5 Requirements for Regulated Projects

The following is a 6-step process required by the Town of Paradise for Regulated Projects as defined in Section 2.2.

5.1 SPECIFY DRAINAGE MANAGEMENT AREAS

Regulated Projects are required to provide a map or diagram that divides the development into discrete Drainage Management Areas (DMAs). These are areas of the project where the nature of the development is distinct from the other portions of the development and, therefore, require a unique approach to mitigating storm water runoff. A separate DMA would also be necessary for portions of the project where post-construction design measures are dedicated to that portion and operate independently from the other DMAs. Some projects will have multiple DMAs while other projects may have only one single DMA.

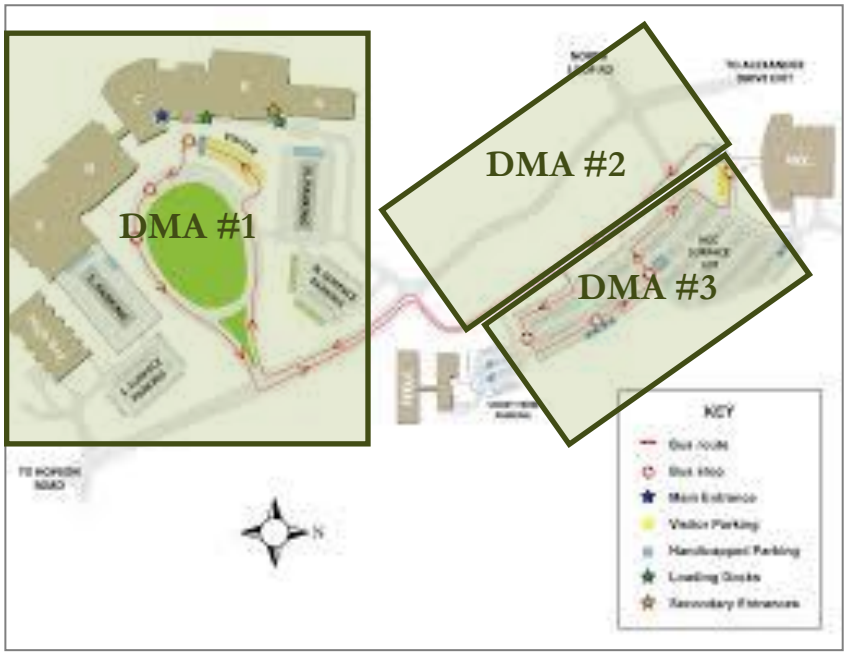

Figure 6 - Regulated Projects must submit a map with the boundaries of the various DMAs depicted.

5.2 IDENTIFY APPLICABLE SOURCE CONTROLS

The project proponent is required to identify potential sources of pollutants and to include into the design appropriate Best Management Practices / Source Controls. If a proposed Regulated Project has any of the potential pollutant-generating activities or sources identified in Table 1, it must be designed and operated consistent with the recommendations provided in the CASQA Storm Water BMP Handbooks. A link is provided in Table 1 to each BMP specification. The CASQA Handbooks can be accessed in their entirety at www.CASQA.org . There is an annual subscription to access the Commercial / Industrial Handbook and the Construction Handbook. At the date of this edition of the Post-Construction Standards Plan, CASQA was still offering free access to their BMP Handbooks for Municipal Operations and New Development and Redevelopment.

REQUIREMENTS FOR REGULATED PROJECTS

TABLE 1 – LIST OF SOURCE CONTROLS

Activity / Pollutant Source	CASQA BMP Handbook Link	Activity or Design-based Control Measure
Accidental spills or leaks	SC-11	Activity
Interior floor drains	SC-10	Activity and Design (connection of interior floor drains to the storm drainage system is prohibited)
Parking / storage areas and maintenance	SC-43	Activity
Indoor and structural pest control	SC-35	Activity
Landscape / outdoor pesticide use	SD-10 BG-40	Activity
Pools, spas, ponds, decorative fountains, and other water features	BG-63 SC-72	Activity and Design
Restaurants, grocery stores, and other food service operations	BG-30	Activity
Refuse areas	SC-34 SD-32	Activity and Design
Industrial processes	SD-35 SD-36	Design
Outdoor storage of equipment or materials	SC-32 SD-34	Activity and Design
Vehicle and equipment cleaning	SC-21 SD-33 BG-65	Activity and Design
Vehicle and equipment repair and maintenance	SC-22 BG-21	Activity
Fuel dispensing areas	SC-20 SD-30 BG-22	Activity and Design
Loading docks	SC-30 SD-31	Activity and Design
Fire sprinkler test water	SC-41	Activity
Drain or wash water from boiler drain lines, condensate drain lines, rooftop equipment, drainage sumps, and other sources	SC-10 SC-41	Activity
Unauthorized non-storm water discharges	SC-10	Activity
Building and grounds maintenance	SC-41	Activity

REQUIREMENTS FOR REGULATED PROJECTS

5.3 INCORPORATE LOW IMPACT DEVELOPMENT DESIGN STANDARDS

The project proponent must demonstrate how each DMA has been designed to accomplish the LID Standards listed in Table 2.

TABLE 2 – LID STANDARDS

1. **Define the development envelope and protected areas, identifying areas that are most suitable for development and areas to be left undisturbed.**
2. **Concentrate development on portions of the site with less permeable soils and preserve areas that can promote infiltration.**
3. **Limit overall impervious coverage of the site with paving and roofs.**
4. **Set back development from creeks, wetlands, and riparian habitats.**
5. **Preserve significant trees.**
6. **Conform the site layout along natural landforms.**
7. **Avoid excessive grading and disturbance of vegetation and soils.**
8. **Replicate the site's natural drainage patterns.**
9. **Detain and retain runoff throughout the site.**

In completing Post-Construction Project Worksheet (included in Appendix 8), the project proponent will be required to demonstrate for each DMA how it is accomplishing the nine LID Standards listed in Table 2. This demonstration can be done through narrative description, calculations, supporting information, and / or site plans and diagrams. The municipal plan checker will review the project proponent's response to each of the nine LID Standards and may challenge unsubstantiated statements, request additional information, or request that more be done to meet the objective of one or more of these LID Standards.

5.4 SELECT AND SIZE SITE DESIGN AND TREATMENT CONTROL MEASURES

As with small projects, Regulated Projects must also select one or more Site Design Measures (also called "facilities" in the Phase II MS4 Permit) that infiltrate, evapo-transpire, harvest and reuse, or biotreat storm water runoff. Regulated Projects are required to reduce the amount of runoff by sizing each "facility" (Site Design or Treatment Control Measure) to one of two hydraulic design criteria specified in the Phase II MS4 Permit. This section of the plan discusses how project proponents select, size, and configure Site Design and Treatment Control Measures.

5.4.1 List of Site Design Measures and Associated Sizing Criteria

Many of the Site Design Measures are described in Section 4.1 of this Post-Construction Standards Plan. Table 3 lists these Site Design Measures along with other possible Treatment Control Measures that infiltrate, evapo-transpire, harvest and reuse, or biotreat storm water runoff. The project proponent will need to select one or more of these control measures for each DMA. For each measure listed in Table 3, the appropriate hydraulic sizing criteria and specification reference is also provided.

REQUIREMENTS FOR REGULATED PROJECTS

TABLE 3 – SITE DESIGN AND TREATMENT CONTROL MEASURES

Site Design or Treatment Control Measure	Description	CASQA Specification	Sizing Criteria
Stream setbacks and vegetated buffers *(Site Design Measure)*	*Preservation of a green strip or vegetated buffer between the development and the discharge point through which storm water runoff passes.*	TC-10	Flow
Soil quality improvement *(Site Design Measure)*	*Commonly used in conjunction with landscaping, bioretention, or storm water gardens. Also known as "engineered soils", through which storm water can infiltrate. This provides additional on-site storage and reduces peak flow rates.*	TC-40	Volume
Tree planting and preservation *(Site Design Measure)*	*Incorporated into the site's landscaping. Trees reduce the energy of falling rain and help to reduce peak flow rates.*	SD-10	SMARTS Calculator
Porous pavement *(Site Design Measure)*	*Porous asphalt, concrete, or pavers; cobbles or rock covered surfaces; typically with at least 18" of drainage rock below the porous surface covering to store and infiltrate storm water.*	SD-20	Volume
Green roofs *(Site Design Measure)*	*Plants and growing media permanently installed on a rooftop to allow a certain amount of storm water infiltration and storage.*	TC-40	Volume
Vegetated swales *(Site Design Measure)*	*Storm water conveyance swales that are vegetated to stabilize the swale and prevent erosion. Vegetated swales improve water quality by providing filtration and bio-uptake of pollutants and by promoting sedimentation of suspended particles. Often, vegetative swales are used in conjunction with "soil quality improvement" to provide greater infiltration and / or with retention or detention basins.*	TC-30	Flow
Rain harvesting and reuse *(Site Design Measure)*	*Large scale or small scale capture, collection and re-use of storm water runoff. Includes rain barrels used at downspouts and large cisterns and collection systems.*	TC-12	Volume
Bioretention and rain gardens *(Treatment Control Measure)*	*Depressed landscaped areas to which storm water runoff flows. These rain gardens are designed with engineered soils so that they facilitate infiltration and storage of storm water.*	TC-32	Volume
Infiltration trench, Flow-through Planter, or Tree Wells *(Treatment Control Measure)*	*Similar in concept to a French drain or a leach field, in which storm water runoff is able to drain to a trench or pit that has been filled with rock. It provides underground storage of the water until it can infiltrate into the soils.*	TC-10	Volume and Flow
Retention and detention basins *(Treatment Control Measure)*	*Aboveground storage of storm water runoff in a basin that allows it to infiltrate into soils and / or be stored and released at a slower flow rate. Impounded water must be infiltrated or discharged within 72 hours to avoid vector breeding problems.*	TC-11 TC-12 TC-22 TC-40	Volume

A single control measure or a combination of two or more of the control measures specified in Table 3 can be used to meet the hydraulic sizing criteria for each DMA. An example of a control measure combination would be a site using engineered soils below a vegetated swale and using a rain harvesting /

collection system for roof drains that are in the same DMA. Information for on-line publicly available design references and guidance to many of the above-listed control measures are provided in Appendix 7.

5.4.2 Volumetric Criteria

The Phase II MS4 Permit requires the municipality to condition applicable new development and redevelopment projects to require "facilities" designed to evapo-transpire, infiltrate, harvest/use, and biotreat storm water ***and that are designated on Table 3 as a volume-based control measure*** to meet at least one of the following volumetric hydraulic sizing design criteria:

- The maximized capture storm water volume for the tributary area, on the basis of historical rainfall records, determined using the formula and volume capture coefficients in the *Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87 (1998)* pages 175-178 (that is, approximately the 85th percentile 24-hour storm runoff event); ***or***
- The volume of annual runoff required to achieve 80 percent or more capture, determined in accordance with the methodology in Section 5 of *CASQA's Stormwater Best Management Practice Handbook, New Development and Redevelopment (2003)*, using local rainfall data.

As a part of this Post-Construction Standards Plan, the Town of Paradise is providing the project proponent with a Microsoft Excel™ worksheet that calculates the volumetric criteria. (Refer to Appendix 6 for information on how to download and use the worksheet). In this worksheet, capture volumes can be calculated using both of the above-referenced volumetric criteria methods. Both methods are described in Section 5 of the *2003 Edition of the CASQA Stormwater Best Management Practice Handbook for New Development and Redevelopment*. Section 5 of the handbook can be accessed and downloaded at the following web link:

www.casqa.org/sites/default/files/BMPHandbooks/BMP_NewDevRedev_Section_5.pdf

The project proponent can select either method to size the Site Design and Treatment Control Measures that require volumetric sizing as specified in Table 3. ***To satisfy the plan check requirements one or more of these control measures must be used for each DMA and sized for the total runoff area of the DMA.***

The State Water Board's Post-Construction Calculator (refer to Appendix 5) provides a discharge credit for trees by allowing an area of 218 ft² for each evergreen tree and 109 ft² for each deciduous tree. If trees are included within the DMA boundary, the project proponent may take the total area within the DMA (number of trees multiplied by the allowed area credit) multiplied by the "P" value (converted from inches to feet) as shown on Volumetric Sizing Tool in Appendix 6. This will provide a volume reduction in cubit feet which may be used in meeting the overall volumetric criteria for the DMA and has been built into the Volumetric Sizing Tool.

5.4.3 Flow-Based Criteria

The Phase II MS4 Permit requires the municipality to condition applicable new development and redevelopment projects to require "facilities" designed to evapo-transpire, infiltrate, harvest/use, and

biotreat storm water ***and that are designated on Table 3 as a flow-based control measure*** to meet at least one of the following flow-based hydraulic sizing design criteria:

- The flow of runoff produced from a rain event equal to at least 0.2 inches per hour intensity; ***or***
- The flow of runoff produced from a rain event equal to at least 2 times the 85th percentile hourly rainfall intensity as determined from local rainfall records. Local rainfall records are provided in Appendix D of the *CASQA Stormwater Best Management Practice Handbook for New Development and Redevelopment* for Fresno, Sacramento, and Redding, California.[3] Table 4 below provides the 85th percentile hourly rainfall intensities for these Central Valley locations as reported in the CASAQ BMP Handbook.

TABLE 4 - RAINFALL INTENSITIES AND FLOW-BASED DESIGN VALUES

Central Valley Weather Station	85th Percentile Rainfall Intensity (inches/hour)	Flow-Based Design Value (2 x 85th Percentile Intensity in inches/hour)
Fresno – Yosemite International Airport (3257)	0.090	0.180
Sacramento – 5 ESE (7633)	0.093	0.186
Redding – Municipal Airport (7304)	0.130	0.260

The project proponent can select either method to size the Site Design and Treatment Control Measures that require flow-based sizing as specified in Table 3. ***To satisfy the plan check requirements one or more of these control measures must be used for each DMA and sized for the total runoff area of the DMA.***

5.4.4 Allowed Variations and Exceptions

Site Design and Treatment Control Measures that infiltrate or bioretain storm water into the subsurface may be altered in their design as specified on Table 5.

[3] www.casqa.org/sites/default/files/BMPHandbooks/BMP_NewDevRedev_Appendix_D.pdf

REQUIREMENTS FOR REGULATED PROJECTS

TABLE 5 – ALLOWED DESIGN VARIATIONS

Condition	Allowed Variation
Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project	May incorporate an impervious cutoff wall between the bioretention / infiltration facility and the structure or other geotechnical hazard
Facilities with documented high concentrations of pollutants in underlying soil or groundwater; facilities located where infiltration could contribute to a geotechnical hazard; and facilities located on elevated plazas or other structures	May incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a "flow-through planter")
Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible	May omit the underdrain
Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites	Are required to provide additional treatment to address pollutants of concern prior to the flow reaching the infiltration facility

If the project proponent demonstrates that the use of bioretention or infiltration control measures are infeasible at the site, other types of treatment such as tree-box biofilters, compost filters, or in-vault media filters may be utilized for the following types of projects:

1. Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;
2. Facilities receiving runoff solely from existing (pre-project) impervious areas; and
3. Historic sites, structures or landscapes that cannot alter their original configuration in order to maintain their historic integrity.

If any of these alternate non-infiltrating treatment control measures are utilized, they must meet the following performance criteria:

- Sized to treat the volumetric criteria specified in Section 5.4.2 or the flow-based criteria in Section 5.4.3 as appropriate to the type of treatment control measure selected.
- Selected to effectively remove pollutants of concern associated with the new development.

The project proponent is required to support the demonstration of infeasibility of using bioretention or infiltration control measures at the project site and the selection of the alternate non-infiltration treatment control measure(s) through the opinion of a qualified expert such as a California licensed Professional Civil Engineer, a California licensed Professional Geologist, a California licensed Geotechnical Engineer,

and/or an EnviroCert International, Inc. Certified Professional in Storm Water Quality (CPSWQ). If an alternate non-infiltrating treatment control measure(s) is proposed by the project proponent, a technical report, stamped and signed by any of the above-referenced experts, demonstrating infeasibility of bioretention or infiltration and the selection and sizing of the alternate treatment control measure must be submitted with the Post-Construction Project Worksheet (Appendix 8).

5.5 INCORPORATE HYDROMODIFICATION MANAGEMENT MEASURES

Storm water runoff that is not addressed with Site Design Measures must be treated with Treatment Control Measures (both of which are identified on Table 3) designed to infiltrate, evapo-transpire, and/or bioretain runoff. In other words, if the DMA is utilizing trees and a storm water capture, collection, and reuse system, **only the net runoff**, after factoring in the credit for the trees and for the amount captured / recycled, is subject to being included in the treatment control requirements. Treatment "facilities" must comply with the following design parameters:

1. Sized to treat the volumetric criteria specified in Section 5.4.2 or the flow-based criteria in Section 5.4.3 as appropriate to the type of treatment control measure selected;
2. Maximum surface loading rate of the infiltration facility of 5 inches per hour, based on the runoff rates calculated for the DMA;
3. Minimum surface reservoir volume equal to surface area of the infiltration facility times a depth of 6 inches;
4. Minimum planting medium depth of 18 inches. The planting medium must sustain a minimum infiltration rate of 5 inches per hour throughout the life of the project and must maximize runoff retention and pollutant removal. A mixture of sand (60%-70%) meeting the specifications of American Society for Testing and Materials (ASTM) C33 and compost (30%-40%) may be used.
5. Subsurface drainage/storage layer (typically gravel) with an area equal to the surface area and having a minimum depth of 12 inches;
6. Underdrain with discharge elevation at top of the gravel layer;
7. No compaction of soils beneath the treatment control "facility"; or if the soils had previously been compacted, they must be ripped and loosened;
8. No liners or other barriers interfering with infiltration; and
9. Appropriate plant palette for the specified soil mix and maximum available water use.

Alternatives to the above-listed nine design parameters for treatment "facilities" is allowed if **all** of the following equivalent effectiveness features are demonstrated:

- Equal or greater amount of runoff infiltrated or evapo-transpired;
- Equal or lower pollutant concentrations in runoff that is discharged after biotreatment / infiltration;
- Equal or greater protection against shock loadings and spills; and

- Equal or greater accessibility and ease of inspection and maintenance.

Regulated projects that create and/or replace one acre or more of impervious surface must have incorporated Site Design and Treatment Control Measures (from Table 3) that prevent the post-project runoff from exceeding the pre-project flow rate for a 2-year, 24-hour storm event. This does not include projects that do not increase impervious surface area over the pre-project conditions. The 2-year, 24-hour values for a few selected Butte County locations are shown in Table 6. The 2-year, 24-hour storm event volumes for all of Northern California are included on an isopluvial map included on the last tab of the Volumetric Post-Construction BMP Sizing Tool (which can be downloaded following the instructions in Appendix 6).

TABLE 6 – 2-YEAR, 24-HOUR STORM TOTALS FOR SELECTED LOCATIONS

Location	2-Year 24-Hour Design Value
Town of Paradise	5.0 inches
Magalia	5.8 inches
City of Chico	2.8 inches
City of Oroville	2.8 inches

5.6 PREPARE THE SUBMITTAL

The sixth and final step for Regulated Projects is to compile the information required to be submitted to the plan checker. This includes the following items:

- A completed Post-Construction Worksheet is required (obtained from Appendix 8).
- A separate site plan for each DMA must be submitted. If there are multiple DMAs, a key map showing the location of the DMAs in relationship to one another and the entire site is required to be submitted. Each DMA site plan is required to show the following information:
  - ✓ DMA name and boundary;
  - ✓ The selected Site Design and Treatment Control Measures (identified in Table 3);
  - ✓ The total drainage area in square feet of the DMA;
  - ✓ The pre-development peak flow rate at the point(s) of discharge;
  - ✓ The predicted post-development peak flow rate at the point(s) of discharge;
  - ✓ Areas of existing impervious surfaces (pre-development);
  - ✓ Proposed areas of impervious surfaces (post-development);
  - ✓ Setbacks from creeks, wetlands, and riparian habitats;
  - ✓ Existing topography and drainage patterns (pre-development);
  - ✓ Proposed topography and drainage patterns (post-development);

- ✓ Soil types, soil type boundaries within the DMA, and their Hydrologic Soil Group Classification rating (A, B, C, or D); and
- ✓ Trees, vegetation, and sensitive environmental areas to be protected and preserved.

Each plan must be stamped by a qualified licensed professional. The plans must be stamped by a California Civil Professional Engineer if any of the following control measures were selected: rooftop and impervious area disconnection, porous pavement, rain cisterns, bioretention or rain gardens, infiltration trench, or retention or detention basins. The plans must be stamped by a California Structural Professional Engineer if a green roof was selected or if there is a significant structural aspect to the rain cisterns and collection system. The plans must be stamped by a California licensed Landscape Architect if any of the following Site Design Measures were selected: stream setbacks and buffers, soil quality improvement, vegetated swales, bioretention and rain gardens. The selected Site Design and Treatment Control Measure(s) must be clearly called out on the submitted plans.

Soil types and Hydrologic Soil Groups (HSGs) can be identified using the USDA's online Web Soil Survey. The online tool uses aerial maps to select the area of interest. To access this online reference, go to:

http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

TABLE 7 – HYDROLOGIC SOIL GROUPS

Group A	Low runoff potential, high infiltration rates
Group B	Moderately low runoff potential, good infiltration rates
Group C	Moderately high runoff potential, low infiltration rates
Group D	High runoff potential, poor infiltration

For more information on the HSG classifications, go to:
http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba

- Design drawings for the proposed Treatment Control Measures showing a plan view, elevation view, and subsurface cross-sections must be submitted. Sufficient detail and specifications should be included in these drawings to provide for adequate plan check review and for the construction of the treatment "facility". The drawings must be stamped by a California Civil Professional Engineer if any of the following control measures were selected: rooftop and impervious area disconnection, porous pavement, rain cisterns, bioretention or rain gardens, infiltration trench, or retention or detention basins. The drawings must be stamped by a California Structural Professional Engineer if a green roof was selected or if there is a significant structural aspect to the rain cisterns and collection system. The drawings must be stamped by a California licensed Landscape Architect if any of the following Site Design Measures were selected: stream setbacks and buffers, soil quality improvement, vegetated swales, bioretention and rain gardens.
- A print out of the results page from the MS Excel™ Volumetric BMP Sizing Tool for each DMA and control measure that requires the volumetric sizing criteria is required to be submitted. (Refer to Appendix 6 for information on how to download the tool.)
- Calculations stamped by the appropriate licensed individual (as described above) for each DMA and control measure that requires flow-based sizing criteria must be included with the submittal.
- An Operation and Maintenance Plan and signed Statement of Responsibility for the proposed treatment control measures must accompany the submittal (refer to Section 6).

6 Operation and Maintenance of Post-Construction Measures

Owners of the projects where post-construction treatment control measures (as identified on Table 3) were installed are required to maintain the control measures so that they operate effectively and as designed. To that effect, the project proponent during the plan check process must submit an Operation & Maintenance (O&M) Plan and a Statement of Responsibility.

6.1 LONG TERM PLAN FOR CONDUCTING REGULAR MAINTENANCE OF CONTROL MEASURES

The owner of the project where any post-construction treatment control measures were installed is required to prepare a written plan for conducting regular inspections and maintenance of the installed treatment facilities. The proposed O&M activities should be commensurate with the maintenance measures identified in the CASQA BMP specifications. (Refer to the hyperlinked references in Table 3.) The O&M Plan is required to identify the following information:

- Property name and address;
- Name of the DMA(s) and Treatment Control Measure(s);
- Property owner's contact information including name, mailing address, telephone number, and email address;
- Contact information for any contracted or delegated inspectors and maintenance personnel;
- Minimum inspection frequency by the property owner or their designee;
- Conditions that require maintenance or repair of the Treatment Control Measure; and
- Preventative maintenance tasks, their frequency, and who will perform them.

The project proponent is required to use the form provided in Appendix 9 for the O&M Plan submittal.

6.2 STATEMENT OF RESPONSIBILITY

On the O&M Plan form (included in Appendix 9) is a Statement of Responsibility that must be accepted and signed by the property owner or the owner's duly authorized representative. The completed and signed form must be submitted during the plan check process. The statement indicates the current property owner's acceptance of responsibility for the on-going operation, inspection, and maintenance of the treatment control measures until the property and / or responsibility is legally transferred to another entity (such as the new property owner or a maintenance district). It is the responsibility of the current owner to notify the new owner or responsible party of their on-going O&M obligations. The storm water municipal code for the Town of Paradise provides the municipality with the legal authority to require any property owner to properly maintain installed storm water treatment control measures.

OPERATION AND MAINTENANCE OF POST-CONSTRUCTION MEASURES

6.3 SELF-CERTIFICATION ANNUAL REPORTS

Each year the Town of Paradise will mail to owners of installed Treatment Control Measures an O&M self-certification form. This form is required to be completed annually by the owner of the property to certify that the O&M program (described in Section 6.1) is being implemented and that the Treatment Control Measure(s) is in an effective operational condition. The property owner will have up to 60 days to complete and return the annual O&M self-certification form. If reports are not received within the 60-day period, the Town of Paradise will perform the inspection and assessment; and the property owner will be invoiced for it as described in the municipal code.