:58:10	City of Algona	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on traffic volume or other road use factors, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/23/2017 14:05:12	City of Arlington	Pipe cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide	Based on a schedule, Based on citizen reports/complaints
1/17/2017 11:34:39	City of Auburn	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/23/2017 14:42:38	City of Bainbridge Island	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Sediment and erosion control, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on citizen reports/complaints
1/27/2017 18:23:26	City of Battle Ground	Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
2/9/2017 15:50:02	City of Bellevue	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes, MANY OF THESE ARE PART OF OTHER PROGRAMS OR "AS NEEDED"	Based on inspection data, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints

Timestamp	Jurisdiction/Organization	5.What types of roads and CB maintenance does your jurisdiction perform? Check any that apply.	6.How does your jurisdiction determine if a catch basin needs to be cleaned out? Check all that apply.
1/27/2017 10:41:03	City of Bellingham	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate	Based on inspection data, Based on a schedule, Based on traffic volume or other road use factors, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/30/2017 14:28:18	City of Bremerton	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints, All catch basins in the ROW are cleaned annually. Facilities and Parks stormwater systems are cleaned when inspection indicates.
2/9/2017 16:39:03	City of Brier	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data
1/30/2017 16:02:02	City of Camas	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints, Past practice was cleaning all CBs working west to east.
2/2/2017 7:19:01	City Of Centralia	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate	Based on inspection data, Based on a schedule, Based on traffic volume or other road use factors, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
2/2/2017 9:42:34	City Of Covington	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate	Based on a schedule, We clean and inspect half of our catch basins every year

Timestamp	Jurisdiction/Organization	5.What types of roads and CB maintenance does your jurisdiction perform? Check any that apply.	6.How does your jurisdiction determine if a catch basin needs to be cleaned out? Check all that apply.
1/25/2017 10:52:36	City of Des Moines	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints, Transfer of ownership
1/30/2017 16:45:50	City of Edgewood	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes, Maintenance Contracted through Pierce County Public Works	Based on inspection data, Based on citizen reports/complaints
1/30/2017 16:18:32	City of Everett	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on citizen reports/complaints
1/30/2017 14:57:09	City of Federal Way	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on traffic volume or other road use factors, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/27/2017 16:14:27	City of Ferndale	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on a schedule, Based on traffic volume or other road use factors, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints, Transfer of ownership
1/23/2017 12:12:13	City of Issaquah	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on traffic volume or other road use factors, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints, Sanding for snow events generally creates the need for arterial catch basin cleaning.

Timestamp	Jurisdiction/Organization	5.What types of roads and CB maintenance does your jurisdiction perform? Check any that apply.	6.How does your jurisdiction determine if a catch basin needs to be cleaned out? Check all that apply.
1/30/2017 11:05:12	City of Kent	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes, CCTV Inspections	Based on inspection data, Based on traffic volume or other road use factors, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints, Transfer of ownership
1/31/2017 16:45:08	City of Kirkland	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on traffic volume or other road use factors, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/20/2017 14:34:07	City of Lakewood	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes, storm drain system inspection and cleaning is performed by a contracted vendor	Based on inspection data, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/25/2017 9:59:46	City of Mercer Island	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/18/2017 7:33:39	City of Mill Creek	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	every cb in public row gets cleaned once every other year
1/17/2017 10:38:54	City of Milton	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on citizen reports/complaints

Timestamp	Jurisdiction/Organization	5.What types of roads and CB maintenance does your jurisdiction perform? Check any that apply.	6.How does your jurisdiction determine if a catch basin needs to be cleaned out? Check all that apply.
1/19/2017 15:54:23	City of Mount Vernon	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate	Based on inspection data, Based on a schedule, Based on occurrence of an emergency, flooding, or CSO event
1/17/2017 13:34:29	City of Mukilteo	CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data
1/26/2017 12:03:43	City of Newcastle	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on traffic volume or other road use factors, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/23/2017 9:24:31	City of Olympia	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on traffic volume or other road use factors, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
2/3/2017 15:18:03	City of Poulsbo	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes, Permeable sidewalks	Based on inspection data, Based on traffic volume or other road use factors, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/17/2017 9:59:19	City of Puyallup	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate	Based on a schedule

Timestamp	Jurisdiction/Organization	5.What types of roads and CB maintenance does your jurisdiction perform? Check any that apply.	6.How does your jurisdiction determine if a catch basin needs to be cleaned out? Check all that apply.
1/30/2017 16:07:16	City of Renton	Pipe cleaning, Culvert cleaning, CB cleanout, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes, Rebuild or replace failed precast structure. Repair or replace pipe as needed.	Based on inspection data, Based on a schedule, Based on traffic volume or other road use factors, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
2/9/2017 16:30:18	City of Sammamish	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Dust control, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on a schedule
1/27/2017 18:25:11	City of Shoreline	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Sediment and erosion control, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints
1/23/2017 11:58:21	City of Sumner	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints, Transfer of ownership
1/20/2017 12:19:10	City of Tumwater	Pipe cleaning, Culvert cleaning, CB cleanout, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints, Transfer of ownership
3/23/2017 17:03	City of Woodinville	Pipe cleaning, Culvert cleaning, CB cleanout, Ditch maintenance, Street cleaning, Road repair and resurfacing, Sanding/de-icing, Other snow and ice control, Roadside landscape maintenance, including vegetation and application of herbicide/pesticide, Sediment and erosion control, Trash and pet waste management, Repair or replacement of CB grate, Sealing cracks in below-ground structure and/or pipes	Based on inspection data, Based on a schedule, Based on occurrence of an emergency, flooding, or CSO event, Based on citizen reports/complaints

Timestamp	Jurisdiction/Organization	7.What types of records do you keep for CB inspection, maintenance, and costs? Check any that apply in the available format.	Inspection	Maintenance	Costs
1/31/2017 11:30:13	WSDOT		SQL Database	SQL Database	Non-Excel database
3/15/2017 12:07	King County		Non-excel database, GIS database	Non-Excel database, Paper files	Non-Excel database
2/17/2017 7:05:16	King County DNRP Parks and Recreation	Field notes, work order documents	Paper files	Paper files, lucity	Paper files
2/23/2017 10:57	King County DOT/Road Services Div/Maintenance Section		Microsoft excel speadsheet, Non-excel database, GIS database, Paper files	Microsoft Excel spreadsheet, Non-Excel database, GIS database, Paper files	Project/task time entry, RoadWorks MMS
3/1/2017 13:59	King County International Airport	invoices, video, reports	Microsoft excel speadsheet, Paper files	Microsoft Excel spreadsheet, GIS database	Non-Excel database
3/1/2017 17:03	King County Wastewater Treatment Division	All records kept on "Mainsaver" program; other records are supplemental.	Microsoft excel speadsheet, Non-excel database, Paper files	Non-Excel database	Not specifically documented

Timestamp	Jurisdiction/Organization	7.What types of records do you keep for CB inspection, maintenance, and costs? Check any that apply in the available format.	Inspection	Maintenance	Costs
2/28/2017 15:27	King County/Facilities Management Division	maintenance deficiencies, inspection date, correction date, aggregate costs	Microsoft excel speadsheet, Paper files, SharePoint	Microsoft Excel spreadsheet, Paper files, SharePoint	Paper files, SharePoint
2/27/2017 14:29	King County/Metro Transit		Microsoft excel speadsheet	Non-Excel database	Non-Excel database
1/26/2017 11:37:27	City Of Tacoma		GIS database, SQL	SQL and SAP(management System)	SAP(management System)
2/7/2017 14:33:15	Seattle Public Utilities		Non-excel database, GIS database	Non-Excel database	Non-Excel database
1/19/2017 15:22:33	Highline College	We keep an excel spreadsheet for call outs of CB's. When a deficiency is noted a work order or repair is created to be corrected. this could merely be a cut back or relabeling to pipe repairs from root intrusions etc... Costs are tracked in a separate excel spreadsheet.	Visual with Word Document guidlines	Microsoft Excel spreadsheet	Microsoft Excel spreadsheet
1/30/2017 17:38:46	Port of Seattle	Maximo database	Microsoft excel speadsheet, Non-excel datab	Microsoft Excel spreadsheet, Non-Excel database, GIS database, Paper files	Microsoft Excel spreadsheet, Non-Excel database

Timestamp	Jurisdiction/Organization	7.What types of records do you keep for CB inspection, maintenance, and costs? Check any that apply in the available format.	Inspection	Maintenance	Costs
1/31/2017 9:51:14	Seattle Public School		School Dude	school Dude	School Dude
2/3/2017 8:05:53	WA Military Department		Paper files, PDFs of reports	PDFs of reports	Paper files
1/30/2017 11:48:09	Western Washington/Lower Columbia College		Microsoft excel speadsheet, Paper files, Computer Management Maint. System	Paper files, CMMS	Paper files, CMMS
2/1/2017 8:54:59	Kitsap County		Non-excel database, GIS database	Non-Excel database, GIS database	Microsoft Excel spreadsheet, Non-Excel database
1/23/2017 14:51:42	Thurston County	Asset Management tracks time, equipment, materials	VUEWorks	VUEWorks	VUEWorks
1/30/2017 15:06:09	Whatcom County	MS Access Database	Non-excel database	Non-Excel database	Microsoft Excel spreadsheet, Paper files

Timestamp	Jurisdiction/Organization	7.What types of records do you keep for CB inspection, maintenance, and costs? Check any that apply in the available format.	Inspection	Maintenance	Costs
2/21/2017 15:58:10	City of Algona		Paper files	Paper files	
1/23/2017 14:05:12	City of Arlington	Employee/Equipment hours	Non-excel database, Paper files	Non-Excel database, Paper files	Non-Excel database
1/17/2017 11:34:39	City of Auburn		Cartegraph asset management program	Cartegraph asset management program	Cartegraph asset management program
1/23/2017 14:42:38	City of Bainbridge Island	CB inspection, maintenance	Microsoft excel speadsheet	Microsoft Excel spreadsheet	
1/27/2017 18:23:26	City of Battle Ground		Non-excel database, Paper files	Non-Excel database	Microsoft Excel spreadsheet
2/9/2017 15:50:02	City of Bellevue		Microsoft excel speadsheet, Non-excel database, GIS database, Paper files	Microsoft Excel spreadsheet, Non-Excel database, GIS database, Paper files	

Timestamp	Jurisdiction/Organization	7.What types of records do you keep for CB inspection, maintenance, and costs? Check any that apply in the available format.	Inspection	Maintenance	Costs
1/27/2017 10:41:03	City of Bellingham		Asset work management system and Granite software.	Microsoft Excel spreadsheet, Asset work management system and Granite software.	Microsoft Excel spreadsheet, Paper files, Asset work management system and Granite software.
1/30/2017 14:28:18	City of Bremerton		GIS database, Paper files	GIS database, Paper files, SQL database linked to the GIS system	Microsoft Excel spreadsheet, Non-Excel database, Paper files, Bremerton's Finance Department tracks the Stormwater Utility's maintenance costs with project numbers.
2/9/2017 16:39:03	City of Brier		Microsoft excel speadsheet, GIS database, Paper files	Microsoft Excel spreadsheet, GIS database, Paper files	
1/30/2017 16:02:02	City of Camas		Paper files	Paper files	Cost are not tracked per CB, but lumped in with all stormwater maintenance.
2/2/2017 7:19:01	City of Centralia		lucity	Paper files, lucity	Microsoft Excel spreadsheet, Paper files
2/2/2017 9:42:34	City Of Covington		Microsoft excel speadsheet	Non-Excel database	Non-Excel database

Timestamp	Jurisdiction/Organization	7.What types of records do you keep for CB inspection, maintenance, and costs? Check any that apply in the available format.	Inspection	Maintenance	Costs
1/25/2017 10:52:36	City of Des Moines		Non-excel database	Non-Excel database	Non-Excel database
1/30/2017 16:45:50	City of Edgewood		Microsoft excel speadsheet, GIS database	Microsoft Excel spreadsheet, GIS database	Paper files
1/30/2017 16:18:32	City of Everett		Microsoft excel speadsheet, Non-excel database, GIS database	Microsoft Excel spreadsheet, Non-Excel database, GIS database	Non-Excel database
1/30/2017 14:57:09	City of Federal Way		Microsoft excel speadsheet, Paper files	Microsoft Excel spreadsheet, Paper files	Microsoft Excel spreadsheet, Paper files
1/27/2017 16:14:27	City of Ferndale		Paper files	Paper files	
1/23/2017 12:12:13	City of Issaquah		Non-excel database, GIS database, Issauah Public Works Operations uses a work order data base for all activities that are performed by the division. We have an activity number for cleaning type I catch basins for example. The catch basins have a facility identification number for tracking maintenance. Inspection, inventory and cleaning work is also tracked in the City's GIS program separately. We are very close to integration between the two systems to eliminate double entries by the crew.	Non-Excel database, GIS database, Same as above	Non-Excel database, Same data base. Cost is tracked by the activity and facility ID number.

Timestamp	Jurisdiction/Organization	7.What types of records do you keep for CB inspection, maintenance, and costs? Check any that apply in the available format.	Inspection	Maintenance	Costs
1/30/2017 11:05:12	City of Kent	Hansen Asset Management Program	Non-excel database, GIS database, Paper files	Non-Excel database, GIS database, Paper files	Non-Excel database
1/31/2017 16:45:08	City of Kirkland		Non-excel database, Paper files	Non-Excel database, Paper files	Non-Excel database, Paper files
1/20/2017 14:34:07	City of Lakewood	Vendor contracted items (inspection and cleaning activities) are tracked via an Excel spreadsheet; minor maintenance is handled by City staff; major repairs are contracted out.	Microsoft excel speadsheet, Paper files	Microsoft Excel spreadsheet, Non-Excel database	Microsoft Excel spreadsheet, Non-Excel database
1/25/2017 9:59:46	City of Mercer Island	CB ID & inspection reports, work orders and invoices	Paper files	Paper files	Paper files
1/18/2017 7:33:39	City of Mill Creek	data base attached to each catch basin in Autocad	GIS database	GIS database	Paper files
1/17/2017 10:38:54	City of Milton		Microsoft excel speadsheet, Paper files	Microsoft Excel spreadsheet, GIS database	

Timestamp	Jurisdiction/Organization	7.What types of records do you keep for CB inspection, maintenance, and costs? Check any that apply in the available format.	Inspection	Maintenance	Costs
1/19/2017 15:54:23	City of Mount Vernon	Inspection and maintenane records are paper copies but we should transition to GIS data base/asset management records in 2017.	Paper files	Paper files	Eden Database
1/17/2017 13:34:29	City of Mukilteo		GIS database	GIS database	
1/26/2017 12:03:43	City of Newcastle		Microsoft excel speadsheet, GIS database, Paper files	Microsoft Excel spreadsheet, GIS database, Paper files	Paper files
1/23/2017 9:24:31	City of Olympia		GIS database, We use Esri's Collector	Non-Excel database, VUEWorks	Costs aren't separate from overall storm program costs
2/3/2017 15:18:03	City of Poulsbo		Microsoft excel speadsheet, Paper files, futur	Microsoft Excel spreadsheet,Paper files, future: GIS	Non-Excel database,financial software
1/17/2017 9:59:19	City of Puyallup	We track costs but not with a high level of accuracy.	Non-excel database	Non-Excel database	Non-Excel database

Timestamp	Jurisdiction/Organization	7.What types of records do you keep for CB inspection, maintenance, and costs? Check any that apply in the available format.	Inspection	Maintenance	Costs
1/30/2017 16:07:16	City of Renton	Service requests and work orders. InforEAM.	Non-excel database, GIS database, Paper files	Non-Excel database, GIS database, Paper files	Non-Excel database, Paper files
2/9/2017 16:30:18	City of Sammamish		Microsoft excel speadsheet	Microsoft Excel spreadsheet	
1/27/2017 18:25:11	City of Shoreline		Non-excel database, GIS database	Non-Excel database, GIS database	Non-Excel database, GIS database
1/23/2017 11:58:21	City of Sumner	City is upgrading to an electronic program to manage maintenance and inspection data.	Paper files	Paper files	Paper files
1/20/2017 12:19:10	City of Tumwater		Non-excel database, GIS database, Lucity Asset Management System	Non-Excel database, GIS database, Lucity Asset Management System	Non-Excel database, Lucity Asset Management System
3/23/2017 17:03	City of Woodinville		GIS database, Paper files	Paper files	Paper files

Timestamp	Jurisdiction/Organization	8.What GIS data do you have for your jurisdiction? Check any that apply.	9.What CB inspection and maintenance data do you have in GIS? Check any that apply.	10. Please provide the cost of your program below for CB inspections and maintenance (not including disposal) on an annual basis or as average cost by catch basin. If this has changed over time since 2007, please indicate how and when cost changed.
1/31/2017 11:30:13	WSDOT	CB type (per definitions in Question 1 above), CB dimensions, CB location, CB age, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Presence/absence of curbs vs. ditches, Average annual daily traffic (AADT), Snow removal routes, Street surface material (e.g. paved, gravel, etc.), Local precipitation data	Maintenance routes and schedules, Inspection dates, Maintenance or repair dates, Maintenance activities performed, Cleaning frequency and dates, Cleaning routes, Inspection, maintenance, or cleaning costs	Data is for both inspections and maintenance as work predominately is done at the same time. Our NPDES permit was issued in March of 2009 with requirements on catch basins that began in 2010, numbers provided date back to the beginning our required inspections in 2010.
3/15/2017 12:07	King County	CB type (per definitions in Question 1 above), CB dimensions, CB location, CB age, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Land use, Average annual daily traffic (AADT), Snow removal routes		Operations cost per CB: $622.09 (2016)
2/17/2017 7:05:16	King County DNRP Parks and Recreation	CB type (per definitions in Question 1 above), CB dimensions, CB location, Pipe sizes into and out of CB, System conveyance (e.g., CB connections), Flow routing through the system	Paper files	25000
2/23/2017 10:57	King County DOT/Road Services Div/Maintenance Section	CB type (per definitions in Question 1 above), CB dimensions, CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Flow routing through the system, Land use, Presence/absence of curbs vs. ditches, Average annual daily traffic (AADT), Snow removal routes	Inspection dates, Maintenance or repair dates, Maintenance activities performed, Circuits with CBs grouped to meet permit option for inspecting on a “circuit basis”	Variations in asset inventory and maintenance needs
3/1/2017 13:59	King County International Airport	CB type (per definitions in Question 1 above), CB dimensions, CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Street surface material (e.g. paved, gravel, etc.)		
3/1/2017 17:03	King County Wastewater Treatment Division	CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), Flow routing through the system, Only partial for most CBs	None	No specific records maintained

Timestamp	Jurisdiction/Organization	8.What GIS data do you have for your jurisdiction? Check any that apply.	9.What CB inspection and maintenance data do you have in GIS? Check any that apply.	10. Please provide the cost of your program below for CB inspections and maintenance (not including disposal) on an annual basis or as average cost by catch basin. If this has changed over time since 2007, please indicate how and when cost changed.
2/28/2017 15:27	King County/Facilities Management Division	check w/ KCWLRD		program started in 2011,
2/27/2017 14:29	King County/Metro Transit	CB type (per definitions in Question 1 above), CB location, Pipe sizes into and out of CB, System conveyance (e.g., CB connections), Flow routing through the system		
1/26/2017 11:37:27	City Of Tacoma	CB type (per definitions in Question 1 above), CB location, CB age, CB elevation (rim and pipe invert), Stormwater drainage basins delineations, Flow routing through the system, Land use, Presence/absence of curbs vs. ditches, Street surface material (e.g. paved, gravel, etc.)	Circuits with CBs grouped to meet permit option for inspecting on a “circuit basis”	275,000 a year which includes cleaning and inspection. We have spent about 275,000 a year on the program fairly consistently for 2014-2016 before 2014 costs were not tracked. If I was to attempt to separate out the costs for cleaning and inspection I would likely super-swag 65%-75% of the cost is cleaning(The cleaning crew completes the inspection).
2/7/2017 14:33:15	Seattle Public Utilities	CB type (per definitions in Question 1 above), CB location, CB age, Pipe sizes into and out of CB, System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Presence/absence of curbs vs. ditches, Snow removal routes, Local precipitation data	Inspection dates	annual
1/19/2017 15:22:33	Highline College	CB location, Pipe sizes into and out of CB, Flow routing through the system	Inspection dates, Maintenance or repair dates, Maintenance activities performed	NA
1/30/2017 17:38:46	Port of Seattle	CB type (per definitions in Question 1 above), CB dimensions, CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Beginning to track many of the above	Inspection dates, Maintenance or repair dates, Maintenance activities performed, Cleaning frequency and dates	We are not able to separate inspection and maintenance costs, so the $$ below are annual costs of combined maint & inspect

Timestamp	Jurisdiction/Organization	8.What GIS data do you have for your jurisdiction? Check any that apply.	9.What CB inspection and maintenance data do you have in GIS? Check any that apply.	10. Please provide the cost of your program below for CB inspections and maintenance (not including disposal) on an annual basis or as average cost by catch basin. If this has changed over time since 2007, please indicate how and when cost changed.
1/31/2017 9:51:14	Seattle Public School	CB location		
2/3/2017 8:05:53	WA Military Department			
1/30/2017 11:48:09	Western Washington/Lower Columbia College	City/County	City/County	Changed 2011, new spill kits,passive skimmers,absorbent socks,car wash kits. 2012 Water sample kits, CESCL training.
2/1/2017 8:54:59	Kitsap County	CB type (per definitions in Question 1 above), CB dimensions, CB location, CB age, Pipe sizes into and out of CB, System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Presence/absence of curbs vs. ditches, Average annual daily traffic (AADT), Snow removal routes, Street surface material (e.g. paved, gravel, etc.), Construction activities in drainage area, Local precipitation data, currently collecting elevations	Maintenance routes and schedules, Inspection dates, Maintenance or repair dates, Maintenance activities performed, Cleaning frequency and dates, Cleaning routes, Street sweeping routes and schedule, Inspection, maintenance, or cleaning costs	
1/23/2017 14:51:42	Thurston County	CB type (per definitions in Question 1 above), CB location, CB age, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Flow routing through the system, Land use, Average annual daily traffic (AADT), Snow removal routes, Street surface material (e.g. paved, gravel, etc.)	Inspection dates, Maintenance or repair dates, Maintenance activities performed, Cleaning frequency and dates	
1/30/2017 15:06:09	Whatcom County	CB type (per definitions in Question 1 above), CB dimensions, CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Snow removal routes, Street surface material (e.g. paved, gravel, etc.)	CB inspection and maintenance data is saved in an Access Database that is linked to GIS.	

Timestamp	Jurisdiction/Organization	8.What GIS data do you have for your jurisdiction? Check any that apply.	9.What CB inspection and maintenance data do you have in GIS? Check any that apply.	10. Please provide the cost of your program below for CB inspections and maintenance (not including disposal) on an annual basis or as average cost by catch basin. If this has changed over time since 2007, please indicate how and when cost changed.
2/21/2017 15:58:10	City of Algona	CB location		
1/23/2017 14:05:12	City of Arlington	CB type (per definitions in Question 1 above), CB dimensions, CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections)		
1/17/2017 11:34:39	City of Auburn	CB type (per definitions in Question 1 above), CB location, CB age, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Snow removal routes, Street surface material (e.g. paved, gravel, etc.)	Data is in Cartegraph asset management software	Unknown
1/23/2017 14:42:38	City of Bainbridge Island	CB location, Stormwater drainage basins delineations		This is not tracked seperatly from overall mainteance costs. I only have a total Stormwater team cost.
1/27/2017 18:23:26	City of Battle Ground	Google Earth	Google Earth	
2/9/2017 15:50:02	City of Bellevue	CB type (per definitions in Question 1 above), CB location, CB age, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Snow removal routes	Inspection dates, Cleaning frequency and dates, ONLY FOR THE LAST COUPLE YEARS	

Timestamp	Jurisdiction/Organization	8.What GIS data do you have for your jurisdiction? Check any that apply.	9.What CB inspection and maintenance data do you have in GIS? Check any that apply.	10. Please provide the cost of your program below for CB inspections and maintenance (not including disposal) on an annual basis or as average cost by catch basin. If this has changed over time since 2007, please indicate how and when cost changed.
1/27/2017 10:41:03	City of Bellingham	CB location, CB age, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Presence/absence of curbs vs. ditches, Average annual daily traffic (AADT), Snow removal routes, Street surface material (e.g. paved, gravel, etc.), Construction activities in drainage area, Local precipitation data, Plants	Inspection dates, Maintenance or repair dates, Maintenance activities performed, Cleaning routes, Inspection and maintenance records (pre-2007), Street sweeping routes and schedule, Inspection, maintenance, or cleaning costs	
1/30/2017 14:28:18	City of Bremerton	CB type (per definitions in Question 1 above), CB dimensions, CB location, CB age, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Construction activities in drainage area, Local precipitation data	Maintenance routes and schedules, Inspection dates, Maintenance or repair dates, Maintenance activities performed, Cleaning frequency and dates, Cleaning routes	This is not tracked as a separate item
2/9/2017 16:39:03	City of Brier	CB type (per definitions in Question 1 above), CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system	Inspection dates, Maintenance or repair dates, Maintenance activities performed, Cleaning frequency and dates, Circuits with CBs grouped to meet permit option for inspecting on a “circuit basis”	
1/30/2017 16:02:02	City of Camas	CB location, Pipe sizes into and out of CB, Stormwater drainage basins delineations, Street surface material (e.g. paved, gravel, etc.)		
2/2/2017 7:19:01	City of Centralia	CB type (per definitions in Question 1 above), CB dimensions, CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations	Inspection dates, Maintenance or repair dates, Maintenance activities performed, Cleaning frequency and dates, Cleaning routes, Street sweeping routes and schedule	
2/2/2017 9:42:34	City Of Covington	CB type (per definitions in Question 1 above), CB location, System conveyance (e.g., CB connections), Land use, Presence/absence of curbs vs. ditches, Snow removal routes, Construction activities in drainage area		The inspection and maintenance of our CB's is done through an annual contract. Our "Vactor" Contractor inspects the CB's at the time of Cleaning. The cost of both activities are rolled into one bill so we can separate out the inspection or maintenance costs.

Timestamp	Jurisdiction/Organization	8.What GIS data do you have for your jurisdiction? Check any that apply.	9.What CB inspection and maintenance data do you have in GIS? Check any that apply.	10. Please provide the cost of your program below for CB inspections and maintenance (not including disposal) on an annual basis or as average cost by catch basin. If this has changed over time since 2007, please indicate how and when cost changed.
1/25/2017 10:52:36	City of Des Moines	CB type (per definitions in Question 1 above), CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Snow removal routes	Maintenance routes and schedules, Cleaning routes, Circuits will be put into GIS but are not currently	For 2016 - Inspection Avg $23/basin and Maintenance Avg $143.01/basin
1/30/2017 16:45:50	City of Edgewood	CB type (per definitions in Question 1 above), CB location, Pipe sizes into and out of CB, Land use	Inspection dates, Maintenance or repair dates, Maintenance activities performed	Annual costs provided below - number of CBs increased over time, and current CB/structure total is 1725
1/30/2017 16:18:32	City of Everett	CB type (per definitions in Question 1 above), CB dimensions, CB location, CB age, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use	Inspection dates, Maintenance or repair dates, Cleaning frequency and dates	$200,000
1/30/2017 14:57:09	City of Federal Way	CB location, Pipe sizes into and out of CB, System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Average annual daily traffic (AADT), Snow removal routes	Cleaning routes, Street sweeping routes and schedule	Note that inspection costs are an estimate of seasonal staff time and overhead, and may be well under-estimated. Maintenance costs are essentially our annual vactor budget and do not include repair costs (excludes CB rebuilds, high impact riser installations, etc).
1/27/2017 16:14:27	City of Ferndale	CB type (per definitions in Question 1 above), CB location, Pipe sizes into and out of CB, System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Average annual daily traffic (AADT), Snow removal routes		
1/23/2017 12:12:13	City of Issaquah	CB type (per definitions in Question 1 above), CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Land use, Snow removal routes, Precipitaion data is tracked in our SCADA system. Field inventory data is in Public Works Operations data base under Facilities and will be linked to the GIS system in the near future.	Inspection dates, Maintenance or repair dates, Maintenance activities performed, Cleaning frequency and dates, Circuits with CBs grouped to meet permit option for inspecting on a “circuit basis”, Maintenacne activities are limited in GIS, just cleaning and non-descriptive repair check box. Cleaning frequency is in the PWO data base and will be linked to GIS at some point. GIS does have a CB needs cleaning and a CB cleaned check box. PWO data base has the inspection, maintenacne and cleaning costs.	$60,000 per year average

Timestamp	Jurisdiction/Organization	8.What GIS data do you have for your jurisdiction? Check any that apply.	9.What CB inspection and maintenance data do you have in GIS? Check any that apply.	10. Please provide the cost of your program below for CB inspections and maintenance (not including disposal) on an annual basis or as average cost by catch basin. If this has changed over time since 2007, please indicate how and when cost changed.
1/30/2017 11:05:12	City of Kent	CB type (per definitions in Question 1 above), CB dimensions, CB location, CB age, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Snow removal routes, Construction activities in drainage area	Inspection dates, Maintenance or repair dates, Maintenance activities performed, Cleaning frequency and dates, Inspection and maintenance records (pre-2007), Inspection, maintenance, or cleaning costs	
1/31/2017 16:45:08	City of Kirkland	CB type (per definitions in Question 1 above), CB location, Pipe sizes into and out of CB, System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Land use, Presence/absence of curbs vs. ditches, Snow removal routes, Construction activities in drainage area	Maintenance routes and schedules, Inspection dates, Maintenance or repair dates, Maintenance activities performed, Cleaning frequency and dates, Inspection and maintenance records (pre-2007), Street sweeping routes and schedule, Inspection, maintenance, or cleaning costs	Still compiling this data
1/20/2017 14:34:07	City of Lakewood	CB type (per definitions in Question 1 above), CB dimensions, CB location, Pipe sizes into and out of CB, System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Presence/absence of curbs vs. ditches, Snow removal routes	Maintenance routes and schedules, Street sweeping routes and schedule	Costs have changed due to inflation; and we've had two - 6-year contracts since 2007 and the bids varied. Also, price increases or not are based on the Seattle/Tacoma/Bremerton CPI.
1/25/2017 9:59:46	City of Mercer Island	CB type (per definitions in Question 1 above), CB location, Pipe sizes into and out of CB, System conveyance (e.g., CB connections), Flow routing through the system, Presence/absence of curbs vs. ditches, Snow removal routes, Street surface material (e.g. paved, gravel, etc.)	Maintenance or repair dates, Street sweeping routes and schedule	
1/18/2017 7:33:39	City of Mill Creek	CB type (per definitions in Question 1 above), CB location, CB age, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Flow routing through the system	notes in Autocad attached to structure. When repaired the note gets removed	Mill Creek started CCTV pipe inspections in 2012 and contractors charge for cleaning catch basins. The inspection areas are outside of catch basin cleaning area.
1/17/2017 10:38:54	City of Milton	CB type (per definitions in Question 1 above), CB location, Pipe sizes into and out of CB, Stormwater drainage basins delineations		Records of this type have not been kept in the past. We have municipal workers who work on streets, water, and storm. Going forward our Stormwater will be its own utility and we will be employing asset management software, so going forward we could answer a question like this, but not for the past.

Timestamp	Jurisdiction/Organization	8.What GIS data do you have for your jurisdiction? Check any that apply.	9.What CB inspection and maintenance data do you have in GIS? Check any that apply.	10. Please provide the cost of your program below for CB inspections and maintenance (not including disposal) on an annual basis or as average cost by catch basin. If this has changed over time since 2007, please indicate how and when cost changed.
1/19/2017 15:54:23	City of Mount Vernon	CB type (per definitions in Question 1 above), CB dimensions, CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Snow removal routes, Street surface material (e.g. paved, gravel, etc.), Construction activities in drainage area, Local precipitation data		$124,000 per year or $49 per CB
1/17/2017 13:34:29	City of Mukilteo	CB type (per definitions in Question 1 above), CB location, System conveyance (e.g., CB connections), there may be info on elevations & pipe sizes, but its spotty and some is not QC'd	Inspection dates, Cleaning frequency and dates	
1/26/2017 12:03:43	City of Newcastle	CB type (per definitions in Question 1 above), CB location, Pipe sizes into and out of CB, System conveyance (e.g., CB connections), Stormwater drainage basins delineations	Inspection dates, Maintenance or repair dates, Maintenance activities performed	
1/23/2017 9:24:31	City of Olympia	CB type (per definitions in Question 1 above), CB dimensions, CB age, CB elevation (rim and pipe invert), Flow routing through the system, Land use, Presence/absence of curbs vs. ditches, Snow removal routes, Street surface material (e.g. paved, gravel, etc.), Construction activities in drainage area, Local precipitation data, Many fields for above checked are blank	Inspection dates, Cleaning frequency and dates, Cleaning routes	Our program started in 2015
2/3/2017 15:18:03	City of Poulsbo	CB type (per definitions in Question 1 above), CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Land use		1. Changes based on pay rate adjustments 2. Cost per CB
1/17/2017 9:59:19	City of Puyallup	CB type (per definitions in Question 1 above), CB location, CB age, Pipe sizes into and out of CB, System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Land use, Presence/absence of curbs vs. ditches, Snow removal routes, Snow days (avg. number of snow removal days per year), Street surface material (e.g. paved, gravel, etc.), Local precipitation data	Inspection dates, Maintenance or repair dates, Maintenance activities performed, Cleaning frequency and dates, Cleaning routes, Circuits with CBs grouped to meet permit option for inspecting on a “circuit basis”, Street sweeping routes and schedule	We began cost tracking in 2016. No reliable data yet.

Timestamp	Jurisdiction/Organization	8.What GIS data do you have for your jurisdiction? Check any that apply.	9.What CB inspection and maintenance data do you have in GIS? Check any that apply.	10. Please provide the cost of your program below for CB inspections and maintenance (not including disposal) on an annual basis or as average cost by catch basin. If this has changed over time since 2007, please indicate how and when cost changed.
1/30/2017 16:07:16	City of Renton	CB type (per definitions in Question 1 above), CB location, CB age, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Construction activities in drainage area	Maintenance routes and schedules, Maintenance activities performed, Cleaning frequency and dates, Cleaning routes, Circuits with CBs grouped to meet permit option for inspecting on a "circuit basis", EAM. Maintenance/repair dates and maintenance activities performed are stored in EAM, the current asset management system, where we can join to GIS and view the data geographically. We are in the process of migrating	Not available.
2/9/2017 16:30:18	City of Sammamish	CB type (per definitions in Question 1 above), CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Land use, Snow removal routes, Street surface material (e.g. paved, gravel, etc.)		
1/27/2017 18:25:11	City of Shoreline	CB type (per definitions in Question 1 above), CB dimensions, CB location, CB age, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Land use, Presence/absence of curbs vs. ditches, Average annual daily traffic (AADT), Snow removal routes, Street surface material (e.g. paved, gravel, etc.)	Inspection and Maintenace are captured in Cityworks	
1/23/2017 11:58:21	City of Sumner	CB type (per definitions in Question 1 above), CB dimensions, CB location, CB elevation (rim and pipe invert)	Inspection dates	35000 for 2016 maintenance. In house work isn't tracked
1/20/2017 12:19:10	City of Tumwater	CB location, System conveyance (e.g., CB connections), Flow routing through the system, Land use, Snow removal routes, Street surface material (e.g. paved, gravel, etc.)	This type of information is maintained in Lucity	Data not readily available
3/23/2017 17:03	City of Woodinville	CB type (per definitions in Question 1 above), CB dimensions, CB location, Pipe sizes into and out of CB, CB elevation (rim and pipe invert), System conveyance (e.g., CB connections), Stormwater drainage basins delineations, Flow routing through the system, Presence/absence of curbs vs. ditches, Snow removal routes	Maintenance routes and schedules	

Timestamp	Jurisdiction/Organization	Inspection Costs 2008	Inspection Costs 2009	Inspection Costs 2010	Inspection Costs 2011	Inspection Costs 2012	Inspection Costs 2013	Inspection Costs 2014	Inspection Costs 2015
1/31/2017 11:30:13	WSDOT				$2,608,623	$3,031,784	$5,114,773	$3,727,603	$4,783,966
3/15/2017 12:07	King County						$50 per CB	$50 per CB	$50 per CB
2/17/2017 7:05:16	King County DNRP Parks and Recreation								
2/23/2017 10:57	King County DOT/Road Services Div/Maintenance Section	N/A	N/A	Need time to gather data	Need time to gather data	Need time to gather data	~$20.00/CB	Need time to gather data	Need time to gather data
3/1/2017 13:59	King County International Airport								
3/1/2017 17:03	King County Wastewater Treatment Division								

Timestamp	Jurisdiction/Organization	Inspection Costs 2008	Inspection Costs 2009	Inspection Costs 2010	Inspection Costs 2011	Inspection Costs 2012	Inspection Costs 2013	Inspection Costs 2014	Inspection Costs 2015
2/28/2017 15:27	King County/Facilities Management Division								2016: $24,578 $62/CB
2/27/2017 14:29	King County/Metro Transit								
1/26/2017 11:37:27	City Of Tacoma								
2/7/2017 14:33:15	Seattle Public Utilities	433,949	697,336	474,130	337,329	340,158	220,626	435,700	429,337
1/19/2017 15:22:33	Highline College	NA	NA	Program started NA (Really don't track this labor hour cost)	$500 Labeling and identifying CB's/ yr	$0	$0	$50 re-labeling	NA
1/30/2017 17:38:46	Port of Seattle	Not available	$195,203	$210,342	$272,192	$305,898	$333,267	$282,838	$444,261

Timestamp	Jurisdiction/Organization	Inspection Costs 2008	Inspection Costs 2009	Inspection Costs 2010	Inspection Costs 2011	Inspection Costs 2012	Inspection Costs 2013	Inspection Costs 2014	Inspection Costs 2015
1/31/2017 9:51:14	Seattle Public School								
2/3/2017 8:05:53	WA Military Department								
1/30/2017 11:48:09	Western Washington/Lower Columbia College	$900.00	SAME	SAME	SAME	SAME	SAME	SAME	$900.00
2/1/2017 8:54:59	Kitsap County								
1/23/2017 14:51:42	Thurston County						210000	317000	357000
1/30/2017 15:06:09	Whatcom County								

Timestamp	Jurisdiction/Organization	Inspection Costs 2008	Inspection Costs 2009	Inspection Costs 2010	Inspection Costs 2011	Inspection Costs 2012	Inspection Costs 2013	Inspection Costs 2014	Inspection Costs 2015
2/21/2017 15:58:10	City of Algona								
1/23/2017 14:05:12	City of Arlington								
1/17/2017 11:34:39	City of Auburn	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
1/23/2017 14:42:38	City of Bainbridge Island								
1/27/2017 18:23:26	City of Battle Ground	0	0	0	0	0	0	0	0
2/9/2017 15:50:02	City of Bellevue								

Timestamp	Jurisdiction/Organization	Inspection Costs 2008	Inspection Costs 2009	Inspection Costs 2010	Inspection Costs 2011	Inspection Costs 2012	Inspection Costs 2013	Inspection Costs 2014	Inspection Costs 2015
1/27/2017 10:41:03	City of Bellingham								
1/30/2017 14:28:18	City of Bremerton	This is not tracked as a separate item	This is not tracked as a separate item	This is not tracked as a separate item	This is not tracked as a separate item	This is not tracked as a separate item	This is not tracked as a separate item	This is not tracked as a separate item	This is not tracked as a separate item
2/9/2017 16:39:03	City of Brier								
1/30/2017 16:02:02	City of Camas								
2/2/2017 7:19:01	City of Centralia								
2/2/2017 9:42:34	City Of Covington	$62,265 Inspection and Maintenance	$68,598 Inspection and Maintenance	$42,843 Inspection and Maintenance	$19,107 Inspection and Maintenance	$41,967 Inspection and Maintenance	$92,573 Inspection and Maintenance	$50,308 inspection and Maintenance	$55,916 Inspection and Maintenance

Timestamp	Jurisdiction/Organization	Inspection Costs 2008	Inspection Costs 2009	Inspection Costs 2010	Inspection Costs 2011	Inspection Costs 2012	Inspection Costs 2013	Inspection Costs 2014	Inspection Costs 2015
1/25/2017 10:52:36	City of Des Moines								
1/30/2017 16:45:50	City of Edgewood	Included with Maintenance totals	Included with Maintenance totals	Included with Maintenance totals	Included with Maintenance totals	Included with Maintenance totals	Included with Maintenance totals	Included with Maintenance totals	Included with Maintenance totals
1/30/2017 16:18:32	City of Everett			$50,000	$50,000	$50,000	$40,000	$40,000	$40,000
1/30/2017 14:57:09	City of Federal Way	$8,500	$8,700	$8,900	$9,200	$9,500	$9,800	$10,100	$10,500
1/27/2017 16:14:27	City of Ferndale								
1/23/2017 12:12:13	City of Issaquah	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Catch basin inspections are conducted independently at times but more often in conjunction with other related activities. PWO has emphasized completing a field inventory of Issaquah's catch basins and recording the data in the PWO data base. All the field workers are trained to conduct catch basin inspections when performing any catch basin activity. Consequently, separating the cost of the inspection from other catch basin work is not readily

Timestamp	Jurisdiction/Organization	Inspection Costs 2008	Inspection Costs 2009	Inspection Costs 2010	Inspection Costs 2011	Inspection Costs 2012	Inspection Costs 2013	Inspection Costs 2014	Inspection Costs 2015
1/30/2017 11:05:12	City of Kent	Not Tracked	Not Tracked	Not Tracked	Not Tracked	$12.75 / CB	$12.96 / CB	$20.50 / CB	$32.06 / CB
1/31/2017 16:45:08	City of Kirkland								
1/20/2017 14:34:07	City of Lakewood	$18.02/Type I and Drywell; $24.02/Type II and manhole	No change from 2008 (CPI was zero or negative)	No change from 2008 (CPI was zero or negative)	$20.74/Type I and Drywell; $36.84/Type II and manhole (increased to account for CPI increase and an increase in prevailing wage rate for operator position)	$25.00/HR (new contract separated inspection and cleaning as separate bid items)	$25.40/HR (CPI increase)	$25.90/HR (CPI increase)	$26.31/HR (CPI increase)
1/25/2017 9:59:46	City of Mercer Island								est. $30 per CB
1/18/2017 7:33:39	City of Mill Creek	30,000	25,000	25,000	30,000	60,000	56,000	45,000	40,000
1/17/2017 10:38:54	City of Milton	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

Timestamp	Jurisdiction/Organization	Inspection Costs 2008	Inspection Costs 2009	Inspection Costs 2010	Inspection Costs 2011	Inspection Costs 2012	Inspection Costs 2013	Inspection Costs 2014	Inspection Costs 2015
1/19/2017 15:54:23	City of Mount Vernon								
1/17/2017 13:34:29	City of Mukilteo								
1/26/2017 12:03:43	City of Newcastle								
1/23/2017 9:24:31	City of Olympia								Unknown
2/3/2017 15:18:03	City of Poulsbo	7.82	8.22	8.22	8.3	8.53	8.66	8.82	9
1/17/2017 9:59:19	City of Puyallup								

Timestamp	Jurisdiction/Organization	Inspection Costs 2008	Inspection Costs 2009	Inspection Costs 2010	Inspection Costs 2011	Inspection Costs 2012	Inspection Costs 2013	Inspection Costs 2014	Inspection Costs 2015
1/30/2017 16:07:16	City of Renton								
2/9/2017 16:30:18	City of Sammamish								
1/27/2017 18:25:11	City of Shoreline								
1/23/2017 11:58:21	City of Sumner								
1/20/2017 12:19:10	City of Tumwater								
3/23/2017 17:03	City of Woodinville	Not available	$3261.25/year	$$4219.23/year	$5371.65/year	$7,020.27/year	$6,222.41/year	$4,647.0/year	$6,744.75/year

Timestamp	Jurisdiction/Organization	Maintenance Costs 2008	Maintenance Costs 2009	Maintenance Costs 2010	Maintenance Costs 2011	Maintenance Costs 2012	Maintenance Costs 2013	Maintenance Costs 2014	Maintenance Costs 2015
1/31/2017 11:30:13	WSDOT								
3/15/2017 12:07	King County						$553.61 per CB	$553.84 per CB	$571.94 per CB
2/17/2017 7:05:16	King County DNRP Parks and Recreation								
2/23/2017 10:57	King County DOT/Road Services Div/Maintenance Section	N/A	N/A	Need time to gather data	Need time to gather data	Need time to gather data	~$136.00/CB	Need time to gather data	Need time to gather data
3/1/2017 13:59	King County International Airport	$50K / year	$50K / year	$50K / year	$50K / year	$50K / year	$50K / year	$50K / year	$100K year
3/1/2017 17:03	King County Wastewater Treatment Division								

Timestamp	Jurisdiction/Organization	Maintenance Costs 2008	Maintenance Costs 2009	Maintenance Costs 2010	Maintenance Costs 2011	Maintenance Costs 2012	Maintenance Costs 2013	Maintenance Costs 2014	Maintenance Costs 2015
2/28/2017 15:27	King County/Facilities Management Division								All maintenance costs are aggregated
2/27/2017 14:29	King County/Metro Transit								
1/26/2017 11:37:27	City Of Tacoma								
2/7/2017 14:33:15	Seattle Public Utilities	605,886	1,062,039	861,536	648,879	756,259	650,224	674,647	719,794
1/19/2017 15:22:33	Highline College	NA	NA	NA	$0	$50/CB	$54.55/CB	$0	$52.94/CB
1/30/2017 17:38:46	Port of Seattle	Not available	see above	see above	see above	see above	see above	see above	see above

Timestamp	Jurisdiction/Organization	Maintenance Costs 2008	Maintenance Costs 2009	Maintenance Costs 2010	Maintenance Costs 2011	Maintenance Costs 2012	Maintenance Costs 2013	Maintenance Costs 2014	Maintenance Costs 2015
1/31/2017 9:51:14	Seattle Public School								
2/3/2017 8:05:53	WA Military Department								
1/30/2017 11:48:09	Western Washington/Lower Columbia College	0	0	0	$2,809.37/yr	$1,242.93/yr	$133.92/yr	$180.00	$88.97
2/1/2017 8:54:59	Kitsap County								
1/23/2017 14:51:42	Thurston County						480000	510000	340000
1/30/2017 15:06:09	Whatcom County								

Timestamp	Jurisdiction/Organization	Maintenance Costs 2008	Maintenance Costs 2009	Maintenance Costs 2010	Maintenance Costs 2011	Maintenance Costs 2012	Maintenance Costs 2013	Maintenance Costs 2014	Maintenance Costs 2015
2/21/2017 15:58:10	City of Algona								
1/23/2017 14:05:12	City of Arlington								Estimated $30000
1/17/2017 11:34:39	City of Auburn	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
1/23/2017 14:42:38	City of Bainbridge Island								
1/27/2017 18:23:26	City of Battle Ground	Unknown	$684	$27,930	$37,449	$456	$18,810	$17,214	$4,389
2/9/2017 15:50:02	City of Bellevue								

Timestamp	Jurisdiction/Organization	Maintenance Costs 2008	Maintenance Costs 2009	Maintenance Costs 2010	Maintenance Costs 2011	Maintenance Costs 2012	Maintenance Costs 2013	Maintenance Costs 2014	Maintenance Costs 2015
1/27/2017 10:41:03	City of Bellingham								
1/30/2017 14:28:18	City of Bremerton	This is not tracked as a separate item	This is not tracked as a separate item	This is not tracked as a separate item	This is not tracked as a separate item	This is not tracked as a separate item	This is not tracked as a separate item	This is not tracked as a separate item	This is not tracked as a separate item
2/9/2017 16:39:03	City of Brier				20K	17K	5K	2K	2K
1/30/2017 16:02:02	City of Camas								
2/2/2017 7:19:01	City of Centralia								
2/2/2017 9:42:34	City Of Covington	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Timestamp	Jurisdiction/Organization	Maintenance Costs 2008	Maintenance Costs 2009	Maintenance Costs 2010	Maintenance Costs 2011	Maintenance Costs 2012	Maintenance Costs 2013	Maintenance Costs 2014	Maintenance Costs 2015
1/25/2017 10:52:36	City of Des Moines								
1/30/2017 16:45:50	City of Edgewood	17033	19941	21292	22175	23284	24448	134780	245111
1/30/2017 16:18:32	City of Everett			$220,000	$220,000	$220,000	$90,000	$90,000	$90,000
1/30/2017 14:57:09	City of Federal Way	$108,000	$140,000	$140,000	$140,000	$140,000	$154,250	$150,500	$166,500
1/27/2017 16:14:27	City of Ferndale								
1/23/2017 12:12:13	City of Issaquah						$15,224.00	$52,515.00	$49,543.00

Timestamp	Jurisdiction/Organization	Maintenance Costs 2008	Maintenance Costs 2009	Maintenance Costs 2010	Maintenance Costs 2011	Maintenance Costs 2012	Maintenance Costs 2013	Maintenance Costs 2014	Maintenance Costs 2015
1/30/2017 11:05:12	City of Kent	$171.20 /CB	$151.13 / CB	$174.49 / CB	$98.20 / CB	$165.96 / CB	$276.77 / CB (Frame and lid change out project included))	$261.01 / CB (CB locate project included)	$254.61 / CB
1/31/2017 16:45:08	City of Kirkland								
1/20/2017 14:34:07	City of Lakewood	Maintenance (cleaning) and inspection costs are one in the same	Same as above	Same as above	Same as above	$21.00/Type I and Drywell; $37.00/Type II and manhole (new contract separated cleaning and inspection as separate bid items)	$21.33/Type I and Drywell; $37.59 Type II and manhole (CPI increase)	$21.75/Type I and Drywell; $38.34/Type II and manhole (CPI increase)	$22.10/Type I and Drywell; $38.95/Type II and manhole (CPI increase)
1/25/2017 9:59:46	City of Mercer Island								est. $30 per CB
1/18/2017 7:33:39	City of Mill Creek								
1/17/2017 10:38:54	City of Milton	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

Timestamp	Jurisdiction/Organization	Maintenance Costs 2008	Maintenance Costs 2009	Maintenance Costs 2010	Maintenance Costs 2011	Maintenance Costs 2012	Maintenance Costs 2013	Maintenance Costs 2014	Maintenance Costs 2015
1/19/2017 15:54:23	City of Mount Vernon								
1/17/2017 13:34:29	City of Mukilteo								
1/26/2017 12:03:43	City of Newcastle								
1/23/2017 9:24:31	City of Olympia								Unknown
2/3/2017 15:18:03	City of Poulsbo	62.73	65.25	65.25	65.75	67.24	68.03	69.1	70.2
1/17/2017 9:59:19	City of Puyallup								

Timestamp	Jurisdiction/Organization	Maintenance Costs 2008	Maintenance Costs 2009	Maintenance Costs 2010	Maintenance Costs 2011	Maintenance Costs 2012	Maintenance Costs 2013	Maintenance Costs 2014	Maintenance Costs 2015
1/30/2017 16:07:16	City of Renton								
2/9/2017 16:30:18	City of Sammamish								
1/27/2017 18:25:11	City of Shoreline								
1/23/2017 11:58:21	City of Sumner								17000
1/20/2017 12:19:10	City of Tumwater								
3/23/2017 17:03	City of Woodinville	Not available	$9,783.75/year	$12,657.68/year	$16,114.95/year	$21,060.81/year	$18,667.23/year	$13,941/year	$20,234.25/year

Timestamp	Jurisdiction/Organization	11.If available, please send an example field inspection form(s) used by your jurisdiction for catch basin inspection and maintenance.	12.If available, please send your jurisdiction's Standard Operating Procedures (SOP) document(s) for catch basin inspection and maintenance.	13. Do you have any questions, comments, or feedback about the study or survey?	The next step is to upload your files. We will send a link and instructions on how to upload files to the e-mail addresses that you provide below. Please include anyone you would like to have access.
1/31/2017 11:30:13	WSDOT	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		
3/15/2017 12:07	King County	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.	We use Appendix A of the King County Stormwater design manual.	Mark.Preszler@kingcounty.gov
2/17/2017 7:05:16	King County DNRP Parks and Recreation	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		
2/23/2017 10:57	King County DOT/Road Services Div/Maintenance Section	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.		brent.dhoore@kingcounty.gov
3/1/2017 13:59	King County International Airport	No, no field inspection form available.	Yes, SOP will be sent with data transmittal.	No	
3/1/2017 17:03	King County Wastewater Treatment Division	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		

Timestamp	Jurisdiction/Organization	11.If available, please send an example field inspection form(s) used by your jurisdiction for catch basin inspection and maintenance.	12.If available, please send your jurisdiction's Standard Operating Procedures (SOP) document(s) for catch basin inspection and maintenance.	13. Do you have any questions, comments, or feedback about the study or survey?	The next step is to upload your files. We will send a link and instructions on how to upload files to the e-mail addresses that you provide below. Please include anyone you would like to have access.
2/28/2017 15:27	King County/Facilities Management Division	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		bill.eckel@kingcounty.gov; alexander.jones@kingcounty.gov
2/27/2017 14:29	King County/Metro Transit	No, no field inspection form available.	No, SOP not available.		talon.swanson@kingcounty.gov
1/26/2017 11:37:27	City Of Tacoma	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.		
2/7/2017 14:33:15	Seattle Public Utilities	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.		david.shin@seattle.gov
1/19/2017 15:22:33	Highline College	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.	No	
1/30/2017 17:38:46	Port of Seattle	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.		dewell.j@portseattle.org; silcox.s@portseattle.org; mprasek@eaest.com; ecrumbaker@aspectconsulting.com

Timestamp	Jurisdiction/Organization	11.If available, please send an example field inspection form(s) used by your jurisdiction for catch basin inspection and maintenance.	12.If available, please send your jurisdiction's Standard Operating Procedures (SOP) document(s) for catch basin inspection and maintenance.	13. Do you have any questions, comments, or feedback about the study or survey?	The next step is to upload your files. We will send a link and instructions on how to upload files to the e-mail addresses that you provide below. Please include anyone you would like to have access.
1/31/2017 9:51:14	Seattle Public School	No, no field inspection form available.	No, SOP not available.		
2/3/2017 8:05:53	WA Military Department				
1/30/2017 11:48:09	Western Washington/Lower Columbia College	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		none
2/1/2017 8:54:59	Kitsap County	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.	I'll send cost data with other data.	agallard@co.kitsap.wa.us
1/23/2017 14:51:42	Thurston County	No, no field inspection form available.	No, SOP not available.		
1/30/2017 15:06:09	Whatcom County	Yes, example field inspection form will be sent with data transmittal.			ccraver@co.whatcom.wa.us

Timestamp	Jurisdiction/Organization	11.If available, please send an example field inspection form(s) used by your jurisdiction for catch basin inspection and maintenance.	12.If available, please send your jurisdiction's Standard Operating Procedures (SOP) document(s) for catch basin inspection and maintenance.	13. Do you have any questions, comments, or feedback about the study or survey?	The next step is to upload your files. We will send a link and instructions on how to upload files to the e-mail addresses that you provide below. Please include anyone you would like to have access.
2/21/2017 15:58:10	City of Algona	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.		
1/23/2017 14:05:12	City of Arlington	No, no field inspection form available.	No, SOP not available.		
1/17/2017 11:34:39	City of Auburn	No, no field inspection form available.	No, SOP not available.		mmay@auburnwa.gov
1/23/2017 14:42:38	City of Bainbridge Island	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		dberry@bainbridgewa.gov ; Ray Navarette (rnavarette@bainbridgewa.gov)
1/27/2017 18:23:26	City of Battle Ground	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		Kelly.Uhacz@cityofbg.org
2/9/2017 15:50:02	City of Bellevue	No, no field inspection form available.	Yes, SOP will be sent with data transmittal.		

Timestamp	Jurisdiction/Organization	11.If available, please send an example field inspection form(s) used by your jurisdiction for catch basin inspection and maintenance.	12.If available, please send your jurisdiction's Standard Operating Procedures (SOP) document(s) for catch basin inspection and maintenance.	13. Do you have any questions, comments, or feedback about the study or survey?	The next step is to upload your files. We will send a link and instructions on how to upload files to the e-mail addresses that you provide below. Please include anyone you would like to have access.
1/27/2017 10:41:03	City of Bellingham	No, no field inspection form available.	No, SOP not available.		
1/30/2017 14:28:18	City of Bremerton	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.	Our operations and maintenance tasks, such as: cleaning catch basins and ditches; and green infrastructure maintenance, are not individually tracked in our Stormwater Program financial system. For catch basin maintenance, we clean all catch basins annually for right-of-way systems. We have tracking numbers for the main Permit components and details can be broken out of the records with effort if needed. Street sweeping is tracked with its own number. Sweeping and catch basin cleaning spoils are collected in the same pile and disposed of under the same waste permit at the landfill. Our stormwater system GIS files have varying degrees of detail for the individual catch basin, or manholes in the system, and are continuously updated and expanded.	chance.berthiaume@ci.bremerton.wa.us
2/9/2017 16:39:03	City of Brier				
1/30/2017 16:02:02	City of Camas	No, no field inspection form available.	No, SOP not available.		Steve Wall swall@cityofcamas.us
2/2/2017 7:19:01	City of Centralia	No, no field inspection form available.	No, SOP not available.	no	
2/2/2017 9:42:34	City Of Covington	No, no field inspection form available.	No, SOP not available.	N/A	bparrish@covingtonwa.gov

Timestamp	Jurisdiction/Organization	11.If available, please send an example field inspection form(s) used by your jurisdiction for catch basin inspection and maintenance.	12.If available, please send your jurisdiction's Standard Operating Procedures (SOP) document(s) for catch basin inspection and maintenance.	13. Do you have any questions, comments, or feedback about the study or survey?	The next step is to upload your files. We will send a link and instructions on how to upload files to the e-mail addresses that you provide below. Please include anyone you would like to have access.
1/25/2017 10:52:36	City of Des Moines	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.		tbeekley@desmoineswa.gov
1/30/2017 16:45:50	City of Edgewood	No, no field inspection form available.	No, SOP not available.		
1/30/2017 16:18:32	City of Everett	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		
1/30/2017 14:57:09	City of Federal Way	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		tony.doucette@cityoffederalway.com
1/27/2017 16:14:27	City of Ferndale	No, no field inspection form available.	No, SOP not available.		
1/23/2017 12:12:13	City of Issaquah	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.	Was this survey intended to include the private stormwater inspection program? In Issaquah, private inspections are conducted by Public Works Engineering and I completed this survey with the data from Public Works Operations for the public stormwater system.	Frank Reinart <frankr@issaquahwa.gov>, Evan Brumfield <EvanB@issaquahwa.gov>

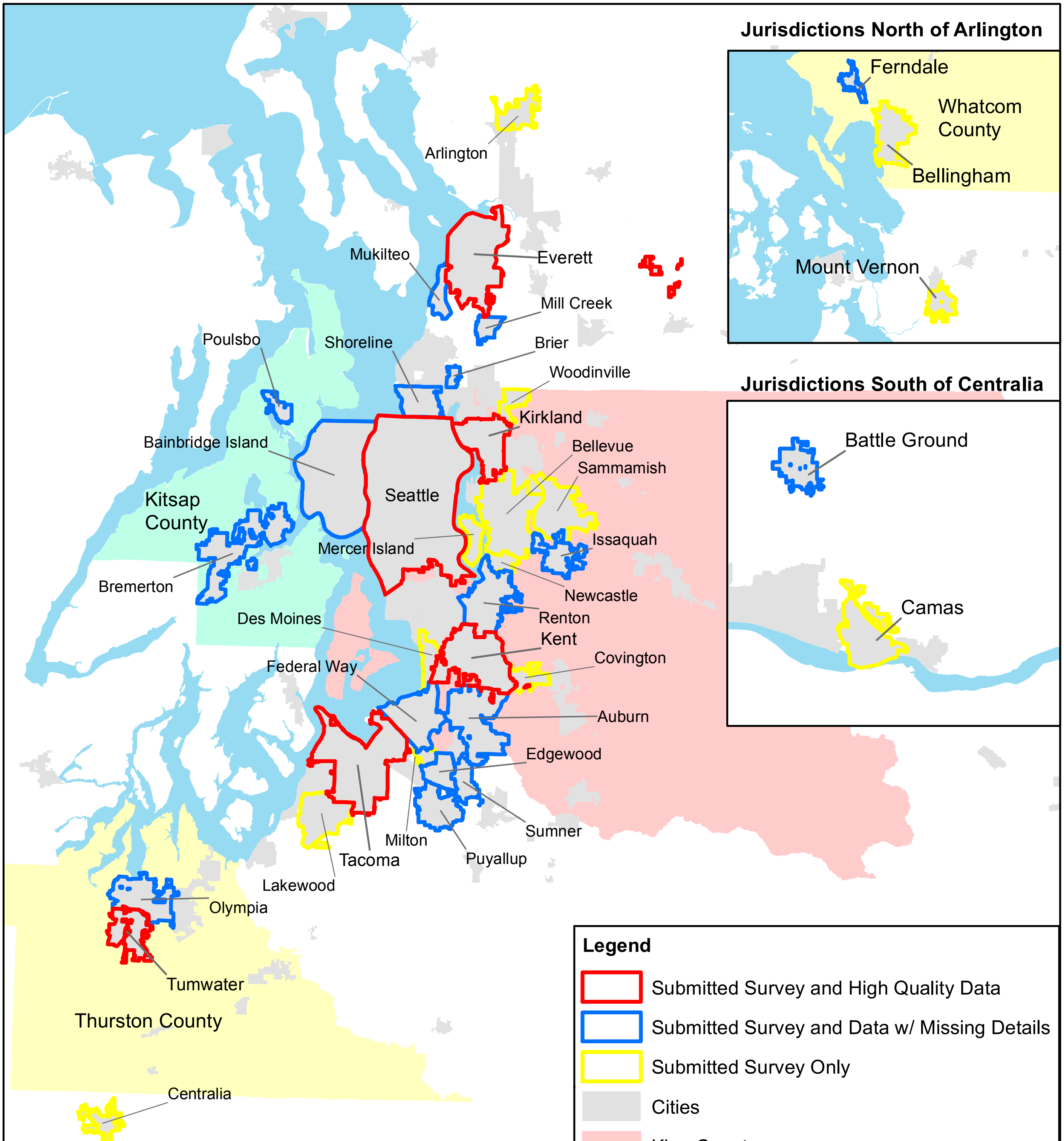
Timestamp	Jurisdiction/Organization	11.If available, please send an example field inspection form(s) used by your jurisdiction for catch basin inspection and maintenance.	12.If available, please send your jurisdiction's Standard Operating Procedures (SOP) document(s) for catch basin inspection and maintenance.	13. Do you have any questions, comments, or feedback about the study or survey?	The next step is to upload your files. We will send a link and instructions on how to upload files to the e-mail addresses that you provide below. Please include anyone you would like to have access.
1/30/2017 11:05:12	City of Kent	No, no field inspection form available.	No, SOP not available.		lharen@kentwa.gov ccouvillion@kentwa.gov
1/31/2017 16:45:08	City of Kirkland	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		wesayers@kirklandwa.gov; jplattner@kirklandwa.gov; jgaus@kirklandwa.gov
1/20/2017 14:34:07	City of Lakewood	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.	The term "maintenance" is a little confusing in the context of this survey. I'm thinking more in terms of cleaning. Maintenance to me means replacing a grate or repairing grout inside a catch basin. I answered question #10 more focused on the cleaning of catch basins vs. maintenance of catch basins.	gvigoren@cityoflakewood.us; dhalar@cityoflakewood.us; tschlepp@cityoflakewood.us
1/25/2017 9:59:46	City of Mercer Island	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.		
1/18/2017 7:33:39	City of Mill Creek	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.	was unsure of what costs were for catch basins annually. We conduct spot repairs and group up catch basin repairs and they are not done annually.	Please send this request to Marci Chew
1/17/2017 10:38:54	City of Milton	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.		jcarter@cityofmilton.net

Timestamp	Jurisdiction/Organization	11.If available, please send an example field inspection form(s) used by your jurisdiction for catch basin inspection and maintenance.	12.If available, please send your jurisdiction's Standard Operating Procedures (SOP) document(s) for catch basin inspection and maintenance.	13. Do you have any questions, comments, or feedback about the study or survey?	The next step is to upload your files. We will send a link and instructions on how to upload files to the e-mail addresses that you provide below. Please include anyone you would like to have access.
1/19/2017 15:54:23	City of Mount Vernon	No, no field inspection form available.	No, SOP not available.	none	
1/17/2017 13:34:29	City of Mukilteo	No, no field inspection form available.	No, SOP not available.		
1/26/2017 12:03:43	City of Newcastle	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		
1/23/2017 9:24:31	City of Olympia	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.	I felt uncomfortable checking some of the choices in this survey due to the fact that we have very limited data. We have fields for information but we don't have the resources to fill in the data.	sbarclif@ci.olympia.wa.us
2/3/2017 15:18:03	City of Poulsbo	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.		Anja Hart ahart@cityofpoulsbo.com; Jordan Schager jschager@cityofpoulsbo.com
1/17/2017 9:59:19	City of Puyallup	No, no field inspection form available.	No, SOP not available.		jgrbich@ci.puyallup.wa.us

Timestamp	Jurisdiction/Organization	11.If available, please send an example field inspection form(s) used by your jurisdiction for catch basin inspection and maintenance.	12.If available, please send your jurisdiction's Standard Operating Procedures (SOP) document(s) for catch basin inspection and maintenance.	13. Do you have any questions, comments, or feedback about the study or survey?	The next step is to upload your files. We will send a link and instructions on how to upload files to the e-mail addresses that you provide below. Please include anyone you would like to have access.
1/30/2017 16:07:16	City of Renton	No, no field inspection form available.	No, SOP not available.		
2/9/2017 16:30:18	City of Sammamish	No, no field inspection form available.	Yes, SOP will be sent with data transmittal.		
1/27/2017 18:25:11	City of Shoreline	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		
1/23/2017 11:58:21	City of Sumner	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.		
1/20/2017 12:19:10	City of Tumwater	Yes, example field inspection form will be sent with data transmittal.	Yes, SOP will be sent with data transmittal.		ageorgeson@ci.tumwater.wa.us
3/23/2017 17:03	City of Woodinville	Yes, example field inspection form will be sent with data transmittal.	No, SOP not available.	No	Asha D'Souza - ashad@ci.woodinville.wa.us

ATTACHMENT C

SURVEY RESULTS SUMMARY



NOTE:
WSDOT and King County submitted survey and high quality data.

Kitsap County submitted survey and data with missing details.

Thurston and Whatcom counties submitted survey only.

OSBORN CONSULTING INCORPORATED

Western Washington Catch Basin Study

Summary of Responses

Washington State

Figure C-1

Prepared by , 6/15/2017

TABLE C-1
Summary of Survey and Data Submissions

Phase	Type	Jurisdiction/Organization	Contact Name	Survey Submitted	Data Submitted	No. of Data Files
Phase 1	Individual	WSDOT	Trett Sutter	X	X	25 (15.2 MB)
Phase 1	Primary	King County	Blair Scott	X	X	1 (9.96 MB)
Phase 1	Primary - CA	King County DNRP Parks and Recreation	David Sizemore	X	X	9 (10.1 MB)
Phase 1	Primary - CA	King County DOT/Road Services Div/Maintenance Section	Brent Dhoore	X		
Phase 1	Primary - CA	King County International Airport	Peter Dumaliang	X		
Phase 1	Primary - CA	King County Wastewater Treatment Division	Jeff Lafer	X		
Phase 1	Primary - CA	King County/Facilities Management Division	Bill Eckel	X	X	4 (902 KB)
Phase 1	Primary - CA	King County/Metro Transit	Talon Swanson	X	X	1 (760 KB)
Phase 1	Primary	City Of Tacoma	Michael A. Rose, P.E.	X	X	145 (3.31 GB)
Phase 1	Primary	Pierce County			X	48 (3.7 MB)
Phase 1	Primary	Seattle Public Utilities	Kate Rhoads	X	X	11 (74.7 MB)
Phase 1	Secondary	Highline College	Barry Holldorf	X	X	15 (37.6 MB)
Phase 1	Secondary	Port of Seattle	Jane Dewell	X	X	2 (5.5 MB)
Phase 1	Secondary	Seattle Public School	Shelly Kerby	X		
Phase 1	Secondary	WA Military Department	Rowena Valencia-Gica	X		
Phase 1	Secondary	Western Washington/Lower Columbia College	Jeff Moenck	X	X	6 (4.69 MB)
Phase 2	--	Kitsap County	Angela Gallardo	X	X	41 (43 MB)
Phase 2	--	Thurston County	Ryan Langan	X		
Phase 2	--	Whatcom County	Cathy Craver	X		
Phase 2	--	City of Algona	Salvador Marez	X	X	1 (246 KB)
Phase 2	--	City of Arlington	Ken Clarke	X		
Phase 2	--	City of Auburn	Chris Thorn	X	X	1(7.8 MB)
Phase 2	--	City of Bainbridge Island	Marilyn Guthrie	X	X	2 (2.4 MB)
Phase 2	--	City of Battle Ground	Kelly Uhacz	X	X	4 (2.76 MB)
Phase 2	--	City of Bellevue	Don McQuilliams	X		
Phase 2	--	City of Bellingham	Jason Porter	X		
Phase 2	--	City of Bremerton	Chance Berthiaume	X	X	1(1.72 MB)
Phase 2	--	City of Brier	Rich Maag	X	X	1(304 KB)
Phase 2	--	City of Camas	Anita Ashton	X		
Phase 2	--	City of Centralia	Fred Chapman	X		
Phase 2	--	City Of Covington	Ben Parrish	X		
Phase 2	--	City of Des Moines	Tyler Beekley	X		
Phase 2	--	City of Edgewood	Jeremy Metzler	X	X	1 (1 MB)
Phase 2	--	City of Everett	Grant Moen	X	X	8 (159 MB)
Phase 2	--	City of Federal Way	Tony Doucette	X	X	228 (183 MB)
Phase 2	--	City of Ferndale	Wendy LaRocque	X	X	33 (50.8 MB)
Phase 2	--	City of Issaquah	Harvey Walker	X	X	1 (5.86 MB)
Phase 2	--	City of Kent	Laura Haren	X	X	2 (42.9 MB)
Phase 2	--	City of Kirkland	Jenny Gaus	X	X	3 (36.5 MB)
Phase 2	--	City of Lakewood	Greg Vigoren	X		
Phase 2	--	City of Mercer Island	Hartvigson	X		
Phase 2	--	City of Mill Creek	Marci Chew	X	X	1 (193 KB)

TABLE C-1
Summary of Survey and Data Submissions

Phase	Type	Jurisdiction/Organization	Contact Name	Survey Submitted	Data Submitted	No. of Data Files
Phase 2	--	City of Milton	Jamie Carter	X		
Phase 2	--	City of Mount Vernon	Blaine Chesterfield	X		
Phase 2	--	City of Mukilteo	Jennifer Adams	X	X	1 (37.2 MB)
Phase 2	--	City of Newcastle	Audrie Starsy	X		
Phase 2	--	City of Olympia	Sue Barclift	X	X	2(1.9 MB)
Phase 2	--	City of Poulsbo	Anja Hart	X	X	1 (362 KB)
Phase 2	--	City of Puyallup	Jon Wikander	X	X	4 (1.1 MB)
Phase 2	--	City of Renton	Kristina Lowthian	X	X	88 (1.87 GB)
Phase 2	--	City of Sammamish	Tawni Dalziel	X		
Phase 2	--	City of Shoreline	Uki Dele	X	X	3 (55.8 MB)
Phase 2	--	City of Sumner	Robert Wright	X	X	12 (10.7 MB)
Phase 2	--	City of Tumwater	Amy Georgeson	X	X	199 (387 MB)
Phase 2	--	City of Woodinville	Brian Meyer	X		
			TOTAL	54	34	

NOTES:

Primary - CA = Primary - Custodial Agency of King County

TABLE C-2
SURVEY RESULTS SUMMARY

						CB Inspection Schedule				CB Types				CB Inspection Activities			
No.	**Phase**	**Jurisdiction/Organization**	**Contact Name**	**Survey Submitted**	**Data Submitted**	**Std**	**Alt 1**	**Alt 2**	**Alt 3**	**Type I**	**Type II**	**Inlet**	**Other**	**Visual/Photo**	**Field Notes**	**Map/GIS**	**Depth**
1	Phase 1	WSDOT	Trett Sutter	X	X	X				X	X	X		X	X	X	X
2	Phase 1	King County	Blair Scott	X	X	X	X			X	X	X		X	X	X	X
3	Phase 1	King County DNRP Parks and Recreation	David Sizemore	X	X	X				X	X	X		X	X	X	X
4	Phase 1	King County DOT/Road Services Div/Maintenance Section	Brent Dhoore	X				X		X	X	X		X	X	X	X
5	Phase 1	King County International Airport	Peter Dumaliang	X					X	X	X	X		X	X	X	X
6	Phase 1	King County Wastewater Treatment Division	Jeff Lafer	X		X		X		X	X	X			X		
7	Phase 1	King County/Facilities Management Division	Bill Eckel	X	X	X				X	X	X		X	X	X	X
8	Phase 1	King County/Metro Transit	Talon Swanson	X	X	X	X		X	X	X	X		X	X		X
9	Phase 1	City Of Tacoma	Michael A. Rose, P.E.	X	X			X		X	X	X		X	X	X	X
10	Phase 1	Pierce County			X												
11	Phase 1	Seattle Public Utilities	Kate Rhoads	X	X	X				X	X	X		X	X	X	X
12	Phase 1	Highline College	Barry Holldorf	X	X	X				X	X	X		X	X		
13	Phase 1	Port of Seattle	Jane Dewell	X	X	X				X	X	X		X	X	X	X
14	Phase 1	Seattle Public School	Shelly Kerby	X		X			X	X				X			
15	Phase 1	WA Military Department	Rowena Valencia-Gica	X					X	X		X		X	X	X	X
16	Phase 1	Western Washington/Lower Columbia College	Jeff Moenck	X	X		X			X	X			X	X		
17	Phase 2	Kitsap County	Angela Gallardo	X	X					X	X	X		X	X	X	X
18	Phase 2	Thurston County	Ryan Langan	X		X				X	X	X		X	X	X	X
19	Phase 2	Whatcom County	Cathy Craver	X		X				X	X			X	X		X
20	Phase 2	City of Algona		X	X		X			X	X	X		X	X		X

						CB Inspection Schedule				CB Types				CB Inspection Activities			
No.	Phase	Jurisdiction/Organization	Contact Name	Survey Submitted	Data Submitted	Std	Alt 1	Alt 2	Alt 3	Type I	Type II	Inlet	Other	Visual/Photo	Field Notes	Map/GIS	Depth
21	Phase 2	City of Arlington	Ken Clarke	X		X				X	X	X		X	X		
22	Phase 2	City of Auburn	Chris Thorn	X	X	X				X		X		X	X	X	X
23	Phase 2	City of Bainbridge Island	Marilyn Guthrie	X	X	X				X	X			X			X
24	Phase 2	City of Battle Ground	Kelly Uhacz	X	X	X				X		X		X	X	X	X
25	Phase 2	City of Bellevue	Don McQuilliams	X		X				X	X	X		X	X	X	X
26	Phase 2	City of Bellingham	Jason Porter	X				X		X	X	X		X	X	X	X
27	Phase 2	City of Bremerton	Chance Berthiaume	X	X	X				X	X	X	X	X	X	X	X
28	Phase 2	City of Brier	Rich Maag	X	X			X		X	X	X			X	X	
29	Phase 2	City of Camas	Anita Ashton	X		X				X	X	X		X			
30	Phase 2	City of Centralia	Fred Chapman	X		X				X				X	X	X	X
31	Phase 2	City Of Covington	Ben Parrish	X		X				X	X	X		X	X		X
32	Phase 2	City of Des Moines	Tyler Beekley	X				X		X		X		X	X	X	X
33	Phase 2	City of Edgewood	Jeremy Metzler	X	X	X				X	X	X		X	X	X	X
34	Phase 2	City of Everett	Grant Moen	X	X	X				X	X	X		X	X	X	X
35	Phase 2	City of Federal Way	Tony Doucette	X	X		X			X	X	X	X	X	X	X	X
36	Phase 2	City of Ferndale	Wendy LaRocque	X	X				X	X	X	X		X	X	X	
37	Phase 2	City of Issaquah	Harvey Walker	X	X			X		X	X	X		X	X	X	X
38	Phase 2	City of Kent	Laura Haren, Chris Couvillion	X	X	X				X	X	X	X	X	X	X	
39	Phase 2	City of Kirkland	Jenny Gaus	X	X	X				X	X	X		X	X	X	
40	Phase 2	City of Lakewood	Greg Vigoren	X		X				X	X	X	X	X	X		X
41	Phase 2	City of Mercer Island	Hartvigson	X		X				X	X	X		X	X	X	
42	Phase 2	City of Mill Creek	Marci Chew	X	X				X	X	X			X	X	X	
43	Phase 2	City of Milton	Jamie Carter	X		X				X	X	X		X	X		X
44	Phase 2	City of Mount Vernon	Blaine Chesterfield	X		X				X	X	X		X	X		X
45	Phase 2	City of Mukilteo	Jennifer Adams	X	X	X				X	X	X		X	X		X

TABLE C-2
SURVEY RESULTS SUMMARY

						CB Inspection Schedule				CB Types				CB Inspection Activities			
No.	**Phase**	**Jurisdiction/Organization**	**Contact Name**	**Survey Submitted**	**Data Submitted**	**Std**	**Alt 1**	**Alt 2**	**Alt 3**	**Type I**	**Type II**	**Inlet**	**Other**	**Visual/Photo**	**Field Notes**	**Map/GIS**	**Depth**
46	Phase 2	City of Newcastle	Audrie Starsy	X		X				X	X	X		X	X	X	X
47	Phase 2	City of Olympia	Sue Barclift	X	X	X				X	X	X		X	X	X	
48	Phase 2	City of Poulsbo	Anja Hart	X	X	X				X	X	X		X	X	X	X
49	Phase 2	City of Puyallup	Jon Wikander	X	X				X	X	X	X		X	X	X	X
50	Phase 2	City of Renton	Kristina Lowthian	X	X	X		X	X	X	X	X		X		X	
51	Phase 2	City of Sammamish	Tawni Dalziel	X		X				X	X	X					
52	Phase 2	City of Shoreline	Uki Dele	X	X	X				X	X				X	X	X
53	Phase 2	City of Sumner	Robert Wright	X	X	X		X	X	X	X	X		X	X	X	X
54	Phase 2	City of Tumwater	Amy Georgeson	X	X	X				X	X	X		X	X	X	X
55	Phase 2	City of Woodinville	Brian Meyer	X		X				X	X			X	X	X	X
		TOTAL		54	34	39	5	9	9	54	48	46	4	50	49	38	39

TABLE C-2
SURVEY RESULTS SUMMARY

			CB Maintenance Records														CB Cleaning Decision					
No.	Phase	Jurisdiction/Organization	Pipe Cleaning	Culvert Cleaning	CB Cleanout	Ditch Maint.	Street Cleaning	Road Repair/ Resurf	Sanding/ de-icing	Other snow/ice control	Landscape Maint.	Dust Control	Sediment/ Erosion Control	Trash/pet waste	Repair of CB grate	Crack sealing	Inspection Data	Schedule	Traffic Volume/ Road Factors	Emergency	Complaints	Transfer ownership
1	Phase 1	WSDOT	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
2	Phase 1	King County	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
3	Phase 1	King County DNRP Parks and Recreation	X		X	X	X				X	X	X	X	X	X	X			X	X	
4	Phase 1	King County DOT/Road Services Div/Maintenance Section	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	
5	Phase 1	King County International Airport	X		X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	
6	Phase 1	King County Wastewater Treatment Division			X						X						X	X				
7	Phase 1	King County/Facilities Management Division			X	X									X	X	X					
8	Phase 1	King County/Metro Transit	X	X	X	X	X	X	X	X	X			X	X	X	X	X		X		
9	Phase 1	City Of Tacoma	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
10	Phase 1	Pierce County																				
11	Phase 1	Seattle Public Utilities	X	X	X	X	X	X	X		X	X	X		X	X	X			X	X	
12	Phase 1	Highline College	X		X			X	X		X		X	X	X		X			X	X	
13	Phase 1	Port of Seattle	X		X	X			X				X	X	X	X	X	X		X	X	
14	Phase 1	Seattle Public School	X	X	X								X					X			X	
15	Phase 1	WA Military Department			X		X						X				X					
16	Phase 1	Western Washington/Lower Columbia College			X				X	X			X		X		X					
17	Phase 2	Kitsap County	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	
18	Phase 2	Thurston County	X	X	X	X	X	X	X		X	X	X	X	X	X	X					
19	Phase 2	Whatcom County	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		
20	Phase 2	City of Algona	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	

TABLE C-2
SURVEY RESULTS SUMMARY

No.	Phase	Jurisdiction/Organization	CB Maintenance Records														CB Cleaning Decision					
			Pipe Cleaning	Culvert Cleaning	CB Cleanout	Ditch Maint.	Street Cleaning	Road Repair/ Resurf	Sanding/ de-icing	Other snow/ice control	Landscape Maint.	Dust Control	Sediment/ Erosion Control	Trash/pet waste	Repair of CB grate	Crack sealing	Inspection Data	Schedule	Traffic Volume/ Road Factors	Emergency	Complaints	Transfer ownership
21	Phase 2	City of Arlington	X		X	X	X	X	X		X							X			X	
22	Phase 2	City of Auburn	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	
23	Phase 2	City of Bainbridge Island	X	X	X	X	X	X	X				X		X	X	X	X			X	
24	Phase 2	City of Battle Ground		X	X	X	X	X	X	X	X		X	X	X	X	X			X	X	
25	Phase 2	City of Bellevue	X	X	X	X	X	X	X		X	X	X	X	X	X	X			X	X	
26	Phase 2	City of Bellingham	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	
27	Phase 2	City of Bremerton	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	
28	Phase 2	City of Brier	X	X	X	X	X	X	X		X		X	X	X	X	X					
29	Phase 2	City of Camas	X	X	X	X	X		X	X	X	X	X	X	X	X				X	X	
30	Phase 2	City of Centralia	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	
31	Phase 2	City Of Covington	X	X	X	X	X	X	X		X		X	X	X			X				
32	Phase 2	City of Des Moines	X	X	X	X	X	X	X		X		X	X	X	X	X			X	X	X
33	Phase 2	City of Edgewood	X	X	X	X	X	X	X		X		X	X	X	X	X				X	
34	Phase 2	City of Everett	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	
35	Phase 2	City of Federal Way	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
36	Phase 2	City of Ferndale	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
37	Phase 2	City of Issaquah	X	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	
38	Phase 2	City of Kent	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
39	Phase 2	City of Kirkland	X	X	X	X	X	X	X		X		X	X	X	X	X		X	X	X	
40	Phase 2	City of Lakewood	X	X	X	X	X	X	X	X	X		X	X	X	X	X			X	X	
41	Phase 2	City of Mercer Island	X	X	X	X	X	X	X		X		X	X	X	X	X	X		X	X	
42	Phase 2	City of Mill Creek	X	X	X	X	X	X	X		X	X	X	X	X	X						
43	Phase 2	City of Milton	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
44	Phase 2	City of Mount Vernon	X	X	X	X	X	X	X	X	X		X	X	X		X	X		X		
45	Phase 2	City of Mukilteo			X	X	X	X	X		X		X	X	X	X	X					

TABLE C-2
SURVEY RESULTS SUMMARY

			CB Maintenance Records														CB Cleaning Decision					
No.	**Phase**	**Jurisdiction/Organization**	**Pipe Cleaning**	**Culvert Cleaning**	**CB Cleanout**	**Ditch Maint.**	**Street Cleaning**	**Road Repair/ Resurf**	**Sanding/ de-icing**	**Other snow/ice control**	**Landscape Maint.**	**Dust Control**	**Sediment/ Erosion Control**	**Trash/pet waste**	**Repair of CB grate**	**Crack sealing**	**Inspection Data**	**Schedule**	**Traffic Volume/ Road Factors**	**Emergency**	**Complaints**	**Transfer ownership**
46	Phase 2	City of Newcastle	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	
47	Phase 2	City of Olympia	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	
48	Phase 2	City of Poulsbo	X	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	
49	Phase 2	City of Puyallup	X	X	X	X	X	X	X	X	X	X	X	X	X			X				
50	Phase 2	City of Renton	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
51	Phase 2	City of Sammamish	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X				
52	Phase 2	City of Shoreline	X	X	X	X	X	X	X				X		X	X	X			X	X	
53	Phase 2	City of Sumner	X	X	X	X	X	X	X		X		X	X	X	X	X	X		X	X	X
54	Phase 2	City of Tumwater	X	X	X		X	X	X	X	X		X	X	X	X	X			X	X	X
55	Phase 2	City of Woodinville	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	
		TOTAL	48	44	54	47	48	46	49	29	47	24	50	44	50	43	46	27	12	35	39	6

TABLE C-2
SURVEY RESULTS SUMMARY

			Inspection Data Format					Maintenance Data Format					Cost Data Format				
No.	**Phase**	**Jurisdiction/Organization**	**Excel**	**Other DB**	**GIS**	**Paper**	**Other**	**Excel**	**Other DB**	**GIS**	**Paper**	**Other**	**Excel**	**Other DB**	**GIS**	**Paper**	**Other**
1	Phase 1	WSDOT					X					X		X			
2	Phase 1	King County		X	X				X		X			X			
3	Phase 1	King County DNRP Parks and Recreation				X	X				X	X				X	
4	Phase 1	King County DOT/Road Services Div/Maintenance Section	X	X	X	X		X	X	X	X						X
5	Phase 1	King County International Airport	X			X	X	X		X				X			
6	Phase 1	King County Wastewater Treatment Division	X	X		X	X		X								
7	Phase 1	King County/Facilities Management Division	X			X	X	X			X					X	X
8	Phase 1	King County/Metro Transit	X						X					X			
9	Phase 1	City Of Tacoma			X							X					X
10	Phase 1	Pierce County															
11	Phase 1	Seattle Public Utilities		X	X				X					X			
12	Phase 1	Highline College					X	X					X				
13	Phase 1	Port of Seattle	X	X	X	X	X	X	X	X	X		X	X			
14	Phase 1	Seattle Public School					X					X					X
15	Phase 1	WA Military Department				X										X	
16	Phase 1	Western Washington/Lower Columbia College	X			X	X				X	X				X	X
17	Phase 2	Kitsap County		X	X				X	X			X	X			
18	Phase 2	Thurston County					X					X					
19	Phase 2	Whatcom County		X			X		X				X			X	
20	Phase 2	City of Algona				X					X						

TABLE C-2
SURVEY RESULTS SUMMARY

			Inspection Data Format					Maintenance Data Format					Cost Data Format				
No.	**Phase**	**Jurisdiction/Organization**	**Excel**	**Other DB**	**GIS**	**Paper**	**Other**	**Excel**	**Other DB**	**GIS**	**Paper**	**Other**	**Excel**	**Other DB**	**GIS**	**Paper**	**Other**
21	Phase 2	City of Arlington		X		X	X		X		X			X			
22	Phase 2	City of Auburn					X					X					X
23	Phase 2	City of Bainbridge Island	X				X	X									
24	Phase 2	City of Battle Ground		X		X			X				X				
25	Phase 2	City of Bellevue	X	X	X	X		X	X	X	X						
26	Phase 2	City of Bellingham					X	X				X	X			X	X
27	Phase 2	City of Bremerton			X	X				X	X	X	X	X		X	X
28	Phase 2	City of Brier	X		X	X		X		X	X						
29	Phase 2	City of Camas				X					X						
30	Phase 2	City of Centralia					X				X	X	X			X	
31	Phase 2	City Of Covington	X						X					X			
32	Phase 2	City of Des Moines		X					X					X			
33	Phase 2	City of Edgewood	X		X			X		X						X	
34	Phase 2	City of Everett	X	X	X			X	X	X				X			
35	Phase 2	City of Federal Way	X			X		X			X		X			X	
36	Phase 2	City of Ferndale				X					X						
37	Phase 2	City of Issaquah		X	X		X		X	X				X			X
38	Phase 2	City of Kent		X	X	X	X		X	X	X	X		X			X
39	Phase 2	City of Kirkland		X		X			X		X			X		X	
40	Phase 2	City of Lakewood	X			X	X	X	X				X	X			
41	Phase 2	City of Mercer Island				X	X				X					X	
42	Phase 2	City of Mill Creek			X		X			X						X	
43	Phase 2	City of Milton	X			X		X		X							
44	Phase 2	City of Mount Vernon				X	X				X						X
45	Phase 2	City of Mukilteo			X					X							

TABLE C-2
SURVEY RESULTS SUMMARY

No.	Phase	Jurisdiction/Organization	Inspection Data Format					Maintenance Data Format					Cost Data Format				
			Excel	Other DB	GIS	Paper	Other	Excel	Other DB	GIS	Paper	Other	Excel	Other DB	GIS	Paper	Other
46	Phase 2	City of Newcastle	X		X	X		X		X	X					X	
47	Phase 2	City of Olympia			X				X			X					
48	Phase 2	City of Poulsbo	X		X	X		X		X	X			X			X
49	Phase 2	City of Puyallup		X			X		X					X			
50	Phase 2	City of Renton		X	X	X	X		X	X	X			X		X	
51	Phase 2	City of Sammamish	X					X									
52	Phase 2	City of Shoreline		X	X				X	X				X	X		
53	Phase 2	City of Sumner				X	X				X					X	
54	Phase 2	City of Tumwater		X	X		X		X	X		X		X			X
55	Phase 2	City of Woodinville			X	X					X					X	
		TOTAL	19	19	22	28	26	17	23	19	24	13	10	21	1	17	13

TABLE C-2
SURVEY RESULTS SUMMARY

			GIS Data Available															
No.	**Phase**	**Jurisdiction/Organization**	**CB type**	**CB dimension**	**CB age**	**Pipe sizes**	**CB elevation**	**System conveyance**	**basins delineations**	**Flow routing**	**Land use**	**Presence/absence of curbs vs. ditches**	**AADT**	**Snow removal routes**	**Snow days**	**Street surface material**	**Construction activities**	**Local precipitation**
1	Phase 1	WSDOT	X	X	X	X	X	X	X	X	X	X	X	X		X		X
2	Phase 1	King County	X	X	X	X	X	X	X		X		X	X				
3	Phase 1	King County DNRP Parks and Recreation	X	X		X		X		X								
4	Phase 1	King County DOT/Road Services Div/Maintenance Section	X	X		X	X	X		X	X	X	X	X				
5	Phase 1	King County International Airport	X	X		X	X	X	X	X	X					X		
6	Phase 1	King County Wastewater Treatment Division				X	X			X								
7	Phase 1	King County/Facilities Management Division																
8	Phase 1	King County/Metro Transit	X			X		X		X								
9	Phase 1	City Of Tacoma	X		X		X		X	X	X	X				X		
10	Phase 1	Pierce County																
11	Phase 1	Seattle Public Utilities	X		X	X		X	X	X	X	X		X				X
12	Phase 1	Highline College				X				X								
13	Phase 1	Port of Seattle	X	X		X	X	X	X	X								
14	Phase 1	Seattle Public School																
15	Phase 1	WA Military Department																
16	Phase 1	Western Washington/Lower Columbia College																
17	Phase 2	Kitsap County	X	X	X	X		X	X	X	X	X	X	X		X	X	X
18	Phase 2	Thurston County	X		X	X	X	X		X	X		X	X		X		
19	Phase 2	Whatcom County	X	X		X	X	X	X	X	X			X		X		
20	Phase 2	City of Algona																

TABLE C-2
SURVEY RESULTS SUMMARY

			GIS Data Available															
No.	**Phase**	**Jurisdiction/Organization**	**CB type**	**CB dimension**	**CB age**	**Pipe sizes**	**CB elevation**	**System conveyance**	**basins delineations**	**Flow routing**	**Land use**	**Presence/absence of curbs vs. ditches**	**AADT**	**Snow removal routes**	**Snow days**	**Street surface material**	**Construction activities**	**Local precipitation**
21	Phase 2	City of Arlington	X	X		X	X	X										
22	Phase 2	City of Auburn	X		X	X	X	X	X	X	X			X		X		
23	Phase 2	City of Bainbridge Island							X									
24	Phase 2	City of Battle Ground																
25	Phase 2	City of Bellevue	X		X	X	X	X	X	X	X			X				
26	Phase 2	City of Bellingham			X	X	X	X	X	X	X	X	X	X		X	X	X
27	Phase 2	City of Bremerton	X	X	X	X	X	X	X	X	X						X	X
28	Phase 2	City of Brier	X			X	X	X	X	X								
29	Phase 2	City of Camas				X			X							X		
30	Phase 2	City of Centralia	X	X		X	X	X	X									
31	Phase 2	City Of Covington	X					X			X	X		X			X	
32	Phase 2	City of Des Moines	X			X	X	X	X	X	X			X				
33	Phase 2	City of Edgewood	X			X					X							
34	Phase 2	City of Everett	X	X	X	X	X	X	X	X	X							
35	Phase 2	City of Federal Way				X		X	X	X	X		X	X				
36	Phase 2	City of Ferndale	X			X		X	X	X	X		X	X				
37	Phase 2	City of Issaquah	X			X	X	X	X		X			X				
38	Phase 2	City of Kent	X	X	X	X	X	X	X	X				X			X	
39	Phase 2	City of Kirkland	X			X		X	X		X	X		X			X	
40	Phase 2	City of Lakewood	X	X		X		X	X	X	X	X		X				
41	Phase 2	City of Mercer Island	X			X		X		X		X		X		X		
42	Phase 2	City of Mill Creek	X		X	X	X	X		X								
43	Phase 2	City of Milton	X			X			X									
44	Phase 2	City of Mount Vernon	X	X		X	X	X	X	X	X			X		X	X	X
45	Phase 2	City of Mukilteo	X					X										

TABLE C-2
SURVEY RESULTS SUMMARY

			GIS Data Available															
No.	**Phase**	**Jurisdiction/Organization**	**CB type**	**CB dimension**	**CB age**	**Pipe sizes**	**CB elevation**	**System conveyance**	**basins delineations**	**Flow routing**	**Land use**	**Presence/absence of curbs vs. ditches**	**AADT**	**Snow removal routes**	**Snow days**	**Street surface material**	**Construction activities**	**Local precipitation**
46	Phase 2	City of Newcastle	X			X		X	X									
47	Phase 2	City of Olympia	X	X	X		X			X	X	X		X		X	X	X
48	Phase 2	City of Poulsbo	X			X	X	X			X							
49	Phase 2	City of Puyallup	X		X	X		X	X		X	X		X	X	X		X
50	Phase 2	City of Renton	X		X	X	X	X	X	X	X						X	
51	Phase 2	City of Sammamish	X			X	X	X			X			X		X		
52	Phase 2	City of Shoreline	X	X	X	X	X	X	X	X	X	X	X	X		X		
53	Phase 2	City of Sumner	X	X			X											
54	Phase 2	City of Tumwater						X		X	X			X		X		
55	Phase 2	City of Woodinville	X	X		X	X	X	X	X		X		X				
		TOTAL	41	19	17	41	29	39	31	32	30	14	9	26	1	16	9	8

TABLE C-2
SURVEY RESULTS SUMMARY

			GIS Inspection and Maintenance Data Available											
No.	**Phase**	**Jurisdiction/Organization**	**Maintenance routes and schedules**	**Inspection dates**	**Maintenance or repair dates**	**Maintenance activities performed**	**Cleaning frequency and dates**	**Cleaning routes**	**Inspection and maintenance records (pre-2007)**	**circuit basis**	**Street sweeping routes and schedule**	**Inspection, maintenance or cleaning costs**	**Field Inspection Form**	**SOP for Inspection and Maintenance**
1	Phase 1	WSDOT	X	X	X	X	X	X					X	X
2	Phase 1	King County											X	
3	Phase 1	King County DNRP Parks and Recreation											X	X
4	Phase 1	King County DOT/Road Services Div/Maintenance Section		X	X	X				X			X	
5	Phase 1	King County International Airport												X
6	Phase 1	King County Wastewater Treatment Division											X	X
7	Phase 1	King County/Facilities Management Division											X	X
8	Phase 1	King County/Metro Transit												
9	Phase 1	City Of Tacoma								X			X	
10	Phase 1	Pierce County												
11	Phase 1	Seattle Public Utilities		X									X	
12	Phase 1	Highline College		X	X	X							X	X
13	Phase 1	Port of Seattle		X	X	X	X						X	
14	Phase 1	Seattle Public School												
15	Phase 1	WA Military Department												
16	Phase 1	Western Washington/Lower Columbia College											X	X
17	Phase 2	Kitsap County	X	X	X	X	X	X			X		X	X
18	Phase 2	Thurston County		X	X	X	X							
19	Phase 2	Whatcom County											X	
20	Phase 2	City of Algona											X	

TABLE C-2
SURVEY RESULTS SUMMARY

			GIS Inspection and Maintenance Data Available											
No.	Phase	Jurisdiction/Organization	Maintenance routes and schedules	Inspection dates	Maintenance or repair dates	Maintenance activities performed	Cleaning frequency and dates	Cleaning routes	Inspection and maintenance records (pre-2007)	circuit basis	Street sweeping routes and schedule	Inspection, maintenance or cleaning costs	Field Inspection Form	SOP for Inspection and Maintenance
21	Phase 2	City of Arlington												
22	Phase 2	City of Auburn												
23	Phase 2	City of Bainbridge Island											X	X
24	Phase 2	City of Battle Ground											X	X
25	Phase 2	City of Bellevue		X			X							X
26	Phase 2	City of Bellingham		X	X	X		X	X		X			
27	Phase 2	City of Bremerton	X	X	X	X	X	X					X	X
28	Phase 2	City of Brier		X	X	X	X			X				
29	Phase 2	City of Camas												
30	Phase 2	City of Centralia		X	X	X	X	X			X			
31	Phase 2	City Of Covington												
32	Phase 2	City of Des Moines	X					X					X	
33	Phase 2	City of Edgewood		X	X	X								
34	Phase 2	City of Everett		X	X		X						X	X
35	Phase 2	City of Federal Way						X			X		X	X
36	Phase 2	City of Ferndale												
37	Phase 2	City of Issaquah		X	X	X	X			X			X	
38	Phase 2	City of Kent		X	X	X	X		X					
39	Phase 2	City of Kirkland	X	X	X	X	X		X		X		X	X
40	Phase 2	City of Lakewood	X								X		X	X
41	Phase 2	City of Mercer Island			X						X		X	
42	Phase 2	City of Mill Creek											X	
43	Phase 2	City of Milton											X	
44	Phase 2	City of Mount Vernon												
45	Phase 2	City of Mukilteo		X			X							

TABLE C-2
SURVEY RESULTS SUMMARY

			GIS Inspection and Maintenance Data Available											
No.	Phase	Jurisdiction/Organization	Maintenance routes and schedules	Inspection dates	Maintenance or repair dates	Maintenance activities performed	Cleaning frequency and dates	Cleaning routes	Inspection and maintenance records (pre-2007)	circuit basis	Street sweeping routes and schedule	Inspection, maintenance or cleaning costs	Field Inspection Form	SOP for Inspection and Maintenance
46	Phase 2	City of Newcastle		X	X	X							X	X
47	Phase 2	City of Olympia		X			X	X					X	X
48	Phase 2	City of Poulsbo											X	
49	Phase 2	City of Puyallup		X	X	X	X	X		X	X			
50	Phase 2	City of Renton	X			X	X	X		X				
51	Phase 2	City of Sammamish												X
52	Phase 2	City of Shoreline											X	X
53	Phase 2	City of Sumner		X									X	
54	Phase 2	City of Tumwater											X	X
55	Phase 2	City of Woodinville	X										X	
		TOTAL	8	22	18	17	16	10	3	6	8	0	33	21

			DATA SUBMITTED SUMMARY					
No.	**Phase**	**Jurisdiction/Organization**	**CB Data in Excel**	**CB Data in GIS**	**Inspection & Maintenance Data in Excel**	**Inspection & Maintenance Data in GIS**	**Field Inspection Form**	**SOP for Inspection and Maintenance**
1	Phase 1	WSDOT	Provided	Missing	Provided	Not Available		Provided: CB Inspection Criteria
2	Phase 1	King County	Not Available	Provided	Provided missing maintenance data, only has task detail from inspection	Not Available	Not Available	Not Available
3	Phase 1	King County DNRP Parks and Recreation	Not Available	Missing	Not Avaialable	Not Available	Missing	Provided
4	Phase 1	King County DOT/Road Services Div/Maintenance Section						
5	Phase 1	King County International Airport						
6	Phase 1	King County Wastewater Treatment Division						
7	Phase 1	King County/Facilities Management Division	Missing	Not available	Missing	Not Available	Provided	Provided
8	Phase 1	King County/Metro Transit						
9	Phase 1	City Of Tacoma	Not Available	Provided;Missing fields: basins delineations landuse Presence/absence of curbs vs. ditches Street surface material	Provided: CB Inspection Spreadsheet	Not Available	Missing	Not Available
10	Phase 1	Pierce County	Not Available		Not Avaialable	Provided : Inspection and Maintenance data for the year 2016. Inspection dates, Maintenance dates and Maintenance activities performed	Not Available	Not Available
11	Phase 1	Seattle Public Utilities	Provided	Missing no GIS data was provided	Provided inspection & maintenance data from 2008-2016	Missing	Missing	Not Available
12	Phase 1	Highline College	Missing CB location	Missing	Missing inspection data & result	Not Available	Provided	Provided
13	Phase 1	Port of Seattle	Not Available	Provided; Missing fields: CB dimention	Provided	Provided	Provided	Provided
14	Phase 1	Seattle Public School						
15	Phase 1	WA Military Department						
16	Phase 1	Western Washington/Lower Columbia College	Not Available	Not Available	Missing	Not Available	Provided	Missing
17	Phase 2	Kitsap County	Provided: Only type and as built date	Provided; Missing fields: pipe sizes, system conveyance,land use, AADT, snow removal routes, street surface material, construction activities,local precipitation	Provided	Missing	Missing	Missing
18	Phase 2	Thurston County						
19	Phase 2	Whatcom County						
20	Phase 2	City of Algona						

			DATA SUBMITTED SUMMARY					
No.	Phase	Jurisdiction/Organization	CB Data in Excel	CB Data in GIS	Inspection & Maintenance Data in Excel	Inspection & Maintenance Data in GIS	Field Inspection Form	SOP for Inspection and Maintenance
21	Phase 2	City of Arlington						
22	Phase 2	City of Auburn	Provided:CB dimensions, location, basin ID, street surface material, flow routing through the system etc in the inspection summary	Missing	Provided: CB inspection summary with inspection date, cleaning routes etc	Not Available	Not Available	Not Available
23	Phase 2	City of Bainbridge Island	Not Available	Missing	Provided: CB inspection and maintenance summary,street sweeping summary(2011-2017), Ditching ffotage/Time tracker(2011-2017), Culvert Installation and cleaning summary(2012-2016)	Not Available	Provided: Manual	Provided : O/M manual
24	Phase 2	City of Battle Ground	Not Available	Not Avaialble	Provided: Inspection data with date	Not Available	Provided	Provided
25	Phase 2	City of Bellevue						
26	Phase 2	City of Bellingham						
27	Phase 2	City of Bremerton	Not Available	Missing	Not Avaialable	Missing	Provided: Manual	Provided: manual
28	Phase 2	City of Brier	Not Available	Missing	Missing	Missing	Not Available	Not Available
29	Phase 2	City of Camas						
30	Phase 2	City of Centralia						
31	Phase 2	City Of Covington						
32	Phase 2	City of Des Moines						
33	Phase 2	City of Edgewood	Not Available	Provided;Missing fields: Landuse	Missing	Provided	Not Available	Not Available
34	Phase 2	City of Everett	Not Available	Provided & Completed	Provided	Provided	MIssing	Missing
35	Phase 2	City of Federal Way	Not Available	Provided;Missing fields: basins delineations, snow removal routes, AADT	Providied CB type and percentage of sediment	Not Available	Missing	Missing
36	Phase 2	City of Ferndale	Not Available	Missing	Provided: CB Inspection findings (2006-2016). CB cleaning date provided in a pdf.	Not Available	Not Available	Not Available
37	Phase 2	City of Issaquah	Not Available	Provided; Missing fields: CB type, CB elevation, Land use, snow removal routes	Not Avaialable	Provided	Missing	Not Available
38	Phase 2	City of Kent	Not Available	Provided;Missing fields: Flow routing, snow removal routes, street surface material,land use	Missing: Inspection dates, cleaning frequency Maintenance records only after 2007 provided	Provided	Not Available	Not Available
39	Phase 2	City of Kirkland	Not Available	Provided; Missing fields: Landuse, snow removal routes, construction activities	Not Avaialable	Not Available	Provided	Provided
40	Phase 2	City of Lakewood						
41	Phase 2	City of Mercer Island						
42	Phase 2	City of Mill Creek	Not Available	Missing	Not Avaialable	Missing	Missing	Not Available
43	Phase 2	City of Milton						
44	Phase 2	City of Mount Vernon						
45	Phase 2	City of Mukilteo	Not Available	Provided. Also available basin delineations	Not Avaialable	Provided. Also available maintenance activities record	Not Available	Not Available

TABLE C-2
SURVEY RESULTS SUMMARY

			DATA SUBMITTED SUMMARY					
No.	**Phase**	**Jurisdiction/Organization**	**CB Data in Excel**	**CB Data in GIS**	**Inspection & Maintenance Data in Excel**	**Inspection & Maintenance Data in GIS**	**Field Inspection Form**	**SOP for Inspection and Maintenance**
46	Phase 2	City of Newcastle						
47	Phase 2	City of Olympia	Provided: data on CB type, CB location, elevation, in snow route or not	Missing	Provided: CB Inspection data with date and work performed	Not Available	Missing	Missing
48	Phase 2	City of Poulsbo	Not Available	Missing	Spreadsheet only has % of sediment and inspection date and performed maintenace or not	Missing	Provided	Not Available
49	Phase 2	City of Puyallup	Provided: CB type, sump depth, street address and year installed	Missing. Provided Contact for GIS person on	Provided: CB inspection data	Not Available	Not Available	Not Available
50	Phase 2	City of Renton	Not Available	Provided: Need clarification on construction activity refers to	Provided: CB cleaning and inspection data	Missing	Not Available	Not Available
51	Phase 2	City of Sammamish						
52	Phase 2	City of Shoreline	same as CB inspection	Provided & Completed	Provided & Completed	Missing	Missing	Missing
53	Phase 2	City of Sumner	Not Available	Manholes, Storm lines and CB's provided in google earth	Not Avaialable	CB's inspection roads, Cb's cleaned provided in google earth	Provided	Not Available
54	Phase 2	City of Tumwater	Not Available	Provided: Only storm conduit, structure and street data. Landuse, street surface material info provided in storm structure inventory master report.	Structure inventory and inspection summary report provided in a pdf and csv file	Missing	Storm structure inventory master report provided	Storm structure inventory master report provided
55	Phase 2	City of Woodinville						
		TOTAL						

TABLE C-3
INTERVIEWS SUMMARY

						Interview			
No.	Phase	Jurisdiction/Organization	Contact Name	Survey Submitted	Data Submitted	Interview Priority Level	OCI Comments	Questions to ask during Interview	Comments
1	Phase 1	WSDOT	Trett Sutter	X	X	Level 2 - May need inspection dates and results or CB locations	Missing CB data		Emailed 4/18/17 to request additional missing data and followed up with clarification requests.
2	Phase 1	King County	Blair Scott	X	X	No Interview - too little data available			
3	Phase 1	King County DNRP Parks and Recreation	David Sizemore	X	X	No Interview - too little data available	missing CB data & inspection & maintenace data		Maintenance checklist and surface water design manual provided
4	Phase 1	King County DOT/Road Services Div/Maintenance Section	Brent Dhoore	X		Level 4 - Interview possible when data arrives; important permittee	waitting for data		
5	Phase 1	King County International Airport	Peter Dumaliang	X		No Interview - too little data available			
6	Phase 1	King County Wastewater Treatment Division	Jeff Lafer	X		Not applicable - no data submitted.			
7	Phase 1	King County/Facilities Management Division	Bill Eckel	X	X	No Interview - too little data available	missing CB location, inspection data, cost and cost data		
8	Phase 1	King County/Metro Transit	Talon Swanson	X	X	No Interview - too little data available			
9	Phase 1	City Of Tacoma	Michael A. Rose, P.E.	X	X	Level 3 - Cost Data or SOP needed.	no SOP & cost data (in SQL and SAP database that the city is using), no field inspection form		Additional information from 1/30 email: "Question 3 answer which I need to add to the survey: We use the WSDOT definition of catch basins although we do not use a minimum sump depth. Question 10: 275,000 a year which includes cleaning and inspection. Question 11 I believe was a cost breakdown by year?: We have spent about 275,000 a year on the program fairly consistently for 2014-2016 before 2014 costs were not tracked. If I was to attempt to separate out the costs for cleaning and inspection I would likely super-swag 65%-75% of the cost is cleaning(The cleaning crew completes the inspection)." Emailed 4/18 to follow-up on data gaps in database fields and schedule in depth interview on cost efficiencies.
10	Phase 1	Pierce County			X	No Interview - too little data available			Contacted to provide additional information on 4/4/17.
11	Phase 1	Seattle Public Utilities	Kate Rhoads	X	X	Level 4 - Interview possible when data arrives; important permittee	Missing GIS data, SOP and cost data. CB data provided by excel change color code to green inpsection and maintaince data provided between 2008 and 2016	asking for GIS data, SOP and cost data	Requested clarification on data uploads via email on 4/21/2017 and followed up with phone conversations.
12	Phase 1	Highline College	Barry Holldorf	X	X	No Interview - too little data available	missing cb location, inspection result and cost might not need to interview since too little data available		
13	Phase 1	Port of Seattle	Jane Dewell	X	X	Level 1 - Inspection dates and results and/or CB locations needed	Port of Seattle uses Maxmo as its database for CB and Inspection data	# of CB from date files ask for SOP verify if Maximo contains inpsection dates, result and CB data.	Interviewed 3/14/17 and discussed additional data needs. Submitted additional data 4/7. Still need additional inspection and maintenance data from Maximo. Additional questions sent on 4/18/17. No additional data available.
14	Phase 1	Seattle Public School	Shelly Kerby	X		Not applicable - no data submitted.			
15	Phase 1	WA Military Department	Rowena Valencia-Gica	X		Not applicable - no data submitted.			
16	Phase 1	Western Washington/Lower Columbia College	Jeff Moenck	X	X	No Interview - too little data available			CB data with CB type, pipe size and year of CB inspection provided in a pdf
17	Phase 2	Kitsap County	Angela Gallardo	X	X	Level 3 - Cost Data or SOP needed.	missing SOP and cost		Emailed 3/8/17 to request additional data. Interviewed on 5/8/17.
18	Phase 2	Thurston County	Ryan Langan	X		Level 4 - Interview possible when data arrives; important permittee	waitting for data		
19	Phase 2	Whatcom County	Cathy Craver	X		Level 4 - Interview possible when data arrives; important permittee	waitting for data		

TABLE C-3
INTERVIEWS SUMMARY

						Interview			
No.	Phase	Jurisdiction/Organization	Contact Name	Survey Submitted	Data Submitted	Interview Priority Level	OCI Comments	Questions to ask during Interview	Comments
20	Phase 2	City of Algona		X	X	No Interview - too little data available			
21	Phase 2	City of Arlington	Ken Clarke	X		Not applicable - no data submitted.			
22	Phase 2	City of Auburn	Chris Thorn	X	X	Level 2 - May need inspection dates and results or CB locations	Has all four critical information from the inspection recoards. Change to level 3 since no SOP and no cost.		Requested clarification on data uploads via email on 4/19/2017.
23	Phase 2	City of Bainbridge Island	Marilyn Guthrie	X	X	Level 2 - May need inspection dates and results or CB locations	only has location for inspected CBs		Provided O/M manual
24	Phase 2	City of Battle Ground	Kelly Uhacz	X	X	Level 2 - May need inspection dates and results or CB locations	move to Level 3, missing Cost and SOP		Requested clarification on data uploads via email on 4/19/2017.
25	Phase 2	City of Bellevue	Don McQuilliams	X		Not applicable - no data submitted.			
26	Phase 2	City of Bellingham	Jason Porter	X		Not applicable - no data submitted.			
27	Phase 2	City of Bremerton	Chance Berthiaume	X	X	Level 1 - Inspection dates and results and/or CB locations needed	missing CB data & inspection & maintenace data Provided storm water facility manual	request for GIS data since their SQL database is linked to GIS verfity if the SQL database contains the CB location, inspection data & result and maintenace data	Interviewed 3/14/17. Program has a dedicated crew that inspects and cleans the catch basins on a circuit basis for 6 months out of each year. No tracking of individual CB inspection results or costs associated with the inspection and maintenance.
28	Phase 2	City of Brier	Rich Maag	X	X	No Interview - too little data available			Given the number of CB's inspected, rebuilt,CB's that require maintenance and cleaned in a pdf
29	Phase 2	City of Camas	Anita Ashton	X		Not applicable - no data submitted.			
30	Phase 2	City of Centralia	Fred Chapman	X		Not applicable - no data submitted.			
31	Phase 2	City Of Covington	Ben Parrish	X		Not applicable - no data submitted.			
32	Phase 2	City of Des Moines	Tyler Beekley	X		Not applicable - no data submitted.			
33	Phase 2	City of Edgewood	Jeremy Metzler	X	X	Level 3 - Cost Data or SOP needed.	missing SOP and cost		Emailed 3/8/17 to request additional data.
34	Phase 2	City of Everett	Grant Moen	X	X	Level 4 - Interview possible when data arrives; important permittee	missing SOP and cost, change color code to green	Ask for 1) field inspection form, 2) what kind of data base is used for cost? 3)SOP is missing however, the inspection and maintanice data providied were very detailed	Requested clarification on data uploads via email on 4/19/2017 and followed up with clarifications requests.
35	Phase 2	City of Federal Way	Tony Doucette	X	X	Level 3 - Cost Data or SOP needed.	missing SOP and cost		Emailed 3/8/17 to request additional data.
36	Phase 2	City of Ferndale	Wendy LaRocque	X	X	Level 2 - May need inspection dates and results or CB locations	missing CB location and inpsectption data		
37	Phase 2	City of Issaquah	Harvey Walker	X	X	Level 1 - Inspection dates and results and/or CB locations needed	CB data provided in GIS, PWO and NPDES inspection date & results provided in GIS.	ask for SOP data and cost data	Left a message on 3/14 and 3/17. Interviewed on 4/03/17. Dates available on GIS only for those CBs inspected. No additional data available. No additional SOP or cost data available.
38	Phase 2	City of Kent	Laura Haren, Chris Couvillion	X	X	Level 1 - Inspection dates and results and/or CB locations needed	CB data provided in GIS, Inspection/Maintenance date &result provided in Excel	verify if Hanses Asset management Program has cost for inpsection ask for SOP data	Interviewed 3/31/17. Resolved multiple survey submission. Second survey is the correct one. No additional data available. Don't have SOP as it is being revised.
39	Phase 2	City of Kirkland	Jenny Gaus	X	X	Level 1 - Inspection dates and results and/or CB locations needed	missing CB inspection date & result	Missing Inspection data and result Ask for cost data	Interviewed 3/30/17. Will look into what additional information they can provide. They have costs for inspection, dates and metrics. May be a good candidate for in-person interviews to extract program efficiencies because they changed their program in the last few years and could compare the inspect+clean at once verson inspect first and only CBs with sediment accumulation. Emailed 4/18/17 to request additional missing data.
40	Phase 2	City of Lakewood	Greg Vigoren	X		Not applicable - no data submitted.			Interviewed 5/5/17.

TABLE C-3
INTERVIEWS SUMMARY

						Interview			
No.	**Phase**	**Jurisdiction/Organization**	**Contact Name**	**Survey Submitted**	**Data Submitted**	**Interview Priority Level**	**OCI Comments**	**Questions to ask during Interview**	**Comments**
41	Phase 2	City of Mercer Island	Hartvigson	X		Not applicable - no data submitted.			
42	Phase 2	City of Mill Creek	Marci Chew	X	X	Level 1 - Inspection dates and results and/or CB locations needed	missing CB location & CB inspection date & result stated database attached to each catch basin in AutoCAD did not see data	ask for CB data, inspectiona data and result, maintanice data ask for maintenacne cost ask for SOP data	Interviewed 4/10/17. Provided additional details about the CB inspection schedule.
43	Phase 2	City of Milton	Jamie Carter	X		Not applicable - no data submitted.			
44	Phase 2	City of Mount Vernon	Blaine Chesterfield	X		Not applicable - no data submitted.			
45	Phase 2	City of Mukilteo	Jennifer Adams	X	X	No Interview - too little data available			
46	Phase 2	City of Newcastle	Audrie Starsy	X		Not applicable - no data submitted.			Connected about data upload request, but no data was uploaded due to lack of required details.
47	Phase 2	City of Olympia	Sue Barclift	X	X	Level 3 - Cost Data or SOP needed.	Missing SOP and cost, has CB coordinate location from the CB inspection data		Emailed 3/8/17 to request additional data.
48	Phase 2	City of Poulsbo	Anja Hart	X	X	Level 1 - Inspection dates and results and/or CB locations needed	missing CB location	Ask for CB data/ location, inspection data & result,& maintainace askf ro cost data and SOP	Interviewed 4/09/17. Requested clarification on data uploads via email on 4/19/2017.
49	Phase 2	City of Puyallup	Jon Wikander	X	X	Level 1 - Inspection dates and results and/or CB locations needed	missing CB location /Data	Ask for CB location/data ask for SOP and CB inspection cost	Contact number provided to get GIS data. Talked Josh Girbich on 4/19/2017 about data availability. Submitted everything they have available at the moment.
50	Phase 2	City of Renton	Kristina Lowthian	X	X	Level 3 - Cost Data or SOP needed.	missing SOP and cost		Emailed 3/8/17 to request additional data.
51	Phase 2	City of Sammamish	Tawni Dalziel	X		Not applicable - no data submitted.			
52	Phase 2	City of Shoreline	Uki Dele	X	X	Level 3 - Cost Data or SOP needed.	missing SOP and cost		Emailed 3/8/17 to request additional data.
53	Phase 2	City of Sumner	Robert Wright	X	X	Level 1 - Inspection dates and results and/or CB locations needed	missing CB inspection date & result	Assume CB location is provided via google earth ask for inspection data/result and maintenance data ask for SOP	
54	Phase 2	City of Tumwater	Amy Georgeson	X	X	Level 2 - May need inspection dates and results or CB locations			Requested clarification on data uploads via email on 4/19/2017. Received additional data on 4/20/17.
55	Phase 2	City of Woodinville	Brian Meyer	X		Not applicable - no data submitted.			
		TOTAL		54	34				

ATTACHMENT D

DATABASE INFORMATION

TABLE D-1
Data Completeness for Selected Jurisdictions

Jurisdiction	Catchbasin Data Completeness (%)		Inspection Data Completeness(%)		Maintenance Data Completeness(%)		Location Data	
	Database Fields	Excluding Missing Data	Database Fields	Excluding Missing Data	Database Fields	Excluding Missing Data	XY Data	Data Format
Tacoma	89	44	100	80	100	80	Yes	GIS
Port of Seattle	55	55	40	20	40	0	Yes	GIS
SPU	27	27	80	80	100	100	Yes	Excel
WSDOT	40	33	80	80	100	100	Yes(Lat/Long)	Excel
Kent	54	46	80	80	100	100	Yes	GIS
Kirkland	78	78	100	60	100	100	Yes(Lat/Long)	Excel
Auburn	78	78	100	60	40	40	No	Excel
Battle Ground	45	27	80	40	100	80	Yes(Lat/Long)	Excel
Tumwater	70	70	80	80	100	100	Yes	GIS
Puyallup	58	42	60	60	80	80	Yes	Excel
Poulsbo	27	27	80	60	60	60	Yes	GIS
Everett	60	60	100	100	100	100	Yes	GIS
King County	93	93	100	100	100	100	No	Excel

King County Database			
Catch Basin Table		WSDOT	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
Shape			
AssetID	Primary	Feature Number	Yes
Component	Primary		
ComponentType	Primary	Feature Type	Yes
DesignType		Grate Type	Yes
PipeCount			
Material			
Diameter	Primary		
WidthA	Primary		
WidthB	Primary		
StructureShape	Primary - NC		
FilterSock			
OutletDepth	Primary		
SumpDepth	Primary		
SumpVolume	Primary		
Sump	Primary	Sump	Yes
TotalDepth	Primary	Bottom depth	Missing
CoverSize			
CoverStyle		Cover Type	Yes
CoverElevation	Primary		
OutletElevation	Primary		
SumpBtmElevation	Primary		
ControlStructure			
SpillControl			
FlowSplitter			
ProprietaryDevice			
OwnerEntity	Primary - NC		
CurrentStatus			
MeasSource			
XYSource			
DateInstalled			
OrigAssetID			
Notes	Primary - NC	Comments	Yes
GlobalID			
Address			
JurisdictionID	Primary	JurisdictionID	Yes
# Fields	15	6	5
% Data Complete		40	33

Design Type	

Abbreviations Used	

ControlStructure	

Notes
There are multiple entries of inspection about the same catchbasin with same inspection date but different time and eventid. Also, comments are different. All entries are included in the database.
CB definition according to survey " A drainage structure with a sump that interrupts the flow of rainwater and allows for settling and collection of sediment, debris, detritus, contaminan
WSDOT does not have a separate CB data. CB data is extracted from Inspection and Maintenance data.
Multiple Inspection and Maintenance records have no AssetID listed
80,053 Non-Matching Inspection Records
748 Non-Matching Maintenance Records
There were multiple entries of " percent full" data for the same eventid. As per response from WSDOT second entry is reported as the correct value.
Inspection Table Data Qualifiers: P = Percent Fill > 100%; M = Percent Fill is Missing
CB Table Data Qualifiers: S = Sump Depth is Listed as equal to or less than 0; M = Sump Depth is Missing

Assumptions
End date is set same as Start date

King County Database			
Inspection Table		WSDOT	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
InspectionID	Primary	EventId	Yes
SedimentDepth	Primary		
PercentFill	Primary	Percent full	Yes
RepairRequired		Need Repair	Yes
SourceControl			
StructuralRating			
FunctionalRating			
ConditionRating			
InspectionDate	Primary	Date	Yes
AssetID	Primary	Feature Number	Yes
Status		Comments	Yes
# Fields	5	4	4
% Data Complete		80	80

Primary Fields Not Filled In	
Diameter	Data not provided
WidthA	Data not provided
WidthB	Data not provided
StructureShape	Data not provided
OutletDepth	Data not provided
SumpDepth	Data not provided
SumpVolume	Data not provided
CoverElevation	Data not provided
OutletElevation	Data not provided
SumpBtmElevation	Data not provided
OwnerEntity	Data not provided
SedimentDepth	Data not provided

Calculated/Filled Fields	
Component	Filled in
EndDate	Same as StartDate

King County Database			
Maintenance Table		WSDOT	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
MaintID	Primary	EventId	Yes
Activity	Primary	Activity	Yes
StartDate	Primary	Date	Yes
EndDate	Primary		
Cost			
Notes		Maintenance Notes	Yes
AssetID	Primary	Feature Number	Yes
# Fields	5	5	5
% Data Complete		100	100

Legend

	Fields present
Missing	Fields present but data missing
	Fields calculated based on other information
NC	Non critical fields
Primary - NC	Primary Field Not Critical

ATTACHMENT D
KING COUNTY DATABASE NOTES

King County Database			
Catch Basin Table		King County	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
Shape			
AssetID	Primary	AssetID	Yes
Component	Primary	Component	Yes
ComponentType	Primary	ComponentType	Yes
DesignType		DesignType	Yes
PipeCount		PipeCount	Yes
Material		Material	Yes
Diameter	Primary	Diameter	Yes
WidthA	Primary	WidthA	Yes
WidthB	Primary	AssetID	Yes
StructureShape	Primary - NC	StructureShape	Yes
FilterSock			
OutletDepth	Primary	OutletDepth	Yes
SumpDepth	Primary	SumpDepth	Yes
SumpVolume	Primary		
Sump	Primary		
TotalDepth	Primary	TotalDepth	Yes
CoverSize		CoverSize	Yes
CoverStyle		CoverStyle	Yes
CoverElevation	Primary	CoverElevation	Yes
OutletElevation	Primary	OutletElevation	Yes
SumpBtmElevation	Primary		
ControlStructure		ControlStructure	Yes
SpillControl		SpillControl	Yes
FlowSplitter		FlowSplitter	Yes
ProprietaryDevice		ProprietaryDevice	Yes
OwnerEntity	Primary - NC	OwnerEntity	Yes
CurrentStatus		CurrentStatus	Yes
MeasSource		MeasSource	Yes
XYSource		XYSource	Yes
DateInstalled		DateInstalled	Yes
OrigAssetID		AssetID	Yes
Notes	Primary - NC	Notes	Yes
GlobalID		GlobalID	Yes
Address		Address	Yes
JurisdictionID	Primary	JurisdictionID	Yes
# Fields	15	14	14
% Data Complete		93.33	93.33

Design Type	

Abbreviations Used	

ControlStructure	

Notes
Percent fill values seem to be very high.
All primary fields are filled in
261 Non-Matching Inspection Records for 2015-16
261 Non-Matching Maintenance Records for 2015-16
128 Non-Matching Maintenance Records for 2011-14
Inspection Table Data Qualifiers: P = Percent Fill > 100%; M = Percent Fill is Missing; K = Old King County Inspection Data
CB Table Data Qualifiers: S = Sump Depth is Listed as equal to or less than 0; M = Sediment Depth is Missing
Covert SedimentDepth from INCH to FEET for all inpsection data tabs
For SumpVolume calculation, covert widthA and widthB to FT from INCH

Assumptions
End date is assumed to be same as Start date
sediment depth was measured in INCH from Inspection raw data
CB widthA and widthB values are in INCH

King County Database			
Inspection Table		King County	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
InspectionID	Primary	CB_GUID	Yes
SedimentDepth	Primary	Sediment_MD	Yes
PercentFill	Primary		
RepairRequired			Yes
SourceControl			
StructuralRating			
FunctionalRating			
ConditionRating			
InspectionDate	Primary	InspectionDate	Yes
AssetID	Primary	AssetID	Yes
Status			
# Fields	5	5	5
% Data Complete		100	100

Primary Fields Not Filled In	

Calculated/Filled Fields	
Sump Volume	Calculated based on Diameter/ Width and sump depth
Sump Bottom Elevation	Calculated based on cover elevation and total depth
Percent Fill	Calculated
Activity	Filled in based on Cleaning Date
EndDate	Same as StartDate

King County Database			
Maintenance Table		King County	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
MaintID	Primary	CB_GUID	Yes
Activity	Primary		
StartDate	Primary	MaintCle_1	Yes
EndDate	Primary		
Cost			
Notes			
AssetID	Primary	AssetID	Yes
# Fields	5	5	5
% Data Complete		100	100

Legend

	Fields present
Missing	Fields present but data missing
	Fields calculated based on other information
NC	Non critical fields
Primary - NC	Primary Field Not Critical

King County Database			
Catch Basin Table		WSDOT	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID		GIS_FEATURE_KEY	Yes
Shape			
AssetID	Primary	ASSETNUM	Yes
Component	Primary	MEASUREPOINT_CATEGORY_NAME	Yes
ComponentType	Primary	GIS_FEATURE_TYPE	Yes
DesignType			
PipeCount			
Material			
Diameter	Primary		
WidthA	Primary		
WidthB	Primary		
StructureShape	Primary - NC		
FilterSock			
OutletDepth	Primary		
SumpDepth	Primary		
SumpVolume	Primary		
Sump	Primary		
TotalDepth	Primary		
CoverSize			
CoverStyle			
CoverElevation	Primary		
OutletElevation	Primary		
SumpBtmElevation	Primary		
ControlStructure			
SpillControl			
FlowSplitter			
ProprietaryDevice			
OwnerEntity	Primary - NC		
CurrentStatus		ASSET_STATUS	Yes
MeasSource			
XYSource			
DateInstalled		INSTALLDATE	Yes
OrigAssetID			
Notes	Primary - NC		
GlobalID			
Address		ADDRESS	Yes
JurisdictionID	Primary	JurisdictionID	Yes
# Fields	15	4	4
% Data Complete		27	27

Design Type	
CB	Catch Basin

Abbreviations Used	

ControlStructure	

Notes
95,029 non-matching inspection data
817 Assset ID missing maintenace data, 5,876 non-matching inspection data
SedunebtDepth is measured in tenths of a foot, comverted to ft
some SedimentDepth values are unreasonally high, >30ft
convert MeasureDate data from General digits to Short Date format
Based on inspection descrption, removed all inspection that is not associated with sediment removal (removed inspection data if the descrption is CB casting worn, CB inlet debris, CB inlet roots, CB outfall debris, CB outfall roots, CB structure defects, CB trap, QA inpsection, Standard top - catch basin etc)
removed 11,556 maintenace data that are not related with sediment removal
CB Table Data Qualifiers: S = Sump Depth is Listed as equal to or less than 0
Inspection Table Data Qualifiers: P = Percent Fill > 100%; M = Percent Fill is Missing

Assumptions
End date is set same as Start date

King County Database			
Inspection Table		WSDOT	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
InspectionID	Primary	POINTNUM	Yes
SedimentDepth	Primary	MEASUREMENTVALUE	Yes
PercentFill	Primary		
RepairRequired			
SourceControl			
StructuralRating			
FunctionalRating			
ConditionRating			
InspectionDate	Primary	MEASUREDATE	Yes
AssetID	Primary	ASSETNUM	Yes
Status		Description	Yes
# Fields	5	4	4
% Data Complete		80	80

Primary Fields Not Filled In	
Diameter	Data not provided
WidthA	Data not provided
WidthB	Data not provided
OutletDepth	Data not provided
SumpDepth	Data not provided
SumpVolume	Data not provided
Sump	Data not provided
TotalDepth	Data not provided
CoverElevation	Data not provided
OutletElevation	Data not provided
SumpBtmElevation	Data not provided
PercentFill	Sump Depth data not provided, Unable to Calculate

Calculated/Filled Fields	
StartDate	Same as EndDate

King County Database			
Maintenance Table		WSDOT	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
MaintID	Primary	WONUM	Yes
Activity	Primary	INSP/MAINT	Yes
StartDate	Primary		
EndDate	Primary	ACTFINISH	Yes
Cost		WorkOrder_Costs	Yes
Notes		WODESC	Yes
AssetID	Primary	ASSETNUM	Yes
# Fields	5	5	5
% Data Complete		100	100

Legend

	Fields present
Missing	Fields present but data missing
	Fields calculated based on other information
NC	Non critical fields
Primary - NC	Primary Field Not Critical

ATTACHMENT D
TACOMA DATABASE NOTES

King County Database			
Catch Basin Table		Tacoma	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
Shape			
AssetID	Primary	FACILITYID/ORACLEID	Missing
Component	Primary		
ComponentType	Primary	INLETTYPE	Yes
DesignType		CBTYPE	Yes
PipeCount			
Material		MATERIAL	Missing
Diameter	Primary	DIAMETER	Missing
WidthA	Primary	NC	
WidthB	Primary	NC	
StructureShape	Primary - NC		
FilterSock			
OutletDepth	Primary	NC	
SumpDepth	Primary	SumpDepth	Yes
SumpVolume	Primary		Missing
Sump	Primary		
TotalDepth	Primary	NC	
CoverSize			
CoverStyle		LIDSTYLETY	Yes
CoverElevation	Primary	RIMELEV	Yes
OutletElevation	Primary	NC	
SumpBtmElevation	Primary	NC	
ControlStructure		FLOWCONTRO	Yes
SpillControl			
FlowSplitter		FLOWSPLITT	Yes
ProprietaryDevice			
OwnerEntity	Primary - NC	OWNEDBY	Yes
CurrentStatus			
MeasSource			
XYSource			
DateInstalled		INSTALLDAT	Yes
OrigAssetID			
Notes	Primary - NC	COMMENTS	Yes
GlobalID			
Address			
JurisdictionID	Primary	JurisdictionID	Yes
# Fields	15	8	4
% Data Complete		89	44

Design Type	
CURBINLET	
SLOTDRAIN	
Type 1	
TYPE 1	
TYPE 1 L	
TYPE2	
UNK	
YARDDRAIN	

Abbreviations Used

ControlStructure

Notes
According to their survey they use WSDOT definition for a catchbasin(i.e. 12 in minimum sump depth) but do not use a minimum sump depth.
Majority of the Diameter field was filled in as zero in the data provided(they can be rectabgular in shape but noinformation on their widths)
Maintenance Start and End date are recorded as "NULL" if no cleaning is required.
DesignType information is available for very few CB's.
From the data provided only CB's owned by City of Tacoma are included in the database.
"Repair required" codes 0,1,2,3,4 are used in the database as provided in the data.
SLOTDRAIN,YARDDRAIN data are removed
736 Non-Matching Inspection Records
736 Non-Matching Maintenance Records
Data quality of percent filled is questionable due to varying depth measurements.
Coverted SumpDepth, SedimentDepth from inch to feet.
Inspection Table Data Qualifiers: P = Percent Fill > 100%; M = Percent Fill is Missing
CB Table Data Qualifiers: S = Sump Depth is Listed as equal to or less than 0

King County Database			
Inspection Table		Tacoma	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
InspectionID	Primary		
SedimentDepth	Primary	SedimentDepth	Yes
PercentFill	Primary		
RepairRequired		Repair	Yes
SourceControl		SourceControl	Yes
StructuralRating			
FunctionalRating			
ConditionRating			
InspectionDate	Primary	CBAsmtDate	Yes
AssetID	Primary	SAPID	Yes
Status			
# Fields	5	5	4
% Data Complete		100	80

King County Database			
Maintenance Table		Tacoma	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
MaintID	Primary		
Activity	Primary		
StartDate	Primary	CleaningDate	Yes
EndDate	Primary	CleaningDate	Yes
Cost			
Notes		Comments	Yes
AssetID	Primary	SAPID	Yes
# Fields	5	5	4
% Data Complete		100	80

Legend

	Fields present
Missing	Fields present but data missing
	Fields calculated based on other information
NC	Non critical fields
Primary - NC	Primary Field Not Critical

Assumptions
StructureShape is filled in as "Round" for the ones with diameter > 0 in the data provided.
It is assumed to have a sump when the SumpDepth is > 0 in the data provided.
Maintenance End date is assumed to be same as Start date.
SourceControl 0-No and 1-Yes
Status field in Inspection Table and Activity field in Maintenance table filled in based on Cleaning date. If the cleaning date is NULL it means its not cleaned.

Primary Fields Not Filled In	
WidthA	Not provided in the data
WidthB	Not provided in the data
OutletDepth	Not provided in the data
Total Depth	Not provided in the data
Component	Not provided in the data
OutletElevation	Not provided in the data

Calculated/Filled Fields	
Sump Volume	Calculated only for the CB's with both diameter and sump depth given.
Sump	Filled in
Percent Fill	Calculated based on sump depth and sediment depth.
Status	Filled in based on CleaningDate
Activity	Filled in based on CleaningDate

ATTACHMENT D
EVERETT DATABASE NOTES

King County Database			
Catch Basin Table		Everett	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
Shape			
AssetID	Primary	TUMMS_ID	Yes
Component	Primary		
ComponentType	Primary	CODE	Yes
DesignType		CATCH_BASIN_TYPE_CODE	Yes
PipeCount			
Material			
Diameter	Primary		
WidthA	Primary		
WidthB	Primary		
StructureShape	Primary - NC		
FilterSock			
OutletDepth	Primary	NC	
SumpDepth	Primary	DEPTH	Yes
SumpVolume	Primary		
Sump	Primary	NC	
TotalDepth	Primary	NC	
CoverSize			
CoverStyle			
CoverElevation	Primary	RIM_ELEVATION	Yes
OutletElevation	Primary	NC	
SumpBtmElevation	Primary	NC	
ControlStructure			
SpillControl			
FlowSplitter			
ProprietaryDevice			
OwnerEntity	Primary - NC	Owner	Yes
CurrentStatus		STATUS_COD	Yes
MeasSource			
XYSource			
DateInstalled		INSTALLATION_DATE	Yes
OrigAssetID		TUMMS_ID	Yes
Notes	Primary - NC		
GlobalID			
Address		ADDRESS	Yes
JurisdictionID	Primary	JurisdictionID	Yes
# Fields	15	6	6
% Data Complete		60	60

Design Type	
A	CB Type A
B	CB Type B
Bio	Biofilter
CB	CB Unknown
CIL	Curb Inlet
II	CB Type II
IL	Inlet
SED	Sedimentation Trap
DCB	Catch Basin
DIL	Inlet
	Sediments

Abbreviations Used	
COE	City of Everett
DD5	Diking District 5
PRIV	Private

ControlStructure	

Notes
According to the survey CB definition is any stormwater structure with a sump greater than 0.6 ft. All inlets and CB's are included in the database irrespective of their depth.
Sediment % fill doesn't look correct. Very high values upto 5000 observed.
Cost in maintenance database is the total cost of the work order.
2191 Non-Matching Inspection Records
815 Non-Matching Maintenance Records
CB's owned by Diking District 5 and Private are also included in the database since there are inspection and maintenance data for some of the privately owned CB's.
Inspection data in Inspection Archive sheet is included.
Address provided in CB data doesn't look correct.
Inspection ID provided is not unique.
Inspection Table Data Qualifiers: P = Percent Fill > 100%; M = Percent Fill is Missing
CB Table Data Qualifiers: S = Sump Depth is Listed as equal to or less than 0

Assumptions
Start date in Maintenance table is assumed to be same as end date.

ATTACHMENT D
EVERETT DATABASE NOTES

King County Database			
Inspection Table		Everett	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
InspectionID	Primary	InspectionID	Yes
SedimentDepth	Primary	Sediment Depth	Yes
PercentFill	Primary	SEDIMENTPERC	Yes
RepairRequired		DAMAGE	Yes
SourceControl			
StructuralRating			
FunctionalRating			
ConditionRating			
InspectionDate	Primary	Inspection Started	Yes
AssetID	Primary	TUMMS_ID	Yes
Status		Comments	Yes
# Fields	5	5	5
% Data Complete		100	100

Primary Fields Not Filled In	
OutletDepth	Data not provided
Sump	Data not provided
TotalDepth	Data not provided
OutletElevation	Data not provided
SumpBtmElevation	Data not provided

Calculated/Filled Fields	
Component	Filled in
StartDate	Same as EndDate

King County Database			
Maintenance Table		Everett	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
MaintID	Primary	Work Order Number	Yes
Activity	Primary	ACTIVITY_CODE	Yes
StartDate	Primary		
EndDate	Primary	COMPLETED_DATE	Yes
Cost		TOTAL_COST	Yes
Notes		Remarks	Yes
AssetID	Primary	STRUCT_1	Yes
# Fields	5	5	5
% Data Complete		100	100

Legend

	Fields present
Missing	Fields present but data missing
	Fields calculated based on other information
NC	Non critical fields
Primary - NC	Primary Field Not Critical

King County Database		Kent	
Catch Basin Table			
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
Shape			
AssetID	Primary	COMPKEY	Yes
Component	Primary		
ComponentType	Primary	STRUC_TYPE	Yes
DesignType		SPECS	Yes
PipeCount			
Material		SPECS2	Yes
Diameter	Primary	SPECS	Missing
WidthA	Primary	NC	
WidthB	Primary	NC	
StructureShape	Primary - NC		
FilterSock			
OutletDepth	Primary		
SumpDepth	Primary		
SumpVolume	Primary		
Sump	Primary		
TotalDepth	Primary		
CoverSize			
CoverStyle			
CoverElevation	Primary	RIM_EL	Yes
OutletElevation	Primary	INVERT_EL	Yes
SumpBtmElevation	Primary		
ControlStructure		CONTROL	Yes
SpillControl			
FlowSplitter			
ProprietaryDevice			
OwnerEntity	Primary - NC	OWNER	Yes
CurrentStatus			
MeasSource			
XYSource			
DateInstalled		AGE	Yes
OrigAssetID			
Notes	Primary - NC		
GlobalID		GLOBALID	Yes
Address			
JurisdictionID	Primary	JurisdictionID	Yes
# Fields	15	7	6
% Data Complete		54	46

Design Type	
CB	Definition according to survey
Inlet	A storm structure with NO SUMP (may have any lid type)
Catch Basin Type I	A rectangular shaped storm basin WITH SUMP (may have any lid type).
Catch Basin Type II	A barrel shaped storm basin WITH SUMP (may have any lid type). Per City of Kent Construction Standards, steps or a ladder are required if the height between the rim and lowest invert is greater than 4ft.
Manhole	An access point into a channeled storm line or storm pipe (neither with sump) (may have any lid type).
Control	Any storm basin that has a control structure (flow restrictor or FROP) within it.
Access to a Detention Tank, Detention Vault, Detention Pipe, or Storm Filter Vault	A distinct access point into a detention vault, detention tank, detention pipe, or storm filter vault (may have any lid type).

Abbreviations Used	

ControlStructure	
FC	
FCWQ	
No	
NULL	
WQ	
WQFC	

Notes
4,941 Non-Matching Inspection Records
5,503 Non-Matching Maintenance Records
431 Catchbasins found without AssetID(Compkey). AssetID (UNK001,...UNK431) were created for them. Their locations are available in the GIS data.
Diameter of CB known for only 1% of the data.
Only CB's owned by KENT included since City of Kent inspects and maintains only CB's owned by them.
CB data is not filtered based on design type(all types are included).
Inspection Table Data Qualifiers: A = Assumed 60% Fill
CB Table Data Qualifiers: S = Sump Depth is Listed as equal to or less than 0; M = Sump Depth is Missing
ControlStructure abbreviation definitions were not found in information from City
Removed maintenance data before 2010, since inspection data started in 2010.

Assumptions
StructureShape is filled in as Round for the ones with known diameter.
During inspection if the percent sediment <= 60%, it is not cleaned and the status is reported as "PASS". For all the CB's with status "PASS" percent sediment is reported as zero.
During inspection if the percent sediment >60%, it is cleaned and the status is reported as "FAIL". For all the CB's with status "FAIL" percent sediment is reported as 60%.
Maintenance End date is filled in same as Start date.
From the maintenance data provided only Activity with "CATCHBASIN PUMP" and "STORM MANHOLE CLEAN" are included in the database.

ATTACHMENT D
KENT DATABASE NOTES

King County Database		Kent	
Inspection Table			
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
InspectionID	Primary	Inspection_Detail	Yes
SedimentDepth	Primary		
PercentFill	Primary		
RepairRequired		PassFail_Repair	Yes
SourceControl			
StructuralRating			
FunctionalRating			
ConditionRating			
InspectionDate	Primary	Inspection_Date	Yes
AssetID	Primary	COMPKEY	Yes
Status		PassFail_Clean	Yes
# Fields	5	4	4
% Data Complete		80	80

Primary Fields Not Filled In	
WidthA	Data not provided
WidthB	Data not provided
OutletDepth	Data not provided
SumpDepth	Data not provided
SumpVolume	Data not provided
Sump	Data not provided
TotalDepth	Data not provided
SumpBtmElevation	Data not provided
Notes	CB Notes field in GIS does not look relevant.
Sediment Depth	Data not provided. Also, cannot be calculated with PercentFill as sump depth data is not provided.

Calculated/Filled Fields	
Component	Filled in
StructureShape	Filled in
PercentFill	Based on PassFail_Clean
EndDate	Same as StartDate

King County Database		Kent	
Maintenance Table			
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
MaintID	Primary	Maintenance_Activity- Work Order Number	Yes
Activity	Primary	Maintenance_Activity/ Activity Description	Yes
StartDate	Primary	Maintenance_Date	Yes
EndDate	Primary		
Cost		Maintenance_Cost	Yes
Notes			
AssetID	Primary	COMPKEY	Yes
# Fields	5	5	5
% Data Complete		100	100

Legend

	Fields present
Missing	Fields present but data missing
	Fields calculated based on other information
NC	Non critical fields
Primary - NC	Primary Field Not Critical

ATTACHMENT D
KIRKLAND DATABASE NOTES

King County Database			
Catch Basin Table		Kirkland	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
Shape			
AssetID	Primary	UNITID	Yes
Component	Primary		
ComponentType	Primary	NODE_TYPE	Yes
DesignType		CB_TYPE	Yes
PipeCount			
Material			
Diameter	Primary	SIZE_	Yes
WidthA	Primary	NC	
WidthB	Primary	NC	
StructureShape	Primary - NC		
OutletDepth	Primary	NC	
SumpDepth	Primary	Depth2	Yes
SumpVolume	Primary		
Sump	Primary		
TotalDepth	Primary	NC	
CoverSize			
CoverStyle			
CoverElevation	Primary	RIM_ELEV	Yes
OutletElevation	Primary	NC	
SumpBtmElevation	Primary	NC	
ControlStructure		L_CONTROL	Yes
SpillControl		L_OVERFLOW	Yes
FlowSplitter		FLOWSPLIT	Yes
ProprietaryDevice			
OwnerEntity	Primary - NC	OWNERSHIP	Yes
CurrentStatus			
MeasSource			
XYSource			
DateInstalled		INSTYEAR	Yes
OrigAssetID			
Notes	Primary - NC		
GlobalID			
Address		Address	Yes
JurisdictionID	Primary	JurisdictionID	Yes
# Fields	15	7	7
% Data Complete		78	78

Design Type	
40	Type 40
CURB	Curb Inlet
FLTRR	filterra
I	Type I
I-L	Type I-L
II	Type II
INLET	I-Inlet
IWSDOT	I-WSDOT
OTHER	Other
SF-1	Storm Filter-1
SF-2	Storm Filter-2
SF-3	Storm Filter-3
SF-4	Storm Filter-4
SF-5	Storm Filter-5
UICW	UICW
UICWPS	UICW Presetting

Abbreviations Used	

ControlStructure	

Notes
According to survey anything with sump depth >= 12 in is a CB. All data with sump depth <12 in are removed in the database.
Width A and Width B not available for catchbasins that are rectangular in shape. They are mostly Inlets,Type-I or Type I-L catchbasins.
Cover Elevation, Outlet elevation and Sump Bottom elevation are all zero's.
There are few entries with InspectionID as zero.
Sediment depth are all zeros in the data
There are few entries with AssetID as zero.
15,103 Non-Matching Inspection Records
45,312 Non-Matching Maintenance Records
Inspection Table Data Qualifiers: P = Percent Fill > 100%; M = Percent Fill is Missing
CB Table Data Qualifiers: S = Sump Depth is Listed as equal to or less than 0
Covert sump depth to FEET from INCH
Removed data that has a DesignType of "OTHER" in the CB tab
Removed CB data for Kirkland AssetID -37735,36802,37808,10610,27222,24749,24625 because they belong to WSDOT or other jurisdictions.
Removed maintenace data that are not related with sediment cleaning, and remove data that are not in the inspection data

Assumptions
EndDate in Maintenance table is assumed to be same as StartDate
Sump depth measure in INCH

King County Database			
Inspection Table		Kirkland	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
InspectionID	Primary	WorkOrderNum	Yes
SedimentDepth	Primary	SedimentDepth	Missing
PercentFill	Primary		Missing
RepairRequired			
SourceControl			
StructuralRating			
FunctionalRating			
ConditionRating			
InspectionDate	Primary	StartDate	Yes
AssetID	Primary	UnitID	Yes
Status		CB_Inspection_Status	Yes
# Fields	5	5	3
% Data Complete		100	60

Primary Fields Not Filled In	
Component	No information in the data provided
WidthA	No information in the data provided
WidthB	No information in the data provided
OutletDepth	No information in the data provided
Sump	No information in the data provided
TotalDepth	No information in the data provided
SedimentDepth	All zeros in the data

Calculated/Filled Fields	
SumpVolume	Sump Volume is calculated using sump depth and diameter.
StructureShape	StructureShape filled in based on City of Kirkland catchbasin specifications. StructureShape not known for design types OTHER,IWSDOT and INLET.
Percent Fill	
EndDate	Same as StartDate

King County Database			
Maintenance Table		Kirkland	
Database Fields	Type of Field	Database Fields	Has Data?
OBJECTID			
MaintID	Primary	WO_NUMBER	Yes
Activity	Primary	Maint_Activity	Yes
StartDate	Primary	WO_Date	Yes
EndDate	Primary		
Cost		Maintenance_Cost	Yes
Notes			
AssetID	Primary	UnitID	Yes
# Fields	5	5	5
% Data Complete		100	100

Legend

	Fields present
Missing	Fields present but data missing
	Fields calculated based on other information
NC	Non critical fields
Primary - NC	Primary Field Not Critical

King County Database				
Catch Basin Table		Tumwater		
Database Fields	Type of Field	Database Fields	Has Data?	Notes
OBJECTID				
Shape				
AssetID	Primary	FACILITYID	Yes	
Component	Primary			
ComponentType	Primary	STRUCTTYPE	Yes	
DesignType		Structure Detail	Yes	
PipeCount				
Material		Wall Material	Yes	
Diameter	Primary	Structure Detail	Yes	
WidthA	Primary	NC		
WidthB	Primary	NC		
StructureShape	Primary - NC			
FilterSock				
OutletDepth	Primary	NC		
SumpDepth	Primary			
SumpVolume	Primary			
Sump	Primary			
TotalDepth	Primary	Struct. Depth	Yes	
CoverSize				
CoverStyle		COVERTYPE	Yes	
CoverElevation	Primary	RIMELEVATI	Yes	
OutletElevation	Primary	NC		
SumpBtmElevation	Primary	NC		
ControlStructure				
SpillControl				
FlowSplitter				
ProprietaryDevice				
OwnerEntity	Primary - NC	OWNEDBY	Yes	
CurrentStatus				
MeasSource				
XYSource				
DateInstalled				
OrigAssetID				
Notes	Primary - NC	Comment	Yes	
GlobalID		GlobalID	Yes	
Address				
JurisdictionID	Primary	JurisdictionID	Yes	
# Fields	15	7	7	
% Data Complete		70	70	

Design Type	

Abbreviations Used	

ControlStructure	

Notes
580 Non-Matching Inspection Records
572 Non-Matching Maintenance Records
According to survey anything with a sump is defined as a catchbasin.
Non-matching inspection and maintenance recoards missing asset ID to associate CB with inspection/maintenace
Inspection Table Data Qualifiers: P = Percent Fill > 100%; M = Percent Fill is Missing
CB Table Data Qualifiers: S = Sump Depth is Listed as equal to or less than 0; M = Sump Depth is Missing

Assumptions
End date is assumed to be same as Start data

King County Database				
Inspection Table		Tumwater		
Database Fields	Type of Field	Database Fields	Has Data?	Notes
OBJECTID				
InspectionID	Primary	Inspection Type Text	Yes	
SedimentDepth	Primary	Debris Depth	Yes	
PercentFill	Primary			
RepairRequired		Cleaning	Yes	
SourceControl				
StructuralRating				
FunctionalRating				
ConditionRating				
InspectionDate	Primary	Date Inspected	Yes	
AssetID	Primary	Assest Number	Yes	
Status				
# Fields	5	4	4	
% Data Complete		80	80	

Primary Fields Not Filled In	
WidthA	Data not provided
WidthB	Data not provided
OutletDepth	Data not provided
SumpDepth	Data not provided
SumpVolume	Sump Depth data not provided, Unable to Calculate
Sump	Data not provided
OutletElevation	Data not provided
SumpBtmElevation	Data not provided
PercentFill	Sump Depth data not provided, Unable to Calculate

Calculated/Filled Fields	
Component	Filled in
StartDate	Same as EndDate

King County Database				
Maintenance Table		Tumwater		
Database Fields	Type of Field	Database Fields	Has Data?	Notes
OBJECTID				
MaintID	Primary	Work Order Number	Yes	
Activity	Primary	Activity	Yes	
StartDate	Primary	Start Dt	Yes	
EndDate	Primary	Completed Date	Yes	
Cost		*TotalCost	Yes	
Notes				
AssetID	Primary	Structure #	Yes	
# Fields	5	5	5	
% Data Complete		100	100	

Legend

	Fields present
Missing	Fields present but data missing
	Fields calculated based on other information
NC	Non critical fields
Primary - NC	Primary Field Not Critical

ATTACHMENT E

DATABASE FILES

(DIGITAL FILES ONLY)

Appendix A4

Catch Basin Inspection and Maintenance Data Analysis

Summary of Uploaded Data for Analysis

Catch basin inspection and maintenance data for eight permittees were uploaded into the project database. Phase 1 permittees included King County, Seattle, and Tacoma (Table A4-1). Phase 2 permittees included Everett, Kent, Kirkland, and Tumwater. Washington Department of Transportation data were recorded as having their own general permit. All of these permittees use the standard inspection schedule except for Tacoma, which uses a circuit approach, and King County which uses a combined circuit and standard inspection schedule. Sump depths were available for four of the eight permittees. Seven of eight permittees use the 60% sediment depth as their cleaning trigger; Tumwater uses a 33% trigger. Some permittees only record exceedance of their threshold (3 permittees), while some record measured sediment depths and/or percent of sump filled (5 permittees).

Table A4-1. Summary of CB Inspection Programs

	WSDOT	King County	Seattle	Tacoma	Everett	Kent	Kirkland	Tumwater
Phase	General	1	1	1	2	2	2	2
Inspection schedule *	Std - Annual	Std & Alt2 - Annual	Std - Annual	Alt2 - Annual	Std - 2 yrs	Std - 2 yrs	Std - 2 yrs	Std - 2 yrs
Sump depths	No	Yes	No	Yes	Yes	No	Yes	No
Sediment depth measured?	No	Yes	Yes	Yes	Yes	No	No	Yes
Percent full	Yes	Calculated	No	Calculated	Yes	Pass/Fail	Pass/Fail	Cleaning need
Cleaning trigger	60%	60%	60%	60%	60%	60%	60%	33%
Use Circuits?	No	Yes	No	Yes	No	No	No	No

*Early permit requirements were less stringent.

Analytical Tiers

Two data quality tiers were defined, low and high confidence, to balance data quantity with uncertainty. Low confidence tier data has higher uncertainty than high confidence tier data but contains a larger dataset. The high confidence tier is a smaller dataset taken from the low confidence tier and associated with greater certainty, i.e., higher data quality.

Data provided by permittees varied in time span, sump depth measurements and presence of inlet data. Assumptions were established to define the scope, limit bias and define rules for large uncertainties (Table A4-2). Rules 1-4 in Table A4-2 define the time period of records, eliminate inlet data, and define the starting point for accumulation rate calculations. These rules applied to both tiers of analysis. Rules 5-7 were developed to define a high confidence tier dataset with reduced uncertainty regarding the different behavior of small versus large sumps, the impact of time between inspections on accumulation rate, and which of multiple sump depth measurements is correct.

Table A4-2 General Assumptions Applied to All Permittees' Data

Assumption #	Low Confidence Tier	Rationale	High Confidence Tier	Rationale
1	Include 2007 data and more recent (no inspection between 1/1/2007 and effective date of permit 2/16/2007)	Scope of this project is last two permit cycles	Same	Same
2	At least one cleaning and two inspections must be provided for a CB.	The change in sediment depth from cleaning to one inspection is not enough to compare failure or accumulation rates.	Same	Same
3	Include CBs with sumps OR sediment depth record > 0.0 ft. OR have % Full or P/F.	Eliminate inlets or structures with no sumps	Same	Same
4	Cleanings before 1st inspection are used as Time Zero for accumulation rate calculations.	There is not always a previous inspection in the database that triggered a cleaning. Need starting point for accumulation rate calculations.	Same	Same
5	Use all CBs with Sump depth > 0	Assumed that sumps of any depth behave the same in terms of accumulation rate.	Use CBs with >12" sump.	Sumps less than ~12" behave differently than larger sumps (assumption).

Assumption #	Low Confidence Tier	Rationale	High Confidence Tier	Rationale
6	Use all inspections regardless of time between inspections	The time between inspections does not skew accumulation rate calculations.	Apply maximum number of days allowed between inspections. Maximum =18 months for Phase 1 and 30 months for Phase 2	Assumption that large gap between inspections skews accumulation rate.
7	Use last record of sump depth when there is more than 1 measurement.	The last record is more accurate if permittee became more precise with time.	Don't include CBs that have multiple sump measurements.	It is uncertain which sump measurement is correct.

Some permittee-specific assumptions were developed because of large uncertainties that impacted substantial amounts of data (Table A4-3). Rules for Tacoma, Everett, and Seattle Public Utilities (SPU) were developed based on consultation with permittee contacts for advice to deal with uncertainties. In the case of SPU, the project team and Technical Advisory Committee (TAC) decided that CSO CBs should be included with the MS4 CBs because their functions are the same.

Table A4-3. Permittee-Specific Assumptions for Low and High Confidence Tiers

Permittee	#	Low Confidence Tier	Rationale	High Confidence Tier	Rationale
WSDOT		None		None	
King County		None		None	
Kent		None		None	
Seattle (SPU)	1	All sumps are 2.5' depth and inspection failure occurs at 1.5' feet (60%).	Seattle informed KC: 1.5 feet is their cleaning threshold and they assume all sumps are 2.5 ft. Because they don't measure sump depths, this assumption has high uncertainty.	Assume we don't know sump depths.	Sump depths are uncertain. Measure-ments not available.
	2	Include MS4 and CSO CBs.	CSO and MS4 CBs function the same.	Same as low confidence tier	
Tacoma	1	Use most recent sump depth if >1 record.	Instructions from Tacoma.	Don't include CBs that have multiple sump measurements.	Uncertain which sump measurement is correct.
	2	Use last sediment depth on same date if >1 record.	Instructions from Tacoma.	Same as low confidence tier.	
Everett	1	Remove CBs with DIL prefix b/c they are inlets.	Instructions from Everett.	Same as low confidence tier.	

The application of assumptions resulted in the exclusion of Tumwater and Kirkland data because their records did not contain more than one inspection per CB. Table A4-4 summarizes the number of inspection and cleaning records and total CBs that remained for each permittee after applying Low and High Confidence Tier assumptions.

Table A4-4. Summary of Database Records for each Tier

Permittee	Tier	# Inspections	# Cleanings	Total CBs
Everett	Low Confidence	11,469	3,997	4,819
	High Confidence	1,461	164	507
Kent	Low Confidence	23,246	11,864	9,549
King County	Low Confidence	7,706	1,457	2,517
	High Confidence	2,362	209	803
SPU MS4	Low Confidence	141,796	42,873	19,084
SPU CSO	Low Confidence	69,855	25,752	12,500
Tacoma	Low Confidence	3,752	3,035	1,679
	High Confidence	1,485	1,092	635
WSDOT	Low Confidence	30,193	12,379	9,382
All	Total	293,325	102,822	61,475

Analytical Methods

A review of available studies was completed by the project team to identify any examples of measuring or estimating CB sediment accumulation. Several studies looked at cleaning frequency on CB maintenance. However, these studies were conducted in California or the East Coast, and had unspecified CB designs or different designs than those typically used in Western Washington. Pitt and Bissonnette (1984) was the only published study identified that estimated municipal CB accumulation rates in the Western Washington region. This study found that CB sump sediments tended to stabilize around 60% full. This study was used to define the threshold for maintenance in the SWMMWW (i.e., 60% sump depth).

The project team calculated metrics of accumulation available from the provided data: days to failure (6 permittees) and accumulation rate (3 permittees). Accumulation rates (sediment accumulated between inspections) could only be calculated for permittees that provided measured sediment depths, or the data to calculate these depths (King County, Everett, and Tacoma). Although drainage basin delineations were requested in the project data solicitation, none were provided. Interviews conducted to pursue additional information were unsuccessful. Due to the critical importance of this information to the analysis, the project team discussed modelling drainage basins based on land elevation, but determined it would result in too much uncertainty. Therefore, there was no way to assign geographic features (land use, precipitation) or stormwater management practices of interest, such as street sweeping, sanding, or construction. Instead, questions were developed for analysis that could be answered using only the time to failure and accumulation rate (Attachment 1 – *Data Analysis Plan*).

- Does the CB inspection and maintenance database indicate 60% full sump is the correct threshold for maintenance or should this threshold be refined?
- How many days pass before most CBs approach 60% full? What does this suggest about inspection frequency needs?
- Are most CBs inspected before they reach 60%?
- Can precipitation be used to predict catch basin maintenance needs?
- What CBs are outliers for sediment accumulation compared to others and may warrant further investigation on unique influencing factors?
- Do sumps with <12" depth have different accumulation rates than those with > 12"?
- Are accumulation rates significantly different for circuit-based inspections vs non-circuit based?
- What key information is needed to enable a more quantitative analysis of CB accumulation rates?

<u>Does the CB data indicate 60% full sump is the correct threshold for maintenance or should this threshold be refined?</u>

To address the analytical questions, data queries were designed and tested for three permittees: Everett, King County, and Tacoma. Inspection results, as a percentage of sump depth with sediment, were plotted against time to test the assumption that sump sediment depths stabilize at 60% full. A log linear trend line was fit to the data for each permittee to look for patterns. Figures A4-1 and A4-2 show Low and High Confidence Tier results. Plotting of these results highlighted several data quality issues:

- Several inspections occurred immediately after a cleaning (e.g., < 1 week).
- Some % full sump values were negative.
- Many inspection records indicate no cleaning had occurred in > 2000 days (over 5 years).

Consultation with the permittees confirmed these results were unexpected and indicative of record errors. Figure A3-1 also indicates bias in the inspection records with many sump measurements at 0 and 50%. This may be due to visual estimation instead of measurement of sump sediment depths, combined with actual low rates of accumulation in certain catch basins resulting in no sump sediments. However, the CB inspection programs are inherently biased in that permittees pick inspection dates that are convenient for them and may combine that with more frequent inspections for CBs that are known to fill quickly. The inspection schedule is also variable by permittee.

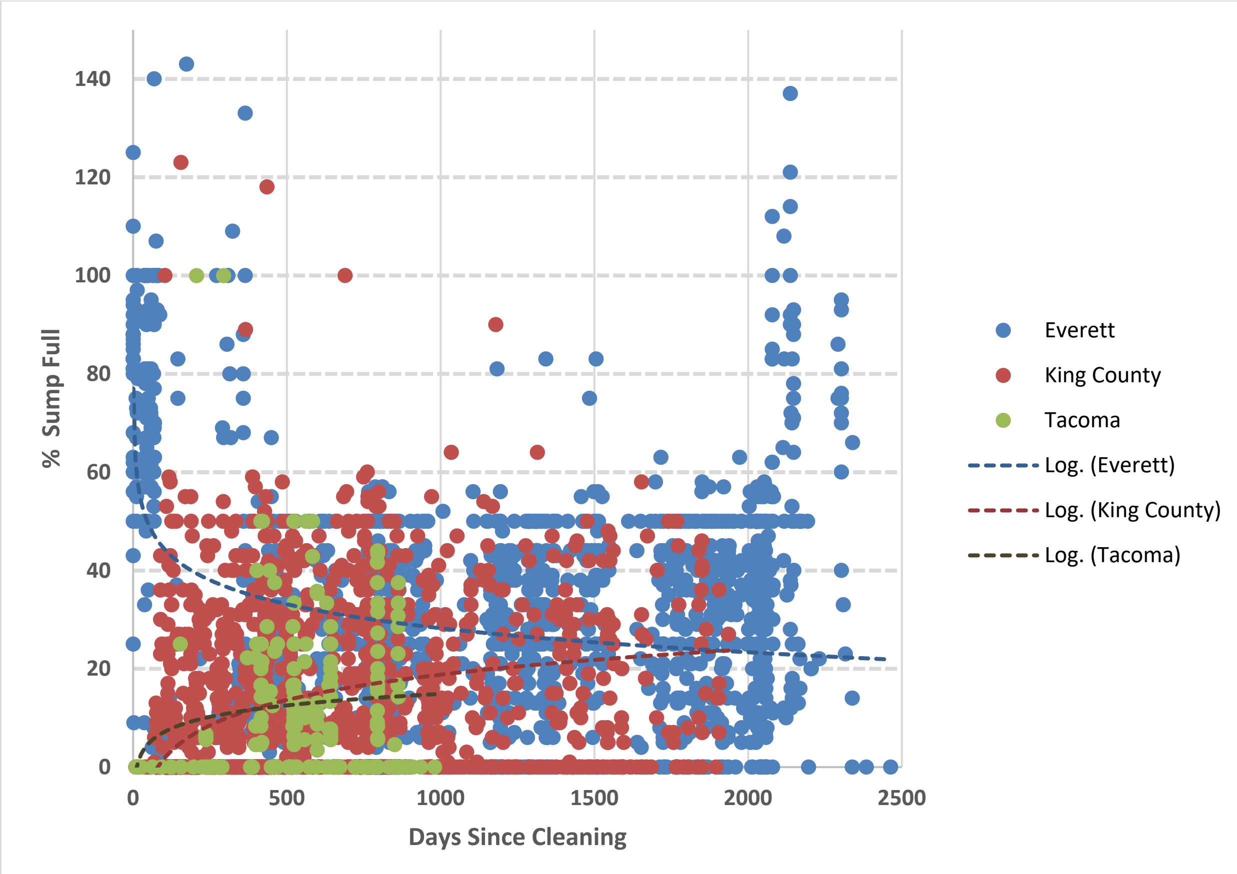


Figure A4-1. Sump sediment depth (%) and days since cleaning for three permittees in low confidence tier. Six King County inspections are not shown because their % Sump Full values were negative.

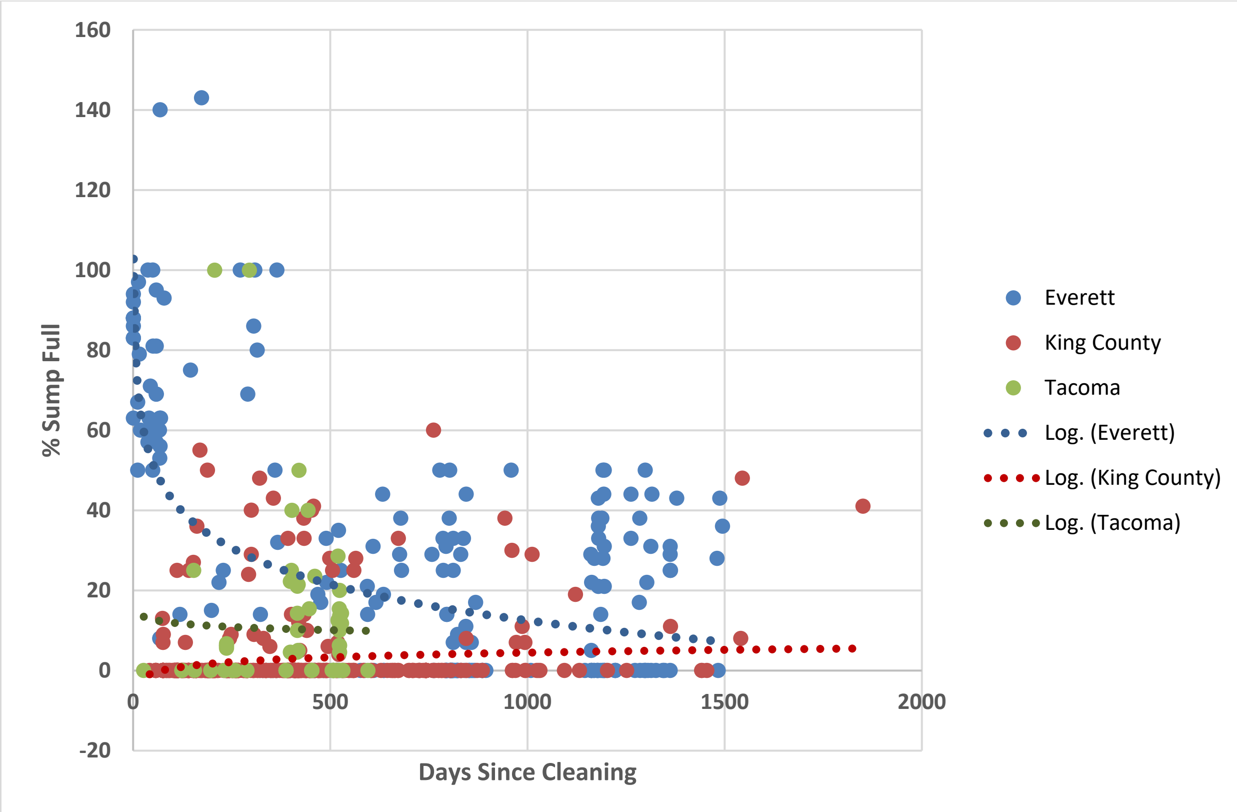


Figure A4-2. **Sump sediment depth (%) with days since cleaning for three permittees in high confidence tier.**

To examine the same question from an alternative perspective, inspection results for CBs with 3 or more inspections occurring after a cleaning were plotted in sequence. Again, Everett, King County, and Tacoma were examined first. Very few CBs in the database satisfy these criteria and ones that do indicated additional record errors. Figures A4-3 and A4-4 show CBs that appear to have missing cleaning records – percent of sump filled often falls to 0% after one or two inspections. With the inherent data bias and magnitude of data errors found, it was concluded that the original analytical question could not be answered with this dataset.

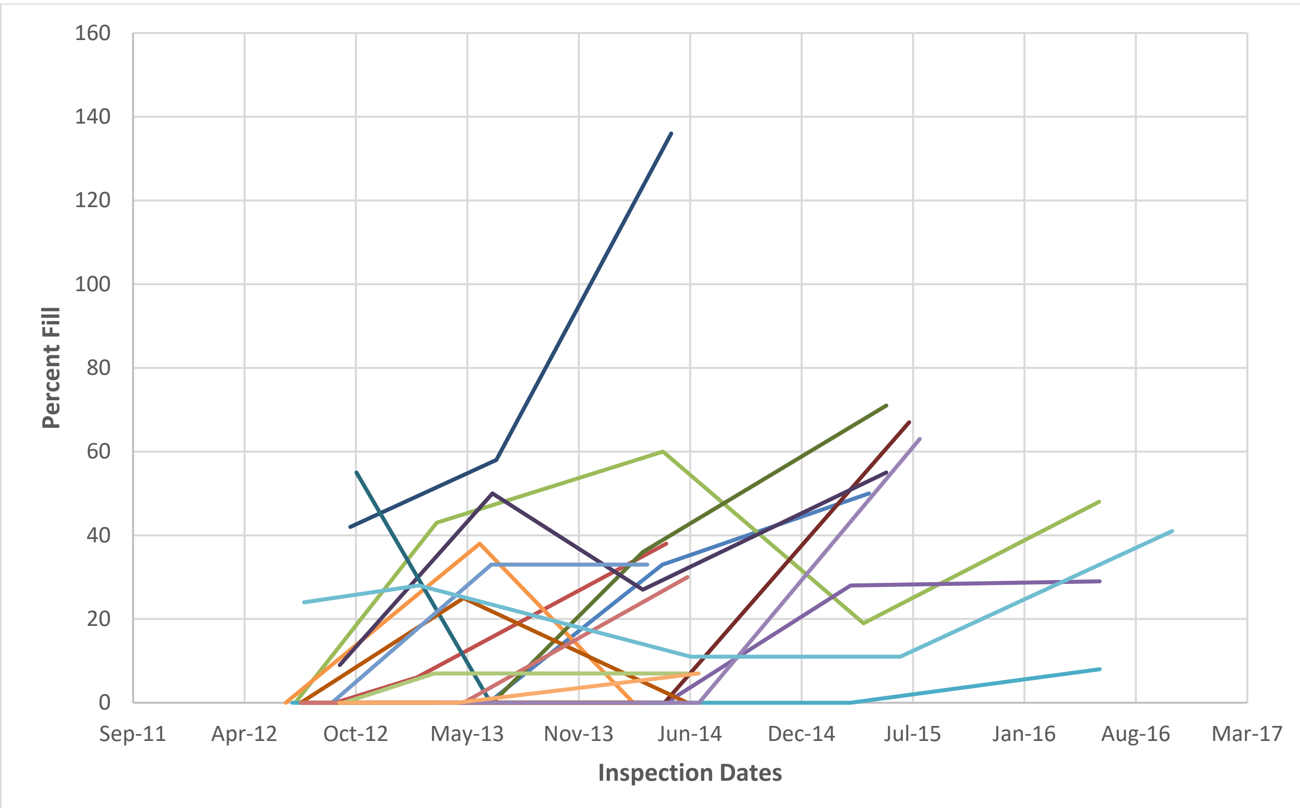


Figure A4-3. Accumulation in CBs with three or more Inspections. CBs without any observed accumulation not plotted.

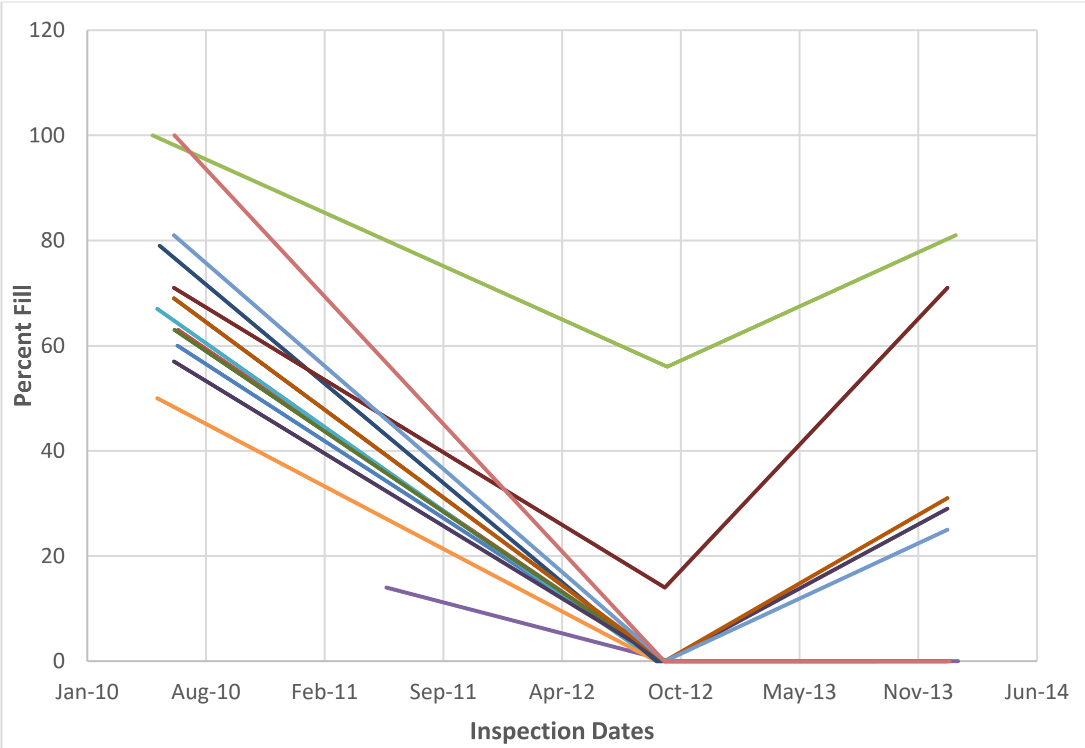


Figure A4-4. Accumulation in CBs with Three or More Inspections. CBs without any observed accumulation not plotted.

<u>How many days pass before most CBs approach 60% full? What does this suggest about inspection frequency needs?</u>

For this question, the time in months after cleaning until failing the sediment depth threshold of 60% was calculated for each CB (Figure A4-5). This was termed "time-to-failure". Records for over 59,530 CBs were included in the low confidence tier. Within this tier, the proportion of CBs that failed within 1 year ranged from 0.3 to 15% across 4 permittees, in addition to SPU's CSO and MS4 CBs; the range for Phase 1 permittees was similar (Table A4-5). Within 2 years, 4 to 34% of CBs failed; however, the range for Phase 2 permittees was 5.0 to 7.5%. The average time-to-failure ranged from 22 to 51 months across permittees. For all permittees except Tacoma, more than half of the CBs in the project database were never recorded as failing. About 41% of Tacoma's CBs never failed.

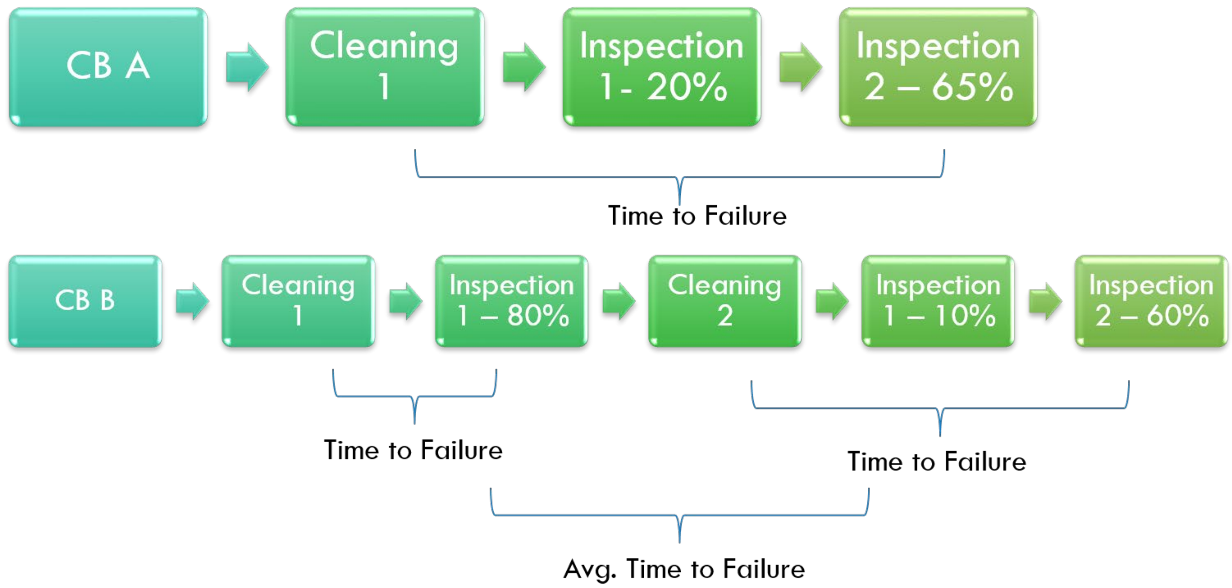


Figure A4-5. Time-to-Failure Calculation for Catch Basins

Table A4-5. Time-to-Failure Statistics for Low Confidence Tier

Agency	Phase	% CBs Failed within 1 Yr	% CBs Failed within 2 Yrs	Avg. Mos. to Failure	# CBs Failed	# CBs Never Failed	% CBs Never Failed	Total CBs
Everett	2	3.4	5.0	51.1	2,203	2,616	54.3	4,819
Kent	2	2.4	7.5	39.9	3,506	6,043	63.3	9,549
King County	1	9.3	18.1	21.6	745	1,772	70.4	2,517
SPU MS4	1	1.4	14.2	40.8	13,275	5,809	69.6	19,084
SPU CSO	1	0.3	4.0	49.4	7,787	4,713	62.3	12,500
Tacoma	1	15.1	34.0	18.6	992	687	40.9	1,679
WSDOT	NA	9.1	22.2	22.1	3,577	5,805	61.9	9,382
Grand Totals	--	--	--	--	32,085	27,445	--	59,530

Only three permittees remained in the high confidence tier due to a lack of sump depth information. Records for 1,945 CBs were included in the high confidence tier. Within this tier, the number of CBs that failed within 1 year was 6.1% for King County and 25% for Tacoma (Table A4-6). Within 2 years 9.7% of Everett's CBs failed. The average time-to-failure ranged from 11 to 18 months across permittees. For all permittees except Tacoma, over 80% of the CBs in the project database were never recorded as failing. Just under half (48%) of Tacoma's CBs never failed. The data quality of this tier is considered much higher than in the low confidence dataset. However, overall the rate of failure within 1 or 2 years is very similar between the low and high confidence tiers.

Table A4-6. Time-to-Failure Statistics for High Confidence Tier

Agency	Phase	% CBs Failed within 1 Yr	% CBs Failed within 2 Yrs	Avg. Months to Failure	# CBs Failed	# CBs Never Failed	% CBs Never Failed	Total CBs
Everett	2	8.5	9.7	18.3	95	412	81.3	507
King County	1	6.1	9.2	15.6	88	715	89.0	803
Tacoma	1	25.4	50.9	10.6	332	303	47.7	635
Grand Totals	--	--	--	--	515	1,430	--	1,945

Are most CBs inspected before they reach 60%?

Based on the time-to-failure results presented for the previous question, it appears that most CBs (>80% never failed) are inspected before they fail in the high confidence tier, except for Tacoma which is closer to 50% failure before inspection. Uncertainty is higher in the low confidence tier and a lower proportion of CBs never failed for Everett, King County, and Tacoma than in the high confidence tier. However, over half of the CBs for all permittees still appear to be inspected before failing with Tacoma closer to 40% of CBs.

Can precipitation be used to predict catch basin maintenance needs?

Pitt and Bissonnette (1984) found that stormwater runoff rates in two Bellevue drainage basins (e.g., catchments) were well correlated with total precipitation. Therefore, it may be reasonable to expect that sediment accumulation rate in CBs would be strongly related to precipitation rate. If this was true, precipitation could be used to help predict CB maintenance needs. This question was investigated by calculating average daily precipitation corresponding to CB accumulation rates. Accumulation rates were calculated from cleaning-to-inspection or between inspections as percent of sump filled (accumulated) per day. An average daily rainfall since CB cleaning was estimated for each catch basin inspection for the three permittees having measured sediment depths (King County, Everett, and Tacoma). Average daily rainfall values were averaged from various gauges depending on the permittee's spatial jurisdiction and availability of rain gauge data for downloading (Table A4-7). Rainfall data were downloaded for one or more gages in a city or county.

Table A4-7. Rainfall Data Sources

Permittee	Gages	# Gages Used
King County	Sea-Tac Airport	1
Everett	Average of Everett gages	3
Tacoma	Average of Tacoma gages	2

Notes: Rain gauge data were downloaded from Everett Flow Works (Everett, permission needed); https://www7.ncdc.noaa.gov/CDO/cdopoemain.cmd (Tacoma and Sea-Tac Airport)

Accumulation rates showed an inverse relationship with average daily rainfall (Figure A4-6). Accumulation rates were sometimes negative values because sump sediment depths decreased from one inspection to the next. Therefore, it was concluded that precipitation rate can't be used to predict accumulation rates based on these CB records.

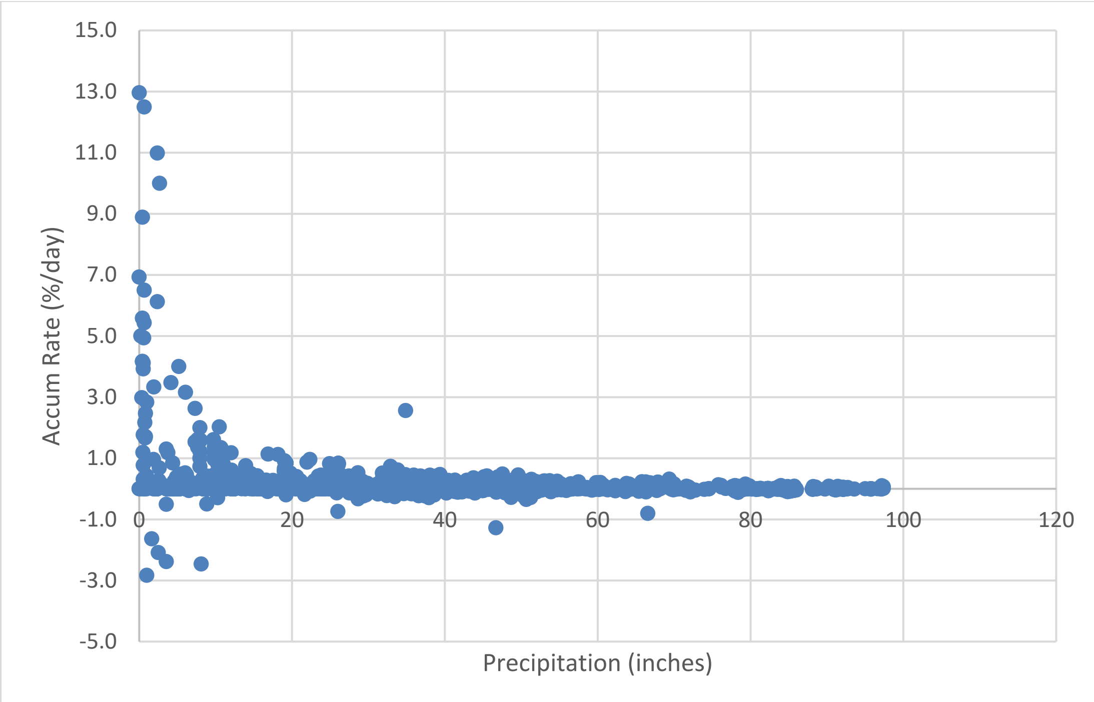


Figure A4-6. Inverse Relationship between Accumulation Rates and Average Daily Rainfall for King County, Everett, and Tacoma data combined (High Confidence Tier Assumptions).

References:

Pitt, R. and P. Bissonnette. 1984. Bellevue Urban Runoff Program. Summary Report. City of Bellevue. US EPA. Center for Watershed Protection (CWP). 2006a. Technical Memorandum – Literature Review. Research in Support or an Interim Pollutant Removal Rate for Street Sweeping and Storm Drain Cleanout Activities. October 2006.

CATCH BASIN STUDY DATA ANALYSIS PLAN 12/20/17

King County Project Team – Blair Scott, Todd Hunsdorfer, Brent Dhoore, Jeff Burkey, Edward McFarlin, Liora Llewellyn, Jenée Colton

The following summarizes the data analysis plan for the Catch Basin Inspection and Maintenance Effectiveness Project. Development of this plan has required substantial, iterative, preliminary analysis. The plan summarizes the catch basin metrics that will be used, definitions for two different data quality tiers, data normalization methods, the specific analytical questions of focus and the resulting study questions that can be answered. Due to labor intensive data preparation and data availability, the study questions have been modified from the original proposal and analyses will be more limited.

Catch Basin Data Metrics

Some catch basin (CB) records include measured sump depths while others do not. Where sump depths are provided, accumulation rates can be calculated as inches per day based on inspection results. When sump depths are not provided, a time to failure can be calculated.

Potential Correlating Factors

The project team has examined the usability of the available CB data to run correlations with independent variables such as land use, % impervious surface, and road size. Unfortunately, without drainage basins delineated, we can't assign values for these variables to individual catch basins. In addition, data screening steps to establish data quality and methods for data normalization have been time consuming. For these reasons, data analysis will not include correlations to independent variables.

Two Analytical Tiers

Data anomalies were identified and sometimes affected substantial volumes of data. Thus, assumptions were implemented to allow use of these data. Because of the tenuous nature of some assumptions, it was decided we would analyze two tiers of CB data (a High Confidence Tier and Low Confidence Tier). High Confidence Tier assumptions are meant to eliminate high uncertainty assumptions so that data quality is higher than the Low Confidence Tier. The Low Confidence Tier is meant to be more inclusive of data quantity but sacrifices some confidence, having greater uncertainty associated with the CB data. See attachment for assumptions made for each tier.

Data normalization

Pitt and Bissonnette (1985) normalized the CB sediment volumes to catchment size (liters/hectare) to account for differences in runoff received. This normalization assumes a relationship between runoff volume and CB sump fill rate. Because drainage catchment sizes are not available for normalizing CB accumulation rates to land area, we will normalize accumulation rates to precipitation. Precip-normalized accumulation rates will be calculated where possible, (i.e. KC, Everett, Tacoma) as well as precip-normalized times to failure for all 6 permittees (Seattle, Everett, Tacoma, King County, Kent, WSDOT). Use of precipitation to normalize accumulation rates is supported by preliminary calculations (See Figure 1: precip-normalized accumulate rates by time since last activity) showing a remarkable unity of data (>18,000 records) from 3 permittees. Note: some negative accumulation rates are seen because this graph displays accumulation rates between inspections as well as from cleaning to inspection. If a CB is full, sediment loss from the sump might have been measured.

Although there are not precipitation gages co-located with the catch basins in the database, there are gages in the general areas where catch basin records were provided. Initial precip-normalization was done coarsely as a count of rain days by dividing the total inches accumulated by the number of rain days since last activity (i.e., inspection or cleaning). Rain days were assigned as 1 or 0 based on having greater or less than 0.05” rain in a 24-hour period (i.e. total daily rainfall). Then, rain days were summed to determine the total number of rain days in the period between inspections and between last cleaning and inspections. Rainfall data were downloaded for one or more gages in a city or county (averages were calculated when >1 gage readily available). Precip data for WSDOT records were obtained from County gages for Whatcom, Thurston, Skagit, and Kitsap Counties and used along with Everett, Tacoma and Seatac gage data. WSDOT records where no county gage data were found were excluded from the normalized data calculation (we have relatively few WSDOT records for these areas).

Table 1 Rainfall data sources

Permittee	**Gages**	**# gages used**
Seattle	Average of Seattle gages	15
King County	Seatac Airport	1
Kent	Seatac Airport	1
Everett	Avg of Everett gages	3
Tacoma	Avg of Tacoma gages	2
WSDOT	By County for King (Seatac), Snohomish (Everett), Skagit (1), Pierce (Tacoma), Thurston (4), Kitsap (3), and Whatcom (1).	15

Specific Analytical Questions

Pitt and Bissonette (1984) is the only published study identified that estimates municipal catch basin accumulation rates in the Western Washington region. Pitt and Bissonnette (1984) found that stormwater runoff rates in the two Bellevue drainage basins (e.g. catchments) studied were well correlated with total precipitation. These authors also found that catch basin sediment volumes stabilized at around 60% in a time period of 13 – 20 months from cleaning. This study was used as the basis for the Ecology municipal catch basin maintenance standards. Ecology assumes that sediment depth is a general indication of sediment volume. We will use sediment depth as a proxy for sump volume and plot depths for all CBs against time-since-cleaning (in rain days) to determine the % sediment depth at which stabilization occurs (see example in Figure 2). This will test if the sediment threshold for this area is close to 60% (or something different) and identify if precip can be used to predict maintenance for CBs in Western Washington (and if so, what precip amount). If time and budget allows, total precipitation will be used instead of rain days. Because a subset of the CB database contains sump depth, we will be able to examine if accumulation rates differ by sump size (> or < 12” depth).

Plotting the distribution of time for CBs to reach the 60% threshold (i.e."time-to-failure") will describe how fast CBs in western Washington accumulate sediment on average and how wide-ranging the timespan is for the region (see Figure 3 for example distribution).

- What is the distribution of time-to-failure across jurisdictions? How similar/different are CBs? What is the average time-to-failure?
- Does % sediment depth (i.e. % Full) stabilize over time for CBs to around 60% or a different value?
- What is the relationship (slope, r^2) between accumulation rates and inspection time interval under High Confidence and Low Confidence tier assumptions?
- Does sump depth (> or < 12") explain variability in accumulation rates?
- Compare circuit-based inspection schedule (Tacoma) accumulation rates to other non-circuit based CB rates. Are they different or similar?
- Identify CBs that are anomalous and behave differently from most as far as accumulation.

If budget allows, we will look into some or all of the following for central Everett where drainage basins are delineated:

Case study:

- Everett: Does Sump Type, % impervious surface, explain variability in accumulation rates?
- Are CBs with fastest/slowest accumulation rates associated with particular land use, road size, and drainage area?

<u>I&M study questions to be answered -</u>

What CBs are outliers for sediment accumulation compared to others and may warrant further investigation on unique influencing factors?

Does the CB I&M database indicate 60% sump fill is the correct threshold for maintenance or should this threshold perhaps be refined?

How many days pass before most CBs approach 60% full? What does this suggest about inspection frequency needs?

Can precipitation be used to predict catch basin maintenance needs?

Do sumps with <12" depth have different accumulation rates than those with > 12"?

Are most CBs inspected before they reach 60%?

Are accumulation rates significantly different for circuit-based inspections vs non-circuit based?

What key information is needed to enable a more quantitative analysis of CB accumulation rates?

Preliminary Results: Precip-normalized accumulation rates by time since last inspection (a few outliers fall above and below the shown y-axis interval; axis truncation provided for data visibility)

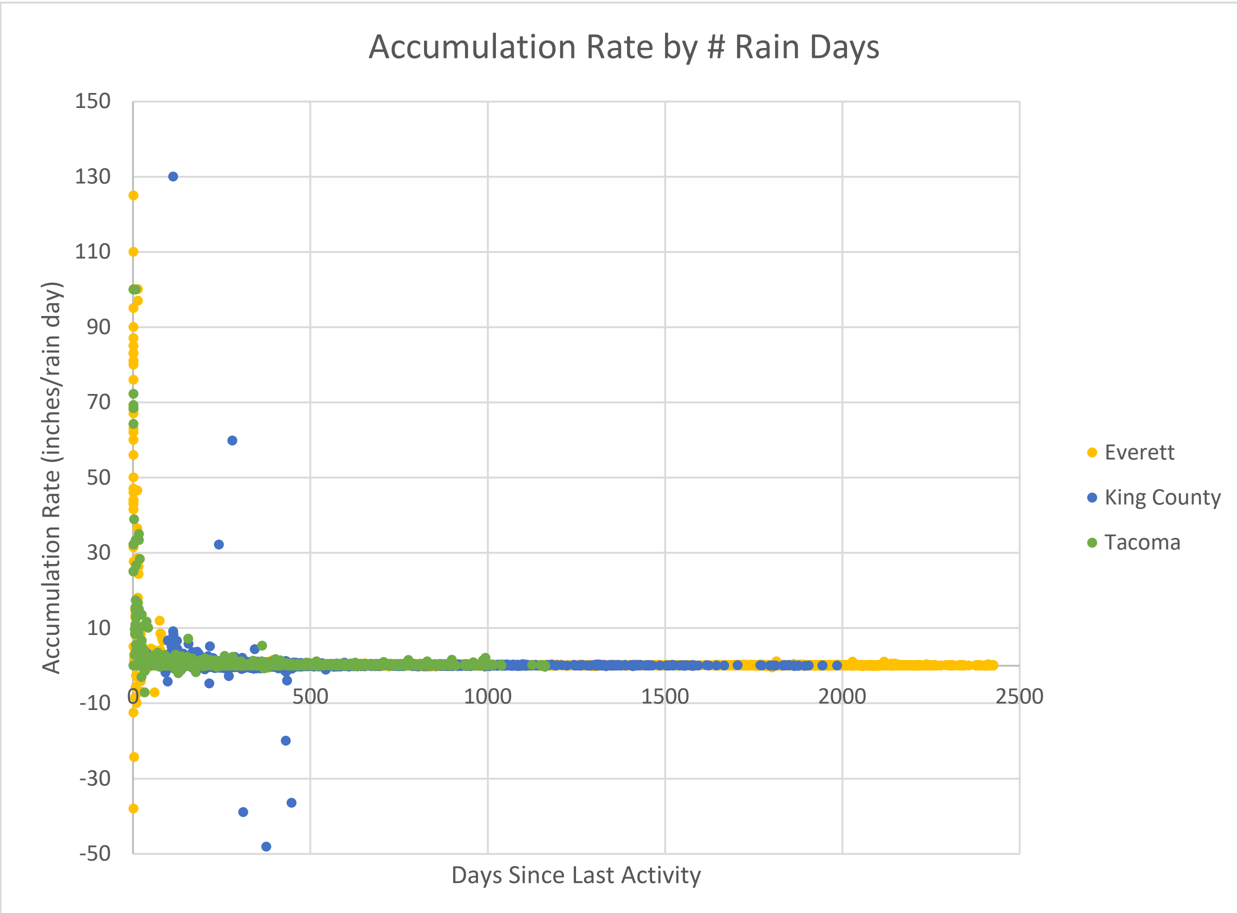


Figure 2 Theoretical example of CB sediment accumulation over time

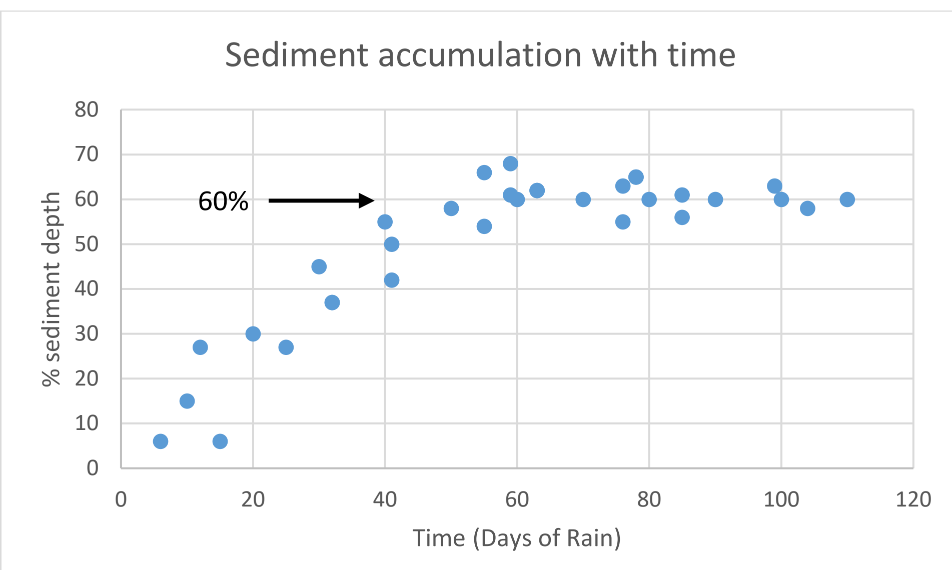
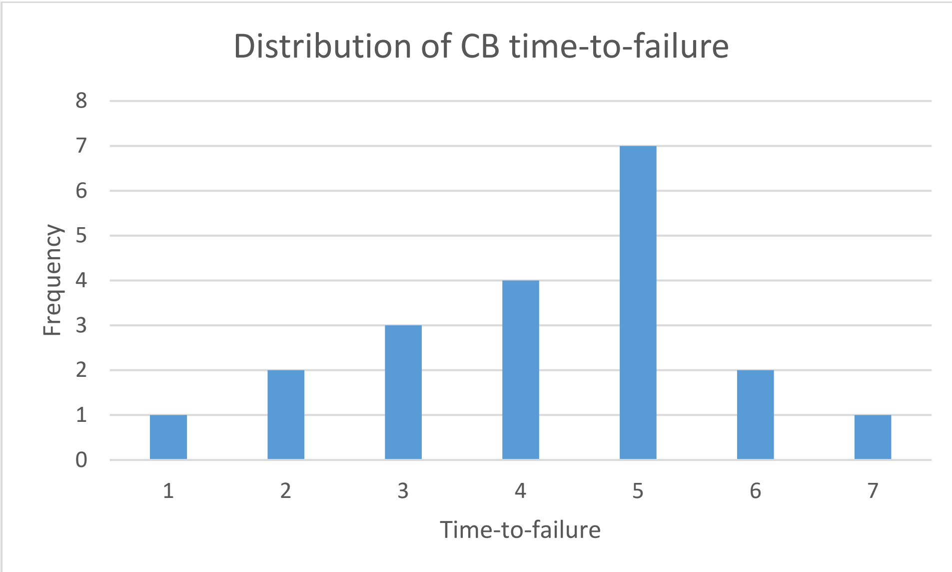


Figure 3. Theoretical example of CB time-to-failure



Assumptions Made for CB Inspection and Maintenance Data

As of **Dec. 13, 2017**

General Assumptions Applied to All				
Assumption #	**Low Confidence Tier**	**Rationale**	**High Confidence Tier**	**Rationale**
1	Include 2007 data and more recent (no inspection between 1/1/2007 and effective date of permit 2/16/2007)	Scope of this project is last two permit cycles	Same	
2	Include CBs with sumps OR sediment depth record >0.0 ft OR have %Full or P/F	Eliminate inlets or structures with no sumps	Same	
3	Cleanings before 1st inspection are not matched to an inspection but used as Time 0 for accumulation rate calcs	There is no previous inspection in the database that triggered the cleaning but it is useful as a starting point for accumulation rate calculations	Same	
4	Use all CBs with Sump depth > 0	All sump depths behave the same in terms of accumulation rate (assumption)	Use catchbasins with >12" sump	Sumps less than ~12" behave differently than larger sumps (assumption)
5	Use all inspections regardless of time between inspections	No assumption that large gap between inspections skews accumulation rate calculation results	Apply maximum number of days allowed between inspections	Assumption that large gap between inspections skews accumulation rate calculation results
6	Use last record of sump depth when there is more than 1 measurement.	The last record is more accurate if permittee became more precise with time.	Don't include CBs that have multiple sump measurements.	Uncertain which sump measurement is correct.

Permittee Specific Assumptions					
Permittee	**#**	**Low Confidence Tier**	**Rationale**	**High Confidence Tier**	**Rationale**
WSDOT		None		None	
King County		None		None	
Kent		None		None	
Kirkland		None		None	
Seattle	**1**	All sumps are 2.5' depth and inspection failure occurs at 1.5' feet (60%).	Seattle informed KC 10/2/17 1.5 feet is their cleaning threshold and they assume all sumps are 2.5 ft. Because they don't measure sump depths regularly, this assumption has high uncertainty.	Assume we don't know sump depths. Only calculate time to failure.	Sump depths are uncertain. Measurements not available.
	2	Include MS4 and CSO CBs	CSO and MS4 CBs function the same.	Same	
Tacoma	**1**	Use most recent sump depth if >1 record	Instructions from Tacoma	Same	
	2	Use last sediment depth on same date if >1 record	Instructions from Tacoma	Same	
Everett	**1**	Remove CBs with DIL prefix b/c they are inlets	Instructions from Everett	Same	
Tumwater	**1**	Excluded	Only have 1 inspection per CB	Excluded	Only have 1 inspection per CB

Appendix B

Final Program Design, Implementation and Cost Analysis Technical Memorandum (pdf)

OSBORN CONSULTING INCORPORATED

1800 112th Avenue NE Suite 220-E | Bellevue, WA 98004 | P: 425.451.4009 | F: 425.451.4901

DATE MARCH 31, 2017

TO JENÉE COLTON, KING COUNTY DEPARTMENT OF NATURAL RESOURCES AND PARKS

FROM DIANA HASEGAN, PE, ENV SP, OSBORN CONSULTING, INC.

SUBJECT WESTERN WASHINGTON CATCH BASIN STUDY – FINAL PROGRAM DESIGN, IMPLEMENTATION, AND COST ANALYSIS TECHNICAL MEMORANDUM

INTRODUCTION

This memorandum summarizes lessons learned and transferable cost-efficiencies in the design and implementation of the inspection and maintenance programs based on information provided by the permittees. The 2017 survey soliciting information from all Phase I and II Western Washington municipal permittees and Washington Department of Transportation (WSDOT) regarding catch basin (CB) inspection and maintenance effectiveness was summarized in the Final Survey Results Technical Memorandum by Osborn Consulting from July 26, 2017. The survey was prepared and distributed to jurisdictions by the project team and Technical Advisory Committee (TAC). Additional follow-up interviews were conducted with selected permittees based on the information received in the survey.

This memorandum includes a review and evaluation of the various inspection and maintenance schedules and protocols used by selected jurisdictions. Cost efficiencies learned from the experience of individual jurisdictions are also summarized based on interviews and information provided. Various cost-saving approaches described by the permittees are presented in a qualitative summary.

This project is funded through the Stormwater Action Monitoring Program (SAM) as part of the Effectiveness Studies Component (S8.C). The municipal NPDES Stormwater permit in Washington State requires permittees to inspect and maintain catch basins under their jurisdiction on a regular basis. For Phase I permittees, the default inspection frequency is annual. For Phase II permittees, the frequency ranges from two to five years. Since the permit allows for an alternative schedule with demonstration that maintenance is needed less frequently, this study aims to extract important information related to the cleaning threshold that would help permittees direct limited inspection and maintenance resources to provide the greatest environmental benefit. Therefore, this study was designed to evaluate the existing records for CB inspection and maintenance to identify correlating factors that could be used to predict CB maintenance needs and to examine the program designs among Western Washington jurisdictions to identify cost efficiencies in program implementation.

PROGRAM DESIGN

Washington's Phase I and Phase II Municipal Stormwater Permits (permits) require inspection and regular maintenance of catch basins and inlets owned or operated by permittees. The default requirements for Phase I permittees include inspecting all catch basins annually (S5.C.9.d), while for Phase II permittees in Western Washington it includes inspecting all catch basins once no later than August 1, 2017 (except the City of Aberdeen, which has an extended deadline of June 30, 2018) and every two years thereafter (S5.C.5.d).

The permittees also have options to implement alternative schedules, which include: (1) establishing a less frequent schedule based on documented evidence; (2) identifying circuits and inspecting 25 percent of the catch basins within each circuit; or (3) cleaning the whole system, including all pipes, ditches, catch basins, and inlets within a circuit once during the five-year permit term, where the circuit drains to a single discharge point.

In the survey conducted in 2017, the first question addressed the permit schedule choices by jurisdictions. The question and responses are summarized below.

Question 1: Which permit schedule for routine CB inspection and maintenance is used by your jurisdiction? Check all that apply.

Inspection schedules vary between Phase I and Phase II permittees, and jurisdictions can select from multiple permit schedules choices for their catch basin program.

Phase I permittees can choose from one or more of the following programs:

- Standard approach – to inspect all CBs and inlet annually.
- Alternative 1 – to inspect all CBs more or less frequently than annually to meet maintenance standards based on at least two years of CB inspection records.
- Alternative 2 – to inspect all CBs annually on a "circuit basis," whereby 25-percent of CBs and inlets within each circuit are inspected to identify maintenance needs.
- Alternative 3 – to clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term.

Phase II permittees can choose from one or more of the following programs:

- Standard approach – to inspect all CBs and inlets once by 8/1/17 and subsequently every two years thereafter.
- Alternative 1 – to inspect all CBs more or less frequently than every two years to meet maintenance standards based on at least four years of CB inspection records.
- Alternative 2 – inspect all CBs once by 8/1/17 and every two years thereafter on a "circuit basis," whereby 25-percent of CBs and inlets within each circuit are inspected to identify maintenance needs.
- Alternative 3 – clean all pipes, ditches, CBs, and inlets within a circuit once during the permit term.

Distributions of catch basin inspection schedules are presented in **Figure 1**. Of the 54 survey respondents, about 70 percent of jurisdictions used the standard approach. Approximately 17 percent of the jurisdictions used either Alternative 2 or Alternative 3, and only 9 percent of jurisdictions used Alternative 1 for routine catch basin inspection and maintenance. Several jurisdictions selected multiple schedules as they use different schedules for specific parts of their system.

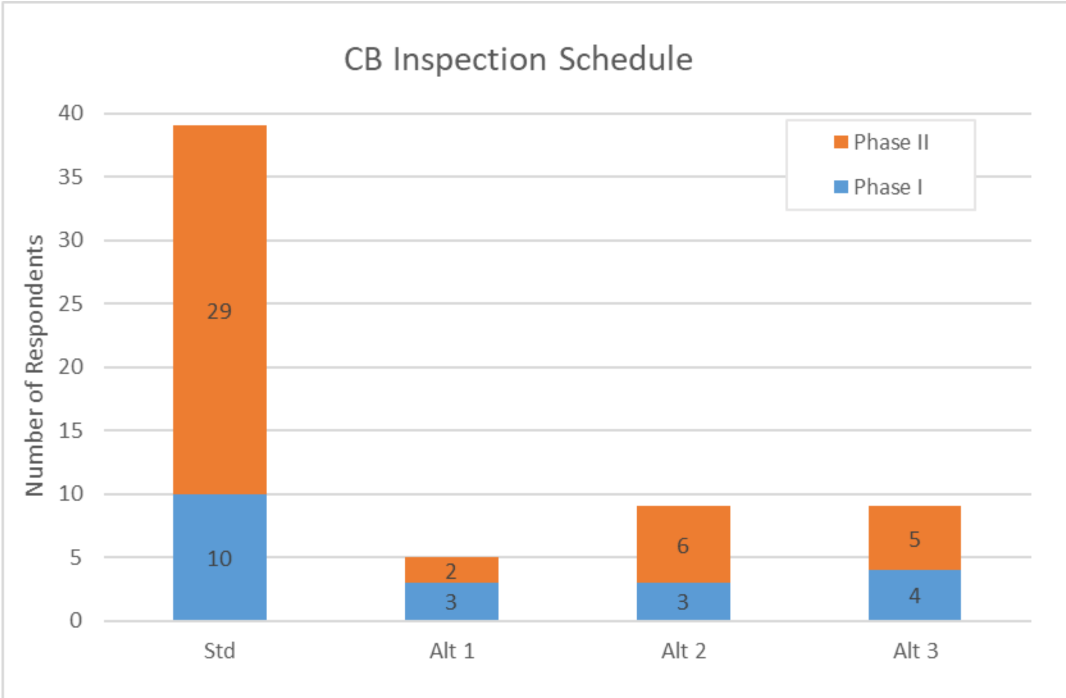


Figure 1: Catch Basin Inspection Schedule

Circuit-Based and Less Frequent Schedule Options

Some jurisdictions have observed variations in sediment accumulation that may be based on drivers such as traffic volumes, land use, topography, street maintenance practices. The less frequent schedule (Alternative 1) allows permittees to have a reduced inspection schedule based on documented evidence from twice the length of the proposed schedule. The circuit inspection alternative schedule (Alternative 2) allows permittees to target inspection of certain catch basins within areas that either drain to a single point or that have similar rates of accumulation and similar maintenance needs.

The permits define a circuit as “a portion of a MS4 discharging to a single point or serving a discrete area determined by traffic volumes, land use, topography, or the configuration of the MS4.” Permittees using the circuit inspection approach have to inspect a minimum of 25 percent of catch basins within a circuit annually or biannually according to phase, including the catch basin immediately upstream of any system outfall (within their jurisdiction). This results in a much smaller burden for inspections for permittees for circuits with little sediment accumulation.

However, the circuit-based option has been poorly understood by jurisdictions and interpretations of how to implement it are highly variable among the members of the TAC for this project. In addition, TAC members and the project team were uncertain of how less frequent inspection schedules could be proposed. No examples of less frequent Phase I or II municipal permit CB inspection schedules were available from The Washington State Department of Ecology (Ecology). However, Ecology provided further clarification on the inspection and maintenance options for permittees in a publication titled “Catch Basin Inspection Alternatives for Phase I and II Municipal Stormwater Permittees.” This resource is included in **Attachment A**. The Ecology publication describes how the documentation for a less frequent schedule needs to include inspection data for a period that is double in length to the time period of alternative frequency. Ecology also provided a list of jurisdictions with alternative schedules (**Attachment A2**) and an example of a support document presenting a less frequent inspection schedule used for private catch basins by the City of Seattle (**Attachment A3**).

The Ecology publication also explains that circuit inspections need to target at least 25 percent of the system and include a few quality control samples outside of the circuit. The inspections need to also incorporate the most downstream catch basin before an outfall. When none of the 25 percent inspected catch basins are found to need maintenance, the inspections can end. If all of the catch basins inspected are found to be needing maintenance, then the entire circuit needs to be inspected. When only a portion of the 25 percent inspected catch basins are found to require maintenance, the circuit may need more evaluation. The publication describes a possible approach implemented by Pierce County where the catch basins are inspected beginning with the most downstream catch basin in the circuit; inspections proceed upstream until three upgradient catch basins in every applicable direction are found that do not trigger maintenance per the standards, or until all catch basins in the circuit are inspected.

Attachments A4 through **A6** also include additional inspection resources about alternative schedules implementation from Ecology, Federal Way, and Pierce County.

SUPPLEMENTAL INTERVIEWS SUMMARY

After reviewing the survey results, the TAC and project team recognized a need to better understand how jurisdictions are implementing CB inspection and cleaning programs and how they calculate program costs. Follow-up interviews were also needed to solicit information on cost savings experienced from changes in program design and management. Therefore, follow-up interviews were conducted with select jurisdictions. The questions for the follow-up interviews were developed in collaboration with the King County Project Manager and are outlined below.

Questions about the Program Schedule and Management:

- What drives the decision to pursue or not pursue circuit-based inspections?
- If using circuit-based inspections, what is your interpretation/decision tree of when failure in inspection of a catch basin happens?
- Does your jurisdiction have a combined inspection and cleaning program or are they separate events? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from doing a new method?
- Is inspection/maintenance done in-house or contracted out to consultant/contractor? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from changing your method?
- Are there any cost savings you have realized through other changes in your CB Inspection and cleaning program?

Questions about the Program Costs:

- What is the total number of CBs in your jurisdiction?
- What is the total cost of the CB maintenance program including inspections, cleaning, maintenance, sweeping etc.? OR, if not answerable, what activities are included in your maintenance cost total?
- What components are included in your costs for inspections and/or maintenance (e.g., data management, training, office staff, equipment the city owns, disposal fees, etc.)?

Questions about Best Management Practices (BMPs):

- Are there any BMPs you are currently implementing that target sediment removal before capture in CBs, such as street sweeping, wet vaults, socks/filters on CBs, curbs, impervious shoulders, etc.?
- Are there any lessons learned or cost savings from implementing them?

Jurisdictions selected for follow-up interviews were either (1) identified by the members of the TAC (Redmond, Pierce County, Seattle Public Utilities, Lakewood, and Thurston County), (2) included in the Catch Basin database (Everett, Kent, Kirkland, Tacoma, Tumwater, Washington State Department of Transportation, and King County), or (3) provided costs in their responses to the 2017 survey (Arlington, Battle Ground, Brier, Covington, Edgewood, Federal Way, Issaquah, Mercer Island, and Woodinville).

Information collected from the survey and follow-up interviews is summarized in the following sections organized by program implementation, transferable lessons learned, and program costs. **Table 1** provides an overview of program designs based on the interviews. The details from the follow-up interviews are included in **Attachment B** to the memorandum along with an exhibit showing the geographical distribution of the jurisdictions interviewed.

Table 1 – Interviews Summary

Jurisdiction	Phase	Program Implementation	Inspection and Cleaning Timing	Circuit-Based
WSDOT	Phase I and II	In house	Mixed Approach	No
Pierce County	Phase I	In house	Separated	No
SPU	Phase I	In house	Combined	No
Tacoma	Phase I	In house	Combined	Yes
King County WLRD	Phase I	In house	Combined	Partially
Redmond	Phase II	In house	Mixed Approach	Partially
Lakewood	Phase II	Contracted	Combined	No
Thurston County	Phase II	In house	Separated	No
Everett	Phase II	In house	Separated	No
Kent	Phase II	In house	Mixed Approach	No
Kirkland	Phase II	In house	Separated	No
Tumwater	Phase II	In house	Combined	No
Battle Ground	Phase II	In house	Separated	No
Brier	Phase II	In house	Combined	Partially
Covington	Phase II	Contracted	Combined	No
Edgewood	Phase II	Contracted	Separated	No
Federal Way	Phase II	In house	Separated	Yes
Mercer Island	Phase II	Contracted	Combined	No
Arlington	Phase II	In house	Combined	No
Issaquah	Phase II	In house	Separated	Yes

PROGRAM IMPLEMENTATION

Circuit-based inspection schedules.

Based on the survey results and interviews, only a few jurisdictions are implementing circuit-based inspections and a few are considering a circuit-based approach. The jurisdictions currently implementing circuit-based inspections include: King County, Tacoma, Federal Way, and Issaquah. The jurisdictions looking to start a circuit-based inspection schedule include Kent, Redmond, and Brier. Some of the reasons why jurisdictions have chosen not to pursue circuit-based inspections include:

- Jurisdictions do not have enough data about their system;
- Catch Basins are all off-line, making the circuit-based approach irrelevant (misunderstanding explained below).
- One jurisdiction found it more efficient to provide a higher level of service by visiting all catch basins and cleaning more often.
- Some jurisdictions were not familiar with the option of circuit-based inspections.

Defining a circuit with similar maintenance needs is critical for drawing conclusions about all catch basins in a system based on a sampling of catch basins. For well-defined circuits that include catch basins with similar sediment loads, sampling any 25 percent of the catch basins should be a representative sample to determine whether widespread maintenance within the circuit is needed. Therefore, circuits do not have to be on-line to allow for circuit approach. Off-line systems could still be inspected based on circuits, because they would have similar sediment loads in well-defined circuits. The most apparent pattern for jurisdictions that can pursue circuit-based inspection is the amount of data and operational knowledge about the stormwater conveyance system, which allows the jurisdiction to divide the geographical areas into circuits.

In-house vs. contracted out implementation strategies.

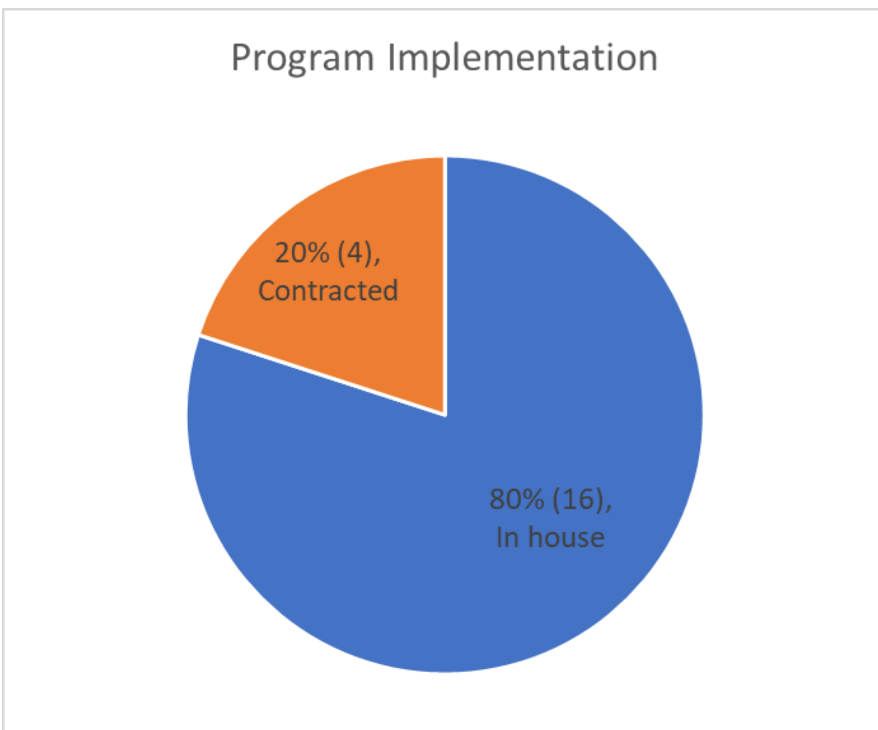


Figure 2: Program Implementation Distribution

Figure 2 above shows the breakdown of the program implementation strategies for the jurisdictions interviewed. Regarding the implementation strategies for inspection and cleaning activities, a high percentage of jurisdictions have the crew and equipment available and have always done the work in-house. Only four of the jurisdictions, representing 20 percent of those interviewed, are currently contracting out the inspection and maintenance activities. The jurisdictions contracting out this work include Lakewood, Covington, Edgewood, and Mercer Island.

Combined vs. separate inspection and cleaning activities.

Another question in the follow-up interviews focused on whether jurisdictions perform inspections separate from cleaning or if they combine them where the Vactor® truck is available at the time of inspection to perform any necessary cleaning. As shown on **Figure 3** below, the distribution is split with as many jurisdictions choosing to perform inspection and cleaning separately as choosing to do them together. A few jurisdictions apply a mixed approach where in some areas inspections and cleaning are combined (e.g., in high traffic areas that require traffic control plans or in areas with high sediment loads that, from experience, are known to need annual cleaning), and in other areas they first perform inspections and then send out the cleaning crew to the catch basins needing to be cleaned.

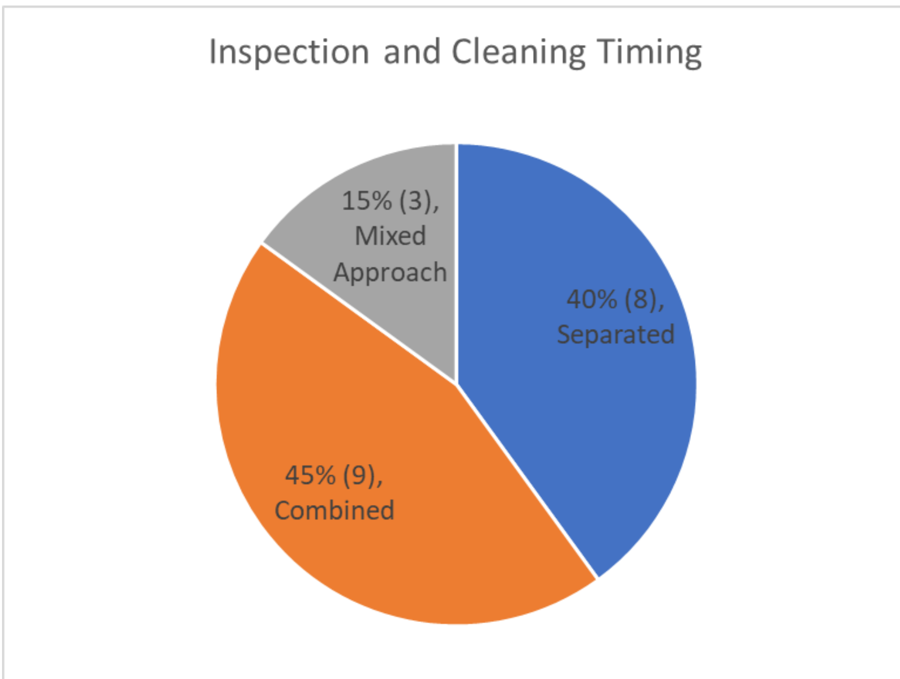


Figure 3: Inspection and Cleaning Timing

Transferable Lessons Learned

Several lessons learned from the survey and the follow-up interviews with jurisdictions have become apparent:

- Using updated data management tools for catch basin data built on digital databases has allowed jurisdictions to become more efficient, analyze trends, and define circuits. Some jurisdictions have implemented GIS-based tracking systems for crews in the field where they can mark inspection results, cleanings, and other issues with catch basins in real-time. Pierce County has realized 24-percent savings in their per catch basin cleaning and inspection costs after implementing an Asset Management System for catch basins. **Attachment A** includes more details about the Pierce County experience.
- Jurisdictions report that sweeping programs are one of the most cost-effective ways to keep streets and catch basins trash and sediment-free. Because street sweepers are much cheaper to operate than Vactor trucks, most of the jurisdictions have a sweeping program. However, none of the jurisdictions have quantified any cost savings realized by increased or targeted sweeping programs. Jurisdictions that experience relatively more snow in Western Washington have designed their sweeping program to remove sand from the roads after snow events and sweep arterials and areas with higher sediment accumulation on a more frequent basis. Some jurisdictions also try to optimize removal of leaves and debris according to the seasons and weather (i.e., deploy sweepers immediately after wind storms in the fall). These jurisdictions report heavier sediment loads in catch basins after heavy snow years that required increased sanding of the roads. A few jurisdictions are looking at using alternatives to sand, such as calcium magnesium acetate or various other salts.
- A few jurisdictions also report that having other BMPs that remove and/or accumulate sediment (i.e., wet vaults, stormwater treatment facilities) allows them to focus their sediment removal to fewer structures. These observations were qualitative; none of the jurisdictions measured reductions in sediment loads or maintenance required in the rest of the system.
- Many jurisdictions have reported that measuring the exact sediment depth has been difficult and inefficient when data for their system is incomplete (i.e., lacking total catch basin depth). While they can measure the depth to sediment, they do not know the total catch basin depth nor do they use a standard depth for sumps that would allow calculation of the sediment depth and the fill percentage. To make the process more efficient, a few jurisdictions are using a minimum of 12 inches clearance from the sediment surface to the invert of the lowest pipe instead of the 60 percent of the sump depth full. This results in fewer sediment accumulation records and more cleanings of catch basins. One jurisdiction reported that performing more cleanings of the catch basins and jetting of the pipes have significantly reduced their flooding events over roadways by 80 to 90 percent.

PROGRAM COSTS SUMMARY

One of the original goals of compiling catch basin inspection and cleaning cost information in this project was to examine how costs of inspection and/or cleaning may be lower depending on program implementation decisions (e.g., inspection schedule, combined/separate inspection, and cleaning). Comparing cost information submitted by jurisdictions has been challenging due to the high variability between jurisdictions' tracking systems. Each jurisdiction tracks their catch basin program in a unique way and includes expenses based on how their accounting system is setup. Generally, jurisdictions combine costs of inspection and cleaning activities in their accounting system, and therefore, a distinction between inspection costs and cleaning costs cannot be drawn. Many jurisdictions also include inspections for structural integrity and repairs to the catch basins in the same accounts that track catch basin inspections and cleanings for compliance with the permit. Some jurisdictions include equipment costs using an asset depreciation and recovery rate, and others do not include equipment costs. Overhead costs are recovered differently for each jurisdiction with some including program management, data management, office staff, or training activities and others including only some or none of the overhead activities. Disposal fees for solids have also been included in the costs of some jurisdictions, but others track the solids disposal separately when they manage sediment decant facilities or participate in other sediment management programs. The lack of uniformity in tracking costs does not allow for an accurate comparison between jurisdictions.

Attachment C includes the information received from jurisdictions in a summarized format. Box and whisker plots show the cost data distribution. The key to understanding the plots is provided in **Figure 4** below. The upper and lower quartiles are shown by the box, and the average is shown with an "X" in the middle of the box. The median is shown as a line across the box. The whiskers on the box show the range of values and outliers with values more than 1.5 times the quartiles are portrayed by the points above and below the extreme value. This plot helps extract any similarities or differences within data of the same kind where it can be divided into different bins.

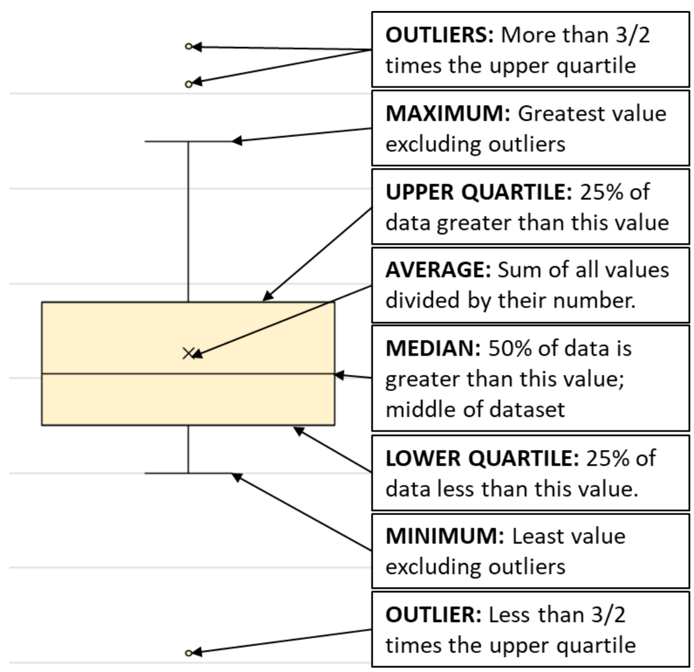


Figure 4: Box and Whisker Plot Key

Figure 5 below shows the distribution of cost data per catch basin in a box and whisker plot. The jurisdictions were separated into categories by size; small (less than 2,000 catch basins), medium (2,000 to 10,000 catch basins) and large (more than 10,000 catch basins); to try to illuminate any trends. Eight jurisdictions had more than 10,000 catch basins: City of Everett, City of Federal Way, City of Kent, City of Kirkland, City of Tacoma, Seattle Public Utilities, Pierce County, and WSDOT. These eight large jurisdictions contributed 43 cost data points between 2008 and 2015. Seven jurisdictions had between 2,000 and 10,000 catch basins: City of Arlington, City of Covington, City of Issaquah, City of Lakewood, City of Mercer Island, Port of Seattle, and Thurston County. These seven medium jurisdictions contributed 32 cost data points between 2008 and 2015. Four jurisdictions had less than 2,000 catch basins: City of Battle Ground, City of Brier, City of Edgewood, and City of Poulsbo. These four small jurisdictions contributed 28 cost data points between 2008 and 2015.

The distributions were similar between the different categories, but inconsistent cost tracking created wide variations in general, including some significant outliers. For example, the overall average cost per catch basin reported by jurisdictions was around $45, but the median value was only around $25. The minimum cost per catch basin reported was around $0.23 and the maximum was around $290. There is similarity in the average and median across the bins compared to the average. Counterintuitive to the paradigm of economies of scale, the large jurisdiction category shows the highest average, median, and outliers.

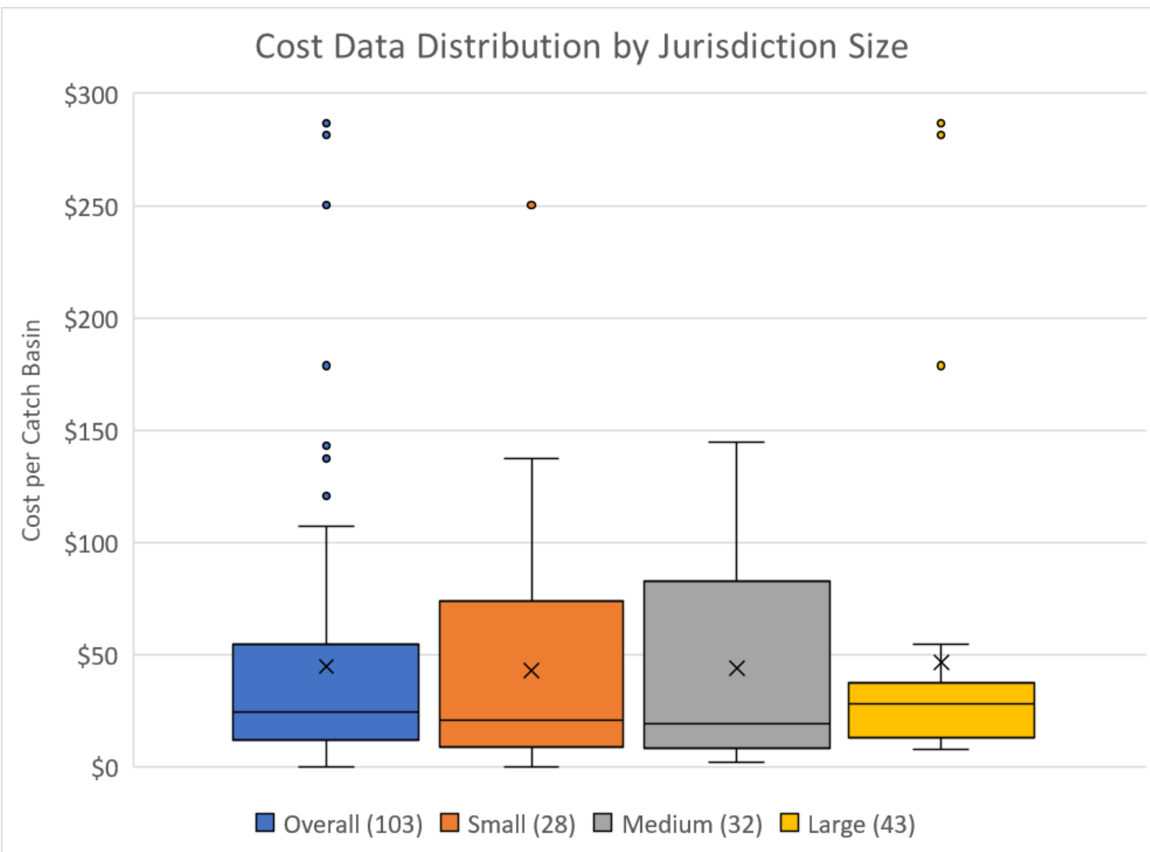


Figure 5: Costs by Permittee Size Distribution

Figure 6 below shows a breakdown of the cost data distribution by permittee phase. Large jurisdictions are typically Phase I permittees and, when the same data set was broken down in two bins by Phase I and Phase II permittees, the cost difference becomes more apparent. Phase I jurisdictions included are Port of Seattle, Seattle Public Utilities, Pierce County and WSDOT. WSDOT has a general NPDES permit that covers both Phase I and Phase II jurisdiction due state-wide distribution, but for the intent of this comparison, it was bundled together with the Phase I jurisdictions. The Phase I jurisdictions contributed only 28 cost data points, while Phase II jurisdictions contributed 75 cost data points. The Phase I cost average and median is showing at a much higher level than Phase II permittees. Additionally, all the outliers in the data appear in the Phase II bin.

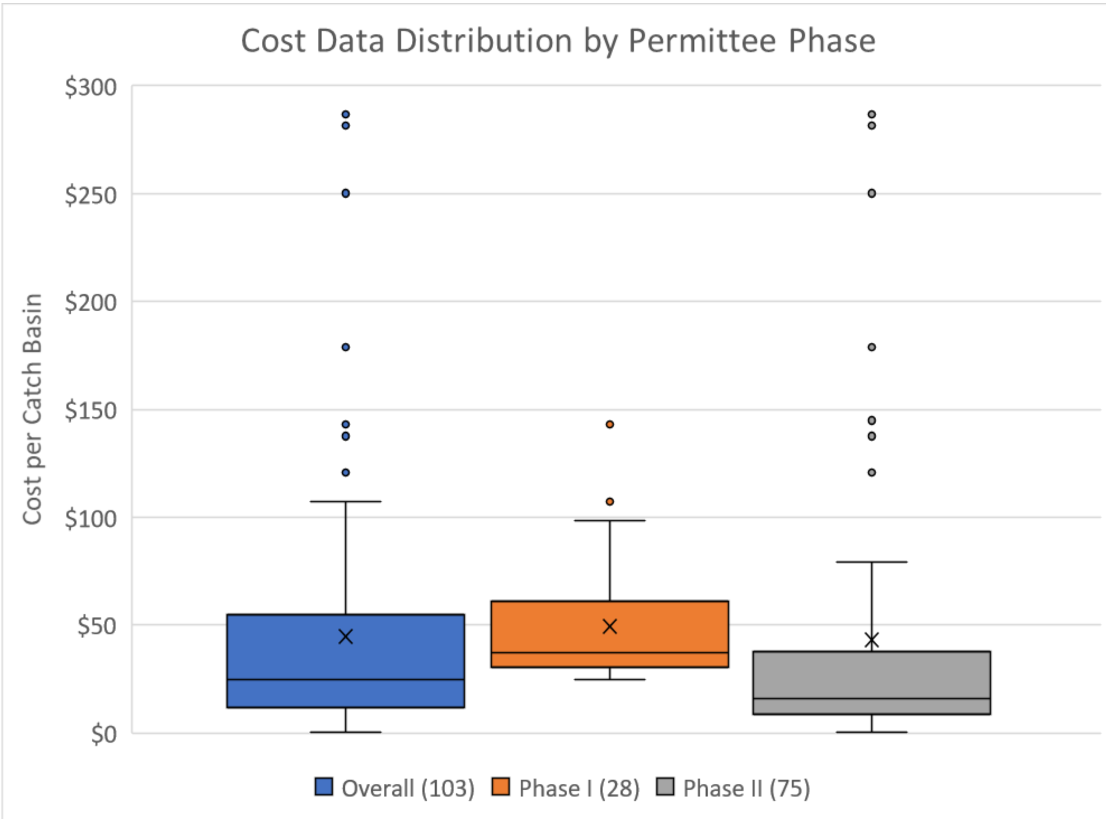


Figure 6: Costs Data Distribution by Permittee Phase

In summary, the lack of consistency in the cost tracking by jurisdiction results in data that do not allow for a lot of meaningful analysis into the reasons for the cost differences and similarities.

LIST OF ATTACHMENTS

Attachment A: Inspection Resources for Alternative Schedules

A1: Catch Basin Inspection Alternatives for Phase I and II

A2: Department of Ecology Alternative Schedule Summary Table

A3: Seattle Private Facilities Inspection Frequencies

A4: Catch Basin Program Presentation by Federal Way

A5: Catch Basin Sediment Evaluation Presentation by Federal Way

A6: Asset Management in Pierce County

Attachment B: Interviews Documentation

B1: Summary of Interviews Figure

B2: Notes from Follow-up Interviews

Attachment C: Cost Information Data Summary

ATTACHMENT A

INSPECTION RESOURCES

FOR ALTERNATIVE SCHEDULES

A Department of Ecology Report

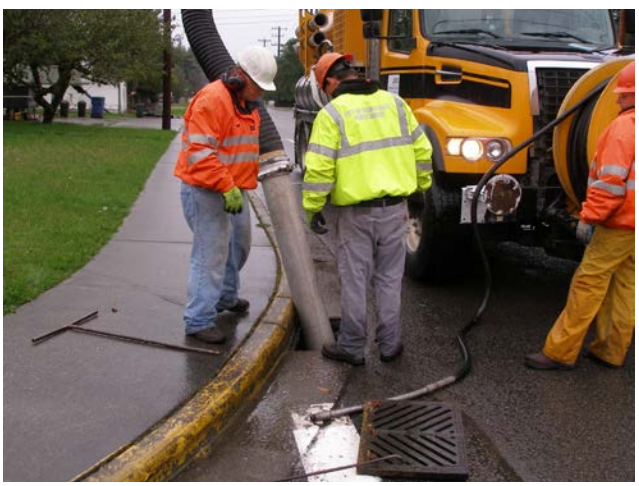
DEPARTMENT OF ECOLOGY State of Washington

Catch Basin Inspection Alternatives for Phase I and II Municipal Stormwater Permittees

Introduction

Washington's Phase I and Phase II Municipal Stormwater Permits (permits) require inspection and regular maintenance of catch basins and inlets[1] owned or operated by permittees. This focus sheet explains the catch basin inspection options in the permits and provides examples. This focus sheet will help permittees:

- Understand their catch basin inspection permit requirements.
- Review the four options each permittee has for implementing catch basin inspections.
- Select a catch basin inspection implementation approach (or approaches).



Vactor truck crew cleaning out a catch basin.

Benefits of catch basin inspection and maintenance

Catch basins have been in use nearly as long as modern storm drainage systems to prevent conveyance pipes from becoming clogged with debris and sediment. Catch basins act as the "first line of defense" by trapping and removing leafy debris, trash, and sediments from stormwater, thus preventing them from entering surface and ground water.

Several studies from around the country[2] have demonstrated the water quality benefits of regular catch basin maintenance. Kitsap County, a Western Washington Phase II permittee, reported removing 1,200 tons of material from catch basin sumps, vaults, stormwater ponds and streets in 2010. The majority, 962 tons, came from the catch basins and

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[1] The term "catch basin" in this document also includes inlets.
[2] USEPA Catch Basin Fact Sheet: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=77&minmeasure=5

vaults. Sediment sampling indicates that this equates to removing roughly 800 pounds of toxic metals (copper, lead, and zinc), nine pounds of polycyclic aromatic hydrocarbons (PAHs), and 290 gallons of oil[3]. This is just one year of maintenance from one of over 100 Washington State permittees.

To maintain proper catch basin functions, permittees need to regularly inspect catch basins and remove the buildup of materials when needed. Inspections also allow permittees to identify and address potential structural and functional issues early. This proactive effort helps prevent small problems from developing into costly, time-consuming repairs.

Catch basin inspection timelines

Washington State municipal stormwater permits establish timelines for catch basin inspection requirements. The default requirements are:

- *Phase I Permit* (S5.C.9.d): Inspect all catch basins annually.
- *Western Washington Phase II Permit* (S5.C.5.d): Inspect all catch basins once no later than August 1, 2017 (except City of Aberdeen by June 30, 2018) and every two years thereafter.
- *Eastern Washington Phase II Permit* (S5.B.6.a.ii (b)): Inspect all catch basins at least once by December 31, 2018, and every two years thereafter.

These inspection timelines (referred to as the standard approach in this document) may be adjusted using the alternatives discussed below.

Vactor truck crew cleaning out a catch basin.

Options for implementing catch basin inspection requirements

Given the wide variability in municipal separate storm sewer system (MS4) configurations and pollutant loading potential, each permit contains four options for inspecting catch basins and inlets:

1. A *standard approach* of inspecting all catch basins and inlets within the MS4 (frequency is set by permit—either annually or every two years).
2. Establishing a specific, *less frequent schedule* based on documented evidence.
3. Identifying *circuits* (see explanation of circuits on page 4) and inspecting 25 percent of the catch basins within each circuit (frequency set by permit—either annually or every two years).
4. Cleaning the *whole system*, including all pipes, ditches, catch basins, and inlets within a circuit once during the five-year permit term, where the circuit drains to a single discharge point.

Permittees may choose to implement one of the four inspection options for the entire MS4, or implement different options for different portions of the MS4. The permit does not require that

[3] Kitsap County: www.kitsapgov.com/sswm/pdf/7007.pdf

Ecology 'approve' a permittee's switch to a less frequent or different inspection schedule or approach. Still, the permittee must be able to explain why a less frequent or different inspection schedule is appropriate in certain areas, and must document and report the change in the Annual Report.

Catch basin inspection for depth of sediment accumulation.

The following are detailed descriptions of the four catch basin inspection options:

1. Standard Approach

With this approach, permittees inspect all catch basins they own or operate according to default permit timelines (described above). Permittees maintain those found out of compliance with applicable maintenance standards.

2. Documentation of a Less Frequent Schedule

Under this option, permittees consult maintenance records or documented maintenance experience to determine a specific, less frequent inspection schedule that will reliably track the condition of the catch basin without exceeding the maintenance standards. For example, maintenance records may document that for a portion of the MS4, the rate of sediment accumulation is equivalent to 10% per year. At this rate of sediment accumulation, it would take six years to reach the sediment height of 60% full. If, for this community, the maintenance standard triggers cleaning at 60% full, then less frequent inspections (e.g., every three years) are entirely appropriate.

Permittees choosing this option must have maintenance records for double the length of time of the proposed inspection frequency. Examples of how to use this option include:

- A Phase I permittee, currently required to conduct annual inspections of catch basins, is planning to inspect once every two years. In this case, the permittee will need at least four years of annual inspection records showing that maintenance was not needed to demonstrate that the proposed two-year inspection schedule is appropriate for the area where it will be implemented.
- A Phase II community hoping to reduce the inspection schedule to once every three years will need to conduct three rounds of inspections (every two years covering six years total), with all inspections showing that the catch basins in the area did not exceed maintenance standards.
- A Phase II permittee with detailed maintenance records that go back to before 2007 could use that data to justify a four year inspection schedule prior to 2015 if the records adequately document that maintenance standards were not exceeded.

The *Less Frequent Schedule* option can only be applied to catch basins with maintenance records of physical inspections or as described in the paragraph below. Documented evidence from the subset of catch basins inspected on the circuit basis cannot be used to justify a less frequent inspection schedule for all the catch basins in the circuit.

Vactor truck crew dislodging accumulated catch basin solids during cleaning.

In the absence of maintenance records, permittees may submit a written statement to Ecology to document a specific, less frequent schedule. Permittees must base the written statement on actual inspection and maintenance experience. Permittees must certify the statement in accordance with G19 Certification and Signature of the permit, which requires a duly authorized representative to certify that the information is “true, accurate, and complete” under penalty of law.

3. Circuit Inspection Approach

Some permittees have found that sediment accumulation and the need for maintenance varies within the MS4 based on traffic volumes, land use, topography, street maintenance practices, or the configuration of the MS4. For example, catch basins in an established residential area with low traffic volumes and gentle slopes may accumulate sediment more slowly than catch basins in a high traffic volume commercial or industrial area. Similarly, catch basins along primary arterials and maintained snow routes are likely to experience increased rates of sediment accumulation. For certain areas, especially those with lower sediment accumulation rates, the ‘circuit inspection approach’ may be a useful alternative to the standard approach.

The ‘circuit inspection approach allows permittees to target inspection of certain catch basins within areas that either drain to a single point or that have similar rates of accumulation and similar maintenance needs.

According to the Definitions and Acronyms section of each permit, “A circuit means a portion of a MS4 discharging to a single point or serving a discrete area determined by traffic volumes, land use, topography, or the configuration of the MS4.” Circuits may vary in size and maintenance needs. The simplest type of circuit is a set of connected facilities that drain to a single point.

Permittees using the ‘circuit inspection approach’ must inspect a minimum of 25 percent of catch basins within a circuit, including the catch basin immediately upstream of any system outfall (within their jurisdiction). Defining a circuit with similar maintenance patterns is critical to allow a “sampling” of a limited number of catch basins to determine conclusions about all catch basins in the circuit. If the circuit is truly similar, then any 25 percent of catch basins should produce a sample that determines whether widespread maintenance within the circuit is needed.

Ecology reminds permittees using the ‘circuit inspection approach’ that they are responsible for ensuring that the catch basins they do not sample meet the program objective of reducing pollutants. During the first few circuit inspections, Ecology encourages permittees to conduct quality control by inspecting additional catch basins outside of the 25 percent sample to ensure the sample is actually representative of the circuit. Establishing the circuit and conducting quality control assures the jurisdiction that its ‘circuit inspection approach’ will work. If there are significant changes to the traffic, land use activities, or other factors, Ecology encourages the permittee to revisit the circuit delineation and adjust it accordingly.

Permittees employing the ‘circuit inspection approach’ can expect to encounter a variety of situations, and should rely on knowledge of their MS4 and best professional judgment to evaluate the next steps. The following are examples of some of the results and preferred responses to sampling results:

- If none of the inspected sampling of catch basins indicates that maintenance is needed, there is no need to inspect additional catch basins within the circuit.
- If all of the inspected catch basins within the circuit indicate that maintenance is needed, inspect all remaining uninspected catch basins within the circuit and perform all necessary maintenance.
- If the circuit inspection yields highly variable results (i.e., some catch basins exceed the maintenance standard while others do not), re-evaluate the ‘circuit inspection approach’ as applied to this area. For example, the circuit may need to be redrawn or the ’circuit inspection approach’ is not appropriate for this area of the MS4.

The following examples illustrate the types of situations that may require further actions or evaluation:

- When an inspected catch basin in a circuit that drains to a single point exceeds the maintenance standard, inspect (and where needed, maintain) catch basins up-gradient of the initial inspected catch basin, beginning with the nearest catch basin. Continue inspecting up-gradient, following each branch within the circuit until reaching catch basins that represent the remaining up-gradient circuit which do not need maintenance.

How Does the Circuit Inspection Approach Work with Asset Management?

Asset management of the MS4 combines regular monitoring, adaptive management, financial considerations, sound engineering practices and other policies and procedures to provide the best and most cost-effective level of service to physical assets such as catch basins. It involves inspecting the structural defects of the catch basin to manage repairs or replacement. Maintenance standards for structural defects include checking the catch basin cover, frame, walls, bottom, or inlet/outlet pipes for cracks, fractures, settlement, or vegetation growth. Stormwater managers using the circuit sampling approach will develop other approaches to evaluate the structural function of catch basins that are not inspected as part of the sample. One cost-efficient option is to coordinate the structural evaluation with illicit discharge inspections. Structural inspections may need to be more frequent in areas of older infrastructure than in areas of new infrastructure.

- For circuits defined by similar traffic or land use conditions in which catch basins are not connected to each other, when an inspected catch basin exceeds the maintenance standard, inspect (and where needed, maintain) all remaining uninspected catch basins with the circuit. If the remaining, uninspected catch basins do not need maintenance, then evaluate why these differences in maintenance needs exist. Are there are other explanations for excess sediment, such as a nearby construction site that discharged sediment-laden runoff during a recent storm event? Or, does the discrepancy indicate that the circuit is not similar enough to support this approach?

Pierce County has integrated circuit-based inspections into their asset management program. Pierce County Road Operations (PCRO) performs annual inspections of over 4,000 circuits. Catch basins are inspected beginning with the most downstream catch basin in the circuit. Inspections proceed upstream until three up-gradient catch basins in every applicable direction are found that do not trigger maintenance per the standards, or until all catch basins in the circuit are inspected. For compliance with the 2013-2018 Phase I permit, the County will also need to assure that a minimum of 25 percent of the catch basins in each circuit are inspected.

4. Whole System Cleaning of a Circuit

Recent efforts by some Phase I permittees have demonstrated the water quality benefits of cleaning all pipes, ditches, catch basins, and inlets within a circuit that drains to a single point. Particularly in older portions of a MS4, contaminants from historical activities may have accumulated in cracks, crevices, low spots, or other areas within the conveyance system prior to the requirements for stormwater source controls and routine maintenance. For such areas, cleaning the whole system within the circuit one time during the permit cycle may make the most sense. Inspection and maintenance to address structural issues may still be needed.

The City of Tacoma recently conducted a study that showed statistically significant reductions in pollutants discharged from the MS4 following circuit-based whole system cleaning. Pollutants monitored included total suspended sediments (TSS), lead, zinc, and PAHs (including both light and heavy PAH fractions), and bis(2-ethylhexyl)phthalate (DEHP). For more information on this study, see the City of Tacoma's webpage (www.cityoftacoma.org/Page.aspx?hid=8096) for Section S8.E Program Effectiveness reports.

Permittees that implement this option will clean their whole system (within a circuit that drains to a single point) once during the five-year permit term. This may significantly reduce the inspection level of effort, which might otherwise occur annually or every other year. Permittees often combine whole system/circuit cleaning with structural inspections. Doing so may lead to early detection and rehabilitation of failing conveyance systems. Removing legacy pollutants from the MS4 and rehabilitating failing conveyances have the potential to significantly improve water quality.

Selecting the best options for the MS4

Ecology recommends the following steps in selecting which approach to apply to different portions of the MS4:

- *Review* system maps and maintenance records for areas with documentation to support a less frequent schedule, to identify areas of similar maintenance patterns for the circuit inspection approach, or to look for opportunities for whole system cleaning.
- *Delineate* areas for the less frequent inspection, the circuit inspection approach, or whole system cleaning.
- *Document* which catch basin approach is being applied in any portion of the MS4, and why. This information must be reflected in the Annual Report submittal.

Vactor truck dumping its load at a decant facility for proper waste handling.

Catch basin maintenance timelines

The permits require permittees to establish catch basin maintenance standards. Compliance with these standards helps keep catch basins functioning as designed, removes pollutants, and prevents re-suspension of pollutants during wet weather events. Permittees must at a minimum base these maintenance standards on the guidance in Chapter 4 of Volume V (Pages 4-37 through 4-38) of Ecology's 2012 *Stormwater Management Manual for Western Washington* (SWMMWW) or Chapters 5, 6 and 8 of the *Stormwater Management Manual for Eastern Washington* (2004) or another technical manual approved by Ecology. The guidance lists conditions when maintenance is needed and the results expected when maintenance is performed.

If an inspection identifies an exceedance of the maintenance standard, the permittee must conduct maintenance. Unless there are circumstances beyond the permittee's control, a permittee must complete required maintenance related to facility function within six months of the date that the maintenance standard exceedance was detected. Maintenance may include simply cleaning the catch basin to remove accumulated debris, or could include correcting structural problems that prevent the facility from functioning as designed. Permittees must dispose of catch basin waste appropriately. When conducting circuit-based whole system cleaning, permittees must be prepared to collect all material removed from the circuit and all water used in cleaning the circuit. These materials are wastes and must be properly handled, stored, tested and disposed of accordingly.

Summary

Ecology encourages permittees to consider the range of available catch basin inspection options and use local knowledge and experience to establish a program that makes the most sense for their MS4.

Over time, permittees may modify their selected approaches to improve effectiveness and efficiency, or to respond to altered land use conditions. Permittees may also change their selected approaches if they change other operational or maintenance practices, such as street sweeping. Although there may be a trial-and-error period to find the right balance of approaches, the objective of selecting an approach is to meet the catch basin maintenance standards with the appropriate level of effort.

For more information

Permittees with questions on catch basin and inlet inspection and maintenance alternatives should contact their regional permit specialist.
www.ecy.wa.gov/programs/wq/stormwater/municipal/municontacts.html

If you need this document in a format for the visually impaired, call the Water Quality Program at 360-407-6600. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

Permittee	Alternative Method	Observation
Bothell	Circuit Based approach. Inspecting the first 3 catch basins above a facility. If they are dirty they clean and jet the whole system. Also, they are inspecting and jetting all pipes	Not clear if this means all 3 catch basins need to be dirty before they clean the system. Also, not sure about the size of the circuit. Presumably the jetting of all pipes keeps the catch basins from refilling quickly. There's no description about how these two strategies are used in combination with each other.
Duvall	Not using an alternative method	Must have answered the annual report question incorrectly
Federal Way	Used the method allowing for cleaning at double the length of time based on existing records – dividing up the city into "circuits" cleaning all catch basins and inventoried. Then measured annually to determine the appropriate cleaning schedule using	This strategy had some big upfront costs, but they now have data justifying the cleaning of some circuits on a 5 year schedule.
King County	Differs by custodial agency. Roads has the largest burden and they implement a circuit based approach. The Airport cleans their entire stormwater system once during the permit term.	No clear description of how a circuit is defined, no identification of how many CBs are inspected as a "subset" of a circuit.
Renton	The Parks and Golf Course Department uses **S5.C.5.d.ii** "*The Permittee may clean all pipes, ditches, catch basins, and inlets within a circuit once during the permit term. Circuits selected for this alternative must drain to a single point*" as its alternative to the standard approach of inspecting all catch basins once no later than August 1, 2017 and every two years thereafter.	No clear description of how a circuit is defined
Snohomish County	Roads Maintenance Division uses the method allowing for cleaning at double the length	Over 4 year period, the division cleaned over 12,000 CBs. In that same period, only

	of time based on existing records.	2 of those basins required more than a single cleaning (>60% full).
Seattle	Frequency of stormwater facility inspections not CBs	May be worth looking at the study done by Cascadia for SPU on alternative schedules for facilities?
Tacoma	City of Tacoma, Environmental Services (ES), Operation and Maintenance Division uses a **circuit based approach**.	Individual maintenance plans are developed for some catchments with especially heavy loads of sediment and individual problem catch basins. These maintenance plans include specific guidelines for the type of maintenance and frequency needed, and are developed as a result of observations during regular maintenance visits by staff. May be worth looking at maintenance plans?

City of Seattle
Seattle Public Utilities

January 4, 2011

Rachel McCrea
Municipal Stormwater Specialist
Water Quality Program
Department of Ecology
Northwest Regional Office
3190 160th Ave SE
Bellevue, WA 98008-5452

Re: Written Statement to Document a Less Frequent Inspection Schedule of Stormwater Facilities Regulated by the City of Seattle

Dear Ms. McCrea,

This written statement by Seattle Public Utilities (SPU) serves to justify a less frequent inspection schedule of stormwater facilities regulated by the City of Seattle (hereafter referred to as private stormwater facilities) as allowed in Special Condition S5.C.9.b.ii(3). Starting on January 1, 2012, SPU would begin conducting inspections on a frequency of once every two years.

SPU has been designated by the Mayor of Seattle as the lead agency responsible for implementation of the 2007 NPDES Phase I Municipal Stormwater Permit (permit). As the lead, SPU is responsible for implementation of Special Condition S5.C.9.b.ii for *maintenance of stormwater facilities regulated by the Permittee.* SPU has successfully implemented a private stormwater facility inspection program as required by the permit. The program is designed to determine if private stormwater facilities are in compliance with the City of Seattle Stormwater Code (SMC Chapters 22.800 – 22.808).

In 2010, SPU hired Cascadia Consulting Group to assist with a study of private stormwater facility compliance to evaluate whether there would be sufficient justification to reduce the frequency of inspections for these facilities from the level specified in the permit (annually starting in 2012). Specifically, Cascadia was hired to design and analyze data for a statistically valid study of inspected facilities to test the potential alternative schedule by estimating continued compliance levels among facilities after one year. The study sought to determine whether at least 80 percent of facilities that were found to be in compliance in 2009 remained in compliance after one year (2010). To help SPU select the private stormwater facilities to visit, Cascadia developed a study design with a randomized list of private stormwater facilities and the number of follow-up stormwater facility visits SPU needed to conduct to achieve a ±5 percent margin of error at the 95 percent confidence level.

Ray Hoffman, Director
Seattle Public Utilities
700 5th Avenue, Suite 4900
PO Box 34018
Seattle, WA 98124-4018

Tel (206) 684-5851
Fax (206) 684-4631
TDD (206) 233-7241
ray.hoffman@seattle.gov

To implement the study, SPU conducted follow-up visits of 267 stormwater facilities that had been inspected, and found to be in compliance, or brought into compliance in 2009 to determine if they were found in compliance in the next year (2010). Based upon these follow-up visits, it has been determined that at least 80 percent of all private stormwater facilities included in this study remained in compliance one year after their previous inspection (Attachment 1. Private Stormwater Facility Inspection Study Report, Cascadia 2010).

The study, based on actual inspection results and the best professional judgment of SPU inspectors indicate that the sample population is not materially different from the overall population of private stormwater facilities. The results support the change in the inspection frequency for all private stormwater facilities that discharge to the City of Seattle's municipal separate storm sewer system to once every two years starting on January 1, 2012. However, if SPU receives a complaint about a private stormwater facility via its Water Quality Hotline or SPU determines during a Source Control Inspection that a site's stormwater facility is out of compliance, SPU will use progressive enforcement to bring the private stormwater facility into compliance with the City ordinances and rules. The study results suggest that stormwater facilities at Public Schools had a lower compliance rate than other categories. Due to the complex nature of these sites, SPU is going to devote extra resources over the next two years to require those sites to achieve compliance. If Ecology agrees with this written statement for a reduction of inspection frequency of stormwater facilities regulated by the City of Seattle for compliance with Special Condition S5.C.9.b.ii(3), SPU requests that Ecology respond in writing that the SPU approach constitutes compliance with the alternative in S5.C.9.b.ii(3).

I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for willful violation.

Cordially,

Nancy Ahern

Nancy Ahern, Director
Utility System Management Branch
Seattle Public Utilities

Attachment: Cascadia Private Stormwater Facility Inspection Study Report

cc: Bruce Bachen, SPU
Ingrid Wertz, SPU
Louise Kulzer, SPU
Kevin Buckley, SPU
Theresa Wagner, City Attorney's Office

CASCADIA
CONSULTING GROUP

To: Ellen Stewart and Kevin Buckley, Seattle Public Utilities, Stormwater Management Program

From: Jessica Branom-Zwick and Christy Shelton

Date: December 3, 2010

Subject: **Results of Study to Assess Private Stormwater Facility Inspection Schedule**

Seattle Public Utilities' (SPU) Stormwater Management Program works with private owners of stormwater facilities to ensure that systems are regularly maintained to prevent flooding, avoid property damage, and protect surface water quality. To comply with the 2007 NPDES (National Pollutant Discharge Elimination System) Phase I Municipal Stormwater permit, SPU is responsible for inspecting private stormwater facilities connected to the municipal separate storm sewer system (MS4). The permit requires SPU to conduct inspections according to the standard schedule described in the permit or according to an alternative schedule supported by maintenance records or a written statement.

Starting in 2012, the permit requires SPU to inspect all stormwater facilities regulated by SPU once each year. SPU program managers wish to discover whether annual inspections are warranted so SPU hired Cascadia Consulting Group to design and analyze data for a statistically valid study of inspected facilities to test the potential alternative schedule by estimating continued compliance levels among facilities after one year. Specifically, this study sought to determine whether at least 80 percent of facilities that were known to be in compliance in 2009 remained in compliance after one year (2010). Using this result, SPU would change the inspection frequency for compliant facilities to every two years. Accordingly, SPU seeks to propose an alternative inspection schedule, outlined in the table below.

	Standard Schedule	Potential Alternative Schedule
Initial Inspections	All private stormwater facilities connected to the MS4 inspected by February 2012	Same
Ongoing Inspections	Annual inspections for all private stormwater facilities connected to the MS4	Annual inspections for facilities inspected and <u>not</u> brought into compliance
		Inspections every two years for facilities inspected and found in or brought into compliance.

Key Findings

Overall, **at least 80 percent of sites included in this study remained in compliance**, although rates varied by subgroup:

- 88 percent compliance among **multifamily** residential sites (n=114).
- 87 percent compliance among **single-family** residential sites (n=30).
- 80 percent compliance among **commercial or mixed use** sites (n=103).
- 40 percent compliance among **church, school, or public** sites (n=20).

Approach and Methodology

To assess whether a reduced inspection frequency is warranted, SPU conducted follow-up visits of stormwater facilities in 2010 that had been inspected in 2009 and were found in or brought into compliance. These follow-up visits determined whether the stormwater facilities that were in compliance in 2009 remained in compliance in 2010 and assessed the proportion of compliant facilities. SPU sought to determine whether at least 80 percent of these previously compliant facilities remained in compliance after one year. This section describes the population of private stormwater facilities, the population and sample sizes included in this study, and the data collected during site visits. The original study design, excluding the randomized list of sites, is presented in Attachment A.

Stormwater Facility Population Characteristics

Current data from SPU indicate that about 1,400 private stormwater treatment and flow control facilities discharge to the MS4 in Seattle, and an additional 286 are uncategorized by sewer class. In consultation with SPU project managers, facilities were arranged into six groups based on the expected facility type and the party responsible for maintenance. Table 1 presents the estimated number of private stormwater facilities flowing to the MS4, grouped by land use type. These facilities represent the total population of relevant facilities; the study sampled a subset of these facilities.

Table 1. Private Stormwater Facilities Flowing to the Separate or Partially Separate Storm Sewer Systems (MS4)

Land Use Type	Facilities
Single-family residential	560
Multifamily residential	392
Commercial or mixed use	323
Church, school, or public	84
Industrial	39
Parking lot	2
Total	1,400

- **95 percent confidence level.** If we were to repeat this study using the same random sampling methods, we expect that the confidence interval—the range defined by the margin of error around the estimate—would contain the true population value 19 out of 20 times (95%). The sample has a small chance of not representing the true population value; that risk is reduced with higher confidence levels (e.g., 99% confidence level).

To reduce the margin of error further, SPU attempted to visit all sites in the study population, increasing the sample sizes above the original study design expectations. During site visits, some sites were re-categorized or removed from the study population for the following reasons:

- Re-categorized to a more appropriate land use type (9 sites).
- Removed because they were duplicates of other sites already included in the study (3 sites).
- Removed because SPU would not be required to inspect them under its NPDES permit as the sites are either not connected to the MS4 (18 sites) or are owned by the City of Seattle and conduct self-inspections (18 sites).

Table 2 presents the final number of sites sampled during the study, number of eligible sites in the study population, and margins of error associated with each subpopulation by land use type. In calculating margins of error, we assumed that the sites sampled from the study population constituted both a random sample (not a sample chosen for convenience) and a representative sample (meaning the unvisited sites were not materially different from the sites sampled).

Table 2. Final Number of Site Visits, Study Population, and Margin of Error

Land Use Type	Site Visits	Study Population	Margin of Error
Single-family residential	30	32	4.5%
Multifamily residential	114	123	2.5%
Commercial or mixed use	103	103	0%
Church, school, or public	20	21	4.9%
Grand Total	267	279	1.2%

Note: The margin of error is zero for commercial or mixed use sites because all eligible sites in the study population were sampled.

The facilities inspected in 2009 and presented as the study population in Table 2 were not randomly selected from all private stormwater facilities connected to the MS4. SPU chose these facilities because they had never been inspected before; they had the oldest previous inspection dates (i.e., all other facilities of that type had been inspected more recently); or they completed the corrective actions needed to reach compliance in 2009. Because these 279 facilities did not constitute a random sample of all facilities, the results of the current analysis statistically apply only to those facilities that were known to be in compliance in 2009, not to the full population of all 1,400 private stormwater facilities. However, the results of this study would apply to all private stormwater facilities to the extent that the facilities visited formed a representative sample of all facilities, which cannot be determined through the current analysis.

Data Collection

This study used existing data from the SPU database as well as new data collected during follow-up visits to sample sites. Although this analysis only considered facility type "land use" and compliance status in 2009 and 2010, SPU inspectors also recorded additional data that could be used in future studies, including type of corrective action(s) needed in 2010 and facility size measured by number of units.

Analytical Results

Based on follow-up visits conducted by SPU inspectors, at least 80 percent of all sites included in this study remained in compliance one year after their previous inspection. Among subgroups, at least 80 percent of single-family residential, multifamily residential, and commercial or mixed use sites included in this study remained in compliance. Compliance among church, school, or public sites was much lower at an average of 40 percent. Table 3 presents the weighted average compliance rate among facilities that received site visits as well as the 95% confidence interval representing the estimated range of compliance for all sites in the study population. The confidence interval was calculated using the margins of error presented above in Table 2.

Table 3. Compliance Rates by Land Use Type

Land Use Type	Average Compliance Rate	95% Confidence Interval	
		Low	High
Single-family residential	**87%**	82%	91%
Multifamily residential	**88%**	85%	90%
Commercial or mixed use	**80%**	80%	80%
Church, school, or public	**40%**	35%	45%
Total	**81%**	**80%**	**82%**

According to the study design, SPU may decide to provide a written statement to the Department of Ecology requesting a proposed alternative inspection schedule for the land use types single-family residential, multifamily residential, and commercial or mixed use sites.

For church, school, or public sites, SPU may conduct further studies to determine whether additional characteristics of church, school, or public stormwater facilities provide more detailed information to support an alternative inspection schedule for these stormwater facilities. In particular compliance in 2010 may have been reduced because over half (12 out of 20) of the church , school, or public sites had originally been inspected in 2009 under an alternative inspection program that used different protocols for determining compliance than SPU inspectors used for other sites in this study. This study could not determine a statistically valid compliance rate among the remaining eight church, school, or public sites due to the small sample size.

Attachment A - Study Design

CASCADIA
CONSULTING GROUP

To:	Ellen Stewart and Kevin Buckley, Seattle Public Utilities, Stormwater Management Program
From:	Jessica Branom-Zwick and Christy Shelton
Date:	September 17, 2010
Subject:	**Study Design to Assess Private Stormwater Facility Inspection Schedule**

Seattle Public Utilities' (SPU) Stormwater Management Program works with private owners of stormwater facilities to ensure that systems are regularly maintained to prevent flooding, avoid property damage, and protect surface water quality. Stormwater facilities typically include storm grates, catch basins, outlet traps, and flow control structures.

To comply with the 2007 NPDES (National Pollutant Discharge Elimination System) Phase I Municipal Stormwater permit, SPU is responsible for inspecting private stormwater facilities connected to the separated stormwater system. The permit requires SPU to conduct inspections according to the standard schedule described in the permit or according to an alternative schedule supported by maintenance records or a written statement. SPU program managers believe the standard schedule, requiring annual inspections of all facilities, to be unnecessary. Accordingly, SPU proposes testing an alternative inspection schedule, outlined in the table below. SPU hired Cascadia Consulting Group to design a statistically valid study of inspected facilities to test the potential alternative schedule and estimate continued compliance levels among facilities inspected every two years.

	Standard Schedule	Potential Alternative Schedule
Initial Inspections	All facilities by February 2012	Same
Ongoing Inspections	Annually for all facilities	Annually for facilities inspected and not brought into compliance
		Every two years for facilities inspected and found in or brought into compliance.

Approach

To assess whether a reduced inspection frequency is warranted, SPU will conduct follow-up visits of stormwater facilities in 2010 that had been inspected in 2009 and were found in or brought into compliance. These follow-up visits will determine whether the stormwater facilities that were in compliance in 2009 remain in compliance in 2010 and assess the proportion of compliant facilities. SPU seeks to determine whether at least 80 percent of these previously compliant facilities remain in compliance after one year.

To achieve a reasonable level of certainty, Cascadia recommends collecting a sufficient sample size to achieve a ±5 percent margin of error at the 95 percent confidence level. These statistical terms have the following meanings:

- **±5 percent margin of error.** The true proportion of compliant facilities is within ±5 percent of the estimated proportion. The margin of error defines a **confidence interval** around the estimated value. For example, an estimated proportion of 85 percent ±5 percent means that the true proportion is expected to be between 80 and 90 percent.
- **95 percent confidence level.** If we were to repeat this study using the same random sampling methods, we expect that the confidence interval, the range defined by the margin of error around the estimate, would contain the true population value 19 out of 20 times (95%). The sample has a small chance of not representing the true population value; that risk is reduced with higher confidence levels (e.g., 99% confidence level). Although Cascadia strongly recommends using at least a 95 percent confidence interval, we also provide sample sizes for conducting the analysis using a 90 percent confidence interval as a lower-cost (but less accurate) alternative for SPU.

Population Characteristics

Current data from SPU indicate that about 1,400 private stormwater treatment and flow control facilities flow into the separated and partially separated storm sewer systems in Seattle, and an additional 286 are uncategorized by sewer class. Although information is not readily available on the specific type of facilities in use (e.g., catch basins, detention ponds, vaults, oil/water separators), land use type (e.g., residential, commercial, school) can serve as a reasonable proxy for different types of facilities. For example, commercial and multifamily residential facilities typically have catch basins, while single-family residential facilities usually do not.

In consultation with SPU project managers, facilities were arranged into six groups based on the expected facility type and party responsible for maintenance. Facilities on mixed-use properties were grouped with commercial properties because they are expected to have similar facility components and be maintained by a commercial property owner or manager. Although facilities at multifamily residential properties are expected to have similar components to facilities on commercial and mixed-use properties, they may be maintained by a homeowners' association or by a residential property owner or manager. Facilities at churches, schools, and other public institutions were grouped because they are expected to face similar budget constraints that may limit facility maintenance.

Table 1 presents the estimated number of private stormwater facilities flowing into the separated or partially separated sewer systems, grouped by land use type. These facilities represent the total population of relevant facilities, but only a portion of these are considered in this study.

Table 1. Private Stormwater Facilities on Separated or Partially Separated Sewer Systems

Land Use Type	Facilities
Single-family residential	560
Multifamily residential	392
Commercial or mixed use	323
Church, school, or public	84
Industrial	39
Parking lot	2
Total	1,400

In 2009, SPU records show that 319 stormwater facilities inspected that year were known to be in compliance. This group includes two sets of facilities. The first set includes facilities that were inspected in 2009 and found to need no corrective actions. The second set includes facilities were inspected in 2009 or earlier and were brought into compliance through corrective actions in 2009. Table 2 presents the number of facilities known to be in compliance in 2009, by land use type and corrective actions needed. These facilities inspected in 2009 represent the study population for the 2010 study as well as the maximum sample sizes that SPU can use for this study (unless additional facilities *not* inspected in 2009 are added).

Table 2. Private Stormwater Facilities in Compliance in 2009

Land Use Type	No Action Needed	Corrective Action Taken	Total Facilities
Single-family residential	23	12	**35**
Multifamily residential	46	77	**123**
Commercial or mixed use	28	85	**113**
Church, school, or public	31	15	**46**
Industrial	2	--	**2**
Parking lot	--	--	**--**
Grand Total	130	189	319

The facilities inspected in 2009 and presented in Table 2 were not randomly selected. SPU chose these facilities because they had never been inspected before; they had the oldest previous inspection dates (i.e., all other facilities of that type had been inspected more recently); or they completed the corrective actions needed to reach compliance in 2009. Because these 319 facilities do not constitute a random sample, the results of the current analysis applies only to those facilities that were known to be in compliance in 2009, not to the full population of all 1,400 private stormwater facilities. The results would apply to all private stormwater facilities only to the extent that the facilities known to be in compliance in 2009 form a representative sample of all facilities, which cannot be determined through the current analysis.

Sample Sizes

This study analyzes a relatively small population—the 319 stormwater facilities that were known to be in compliance in 2009. For the current study, we can take one of two approaches and associated statistical methods:

- **Hypothesis testing,** in which we test whether at least 80 percent of facilities remain in compliance but do not focus on the actual proportion (percentage) of facilities that remain in compliance.
- **Estimation of the proportion** and a surrounding confidence interval, in which we calculate the estimated proportion of facilities that remain in compliance and establish a range that we expect includes the true population value.

We discuss both approaches below and recommend estimating the population proportion, using a sample size sufficient to achieve a ±5 percent margin of error at the 95 percent confidence level.

Hypothesis Testing Approach

One analytical approach is to test the "null" hypothesis that at least 80 percent of facilities remain in compliance after one year. In this approach, we assume that the true population proportion is 80 percent compliance (0.8). We also use a "one-sided" test, meaning that we are interested in determining only if the population proportion is *less* than 80 percent; if it is 80 percent or higher, we do not reject our hypothesis.

In hypothesis testing, two types of errors may occur:

- **Type I errors,** in which the null hypothesis (that at least 80% of facilities remain in compliance) is *rejected* when it is actually *true* (falsely rejected). The approach used here applies a level of significance of α=0.05 (5 percent).
- **Type II errors**, in which the null hypothesis is *not rejected* when it is actually *false* (falsely accepted). The approach used here is designed to achieve at least 80 percent power (β=0.2), a commonly accepted level for increasing the likelihood of obtaining statistically significant results. The sample sizes presented below will detect an effect size of -0.1 (less than 0.8); detecting a smaller effect requires a larger sample size.

Table 3 includes sample sizes needed for testing whether at least 80 percent of facilities in each category remain in compliance. Hypothesis testing can use smaller sample sizes than estimating proportions, but this approach provides less information about the actual percentage of businesses that remain in compliance. This approach focuses on calculation of a test statistic, or *p*-value, rather than an actual estimate of the population proportion. Some literature criticizes this *null hypothesis significance testing* approach and encourages a focus on analysis of population means or proportions and associated confidence intervals. Accordingly, we recommend the **proportion estimation** approach described below.

Proportion Estimation Approach

Since we have little existing information about the true population proportion or variance, we recommend following an exploratory approach, which will provide fuller information for analysis and future inspections. In this method, rather than assuming that the proportion of facilities in compliance is 80 percent, we assume the greatest amount of variability in the population: 50 percent in compliance and 50 percent not in compliance. We also apply a two-tailed test, creating a confidence interval of values both below and above the point estimate (as distinguished from the hypothesis testing approach in which we only looked at lower values, a one-tailed test). This approach produces a point estimate of the expected population value and a confidence interval that is expected to contain the true population value. (This method can also be used to test the hypothesis of at least 80 percent compliance by comparing the confidence interval with the hypothesized range of values.)

The equations commonly used to estimate study sample size assume a very large population size, in the tens of thousands or greater. This approach produces a required sample size (n=385) that is larger than the number of facilities present in the study population (N=319). Accordingly, we apply a finite population correction to adjust for the much smaller population size in this study. To determine the sample sizes needed, we first calculate the sample size for a very large population needed to achieve the desired ±5 percent margin of error at the 95 percent confidence level; then we calculate a corrected sample size that takes into account the actual smaller population. Equation 1 is used to calculate the generic sample size for very large populations, while Equation 2 corrects the generic sample size to calculate a reduced sample size for small populations.[1]

Equation 1. Sample Size for Very Large Populations

$$n_0 = \frac{z^2pq}{E^2}$$

Equation 2. Corrected Sample Size for Small Populations

$$n_C = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Where:

- n_0 is the generic sample size calculated using the equation for very large populations.
- p and q are the expected population proportions (compliant and not compliant). To estimate the population proportion, we recommend setting p and q to 0.5 (50%), the greatest level of variation, for the most conservative sample size.
- z is a value that corresponds to the desired confidence level (CL); for a 95% CL, z is set to 1.95996; for a 90% CL, z is set to 1.64485.
- E is desired maximum margin of error (for ±5%, E is set to 0.05).
- n_C is the corrected sample size for small populations.
- N is the population size.

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[1] Glenn Israel, *Determining Sample Size*, University of Florida—IFAS Extension PEOD6 (1992), accessed September 17, 2010. http://edis.ifas.ufl.edu/pd006.

To estimate compliance in 2010 among the 319 facilities in compliance in 2009 would require completed follow-up visits at 175 randomly selected facilities. Given the variation in land use types, we recommend examining compliance levels according to each land use category, rather than for the overall population of private stormwater facilities.

Table 3 presents the number of follow-up visits that must be *completed* for each land use type to achieve a ±5 percent margin of error at the 95 percent confidence level for each land use type. Cascadia strongly recommends using at least a 95 percent confidence level for more reliable results, but Table 3 also provides sample sizes in this study design to conduct the analysis using a 90 percent confidence level as a lower cost alternative for SPU. For the 90 percent confidence level, the resulting confidence intervals are expected to contain the true population proportion 9 times out of 10 (rather than 19 times out of 20 for the 95% CL).

Table 3. Number of Completed Samples (n) Required for Alternative Study Approaches

Land Use Type	Study Population	Hypothesis Testing *(not recommended)*	Proportion Estimation at 95% CL (recommended)	Proportion Estimation at 90% CL *(not recommended)*
Single-family residential	35	27	33	32
Multifamily residential	123	59	94	85
Commercial or mixed use	113	56	88	80
Church, school, or public	46	33	42	40
Industrial	2	--	--	--
Grand Total	319	175	257	237

Because relative sampling error increases with smaller populations, a common rule of thumb is to conduct a conduct of census for populations of 50 or fewer. Accordingly, we recommend conducting follow-up visits to all facilities in the *Single-family residential* and *Church, school, or public* categories, regardless of confidence level. For *Industrial* stormwater facilities, the number of visits in 2009 was so small (two) that follow-up visits will not yield statistically meaningful results. Given the extremely small sample size for industrial stormwater facilities, we recommend not conducting follow-up visits for this category (though such visits could contribute to the overall analysis of facilities as a whole).

SPU estimated that an average of 5 percent of stormwater facilities contacted for follow-up visits will refuse to participate in the study. Accordingly, to ensure that the sample sizes presented in Table 3 are reached, we recommend that SPU attempt to conduct at least the number of follow-up visits presented in Table 4.

Table 4. Number of Attempted Follow-up Visits for Recommended Approach

Land Use Type	Study Population	Recommended Sample Size	Recommended Visits (n)
Single-family residential	35	35	35
Multifamily residential	123	94	99
Commercial or mixed use	113	88	93
Church, school, or public	46	46	46
Industrial	2	0	0
Grand Total	319	263	273

Data Collection and Analysis

This study will use existing data from the SPU database as well as new data collected during follow-up visits to sample sites. Existing data include the following:

- Compliance status in 2009.
- Facility type "land use."
- Whether repairs were needed to reach compliance in 2009 (optional).

During this analysis, we expect to analyze primarily compliance status in 2009 and 2010; however, we recommend that SPU collect additional data during follow-up visits that could be used in future studies, if needed. Data to be collected during follow-up visits includes the following:

- **Basic facility information.** Information includes site identification number, business name and DBA (doing business as) name, site address, and facility type. This information will help to correctly match the facilities visited in 2010 with those in compliance in 2009.
- **Compliance status in 2010.**
- **Type of corrective action(s) needed in 2010.** Inspectors should use a basic checklist to note which types of corrective actions were needed. The checklist should at least differentiate maintenance and structural actions, and it would ideally correspond to the Corrective Actions Required (CAR) fields used in SPU's database. This information could help identify whether certain corrective actions are more commonly needed than others after one year; if so, SPU could consider an alternative inspection schedule that focuses limited re-inspections or follow-up visits on those actions.
- **Facility size measured by number of units.** Inspectors should note the approximate number of stormwater units (e.g., catch basins, vaults) at each facility, if easy to do during follow-up visits. Inspectors could either report the exact number of units per facility or categorize each facility into pre-determined groups (such as single unit, 2-5 units, 6-10 units, 11-20 units, more than 20 units). This information could help identify whether larger facilities are more likely to need corrective actions after one year, indicating they may need annual inspections or follow-up visits.

Following data collection by SPU, Cascadia will analyze existing data to estimate the percentage of stormwater facilities overall and by land use type that remained in compliance in 2010. As described in the approach, we will assess whether at least 80 percent of stormwater facilities stay in compliance for one year after being found in compliance through an inspection and/or corrective actions. Analysis will also include consideration of the statistical significance of estimated compliance rates.

Potential Outcomes

If data analysis supports a compliance rate of at least 80 percent for any or all groups of stormwater facilities, then SPU expects to provide a written statement to the Department of Ecology requesting a proposed alternative inspection schedule.

If data analysis does not support that at least 80 percent of facilities remain in compliance for one year for some or all groups of stormwater facilities, then SPU may conduct additional studies to determine whether additional characteristics of stormwater facilities may provide more detailed information to support an alternative inspection schedule for a subset of stormwater facilities. Additional characteristics could include number of units, type of units, and compliance history.

If further studies do not support a minimum compliance rate of 80 percent, then SPU plans to hire additional staff to meet the standard inspection schedule while collecting additional data to support future analysis.

Attachment A4

City of Federal Way
Surface Water Management

Catch BAsin Cleaning and Evaluation Program

Program Presentation
October 20/21, 2005
Paul Bucich,P.E.,
Surface Water Manager

Attachment A4

Background Information

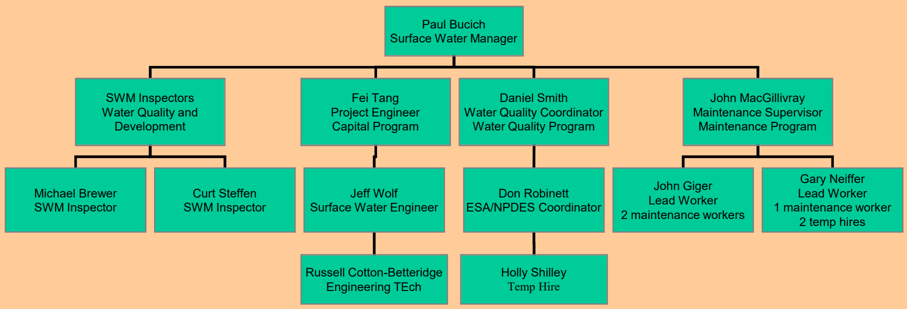
The City of Federal Way is a dynamic and young City. Most problems are the result of prior land use activities where asphalt was king. One of the primary reasons for incorporation was surface water flooding problems.

- City Population: 86,500 +-
- City area: 21.5 square miles
- Miles of paved public streets: 257
- Number of major streams: 5
- Number of major lakes: 4
- Annual SWM collections: $3.2M
- Number of Catch Basins: 10,200
- Number of manholes: 1300

Attachment A4

Surface Water Utility Structure

The surface water utility was formed shortly after incorporation. The utility consists of only 14 positions.



Maintenance Activities

A large percentage of the utility activities and funding goes to annual maintenance activities. The city maintains the 6 large Capital facilities as well as 85 smaller, developer built facilities. In addition, the city contracts for street sweeping, vactor cleaning, TV services, jet rodding, and waste disposal. Maintenance is a high priority for the Council and citizens of Federal Way.

Maintenance activities include:
•Annual minor CIP projects
•Catch basin evaluation program and cleaning
•CPS unit monitoring and cleaning
•Pond maintenance
•Water Quality enhancements of older ponds
•Flood response
•Installation of WQ improvements around lakes
•Maintenance of WQ facilities in right of way
•Weed control – state training
•Training on new procedures
•Annual certifications
•Reconstruction of facilities

Major Program Elements

The Utility is composed of three primary areas: Capital Improvement, Water Quality, and **Maintenance**.

- Separate Operation and Maintenance Manual
- 2000 - $175,000 on CB cleaning
- 2005 - $133,000 on CB cleaning

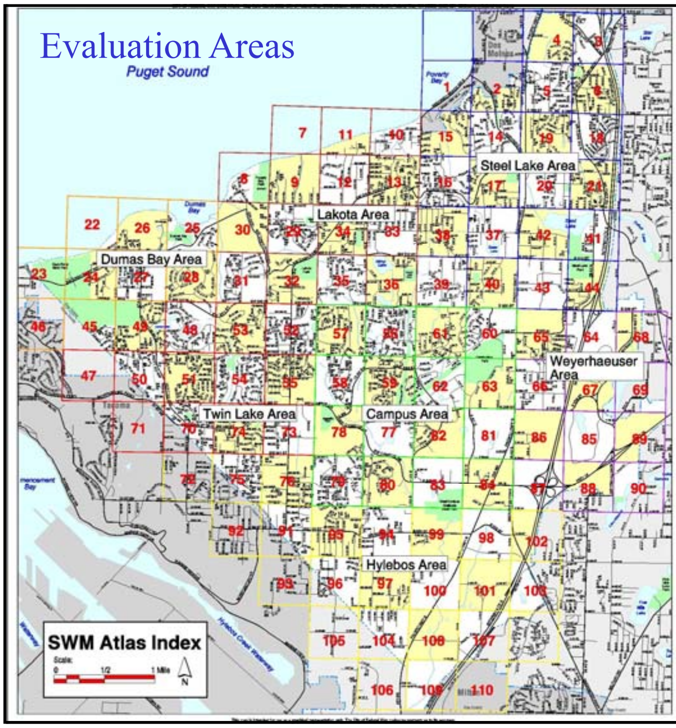
What are we doing differently?

Evaluation Program

Evaluation was initiated as a means to determine if we were wisely spending our limited utility tax dollars.

- Started in 2002
- Means to reduce annual expenditures
- Are we cleaning "clean" structures?
- Determine frequency for cleaning
- Find "special structures"
- Manage increasing infrastructure assets and costs
- NPDES Permit requirement to maintain infrastructure – Pierce County Maintenance Manual, Page 26 – sediment removal @ 60%

Attachment A4



For evaluation, City was broken into 7 distinct areas based on average land use.

Residential

Commercial

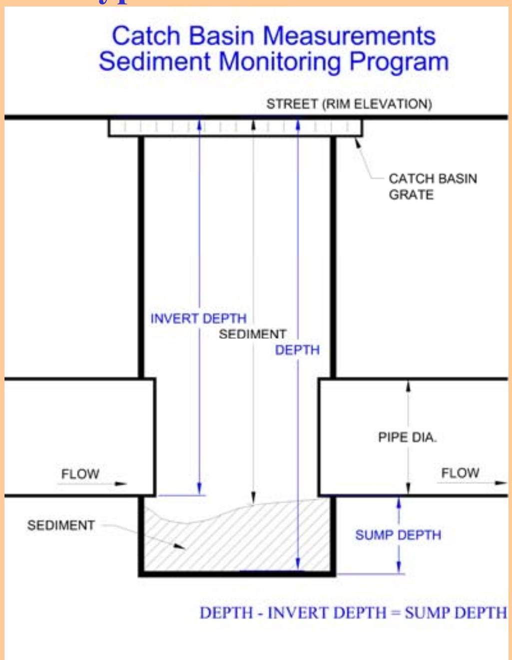
Mixed use

Arterials are a special consideration.

Citywide Infrastructure

Attachment A4

Typical Catch Basin



Evaluation Process

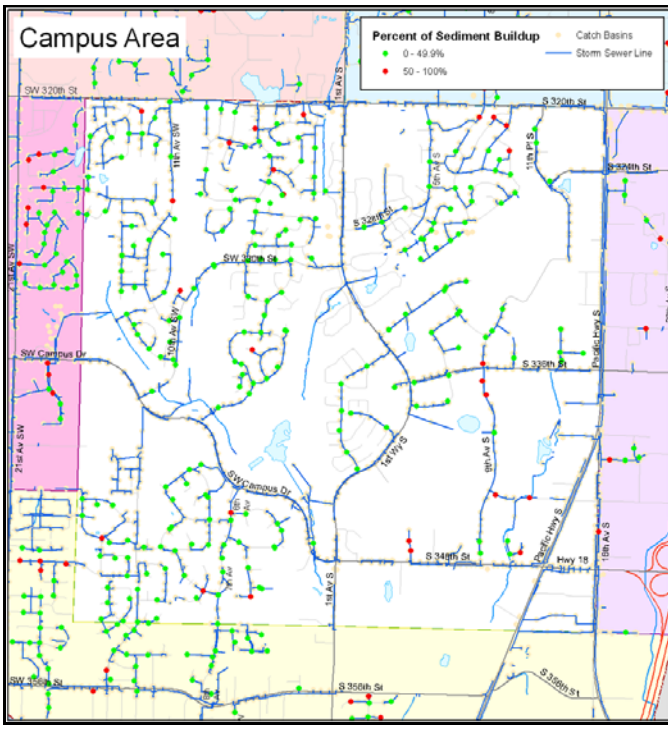
- 1) Clean the area first!
- 2) Hire Temps. ☺ ☺ ☺
- 3) Do the work during the *summer*!
- 4) Need standard safety equipment and a vehicle with arrow board.
- 5) Use existing data base to identify and map structures to be evaluated (generate if needed)
- 6) Carefully track the progress
- 7) Determine if small sumps should be included
- 8) Record data and do again next year (except cleaning before hand…)

Attachment A4

Data sheets

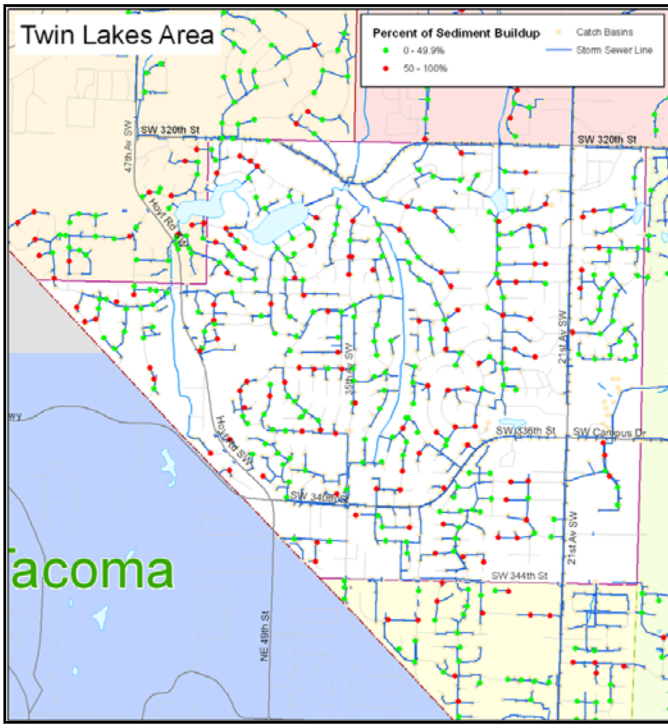
- If everything goes according to plan, should have spread sheets filled with data like this:

					Spot Check:9/11/03		Spot Check:6/22/04		Spot Check:6/6/05	
Map	CB/MH #	Sump	Invert	Sump depth	Sediment	% Full	Sediment	% Full	Sediment	% Full
723NE	64	60	48	12	59	8%	58	17%	58	17%
723NE	78	42	27	15	42	0%	42	0%	40	13%
723NE	68	45	35	10	44	10%	40	50%	39	60%
723NE	83	110	55	55	81	53%	71	71%	70	73%
723NE	90	67	50	17	59	47%	58	53%	58	53%
723NE	119	59	45	14	58	7%	55	29%	57	14%
723NE	131	67	47	20	67	0%	67	0%	66	5%
723NE	121	66	50	16	66	0%	65	6%	63	19%
723NE	100	67	59	8	67	0%	66	13%	67	0%
723NE	94	75	53	22	53	100%	66	41%	56	86%
723NE	22	95	69	26	95	0%	95	0%	35	231%
723NE	152	55	37	18	55	0%	53	11%	43	67%
723NE	161	62	42	20	61	5%	61	5%	47	75%
723NE	172	62	42	20	62	0%	54	40%	53	45%
723NE	184	64	42	22	63	5%	52	55%	51	59%
723NE	248	93	74	19	83	53%	93	0%	92	5%
723NE	251	94	69	25	94	0%	90	16%	84	40%
723NE	233	57	36	21	57	0%	45	57%	40	81%
723NE	32	82	60	22	82	0%	80	9%	72	45%
723NE	28	137	115	22	135	9%	131	27%	131	27%
723NE	199	69	54	15	69	0%	69	0%	67	13%
723NE	220	106	85	21	106	0%	106	0%	105	5%
723NE	183	77	63	14	77	0%	76	7%	74	21%
723NE	165	59	47	12	59	0%	58	8%	59	0%
723NE	153	75	66	9	75	0%	72	33%	71	44%
723NE	137	78	65	13	78	0%	72	46%	70	62%
723NE	4112	59	36	23	57	9%	57	9%	57	9%
723NE	4272	62	51	11	62	0%	61	9%	62	0%
723NE	4201	63	52	11	63	0%	62	9%	63	0%
723NE	253	67	52	15	67	0%	66	7%	66	7%
723NE	245	73	57	16	68	31%	67	38%	62	69%

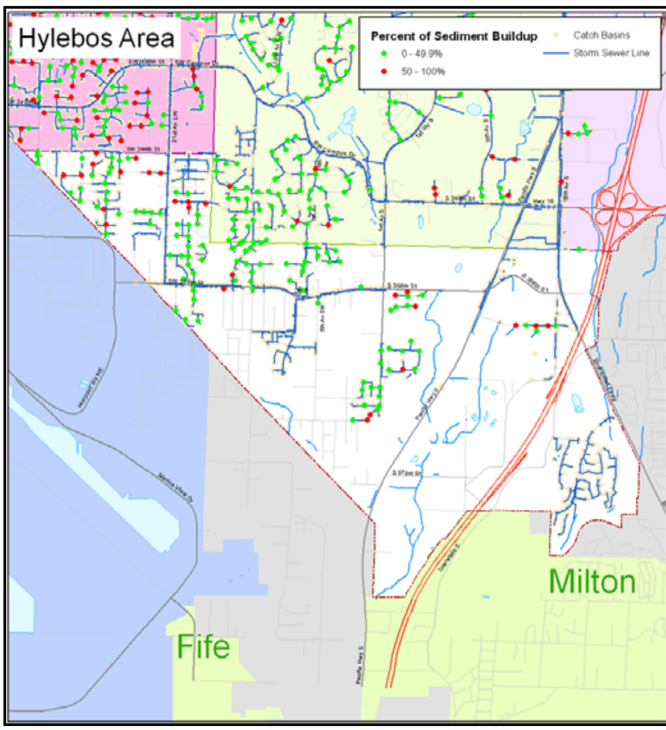


Campus Infrastructure

Attachment A4



Twin Lakes Infrastructure

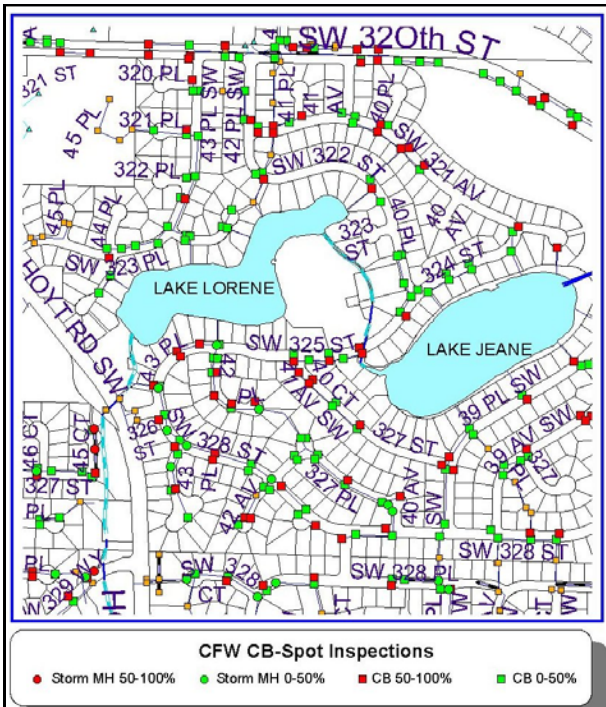


Hylebos Infrastructure

Attachment A4

Catch Basin Sediment Level/Cleaning Status Summary

Cleaning Area	2002	Status	2003	Status	2004	Status	2005	Status	2006	Status	2007
Twin Lakes	Dec	Clean	Oct	14%	June	25%	June	36%			
Campus			Dec	Clean	July	11%	June	13%			
Hylebos					Jan	Clean	May	27%			
Weyerhaeuser					Feb	Clean	April	38%			
Lakota					April	Clean	June	30%			
Steel Lake					June	Clean	June	20%			
Dumas Bay					June	Clean	July	27%			



Early attempts to quantify sediment accumulation levels.

Different structure shapes could significantly skew area results.

Older systems tend to have smaller sumps.

Conclusions

- Sediment accumulations vary significantly by land use
- Residential areas do not need cleaned annually if system (including pipes) are cleaned once
- Industrial areas need more attention (Doh!)
- Arterials are to be cleaned annually
- Significant cost savings can be achieved by knowing your system needs
- NPDES permits require proper maintenance schedules

Capital Program

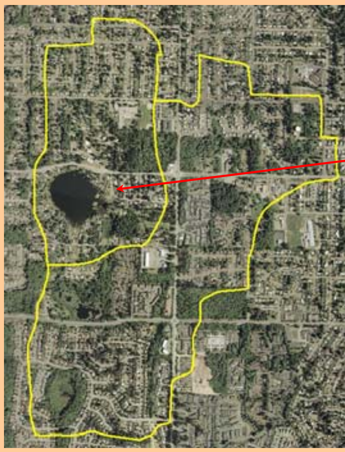
Capital Program is where the rubber hits the road. Citizens judge us on how they are impacted due to flooding of roads and property.

S. 373rd road flooding November of 2001

Fish Ladder at S. 359th

Capital Facilities Program

The Capital Program varies from year to year but typically accounts for $1.25M annually in expenditures. The program has constructed 6 large regional facilities and corrected numerous drainage problems. It encompasses the following elements: flood control, fish passage, stream restoration, water quality facilities, conveyance improvements, and small works improvements.



Two different Regional projects:

Mirror Lake

SW 356th

Capital Facilities Program Stream Restoration

The Capital Program has seen a large increase in stream restoration efforts in 2004 and 2005. Two large efforts of note include these projects.

Lakota Creek Restoration was located along SR-509 which was closed for a week.

West Hylebos Creek Restoration required the use of a helicopter to deliver logs to inaccessible locations

Water Quality Program

The water quality program consists of source control, illicit discharge tracking, water quality sampling, annual macroinvertebrate sampling, public education and outreach, stream team volunteers, participation with local environmental groups monitoring for salmon usage of streams, and evaluation of new W.Q. products.

Kitts Outlet Station

<u>Sampling for:</u>
Dissolved Oxygen
Temperature
pH
Specific Conductivity
Flow
Rainfall (at some locations)

Water Quality Stations

Water quality probes are downloaded, cleaned and calibrated once a month by SWM staff

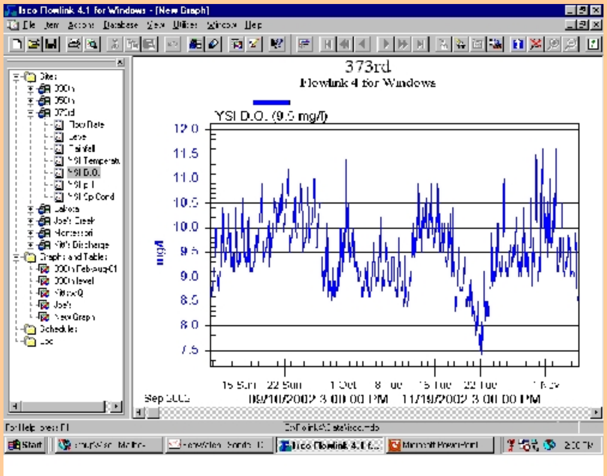
Calibration set-up in office

Close-up of water quality probe

Attachment A4

Water Quality Stations

Water quality data are analyzed by SWM staff for long term trends



Example of Flow Link software data file for S. 373rd Street – Dissolved Oxygen 9/10/02-11/10/02

Surface Water Flow

Nine (9) water quality stations collect real-time flow data, Recording level and velocity measurements every 15 minutes

Water quality flow probes must be periodically field calibrated to ensure that flow data is accurately recorded.

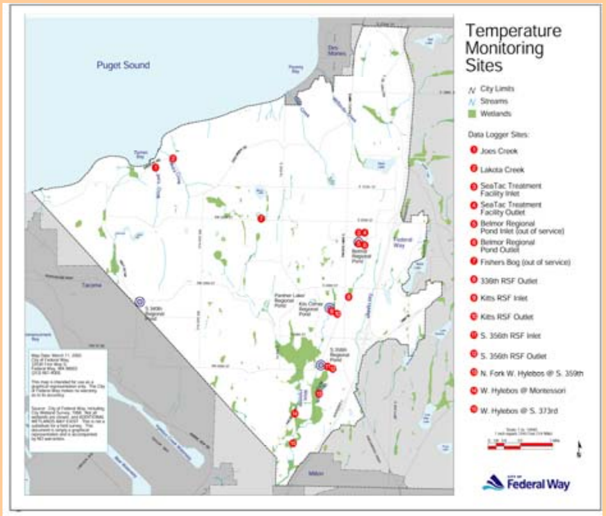
SWM staff calculating total stream discharge in West Hylebos Creek using a hand-held current velocity meter

Close-up of current velocity meter

Attachment A4

Water Temperature Loggers

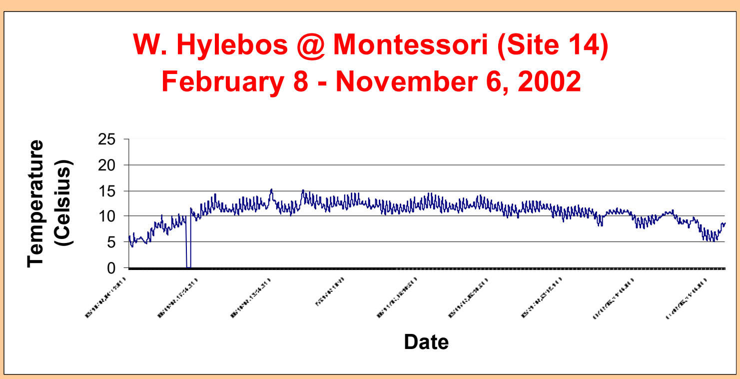
Surface water temperature loggers are deployed at eighteen (18) sites throughout the City



Onset Computer Corporation TidBit Temperature Logger downloaded once per month

Water Temperature Loggers

Temperature data are analyzed by SWM staff for long term trends and compare to DOE Water Quality Standards for surface waters



To date, the data indicates that surface waters in Federal Way comply with the older state standards for temperature discharges. Additional years' of data are needed to establish true trends and compliance with new requirements.

Attachment A4

Macroinvertebrate Sampling

Annual sampling for macroinvertebrates (bugs) is conducted at five (5) sites throughout the City. Samples are collected by SWM staff and volunteers -- then sorted, identified and counted by a contract laboratory.

•Biological monitoring can be a useful tool to indicate the health of our local streams.

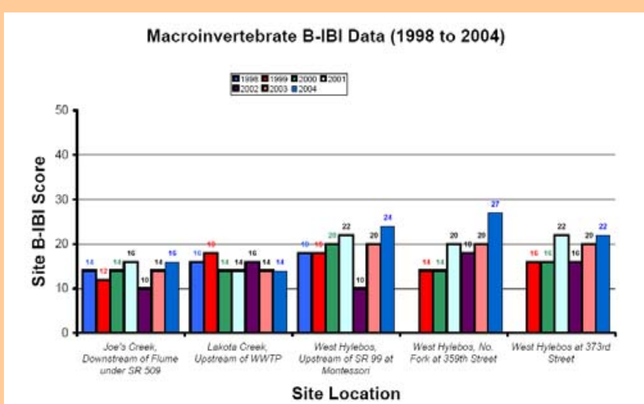
•The presence of a large population of diverse macroinvertebrates (bugs) indicates good water quality.

•Salmon rely on macroinvertebrates for food.

•The score of a stream is measured as excellent, good, fair, poor and very poor. This information provides the opportunity to investigate the types of influences acting upon a watershed.

Macroinvertebrate Scoring

The condition of Federal Way streams have shown some improvement in recent years, however their scores remain in the Poor – Very Poor range.



Condition Ranges

Excellent
46-50

Good
38-44

Fair
28-36

Poor
18-26

Very Poor
10-16

Illicit Discharge Detection and Elimination Program

The goal of this program is to detect and eliminate prohibited discharges to the municipal stormwater system

Program elements include:

- **Mapping and inspecting stormwater outfalls**
- **Detect and eliminate illicit stormwater connections and prohibited stormwater discharges**
- **Enforcement of Stormwater Ordinance**
- **Provide education to businesses and the general public**

Illicit Discharge Detection and Elimination Program

- **Approximately 100 water quality source control inspections have been conducted annually**
- **Enforcement action has resulted in the correction of numerous prohibited stormwater discharges.**

Attachment A4

Illicit Discharge Detection and Elimination Program

- **Smoke testing and dye testing are tools used to detect the presence of illicit connections and prohibited stormwater discharges**

Smoke identifies location of stormwater catch basins on Enchanted Parkway

Bright-colored dyes are used to track stormwater flows

A program for inspecting existing private commercial facilities.
Also inspect new construction (SF) for ESC measures.

- Inspection of commercial stormwater facilities
  - Two inspectors
  - 590 per year
  - 99% compliance with our inspection results
  - 75-80% in need of maintenance on first inspection
  - Many older systems – KC standards
    - Apartment complexes most difficult
    - Condominiums close second
  - Utilize smoker to find old systems often buried and illegal connections
- Utilize same inspectors for single family home construction sites
  - Cradle to grave approach
  - IECA certification is a goal

Attachment A4

The program has been very successful over the past three years bringing facilities into compliance with their original design parameters.

- Developed comprehensive database in 2001
  - Identification of property owners
  - Types of stormwater systems
  - Inspection history
  - System design information
- Hard copy files kept
  - Maps, histories, pipes, ponds, swales, etc.
  - Uses King County "D" file numbers from pre-annexation/incorporation.

Inspection of 590 facilities is beyond capabilities of one FTE

Commercial Inspection Program

Inspection Procedures:

- Advance postcards mailed to all businesses in area - up to 60 days out.
- Request permission to enter property if no easement exists (many older systems)
- Assumes permission if no response
- Opportunity for representative to walk with inspector
- City inspector to identify himself upon entering property

Commercial Inspection Program

Correction procedures follow existing City Codes

- 30-Day Correction Notice
  - Letter sent identifying issues needing attention
  - List of vendors providing services attached
  - Requires response within 30 days or…
- 10-Day Correction Notice
  - If no contact with business owner, 10-day letter sent
  - Usually occurs because 30-day went to wrong party
  - Certified mail
  - Usually gets their attention
- Notice of Violation (NOV)
  - NOV may lead to criminal and/or civil offences
  - Really gets their attention

Attachment A4

Commercial Inspection Program

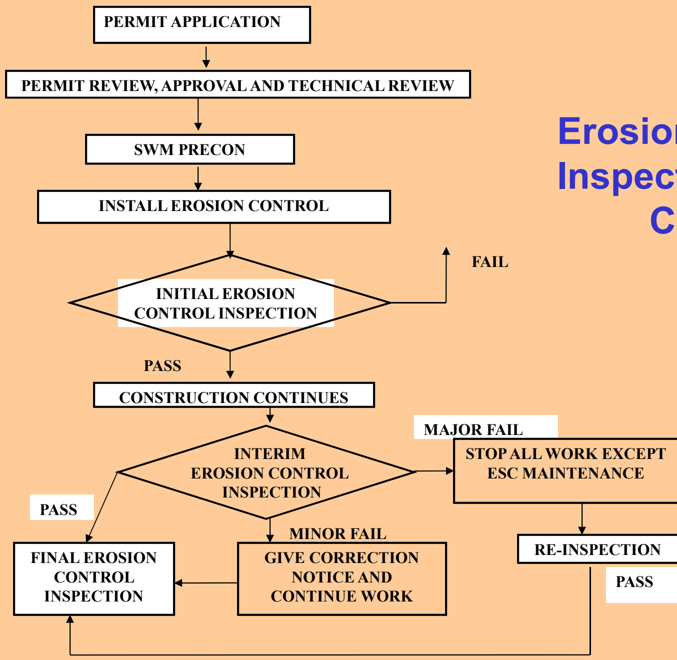
We prefer these types of letters:

- Interim Correction Notice
  - Letter sent identifying issues needing attention
  - Issues are minor and at discretion of inspector
  - Does not require return notification to City
  - Requires correction before next inspection

- Site in Compliance
  - Postcard delivered onsite by inspector
  - System functioning fine, no action needed
  - See them next year ☺
  - Inspection results entered into database

Single Family Construction

Attachment A4



Erosion Control Inspection Flow Chart

Public Education and Involvement

The utility has one person assigned to public education and involvement outside of that which occurs with CIP projects or maintenance activities. In 2003 a staff position was identified specifically to be tasked with this activity. It is an area where growth is expected either through contracting with others or in-house activity.

Public Education and Involvement opportunities:

Brochures produced for mailing to residents
Annual report on utility activities
Numerous volunteer activities – stream restoration, refuse cleanup, invasive weed removal, salmon watcher program, grate keepers program, rainfall data collection, water quality data sampling, etc.
Quarterly newsletter for volunteers and others mailed and posted on website
Car wash kits and work with local car wash organizations for tickets
School curriculum development
Posters for restaurants
Website – posted info
Participation in salmon recovery efforts – WRIA's 9 and 10

Steel Lake Aquatic Weeds Management

Surface Water Management has been partnering with the residents of Steel Lake to combat the on-going problem of invasive aquatic weeds.

- **In 2003, Lake residents were successful in the formation of the first Lake Management District in Federal Way. It became effective in 2004.**
- **SWM is presently working with the lake residents on the second annual work plan to control aquatic weeds after a successful first year.**
- **In 2005 SWM will be working with North Lake residents and Ecology on a second aquatic weeds grant and control efforts.**

NPDES Phase II Permit is coming

The city currently meets or exceeds the older Puget Sound Plan for Comprehensive Stormwater Program elements. We currently meet or exceed most of the Tri-County Stormwater Plank elements. So what are we worried about?

<u>Areas of concern include but may not be limited to:</u>

Arbitrary assumption of third party liability under CWA for elements not envisioned to be in the Phase II permit.

Diversion of funds from activities asked for by Council or citizens – lake management issues, maintenance levels of existing infrastructure, preparation for GASB 34 compliance, expensive water quality sampling, "*monitoring*" unknowns, etc.

Loss of self directed program activities. Imposition of inappropriate standards regardless of actual basin needs. Need to develop expensive and time consuming basin plans to refute Ecology general standards, e.g., level 2 flow control everywhere, application of pre-forested conditions in urban centers, use of 6-month storm for treatment at all times, in all locations.

Attachment A4

Questions and Answers

Federal Way Surface Water Management

October 20/21, 2005

Attachment A5

Sediment Evaluation Program

The program was initiated in 2002 as a means to determine if we are <u>efficiently</u> and <u>cost-effectively</u> maintaining our Catch Basins

Program Goals

- **Reduce Annual Expenditures**
- **To Avoid Cleaning "Clean" Structures**
- **To Determine an Appropriate Cleaning Schedule**
- **To Comply with NPDES Permit Requirements to Maintain Infrastructure**
- **To Satisfy NPDES Permit Requirements to Inspect Catch Basins**

The Process…

- In 2002 all structures were inventoried
- The City was broken into 7 distinct areas based on average land use
  - **Twin Lakes**
  - **Dumas Bay**
  - **Steel lake**
  - **Weyerhaeuser**
  - **Campus**
  - **Lakota**
  - **Hylebos**
- A number of Catch Basins in each area were selected to be measured annually
- Then the Measuring Began!

The Data has proven Valuable

- Literature Review indicates that cleaning should be done at least annually
- Our study indicates a less frequent cleaning schedule is sufficient (resulting in $$ saved)
- Ecology's General Rule- The decision to reduce inspection and/or maintenance frequency shall be based on records of double the length of time of the proposed frequency
- Our goal is to collect 10 years of data

The Measurements

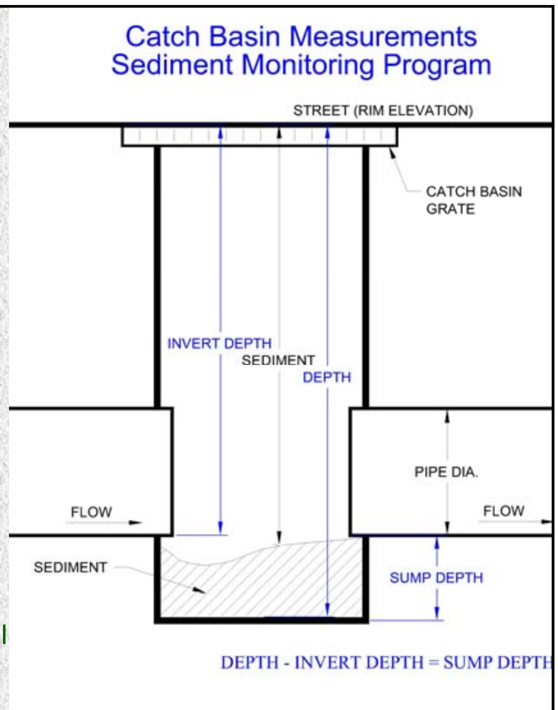
•The measurements of each structure were taken during the initial inventory in 2002

•The annual program involves measuring from the Rim to the Sediment

•Percent Full is Calculated

Depth – Rim to Sediment = % Full

Depth - Invert



Example Excel Database

CAMPUS AREA			Spot Check: 7/12/04		Spot Check: 06/20/05		Spot Check: 06/01/06		Spot Check: 08/07	
CB/ MH #	Sump	Invert	Sediment	% Full	Sediment	% Full	Sediment	% Full	Sediment	% Full
3808	62	47	57	33%	58	27%	55	47%	55	47%
4223	59	42	58	6%	55	24%	52	41%	50	53%
4408	59	43	56	19%	59	0%	53	38%	52	44%
3738	108	62	107	2%	102	13%	108	0%	107	2%
3868	207	183	206	4%	197	42%	203	17%	200	29%
484	63	47	60	19%	60	19%	60	19%	60	19%
3834	64	52	63	8%	58	50%	58	50%	58	50%
3975	82	64	82	0%	82	0%	82	0%	82	0%
474	91	69	90	5%	91	0%	91	0%	91	0%
4145	58	44	57	7%	58	0%	57	7%	57	7%
4008	55	40	50	33%	50	33%	49	40%	48	47%
3945	36	31	36	0%	36	0%	35	20%	34	40%
516	74	59	69	33%	68	40%	68	40%	38	240%
7339	48	34	48	0%	48	0%	38	71%	28	143%
4459	64	43	58	29%	51	62%	55	43%	50	67%
Avg.				**14%**		**22%**		**25%**		**43%**

Factors that determine Sediment Levels

- Storm Intensities
- Sanding during Snow Events
- Structure Sump Depths
- Frequency of Street Sweeping
- Land Use
- Of Course, Cleaning

Analyzing the Data

- A sample is selected and data from the sample is used to make a generalization about the larger population
- How well the sample actually represents the population is gauged by two important statistics- the confidence interval and the margin of error
- We have selected a 90% confidence interval. This means that we are 90% sure that the true value falls within our margin of error
- Margin of error: Indicates how far a sample's result can stray from the true value of the population

Campus Area

Approximate Number of Structures

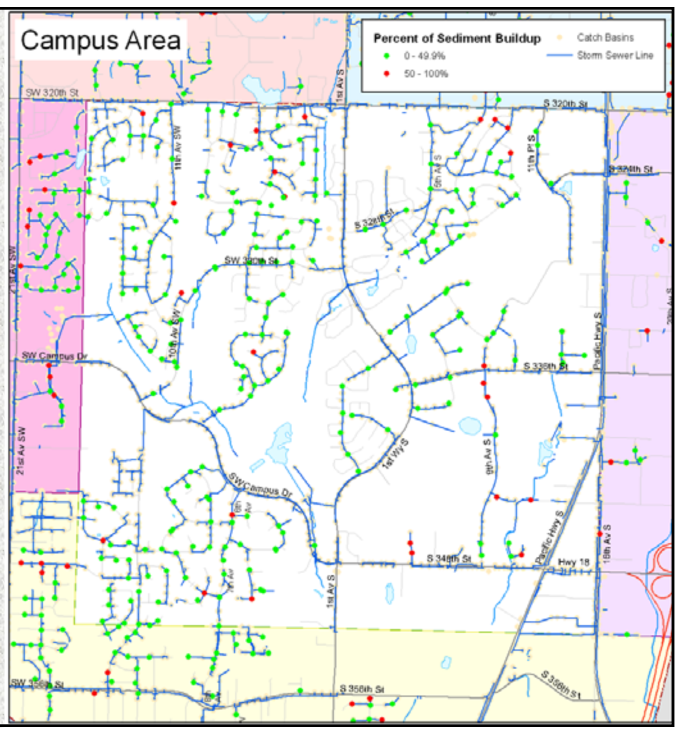
3358

Number of Structures Measured

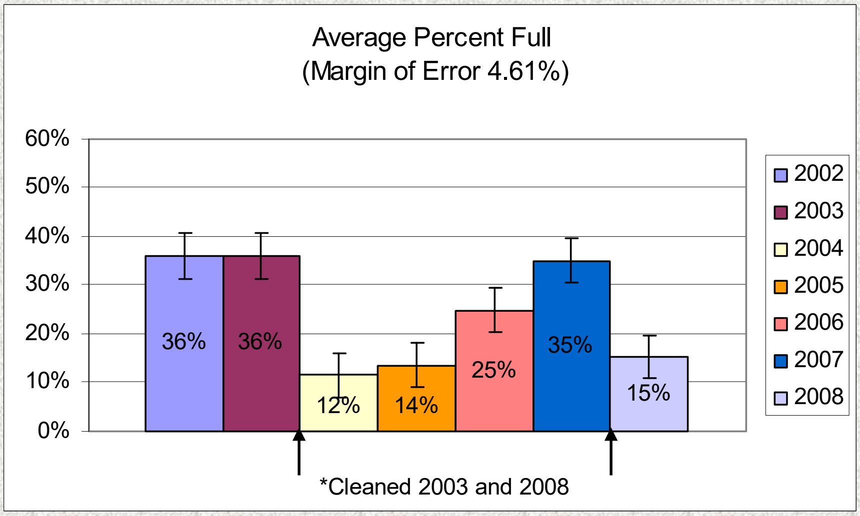
291

Percent Measured

9%



Campus Area



*5 year Cleaning Schedule

Twin Lakes Area

Approximate Number of Structures

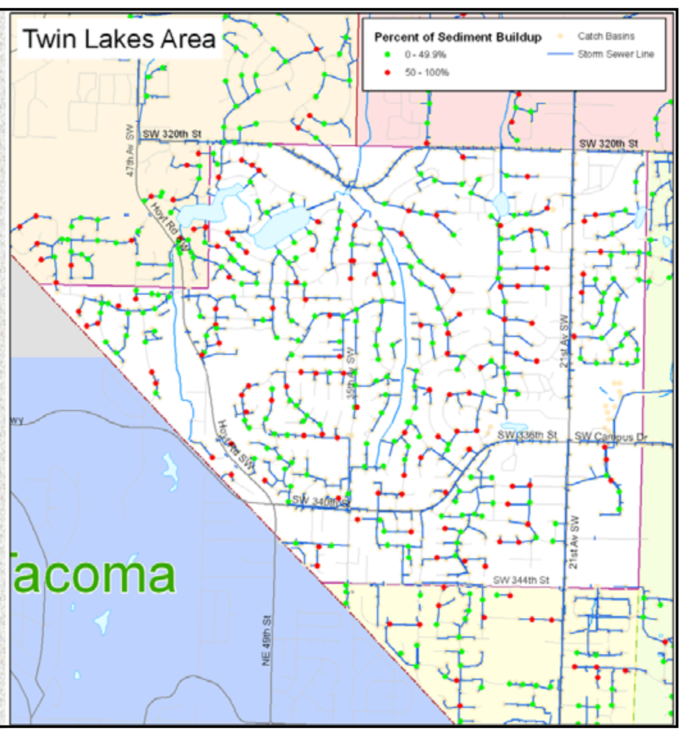
2077

Number of Structures Measured

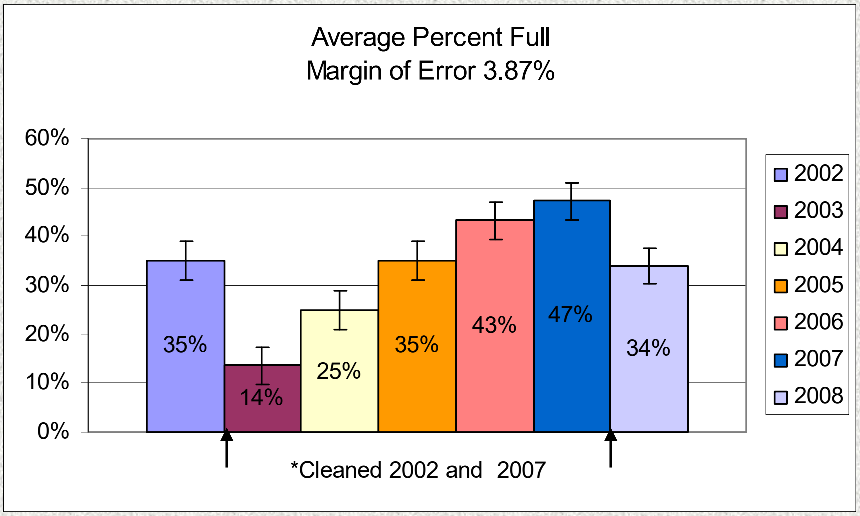
372

Percent Measured

18%



Twin Lakes Area



*5 year Cleaning Schedule

Hylebos Area

Approximate Number of Structures

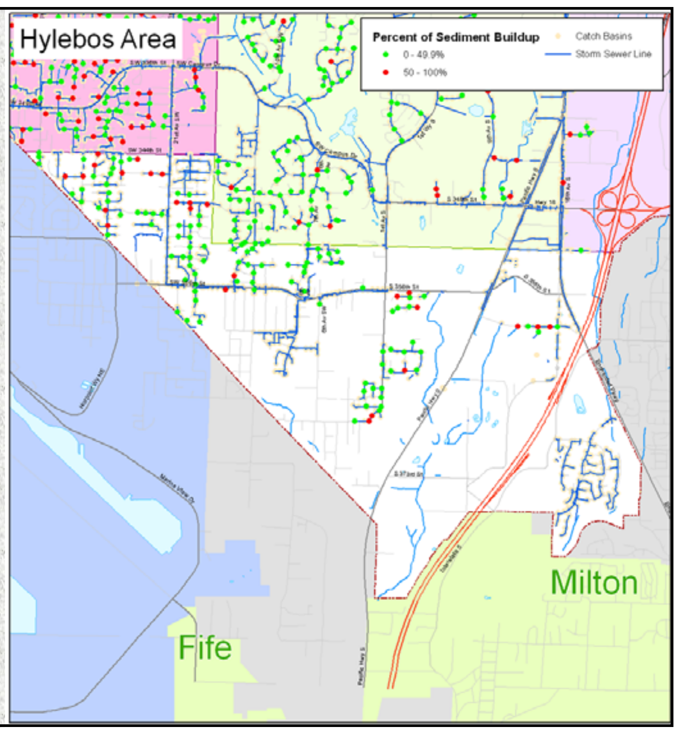
939

Number of Structures Measured

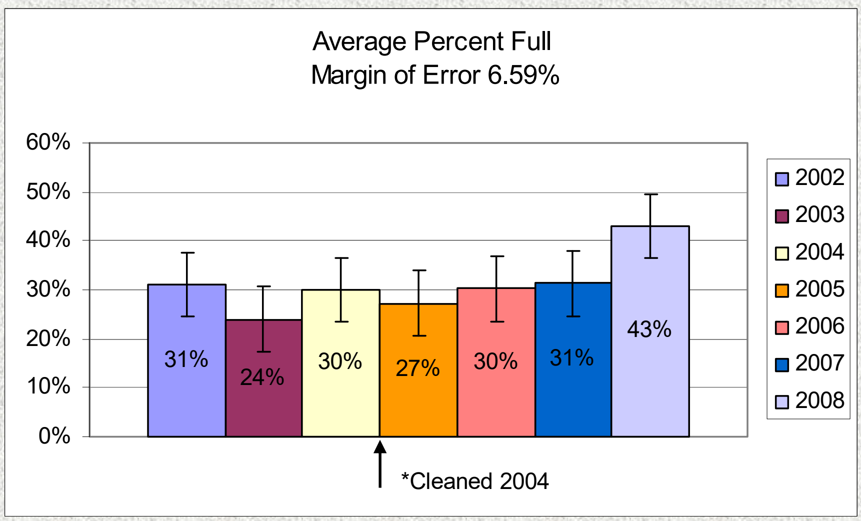
134

Percent Measured

14%



Hylebos Area



*4-5 year Cleaning Schedule

Dumas Bay Area

Approximate Number of Structures

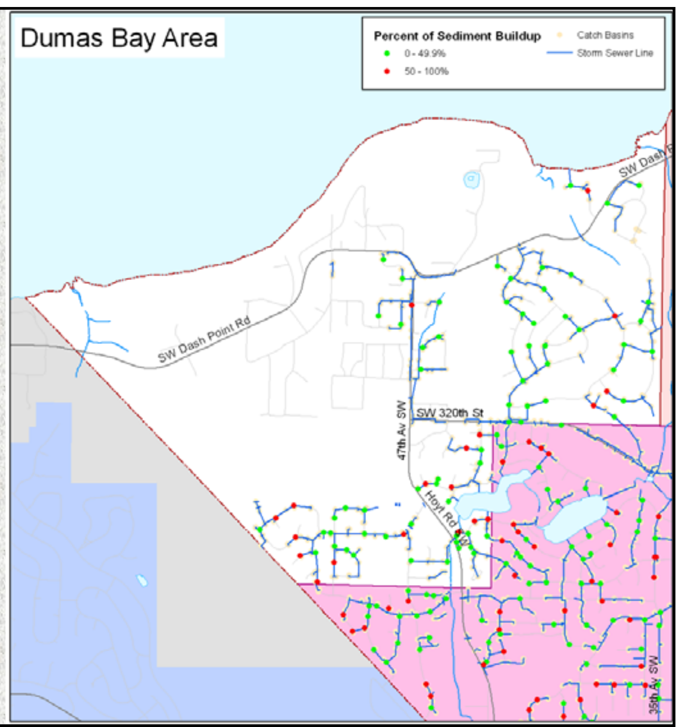
639

Number of Structures Measured

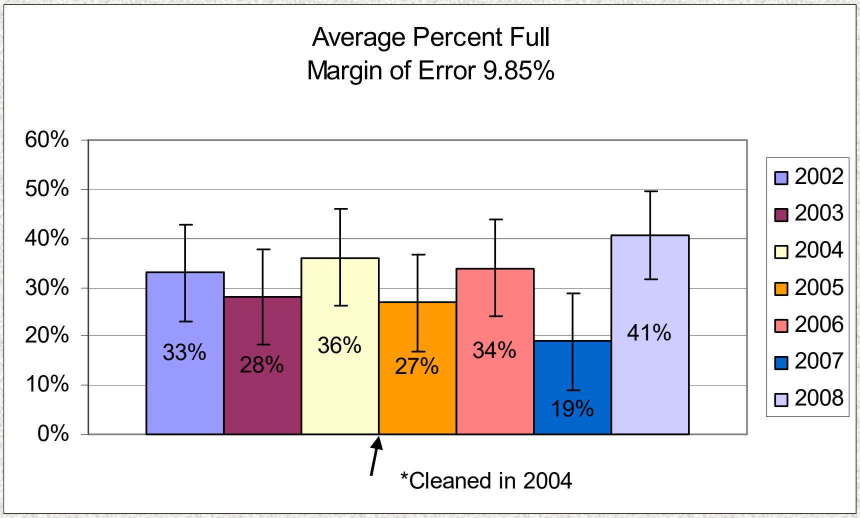
63

Percent Measured

10%



Dumas Bay Area



*4-5 year Cleaning Schedule

Lakota Area

Approximate Number of Structures

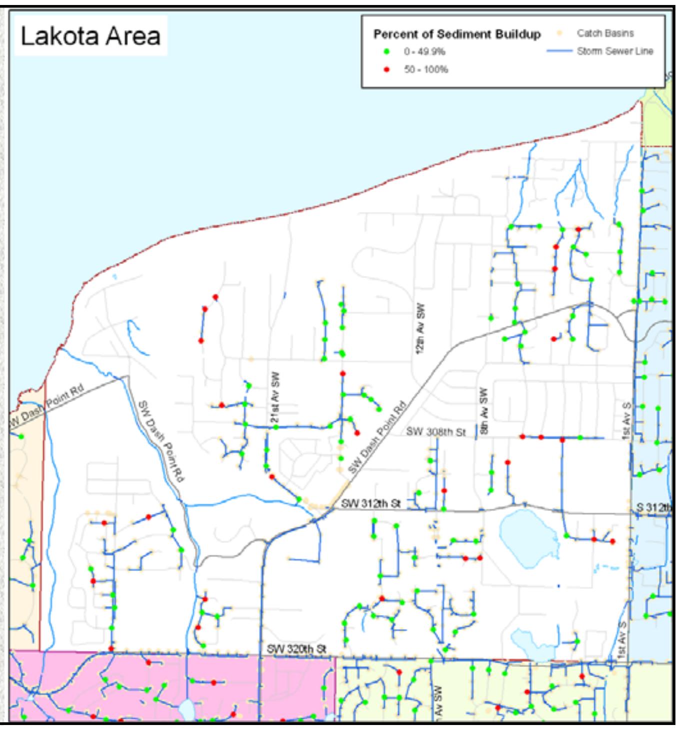
915

Number of Structures Measured

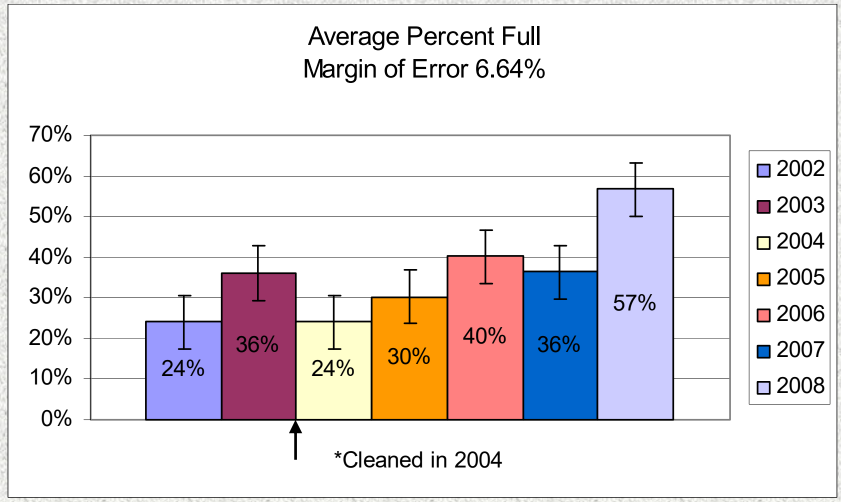
132

Percent Measured

14%



Lakota Area



*3-4 year Cleaning Schedule

Steel Lake Area

Approximate Number of Structures

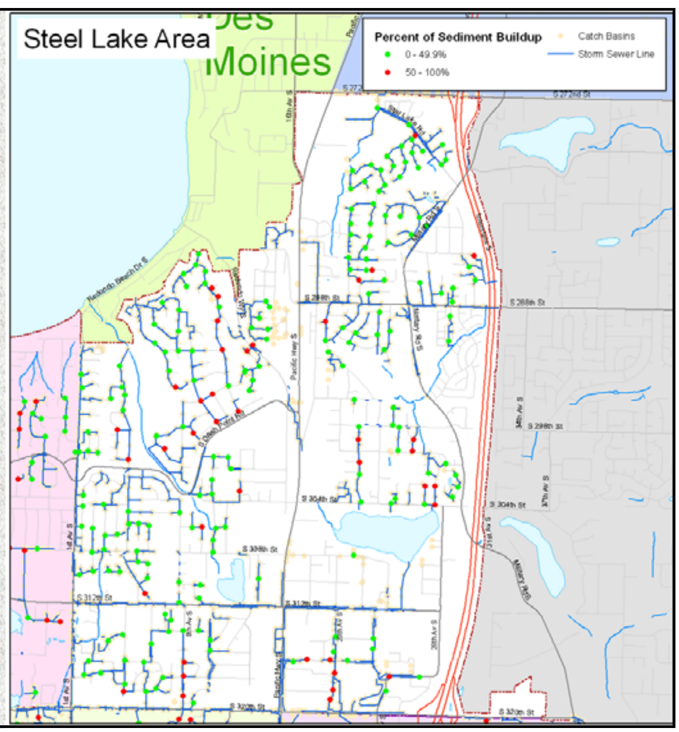
2827

Number of Structures Measured

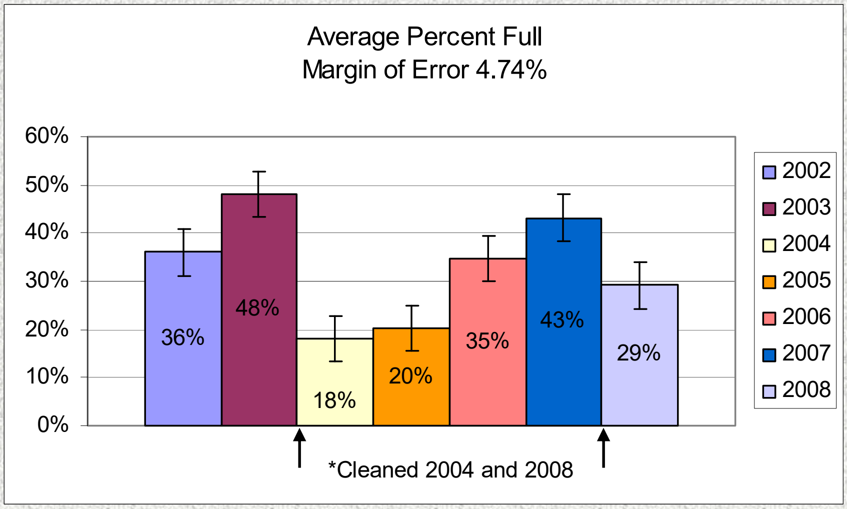
272

Percent Measured

10%



Steel Lake Area



*4-5 year Cleaning Schedule

Weyerhaeuser Area

Approximate Number of Structures

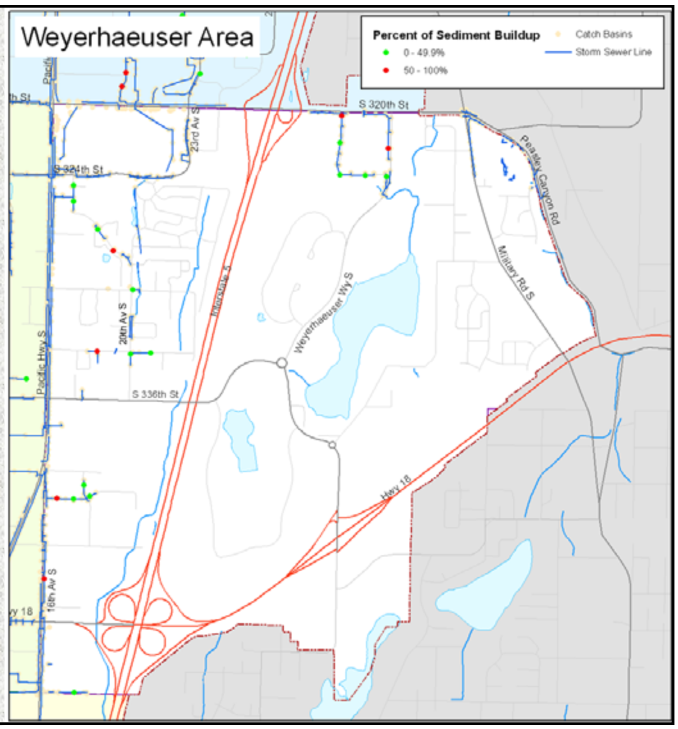
685

Number of Structures Measured

55

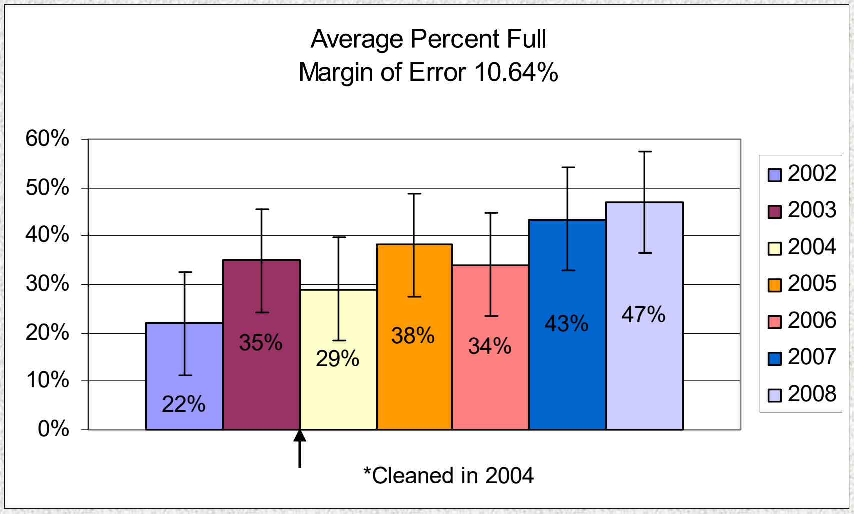
Percent Measured

8%



Attachment A5

Weyerhaeuser Area



*4-5 year Cleaning Schedule

Changes to the Program per the NPDES Permit

- Include structures upstream from outfalls
- Structural maintenance needs will begin to be documented and will need to be corrected within a 6 month timeframe
- Some changes will be made to the number of CBs measured in each area to target a 5% margin of error

Vactor Schedule

2008 Steel Lake(1650) Campus (1760) *Total 3410*	**2009** Hylebos (328) Dumas Bay (328) Weyerhaeuser (102) *Total 758*	**2010** Lakota (604) *Total 604*
2011 Twin Lakes (2077) *Total 2077*	**2012** Steel Lake (2827) Weyerhaeuser (685) *Total 3512*	**2013** Campus (3358) Lakota (915) Total 4237
2014 Hylebos (939) Dumas Bay (639) *Total 1578*	**2015** Steel Lake (2827) *Total 2827*	**2016** Weyerhaeuser (658) Lakota (915) *Total 1600*

Conclusion

- We will continue taking measurements for 3 more years

•After that, inspections can be reduced and will focus on the requirements of the Permit

Attachment A6

Infrastructure Asset Management

Pierce County
Public Works and Utilities

How Pierce County Public Works
Road Operations Division
Uses Infrastructure Asset Management

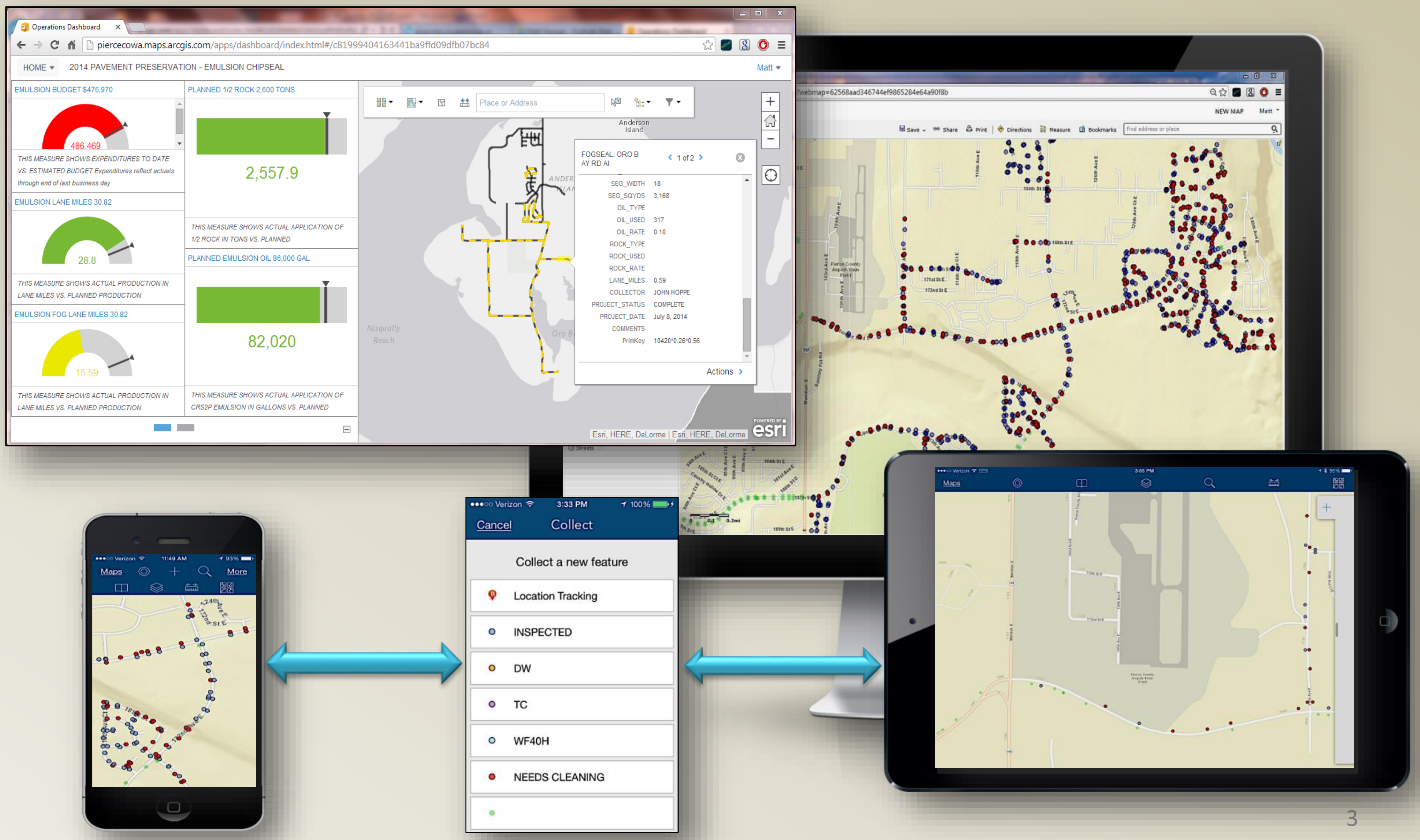
Pierce County Public Works

Road Operations Division

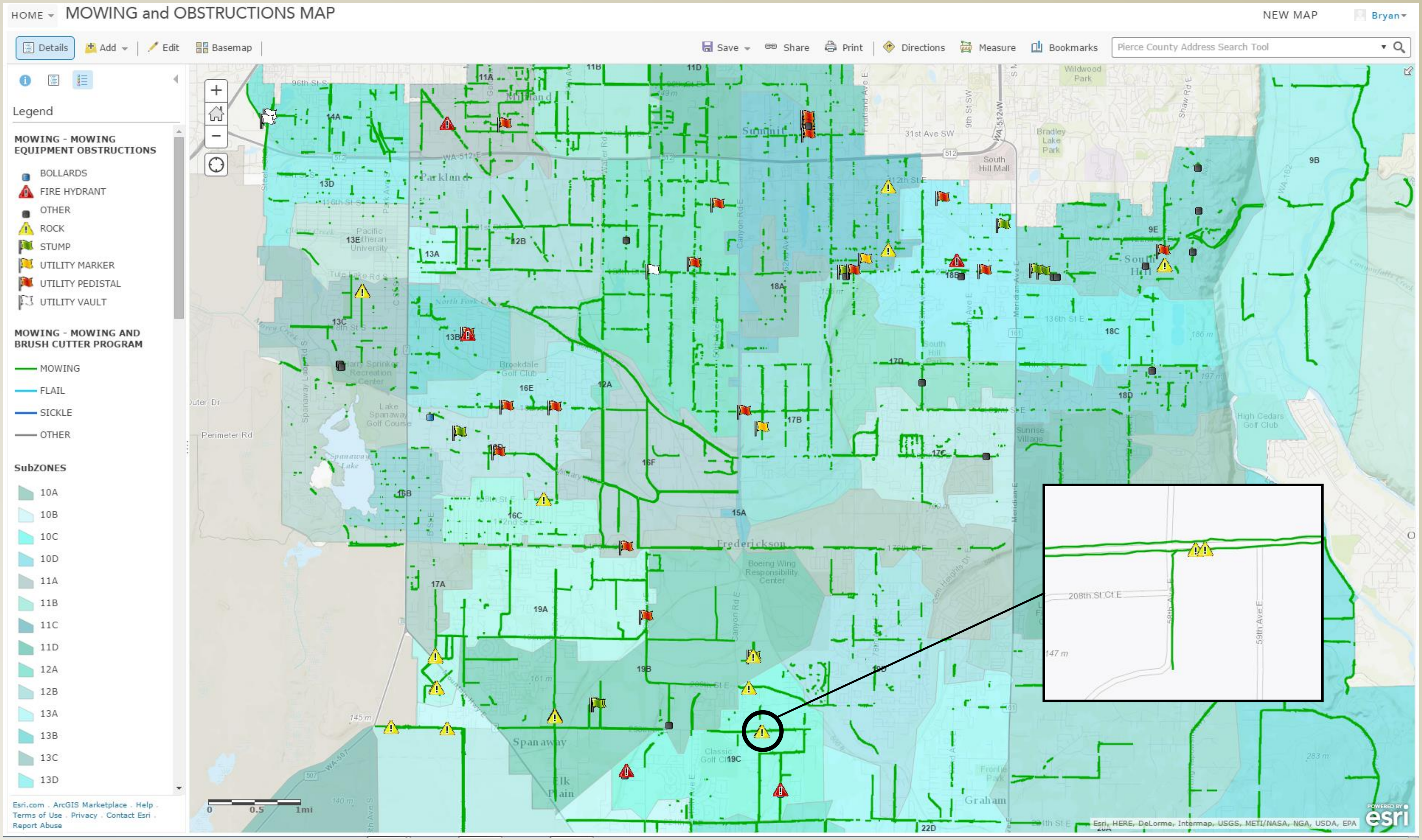
- $29.5M Annual Budget
- 164 FTEs
  - 24 Seasonal Employees
- 3 Facilities
- 10 Active Pit Sites (no active mining)
- 210 Vehicles and Equipment

- 3,150 Lane Miles
- 22,200 Catch Basins
- 550 Miles of Pipe

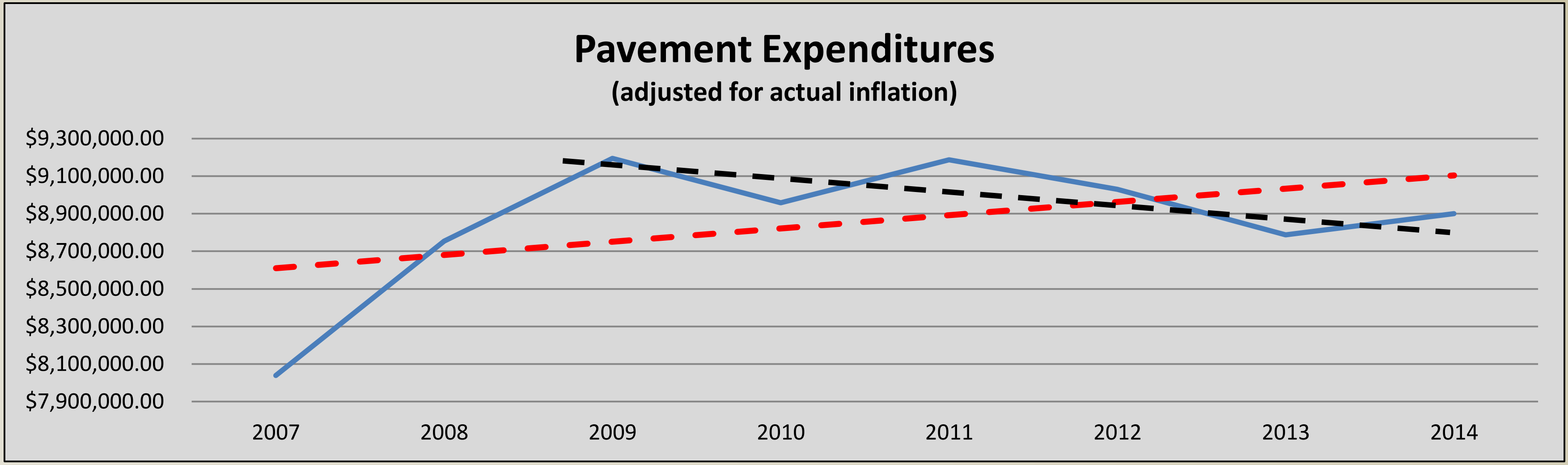
Why Do Asset Management Now?

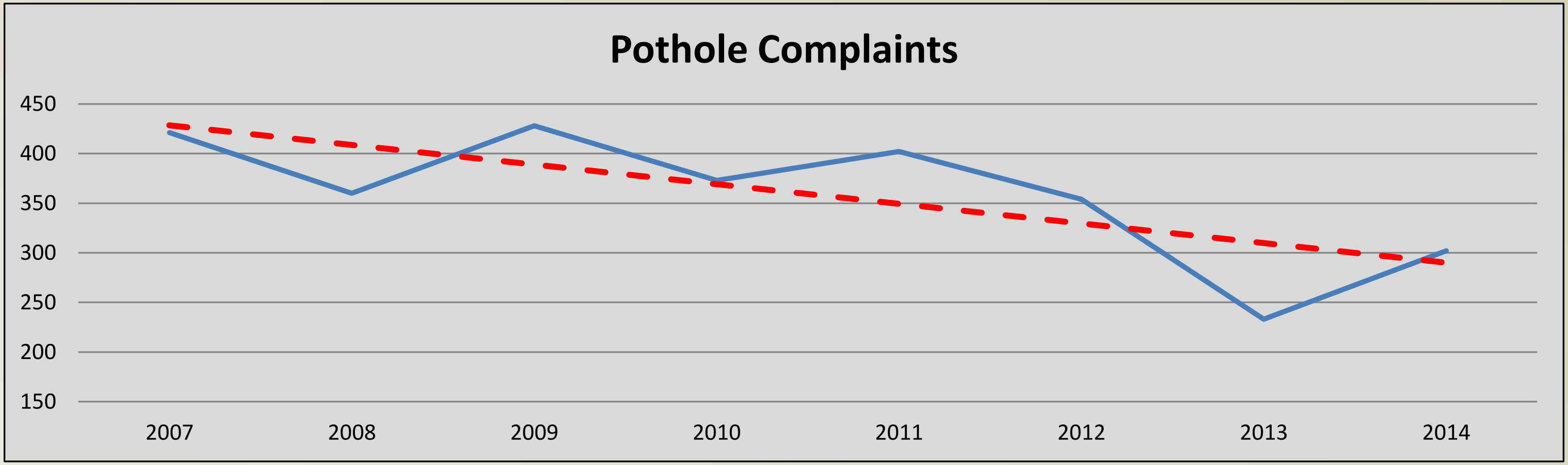


Current Example using Technology

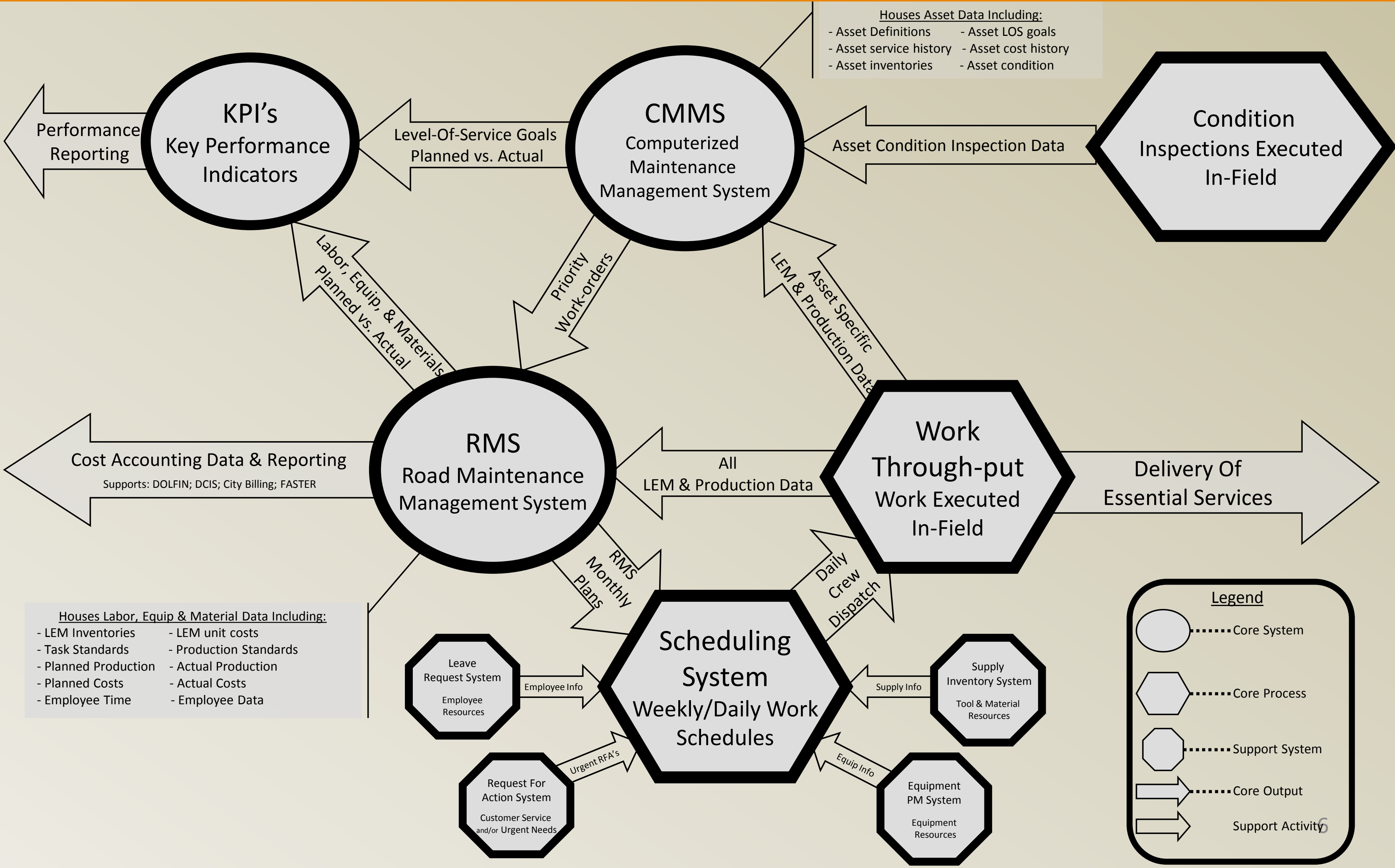


Save Money and Improve Effectiveness





Pierce County Road Operations Work Flow Chart



Pierce County
Public Works and Utilities

Attachment A6

Pierce County's 8 Elements of Assessment Management

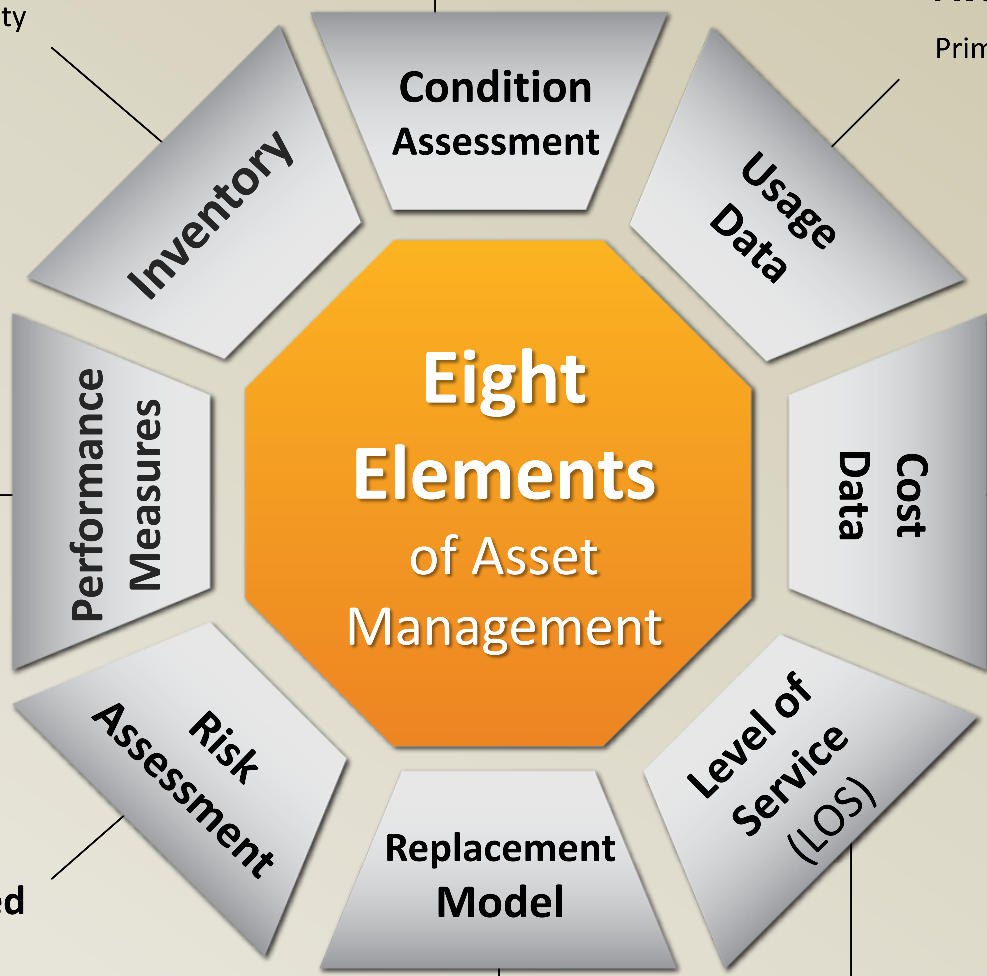
Large initial investment

Field and office resource activity

Work must integrate through hardware/software systems

Available Information

Primarily ADT, population info



Payroll and/or cost accounting system

Procedures, metrics, business rules housed in your manuals and CMMS system

Asset Condition Rating Scale per Function Standard

Defect Severity

A 0 - 3 None to low
B 4 - 6 Moderate
C 7 - 9 High

Defect Extent

1,4,7 Single or Isolated (<10%)
2,5,8 Several or Sporadic (10-50%)
3,6,9 Predominant (50-100%)

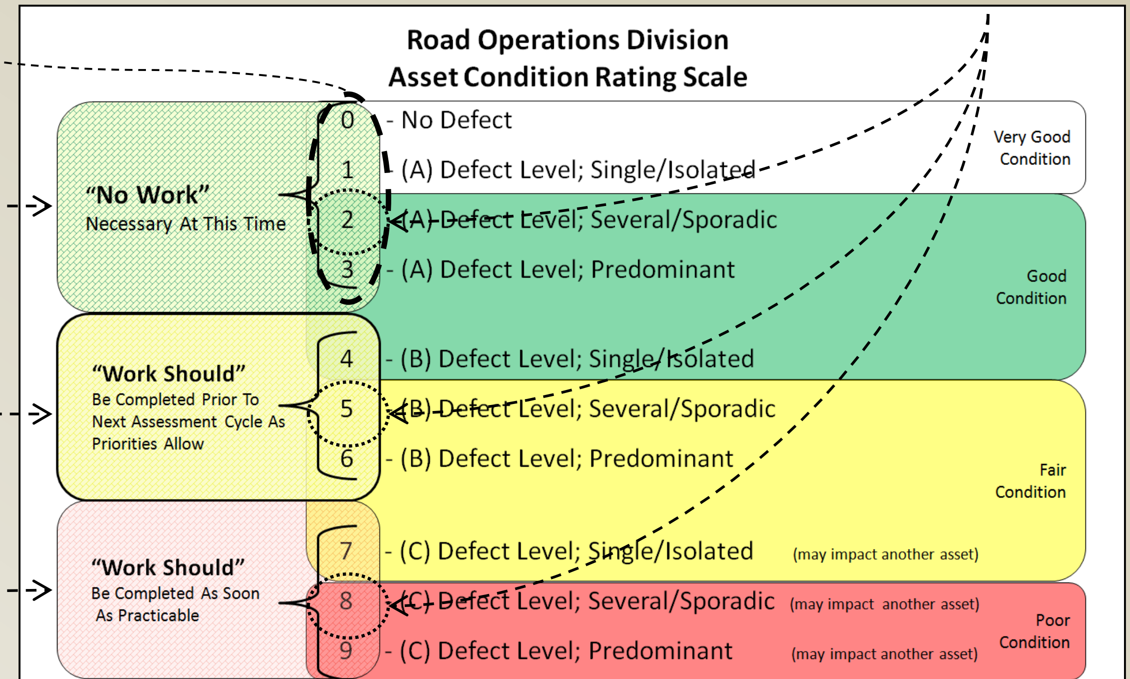
Work Order Prioritization

No Work Necessary
No or tolerable defects;, no work warranted at this time

Work Order Created
Low to moderate priority; should be completed as competing priorities allow

Work Order Created
Moderate to high priority; should be completed as soon as practicable. Condition may affect another asset.

Urgent Work & Emergencies
Emergencies are responded to immediately; emergency work orders are not created as part of an assessment rating process



NOTE: "This asset condition scale is not intended to be utilized to address conditions that pose an immediate or immanent threat to public safety or property. If an asset is found to be in such condition as to pose an immediate threat to public safety, property or habitat, corrective action should be taken as soon as possible."

Performance Measures

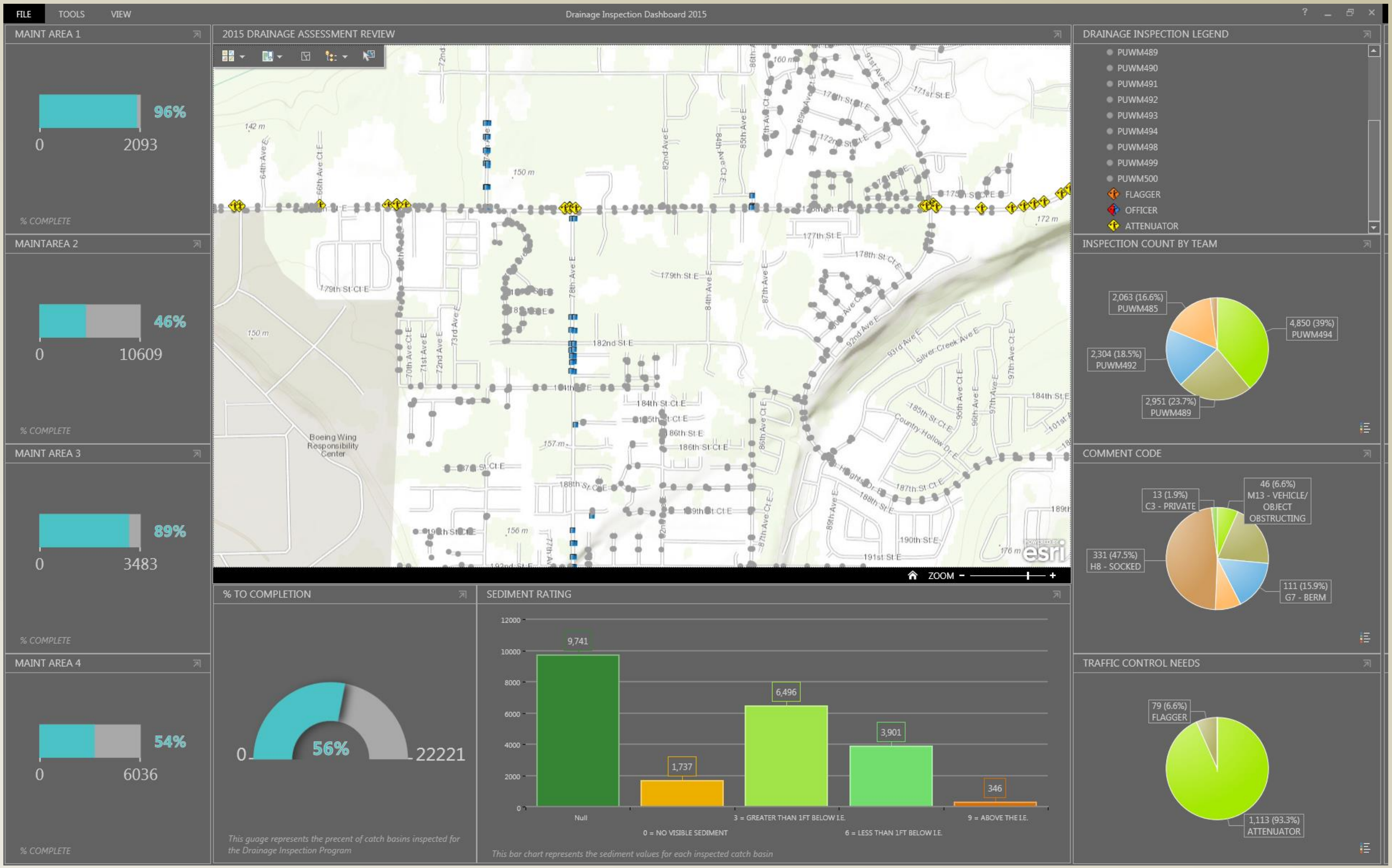
Provide understanding of asset condition in terms easily understood by the public:

- Very Good Condition
- Good Condition
- Fair Condition
- Poor Condition

Pierce County
Public Works and Utilities

Condition Assessment Tools

Condition Assessment Tools – Assessment Dashboard



Asset Management Save Money

Catch Basin Asset Management

- 2003 – 2009: Catch Basin Cleaning - $70.17

- 2010: Catch Basin Cleaning and Inspection - $119.00
- 2011: Catch Basin Cleaning and Inspection - $97.65
- 2012: Catch Basin Cleaning and Inspection - $70.34
- 2013: Catch Basin Cleaning and Inspection - $58.44

2010 to 2013 we saw a 24% drop in overall cost for the inspection and cleaning of our stormwater drainage infrastructure

The Challenges

Leading Change

- Cultural anchors
- Loyalty to legacy systems
- Perceptions of criticism
- Localized compare/contrast reactions
- Learning to trust the instrumentation
  - spatial disorientation reference

- Preserving trust between management and staff
  - Reward and rally the early adopters
  - Celebrate the short term wins
  - Be patient

Attachment A6

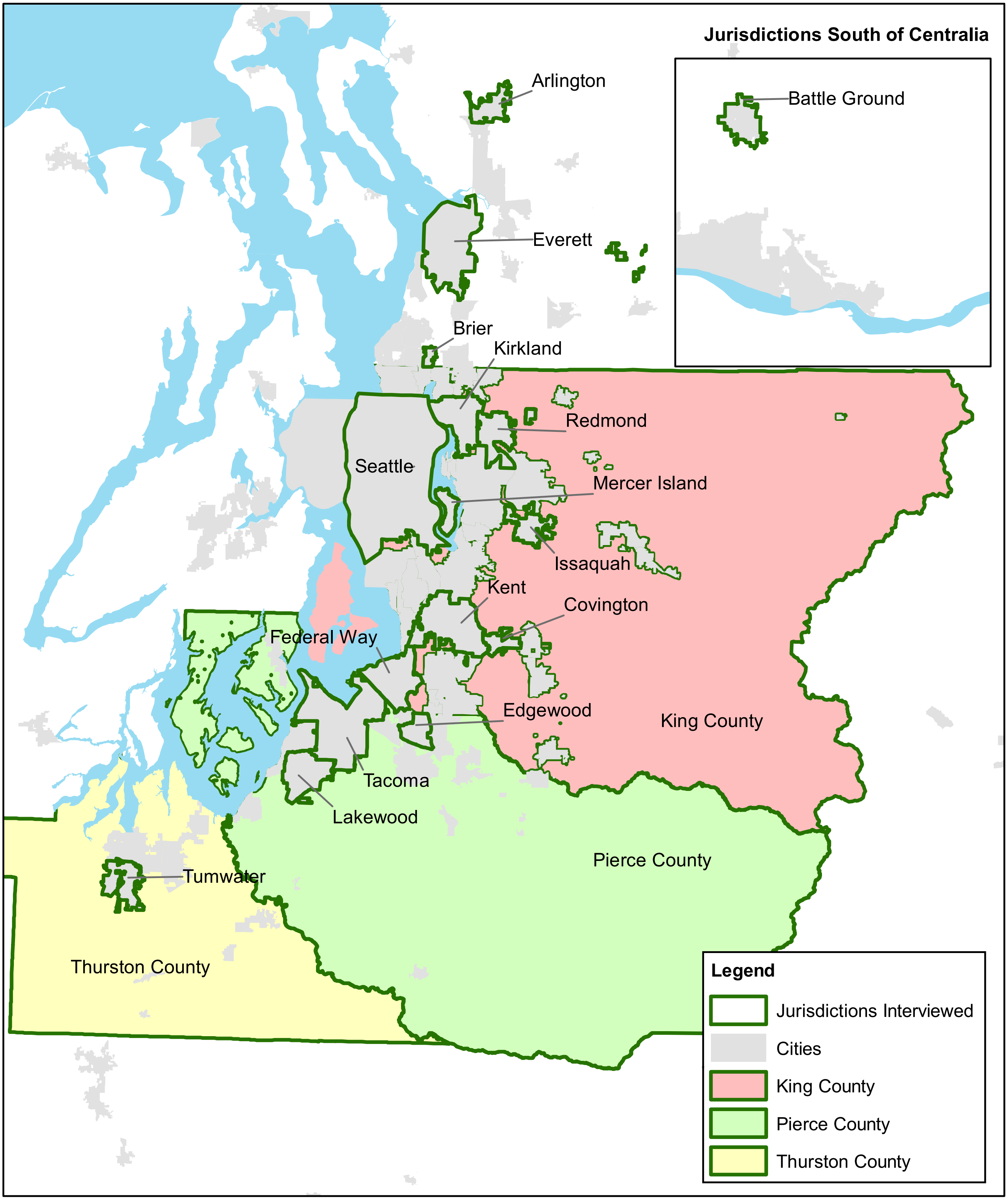
Questions?

Bruce Wagner
Pierce County Public Works
Road Operations Manager
bwagner@co.pierce.wa.us *253-798-6051*

Bryan Chappell
Pierce County Public Works
Water Quality Supervisor
bchappe@co.pierce.wa.us

ATTACHMENT B

INTERVIEWS DOCUMENTATION



OSBORN CONSULTING INCORPORATED

Western Washington Catch Basin Study

Summary of Interviews

Washington State

Figure B-1

Prepared by , 3/23/2018

Jurisdiction	Redmond	Pierce County	SPU	Lakewood
Date of Interview	**11/15/2017**	**1/9/2018**	**11/20/2017**	**11/16/2017**
Person Interviewed	**Peter Holte**	**Dan Smith**	**Kate Rhoads**	**Greg Vigoren**
Job Title	**Stewardship Coordinator**		**Municipal Stormwater Specialist**	**Surface Water Division Manager**
Contact Information - Phone	**(425) 556-2822**	**(253) 798-4652**	**(206) 684-8298**	**(253) 983-7771**
Contact Information - Email	**pholte@redmond.gov**	**dsmith8@co.pierce.wa.us**	**kate.rhoads@seattle.gov**	**gvigoren@cityoflakewood.us**
Alternate Contact	**Jerallyn Roetenmeyer**	**Bryan Chappell**		
Job Title	**NPDES Contact**			
Contact Information - Phone	**(425) 556-2824**	**(253) 798-3561 / 253-208-0727 / 253-255-3430**		
Contact Information - Email	**jroetemeyer@redmond.gov**	**bchappe@co.pierce.wa.us**		
Question				
Program Schedule/Management				
What drives the decision to pursue or not pursue circuit based inspections.	Cleaned all basins within 5 years for the last permit. Currently studying changing to a circuit basis. Working on modeling a circuit-based inspection schedule in one drainage basin while continuing to track more data about CBs and their system. Will implement circuit-based inspections during one year in one part of the city and all CBs cleaned in the other part of the city.	Circuit inspections are not performed any longer. All CBs are inspected. Inspections happen very quickly by measuring whether they have 12in clear space below the invert. This system ends up cleaning a lot more than other jurisdictions, but results in less cleaning of downstream structures (vaults). Have seen less water over roadway events: a reduction of 90% of these events.	SPU does not do circuit based inspections because they wouldn't work for off-line systems.	Circuit-based inspections are not performed. Inspection and cleaning is done for half the system every year.
If using circuit based inspections, what is your interpretation/decision tree of when failure in inspection of a catch basin happens?	Relying on the fact sheet from Ecology to determine how to do circuit-based inspections (provided in Attachment A). Inspections will start at the most upstream catch basin from the outfall and inspect 25% from that outfall. If the last CB was found dirty they will continue cleaning until they find a clean CB.	Circuit inspections before: identify bottom CB before it leaves the ROW; inspect until 3 CBs in a row were clean; made the assumption the rest of the system was cleaned. For a couple of years they did full inspection for asset management.	N/A	N/A
Does your jurisdiction have a combined inspection and cleaning program or are they separate events? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from doing a new method?	Done it both ways. Inspecting and cleaning in the same time has been more efficient in terms of staff and resources. Function critical vs. non-function critical (helps protect the water vs. asset management question), prioritize safety, NPDES, and then asset management. Didn't have capacity to do it in the past to do both in the same time. Maintenance and Operations Crew Supervisor has decided to do inspection separately and then clean all at once.	Inspection separate from cleaning. They start with CBs that have needed to be cleaned all of the last 3 years. Recording sediment both at inspection and cleaning and flagging CBs that have increased in amount of sediment.	Pilot study was inconclusive whether it was more efficient to do inspection and maintenance in the same time. Results of the study will be available Feb-March 2018.	Inspect and clean at the same time. Roughly 60% of catch basins inspected would need cleaning every year. Makes work more efficient. Cheaper than to inspect only. Takes about 4-5 months of the year. Inspecting about half every year. Cleaned about 2,000 of the half of the CBs inspected every year.
Is inspection/maintenance done in-house or contracted out to a consultant/contractor? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from changing your method?	In-house crews. Have not contracted it out before.	All in-house crews (Operations Crews that are trained for asset management). In the process of hiring a dedicated crew.	In-house crew. Have not contracted it out before.	Contracted out, because City management doesn't support bringing it in-house.
Are there any cost savings you have realized through other changes in your CB Inspection and cleaning program?	No further information provided.	No further information provided.	Sediment depth measurements are a large time waster and didn't help with any decisions.	No cost savings, just efficiency in keeping the system clean.

Jurisdiction	Redmond	Pierce County	SPU	Lakewood
Program Costs:				
What is the total number of CBs in your jurisdiction?	No further information provided.	23,000	Already provided information in the survey.	6,800
What is the total cost of the CB maintenance program including inspections, cleaning, maintenance, sweeping etc.? OR, if not answerable, what activities are included in your maintenance cost total?	Contact stormwater supervisor: Ernie Fix (425-556-2758).	Submitted additional cost information. Maintenance Technician from Operations 2012 onwards has inspections separated from flooding events.	Already provided information in the survey.	Total budget item for CB maintenance: $480,000 separate for filter insert: $45,000 Includes about 800 hours ($130,000) for video inspections.
What components are included in your costs for inspections and/or maintenance (e.g., data management, training, office staff, equipment the city owns, disposal fees, etc) ?	No further information provided.	Costs capture labor, equipment and materials, including all the data management, training, office staff, disposal.	No further information provided.	Costs includes jetting lines, video inspections, and other cleanings. Video inspections are probably the largest cost item.
BMPs:				
Are there any BMPs you are currently implementing that target sediment removal before capture in CBs? o street sweeping, o WetVaults, o socks/filters on CBs, o curbs, o impervious shoulders, etc. o other.	Used to have a leaf sucker (talk to Ernie about this). Andy Rheaume has a pilot project for street sweeping. Member of the SWG. Contact number (425-556-2741). Private systems inspections (included CBs in the program not just flow control and water quality structures).	Have tried to enhance sweeping program. Look at where it is more difficult to clean CBs (high traffic roads, confined spaces, etc.). Multi-lane roads trying to sweep twice a month and arterial roads once a month. More CBs on residential roads than on other roads - have been trying to increase that frequency as well. Two decant facilities and 4 Vactors. Implementing top-down measuring approach to identify how much freeboard you have in the system. Also working on getting rid of legacy issues (builders cleaning concrete in CBs, etc.).	Looked at the data for areas that needed more inspections and weren't able to see much. 9 year period. How many times a CB needed to be cleaned. Did not find any trends. Certain areas needed cleaning one year or another due to development happening in the specific basins. Implementing street sweeping on arterials and line-cleaning mostly in the Duwamish because there is not a lot of curb and gutter in the basin.	Street sweeping frequency is based on principal arterial/local access roads and incidental ($150,000/year). Have hydrodynamic separators in about 64 vaults. They are inspected by internal staff and a contractor cleans the vaults. Inspections usually happen before the beginning of the rainy season. Other BMPs include perc filters, storm filters and O/W separators, and some bioswales. No changes in CBs cleaned, because most of the systems were installed at the end of the line rather than at the headwaters.
Are there any lessons learned or cost savings from implementing them?	No further information provided.	No further information provided.	No further information provided.	Copied contract from Kenmore.

Jurisdiction	Thurston County	Everett	Kent	Kirkland
Date of Interview	**11/16/2017**	**12/18/2017**	**11/30/2017**	**1/2/2018**
Person Interviewed	**Ryan Langan**	**Grant Moen**	**Laura Haren**	**Jenny Gaus**
Job Title	**Stormwater Operations Manager**	**Senior Engineer**	**Environmental Conservation Analyst**	**Surface Water Engineering Supervisor**
Contact Information - Phone	**(360) 867-2099**	**(425) 257-8947**	**(253) 856-5537**	**(425) 587-3850**
Contact Information - Email	**langanr@co.thurston.wa.us**	**gmoen@everettwa.gov**	**lharen@kentwa.gov**	**jgaus@kirklandwa.gov**
Alternate Contact			**Chris Couvillion**	**Wess Sayers**
Job Title			**Storm Drainage Field Supervisor**	
Contact Information - Phone			**(253) 856-5633**	
Contact Information - Email			**ccouvillion@kentwa.gov**	**wesayers@kirklandwa.gov**
Question				
Program Schedule/Management				
What drives the decision to pursue or not pursue circuit based inspections.	Not doing circuit-based inspections because it would be cost prohibitive. Higher level of service by cleaning 1/3 of the catch basins every year.	Inspections are not based on circuits. Seemed to be more labor intensive because if finding one CB that did not meet requirements, then you would need to clean the entire system. Also, due to the requirements to inspect for structural integrity, the CBs would have to be visited more frequently anyway.	Inspections are not based on circuits. Looking to try a combination of circuit and non-circuit inspections for comparison.	Inspections are not based on circuits. A lot of work to define the circuits. Inspecting everything seemed easier.
If using circuit based inspections, what is your interpretation/decision tree of when failure in inspection of a catch basin happens?	Understand circuit based inspection as needing to inspect three structures upstream from the outfall. If they fail continue, until three structures in a row pass.	N/A	25% starting at the outfall structure. Based on the common discharge or common use (CBs involved with sanding and deicing will be cleaned every year).	N/A
Does your jurisdiction have a combined inspection and cleaning program or are they separate events? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from doing a new method?	Separated inspection from cleaning. because only about 20% of CBs inspected needed cleaning.	Inspect first and then clean, because only around 30% of CBs inspected need cleaning.	Inspections first. Create work orders to those that need to be cleaned. Some areas may start cleaning at the same time as inspections. Traffic control in high traffic areas may be more efficient with cleaning and inspections together. Anticipate cost savings for personnel, interruption of traffic.	Separate. Used to have a combined way of doing it, but decided to separate because Vactor trucks are expensive. Do not have data to back any cost savings.
Is inspection/maintenance done in-house or contracted out to a consultant/contractor? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from changing your method?	In-house crew. Have not contracted it out before.	In-house crew. Have not contracted it out before.	In-house crew. Have not contracted it out before.	In-house crew. Have not contracted it out before.
Are there any cost savings you have realized through other changes in your CB Inspection and cleaning program?	No further information provided.	No further information provided.	No further information provided.	No further information provided.

Jurisdiction	Thurston County	Everett	Kent	Kirkland
Program Costs:				
What is the total number of CBs in your jurisdiction?	Already provided information in the survey.	Already provided information in the survey.	18,900	15,690 in 2014 Surface Water Master Plan. With new development, probably have added ~50 CBs per year.
What is the total cost of the CB maintenance program including inspections, cleaning, maintenance, sweeping etc.? OR, if not answerable, what activities are included in your maintenance cost total?	Already provided information in the survey.	Already provided information in the survey.	Already provided information in the survey.	Costs provided for through November 2017.
What components are included in your costs for inspections and/or maintenance (e.g., data management, training, office staff, equipment the city owns, disposal fees, etc) ?	Costs include staff wages, benefits and overhead, cost of vehicle. Costs do not include disposal because it is recycled in-house.	Costs do not include disposal of waste. Solid waste handling is done at in-house facility.	Included in the costs are fuel costs, vehicle rentals, maintenance, wages, products, disposal costs. Sweeping is not included, as it is contracted out separately.	Costs do not include all overhead, data management, or disposal fees. A fleet charge recovers the maintenance, repair, and replacement for the equipment.
BMPs:				
Are there any BMPs you are currently implementing that target sediment removal before capture in CBs? o street sweeping, o WetVaults, o socks/filters on CBs, o curbs, o impervious shoulders, etc. o other.	Street sweeping program. BMPs are mostly end of pipe systems prior to infiltration.	The street sweeping program removes large amount of sediments. Different depending on use and historic knowledge of the area. Sweeping right after the sanding efforts in the winter time has removed significant amounts of sediment.	Some BMPs include leaf vacuums for gutter lines to prevent debris in CBs, Filterra and vault systems, and filter socks in CBs for areas with sanding routes.	Each street is swept every two months. Arterials and higher use streets are swept more often. Also targeting problem CBs areas. Development department are very careful about erosion control. WaterWorks grant to do on-site training on erosion control on small sites. Cleaning pipes as well when CBs are cleaned and pipes show more than 1/3 full. Active IDDE program. The city goes out to clean whenever there is a report. Changed snow practices from using sand to using more deicers. Used to do more streambank stabilization, but now focusing more on flow control.
Are there any lessons learned or cost savings from implementing them?	Can't quantify savings or implement tracking for the BMPs.	No way to track effects of BMPs relative to maintenance costs.	Running a city Vactor truck facility rather than disposing the soils reduces the costs with disposal and beneficially reusing them on other sites.	The number of IDDEs and work orders has gone up as a result of community involvement. However, no way of quantifying cost savings.

Jurisdiction	Tacoma	Tumwater	WSDOT	King County WLRD
Date of Interview	11/15/2017	1/4/2018	1/8/2018	1/4/2018 and 1/16/2018
Person Interviewed	Mike Rose	Dan Smith	Trett Sutter	Doug Navetski
Job Title	Professional Engineer	Water Resources Program Manager	Stormwater Compliance Specialist	NPDES Contact
Contact Information - Phone	(253) 502-2264	(360) 754-4140 x149	(360) 705-6964	(206) 477-4783
Contact Information - Email	Mrose@cityoftacoma.org	desmith@ci.tumwater.wa.us	suttert@wsdot.wa.gov	doug.navetski@kingcounty.gov
Alternate Contact		Amy Georgeson		Brent Dhoore
Job Title		Water Resources Specialist		Roads Division
Contact Information - Phone		(360) 754-4144		206.477.2606
Contact Information - Email		ageorgeson@ci.tumwater.wa.us		brent.dhoore@kingcounty.gov
Question				
Program Schedule/Management				
What drives the decision to pursue or not pursue circuit based inspections.	Circuit-based inspections are performed. Better data is needed for efficiency to be evaluated. Intermediate inspection randomly (negligible). Plans to perform some data analysis on sediment accumulation. Trying to use the data to drive the pipe cleaning and sweeping program. Seeing improvements on CB cleaning from doing better maintenance with other programs.	Inspections are not based on circuits. Fifty percent of the catch basins are inspected every year.	Have looked at circuit-based but are not far enough along with definitions of circuits or mapping. Within the NPDES boundaries, inspections performed once a year. Cleaning/repair within 6 months of the inspections. 2 years of tracking inventory.	Circuit-based inspections under the Roads Department (80-90% of the inventory).
If using circuit based inspections, what is your interpretation/decision tree of when failure in inspection of a catch basin happens?	Broken entire city network into convenient geographical boundaries (topography based): 6 general areas broken out into sub-basins. Hit 33% of each sub-basin for cleaning and inspections. Cleaned every single catch basin every 2.5 years. Currently looking to develop return frequencies for geographical areas. One basin with mixed residential and commercial required extensive amount of cleaning.	N/A	N/A	Circuits are formed by CBs that share the same outfall. An outfall is when the water leaves the ROW. Initial inspection includes the 25% most downstream end of the circuit, including the outfall if it is a structure. If all 25% pass the clean threshold (less than 50% full), no cleaning required. If any of those 25% fail, they will be cleaned. If the most upstream (top CB) fails, then it triggers inspection up the circuit until two CBs pass. Structural integrity inspections are done at time of the sediment inspection.
Does your jurisdiction have a combined inspection and cleaning program or are they separate events? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from doing a new method?	Inspect and clean in the same time, because they clean regardless of the sediment depth. Used the cleaning program for a year to remove left behind CB filter socks after construction contracts to have a better system. The costs for removing the filter socks was around $80-100k.	Inspect and clean at the same time. Seems to work well for them. Haven't tried to separate.	In more urban areas (when lane closures need to happen) they usually have the vactor truck follow the inspection crew. In more rural areas that are farther away, will likely have inspection a couple of months before.	Parks Department does inspection and cleaning together (only a few hundred CBs focused in the same area). WLRD and Roads have separate events. Majority of inspections pass, so it makes sense to send the inspector first and then follow-up with the Vactor when cleaning.
Is inspection/maintenance done in-house or contracted out to a consultant/contractor? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from changing your method?	In-house crew. Have not contracted it out before.	In-house crew. Have not contracted it out before.	In-house crew. Have not contracted it out before.	All done by Roads department (county staff). All other departments contract with Roads.
Are there any cost savings you have realized through other changes in your CB Inspection and cleaning program?	Efficiency seen from the GIS mapping of existing and new infrastructure and tracking CB inspections digitally. Realized efficiencies for contaminated/source control questions response and were able to plan routes more efficiently. With the same crew and resources, crews are now able to do inspection and cleaning every 2.5 years for the entire system compared to 7 years it took before digital records.	No further information provided.	No further information provided.	Size of the inventory drives the program decisions. Smaller inventory allows for inspection and cleaning. For large jurisdictions, can only inspect what they can clean in 6 months.

Jurisdiction	Tacoma	Tumwater	WSDOT	King County WLRD
Program Costs:				
What is the total number of CBs in your jurisdiction?	20,000	No further information provided.	Statewide: 34,000 CBs. Overall inventory is 50,000 CBs. Western: 26,000 CBs, all basins within NPDES boundaries. All inventory is 40,000 CBs.	Over 20,000-23,000 structures in the inventory, CBs are a little less.
What is the total cost of the CB maintenance program including inspections, cleaning, maintenance, sweeping etc.? OR, if not answerable, what activities are included in your maintenance cost total?	$250,000, roughly.	No further information provided.	Statewide: $14.9M (CBs, stormwater BMPs) for two years. Western: $12.3M dedicated to assets on the west side of the Cascades. 2015-2017 spending on just CB: $7.5M - 2 years spending. (about $5.5M spent on the west side).	No further information provided.
What components are included in your costs for inspections and/or maintenance (e.g., data management, training, office staff, equipment the city owns, disposal fees, etc) ?	No further information provided.	No further information provided.	Costs include maintenance and inspection of ponds, vaults, etc. Costs includes manhours for inspection and cleaning, disposal, vehicles, and equipment. Does not include equipment purchases, data management, training, or office staff.	No further information provided.
BMPs:				
Are there any BMPs you are currently implementing that target sediment removal before capture in CBs? o street sweeping, o WetVaults, o socks/filters on CBs, o curbs, o impervious shoulders, etc. o other.	Implementing an aggressive sweeping program: all city is swept twice a year, downtown sweeping is completed continuously. Two shifts (evening and morning) once a week cycle for the downtown areas. Heavier arterial roads get swept every one-three months. Driven not by data, but by experience. Zonar program to track trucks that sweep to keep track of the streets swept. Difficult to quantify costs. Tons of materials removed. Some studies show that it doesn't matter. Efficiency realized by having a reduced number of calls from clogged CBs.	Have a street sweeping program.	Have looked at additional sweeping, because a sweeper is much cheaper equipment to operate. Socks and filters haven't worked out well because they typically get forgotten and have caused more flooding events.	SW treatment facilities and sweeping program (recovering sand after storm events). Street sweeping would be the only BMP that they actively target. A grant from Ecology is allowing them to look for scour areas candidates for retrofit structures.
Are there any lessons learned or cost savings from implementing them?	No further information provided.	No further information provided.		

Jurisdiction	Brier	Covington	Edgewood	Federal Way
Date of Interview	1/9/2018	12/1/2017		12/8/2017
Person Interviewed	Rich Maag		Jeremy Metzler	Tony Doucette
Job Title			Senior Engineer/Surface Water Program Manager	Surface Water Management Project Engineer
Contact Information - Phone	(425) 775-5440	(253) 480-2465	(253) 952-3299	(253) 835-2753
Contact Information - Email	rmaag@ci.brier.wa.us	bparrish@covingtonwa.gov	jeremy@cityofedgewood.org	tony.doucette@cityoffederalway.com
Alternate Contact				
Job Title				
Contact Information - Phone				
Contact Information - Email				
Question				
Program Schedule/Management				
What drives the decision to pursue or not pursue circuit based inspections.	The city will start doing circuit-based inspections.	Inspections are not based on circuits. Approach is to clean half the city every year.	Inspections are not based on circuits. Pierce County does inspections for Edgewood.	Circuit-based inspections are performed for 7 sub-basins. City performed a cleaning study between 2005 and 2007 timeframe. The cleaning study helped break down the system into circuits that are now cleaned between once every 3 years and every 5 years.
If using circuit based inspections, what is your interpretation/decision tree of when failure in inspection of a catch basin happens?	Process for circuit-based inspections will be to start at the lowest CB and inspect as many as needed. If 6/7 CBs are clean then assume that the rest is clean. The process will also entail some spot checks.	N/A	N/A	Measured sediment in all CBs in the public ROW the year before they were due for cleaning. Cleaning the following year.
Does your jurisdiction have a combined inspection and cleaning program or are they separate events? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from doing a new method?	Have done it combined, but will move to inspections first and then cleaning.	Inspects and cleans at the same time.		Inspections one year, and then cleaning the next year.
Is inspection/maintenance done in-house or contracted out to a consultant/contractor? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from changing your method?	In-house crew. Have not contracted it out before.	Contracted out.	Contracted out.	In-house inspections and contracted Vactor.
Are there any cost savings you have realized through other changes in your CB Inspection and cleaning program?	No further information provided.	The program seems to be working fine, and haven't looked at any improvements or efficiencies.	No further information provided.	No further information provided.

Jurisdiction	Brier	Covington	Edgewood	Federal Way
Program Costs:				
What is the total number of CBs in your jurisdiction?	1,700	3,400	980	12,528
What is the total cost of the CB maintenance program including inspections, cleaning, maintenance, sweeping etc.? OR, if not answerable, what activities are included in your maintenance cost total?	Already provided information in the survey.	Submitted with the survey.	Changes in inspection requirements and additional works responsible for the higher costs in the later years.	Already provided information in the survey.
What components are included in your costs for inspections and/or maintenance (e.g., data management, training, office staff, equipment the city owns, disposal fees, etc) ?	Costs include manhours only and disposal fees.	Costs include only the Vactor contractor.	No further information provided.	Costs include disposal costs.
BMPs:				
Are there any BMPs you are currently implementing that target sediment removal before capture in CBs? o street sweeping, o WetVaults, o socks/filters on CBs, o curbs, o impervious shoulders, etc. o other.	The city does street sweeping consistently and keeps a very good eye on construction sites. Sweeping right after snow events that required sand applications was found to remove significant amounts of sediment.	The city has a street sweeping contract.	No further information provided.	Street sweeping also contracted out. Sweeping is intensified around high-use intersections that require oil booms.
Are there any lessons learned or cost savings from implementing them?		The city has not looked at reductions in costs.	No further information provided.	Years that they have to clean most is right after heavy snow years.

Jurisdiction	Mercer Island	Issaquah	Arlington	Battle Ground
Date of Interview		**1/4/2018**	**12/6/2017**	**12/1/2017**
Person Interviewed	**Brian Hartvigson**	**Harvey Walker**	**Ken Clarke**	**Kelly Uhacz**
Job Title	**Right-Of-Way Manager**	**Manager of Storm and Sewer Operation**	**Stormwater Technician**	**Associate Stormwater Engineer**
Contact Information - Phone	**(206) 275-7809**	**(425) 837-3480**	**(360) 403-3523**	**(360) 342-5069**
Contact Information - Email	**brian.hartvigson@mercergov.org**	**harveyw@issaquahwa.gov**	kclarke@arlingtonwa.gov	**kelly.uhacz@cityofbg.org**
Alternate Contact			**Mike Wallaneck?**	
Job Title				
Contact Information - Phone			**360.403.3541**	
Contact Information - Email				
Question				
Program Schedule/Management				
What drives the decision to pursue or not pursue circuit based inspections.	Inspections are not based on circuits. All catch basins cleaned on a 2-year cycle.	Divided into 25 circuits based on the outfalls and areas. Program started in August 2017 and has been working well so far. Trying to get the circuits into GIS for tracking.	Inspections are not based on circuits. The city is divided into 3-4 parts and cleaning frequencies favor streets that have sanding activities in the winter.	Not sure what circuit-based inspections mean. Currently, the city is inspecting all of the CBs.
If using circuit based inspections, what is your interpretation/decision tree of when failure in inspection of a catch basin happens?	N/A	Per talking with Pierce County: go upstream until they find 5 clean basins (below threshold for cleaning) in a row. Inspections start at the last basin before it enters the waters of the state/ponds, etc.	N/A	N/A
Does your jurisdiction have a combined inspection and cleaning program or are they separate events? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from doing a new method?	Performing cleaning as we go. It is more efficient because you don't need to come back.	Cleaning is separate from inspections. With sanding operations, they clean catch basins more (often even 3-4 times a year).	Combined inspection and maintenance. Haven't documented the sump depth. An iPad app has allowed them to track CBs and amount of sediment.	Only about 25% needed to be cleaned, but the city is not tracking specific numbers.
Is inspection/maintenance done in-house or contracted out to a consultant/contractor? Did you have a different structure in the past? Have you found any cost efficiencies or lessons learned from changing your method?	Contracted out.	In-house crew. Have not contracted it out before.	In-house crew. Have not contracted it out before.	In-house crew. Have not contracted it out before.
Are there any cost savings you have realized through other changes in your CB Inspection and cleaning program?	Contract because the jurisdiction doesn't have the right equipment.	No further information provided.	Low-tech tracking methods (i.e., spot of green paint on the CB when it is maintained).	No further information provided.

Jurisdiction	Mercer Island	Issaquah	Arlington	Battle Ground
Program Costs:				
What is the total number of CBs in your jurisdiction?	4,641	7,500	3,500	2,000 (used to have 1,800, but have been growing).
What is the total cost of the CB maintenance program including inspections, cleaning, maintenance, sweeping etc.? OR, if not answerable, what activities are included in your maintenance cost total?	Costs cover everything including the waste disposal.	Already provided information in the survey.	Already provided information in the survey.	Already provided information in the survey.
What components are included in your costs for inspections and/or maintenance (e.g., data management, training, office staff, equipment the city owns, disposal fees, etc) ?	Type I and Type II have a different cost structure. Pond cleaning by the hour. Type II - $37 Type I - $24 Costs do not include mobilization and disposal.	Cost data does not include data management, disposal costs, training, management, office/management. Costs include some equipment fees/parts used.	Included in the costs are man-hours, street sweeping and Vactor trucks. Solids from cleaning are stockpiled, and once a year they are tested and disposed. Waste management is not included in the costs.	Includes costs for data management.
BMPs:				
Are there any BMPs you are currently implementing that target sediment removal before capture in CBs? o street sweeping, o WetVaults, o socks/filters on CBs, o curbs, o impervious shoulders, etc. o other.	City has a robust in-house street sweeping. Almost all the sediment structure vaults are mid cycle of the drainage basin. Found that these sediment vaults reduced the sediment downstream. Not a lot of cost savings tracked or realized, just better results for sediment capture. The city does make use of filter socks when needed.	SW Rehabilitation Program: Look at systems where they can improve and at isolated CBs that are not currently visited. Contract sweepers to clean sanded roads, cleaning leaves, etc.	Biggest sediment removal and control is street sweeping, which is completed every other month. Filter socks are standard for construction sites.	Only street sweeping, rotation through the city (3 times a year). Have a few treatment BMPs in the city, but the city doesn't track performance (10-12 filter vaults with Storm Filters).
Are there any lessons learned or cost savings from implementing them?	The city found significant improvements in sediment removal from ensuring car washes had proper barriers for containing wastes.	No further information provided.	CMA (Calcium Magnesium Acetate) replacement for sanding the roads to keep streets clean.	

ATTACHMENT C

COST INFORMATION DATA SUMMARY

ATTACHMENT C

COST INFORMATION DATA SUMMARY

Phase	Jurisdiction	Size	Year									
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Phase 1	Port of Seattle	Medium		$ 62.83	$ 67.70	$ 87.61	$ 98.45	$ 107.26	$ 91.03	$ 142.99		
Phase 1	Seattle Public Utilities	Large	$ 29.34	$ 49.65	$ 37.69	$ 27.83	$ 30.94	$ 24.57	$ 31.33	$ 32.43		
Phase 1	WSDOT	Large				$ 30.56	$ 41.15	$ 54.89	$ 40.83	$ 37.95		
Phase 1	Pierce County	Large			$ 26.23	$ 40.59	$ 34.04	$ 30.20	$ 28.34	$ 26.45	$ 32.99	$ 36.17
Phase 2	City of Battle Ground	Small		$ 0.34	$ 13.97	$ 18.72	$ 0.23	$ 9.41	$ 8.61	$ 2.19		
Phase 2	City of Brier	Small				$ 11.76	$ 10.00	$ 2.94	$ 1.18	$ 1.18		
Phase 2	City of Edgewood	Small	$ 17.38	$ 20.35	$ 21.73	$ 22.63	$ 23.76	$ 24.95	$ 137.53	$ 250.11		
Phase 2	City of Poulsbo	Small	$ 70.55	$ 73.47	$ 73.47	$ 74.05	$ 75.77	$ 76.69	$ 77.92	$ 79.20		
Phase 2	City of Arlington	Medium								$ 8.57		
Phase 2	City Of Covington	Medium	$ 18.31	$ 20.18	$ 12.60	$ 5.62	$ 12.34	$ 27.23	$ 14.80	$ 16.45		
Phase 2	City of Issaquah	Medium						$ 2.03	$ 7.00	$ 6.61		
Phase 2	City of Lakewood	Medium	$ 6.18	$ 6.18	$ 6.18	$ 8.47	$ 15.88	$ 16.14	$ 25.29	$ 25.69		
Phase 2	City of Mercer Island	Medium								$ 60.00		
Phase 2	Thurston County	Medium						$ 120.80	$ 144.78	$ 122.02		$ 37.49
Phase 2	City of Everett	Large			$ 16.36	$ 16.36	$ 16.36	$ 7.88	$ 7.88	$ 7.88		
Phase 2	City of Federal Way	Large	$ 9.30	$ 11.87	$ 11.89	$ 11.91	$ 11.93	$ 13.09	$ 12.82	$ 14.13		
Phase 2	City of Kent	Large					$ 178.71	$ 289.73	$ 281.51	$ 286.67		
Phase 2	City Of Tacoma	Large										$ 12.50
Phase 2	City of Kirkland	Large							$ 14.55	$ 20.04	$ 29.12	

Appendix C

Federal Way and Marysville Alternative Inspection Schedules

From Attachment 6 of 2017 NPDES Annual Report (Federal Way 2017) - Summary of Catch Basin Cleaning Program

Alternative schedule for catch basin cleaning based on a 10-year study performed by the City of Federal Way

The City of Federal Way (City) initiated a Catch Basin Evaluation Study in 2002 as a means to determine the most efficient and cost-effective manner to maintain the City's 12,500 catch basins. The goal of the study was to:

- Reduce annual expenditures
- To avoid cleaning "clean" structures
- To determine an appropriate cleaning schedule
- To comply with NPDES permit requirements to maintain infrastructure
- To satisfy NPDES permit requirements to inspect catch basins

To begin the study, all catch basins were cleaned, measured, and inventoried. The City was broken up geographically into 7 circuits based on average land use. The sediment levels of randomly selected catch basins in each area were measured annually for duration of ten years. The number of catch basins sampled in each area was based on a sample size large enough to be statistically significant so the data could be extrapolated to the entire circuit. This data was used to determine an optimal cleaning schedule for the 7 circuits. The NPDES permit allows for an alternative cleaning schedule to reduce inspection and/or maintenance frequency based on records of double the length of time of the proposed frequency. This study collected 10 years of data and resulted in the following cleaning schedule:

Circuit Name	Number of Catch Basins	Year(s) Cleaned During Permit Cycle	Cleaning Frequency (yrs.)
Lakota	604	2013, 2016	3
Steel Lake	1650	2012, 2015	3
Weyerhaeuser	102	2012, 2016	4
Campus	1760	2013, 2018	5
Hylebos	328	2014	5
Twin Lakes	2077	2017	5
Dumas Bay	639	2014	5

PUBLIC WORKS
Kevin Nielsen, *Director*

80 Columbia Avenue
Marysville, Washington 98270
Phone (360) 363-8100
Fax (360) 363-8284
marysvillewa.gov

MEMORANDUM

Date:	10/17/2017
To:	Project File
Fr:	Brooke Ensor- NPDES Coordinator
Project:	Operations and Maintenance Program
Subject:	Alternative Catch Basin Inspection Schedule

Background

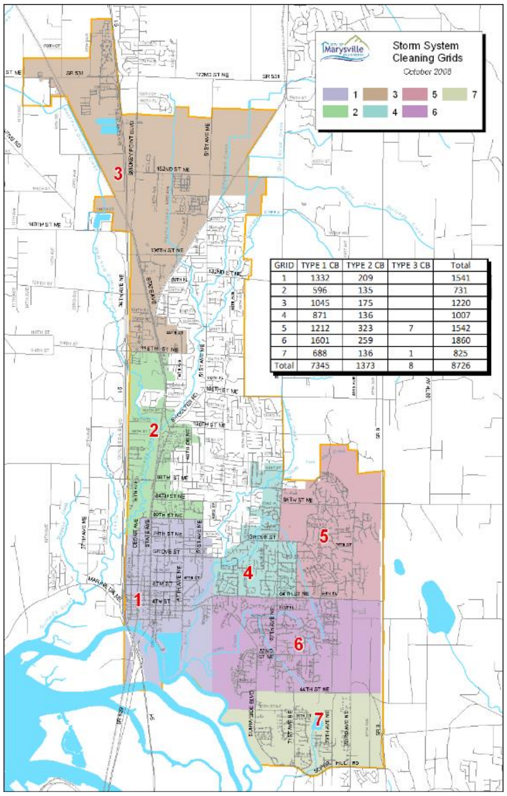
The City of Marysville has developed a catch basin inspection and cleaning program. The program is an integral part of the City's effort to promote the health and wellbeing of our citizens, the surrounding environment and comply with the National Pollutant Discharge Elimination System (NPDES) Western Washington Phase II Municipal Stormwater Permit (Permit).

The City's catch basin inspection and cleaning program is managed cooperatively by the Surface Water Division, and the Sewer/Storm Maintenance Division. The GIS Division plays a critical role in data management and analysis. In 2007, the GIS Utility Maintenance Inspection Tool was created for the Storm/Sewer Maintenance Division to utilize in the field. The tool allows each inspection record to be associated to its catch basin by a unique ID number. The vactor truck has a laptop computer installed and the Storm/Sewer Maintenance Division is primarily responsible for conducting catch basin inspections.

The condition of the catch basin is recorded using the GIS Utility Maintenance Inspection Tool. The inspector clicks on the catch basin and the inspection form opens. During routine inspections, the inspector visually assesses how much silt is in each catch basin compared to its total capacity. The inspection form allows the silt level conditions to be recorded in one of four categories: 0-25%, 25-50%, 50-75%, and 75-100%. The form is completed then the catch basin is usually cleaned, regardless of the condition. If larger repairs are needed a work order is created in the City's Work Management System database and assigned to the appropriate staff member(s). The data is uploaded from the field laptops to a SQL Server database at regular two-week intervals.

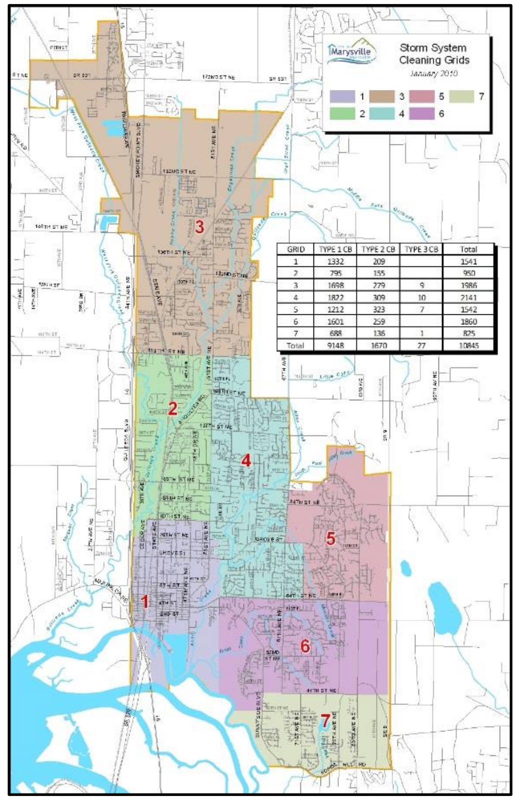
For the 2007-2012 and 2012-2013 Permit terms, the City's MS4 was separated into 7 grids for catch basin inspection and cleaning. In addition to the grid areas, some high traffic sanding routes were inspected and cleaned almost annually. Between 2007 and 2009, large portions of the City's Urban Growth Boundary were annexed and the 7 grids were expanded to encompass those areas.

For the current Permit term, the City's MS4 was separated into four grids (see Figure 3). One grid was planned for each permit year (Aug to Aug) between August 1, 2013 and August 1, 2017.



GRID	TYPE 1 CB	TYPE 2 CB	TYPE 3 CB	Total
1	1332	209		1541
2	596	135		731
3	1045	175		1220
4	871	136		1007
5	1212	323	7	1542
6	1601	259		1860
7	688	136	1	825
Total	7345	1373	8	8726

Figure 1. Grids from 2007



GRID	TYPE 1 CB	TYPE 2 CB	TYPE 3 CB	Total
1	1332	209		1541
2	795	155		950
3	1698	279	9	1986
4	1822	309	10	2141
5	1212	323	7	1542
6	1601	259		1860
7	688	136	1	825
Total	9148	1670	27	10845

Figure 2. Grids from 2010

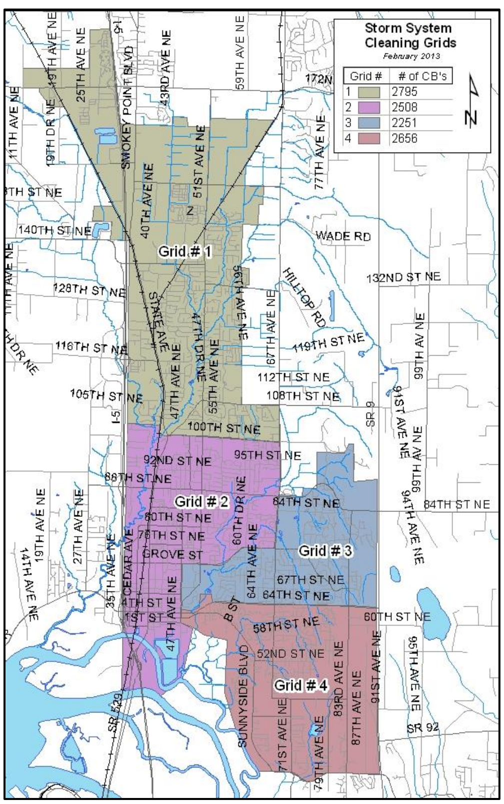


Figure 3. Grids from 2013

Data Review and Results

Over the 10-year period from 2007 to 2017 the Sewer/Storm Maintenance Division recorded over 28,000 measurements. For this report, the earliest measurements were omitted since there was no recorded date for any prior cleanings. Omitting the earliest records leaves only measurements for which a there is a known time interval between cleanings - 16,151 total records.

Using python scripting, data was processed into a table containing the number of years between cleanings associated with each of the four silt level categories. The processed data was imported into MS Excel and using the pivot table functions, the following graph was created showing the average number of years between cleanings, silt level category, and the number of recorded measurements in each category.

The results show that catch basins are typically meeting or exceeding the maintenance standards for the first three and a half years. Catch basins exceed the maintenance standard, 60% full sump depth, just after four years.

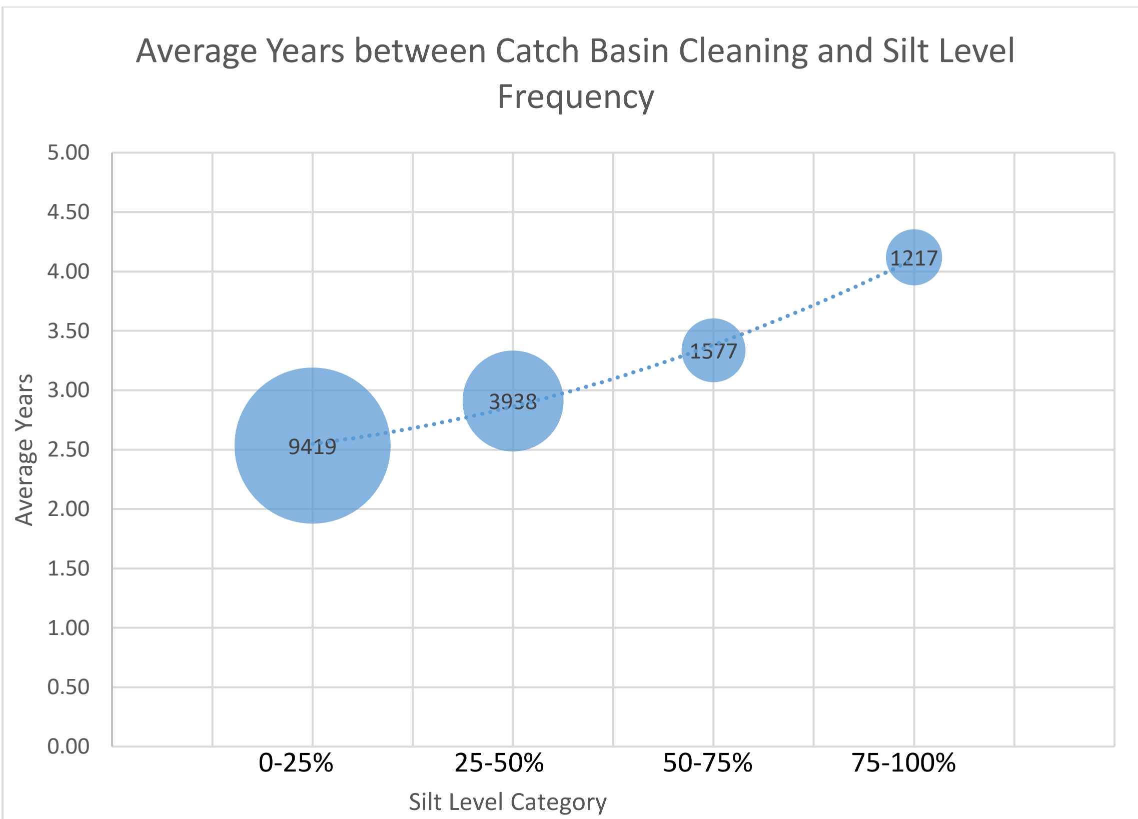


Figure 4. Average Years between Catch Basin Cleaning and Silt Levels

The data shows that 92.5% of the measurements are in the 50-75% or lower categories and that 82.7% of the measurements are in the 25-50% or lower categories. From an empirical standpoint, it indicates that the current schedule of a 4-year cleaning rotation overall and a more frequent cleaning rotation for high-traffic arterials is meeting the current maintenance standard. Below is a graph showing the distribution of silt level frequencies by inspection count.

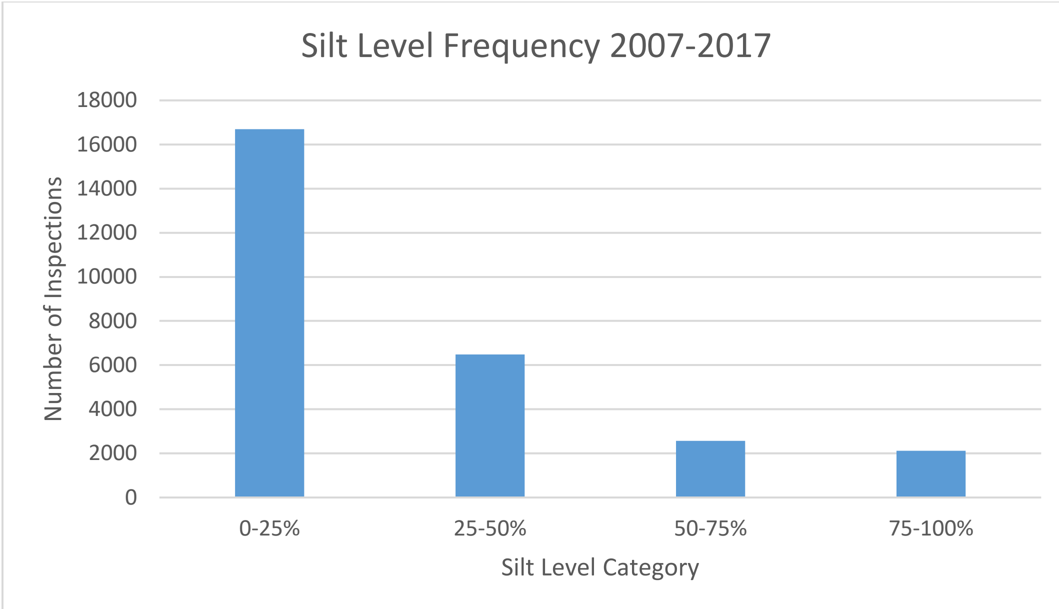
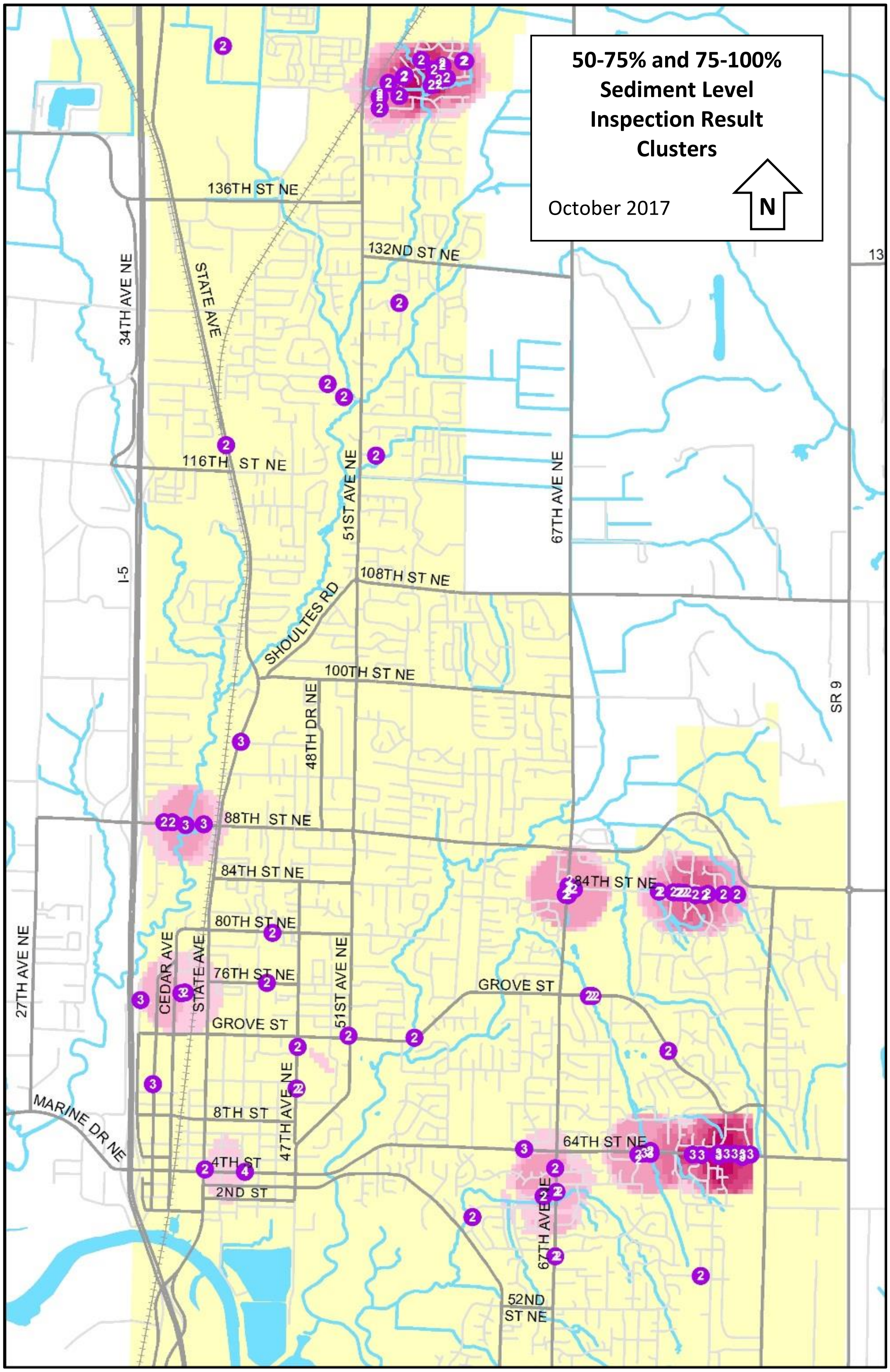


Figure 5. Silt Level Frequency 2007-2017

However, the 75-100% sediment levels, seen after four years, were found in 1,217 catch basins. This represent a small percentage of the total inspections. The overall averages could possibly be improved by addressing areas that are consistently in the 50-75% or higher categories. The following map shows areas with clusters of inspections that had sediment level categories of 50-75% or 75-100%.

Many of these areas are already on the high traffic sanding routes, and inspected and cleaned, after sand is applied in the winter. Some of these routes such as portions of 67th Ave NE, 84th St NE and a portion of 88th St NE will be added to the high traffic route to address these clusters.



50-75% and 75-100% Sediment Level Inspection Result Clusters
October 2017
N
136TH ST NE
132ND ST NE
116TH ST NE
108TH ST NE
100TH ST NE
88TH ST NE
84TH ST NE
80TH ST NE
76TH ST NE
GROVE ST
8TH ST
4TH ST
2ND ST
64TH ST NE
52ND ST NE
34TH AVE NE
27TH AVE NE
STATE AVE
CEDAR AVE
51ST AVE NE
48TH DR NE
47TH AVE NE
67TH AVE NE
SHOULTES RD
MARINE DR NE
I-5
SR 9

New Schedule

Based on this review the City plans to continue inspecting and cleaning catch basins on a four-year cycle. The grids will be modified and divided into 8 smaller grids. This will allow Surface Water Staff and the Sewer/Storm Maintenance Division smaller areas to track and a specific schedule to complete each grid. The smaller grids will also be verified more frequently to ensure each grid is completed in the allotted time. The high traffic and sanding routes have been expanded and will be treated as an additional route that should be cleaned when sand was applied in the winter.

Table 2. New Grid Schedule

Grid #	Dates for Completion
1	August 2017 to December 2017
2	January 2018 to July 2018
3	August 2018 to December 2018
4	January 2019 to July 2019
5	August 2019 to December 2019
6	January 2020 to July 2020
7	August 2020 to December 2020
8	January 2021 to July 2021
High Traffic	Completed in the Spring when sand is applied during the winter

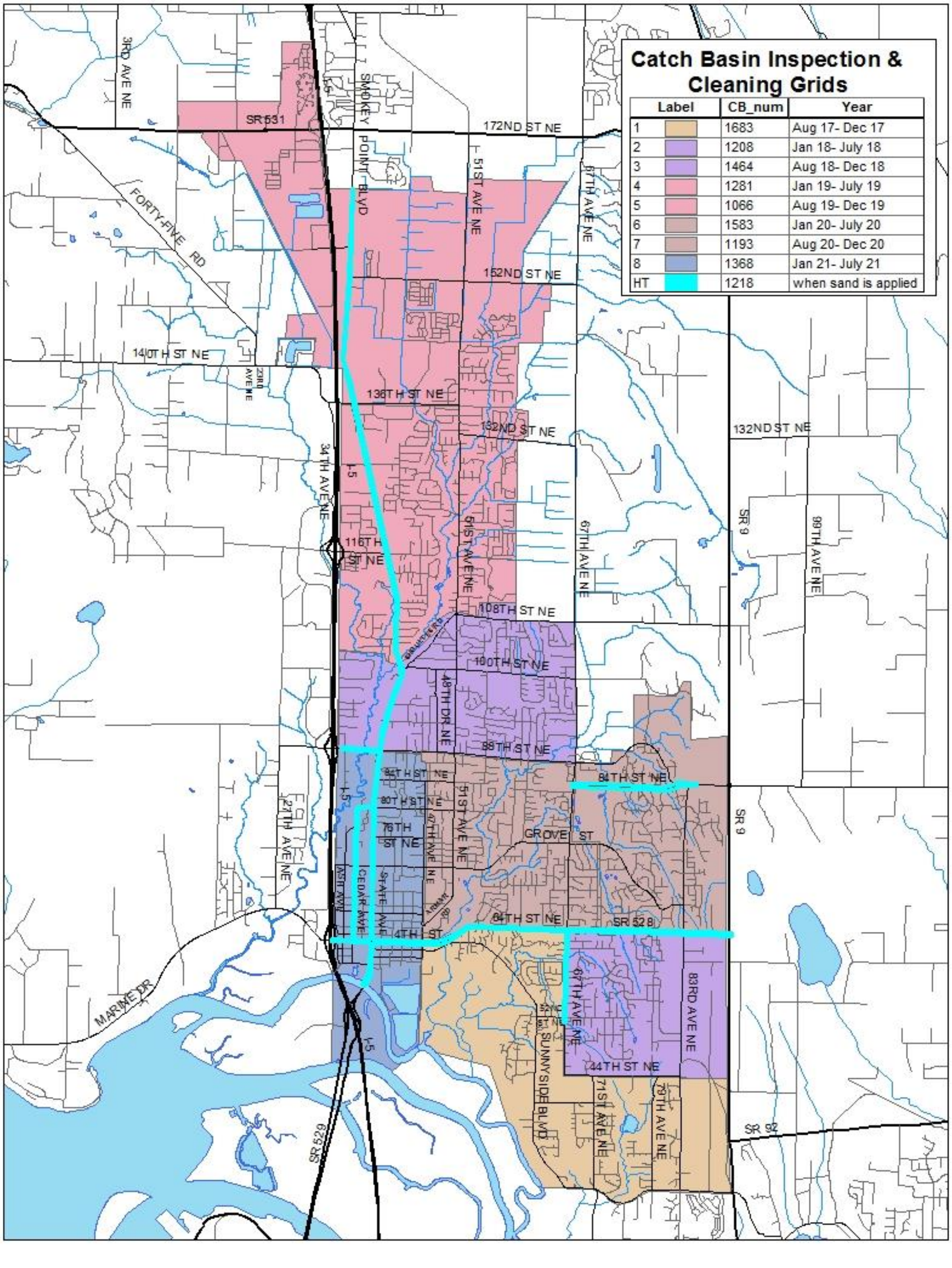


Figure 7. Catch Basin Inspection & Cleaning Grids for 2017 to 2021