SEPTEMBER 2018

CITY OF CHICO

Statewide Trash Amendments: Track 1 Implementation Plan (Part 1 of the Trash Master Plan)

prepared by:

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1. Overview

Trash in California has historically been regulated at varying levels by the California State Water Resources Control Board (State Water Board) and the nine Regional Water Quality Control Boards (Regional Water Boards). To provide statewide consistency regarding trash control, on April 7, 2015, the State Water Board adopted the Proposed Final Amendment to the Water Quality Control Plan for Ocean Waters of California (Ocean Plan) and the Proposed Final Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California (ISWEBE Plan) (together "Statewide Trash Amendments")[1]. The goal of the Statewide Trash Amendments is to address the impacts of trash to the surface waters of California through the establishment of a statewide narrative water quality objective and implementation requirements to control trash, including a prohibition against the discharge of trash. Trash reduction in the storm drain systems will result in trash reductions in the receiving waters to which these systems drain. While trash originating from other sources, such as direct dumping and wind dispersion, are not directly addressed through the Statewide Trash Amendments, the trash control programs implemented by municipalities will result in a significant reduction of trash discharged to waters of the United States.

The Statewide Trash Amendments became effective on December 2, 2015.

Subsequent to the adoption of the Statewide Trash Amendments, State Water Board staff issued a California Water Code Section 13383 Order on June 1, 2017 for all Traditional Small (Phase II) Municipal Separate Storm Sewer Systems (MS4s)[2], including the City of Chico (City). The Order required two actions:

1. By September 1, 2017, submit a letter to the State Water Board identifying the selected compliance option (Track 1 or Track 2) and a preliminary jurisdictional map; and
2. By December 1, 2018, submit an updated jurisdictional map (Track 1 and Track 2) and an implementation plan, if applicable (Track 2 only).

The decision making process and compliance approach selected by the City is briefly described below.

Additionally, the City's new development and redevelopment standards will be revised to include a condition of approval which requires installation of trash controls during construction. This will enable the City to proactively address new projects as they are developed and address trash on-site instead of the public right-of-way and storm drain system.

COMPLIANCE APPROACH

The Statewide Trash Amendments require MS4s with regulatory authority over priority land uses (PLUs) to comply with the prohibition of trash discharge through one of two Tracks. Priority land uses are described in **Table 1**.

[1] https://www.waterboards.ca.gov/water_issues/programs/trash_control/documentation.html

[2] https://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/trash_implementation/trash_13383ltr-taditionalMS4s.pdf

Table 1. Statewide Trash Amendments Priority Land Use Definitions

Priority Land Use	Definition
High Density Residential	At least 10 developed dwelling units/acre.
Industrial	Primary activities on the developed parcels involve product manufacture, storage, or distribution (e.g., manufacturing businesses, warehouses, equipment storage lots, junkyards, wholesale businesses, distribution centers, or building material sales yards).
Commercial	Primary activities on the developed parcels involve the sale or transfer of goods or services to consumers (e.g., business or professional buildings, shops, restaurants, theaters, vehicle repair shops, etc.).
Mixed Urban	High-density residential, industrial, and/or commercial land uses predominate collectively (i.e., are intermixed).
Public Transportation	Facilities or sites where public transit agencies' vehicles load or unload passengers or goods (e.g., bus stations and stops).

- **Track 1** – Install, operate, and maintain full capture systems (FCS) for all storm drains that capture runoff from the PLU in their jurisdictions, or;
- **Track 2** – Install, operate, and maintain any combination of FCS, multi-benefit projects, other treatment controls, and/or institutional controls within either the jurisdiction of the MS4 permittee or within the jurisdiction of the MS4 permittee and contiguous MS4 permittees. The MS4 permittee shall demonstrate that such combination achieves full capture system equivalency (FCSE). The MS4 permittee may determine which controls to implement to achieve compliance with the FCSE. It is…the State Water Board's expectation that the MS4 permittee will elect to install FCS within their PLUs where such installation is not cost-prohibitive.

The constraints, opportunities, and available resources for Track 1 and Track 2 were evaluated at a planning level by the City to determine which Track was most feasible and would yield the highest benefit. As summarized in **Table 2**, Track 1 has more technical and regulatory certainty than Track 2 and allows the City to budget and plan for the full implementation of this Track. In comparison, it is unknown at this time what level of justification and effort will be deemed "enough" by the State Water Board for the implementation of Track 2, which relies heavily on institutional controls. Additionally, the Statewide Trash Amendments require that FCS be installed wherever feasible as a part of a Track 2 approach, indicating that the use of FCS, which is the foundation of Track 1, is preferred. In addition to the Track 1 work effort, the City will continue implementation of existing stormwater program elements that will assist with trash control from a number of other sources. These existing efforts include public education, creek cleanups, street sweeping, catch basins cleaning, illicit discharge detection and elimination, etc.

Table 2. Planning Level Comparison of Track 1 versus Track 2

Consideration	Track 1	Track 2
Methods	• Full Capture Systems	• Full Capture Systems • Multi-Benefit/Treatment • Institutional Controls
Types of Costs	• Capital • O&M • Reporting	• Capital • O&M • Institutional Programs • Monitoring and Reporting
Compliance Assurance	• Install FCS • Report	• Install FCS • Develop Implementation Plan • Demonstrate FCSE • Monitor and Report
Planning	• Consistent • Predictable	• Varied • Adaptive

While the City will continue to implement existing institutional controls/programs (i.e., street sweeping, public education, etc.), **Track 1** was selected as the compliance option for the Statewide Trash Amendments. Although not required by the Statewide Trash Amendments, the following sections of this Plan describe the City's implementation approach for Track 1.

PURPOSE

The purpose of this Implementation Plan is to identify the approach, schedule, and approximate locations for the installation of FCS's that meet the requirements of the Statewide Trash Amendments and 13383 Order. This document, coupled with the Operations and Maintenance Plan, provides the City with a Trash Master Plan for the 10-15 year compliance period[3]. This Plan will be modified as needed as new information and/or data is obtained.

2. Full Capture Systems Analysis

Full Capture Systems are defined as a treatment control, or series of treatment controls, including but not limited to, a multi-benefit project or a low impact development (LID) control, that trap all particles that are 5 mm or greater, and have a design treatment capacity that is either:

a) Not less than the peak flow rate, Q, resulting from a one-year, one-hour, storm in the subdrainage area; or

b) Appropriately sized to, and designed to carry at least the same flows as, the corresponding catch basin.

In addition to the requirements for the devices, the Track 1 compliance pathway requires that the City must install, operate, and maintain full capture systems for all storm drains that capture runoff from the PLU in their jurisdictions. As described in the corresponding Operations and Maintenance Plan, FCS standard operating procedures include a description and depiction of how mosquito vector control personnel can reasonably access areas with standing water within the FCS and/or storm water vault for observation and mosquito treatment.

[3] Full compliance shall occur within ten years of the effective date of the first implementing permit or no later than fifteen years from the effective date of the Statewide Trash Amendments (December 2, 2030).

Consistent with the 13383 Order, **Attachment A** includes the City's jurisdictional maps that identify:

- The PLUs discharging to the City's MS4;
- This City's MS4; and
- The potential locations of regional and distributed FCS.

The maps provided in **Attachment A** provide additional attributes than those listed above, for use in developing this Implementation Plan. These attributes include:

- **New Installations** include locations where it is anticipated distributed inlet devices or regional outfall devices could be installed. Field verification will be necessary to confirm these locations, but these devices have been located based on drainage of PLUs. New Installations also include outfall devices broken up into "small, medium, and large" devices to allow for distribution of planning costs and efforts (planning and installation of a small device draining 10 acres will not be as significant of an effort as for a large device that drains 400 acres). Criteria for these definitions include:
    - Small = 6 – 30 acre drainage area
    - Medium = 30 – 100 acre drainage area
    - Large = >100 acre drainage area.
- **Existing Devices** includes both public and private best management practices that need to be verified as FCS. Public BMPs are owned and operated in the City's right-of way or property. Private BMPs are located on private properties and are the responsibility of the land owner. Device types are discussed further below.
- **Other Areas of Interest** include a lumping of all PLUs together except for industrial land uses. Industrial uses have a unique display due to the recognition that there is uncertainty whether these areas will be addressed by the City or through the Stormwater Industrial General Permit (Order 2014-0057-DWQ)[4] when it is renewed. As such, these areas are considered low priority during the first few years of implementation. Keeping these areas separate on the map helps with planning of installation locations. Also of interest are the Storm Water Resource Plan (SWRP) project areas. These areas will be prioritized for early year installations due to the planning efforts that are already underway.

APPROACH

In order to identify the potential locations for the installation of new FCS, a thorough desktop analysis has been conducted of PLUs, existing stormwater infrastructure, and optimal locations for regional and distributed FCS. The approach used for siting FCS included a stepwise process by identifying:

- PLU areas covered by existing devices or multi-benefit projects;
- Storm Water Resource Plan project areas;
- Drainage areas where larger, high capacity devices could capture large areas of PLU at a single outfall or outlet; and
- Small drainage areas or isolated PLUs which are better suited for smaller inlet devices.

[4] https://www.waterboards.ca.gov/water_issues/programs/stormwater/igp_20140057dwq.shtml

SWRP projects are subject to grant funding. Therefore, these projects will have their own prioritization and schedule with respect to funding resources. Potential SWRP projects[5] included in this Implementation Plan are:

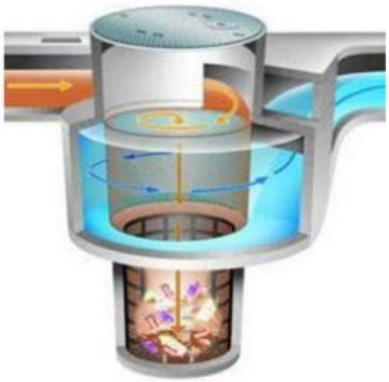
- Laxon South Bioswale – SWRP Project 65
- Trash Reduction Master Plan and Specific Implementation Projects – SWRP Project I
- Fair Street Detention Basin Improvement Plan – SWRP Project R

The focus of the placement of new structural devices was on regional outfall devices (larger, high flow capacity, **Attachment B**) and multi-benefit projects as much as possible. Then, where larger devices were not feasible or appropriate, distributed drain inlet devices of varying sizes are identified. These devices may be selected from the low flow, medium flow, and high flow list (**Attachment C**), or from discussions with approved vendors that sell certified devices. Summaries of the different types of FCS that are primarily being considered for installation in the City are provided in the section that follows. These device types have been selected due to their successful use in other areas of California as well for features of the devices that seem appropriate for use by the City. Suggested prioritization of areas will be continually evaluated as further planning ensues.

POTENTIAL REGIONAL FULL CAPTURE SYSTEMS: OUTFALL DEVICES

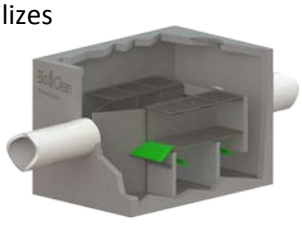
Hydrodynamic Separators

Hydrodynamic Separators (HDS) are devices that utilize the flow of water to create a vortex motion in order to separate solid materials from stormwater flows. The vortex motion forces larger, heavier objects to move towards the center of the device where they are deposited into a separation chamber. Additionally, the vortex motion forces floatable materials to the sides where they can be collected as well. Hydrodynamic separators are generally installed near a stormwater discharge point, but can be installed at almost any point along the storm drain system. The solids are removed using a vactor truck, a removable basket, or a clam shell depending on the user's preference and size of the unit. There are several types of HDS units and models approved by the State Water Board, including continuous deflective separation (CDS), dual vortex separator, and hydrodynamic vortex separator.



Debris Separating Baffle Box

The debris separating baffle box (DSBB) is a storm water treatment system that utilizes a screening technology, three chamber separation, and inline installation. The inline design eliminates the need for diversion structures. The DSBB triple compartment scour-free design and screening system captures sediment and suspends trash and debris in a dry state. Dry state storage minimizes nutrient leaching, bacteria growth, and odors. The unit stores trash in a screening system that is separated from water below. DSBB are good for areas with high groundwater due to their low profile.



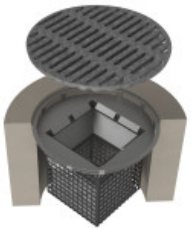
[5] City of Chico Storm Water Resource Plan, Administrative Draft. May 2018. West Yost Associates. http://www.chico.ca.us/building_development_services/sewer/StormWaterResourcePlan.asp

POTENTIAL DISTRIBUTED FULL CAPTURE SYSTEMS: DRAIN INLET DEVICES

Connector Pipe Screens

A Connector Pipe Screen (CPS) is a drain inlet filter that is designed to capture trash. CPS inserts are installed in front of the outlet pipe - trapping trash and debris inside the drain inlet while allowing filtered stormwater to exit into the storm drain infrastructure. CPS inserts also allow stormwater overflow when discharge is greater than the design storm volume to reduce flooding potential. Cleanout of CPS units is necessary prior to the wet season, after the first flush and other large storm events, and routinely during leaf season. Regular inspection is necessary to ensure the CPS units are not full of trash or organic litter. Installation should include a gauge painted on drain inlet wall so that the inspection crew knows when the inlet requires cleaning or maintenance.

Drain Inlet Filter



A drain inlet filter is designed to capture trash, total suspended solids, and hydrocarbons (with absorbant inserts). The filters can fit round or square inlets and are easy to install in tight locations. Routine maintenance is required and can be done by hand or by using a vacuum truck and replacing the sorbent pouches.

Inlet Skimmer Box/Filter

Similar to a CPS, the skimmer box is a filter system that is designed to capture fine to coarse sediments, floatable trash, debris, and hydrocarbons. The screens provide filtration yet still allow water flow. The filter is equipped with high flow bypass to prevent backflow during the largest storm events. The skimmer box can be designed for grated inlets and curb inlets of any size and depth.

MULTI-BENEFIT TREATMENT SYSTEMS

In addition to the FCS described above, the State Water Board and Regional Water Boards promote LID-based designs to capture, reuse, treat, and/or infiltrate storm water runoff. The LID systems and treatment controls that meet the FCS definition within the Statewide Trash Amendments are termed "Multi-Benefit Treatment Systems." Currently, there are five types of Multi-Benefit Treatment Systems that have been approved as FCS[6] as long as they are designed consistent with the Statewide Trash Amendments:

- Bioretention;
- Capture and Use Systems;
- Detention Basin;

[6] https://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/trash_implementation/mbtscoversheet_revised_09mar18b.pdf

- Infiltration Trench or Basin; and
- Media Filter.

Bioretention Basins

Bioretention BMPs, including bio-swales, remove pollutants from storm water runoff through physical filtration as water passes through media layers. The treatment area consists of: a ponding layer; vegetated, mulched, and engineered soil layer; and supporting bed layer of sand or gravel. Storm water entering the treatment area evapotranspires or gradually passes through the mulch/soil/gravel layers where it then infiltrates into native soil or collects in an underdrain that conveys to a discharge point.

Capture and Use Systems

Storm Water Capture and Use BMPs capture and store runoff for use in a variety of applications including irrigation, toilet flushing, and other non-potable uses. There are numerous methods of capturing storm water for use including some of the other certified Multi-Benefit Treatment Systems.

Detention Basins

A detention basin is a local topographic depression designed to reduce potential for flooding by reducing peak flow rates. These basins are also called "dry ponds," "holding ponds," or "dry detention basins," and are distinguishable from basins that are designed to contain some water all-year-round. Detention basins may also be located underground in an array of pipe, chambers, or concrete vaults.

Infiltration Trenches or Basins

An infiltration trench or basin BMP captures and infiltrates storm water runoff into native soils. Infiltration trench or basin BMPs come in a variety of shapes and sizes and the final appearance may vary substantially. Infiltration trenches may be backfilled with porous media such as gravel, sand, Cornell Soil, or various locally earthed rocks known not to generate pollutants of concern to the downstream waters. Subsurface designs may be comprised of perforated pipe, chambers, open bottom concrete galleries or other high voids structures. These trenches and basins store the design water quality volume for infiltration to underlying soils. However, it should be noted that the City does not consider basins or trenches to be trash mitigation unless capture devices are included upstream.

Media Filters

A media filter BMP uses a bed of sand, peat, zeolite, anionic and/or cationic media, granite or other fine-grained materials or fabrics to physically separate sediment and sediment-bound pollutants and/or electrochemically remove dissolved constituents from storm water.

RESULTS

Existing Public and Private Best Management Practices

The City's PLU areas contain a number of existing BMPs, both public and privately owned and operated. Within these PLU areas, a total of 19 existing BMPs are operated by the City, and 93 existing BMPs are installed and operated by private entities. These devices vary in type, and can be described in general categories (**Table 3** and **Table 4**). These devices have been included on the second map in **Attachment A**. The City will need to verify the devices as meeting the FCS requirements (as described in the **Field Verification** section).

Table 3. Existing Best Management Practices that may be Full Capture Systems

Device Location/Type	Number Existing	Notes
Public BMP – Detention Basin	9	Varying sizes throughout City
Public BMP – Other	10	2 leach trenches, 8 interceptors
Private BMP	93	121 total, 93 in PLUs

Table 4. Existing Private BMPs - Types

Type
Concentrator
Contech Filter/Treatment Unit/Water Quality System
D.I.
Detention Basin with Infiltration/Leach Trenches
Detention Pond
Infiltration Trench with or without Pervious Pavers
Interceptor
KriStar Fossil Filter
Leach Trench/Tree Planting/Percolation Pipe/Perforated Pipe/French Drain
Precast with Flow Control/Sand-Oil Separator
Sand and Oil Separator/Drainage Swale/Infiltration Trench
StormTech Infiltrator/Stormwater System
Vegetated Swale/Basin/Flow Through Planter/Bioretention
Water Quality Vault

New FCS Installations

Following the identification of existing multi-benefit treatment devices and other best management practices, locations for the installation of new FCS approved in the Statewide Trash Amendments[7] are located on the second map in **Attachment A**. New FCSs include 132 drainage inlet devices and 69 outfall or outlet devices to be installed over a 12-year timeframe (**Table 5**). Due to the nature and type of devices required for installation at outfalls and outlets, these devices vary in size based on the total drainage area flow.

Table 5. Potential New Full Capture Device Types

Device Location/Type	Size	Number to Install	Drainage Area
Drain Inlet	Varies	132	Parcels
Outfall Device	Small	29	6-30 acres
Outfall Device	Medium	21	30-100 acres
Outfall Device	Large	19	100+ acres

[7] https://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/trash_implementation/a1_certified_fcd_rev_27jun18.pdf

FIELD VERIFICATION

Through a desktop analysis, the City was able to identify the potential locations for the installation of FCS and develop jurisdictional maps required for the State Water Board submittal. However, it will be necessary to field verify these assessments to confirm the location, sizing, and appropriate model/type of FCS to install. Field forms (**Attachment D**) will assist with these site visits to ensure that critical information is collected for obtaining quotes from FCS vendors.

In addition to the installation of new FCS, the City has identified existing LID and/or treatment-based controls that provide multiple benefits and may be deemed FCS. These existing structural controls will also be evaluated to confirm that they comply with the FCS requirements.

3. Phased Approach

The Statewide Trash Amendments require that full compliance occur within 10 years of the effective date of the first implementing permit or 15 years from the effective date of the Amendments (December 2, 2030) and that the municipalities identify and meet interim milestones that demonstrate progress to full implementation. Milestones for this Implementation Plan are presented in table format based on both the number and percentages of FCS installations each year **(Table 8 and Table 9)**. This section describes the phased approach that the City will use to meet their milestones and final compliance deadline.

KEY CONSIDERATIONS FOR PHASING

Priority areas

One of the key drivers for the phased approach is the identification of priority areas for device installation based on design and engineering costs, maintenance needs of devices, whether right-of-way or easements are required, and levels of highest need. It is generally most advantageous to start with a focus on heavy trash areas, or highly visible areas, where installations will demonstrate to the public the importance of this work. The City has also considered that spacing the installations as evenly as possible over the implementation timeframe is most reasonable from a budgeting standpoint. For these reasons, the following areas have been prioritized for initial installation of new FCS. Following the scheduling of these locations, the remaining installations will be distributed by area of the City and type of device, for efficiency (e.g., purchase of devices in bulk may result in cost-savings). After considering these priorities, the initial FCS installations will occur:

- Downtown (there are approximately 12 distributed and 13 regional devices proposed);
- Stormwater Resource Plan Projects (there are 3 distributed and 13 regional devices proposed); and
- Areas draining into Bidwell Park.

Storm Drain System

The characteristics of the storm drain system vary throughout the City's jurisdiction, which may present challenges for installing FCS. For example, some storm drain systems do not have access to the drain inlets or may not have sufficient hydraulic capacity to support a FCS. Additionally, leaf litter is a known issue in the City, and was considered when selected device options. City review of the design and installation requirements for the available FCS and how they may perform is imperative prior to finalizing the type(s) of FCS that will be purchased, installed, and maintained. As the operations and maintenance of these devices is a new element of the City's stormwater program, devices were initially selected which seem consistent with the City's infrastructure and maintenance capabilities.

As installation begins, the City may discover that there are locations within their storm drain network where FCS cannot be implemented, or are better implemented within another land use area. The Statewide Trash Amendments allow for the substitution of one or more PLUs with equivalent alternate land uses (equal or greater trash levels) within the City's jurisdiction. This option may be utilized as needed.

Estimated Costs

Estimated costs for installation, operation and maintenance of new FCS throughout the City's PLUs are included in **Table 6** and **Table 7**. **Table 6** provides a summary of the ranges of costs for the different types of devices based on review of other municipality studies, vendor information, and regional reports. There is a broad range of costs, depending on the area needing treatment, subsequent sizing of the device, and installation/construction. Prices can be better refined once exact locations and devices (including sizing and vendor) are selected.

Table 6. Estimated Capital and Operations & Maintenance Costs Based on Device Types

Device Type	Capital/Installation Cost	O&M Cost
Regional Devices:		
Hydrodynamic Separator	$20,000 - $300,000/device	$1,000/device/year
Debris Separating Baffle Box	$20,000 - $70,000/device	$1,000/device/year
Distributed Devices:		
Connector Pipe Screen	$400 – 600/device	$400/device/year
Drain Inlet Filter	$500 - $1,000/device	$400/device/year
Inlet Skimmer Box/Filter	$1,500 - $2,600/device	$400/device/year

- Revelon Slough/ Beardley Wash (RSBW) Trash BMP Recommendation Report (2012, LWA)
- CCC/ Algalita, 2006 http://www.plasticdebris.org/Trash_BMPs_for_Munis.pdf
- Bay Area-wide Trash Capture Demonstration Project, Final Report, Appendix III (2013, SFEI)
- Gordon and Zamist, 2007. Municipal Best Management Practices for Controlling Trash and Debris in Stormwater and Urban Runoff. California Coastal Commission and Algalita Marine Research Foundation.
- Shimoda Group, LLC for the Greenway Foundation, 2010. Los Angeles River Watershed Trash Reduction Overview. http://colowqforum.org/pdfs/listing-methodology/09-2010/Anacostia%20and%20LA%20Trash%20Program%20Summaries%209-30-10.pdf
- Los Angeles RWQCB, 2007. Revised staff report: Trash TMDLs for the LA River Watershed. http://www.epa.gov/waters/tmdldocs/34863-RevisedStaffReport2v2.pdf
- SFB RWQCB, 2009/2011. Municipal Regional Stormwater Permit (MRP), Appendix I: http://www.cleanwaterprogram.org/uploads/R2-2009-0074_Revised.pdf
- City of San Jose, 2011. San Jose Litter and Trash Reduction Plan http://www.sanjoseca.gov/DocumentCenter/View/1292
- Baltimore City, 2011. Healthy Harbor Plan, Chapter 4. Trash Solutions http://www.healthyharborbaltimore.org/uploads/file/healthy-harbor-plan/04_Chapter_4_Trash.pdf
- City of Palo Alto, City Council Informational Report on Installation of Trash Capture Devices in the Municipal Storm Drain System as Part of Palo Alto's Short-Term Trash Reduction Plan (2012)
- http://www.epa.gov/waters/tmdldocs/34863-RevisedStaffReport2v2.pdf

Based on discussions and work with other municipalities, as well as conversations with vendors, estimates were made based on the ranges summarized above for use in **Table 7**. Again, costs can be better refined once exact locations and devices (including sizing and vendor) are selected. The estimates provided in **Table 7** provide a planning level estimate for this Implementation Plan.

Table 7. Estimated Capital and Operations & Maintenance Costs of Recommended Devices

Device Type	Cost/ Device	Estimated # to Install	Capital/Installation Cost	O&M Cost ($/year) when all installed
Regional Devices:				
Small	$2,000	29	$58,000	$29,000
Medium	$70,000	21	$1,470,000	$21,000
Large	$200,000	19	$3,800,000	$19,000
Distributed Devices:	$500	132	$66,000	$52,800
TOTAL:		**201**	**$5,394,000**	**$121,800/year**

Cost/Device was selected using best available information and the ranges provided in **Table 6**.

IMPLEMENTATION SCHEDULE

The phased implementation approach takes into account the need to secure funding and resources during the early years of the project. However, it is important to recognize that there is some uncertainty regarding industrial land uses and whether the City is responsible for these land uses or whether trash will be addressed through the Industrial General Permit. As such, these areas are considered low priority and won't be address until the final years of implementation.

The phased implementation approach is distributed as evenly as possible throughout the compliance timeframe (assumed to be 12 years – until December 2, 2030). However, the first two years will also be used to start securing funding and plan for the installation of FCS as well as verify existing devices. Therefore, years one and two will each result in less new FCS installation (**Table 8**), and then years 3 - 12 will address the rest of the device installations as evenly as possible. Part of the Implementation Plan also includes verifying that existing BMPs are considered FCS. During the first year, while working on securing funding and planning, the existing public BMPs should be verified. The private BMPs should also be evaluated, but because there are so many of them, the evaluation of these is distributed throughout the first five years. Evaluation of the private BMPs should entail reviewing City records to confirm that the one-year, one-hour design storm is met or exceeded. This schedule will allow time for any necessary modifications to existing BMPs within the implementation timeframe. Costs provided below include evaluation and verification of existing devices, but do not include the cost to make necessary modifications, as those will be case-by-case dependent.

The strategies for implementation are presented in **Tables 8-11**. Additionally, the second map in **Attachment A** displays the different types of FCS for ease in identifying locations. For example, the small regional FCS are denoted by a small blue pentagon while large regional FCS are denoted by a large red pentagon. Similarly, industrial sites (which won't be addressed until later years, if necessary) are demarcated by brown shading.

Table 8. Strategy for Installation of Full Capture Systems, with yearly installation and costs (in 2018 dollars)

Device Type	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Regional: Small	0	1	4	3	3	3	3	3	3	2	2	2
Regional: Medium	0	1	2	2	2	2	2	2	2	2	2	2
Regional: Large	0	0	1	2	2	2	2	2	2	2	2	2
Distributed	3	3	12	12	12	12	13	13	13	13	13	13
Cost	$1,500	$91,500	$426,000	$606,000	$606,000	$606,000	$606,500	$606,500	$606,500	$586,500	$586,500	$586,500

Assumed costs: Small = $20,000/device, Medium = $70,000/device, Large = $200,000/device, Distributed = $500/device. Costs provided above indicate the expenditure each year, not the additive costs.

Table 9. Distribution of Installation of Full Capture Systems, based on percentage of type installed each year

Device Type	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Regional: Small	0%	3%	14%	10%	10%	10%	10%	10%	10%	7%	7%	7%
Regional: Medium	0%	5%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Regional: Large	0%	0%	5%	11%	11%	11%	11%	11%	11%	11%	11%	11%
Distributed	2%	2%	9%	9%	9%	9%	10%	10%	10%	10%	10%	10%

Table 10. Strategy for Verification of Existing Best Management Practices, with yearly percent evaluation and costs (in 2018 dollars)

Device Type	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Public:												
Detention Basin	9	0	0	0	0	0	0	0	0	0	0	0
Leach Trench	2	0	0	0	0	0	0	0	0	0	0	0
Interceptor	8	0	0	0	0	0	0	0	0	0	0	0
Private:												
Various	18	18	19	19	19	0	0	0	0	0	0	0
Cost	$37,000	$18,000	$19,000	$19,000	$19,000	$0	$0	$0	$0	$0	$0	$0

Assumed costs: $1,000 per verification, based on staff rates and expected level of effort. Costs include verification of existing devices, but does not include the cost to make necessary modifications, as those will be case-by-case dependent.

Table 11. Summary of Activities Each Year to Achieve Interim Milestones

Year	Planning Activities	Regional FCS Activities	Distributed FCS Activities	Verification Activities
1-4	Begin planning and work to secure funds (ongoing), planning for FCS in SWRP areas, downtown, and areas draining into Bidwell Park	Installation of 8 small, 5 medium and 3 large FCS in SWRP and downtown areas	Installation of 3 FCS in SWRP areas; installation of 27 FCS in downtown and areas draining into Bidwell Park	Verification of 19 public and 74 private BMPs; Annual reporting
5-8	Planning for FCS in central, western, and northwestern areas	Installation of 12 small, 8 medium, and 8 large FCS in downtown, Bidwell Park, central, and northwestern areas	Installation of 50 FCS in areas draining into Bidwell Park, central area, western or northwestern areas	Verification of 19 private BMPs; Annual reporting
9-12	Planning for FCS in northern and southern areas	Installation of 9 small, 8 medium, and 8 large FCS in western, northern, and southern areas	Installation of 52 FCS in western, northern and southern areas	Annual Reporting

"Planning for FCS" includes field verifications, vendor selection, and securing funding

4. Annual Reporting and Plan Optimization

While this Implementation Plan covers the entire 12-year compliance period, it is understood that the first few years of implementation will serve as a pilot study and data gathering exercise for FCS installation. Information gathered during the initial FCS installations, as well as the introduction and/or approval of new FCS by vendors in the future, may alter the current, estimated costs and initial decisions presented in this Implementation Plan. As such, this Implementation Plan is dynamic and will be modified as needed based on experience and knowledge gained.

ANNUAL REPORT

Annual reporting for Track 1 (FCS compliance) includes a report submitted via the State Water Board's SMARTS system demonstrating installation, operation, maintenance, and the Geographic Information System- (GIS-) mapped location and drainage area served by the City's full capture systems. A template for annual reporting in provided in **Attachment E**.

IMPLEMENTATION PLAN OPTIMIZATION

The City will evaluate the Implementation Plan every two years and make modifications as needed. In conducting this review, the City will consider data and information provided by program staff and/or other sources as needed. The Implementation Plan may be modified to remove or adjust FCS determined as ineffective, inappropriate, or undesirable. This review will generally include, but not be limited to, the following:

- Review of Funding
    - Have there been challenges in obtaining the necessary funding or supporting resources?
        - If so, have these been overcome?
    - Are there additional funds that may be available?
- Review of Devices
    - Are installed devices working as designed?
    - Are there any maintenance concerns?
    - Have any devices broken or been vandalized?
    - Have any new devices been approved by the State Water Board that may meet the City's needs?
- Review of Priority Areas
    - Are higher/lower levels of trash noticed anywhere in the City, such that the installation of FCS should be re-prioritized?
    - Are higher/lower levels of trash noticed anywhere in the City that is not a defined PLU, but should be considered for an alternative land use swap?
- Review of Installation Schedule
    - Is the City on schedule?
    - Are schedule modifications needed?

A log of any significant revisions to the Implementation Plan will be maintained (**Attachment F**).

Attachment A. Jurisdictional Maps and Identification of Potential Full Capture Systems

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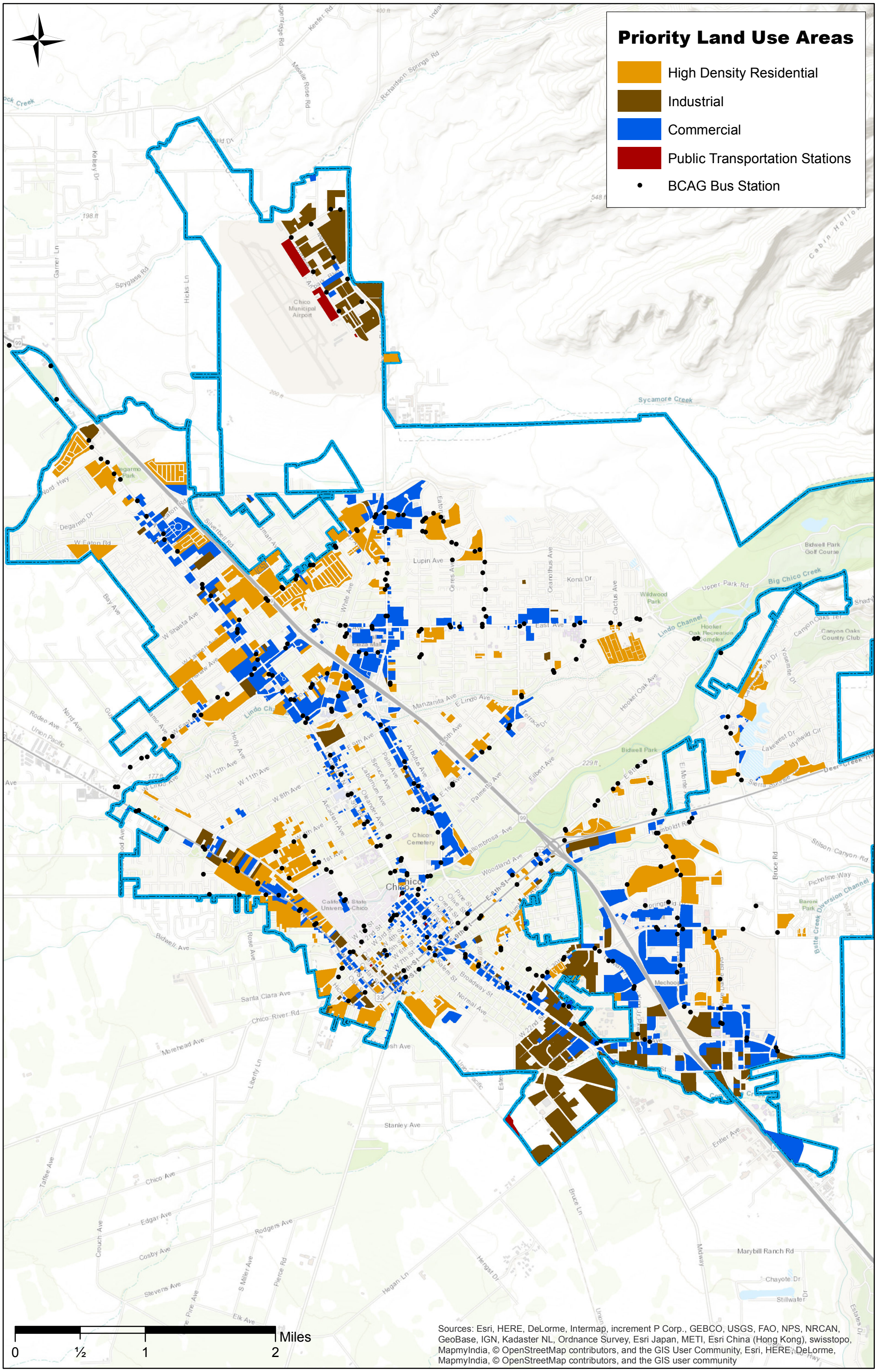
Priority Land Use Areas
High Density Residential
Industrial
Commercial
Public Transportation Stations
BCAG Bus Station
Chico Municipal Airport
Sycamore Creek
Lupin Ave
Manzanita Ave
E Lindo Ave
W Shasta Ave
Bidwell Park
Big Chico Creek
Lindo Channel
Chico
Stanley Ave
Marybill Ranch Rd
Chico River Rd
Santa Clara Ave
Morehead Ave
Bidwell Ave
Stillwater
Miles
0
½
1
2
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

Potential Full Capture Systems

New Installations

- Inlet Device
- Small Outfall Device
- Medium Outfall Device
- Large Outfall Device

Existing Devices

- Public Interceptor
- Other Public BMP
- Private BMP
- Detention Basin
- Stormdrain Lines

Other Areas of Interest

Priority Land Use Area

- Other PLU
- Industrial PLU
- SWRP Project Area
- City Boundary

0 ½ 1 2 Miles

Attachment B. Potential Regional Full Capture Systems: Outfall Devices

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Potential Regional Full Capture Systems: Outfall Devices

BMPs	Manufacturer	Size Range	Treatment Flow	Storage Capacity	Efficiency	Maintenance	Cost	Limitation	Other Benefits	Recommendations
Hydrodynamic Separators										
Continuous Deflective Separation (CDS)	Contech Engineered Solutions Sales (Novato, CA): Curt Kruger, 415-897-8587 krugerc@contech-cpi.com	For drainge area of 3-1000 acres; device can be sized to drainage area, runoff coefficient, and rain intensity		25-134 cu.ft	Sediment smaller than 50 microns (0.05 mm)	Once/year, no entry required. ($700-$1,500)	$10,000-$100,000	Vector control issues; large depth placement; Large sizes may require an external bypass vault at additional ~$15,000.	Removes sediment, oils, petroleum hydrocarbons, debris; 2 yr warranty	For areas with high trash generation rates (TGR) or large drainage areas; Not restricted vertically; Not good in heavily populated area due to vector control issues
Dual Vortex Separator (DVS)	Oldcastle Precast Sales (Santa Rosa, CA): Gregory Bull, 707-849-1530 Greg.Bull@oldcastle.com	Sized to meet site-specific requirements; Considers mean particle size, local rainfall data, and hydraulic capacity; Unit size: 3-12 feet in diameter	26 cfs max	8-481 cu.ft	unspecified	After it reaches 50% capacity; 2 inspections/ year, no entry required	$8,000 - 60,000	unspecified	Square configuration to accept multiple inlet pipes; 5 yr warranty, replacement parts available; Multiple access points	For areas limited in space; For areas with high erosion/sediment and trash problems; Rectangular or circular
Downstream Defender™	Hydro Internationals Sales (Santa Rosa, CA): Sue Lillo, 800-579-8819 slillo@kristar.com	Acceptable inlet/outlet pipe sizes range from 12 inches to 36 inches	3.0-38 cfs	Storage capacity: 21.2 cu.ft (for 6ft model)	90% removal of particles greater than 150 microns	As needed; 2 inspections/ year; no entry required	$13,000 - 65,000	1 review stated poor performance	Removes solids, debris, and petroleum hydrocarbons; 5 yr warranty	For area limited in space and high trash generation area
Debris Separating Baffle Box										
Nutrient Separating Baffle Box	Bio Clean Environmental Services Sales contacts: Greg Kent, (760) 433-7640 or Kirk Vallejo, (760) 681-9583 gkent@biocleanenvironmental.net; kvallejo@biocleanenvironmental.net	72 inches to 114 inches	>1 year, 1 hour storm with proper sizing	48 - 1190 cu.ft	unspecified	2 inspections/ year; clean once/year; replace HC boom once/year; no entry required	$18,000 - $70,000 + delivery	unspecified	Inline Treatment System for TSS, hydrocarbons, and gross solids with trash screens. 5 yr warranty	Low head loss, easily installed inline

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Attachment C. Potential Distributed Full Capture Systems: Inlet Devices

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Potential Distributed Full Capture Systems: Inlet Devices

HIGH FLOW BMPS	Manufacturer	Size Range	Treatment Flow	Storage Capacity	Maintenance	Cost	Other Benefits
G2 CPS-MOD Series	G2 Construction, Inc.	Device handles flows greater than the design capacity of the stormwater pipe.		unspecified	Entry needed; sharp edges are a hazard to muni works	$425/unit for 20 devices; $250/unit for 100-500 devices	unspecified
Drop-In CPS Screen	G2 Construction, Inc.	Device handles flows greater than the design capacity of the stormwater pipe.		unspecified	Entry needed; sharp edges are a hazard to muni works	$745/unit for 10 devices	unspecified
REM Triton Full Capture Device Filter	Revel Environmental Manufacturing Inc.	12 - 48 inch diameter	0.42-20.59 cfs	0.24-35.6 cu. ft	Maintenance as needed, but typically replace filters once a year	smaller units -$260-$590/unit; larger units - $360-$390/unit; Installation cost: $100-$195/unit; $14.75-$19.5 for media replacement	High flow bypass; 3-D filtering for higher flow
MEDIUM FLOW BMPS	**Manufacturer**	**Size Range**	**Treatment Flow**	**Storage Capacity**	**Maintenance**	**Cost**	**Other Benefits**
Grate Inlet Skimmer Box (square design)	Bio Clean Environmental Services, Inc.	12x12 inches to 48x48 inches	0.5-6.6 cfs (Bypass 0.5-13.3 cfs)	unspecified	Clean filter when over 40% full; prefer round design for ease of maintenance; No entry required; Replace hydrocarbon boom at least 2x year	$1,140-$2,235/unit; discount available based on quantity	media filter available; 8 year warranty
FloGard Plus Catch Basin Filter Insert (combination inlet)	Oldcastle Precast	Inlet: 16x33 inches to 24x36 inches Outlet: 12x14 inches to 24x36 inches	1.1-2.0 cfs	1.4-1.95 cu. ft	No entry	$500-900/unit	unspecified
Connector Pipe Screen (CPS)	United Stormwater, Inc.	28x18 inches to 60x52 inches	unspecified	unspecified	Entry Needed; Cleaned when screen is >40% covered	$380/unit	unspecified
LOW FLOW BMPS	**Manufacturer**	**Size Range**	**Treatment Flow**	**Storage Capacity**	**Maintenance**	**Cost**	**Other Benefits**
Curb Inlet	Bio Clean Environmental Services, Inc.	24 to 264 inch basket	0.85 cfs (Bypass Unlimited)	unspecified	No entry; Clean filter when over 40% full; Vacuum truck; replace hydrocarbon boom at least 2x year	$1,465-$2,455/unit installed; discount available based on quantity	removes TSS, nitrates, zinc, BOD, and turbidity; 8 year warranty
Round Curb Inlet	Bio Clean Environmental Services, Inc.	24 to 264 inches	2.4 cfs	unspecified	No entry	$1,611-$2,601/unit; discount available based on quantity	8 year warranty

LOW FLOW BMPS	Manufacturer	Size Range	Treatment Flow	Storage Capacity	Maintenance	Cost	Other Benefits
FloGard Plus Catch Basin Filter Inserts (flat grated inlet)	Oldcastle Precast	Inlet: 12x12 inches to 22x34 inches Outlet: 12x14 inches to 24x36 inches	0.25-2.0 cfs (shallow or standard depth);	0.15-3.4 cu. ft	No entry	$750-$3,000/unit	unspecified
FloGard Plus Catch Basin Filter Inserts (curb inlets)	Oldcastle Precast	Inlet diameter: 15 inches to 36 inches Outlet diameter: 18 inches to 39 inches	0.4-2.0 cfs	0.3-3.6 cu. ft	No entry	Price based on diameter: 24" = $450; 36" = $610; 48" = $800	unspecified
DrainPac - Drop Inlet for curb inlet	United Stormwater, Inc.	24-48 inches x 12 inches; customized to any size/shape	140 cfs/sq.ft	unspecified	No entry	$424-662/unit installed	unspecified

Attachment D. Full Capture System Field Verification and Site Evaluation Form

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FCS Field Verification and Site Evaluation Form Site ID:_____

General Staff name(s): Date: Time:

Location: _____

Material: _____ Size: _____ Other info (bars, screens, gates, etc.) _____

_____

Structure considered for BMP ☐ Manhole ☐ Catch Basin ☐ Curb Inlet ☐ Outfall

Location in relation to outfall: _____

Dimensions: _____

Inlet size: _____ Depth from rim to inlet invert: _____ Material: _____

Inlet size: _____ Depth from rim to inlet invert: _____ Material: _____

Inlet size: _____ Depth from rim to inlet invert: _____ Material: _____

Outlet size: _____ Depth from rim to outlet invert: _____ Material: _____

Other info (inlet/ outlet pipe angle, screens, etc.) Use back to sketch if needed. _____

_____

Area observations Surrounding land uses: ☐Residential ☐Commercial ☐Industrial ☐Transit

Describe any potential concerns for access / setup for periodic maintenance. Take photos!

Pavement type: ☐ paved ☐ gravel ☐ dirt ☐ other: _____

Access (e.g.: street, easement, etc.) _____

_____

Parking availability _____

Traffic management _____

_____

Overhead obstructions (power lines, trees, etc.) _____

_____

Risk for clogging (nearby trees?) _____

Risk for vandalism _____

General trash observations in area: ☐ low ☐ medium ☐ high ☐ very high

Additional notes / missing info needed, etc. _____

Additional notes or sketches

Attachment E. City of Chico Annual Report of Full Capture System Compliance

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City of Chico Annual Report of Full Capture System Compliance

Date:

Device ID	Type of FCS	Date Installed	Inspection Frequency	Date of Last Inspection	Date of Last Maintenance	Drainage Area Mapped?

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Attachment F. Implementation Plan Change Log

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Trash Implementation Plan Change Log

Date	Summary of Changes Made	Personnel	Comments

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Attachment G. August 2018 Public Review – Response to Comments

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City of Chico Track 1 Trash Implementation Plan

August 2018 Public Review - Response to Comments

Number	Commentor	Comment	Response
1	Susan Mason	Regarding the Trash Master Plan for the City of Chico, I read the implementation and O&M plans and attended the presentation about the plan. What is primarily missing from the documents is a clear statement that this plan applies only to capturing trash from the city right-of-ways, primarily from pavement. Its purpose is to comply with the State Water Board mandate, but unfortunately it will only eliminate a tiny fraction of the trash in Chico's creeks at a very high cost for installation and maintenance.	Thank you for participating in the public review of the documents. A statement has been included in Section 1 regarding the intent of Trash Amendments.
2	Susan Mason	As someone who's spent several thousand hours doing volunteer trash cleanup in and around Chico's open spaces and creeks during the last 19 years, I know that the majority of the trash in the creeks comes from homeless camps in the creeks and from trash dumping off bridges and from streets and alleys that come close enough to the creeks to provide easy vehicle access for dumping. For example, last week we filled 30 33-gallon garbage bags with small items from 3 camps on Little Chico Creek upstream of the Boucher St. Bridge. All of this trash would be in the creek during a rainstorm and is equal to the amount of trash that will be collected by dozens of expensive filters.	Alhtough outside of the scope of the Trash Amendments, we understand the concern and are including a statment in Section 1 regarding the other components of the stormwater program (public education, creek cleanups, street sweeping, etc.) that will assist in addressing trash from these other sources.
3	Susan Mason	One location where you might capture some of this camp trash would be to put a filter on the Teichert Ponds outlet into Little Chico Creek which would catch trash from camps that flood out during winter rains. However, the map on pg. 20 doesn't show a filter in that location. By the way, this map indicates that TP is a detention basin. However, since it never dries up, technically it's a retention basin. Besides TP, there may be other locations where camp trash could be captured before it washed into a creek but there have been no on-the-ground surveys to find them.	The Teichert Ponds are included as one of the Stormwater Resource Plan projects. As planning and funding are further evaluated, decisions will be made on how to best implement trash control in this location.
4	Susan Mason	Giving a high priority to the "areas around Bidwell Park" is a waste of money, except for Lost Park (which will be included in the downtown priority anyway). The neighborhoods on the north side of Lower Park don't generate much street trash. If they did, the major storm drain outlet at Madrone Ave. on the edge of the park would be full of trash after every storm but it isn't. Trash on the south side of Vallombrosa Ave. doesn't go into any storm drains. There aren't any storm drains on South Park Dr or Petersen Memorial Drive in Lower Park. Filters on storm drains on East 8th St. on the south side of Lower Park might reduce trash in Little Chico Creek slightly but much more LCC storm drain trash is from the south of campus area and Humboldt Ave.	Initial installation prioritization may be modified in the future during plan optimization. However, the Trash Amendments require that all of the state-defined priority land uses (PLUs) must be addressed. The City is complying with the state mandate by addressing all of the PLUs.
5	Susan Mason	It seems to me that rather than relying on "literature that indicates activities that are high trash generating sources" (as described in the presentation) to select areas to have filters, it would be prudent to do a trash study to select the highest priority drains to receive filters. I understand that by selecting Track 1, this isn't required but if the city is going to be spending $5M, shouldn't they know that they're receiving good value for their investment?	The City is complying with the state mandate by addressing all of the PLUs defined by the state. While all PLUs must be addressed for compliance, the City is taking steps to perform these installations in highest trash areas first.

City of Chico Track 1 Trash Implementation Plan

August 2018 Public Review - Response to Comments

Number	Commentor	Comment	Response
6	Susan Mason	Also, I don't understand how the Adaptive Management element would work. What information will be collected and analyzed that might affect plan implementation? Who will be doing this analysis?	The title for Section 4 has been modified to "Plan Optimization" so that it is more explicit as to what is being achieved through this work effort. As is described in this section, the City will conduct a review every two years to ensure that the plan is achieving the established goals and modify it as needed. The types of information that will be collected and assessed are expressed through the list of questions presented in this section.
7	Susan Mason	I realize that the city is doing this plan because it's an (unfunded) state mandate, but it would be better if the plan included some elements that would actually result in a significant reduction of trash in our waterways. Five million dollars is a lot to spend on something for which there are no measurable results	Thank you for this comment. The Plan has been revised to include more information regarding the benefits of the program and what the results will be.
8	Curt Kruger, Contech	The Trash Master Plan is a comprehensive document that provides a solid plan for Chico.	Thank you for your comment.
9	Curt Kruger, Contech	It would be helpful if the PLU areas were overlaid over the MS4 plan. It appears to me that the drainage areas associated with the large devices provide overlap into non-PLU residential areas. If so, the total non-PLU area treated can be credited against small, isolated, moderate trash areas such as bus stops. It would not be a one-for-one credit, perhaps maybe a three-for-one credit. This should be examined using a visual assessment technique such as the one used in the Bay Area to determine the amount of credit earned by treating the non-PLU areas. This approach has been accepted under the Bay Area program.	Thank you for your comment. The City may continue to evaluate alternative land use trades, should the trash levels in the non-PLU areas being treated have similar or greater trash generation to isolated PLU areas.
10	Curt Kruger, Contech	The estimated costs shown for small FCS is in line with estimates I've seen from other areas within the State. For large FCS, the range given is very broad and may not be that helpful. Experience with dozens of installations in the Bay Area has yielded a blended cost per acre that I believe is more helpful for initial planning purposes. I suggest using an estimate of $1,900/acre for large drainages, $4,000/acre for medium drainages and $7,000/acre for small drainages. These estimates include installed cost but do not include engineering.	Thank you for these values. Further refinement to cost estimates may be made as additional planning for installations occurs. Through the Implementation Plan Optimization process estimates may be refined.
11	Curt Kruger, Contech	Most existing Multi-Benefit BMPs are not sized large enough to meet the trash capture requirements. These may need to be retrofitted with non-clogging overflow screens.	Thank you for this comment.
12	Curt Kruger, Contech	Private development can potentially be utilized to meet a portion of the City's requirements. Any NEW development within a PLU should be required to provide FCS if it will contribute to the overall plan. For example a development with its own outfall should be required to install FCS. However, a development within a PLU whose stormwater will combine with others in the MS4 and will be treated by a large downstream FCS should not be subject to that requirement.	Text has been added to the Plan in Section 1 regarding incorporating trash controls into new/re-development standards.

City of Chico Track 1 Trash Implementation Plan

August 2018 Public Review - Response to Comments

Number	Commentor	Comment	Response
13	Curt Kruger, Contech	Installation costs for underground FCS are significantly reduced when combined with other municipal construction. All planned or emergency underground construction activity within the City should include FCS installation. Even if the FCS is not in the same street, adding its installation into another underground construction contract will reduce overall costs.	Thank you for bringing our attention to this consideration.