REGIONAL ALTERNATIVE COMPLIANCE SYSTEM LITERATURE REVIEW

REGIONAL COMPLIANCE FOR A SUSTAINABLE BAY

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ACRONYMS AND ABBREVIATIONS

µg	microgram
µg/kg	micrograms per kilogram
BASMAA	Bay Area Stormwater Management Agencies Association
Bay	San Francisco Bay
BMP	best management practice
BOO	Build-Own-Operate
CBP3	Community-Based Private-Public Partnership
CCCWP	Contra Costa Clean Water Program
CEQA	California Environmental Quality Act
CWA	Clean Water Act
DBF	Design-Build-Finance
DBFM	Design-Build-Finance-Maintain
DBFOM-AP	Design-Build-Finance-Operate-Maintain-Available Payment
DBFOM-RC	Design-Build-Finance-Operate-Maintain-Revenue Concession
DBOM	Design-Build-Operate-Maintain
DCIA	Directly Connected Impervious Area
DOEE	Department of Energy and Environment
DWR	Department of Water Resources
EIA	Effective Impervious Area
EIR	Environmental Impact Report
EQIP	Environmental Quality Incentives Program
FRB	Forest Resilience Bond
g	gram
GSI	Green Stormwater Infrastructure
HSPF	Hydrological Simulation Program – Fortran
kg	kilogram
kg/yr	kilograms per year
lbs/year	pounds per year
LEAP	Landowner Environmental Assistance Program
LID	Low Impact Development

Literature Review	Regional Alternative Compliance System Literature Review
LSRCA	Lake Simcoe Region Conservation Authority
MDE	Maryland Department of the Environment
mg	milligrams
mg/kg	milligrams per kilogram
MOU	memorandum of understanding
MRP	San Francisco Bay Municipal Regional Stormwater NPDES Permit
MS4	Municipal Separate Storm Sewer System
NCRWQCB	North Coast Regional Water Quality Control Board
ng	nanograms
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source
NRDA	Natural Resource Damage Assessment
O&M	operations and maintenance
P3	Public-Private Partnership
PAHs	polycyclic aromatic hydrocarbons
PBTs	Persistant Bioaccumulative Toxics
PCBs	polychlorinated biphenyls
POCs	pollutants of concern
PS	point source
RAA	Reasonable Assurance Analysis
RFP	request for proposal
RFQ	request for qualifications
RIBITS	Regulatory In-lieu fee and Bank Information Tracking System
RMP	Regional Monitoring Program
SBE/MBE/DBE	small, minority, and disadvantaged business
SFEI	San Francisco Estuary Institute
SFRWQCB	San Francisco Bay Regional Water Quality Control Board
SRC	Stormwater Retention Credit
SWMM	Stormwater Management Model
System	Regional Alternative Compliance System

East County Permittees	The cities of Antioch, Brentwood, Oakley, and the eastern portions of unincorporated Contra Costa County and the Contra Costa County Flood Control & Water Conservation District
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
WDR	Waste Discharge Requirement
WLA	wasteload allocation
WLEB	Western Lake Erie Basin
WQ	water quality
WQBEL	Water Quality-Based Effluent Limitation
WQE	Water Quality Equivalency Guidance Document
WQT	Water Quality Trading
WWTPs	wastewater treatment plants
WY	Water Year

REPORT OVERVIEW

This Regional Alternative Compliance System Literature Review (Literature Review) summarizes information regarding key components and decisions required to develop a successful Regional Alternative Compliance System for Contra Costa County (Contra Costa County System). Alternative compliance systems are flexible compliance programs that allow regulated dischargers, with costly or infeasible pollutant control requirements, to meet equivalent discharge reductions by investing in the implementation of cost-effective and feasible controls at other locations. Such investments thereby achieve an overall environmental benefit at a reduced overall cost. The objective of this Literature Review is to outline the range of options for system development and provide recommendations on next steps needed to develop the Contra Costa County System.

The Contra Costa County System is being developed to facilitate efficient and cost-effective water quality improvements and associated ancillary benefits and to reduce permit compliance pressures. It is intended that the Contra Costa County System will enable implementation of green stormwater infrastructure (GSI)/low impact development (LID) and other pollutant control measures across the San Francisco Bay Area. The Contra Costa County System could provide substantial cost savings, while helping Permittees meet San Francisco Bay Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit requirements (MRP; Order No. R2-2015-0049 and future orders) and the total maximum daily load (TMDL) water quality goals incorporated therein. The Contra Costa County System, as termed, will be developed for Contra Costa County, with the intent that project deliverables be readily adaptable for other regions and entities subject to the same water quality compliance requirements. A summary of regulatory considerations for the Contra Costa County System is provided in Section 2.

Fundamental components of alternative compliance systems across approaches presented are defined in Section 3 of this Literature Review. System components described include eligible entities, eligible transactions, trade ratios, an exchange baseline, and system restriction considerations where applicable. These definitions provide an introduction to terms used in Section 4, which describes alternative compliance approaches that have been utilized in other systems throughout the United States and North America. These approaches include Water Quality Trading (WQT) programs, water quality and stormwater crediting and offset programs, performance-based approaches, community-based public private partnerships (CBP3s), and other similar market-based program frameworks. A variety of example programs are referenced throughout this Literature Review to highlight the differences and similarities of the approaches presented. The existing approaches summarized herein each include aspects relevant to or that can be adapted for the benefit of the Contra Costa County System.

Section 5 of this Literature Review provides a detailed definition of the alternative compliance system metric. The system metric represents the unit of equivalent discharge reduction that reflects both the regulatory pollution control requirement and the measure of estimated outcome at the alternative source of control. Metrics currently under consideration for the Contra Costa County System include impervious acres greened, impervious acres treated, volume managed per

year, and TMDL-specified polychlorinated biphenyls (PCBs) load reductions. The determination of which metric or metrics will be used for the Contra Costa County System will be a crucial factor for selecting the appropriate compliance approach for the System framework. In addition, the calculation method selected for estimating generated alternative compliance metric(s) will contribute to the overall reception of the Contra Costa County System by regulators, participants, and the public. The metric quantification method used must be scientifically defensible and approved by the regional Clean Water Act (CWA)-delegated authority before being utilized for accounting towards compliance requirements.

An alternative compliance system requires the implementation of actions or control measures that result in measurable or estimated benefits, expressed in the context of the selected metric or metrics. These metric-defined benefits are exchanged between entities participating in the Contra Costa County System. Control measures associated with the identified metrics under consideration include installation of GSI and other urban stormwater treatment measures, source controls and other measures specifically designed to treat PCBs, mercury or other sediment-bound pollutants. Control measures are described in Section 6.

Section 7 of this Literature Review describes factors for addressing participant compliance risk and uncertainty in using an alternative compliance system. Also addressed are system elements for certifying that the alternative compliance framework generates expected water quality benefits required by the regulatory provisions it was designed to address. These processes, referred to as certification and verification, also include considerations for annual control measure operations and maintenance. Reporting and inspection requirements related to metric verification and certification in the Contra Costa County System should be developed with consideration of actions already required of Permittees.

Tracking of generated metrics is important for accounting towards compliance goals and public transparency of the alternative compliance system. For the Contra Costa County application, the San Francisco Estuary Institute (SFEI) will be developing the tracking framework. Key elements for tracking and allowing public access to information are introduced in Section 8.

An important factor in the ultimate success of the Contra Costa County System will be accessibility to capital for those entities generating water quality benefits to be used by regulated entities for alternative compliance. To maximize the availability of capital, the Contra Costa County System should be developed with flexibility to enable and harmonize multiple sources of funding and if necessary, provide opportunities to utilize various mechanisms for financing pollutant controls. Potential options for funding and, as needed or applicable, financing methods are provided in Section 9.

Finally, in addition to providing an outline of alternative compliance approaches and available options for key system components, this document is intended to narrow down the range of appropriate options for the Contra Costa County System. Section 10 therefore provides recommendations for decision-making around Contra Costa County System development and summarizes recommended next steps for framework development.

A glossary of key terms is provided following the main text of the Literature Review. A Cross-cut summary of example alternative compliance programs is provided in Appendix A.

1 INTRODUCTION AND OBJECTIVES

Over the past 25 years, alternative water quality compliance approaches, including water quality trading (WQT) and other similar market-based types of programs, have evolved into cost-effective compliance options for regulated dischargers. This Regional Alternative Compliance System Literature Review (Literature Review) is part of a broader effort to develop and pilot a Regional Alterative Compliance System (Contra Costa County System) to achieve the water quality objectives of the San Francisco Bay Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (MRP; Order No. R2-2015-0049 and future orders), which incorporates performance standards for new development and redevelopment, as well as control measures to implement the San Francisco Bay Total Maximum Daily Loads (TMDLs) for polychlorinated biphenyls (PCBs) and mercury. The System is intended to meet the needs of stakeholders by providing a flexible, cost-effective, and scientifically defensible compliance option for addressing the green stormwater infrastructure (GSI) and mercury/ PCBs control requirements outlined in the MRP (Provisions C.3, C.11, and C.12, respectively). The Contra Costa County System, as termed, will be developed for Contra Costa County; however, the framework is intended to be easy to adapt by other programs and entities subject to the same water quality compliance requirements.

This Literature Review provides key background information, context, and examples to assist in guiding the development of a Permittee-focused Contra Costa County System framework that will address considerations for the GSI requirements and the unique contaminants of concern for San Francisco Bay. The Literature Review identifies the elements of market-based alternative compliance systems and describes how these elements will be refined for the Contra Costa County System. This Literature Review also includes a cross-cut summary of example alternative compliance programs implemented across North America to allow for a comparative analysis between different system approaches and elements (Appendix A).

2 REGULATORY CONSIDERATIONS

A regional alternative compliance system must address several legal considerations at the local, regional, state, and federal level. At its core, the Contra Costa County System must be grounded in a legal framework that is defensible and consistent with all relevant legal requirements. This section will describe the legal elements that must be addressed by the Contra Costa County System and the legal considerations that may ultimately influence the type of approach the Contra Costa County System will ultimately utilize. A summary of key questions and/or decision points and preliminary findings relating to legal basis and CEQA considerations for the Contra Costa County System can be found in Section 10.

2.1 Legal Basis and Compliance Drivers for Alternative Compliance

Under the Clean Water Act, regulated wastewater and stormwater discharges are prohibited except in compliance with an NPDES permit. 33 U.S.C. §§ 1311(a), 1342(a) and (p). In watersheds with approved TMDLs, those permits must be consistent with the assumptions and requirements of any available wasteload allocations in those TMDLs. 40 C.F.R. § 122.44(d)(1)(vii)(B). The MRP is a form of NPDES permit and includes control requirements to implement the allocations in the approved mercury and PCB TMDLs. The MRP also explicitly authorizes the development of alternative compliance options to meet the performance standards for new development and redevelopment, and to use those options – including GSI / LID – to achieve the required TMDL-based control measures. For these reasons, the MRP provides the legal framework for the Regional Alternative Compliance System and should be the primary point of focus for its development and implementation.

The MRP makes the Contra Costa County System unique in comparison to other alternative compliance programs around the country. Many of those programs are governed by state statutes (as is the case for water quality trading among significant industrial and municipal dischargers in Virginia's portion of the Chesapeake Bay Watershed), state regulations (as is the case for water quality trading in Ohio and a number of other states) and/or state-based guidance or policies designed to facilitate alternative compliance markets (as is the case for the pilot phase of the interstate water quality trading project for the Ohio River Basin, in which EPA, Ohio, Indiana and Kentucky are all participants).

At the federal level, the Clean Water Act is silent as to alternative compliance programs. However, for many years, EPA has interpreted the CWA to allow pollutant reduction from water quality trading, offsets, and other similar programs to be used for ensuring compliance with regulatory requirements. EPA supports states in implementing such programs in order to meet the water quality objectives set forth in 33 U.S.C. § 1313(c) (water quality standards) and (d) (impaired waters and TMDLs). EPA's memorandum updating their Water Quality Trading Policy to promote market-based mechanisms (2019) and earlier Water Quality Trading Policy (2003) reflects this long-standing position.[1]

[1] See also, Chapter 5 of *Advances in Water Quality Trading as a Flexible Compliance Tool*. 2015. Water Environment Federation, Special Publication, ISBN 978-1-57278-315-7.

Alternative compliance systems are intended to provide regulated entities a flexible path to compliance with water quality requirements in regional water quality permitting and TMDL requirements. These requirements act as the drivers for alternative compliance and serve as the primary focus when designing the Contra Costa County System.

2.1.1 Legal Basis for Alternative Compliance

Legal bases for various alternative compliance systems have been established and supported through several legal mechanisms.

2.1.1.1 Statutes

State legislatures may adopt statutes specifically authorizing alternative compliance systems and imposing requirements, limitations and conditions on their use.

2.1.1.2 Rules

In states with specific authorizing statutes, state environmental agencies often need to adopt rules governing how the alternative compliance systems will be implemented. Even absent specific authorizing statutes, some state environmental agencies have adopted rules for implementation of such systems based on general authority conferred by their state water quality control laws. Rules can also be adopted at the local level through ordinances that guide implementation of state statutes, rules or otherwise applicable permit requirements.

A rule may provide an explicit mandate for the development or framework of an alternative compliance system. Rules associated with statutes or state regulation are typically drafted by the state-delegated CWA authority. The rule-making process at this level can be time-consuming and will be subject to the regulatory agency's interest and capacity. This is the case for several different alternative compliance approaches including the establishment of the Maryland Water Quality Trading, Washington, D.C. Stormwater Retention Credit Trading, and North Carolina In-lieu Fee Mitigation Programs. A rule may also amend and expand the geographic scope of an established alternative compliance system. For example, the North Coast Regional Water Quality Control Board (NCRWQCB) approved Resolution No. R1-2018-0025 to update and expand the Laguna de Santa Rosa Nutrient Offset Program to be available to the City of Santa Rosa and the Town of Windsor. Such a rule was initially established by the NCRWQCB following a multi-year, stakeholder led process to assess compliance program options and approaches that best-suited local compliance needs. See Section 4 for more details on all these programs.

2.1.1.3 Guidance

In the context of a legal basis for alternative compliance systems, guidance refers to standards or frameworks provided or approved by a CWA-delegated agency to provide advice on how best to comply with specific rules. In 2016, the State of Idaho updated their guidance document for use of WQT as an alternative compliance approach for regulated and non-regulated phosphorus discharges (Idaho Department of Environmental Quality, 2016). Their guidance set forth expectations for parties seeking to use this form of compliance under rigorously monitored conditions to ensure specific and measurable water quality improvements. The state's guidance was intended to provide an understanding of the details involved in WQT.

2.1.1.4 Plans

A plan refers to a CWA-delegated agency approved course of action, such as a TMDL implementation plan, designed to meet water quality standards. WQT plans are used, for example, under Ohio's promulgated WQT rules on a watershed by watershed basis where trading is being considered as an approved means of alternative compliance by a regulated discharger. In Ohio, these plans must be submitted to the state environmental agency for formal approval (Ohio Environmental Protection Agency, 2020). For example, the Alpine Cheese Phosphorus Nutrient Trading Plan described the phosphorus abatement strategies that would be used by local farmers with a schedule of implementation and a monitoring plan to identify the alternative pollutant load reductions to be used by this NPDES permit holder for alternative compliance. The Alpine Cheese Phosphorus Nutrient Trading Plan also identified the parties responsible for ensuring all elements of the state's promulgated trading rules were being addressed without assigning such responsibilities to state agencies. With the WQT Plan process, flexibility was available in each unique watershed setting to implement an alternative compliance system that best fit local participant needs.

CWA Section 303(e) requires each state to have in place a "continuing planning process" (CPP) which is approved by the U. S. EPA (California State Water Resources Control Board, 2001). In California, the State Water Resources Control Board (SWRCB) and the regional water boards, including the SFBRWQCB, develop, adopt, and implement Water Quality Control Plans (i.e., Basin Plans). The Basin Plan for the San Francisco Bay Basin is "the master policy document that contains descriptions of the legal, technical, and programmatic bases of water quality regulation in the Region" (SFBRWQCB, 2020).

Section 208 of the CWA required the development of areawide waste treatment management plans (areawide plans) for the control of point and nonpoint sources of pollution, the establishment of regulatory programs, and the designation by the states of management agencies to implement the areawide plans. California designated nine Areawide Waste Management Planning agencies for California, including the Association of Bay Area Governments (ABAG). For all areas of the State not covered by the mandates of these nine agencies, the State, through the SWRCB, is the planning agency. Each designated "208 agency" prepared a Water Quality Management Plan for its area, and these were approved by the SWRCB. The State Board, as the state-wide planning agency, acting through the regional water boards, incorporated waste treatment planning into the State's ten basin plans, and these were adopted as the state-wide waste management plan (California SWRCB, 2001).

In addition to the Basin Plans adopted by each regional water board, statewide plans adopted by the California SWRCB include:

- California Ocean Plan – Water Quality Control Plan for Ocean Water of California, which includes the following amendments:
    - State Water Quality Protection Areas & Marine Protected Areas Amendment (Resolution No. 2012-0056),
    - Model Monitoring, Vessel Discharges and Non-Substantive Amendments (Resolution No. 2012-0057),

  - Trash Control in California's Waters (Resolution No. 2015-0019),
  - Desalination Facilities and Brine Disposal (Resolution No. 2015-0033),
  - Bacteria Provisions and Variance Policy (Resolution No. 2018-0038), and
  - State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State (Resolution No. 2019-0015);

- California Thermal Plan - Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (Resolution No. 75-89);
- Enclosed Bays and Estuaries Plan - Water Quality Control Plan for Enclosed Bays and Estuaries: Part 1 Sediment Quality Objectives (Resolution No. 2008-0070, as amended by Resolution No. 2011-0017 and Resolution No. 2018-0028);
- Inland Surface Waters, Enclosed Bays, and Estuaries of California amendments, including:
  - Trash Provisions (Resolution No. 2015-0019),
  - Tribal Subsistence Beneficial Uses and Mercury Provisions (Resolution No. 2017-0027),
  - Bacteria Provisions and Variance Policy (Resolution No.2018-0038), and
  - State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State (Resolution No. 2019-0015).

Eastern Contra Costa County is also subject to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) (Resolution No. 2018-0059).

2.1.1.5 Permits

Ultimately, any applicable legal requirement arising out of a statute, rule (as informed by guidance), or plan must be applied to particular permittees/systems/dischargers through permits. For example, permits must include limits that are consistent with the assumptions and requirements of the wasteload allocations in a TMDL (since TMDLs are binding on permittees). See 40 CFR 122.44(d)(1)(vii)(B). Under the CWA, if a permittee is in compliance with its NPDES permit, it is in compliance with the Act; provided it fully complies with all application requirements.33 U.S.C. § 1342(k). This so-called permit shield is an important consideration for permittees and serves as an incentive for ensuring that all applicable requirements are clearly articulated in the permit.

2.1.1.6 Memoranda of Understanding

A memorandum of understanding (MOU) is usually considered a nonbinding agreement between two or more parties. The MOU outlines terms and details of an understanding regarding requirements and responsibilities of signatories to the agreement. It often serves as the first step towards the formulation of a formal contract or binding agreement. In 2017, the Great Lakes

Commission facilitated the signing of an MOU between Ohio, Indiana and Michigan for mutually adopting a common framework for WQT in the Western Lake Erie Basin (WLEB) (Great Lakes Commission, 2017). Previously, only Ohio had promulgated Water Quality Trading Rules, while Michigan's trading rules had been rescinded, and Indiana had otherwise never formally adopted any such alternative compliance approach. The MOU allowed for interstate trading of phosphorus discharging to the WLEB via the mutually agreed upon compliance framework.

2.1.1.7 Legal Basis for Alternative Compliance System for Contra Costa County

In the context of the development of a regional alternative compliance system, the Contra Costa County System has a legal basis in the following principles:

1. TMDLs are not self-implementing. Rather, the wasteload allocations assigned to point sources must be implemented through limits in NPDES permits and the load allocations assigned to nonpoint sources must be addressed through the state's Section 208 water quality management plans (i.e., California Basin Plans), Section 303(e) continuing planning process, and other nonpoint source control programs.
2. However, NPDES permits must be written with limits/conditions that are consistent with the assumptions and requirements of the TMDL wasteload allocations (40 Code of Federal Regulations 122.44(d)(1)(vii)(B));
3. The MRP includes limits/conditions that specifically allow for the development of an alternative compliance program and the use of Low Impact Development (LID)/GSI[2] to meet the relevant PCBs and mercury limits.

2.1.2 San Francisco Bay Area Alternative Compliance Drivers

Drivers for the Contra Costa County System include the MRP, specifically provisions C.3, C.11, and C.12, the latter two of which implement requirements from the San Francisco Bay PCBs TMDL and mercury TMDL All three of these regulatory documents are described.

2.1.2.1 PCBs and Mercury TMDLs

Fish tissue monitoring in the San Francisco Bay (Bay) has revealed bioaccumulation of PCBs, mercury, and other pollutants. The levels found are considered to pose a health risk to people consuming fish caught in the Bay. As a result of these findings, California has issued an interim advisory on the consumption of fish from the Bay. The advisory led to the Bay being designated as an impaired water body on the Clean Water Act "Section 303(d) list" due to PCBs, mercury, and other pollutants. In response, the SFBRWQCB has developed TMDL water quality restoration programs targeting PCBs and mercury in the Bay. The general goals of the TMDLs

[2] GSI is Infrastructure that uses vegetation, soils, and natural processes to manage water and create healthier urban environments. At the scale of a city or county, green stormwater infrastructure refers to the patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the scale of a neighborhood or site, green stormwater infrastructure refers to stormwater management systems that mimic nature by soaking up and storing water. When used for regulated project compliance under MRP Provision C.3, GSI must be engineered and sized to meet permit specifications.

are to identify sources of PCBs and mercury to the Bay and implement actions to control the sources and restore water quality.

Municipal separate storm sewer systems (MS4s) are one of the PCBs and mercury source/ pathways identified in the TMDL plans. Local public agencies (i.e., Permittees) subject to requirements via NPDES permits are required to implement control measures to reduce PCBs and mercury from entering stormwater runoff and the Bay. These control measures, also referred to as best management practices (BMPs), are the tools that Permittees can use to assist in restoring water quality in the Bay.

2.1.2.1.1 PCBs TMDL

The PCBs TMDL was developed based on a fish tissue target of 10 nanograms (ng) of PCBs per gram (g) of fish tissue. This target is based on a cancer risk of one case per an exposed population of 100,000 for the 95th percentile San Francisco Bay Area sport and subsistence fisher consumer (32 g fish per day) (SFBRWQCB, 2008). A food web model was developed by San Francisco Estuary Institute (SFEI) to identify the sediment target concentration that would yield the fish tissue target; this sediment target was found to be one microgram (µg) of PCBs per kilogram (kg) of sediment. This is equivalent to reducing the total mass of PCBs in the active layer of the San Francisco Bay to 160 kg. SFEI developed a mass budget model that identified the total external load of PCBs to the Bay that would attain a long-term (i.e., equilibrated) PCBs mass in the bay of 160 kg within approximately 30 years (Davis, 2003; SFEI, 2007a). The mass budget model estimated that reduction of the external load to 10 kg of PCBs per year would achieve this goal, assuming a starting Bay-wide PCBs concentration in surface sediment of 4.65 micrograms per kilogram (µg/kg)[3] (SFEI, 2007a). Twenty percent of the estimated allowable external load was allocated to urban stormwater runoff, as described below.

The wasteload allocation (WLA) for PCBs for urban stormwater is 2 kg per year (kg/yr) by 2030. This allocation was developed by applying the required sediment concentration (1 µg/kg) to the estimated annual sediment load discharged from local tributaries. The PCBs TMDL staff report (SFBRWQCB, 2008) estimated the annual sediment load originating from stormwater to be 2,000,000 metric tons (i.e., 2,000,000,000 kg/yr) based on a range of then available estimates and differing methods. This WLA was distributed among the counties based on population in the year 2000. A summary of the allocations for each county is provided in Table 1.

[3] Bay-wide PCBs concentration in surface sediment estimated based on Regional Monitoring Program 2004 – 2006 data (SFEI, 2007a).

Table 1: PCBs Wasteload Allocations by San Francisco Bay Area County

County	Population (year 2000)	Wasteload Allocations (kg/yr)
Alameda	1,440,000	0.5
Contra Costa	790,000	0.3
Marin	240,000	0.1
Napa	120,000	0.05
San Francisco	630,000	0.2
San Mateo	600,000	0.2
Santa Clara	1,600,000	0.5
Solano	290,000	0.1
Sonoma	110,000	0.05
Total		2

The PCBs TMDL Staff Report estimates a total stormwater load, including individual NPDES permitted entities, of 20 kg/yr based on studies conducted by SFEI (2006, 2007b). SFEI calculated this baseline load (2006, 2007b) using three different methods to scale monitoring data (grab sample concentration data from Water Year (WY) 2005;[4] United States Geologic Survey (USGS) continuous discharge and suspended sediment data) from Coyote Creek and the Guadalupe River by area and land use. Subtracting the WLA for urban stormwater from this estimate resulted in a required load reduction of 18 kg/yr (i.e., a 90% reduction) by 2030. Note that the MRP area[5] portion of the 2 kg/yr allocation is 1.6 kg/yr.

Contra Costa's population-based proportion of the 20 kg/yr assumed TMDL baseline is 2.7 kg/yr. The Contra Costa Clean Water Program (CCCWP) is developing a Contra Costa PCBs and Mercury TMDL Control Measure Plan and Reasonable Assurance Analysis (RAA) report (CCCWP, 2020), which will be submitted to the SFBRWQCB in September 2020. This report will include an updated estimate for the baseline PCBs load in urban runoff from Contra Costa County (i.e., as of 2003 – 2005) resulting from an RAA model. An overview of the RAA method is provided in the Quantitative Relationship Between Green Infrastructure Implementation and PCBs/Mercury Load Reductions (CCCWP, 2018).

PCBs TMDL compliance can be demonstrated through two different approaches:

1. Meet the WLA (i.e., monitoring and/or modeling-based compliance demonstration); or
2. Demonstrate the required load reductions can be achieved (i.e., modeling-based compliance demonstration).

2.1.2.1.2 Mercury TMDL

The mercury TMDL addresses two water quality objectives. The first, established to protect people who consume Bay fish, applies to fish large enough to be consumed by humans. The

[4] Although the PCBs TMDL Staff Report states that PCBs loads estimates for the Guadalupe River were based on data collected between 2003 and 2005, SFEI (2006) indicates that the baseline load estimate of 20 kg/yr was based on an extrapolation of monitoring data collected in WY 2005.
[5] Marin, Napa, San Francisco, and Sonoma are not within the MRP boundary.

objective is 0.2 milligrams (mg) of mercury per kg of fish tissue (average wet weight concentration measured in the muscle tissue of fish large enough to be consumed by humans). The second objective, established to protect aquatic organisms and wildlife, applies to small fish (3-5 centimeters in length) commonly consumed by the California least tern, an endangered species. This objective is 0.03 mg mercury per kg fish (average wet weight concentration). To achieve the human health and wildlife fish tissue and bird egg monitoring targets and to attain water quality standards, the Bay-wide suspended sediment mercury concentration target is 0.2 mg mercury per kg dry sediment.

A roughly 50% decrease in sediment, fish tissue, and bird egg mercury concentrations is necessary for the Bay to meet water quality standards. Reductions in sediment mercury concentrations are assumed to result in a proportional reduction in the total amount of mercury in the system, which will result in the achievement of target fish tissue and bird egg concentrations (SFBRWQCB, 2004).

The urban stormwater runoff load to the San Francisco Bay is estimated to be equivalent to 116 kg/yr, as reported in the San Francisco Bay Regional Monitoring Program (RMP) for Water Quality's Sources, Pathways, and Loadings Report (McKee et al., 2015), which is less than the Mercury TMDL Staff Report reported load of 160 kg/yr[6] (corresponding to the "baseline year" of 2003). The WLA for urban stormwater is 82 kg/yr, allocated among San Francisco Bay Area urban stormwater MS4 entities (SFBRWQCB, 2006). A summary of the WLA and load reductions required for each urban stormwater entity subject to the TMDL is provided in Table 2 below (SFBRWQCB, 2006).

Table 2: Mercury Wasteload Allocations by San Francisco Bay Area Entity

Entity	Wasteload Allocation (kg/yr)[1]
Santa Clara Valley Urban Runoff Pollution Prevention Program	23
Alameda Countywide Clean Water Program	20
Contra Costa Clean Water Program	11
San Mateo County Stormwater Pollution Prevention Program	8.4
Vallejo Sanitation and Flood Control District	1.6
Fairfield-Suisun Urban Runoff Management Program	1.6
American Canyon	0.14
Sonoma County area	1.6
Napa County area	1.6
Marin County area	3.3
Solano County area	0.81
San Francisco County area	8.8
Total	82

[1] Listed in Table 4-w of Appendix A in the Mercury TMDL Staff Report (SFBRWQCB, 2006).

[6] This loading assumes an annual sediment load of 410,000,000 kg/yr of sediment with a concentration of 0.38 mg/kg (parts per million) (SFBRWQCB, 2006). Although the estimates were based on monitoring data collected in previous years, the TMDL states the baseline year as 2003.

Similar to PCBs, the updated mercury baseline load summarized in the CCCWP PCBs and Mercury TMDL Control Measure Plan and RAA should be used to adjust the required mercury load reduction for Contra Costa County.

Mercury TMDL compliance can be demonstrated through the following three approaches[7]:

1. Show mercury concentrations are below 0.2 milligrams per kilogram (mg/kg) on a countywide level (i.e., monitoring-based compliance demonstration);
2. Meet the WLA (i.e., monitoring and/or modeling-based compliance demonstration);[8] or
3. Demonstrate the required load reductions can be achieved (i.e., modeling-based compliance demonstration).

2.1.2.2 Municipal Regional Permit

NPDES permit requirements associated with Phase I municipal stormwater programs and Permittees in the San Francisco Bay Area are included in the MRP, which was issued to 76 cities, counties and flood control districts in 2009 and revised in 2015.

The MRP was amended on February 13, 2019, to add the cities of Antioch, Brentwood, Oakley, and the eastern portions of unincorporated Contra Costa County and the Contra Costa County Flood Control & Water Conservation District (the East County Permittees), which are located within the jurisdiction of the Central Valley Regional Water Quality Control Board (Region 5) and were previously covered under a separate Joint Municipal NPDES Permit titled "East Contra Costa County Municipal NPDES Permit." The East County Permittees are not subject to the PCBs and mercury TMDLs, although they have been implementing PCBs and mercury control measures. The amended MRP specifically exempts the East County Permittees from MRP Provisions C.11 and C.12 (mercury controls and PCBs controls, respectively), but does incorporate requirements for the Sacramento-San Joaquin Delta Estuary Methylmercury TMDL.

MRP Provision C.3 is primarily focused on appropriate source control, site design, and stormwater treatment and hydromodification management measures for new development and redevelopment projects. The provision describes which development projects are considered a Regulated Projects and must implement LID practices. LID treatment measures are stormwater treatment facilities that capture stormwater for harvesting and use, infiltration, evapotranspiration, and/or biotreatment. GSI facilities are considered LID treatment measures. GSI/LID treatment measures must be sized per the MRP specified numeric sizing criteria.

MRP Provision C.3.e specifically allows alternative compliance for Regulated Projects:

> *"The Permittees may allow a Regulated Project to provide alternative compliance with Provision C.3.b in accordance with one of the two options listed below:*

[7] Detailed documentation requirements for demonstration of these approaches are summarized in the Mercury TMDL Staff Report (SFBRWQCB, 2006).
[8] Modeling-based compliance demonstration requires monitoring-based empirical inputs to conduct the analyses.

(1) Option 1: LID Treatment at an Offsite Location

Treat a portion of the amount of runoff identified in Provision C.3.d for the Regulated Project's drainage area with LID treatment measures onsite or with LID treatment measures at a joint stormwater treatment facility ***and*** *treat the remaining portion of the Provision C.3.d runoff with LID treatment measures at an offsite project in the same watershed. The offsite LID treatment measures must provide hydraulically-sized treatment (in accordance with Provision C.3.d) of an equivalent quantity of both stormwater runoff and pollutant loading and achieve a net environmental benefit.*

(2) Option 2: Payment of In-Lieu Fees

Treat a portion of the amount of runoff identified in Provision C.3.d for the Regulated Project's drainage area with LID treatment measures onsite or with LID treatment measures at a joint stormwater treatment facility ***and*** *pay equivalent in-lieu fees*[9] *to treat the remaining portion of the Provision C.3.d runoff with LID treatment measures at a Regional Project.*[10] *The Regional Project must achieve a net environmental benefit.*

(3) For the alternative compliance options described in Provision C.3.e.i.(1) and (2) above, offsite and Regional Projects must be completed within three years after the end of construction of the Regulated Project. However, the timeline for completion of a Regional Project may be extended, up to five years after the completion of the Regulated Project, with prior Executive Officer approval. Executive Officer approval will be granted contingent upon a demonstration of good faith efforts to implement the Regional Project, such as having funds encumbered and applying for the appropriate regulatory permits."

In addition to LID/GSI requirements for new and redevelopment, Subprovision C.3.j required the Permittees to develop a Green (Stormwater) Infrastructure Plan for inclusion in their 2019 Annual Reports. The GSI Plans included a mechanism to prioritize and map areas for potential and planned green infrastructure projects, both public and private, on a drainage-area-specific basis, for implementation by 2020, 2030, and 2040. Subprovision C.3.j also includes an early implementation component that requires Permittees to review capital projects for opportunities to include GSI.

MRP Provisions C.11 and C.12 require implementation of control programs for mercury and PCBs, respectively. The required control programs include load reduction assessments, implementation of GSI to specifically reduce loads of PCBs and mercury, implementation of

[9] As indicated in the MRP, *"**In-lieu fees** – Monetary amount necessary to provide both hydraulically-sized treatment (in accordance with Provision C.3.d) with LID treatment measures of an equivalent quantity of stormwater runoff and pollutant loading, and a proportional share of the operation and maintenance costs of the Regional Project."*

[10] As indicated in the MRP, *"**Regional Project –** A regional or municipal stormwater treatment facility that discharges into the same watershed as the Regulated Project."*

other control measures, load reduction accounting, development of a TMDL Implementation Plan and RAA, and other reporting.

2.1.3 Context and Considerations of Phase II General Permit

San Francisco Bay Area Phase II municipal stormwater programs, including Marin County and its Cities, Napa County and its Cities, City and County of San Francisco,[11] Solano County and the City of Benicia, and Sonoma County and the Cities of Petaluma and Sonoma, along with non-traditional facilities that can include schools, universities, prisons, hospitals, military bases, state and regional parks and office building complexes, are covered by the NPDES General Permit For Waste Discharge Requirements (WDRs) For Storm Water Discharges From Small MS4s[12] (Phase II General Permit) issued in 2013 and revised in 2015, 2016, and 2018 (California State Water Resources Control Board, 2013).

Like MRP Provision C.3, the Phase II General Permit Provision E.12 is primarily focused on appropriate source control, site design, and stormwater treatment measures in new development and redevelopment projects. The provision describes which development projects are considered Regulated Projects and must implement LID practices. LID treatment measures must be sized per the Phase II General Permit specified numeric sizing criteria (which are similar to Phase I criteria).

The Phase II General Permit Provision E.12.I specifically allows alternative compliance for Regulated Projects:

> *"A Permittee may propose alternative post-construction measures in lieu of some or all of Section E.12 requirements for multiple benefit projects. Multiple-benefit projects include projects that may address any of the following, in addition to water quality: water supply, flood control, habitat enhancement, open space preservation, recreation, climate change. Multiple-benefit projects may be applied at various scales including project site, municipal or sub-watershed level. Multiple-benefit projects may include, but are not limited to, projects developed under Watershed Improvement Plans (Water Code §16100 et seq.), IRWMP implementation and green infrastructure projects. Multiple benefit projects must be equally or more protective of water quality than Section E.12. requirements. The Regional Water Board or the Executive Officer may approve alternative post-construction measures for multiple-benefit projects, as described above, after an opportunity for public comment, if the Regional Water Board or Executive Officer finds that the alternative measures are consistent with the MEP standard."*

The Phase II General Permit is in the renewal process with a scheduled reissuance date of late 2021. During the June 2020 Workshops on the Phase II General Permit renewal process, the State indicated that additional alternative compliance language will be included in the reissued permit to provide more detailed requirements, such as clarifying that off-site projects need to be

[11] Areas draining to MS4 only.
[12] Water Quality (WQ) Order 2013-0001-DWQ NPDES No. Cas000004 as amended by Order WQ 2015-0133-Exec, Order WQ 2016-0069-Exec, WQ Order 2017-XXXX-DWQ, Order WQ 2018-0001-Exec, And Order WQ 2018-0007-Exec.

in the same watershed as the Regulated Projects and that in-lieu fees may be collected. These requirements are like the current region-specific alternative compliance requirements enacted by the Central Coast Regional Water Quality Control Board in 2013 (Central Coast Regional Water Quality Control Board, 2013).

2.2 Environmental Clearance (CEQA Considerations)

The California Environmental Quality Act (CEQA) requires state and local government agencies to inform decision makers and the public about potential environmental impacts of proposed projects, and to mitigate any significant environmental effects to the extent feasible. A "project" is defined under CEQA as "an activity which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment" (Public Resources Code Section 21065). The Contra Costa County System would guide future alternative compliance actions under the MRP and TMDL. The Contra Costa County System does not meet the definition of a "project" under CEQA because the Contra Costa County System does not authorize any activity that could result in a physical change on the environment.

Subsequent to adoption of the Contra Costa County System, public agencies may apply the Contra Costa County System to future development projects and projects that would create water quality benefits and associated credits. Any subsequent development project or water quality crediting project would be subject to environmental review under CEQA. Key considerations in determining the appropriate approach to environmental review for subsequent projects include defining the CEQA "Lead Agency" and defining the "whole of the action".

Pursuant to CEQA, the Lead Agency is "the public agency which has the principal responsibility for carrying out or approving a project" that is subject to CEQA (Public Resources Code Section 21067). CEQA defines a "project" to include the "whole of the action". The "whole of the action" includes all activities necessary for operation of a project and reasonably foreseeable consequences of approving a project. CEQA also requires evaluation of the impacts of mitigation measures in an environmental document. The definition of project under CEQA is intended to avoid piecemealing or segmenting of projects into two or more pieces because dividing a project into pieces could allow a Lead Agency to minimize the apparent environmental impacts of a project or affect the ability to develop comprehensive mitigation strategies. If a Lead Agency needs to grant more than one approval for a project or if more than one government agency must grant an approval, only one CEQA document should be prepared. Subsequent to adoption of the Contra Costa County System, agencies will need to evaluate whether an alternative compliance project is a reasonably foreseeable consequence of any development project under review and verify lead agency and responsible agency status.

The Contra Costa County System would allow for development of projects that would require mitigation in one jurisdiction and projects that would generate credits and serve as mitigation in other jurisdictions. Where the Contra Costa County System is applied as mitigation to address project impacts, the mitigation must meet the requirements of CEQA Guidelines 15126.4, which

requires mitigation to be enforceable,[13] not deferred,[14] roughly proportional to the impact, and have a clear nexus to the impact. CEQA recommendations to ensure that use of the Contra Costa County System complies with CEQA mitigation requirements are provided in Section 10.

2.3 Additional Considerations for Alternative Compliance Approaches and PCBs and Mercury

2.3.1 2003 USEPA Water Quality Trading Policy

WQT programs have traditionally been utilized to provide a compliance approach for watersheds with impairments for nutrients, sediment and temperature. In 2003, USEPA Office of Water released the agency's policy statement on Water Quality Trading to encourage the development of WQT programs for water quality pollutants. In the policy statement, USEPA provided guidance for when trading may occur, and elements of trading programs. Pertaining to bioaccumulative toxics, the 2003 policy states that:

> *"EPA does not currently support trading of pollutants considered by EPA to be persistent bioaccumulative toxics (PBTs). EPA would consider a limited number of pilot projects over the next two to three years to obtain more information regarding trading of PBTs. EPA believes pilot projects may be appropriate where the predominant loads do not come from point sources, trading achieves a substantial reduction of the PBT traded and where trading does not cause an exceedance of an aquatic life or human health criterion. Based on the findings of these pilot projects, EPA will consider making revisions to its policy"* (USEPA, 2003).

The EPA's 2003 Policy is guidance and should be considered but should not ultimately decide the alternative compliance approach for the Contra Costa County System in regards to bioaccumulative toxins.

2.3.2 2019 USEPA Water Quality Trading Memorandum

The 2019 memorandum "Updating the USEPA Water Quality Trading Policy to Promote Market-Based Mechanisms for Improving Water Quality" acknowledged that the 2003 USEPA Policy was not intended to be prescriptive (USEPA, 2019). It provides new market-based principles to support WQT and other market-based programs that can provide water quality improvements at a lower cost. Some of these principles are relevant to the development of the Contra Costa County System including:

[13] Mitigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments. In the case of the adoption of a plan, policy, regulation, or other public project, mitigation measures can be incorporated into the plan, policy, regulation, or project design.

[14] The specific details of a mitigation measure, however, may be developed after project approval when it is impractical or infeasible to include those details during the project's environmental review provided that the agency (1) commits itself to the mitigation, (2) adopts specific performance standards the mitigation will achieve, and (3) identifies the type(s) of potential action(s) that can feasibly achieve that performance standard and that will considered, analyzed, and potentially incorporated in the mitigation measure. Compliance with a regulatory permit or other similar process may be identified as mitigation if compliance would result in implementation of measures that would be reasonably expected, based on substantial evidence in the record, to reduce the significant impact to the specified performance standards.

- "EPA encourages stakeholders to consider allowing credit to be generated and verified based on scientifically defensible estimates of pollutant reductions (to discourage impediments to market-based programs related to demanding too much precision in measuring or quantifying pollutant reductions).
- Market-based programs should include adaptive management concepts to allow improvement and refinement over time without sacrificing regulatory certainty for existing market participants.
- Policy makers and stakeholders pursuing a small market-based program should consider structuring the program so it can be integrated into a larger regional program in the future.
- USEPA encourages simplicity and flexibility in implementing baseline concepts.
- USEPA encourages the use of innovative financing mechanisms to promote integrated point and nonpoint pollutant reduction strategies."

This 2019 memorandum highlighted expanded support for water quality trading but did not provide further comment on support for the trading of bioaccumulative toxics (Ross, 2019).

2.3.3 System Considerations Regarding EPA Water Quality Trading Policy

Regardless of the alternative compliance approach selected, the final Contra Costa County System should seek to abide by the 2003 WQT Policy principles laid out by USEPA for potential PBT pilot projects (i.e., predominant load not coming from point sources, will achieve a substantial reduction of the PBT, and no exceedance in aquatic life or human health criteria).

At the time of this writing, Contra Costa County jurisdictions have decided to explore Regional Alternative Compliance Systems that will meet their stated objectives and conform with the USEPA 2019 WQT Memorandum and 2003 WQT Policy. See additional details in Section 10.

3 ALTERNATIVE COMPLIANCE SYSTEM COMPONENTS

Many of the core components of existing alternative compliance systems were identified in the 2003 EPA Water Quality Trading Policy (USEPA, 2003) and adapted to meet the needs of various regulatory contexts (USEPA, 2003). This section defines and summarizes considerations for the various components typically included as part of alternative compliance programs. Alternative compliance programs relevant for the Contra Costa County System that have been implemented are summarized in Section 4 and a crosscut analysis provided as Appendix A. Appendix A includes the characteristics of these components for each of the programs summarized. Considerations for Contra Costa County System components and next steps are included in Section 10.

3.1 System Metric

An alternative compliance system metric (metric) is a measuring unit of equivalent discharge reduction that reflects both the regulatory pollution control requirement and the measure of estimated outcome at the alternative source of control. More details and specifics relating to metric selection, calculation methods, and considerations are provided in Section 5.

3.2 Eligible Entities

Specific point source and nonpoint source groups that participate in alternative compliance programs traditionally encompass agriculture and NPDES permittees, the latter including industrial wastewater discharges, municipal WWTPs, and stormwater dischargers (e.g., MS4s). Alternative compliance systems may limit the specific source groups that may participate in either the generation or purchase of a unit of metric, or the extent to which they can participate. Eligibility may also be determined based on whether a participating entity is public or private, a new or existing developer, or size of development.

Potential sellers may include, but are not limited to MS4s, private property owners, third parties, and entrepreneurial investors. Potential buyers may include other MS4s, individual NPDES Permittees, credit aggregators, agencies, and developers.

3.3 Eligible Transactions

The eligible entities in alternative compliance systems will define the allowable types of transactions. Traditionally, these transactions can occur between a combination of point sources (PSs) with well-identified, piped discharges, and nonpoint sources (NPSs) where surface water discharges are diffuse and not confined to a pipe.[15] Alternative compliance systems can be arranged to allow transactions between:

- Point Source - Point Source (PS-PS).
- Point Source - Nonpoint Source (PS-NPS).
- Nonpoint Source - Nonpoint Source (NPS-NPS).

[15] For the System, NPS sources may include diffused sources with exposed contaminated soil such as a brownfield site.

Eligible transactions can also apply to specific groups of sources.

3.4 Trade Ratios

The concept of trade ratios, also known as scaling factors, was developed in water quality trading systems but has been utilized in other approaches to alternative compliance. Trade ratios are a numeric value, or multiplier, that is applied to a pollution reduction metric to convert it into an exchangeable, scaled unit of metric (i.e., credit). Trade ratios can be used for a number of considerations, including those summarized below[16]:

1. *Uncertainty:* Trade ratios can be used to manage the uncertainty of pollutant reductions, either from specific practices/activities or from the system as a whole. Trade ratios can either be developed for specific practices/activities or a single trade ratio can be used for all pollutant reductions to ensure that water quality goals of the alternative compliance are accomplished.
2. *Equivalency:* Trade ratios can also be used to ensure equivalency of pollution reductions either across distance between where the pollutant reduction is generated and the purchaser.[17] Trade ratios have also been explored as a potential solution for the exchange between different units of metrics (i.e., stream biological function and nutrient loading).
3. *Location:* Trade ratios can be used to account for the location of the source in the watershed relative to a downstream, area of concern. This may include considerations such as land use type.
4. *Delivery:* Trade ratios can also be used to account for the distance and unique watershed features that affect pollutant fate and transport between exchanging entities.
5. *Credit Reserve and/or Credit Retirement:* Trade ratios may be applied to exchanges to provide a reserve pool of credits that may be used to insure against unforeseen credit losses due to project failure. Some programs will use a trade ratio to permanently retire a percentage of credits to ensure a net water quality benefit.
6. *Incentives/Disincentives*: Trade ratios can also be utilized in creative ways to incentivize or disincentivize the generation of units of metric that provide additional benefits. This may include the use of a favorable ratio for units of metric that are generated in disadvantaged communities or adhere to a regional plan or vision. Favorable trade ratios can also be applied to generated units of metrics that provide ancillary environmental benefits such as flood control, climate resiliency, infiltration, and water supply benefits.

Trade ratios in alternative compliance programs are generally in the range of 1:1 to 2:1 but have been observed as high as 4:1 (Morgan and Wolverton, 2005). Trade ratios can also be variable based on location, land use, and control measure type.

[16] These categories of considerations are introduced in USEPA's Water Quality Trading Toolkit for Permit Writers (USEPA, 2009). Additional context is provided by authors.
[17] This type of trade ratio is often applied as a function of distance. An equivalency trade ratio may be applicable in the System for PCBs given their affinity to varying grain sizes of sediment. Thus, spatial variations in sediment composition and PCBs concentrations may require some level of equivalency factor application to ensure there is kg to kg load reduction equivalence in alternative compliance applications.

3.5 Exchange Baseline

Exchange baselines refer to any conditions that a source must meet before generating a metric of water quality improvement and provide a point of reference for measuring the unit of water quality benefit generated. Exchange baselines are generally included in alternative compliance systems based on existing regulatory requirements and are not allowed to be exchanged.

1. *Practice-based Exchange Baselines*: Alterative compliance systems may require sources to implement specific practices or pollutant controls onsite before generating a unit of metric. This is seen in the Virginia Stormwater Management Program that requires agricultural nonpoint sources to implement nutrient management, cover cropping, livestock stream exclusion, and/or field buffers before generating permanent phosphorus offsets for new development (Virginia Department of Environmental Quality, 2008).
2. *Loading/Condition-based Exchange Baselines*: Alternative compliance programs will more frequently use a baseline that is based on loading conditions related to the source generating the unit of metric. This may be as simple as the source's current conditions or may be set at a loading condition equal to a regulatory/TMDL allocation. This type of baseline can also be modified over time within the system to create interim milestones for pollutant reduction generators. It is notable that setting more stringent baselines for a system may unintentionally discourage some pollutant reduction generators from participation.

3.6 System Restrictions/Restricted Waters

Alternative compliance systems may place restrictions on both the generation of pollutant reductions and how purchased or traded pollutant reductions can be utilized by a purchasing entity to meet regulatory requirements.

3.6.1 Restrictions on Generation of Alternative Compliance Metric

Restrictions on the generation of water quality benefits are not uncommon in alternative compliance programs. Restrictions observed in existing systems include, but are not limited to:

- Location and land use,
- Practice restrictions due to lease or restrictive covenants and permanent easements,
- Length of time that a practice/activity can generate water quality benefits,
- Stacking or bundling benefits (see Section 5.5 below), and
- Utilization of public monies.

3.6.2 Restrictions on Use of Alternative Compliance Metric

Restrictions on the purchase or use of water quality benefits observed in existing systems include, but are not limited to:

- Purchase of water quality benefits in the same local watershed/system only;
- Purchase of water quality benefits in the same jurisdiction (where watersheds cross multiple jurisdictions);

- Purchase of upstream water quality benefits only;
- Purchase of downstream water quality benefits with a discounting factor;
- Amount of drainage area draining into alternative control measure versus onsite conditions; and
- Cap on amount of water quality benefit requirements that can be satisfied through the offsite program.

4 ALTERNATIVE COMPLIANCE APPROACHES

A variety of alternative compliance approaches are being used in programs throughout the nation to facilitate compliance with water quality regulations using alternative means. These approaches also allow for an entity seeking compliance to purchase, or obtain via exchange, water quality units of "metric" (see Section 5) or credits, generated at an alternative off-site location by an allowable control measure (see Section 6). The array of water quality requirements and needs of regulated dischargers in individual watersheds is reflected by the wide range of approaches currently used. Outlined here are short summary descriptions of existing alternative compliance approaches with relevance for the Contra Costa County System and example programs for each alternative compliance approach. These example programs are also referenced in the Appendix A Crosscut Analysis, with links to program pages with additional information. Preliminary recommendations and next steps for the Contra Costa County System approach are provided in Section 10.

4.1 Water Quality Trading Programs

WQT is a market-based approach for compliance with a water quality-based effluent limitation (WQBEL) in NPDES permits that may be driven by a water quality standard or TMDL. In a WQT Program, water quality benefits generated through control measures can be traded to regulated dischargers within the same trading area to meet permit requirements. WQT programs have emerged to provide cost-effective pollutant reductions for regulated dischargers from offsite sources. These sources are traditionally generated from agricultural control measures but may include stormwater control measures. Examples of programs with relevance to the project setting are provided as follows.

4.1.1 Laguna de Santa Rosa Nutrient Offset Program

California's NCRWQCB approved the Laguna de Santa Rosa Nutrient Offset Program in 2008 and adopted the Water Quality Trading Framework for the Laguna de Santa Rosa Watershed in 2018 (NCRWQCB, 2018). The WQT framework for this program allowed NPDES Permittees and unregulated nonpoint sources to trade phosphorus load reduction (in pounds per year, lbs/year) credits. The program does not prohibit point source dischargers from trading amongst themselves or credit-generating entities from using credits for their own use. At its launch, the Laguna de Santa Rosa Nutrient offset program did not develop a pre-approved list of practices/projects and opted instead to approve control measures on an on-going basis. Control measures and associated documents (quantification methods, practice standards, and review and verification procedures) used to generate credits are subject to public review and approval by the NCRWQCB Executive Officer on an ongoing basis. Once a practice is approved, the practice is considered pre-qualified for future use. To date, the program has only generated nutrient offset trading from four nutrient offset projects for the City of Santa Rosa. The Sonoma County Resource Conservation Distract has assisted the City in identifying potential crediting projects in the informal role of a broker between parties.

4.1.2 Virginia Nutrient Trading Programs

Virginia currently has several WQT programs to meet the varying regional water quality goals of their regulated dischargers. Virginia's Nutrient Trading for MS4s allows Virginia MS4s to meet

their water quality requirements for stormwater runoff through the purchase of phosphorus, nitrogen, and sediment credits (lbs/year) from nonpoint source credit providers from within the same river basin (Stephenson, K. et al., 2016).

Urban land developers subject to Virginia Stormwater Management Program are required to implement runoff control practices to manage stormwater. Small developments can meet this requirement through purchasing permanent phosphorus reductions from nonpoint sources that provide permanent reductions by converting land to less nutrient-intensive uses.

Virginia municipal and industrial wastewater treatment plants in the Chesapeake Bay Watershed may meet their nitrogen and phosphorus wasteload allocations through point source-to-point source credit trading. Existing sources may buy point source credits while new sources must offset all loads and may purchase nutrient credits from nonpoint sources if no point source credits are available.

4.1.3 Maryland Nutrient Trading Program

Maryland Department of the Environment (MDE) established Maryland's compliance-based Nutrient Trading Program in 2018 to allow the purchase of nitrogen, phosphorus, and sediment load reductions from agricultural sources by stormwater, wastewater, and industrial wastewater dischargers (Maryland Department of the Environment, 2020). As part of administering the Maryland Nutrient Trading Program, MDE has created tools to facilitate trading between credit buyers and generators, including an online tool that calculates baselines, nutrient and sediment reductions from off-site control measures, delivery ratios for credits (the Maryland Nutrient Tracking Tool), a registry to track generated and sold water quality credits, and the publicly-accessible MDE Trading Market Board to facilitate negotiation and communication between credit generators and buyers (see additional program details and links in Appendix A).

Restrictions: In the Maryland Water Quality Trading Program, credit generators from agricultural sources are not allowed to utilize public monies for projects (Maryland Department of the Environment, 2020).

4.2 Water Quality and Stormwater Crediting and Offset Programs

Since the emergence of WQT, emerging market-based programs in the United States have utilized many of the core principles and structure of WQT programs with a focus on water quality benefits outside of the traditionally traded pollutants. WQT systems have typically been utilized to achieve a formal load reduction cap on water pollutants in a defined watershed. In contrast, other crediting and offset programs have been developed to have more flexible applications than WQT, such as their use in meeting new development and urban growth stormwater requirements. These programs also provide a pathway for exchanging nontraditional water benefits that may otherwise be limited by the USEPA 2003 WQT Policy such as PBTs. Relevant examples are highlighted here.

4.2.1 Lake Simcoe Phosphorus Offset Program

Located in Southern Ontario, Canada, the Lake Simcoe Basin is projected to experience substantial population growth in the next decade. In response, the Lake Simcoe Protection Plan assigned a maximum phosphorus loading of 44 tonnes/year from all sources and requires that

future population growth be accommodated without an increase in overall phosphorus loading (Ogilvie, 2013). The Lake Simcoe Region Conservation Authority (LSRCA) identified an offset program as an appropriate approach for meeting these requirements and developed the Lake Simcoe Offset Program. The Lake Simcoe Offset Program allows for point source-point source, nonpoint source-point source, and nonpoint source-nonpoint source offset exchanges. However, the principal source and use of offsets is for new or infill development, which is required to install a minimum level of advanced on-site stormwater controls but meet a net-zero stormwater phosphorus discharge. Where such controls cannot meet the zero-discharge requirement, developers are allowed to purchase credits generated by MS4 infrastructure retrofits and LID measures. This also provides a funding source for municipalities that have insufficient funding to do such retrofits on their own. Offset projects remain owned by the municipality, which also assumes long-term operations and maintenance (O&M) for the project. The price of the offsets account for these O&M needs (XCG Consultants LTD and Kieser & Associates, LLC, 2014). Developers bought into the program when it was determined the costs of the offset program would be about $2,000/new home. Developers considered the cost small in comparison to potential revenue, given that new home prices averaged $800,000.

The Lake Simcoe Offset Program manages uncertainty related to pollution reduction in several ways. First, an offset ratio of 2.5:1 is applied to adjust for both the location and uncertainty of offset projects within the same subbasin, as well as the efficiency of phosphorus load reduction of certain control measures. Additionally, the program utilizes a reserve credit pool where credits may be generated from agricultural projects from LSRCA's Landowner Environmental Assistance Program (LEAP) in the case of retrofit failure or underperformance. This reserve pool of credits generated from LEAP is intended to serve as a temporary and occasional measure to provide insurance during the first phase of the program.

4.2.2 Lake Tahoe Crediting Program

Lake Tahoe has experienced a decline in water clarity since the late 1960s which prompted TMDL development for fine sediment, phosphorus, and nitrogen loads (Lahontan California Regional Water Quality Control Board and Nevada Division of Environmental Protection, 2011). Feasibility studies in Lake Tahoe recognized that cost-effective reductions for these pollutants would come from nonpoint source urban control measures such as road operation and management (e.g., street sweeping) and treatment/parcel BMPs (Environmental Incentives, 2015). In 2011, the Lake Clarity Crediting Program was adopted by the Lahontan Regional Water Quality Control Board in California and the Nevada Division of Environmental Protection. The program allows regulated MS4 dischargers to purchase a Lake Clarity Credit from other MS4s to meet individual TMDL load reductions goals in each stormwater permit cycle. Credits are bundled and constituted of sediment, nitrogen, and phosphorus reductions.

The Lake Tahoe Crediting Program has been successful, with urban implementers basin-wide achieving 118% of the total credits targeted and nearly all implementers surpassing their individual credit targets (Environmental Incentives, 2020). This program uses a unique approach to crediting by weighting each constituent pollutant with a multiplier and then summing these together to create a bundled Lake Clarity Credit. The relative weights for each constituent are set by Lahontan Water Board and Nevada Division of Environmental Protection based on their

understanding of the impact of each pollutant on lake clarity. These weights can be changed through a TMDL program adjustment according to the needs of Lake Tahoe.

4.2.3 Washington, D.C. Stormwater Retention Credit Trading Program

In 2013, Washington D.C. required new development and renovation projects within D.C. to capture and retain the stormwater runoff produced from specified design storms from their property (District of Columbia Department of the Environment, 2013). In response, the District Department of Energy and Environment (DOEE) created the first Stormwater Retention Credit (SRC) Market which would use captured stormwater volume as their metric for the program. Retained stormwater volume was utilized as a proxy to represent load reductions of nitrogen, phosphorus, and sediment for the Chesapeake Bay TMDL.

The Stormwater Retention Credit Trading Program experienced limited trades in its early years. Limited trading at the time was attributed to timing, uncertainty, and risk for both buyers and sellers. The generation of storm retention credits can be lengthy as voluntary retrofits must go through the plan review process to meet district BMP specifications. Additionally, entities were hesitant to participate as buyers because utilization of SRCs would lock the property into purchasing SCRs annually in perpetuity at a variable cost. Lastly, sellers did not want to implement a retrofit project without first identifying a buyer (Hoffman, n.d.). Since the program's initial iteration, DOEE has attempted to resolve these issues surrounding uncertainty and risk by using a Buyer-of-last-Resort mechanism and providing a Price Lock Program in 2017 for eligible SRC generators. This allowed DOEE to give SRC generators the option to sell their generated SRCs to DOEE at fixed prices if a buyer cannot be found, which DOEE can provide to eligible buyers at a discounted price (District of Columbia Department of Energy & Environment, 2020). The Price Lock Program allows sellers to look for more competitive pricing while providing security that their investment will make an expected minimum amount of revenue, allowing DOEE to supplement the market with financial assurances as opposed to acting as the only buyer. Although it is still too early to determine whether the Price Lock Program is a success, early indications are promising as the number of sales, total SRCs, and total value of SRCS sold have continued to grow year after year since the roll out of the program.

Restrictions: In Washington, D.C.'s Stormwater Retention Credit Program, projects that drain to a combined sewer system may comply with the entirety of their stormwater obligations through the purchase of Stormwater Retention Credits (District of Columbia Department of Energy & Environment, 2020b). However, all other projects are only allowed to meet half of their stormwater obligation offsite (Hoffman, n.d.).

4.2.4 North Carolina Ecosystem Enhancement Program Offset

In 2004, North Carolina began implementing a nutrient offset program for specific watersheds with nitrogen and phosphorus impairments, including the Tar-Palico, Neuse River Basin, Falls Lake Water, and Jordan Lake Watershed. Nutrient impacts from new and existing development can be offset by environmental restoration projects conducted by private mitigation banks or North Carolina's Department of Mitigation Services through various nonpoint source credit generators (North Carolina Department of Environmental Quality, 2020). New development may create or purchase nutrient credits generated by stormwater control measures only, while existing

development may utilize nutrient credits generated from either stormwater control measures or other nonpoint sources, such as agricultural buffer restoration or discharging sand filters.

4.2.5 City of San Diego Offsite Stormwater Alternative Compliance Program

The City of San Diego is a Permittee under the San Diego Regional MS4 Permit. This permit allows the City of San Diego to authorize new development and redevelopment projects (public and private) to use offsite projects to meet required onsite BMP requirements. This approach may be used to comply with the Permit's requirements for pollutant control and/or hydromodification control on Priority Development Projects (Mosolgo and Gummadi, 2016; County of San Diego Watershed Protection Program, 2018; City of San Diego, 2020).

The City of San Diego is currently developing a credit system as their preferred system, citing that a credit program would allow broader participation in the program and a shorter timeframe to initiate. The City has developed a Draft Program Standards Document, which currently serves as the draft framework for the proposed program. The City is currently in the process of preparing an Environmental Impact Report (EIR) to assess potential program impacts and provide additional technical and legal support to a potential program. The program itself is not yet operating.

Under the program, offsite projects could include structural BMPs such as retrofit, regional, and water supply BMPs and natural system management practices such as stream rehabilitation, land restoration, and land preservation. Credit types and calculations are based on the Regional Water Quality Equivalency Guidance Document (WQE; County of San Diego Watershed Protection Program, 2018) which establishes the technical requirements for demonstrating equivalent onsite and offsite benefit. Other elements of the proposed program include a project and credit tracking tool, and template legal agreements for system implementation. Additional details of the draft City of San Diego program are described in later sections of this Literature Review.

Restrictions: The following restrictions have been identified to govern the offsite alternative control measures that could be used by buyers depending credit type:

- For the hydromodification metric, use would be subject to whether the development project is new development, redevelopment increasing impervious area, or redevelopment with no increase in impervious area, and may include upstream location requirements or additional restrictions.
- For the pollutant control metric, use restrictions would include requirements for buying water quality benefits from an offsite control measure from the same local watershed/system (additional location requirements may apply in TMDL watersheds) (County of San Diego Watershed Protection Program, 2018).

4.3 Wetland and Stream Compensatory Mitigation Mechanisms

Under CWA Section 404, unavoidable resource losses to wetland, stream, and other aquatic resources areas can be mitigated through three compensatory mitigation mechanisms that provide restored, established, enhanced, or preserved habitat restoration including (USEPA, 2015):

- *Permittee-Responsible Mitigation:* Permittee performs the required mitigation after the permit is issued and retains responsibility for the implementation and maintenance of the mitigation.
- *Mitigation Banking:* Upon approval of regulatory agencies, Permittees can purchase wetland and stream mitigation credits generated from an offsite mitigation bank. Mitigation banks are sponsored by public or private mitigation bankers and are secured and initiated in advance of debits. Credits are based on feet of stream or acres of wetland restored/created and tracked online by the United States Army Corps of Engineers (USACE) on the Regulatory In-lieu fee and Bank Information Tracking System (RIBITS).
- *In-lieu Fee:* Permittee provides funds in the form of an in-lieu fee to an administering government or non-profit conservation organization. These fees are then pooled to build and maintain offsite mitigation sites. The USACE and other permitting agencies can approve advance credits for sale prior to transfer; however, use of advance credits requires mitigation at a higher ratio to offset the duration of impact prior to mitigation.

4.3.1 North Carolina Ecosystem Enhancement Program - In-lieu Fee Mitigation Program

North Carolina's Department of Mitigation Services is one of the longest running mitigation in-lieu fee programs and has implemented over 600 projects to protect over four million feet of stream and 29,000 acres of wetland (North Carolina Department of Environmental Quality, 2019). Department of Mitigation Services currently operates four different in-lieu fees including a North Carolina Department of Transportation stream/wetland program, statewide stream/wetland program, riparian buffer program, and nutrient offset program. In the nutrient offset program, developers can choose to either purchase a nutrient offset or a "buy-down option" and request to pay an in-lieu fee to North Carolina's Ecosystem Enhancement Program.

4.4 Payment for Ecosystem Services

Payment for ecosystem services generally refers to a system that provides incentives for providers to supply an ecological service. In the context of urban settings and stormwater, this concept has been explored by municipalities and utilities to provide water quality benefits for the watershed through forest management practices.

4.4.1 Denver Water

The potential of major wildfires in the Upper South Platte River watershed presents a serious threat to Denver's drinking water supply. In 2011, Denver Water, the utility that provides drinking water to the metropolitan area, signed a $33 million cost-sharing agreement with the Forest Service to fund tree-thinning and prescribed burns on 36,000 acres of forest in the watershed (LaRubbio, 2012). Denver Water utilized a utility fee, charging average residential water users an extra $27 over the course of five years to meet their $16.5 million match with the Forest Service.

4.4.2 Forest Resilience Bond

Developed by Blue Forest, the Forest Resilience Bond (FRB) was created to secure water quality benefits through reforestation using private capital and financing. The Forest Resilience Bond

works with beneficiaries (e.g. United States Forest Service, utilities, etc.) to identify projects, determine metrics of success, create contracts with beneficiaries, provide private capital for the projects, and structures repayments to investors from beneficiaries (Blue Forest Conservation, 2019). In 2018, the Forest Resilience Bond helped provide funding for $4.6 million in forest restoration projects to mitigate wildfire risk in Tahoe National Forest (World Resources Institute, 2018).

4.5 One-off Market-Based Approaches and Early Market-Based Pilot Trading for Non-Conventional Pollutants

There are a few notable market-like approaches that have been utilized for non-conventional pollutants in California. The Grassland Area Farmers Tradable Loads Program for selenium was utilized from 1995 to 2009, while the Sacramento River Watershed Mercury Offset Program is currently under consideration.

4.5.1 Grassland Area Farmers Tradable Loads Program

Located in California's Lower San Joaquin River watershed, the seven irrigation and drainage districts of the San Luis and Delta-Mendota Water Authority—known as the Grassland Area Farmers—implemented a trading program for Selenium to meet the regional cap (USEPA, 2007). Each member of the Grassland Area Farmers has an allocation of the regional cap and may purchase selenium load allocations from other members to meet their allocation. Any members that do not meet their allocation will pay an incentive fee. Selenium loads can be directly purchased or exchanged between members and are generated from drainage diversion practices. Instead of using estimated load reductions, selenium loading is determined by the flow measurements and analytical sampling by the drainage districts; credits are calculated retroactively. on monthly basis. Due to this approach, there are no trade ratios needed to account for uncertainty.

4.5.2 Sacramento River Watershed Mercury Offset Program

The Sacramento-San Joaquin methylmercury TMDL was adopted by the Central Valley Regional Water Quality Control Board in 2010 (Central Valley Regional Water Quality Control Board, 2017). Currently known as the Delta Mercury Control Program, the Central Valley Regional Water Quality Control Board is required to consider the inclusion of a mercury offset program by 2020 that will address guiding principles such as allowing offsets to substitute for reasonable actions to address local impacts (Central Valley Regional Water Quality Control Board, 2009). The offset program is currently under consideration and details about the framework have not been made public yet. This Offset Program applied to East Contra Costa County.

4.6 Performance-Based Project Delivery

Performance-based approaches tie the payment for a service or action to the outcomes of that service or action. Such approaches may be used as an alternative compliance system approach for project delivery or adapted as a contracting structure and used to supplement an alternative compliance system approach. This section will review the ways that Performance-based project

delivery has been utilized as an alternative compliance system approach; relevant contracting structures are identified and summarized in Section 9.4.

4.6.1 Pay for Performance

Procurement and financial instruments used in stormwater programs have traditionally paid contractors for delivering a set of practices or services. Adapted from the field of healthcare, performance-based contracting or "Pay-for-Performance" is an approach that requires payments to be based on outcomes instead of actions or practices. In the realm of environmental alternative compliance, this means that contracts are designed to meet specific environmental performance metrics and create financial incentives for producers to generate and maintain environmental outcomes over time.

Although there are various permutations of contract structuring, all performance-based contracting schemes include the same three essential concepts, as described, for example, by Environmental Incentive's Pay for Performance Toolkit (Environmental Incentives Performance Platform, 2020):

1. Performance metric that defines a consistent and repeatable method to measure the quantity/quality of environmental outcomes aligned with long-term water quality goals.
2. Verification processes that define who, how, and when performance is assessed.
3. Outcome-based payment terms that define the portion of payment linked to verification of environmental outcomes using the performance metric.

Benefits of performance-based contracting include, but are not limited to (Alexandrovich, 2017):

- Transfers performance risk from public sector to private sector;
- Allows for expedited and parallel implementation;
- Creates efficiencies and reduces costs;
- Promotes reporting and verification;
- Creates additional opportunities for innovative partnership agreements with the private sector;
- Leverages innovation from the private sector;
- Incentivizes delivery of long-term operations and maintenance;
- Streamlines procurement and contracting; and
- Leverages private capital and private property owners.

4.6.1.1 Anne Arundel County Watershed Protection and Restoration Program

In the Chesapeake Bay Region, USEPA Region 3 has required local governments to restore the health of the Bay by 2025 under a Bay TMDL. For Anne Arundel County to meet its MS4 permit requirements, Chesapeake Bay TMDL, and Maryland Phase II Watershed Improvement Plan, Anne Arundel County implemented a performance-based contracting program called the Watershed Protection and Restoration Program. The program released a request for proposal

(RFP) for full delivery of water quality benefits from infrastructure projects that retrofit impervious areas and reduce pollutant loads on private lands. The full delivery RFP is similar to a design-build-finance-operate-maintain-availability payment structure where payments are contingent on the delivery of modeled environmental outcomes.

This approach places responsibility for designing, building, operating and maintaining the project on the contractor, and incentivizes cost-efficiency and control measure effectiveness. To ensure ongoing maintenance, Anne Arundel County makes a portion of the payment contingent upon successful inspections over a five-year maintenance period. With this approach, Anne Arundel County is responsible for defining the outcome to be achieved, selecting and inspecting projects, and paying contractors based on the delivery of the performance metrics.

Additionally, all projects implemented under the RFP must be designed to be eligible for Water Quality Credits consistent with the standards of the Maryland Department of Environment. The inclusion of this requirement enables the program to incorporate aspects from other approaches, like mitigation banking, where entrepreneurial entities develop projects in advance and in anticipation of a solicitation.

4.6.1.2 California DWR Marsh Restoration Program

California Department of Water Resources (DWR) is obligated to restore or create acres of quality habitat within the Delta and Suisun Marsh to benefit Delta Smelt, salmonids, Central Valley Steelhead, and Longfin Smelt. In 2016, DWR released a $42.5 million performance-based RFP to develop high-quality tidal wetland habitat for California Delta Smelt (California Department of Water Resources, 2016). In the DWR RFP, payments are made on milestones in the project, with full project payment made after the successful verification of habitat outcomes such as acres of high-quality habitat restored. Through this approach, DWR estimates an overall cost savings of 40% relative to more traditional project delivery processes (Hayden, Riley, and Cain, 2018).

4.6.2 Community-Based Public Private Partnerships (CBP3)

Community-Based Public Private Partnerships (CBP3s) are a type of performance-based contracting approach that is typically awarded through a competitive bidding process. Sharing many of the same financial and procurement arrangements as a traditional Public Private Partnership (P3), CBP3s are a partnership between a local government and a private entity to address a regulatory goal while meeting the needs of community stakeholders. There are various P3 structures that are utilized in performance-based contracting that are also applicable to CBP3s (which are summarized in Section 9.4).

CBP3s and P3 programs for environmental projects are broadly enabled throughout the state of California through the California Infrastructure Finance Act (California Government Code Section 5956) (Hewes and Randolph, 2018). The California Infrastructure Finance Act requires selection of private entities be based on qualifications, that projects be operated at a fair and reasonable price, and the use of a competitive negotiation process. However, the legislation leaves independence to local government agencies for how to utilize and structure P3s.

4.6.2.1 Prince George's County Clean Water Partnership

Mandated under the Chesapeake Bay TMDL, Prince George's County is required under its Phase II Water Implementation Plan to retrofit 15,000 acres of impervious area by 2025. To meet this goal and its MS4 Permit, the County entered into a thirty-year community-based public-private partnership called the Clean Water Partnership in 2015 to initiate the implementation of 15,000 acres of retrofitted impervious area at a cost of $1.5 billion (Alexandrovich, 2017). The Clean Water Partnership is modeled as a Design-Build-Operate-Maintain CBP3, where Corvias Solutions manages the partnership and is in charge of overseeing all subcontractors throughout the design, construction, and O&M of stormwater improvement projects. The scope of Corvias' agreement with the County includes an initial program area of 2,000 acres of publicly-owned impervious area and an extended program area of an additional 2,000 acres. Corvias will become eligible to oversee the expanded program area if they achieve milestones tied to the delivery of both social and economic goals including generation of impervious area credits, participation of local small and disadvantaged businesses, job participation of County residents, implementation of a mentor program, and meeting the scheduled construction timeline within budget.

4.6.2.2 City of Salinas CBP3 RFQ for Green Stormwater Infrastructure

In November 2019, the City of Salinas, California released a request for qualifications (RFQ) for a thirty-year CBP3, modeled in a Design-Build-Finance-Operate arrangement, to implement and maintain green stormwater infrastructure to meet MS4 permit and pending TMDL requirements. The Partnership as described in the RFQ will be driven by a collection of quantitative environmental and social metrics that will serve as the performance measures for the Partnership. Environmental metrics include impervious area, stormwater volume, stormwater particulate load, trash priority urban land use area, and riparian area. Community metrics include park area, park condition, and park density. Socioeconomic metrics include small, minority, and disadvantaged business (SBE/MBE/DBE) utilization, local business utilization, local SBE/MBE/DBE businesses in protégé program, and city residents trained or employed (Global Water Intelligence, 2019). The RFQ states that the City is planning an initial investment of $50 million for 600 impervious acres of green stormwater infrastructure depending on the establishment of a stormwater utility, or alternatively a cohesive, low-cost and responsible financing approach.

5 ALTERNATIVE COMPLIANCE SYSTEM METRIC

An alternative compliance system metric (metric) is a measuring unit of equivalent discharge reduction that reflects both the regulatory pollution control requirement and the measure of estimated outcome at the alternative source of control. In the context of the Contra Costa County System, the metric(s) will provide the basis for water quality benefit exchange between entities and must reflect regulatory requirements of the MRP and San Francisco Bay TMDLs. Specifically, the metric(s) should address GSI requirements under MRP Provision C.3 and PCBs control in Provision C.12. It is expected that mercury controls (Provision C.11) will be addressed through "net environmental benefit" rather than directly through the metric selection.

Metrics currently under consideration include impervious acres greened, impervious acres treated, volume managed per year, and TMDL-specified PCBs load reductions. The determination of which metric will be used will be a crucial determining factor for which compliance approach should be selected for the Contra Costa County System framework (see Section 4 for alternative compliance approaches). Considerations for Contra Costa County System metric(s) and next steps are included in Section 10.

5.1 Water Quality Benefit

In the context of the San Francisco Bay TMDLs and MRP, there are several water quality benefits and pollutants of concern (POCs). These include PCBs and mercury as well as other CWA Section 303(d) listed pollutants, including chlordane, DDT, dieldrin, dioxin compounds, furans, invasive species, selenium, and trash—in San Francisco Bay segments—and varying combinations of these compounds in tributary urban creeks, as well as indicator bacteria at coastal bay and shoreline areas.

The MRP identifies additional pollutants of concern in runoff discharges in MRP Finding 14, including those mentioned:

- certain heavy metals;
- excessive sediment production from erosion due to anthropogenic activities;
- petroleum hydrocarbons from sources such as used motor oil;
- microbial pathogens of domestic sewage origin from illicit discharges;
- certain pesticides associated with acute aquatic toxicity;
- excessive nutrient loads, which can cause or contribute to the depletion of dissolved oxygen and/or toxic concentrations of dissolved ammonia;
- trash, which impairs beneficial uses including, but not limited to, support for aquatic life; and
- other pollutants that can cause aquatic toxicity in the receiving waters.

The MRP also identifies, in MRP Finding 16, pollutants present in stormwater and/or urban runoff derived from extraneous sources over which the Permittees have limited or no direct jurisdiction, including:

- polycyclic aromatic hydrocarbons (PAHs);
- heavy metals, such as copper from vehicle brake pad wear and zinc from vehicle tire wear;
- dioxins as products of combustion;
- polybrominated diphenyl ethers that are incorporated in many household products as flame retardants;
- mercury resulting from atmospheric deposition; and
- naturally occurring minerals from local geology.

5.2 Alternative Compliance Metric

The alternative compliance metric is the common measurement unit of equivalent water quality benefit used for exchange, which reflects both the regulatory pollution control requirement and the measurable or estimated outcome of an alternative pollution control measure. The alternative compliance metric is often expressed as a mass pollutant load reduction per time or an equivalency between the regulatory requirement and the measurable benefit from a pollutant control measure. All alternative compliance systems have an alternative compliance metric or may use multiple metrics when stakeholders determine that there are multiple water quality benefits that should be addressed in the system and/or there are other motivating factors in tracking separate metrics. Examples of systems that utilize multiple metrics include City of San Diego's Draft Offsite Stormwater Alternative Compliance System and Anne Arundel County Watershed Protection and Restoration Program (see descriptions of these programs in Section 4). Important factors for selecting the appropriate alternative compliance metric(s) include how the metric:

- Addresses the underlying water quality benefit driving the alternative compliance system;
- Synchronizes with and satisfies compliance requirements of participants in the alternative compliance system; and
- Effectively quantifies the underlying water quality benefit and acknowledges and manages associated quantification uncertainty

In the context of stormwater compliance, metrics may need to quantify underlying water quality benefits such as pollutant reductions or hydromodification control. A regional alternative compliance system for the MRP and TMDL requirements should be designed to directly or indirectly address key water quality compliance need(s), including PCBs load reductions, mercury load reductions, and control of other POCs. This section will provide further context and examples of metric types utilized in existing stormwater alternative compliance.

5.2.1 Pollution Reduction Control Metrics

5.2.1.1 Pollutant Load Reduction (Mass/Time)

Pollutant load reduction-based metrics have often been utilized to quantify the nitrogen, phosphorus, and sediment reductions generated from control measures in both stormwater and agricultural settings. For example, GSI projects funded by the Anne Arundel County Watershed

Protection and Restoration Program's performance-based contracting approach are quantified for nitrogen, phosphorus, and sediment load reductions to meet the needs of the Chesapeake Bay TMDL and be consistent with Maryland Department of Environment standards. Additionally, control measures can be quantified with an equivalent impervious acres metric to meet Anne Arundel's requirements under the Phase II Watershed Improvement Plan (Anne Arundel County Department of Public Works, 2019).

5.2.1.2 Volume Treated

5.2.1.2.1 Stormwater Pollutant Control Volume

The City of San Diego's Offsite Stormwater Alternative Compliance Program utilizes a volume treated-based "Earned Stormwater Pollutant Control Volume" metric to account for pollutant reduction from structural pollutant control measures that detain, retain, filter, remove, or prevent the release of pollutants in perpetuity. The volume-based metric was chosen in this alternative compliance system due to the volume-based pollutant control performance standard defined in the MS4 Permit and the large number of different pollutants that the system wanted to capture (TSS, TP, TN, TCu, TPb, TZn, and FC). The stormwater pollutant control volume is determined by taking the design capture volume of a pollutant control measure and then applying a Land Use Factor and BMP Efficacy Factor (County of San Diego Watershed Protection Program, 2018).

5.2.1.2.2 Stormwater Retention Credit (Volume/Year)

New stormwater regulations required new development and renovation projects within Washington, D.C. to capture and retain stormwater runoff associated with specified design storms in order to manage associated nitrogen, phosphorus, and sediment load reductions. In response, Washington, D.C. Department of Energy and Environment's Stormwater Retention Credit Program utilizes a volume retained-based metric, Stormwater Retention Credit, to address the new requirements for runoff and green infrastructure (Hoffman, n.d.) The program strictly uses this volume-retained metric without further quantification of pollutant load reductions as the pollutants associated with the retained volume are assumed to be removed (i.e., treated in stormwater treatment facilities, then typically infiltrated to the subsurface, where additional filtration occurs).

5.2.1.3 Impervious Area Treated or Managed

5.2.1.3.1 Impervious Area Treated

The Chesapeake Bay TMDL for nitrogen and phosphorus load reductions is the key driver for the Maryland Phase II Water Implementation Plan (Prince George's County Department of Environmental Resources, 2012). Prince George's County is required under its Phase II Water Implementation Plan to retrofit 15,000 acres of impervious area by 2025. The Clean Water Partnership CBP3 (also see Section 4.6.2.1), which is being implemented to achieve compliance goals, utilizes impervious acres as the unit of metric, as this mirrors the compliance requirements in the Phase II Water Implementation Plan. This metric is regulatorily and scientifically satisfactory, as the prescribed impervious acres requirements in the Plan were determined by Prince George County agencies and the Maryland Department of Natural Resources. These were derived from stormwater wasteload allocation accounting procedures provided by the Maryland Department of the Environment.

5.2.1.3.2 Directly Connected Impervious Area Effectively Managed

The City of San Diego's Draft Offsite Stormwater Alternative Compliance Program also utilizes a "Directly Connected Impervious Area Effectively Managed" metric to account for benefits associated with effective hydromodification flow control (County of San Diego Watershed Protection Program, 2018). This metric quantifies effective hydromodification flow control from both structural BMPs and natural system management practices that are implemented to restore and preserve predevelopment watershed functions. Natural system management practices include practices such as land restoration, land preservation, and stream rehabilitation. The *Water Quality Equivalency Guidance Document* acknowledges that although natural system management practices have infiltration and pollutant reduction benefits, in addition to hydromodification benefits, pollutant reduction associated with natural system management practices was not quantified as part of the draft 2018 effort (County of San Diego Watershed Protection Program, 2018). The document cited that some of the quantification techniques had not been developed or assessed and that these would be considered priorities for future resolution.

5.3 Alternative Compliance Metric Calculation Methods

The calculation method selected for an alternative compliance metric(s) will contribute to the overall reception of the Contra Costa County System by regulators, participants, and the public. These calculation methods can range in complexity from simple calculations using empirical data to sophisticated geospatial and mechanistic modeling. Regardless of the complexity of the selected calculation method, the method must be scientifically defensible and approved by the regional CWA-delegated authority (in the case of the Contra Costa County System, the SFBRWQCB) before being utilized for compliance requirements. Although there is an array of methodologies to consider for each metric, this section will review relevant examples for stormwater-related metrics.

5.3.1 Calculation Methods for Pollutant Control Metrics

5.3.1.1 Bay Area RAAs for PCBs and Mercury Load Reduction

To shorten the review process and avoid complications, alternative compliance metric calculation methods should be based on existing methods developed, reviewed, or approved by the regional CWA-delegated authority whenever possible. At present, Contra Costa County has an RAA model developed for the Contra Costa PCBs and Mercury TMDL Control Measure Plan and RAA report (CCCWP, 2020), which includes an updated estimate for the PCBs load from Contra Costa County. An overview of the RAA method is provided in the Quantitative Relationship Between Green Infrastructure Implementation and PCBs/Mercury Load Reductions (CCCWP, 2018). Since the publication of the 2018 report, the methodology has been peer reviewed by two third party peer reviewers. The method is consistent with the *Reasonable Assurance Analysis (RAA) Guidance Document* (Bay Area Stormwater Management Agencies Association [BASMAA], 2017b), a document developed with support from USEPA Region 9 and the SFBRWQCB for calculating PCBs and mercury load reductions from control measures proposed in the MRP Permittee's GSI Plans and PCBs and Mercury Control Measure Implementation Plans.

Contra Costa County RAA model components include a baseline pollutant loading model, which consists of a continuous simulation[18] hydrology model combined with pollutant loading inputs to obtain the average annual loading of PCBs and mercury across Contra Costa County during the TMDL baseline period (i.e., 2003 – 2005, see BASMAA, 2017b). The RAA model also includes GSI performance models, which were developed to represent load reductions resulting from implementation of GSI, along with methods for estimating load reduction associated with implementation of the source control measures. These are described in further detail, along with model results, in the Contra Costa PCBs and Mercury TMDL Control Measure Plan and RAA Report (CCCWP, 2020).

5.3.1.2 Example Calculation Methods for Volume Treated-Based Metric

The pollutant control metric in the City of San Diego's Draft Offsite Stormwater Alternative Compliance Program, called the Earned Stormwater Pollutant Control Volume (V_e), is calculated by taking the design capture volume of a pollutant control measure and then applying a Land Use Factor and BMP Efficacy Factor (County of San Diego Watershed Protection Program, 2018). The Land Use Factor is a ratio of pollutant concentrations generated by the offsite area to those generated by the development project area, to account for variations in pollutant concentrations between the development project and the drainage area tributary to the offsite control measure. The BMP Efficacy Factor is an additional ratio that accounts for the variations in the ability of different pollutant control measures to remove pollutants in runoff. The simplified calculation for this metric is as follows:

$$V_e = L(\Delta V + V_2 B_2 - V_1 B_1)$$

Where:

V_e: Stormwater Pollutant Control Volume (cubic feet)
L: Land Use Factor
ΔV: Change in Design Capture Volume (V_1-V_2)
V_1: Impacted Condition Design Capture Volume for Offsite Control Measure
V_2: Mitigated Condition Design Capture Volume for Offsite Control Measure
B_1: Impacted Condition BMP Efficacy Factor
B_2: Mitigated Condition BMP Efficacy Factor

To determine the amount of Earned Stormwater Pollutant Control Volume required for a development project participating in the Alternative Compliance Program, participants would determine the portion of the Design Capture Volume not treated by onsite retention or biofiltration BMPs. The Design Capture Volume is the total volume of water that must be treated either onsite or offsite and is determined by the Count of San Diego BMP Design Manual (County of San Diego, 2019).

[18] Continuous simulation models calculate outputs (e.g., runoff) "continuously", i.e., for many time steps over a long-term period of record (e.g., every 10 minutes for 10 years). Long-term "continuous" input data (e.g., hourly rainfall) is required. This is contrasted with design-event simulations which model a single rainfall event, e.g., a 24-hour storm with a 10-year recurrence frequency.

5.3.1.3 Example Calculation Methods for Impervious Area

5.3.1.3.1 Impervious Area Treated

Prince George's County's required pollutant load reductions, in impervious acres, were determined by the Chesapeake Bay Model—per requirements for the County's Phase II Watershed Implementation Plan—and do not need to be extrapolated by the Prince George's County Clean Water Partnership. Equivalent impervious acres for structural and non-structural (e.g., street sweeping) control measures are calculated per Maryland Department of the Environment's *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* document (Maryland Department of the Environment, 2014). This approach for calculating equivalent impervious acres for non-structural control measures is based on an impervious acre conversion factor that is calculated for each approved non-structural control measure. This factor is derived by applying the pollutant load reduction efficiency of a non-structural control measure to the pollutant load associated with runoff from an acre of impervious land cover.

5.3.1.3.2 Directly Connected Impervious Area Effectively Managed

Directly Connected Impervious Area Effectively Managed in the City of San Diego's Offsite Stormwater Alternative Compliance Program is determined when feasible by measuring the actual Directly Connected Impervious Area (DCIA) or mitigated DCIA in the offsite drainage area. When this is not feasible, this metric can be calculated by estimating the total existing impervious area using coefficients from the document *User's Guide for the California Impervious Surface Coefficients*, and then estimating the subset of existing DCIA using calculations from an appropriate Sutherland Effective Impervious Area (EIA) Equation (Washburn, Yancey, and Mendoza, 2010).

The amount of DCIA required to be mitigated for a development is identified as the Deficit of Total Impervious Area Effectively Managed and is calculated by summing up the area of all the proposed impervious surfaces and semi-pervious surfaces[19] not effectively managed onsite. Semi-impervious surfaces in this program are treated as impervious surfaces due to a lack of validated methods for estimating an equivalent impervious area as a fraction of a total semi-impervious area. Exclusions exist for pervious landscape surfaces that would utilize the same previous rainfall loss parameters as pre-development surfaces if these areas are modeled using Hydrological Simulation Program – Fortran (HSPF) or USEPA's Stormwater Management Model (SWMM) (The City of San Diego, 2020).

5.4 Current Potential Contra Costa County System Metrics

Draft definitions for the Contra Costa County System metrics currently under consideration are:

- **Impervious Acres Greened.** Impervious acres draining to GSI facilities sized to capture MRP-defined volume hydraulic design basis (i.e., 80% average annual runoff capture), or MRP-defined flow hydraulic design basis (i.e., flow resulting from a rainfall intensity of 0.2 in/hr).

[19] Semi-pervious surfaces include decomposed granite, cobbles, crushed aggregate, or compacted soils such as unpaved parking (County of San Diego, 2019).

- **Impervious Acres Treated.** Impervious acres draining to treatment facility (*allowed list to be determined*) sized to capture MRP-defined volume hydraulic design basis (80% average annual runoff capture) or MRP-defined flow hydraulic design basis. Facilities could also be sized via methods allowed in the CCCWP C.3 Manual.
- **Volume Managed per Year.** Total volume captured and treated by stormwater runoff capture facility per year.
- **PCBs Load Reduced**. Total load reduced, in grams per year.

Given the differing objectives and control measures, separate compliance metrics could be utilized to address the MRP requirements for GSI and PCBs controls (Provisions C.3 and C.12, respectively). Specifically, a metric related to the implementation of GSI could be used to address Provision C.3, while a pollutant load reduction metric allowing for a range of control measures could be included to allow for flexible compliance with MRP Provision C.12 and the TMDL. This separation of compliance metrics would enable approaches that can incentivize the implementation of projects that maximize the water quality benefits in the Contra Costa County System for both the MRP's GSI and PCBs provisions.

If multiple compliance metrics are identified, it is recommended that an alternative compliance approach be employed that maximizes the water quality benefit generated by the identified metrics through control measures specific to those metrics. This could also enable future water quality objectives for the San Francisco Bay to be added as additional metrics to the Contra Costa County System without compounding the Contra Costa County System's complexity. Regardless of the alternative compliance approach taken or compliance metric selected, it is recommended that the Contra Costa County System include a process to track all control measures and compliance metrics generated under the same tracking system. Tracking needs are described further in Section 8. See Section 10 for the next steps for metric selection and the recommended decision-making process for the Contra Costa County System.

5.5 Stacking and Bundling

Stacking and bundling are different approaches for how to account for and exchange multiple benefits or metrics generated from a single control measure. These approaches are used to enhance the value of the ecosystem services generated and set boundaries on how varying ecosystem services can be exchanged (Von Hase, Amrei, and Cassin, 2018). Each approach has inherent benefits and challenges (e.g., likelihood additional benefit is provided vs. financial incentive for sellers) that should be considered carefully before selection.

1. *Stacking*: Stacking refers to separately measuring various benefits and separately selling benefits as a range of different credit types. The primary distinguishing feature of a stacking approach is that multiple types of credits generated from a single control measure can be separated and sold individually to different buyers, with separate payments received for each credit type.

   Stacking Example: A LID project generates 5 acres of GSI or "acres greened" equivalent credits. The LID controls also capture 50 mg of PCBs load (or 5 reduction credits). Buyer A could buy all acres greened credits while Buyer B can buy all PCBs load reduction credits. Moreover, depending on their compliance needs, any buyers can buy a

combination of different types of credits generated from the LID project. For example, Buyer A can buy 4 acres greened credits and 1 PCBs load reduction credit, and Buyer B can buy the remaining 1 acre greened and remaining 4 PCBs load reduction credits.

2. *Bundling*: Bundling refers to the control project outcome where multiple benefits are generated from a project but are only sold as a single metric to a buyer(s) (as defined by the metric necessary for their compliance). Often, bundling utilizes a more general, proxy metric such as an acre of wetland. In some cases, the subset of benefits may be explicitly measured and resemble stacking. However, the main difference is that even if those benefits are individually measured, all the benefits are sold as a bundle from the control measure. As such, all other benefits generated in addition to the metric of interest are simply regarded as net environmental benefit.

   Bundling Example: The overall LID project generates 5 "acres greened" credits and 50 mg of PCBs load reduction. One buyer wishing to purchase 5 acres greened credits receives the pollutant load reduction as net environmental benefit but does not incur the right to separately sell these PCBs reductions. In another scenario of partial credit purchases from a control project, Buyer A might need 3 acres greened for compliance. Their purchase would include the net environmental benefit of 30 mg of PCBs load reduction, but not as separately saleable PCBs credits. For the other 2 remaining acres greened credits and the 20 mg PCBs load reduction credits, another buyer could purchase the PCBs credits, whereby the two acres green credits would not be separately salable and instead would become the net environmental benefit.

   For some projects, different components of a site control project could be separated and considered as a hybrid bundling opportunity. For example, a PCBs capture device, with a filter mechanism that solely captured PCBs by treating 5 acres of stormwater runoff, could generate PCBs reduction credits. If the treated runoff is then treated in an approved greened acres control, it is possible in the hybrid scenario that there could be an additional 5 greened acre credits (additional PCBs load reduction credits would not be generated from the infiltration device in this case). This approach would honor the notion of "additionality" through bundling, but potentially enhance the actual environmental benefits of a project opportunity through innovation at a site with both LID and pollutant removal potential. Not all geographic areas in the county may possess both LID and effective PCBs capture opportunities for this hybrid scenario. But where these opportunities do coexist, this alternative compliance system option could incentivize investors to seek out such locations.

One example of these concepts is the Laguna de Santa Rosa Nutrient Offset Program, which allows for stacking of credits but requires proportional discounting of their use, meaning that a project that generates both wetland and phosphorus credits that has sold 70% of its wetland credits, may only sell 30% of the phosphorus credits generated by the project (NCRWQCB, 2018).

6 CONTROL MEASURES

An alternative compliance system requires the implementation of actions or control measures that result in measurable or estimated benefits, expressed in the context of the appropriate metric. These metric-defined benefits are exchanged as credits between entities. Control measures include installation of GSI and other urban stormwater treatment or source control measures (especially those for PCBs and mercury or other sediment-bound pollutants).

6.1 Control Measure Types

As described in Section 5, there are four metrics currently under consideration for the Contra Costa County System: 1) impervious acres greened, 2) impervious acres treated, 3) volume managed, and 4) PCBs load reduced. Depending on the metric(s) selected, different control measure types may be eligible to generate units of metric under the Contra Costa County System.

6.1.1 GSI Control Measures

As GSI measures are currently the required control measures for compliance with MRP Provisions C.3.c (Low Impact Development) and C.3.j (Green Infrastructure Planning and Implementation, i.e., GSI retrofits), the Contra Costa County System will incorporate these types of control measures in the framework. GSI control measures could be used to generate any of the metrics currently under consideration.

The MRP defines GSI as infrastructure that uses vegetation, soils, and natural processes to manage water and create healthier urban environments. At the scale of a city or county, green stormwater infrastructure refers to the patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the scale of a neighborhood or site, green stormwater infrastructure refers to stormwater management systems that mimic nature by soaking up and storing water. Facilities appropriate for use are those that meet C.3 requirements per countywide stormwater program technical guidance manuals.

GSI control measures included in the CCCWP C.3 Manual (CCCWP, 2017) are pervious pavement, bioretention facilities, flow-through planters, dry wells, infiltration basins, cisterns + bioretention (series), and bioretention + vaults (series). Details about these control measures are provided in the CCCWP C.3 Manual (CCCWP, 2017).

6.1.2 Non-LID Stormwater Treatment Facilities

Non-LID stormwater treatment facilities are currently allowable for "Special Projects"[20] as defined under MRP Subprovision C.3.e.ii. Given the space constraints associated with this

[20] Per the MRP, Special Projects are defined as projects that have established "all of the following: (a) The infeasibility of treating 100% of the amount of runoff identified in Provision C.3.d for the Regulated Project's drainage area with LID treatment measures onsite; (b) The infeasibility of treating 100% of the amount of runoff identified in Provision C.3.d for the Regulated Project's drainage area with LID treatment measures offsite or paying in-lieu fees to treat 100% of the Provision C.3.d runoff with LID treatment measures at an offsite or Regional Project; and (c) The infeasibility of treating 100% of the amount of runoff identified in Provision C.3.d for the Regulated Project's drainage area with some combination of LID treatment measures onsite, offsite, and/or paying in-lieu fees towards at an offsite or Regional Project. For each Special Project, a Permittee shall document the basis of infeasibility used to establish technical and/or economic infeasibility."

project designation, allowable treatment devices provide treatment in a smaller footprint through design assuming high media flowrates. The non-LID measures allowed by the MRP for Special Projects are tree-box-type high-flowrate biofilters and vault-based high-flowrate media filters. Technical criteria for these types of facilities are provided in the C.3 Manual (CCCWP, 2017).

It is expected that non-LID stormwater treatment facilities could be allowable through the Contra Costa County System for generation of metrics that are not tied to treatment with LID or GSI (e.g., "acres treated" or "volume managed"). Non-LID stormwater treatment facilities may also be used provide PCBs load reduction benefits to address the TMDL load reduction requirements. The EPA grant-funded "Clean Watersheds for a Clean Bay" project (BASMAA, 2017a) conducted pilot monitoring of tree-box-type high-flowrate biofilters and cartridge high-flowrate media filters. PCBs load reductions were observed for both types of facilities that were comparable to the GSI measures that were studied.

Other non-LID treatment measures that could be considered for certain pollutants of concern include full trash capture systems. The Clean Watersheds for a Clean Bay project studied full trash capture systems, such as hydrodynamic separators and inlet-based devices, that are specifically installed to capture and reduce trash loads to meet MRP Provision C.10 (trash controls) but demonstrated some effectiveness at reducing PCBs load (BASMAA, 2017a; BASMAA, 2020).

6.1.3 PCBs and Mercury Source Control Measures

In addition to GSI and non-LID measures designed to treat stormwater runoff, there are other control measures identified as reducing PCBs, targeting older industrial and older urban areas[21]. Currently, there are several source control programs that have been or will be implemented by the Permittees to reduce PCBs loads in urban runoff, including:

1. Source Property Identification and Abatement
2. PCBs in Building Materials Management
3. PCBs in Electrical Utilities Management Program
4. PCBs in Infrastructure
5. Enhanced Operations and Maintenance
6. Diversion to Public Operated Treatment Works (POTW)

These source control measures are described in the BASMAA Source Control Load Reduction Accounting for Reasonable Assurance Analysis report (BASMAA, 2020).

[21] PCBs were more heavily used in older industrial (pre-1980) areas, so older industrial land use areas have been found to yield a much higher mass of PCBs per unit area than newer urban land use areas. PCBs were used in building materials (e.g., sealants and caulks) in residential and commercial construction between approximately 1950 and 1980, hence the higher level in older urban versus newer urban land use areas.

6.2 Control Measure Specifications and Standards

The MRP requires specific control measure sizing for compliance with Provision C.3. A summary of these sizing methods is provided below (from MRP Provision C.3.d):

> *(1) Volume Hydraulic Design Basis – Treatment systems whose primary mode of action depends on volume capacity shall be designed to treat stormwater runoff equal to:*
>
> *(a) The maximized stormwater capture volume for the area, on the basis of historical rainfall records, determined using the formula and volume capture coefficients set forth in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, (1998), pages 175–178 (e.g., approximately the 85th percentile 24-hour storm runoff event); or*
>
> *(b) The volume of annual runoff required to achieve 80 percent or more capture, determined in accordance with the methodology set forth in Section 5 of CASQA's Stormwater Best Management Practice Handbook, New Development and Redevelopment (2003), using local rainfall data.*
>
> *(2) Flow Hydraulic Design Basis – Treatment systems whose primary mode of action depends on flow capacity shall be sized to treat:*
>
> *(a) 10 percent of the 50-year peak flow rate;*
>
> *(b) The flow of runoff produced by a rain event equal to at least two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depths; or*
>
> *(c) The flow of runoff resulting from a rain event equal to at least 0.2 inches per hour intensity.*
>
> *(3) Combination Flow and Volume Design Basis – Treatment systems that use a combination of flow and volume capacity shall be sized to treat at least 80 percent of the total runoff over the life of the project, using local rainfall data.*

Current definitions of proposed metrics assume that stormwater treatment facilities (GSI or non-LID facilities) will be sized based on the most commonly used MRP-required design criteria (i.e., 80 percent capture of annual runoff or runoff resulting from a rain event intensity of 0.2 in/hr) (also see BASMAA, 2019). Studies have demonstrated, however, that water quality benefits equivalent to those required by C.3.d in terms of volume captured can be achieved even with smaller facility sizes. Therefore, it is likely that smaller facilities could be allowable under the Contra Costa County System with appropriate discounting or scaling factors.

7 COMPLIANCE CONSIDERATIONS

Alternative compliance systems must include processes to certify that the system is generating the water quality benefits required by the regulatory provisions it was designed to address. These processes should include safety factors for participant compliance with system criteria. This section will review common mechanisms adapted across alternative compliance systems for addressing regulatory compliance for participants and the system as a whole, as well as key considerations for addressing compliance during system development.

7.1 Certification

In order to ensure compliance with system guidelines and standards for pollution control measures across a variety of potential metric generators, many alternative compliance systems utilize what is known as certification processes.

A certification process refers to the final administrative review, approval, documentation and tracking of pollution control measures to ensure all applicable criteria for generating a unit of metric have been satisfied. This can include the review of control measure design and on-going control measure performance (i.e., data and monitoring reports). This process can be undertaken by the system administrator (generally a CWA-delegated authority) or a certifying third-party. The certification process is a demonstration to all stakeholders that pollution control measures will meet expectations as defined by the system.

An integral part of the certification process is verification, which consists of the onsite inspection of control measures to ensure that they are sufficiently designed, implemented, and maintained to achieve intended outcomes. Verification can be undertaken by the system administrator (generally a CWA-delegated authority) or a certifying third-party, which can differ from the entity responsible for the approval, documentation, and tracking responsibilities of the certification process.

The extent and frequency of certification will vary by system depending on the system approach. In performance-based approaches, the exchange of units of metrics are tied to the specific desired outcomes of control measure projects, as defined by the initial agreement; thus, the conditions for certification and verification will be determined based on these outcomes.

In other system approaches, the requirements for certification and verification can be modified to meet the needs of stakeholders. In a system where stakeholders demand more certainty that control measures are meeting system requirements over time, a more rigorous certification process may be implemented that would require certification of all documentation and verification at the same frequency that the metric is generated (e.g., annually, permit term, etc.). This type of approach would provide the most certainty that participants are in compliance with control measure requirements at the expense of higher administrative costs. Potential adjustments to certification and verification requirements include adjusting the amount of documentation to be reviewed and the frequency of verification (i.e., random and/or designated frequencies to produce statistically significant results) (Willamette Partnership and World Resources Institute, 2015).

7.2 Evaluation of Control Measure Effectiveness

Alternative compliance systems should consider how the system will demonstrate that pollutant control measures in the system are providing the estimated water quality benefits. If monitoring data for control measures or an accepted modeling method is not in place, some alternative compliance systems implement site-specific water quality or watershed ambient monitoring requirements to confirm that the estimated water quality impacts of pollutant controls measures are providing the intended water quality benefits. This is typically not required at all locations, but at 5-10% of sites or locations being used for system exchanges. However, site-specific and/or ambient monitoring are not necessarily mandatory for demonstrating the effectiveness of control measures implemented within the system. Regions that have an existing dataset of monitoring data for control measure effectiveness and/or methodologies for evaluating control measure effectiveness, approved by the state-delegated CWA authority, may choose to use these existing resources and consider foregoing additional monitoring requirements.

Additional monitoring requirements are not anticipated to be necessary for the Contra Costa County System if the System utilizes the locally accepted RAA methodology for PCBs load reduction accounting, and/or existing visual assessment practices for confirmation of GSI implementation.

7.3 Compliance and Enforcement

Enforcement mechanisms will be required for situations when a regulated entity fails to meet alternative compliance conditions. Most alternative compliance programs are both administered and enforced by a state-delegated CWA authority. In California, these entities are the regional water boards and the SWRCB. In the case of the Contra Costa County System, it is not envisioned that the SFBRWQCB and SWRCB would be involved in either the administration or enforcement of non-compliance events in the System. Contra Costa Permittees are reviewing the possibility that the System could be administered and enforced by a third party or an existing quasi-municipal authority.[22]

Under the CWA, the SWRCB and regional water boards have been delegated authority from the EPA to oversee and enforce compliance with the CWA and permits issued thereunder. EPA retains separate authority to enforce, as well, both together with and independent from the state and regional water boards. The CWA also empowers "any person" to step into the shoes of the agencies and enforce violations where neither EPA nor the state has done so. Under this citizen suit provision, after providing notice to the agencies and permittee, the citizen plaintiff may file a lawsuit in federal court to prosecute the violations, and if successful, may recover penalties for the government, as well as injunctive relief to mitigate the impacts of any noncompliance and also ensure continuing compliance going forward.

Designated alternative compliance system authorities can either: 1) choose to use the same enforcement provisions used in other aspects of pollution control and tailor these provisions for an alternative compliance system, or 2) develop alternative compliance-specific provisions if existing provisions are not appropriate. In the WQT context, most agencies have opted to use

[22] In the case of the Contra Costa County System, the permittees have the authority to enforce their CWA requirements.

their current NPDES permit enforcement provisions since liability remains with the Permittee (Willamette Partnership and World Resources Institute, 2015). Provisions for non-compliance in these systems may be determined by the administrating entity but are still enforced by the State-delegated CWA authority.

7.4 Compliance Risk Assurances

Mechanisms can be designed in an alternative compliance system's framework or in individual contracts to protect buyers from noncompliance stemming from a loss of credits, or default, due to a failure in the implementation, operation, and/or maintenance of a pollutant control measure.

1. *Reserve Pool*: One mechanism that has been implemented in the context of water quality trading and offset programs is a reserve pool of credits or offsets that can be accessed by buyers if more credits are required to meet their compliance requirements. This reserve pool is typically procured on a regular basis by applying a reserve trade ratio to exchanges and pooling a percentage of credits or offsets across all users in the system, which is then managed and tracked by the administering entity of the system.
2. *True-up Period*: A true-up period is a reconciliation period, usually at the end of a compliance year, that allows buyers to purchase any additional, unforeseen units of metric needed to meet their compliance requirements. The use of a true-up period can prevent the over purchase and under purchase of units of metric and can be combined with a reserve pool to better ensure that a supply of valid units of metric are available. For buyers, credits purchased during the true-up period are generally more expensive than credits purchased in advance for the same compliance year.
3. *Contractual Mechanisms*: If individual contracts are utilized in the alternative compliance system between buyers and sellers, clauses may be included requiring corrective actions to be taken within an approved grace period or for payment to be withheld until intended outcomes are delivered.

8 TRACKING

Tracking of generated metrics is important for accounting towards compliance goals. For the Contra Costa County System, SFEI will develop a tracking framework. Key elements for tracking and allowing public access to information is described herein.

8.1 Basic Elements to Track in an Alternative Compliance System

Alternative compliance systems are required to track compliance and accounting of units of metric to provide an appropriate level of accountability to stakeholders. Elements that should be tracked include (Willamette Partnership and World Resources Institute, 2015):

Project Information:

- Project generator contact information
- Location of project
- Ongoing project status/project reviews (e.g., certified, under review, ongoing review)
- Documentation and reports for on-going operation and maintenance
- Monitoring reports (when required)
- Project life

Unit of Metric:

- Units of metric tracked (i.e., quantities of all metrics tracked)
- Which unit of metric generated will be used for "exchange"
- Ongoing credit status (e.g., active, retired, suspended, cancelled)
- Compliance year or "vintage"

Exchanges/Accounting for Units of Metric:

- Summarization of account credits, debits, and balances
- Credit purchaser information

Depending on the anticipated number of participants, projects, and public accessibility required for an alternative compliance system, these elements can be tracked with sophisticated online registries and ledgers or with simplified excel worksheets. Although it is possible for programs to require regulated Permittees to internally track their own balances and provide regular reports, it can create additional burdens for buyers and introduce the possibility of accounting errors. Most alternative compliance systems utilize a centralized tracking system to simplify the process for participants and reduce accounting errors.

8.2 Public Availability of Information

It is important for the public to access information pertaining to the alternative compliance system to ensure that the system is consistent with water pollution requirements. In light of this,

it will be important to determine the appropriate amount of information to proactively disclose to the public in order to strike the right balance between accountability and confidentiality. Several levels of public disclosure can be used including (Willamette Partnership and World Resources Institute, 2015):

- Withholding personal contact and confidential business information
- Withholding exact project location
- Withholding all information but project name and credit quantity

Note that the CWA, the Freedom of Information Act, and state privacy laws will be the primary determination of what information may be made publicly available.

9 FUNDING AND FINANCING CONSIDERATIONS

Alternative compliance systems are developed with the intent of successfully providing environmental benefits and satisfying compliance requirements at a lower overall cost. Unfortunately, it is not unheard of for a system to languish because capital for the implementation, operation, and maintenance of control measures does not materialize. An important factor in the ultimate success of the Contra Costa County System will be accessibility to capital for water quality benefit generators. To maximize the availability of capital, the Contra Costa County System should be developed with the flexibility to enable and harmonize multiple sources of funding and provide opportunities to utilize various mechanisms for financing pollutant controls.

9.1 Funding versus Finance

"Funding" and "financing" are terms that are often mistakenly used in place of one another and should not be used interchangeably. Funding refers to the act of providing capital to pay for a project without an expectation of repayment. Financing refers to the act of providing capital, typically at the onset of a project, with an expectation of repayment. This distinction is important as the two should be prioritized differently during the development of a system. Potential funding and financing opportunities from public and private entities that may be utilized for the implementation, operation, and maintenance of control measures are summarized in the following sections.

9.2 Funding

Identifying potential funding opportunities and mechanisms from public and private entities during the development of the system should help guide the framework to have flexible provisions for control measure generators to access multiple and combined sources of funding.

9.2.1 Public Funding

9.2.1.1 Capital and Utility-based Funding

Capital Budgets: Some public funding for green stormwater infrastructure comes from the capital budgets of local governments. This funding source is limited, however, and green stormwater infrastructure projects must compete with all other high-priority capital improvement program needs, including public health and safety related needs.

Utility Fees: Utility fees are a funding framework where users pay fees issued by utilities for public works projects. As opposed to funding from capital budgets, utility fees are a complete source of funding and are therefore more insulated from changes to a capital budget. This funding mechanism has been utilized by local water utilities for an array of water quality benefits and non-traditional control measures. Examples of utility fees utilized in this context include green infrastructure implementation by Prince George's County Clean Water Partnership and forest management practices by the Denver Water Supply Agency (Alexandrovich, 2017; World Resources Institute, 2018). In the California context, stormwater utility fees must abide by California Proposition 218 and are not exempt from the proposition's public hearing and ballot proceedings (as clarified by *Howard Jarvis Taxpayers Association v. City of Salinas*) (California Stormwater Quality Association, 2020).

9.2.1.2 Pooled Fee Funding

Pooled fee funding, such as in-lieu fee programs, allow a government or non-profit organization to pool fees from regulated entities seeking to meet their compliance requirements in order to then implement projects that provide the environmental benefits required under a permit. Pooled fee funding programs have been used in different water quality contexts but are most well known for their use in compensatory mitigation. The use of pooled fees is a possible funding mechanism acknowledged in the MRP for meeting alternative compliance requirements for Provision C.3 (SFBRWQCB, 2015).

9.2.1.3 Federal Programs

Natural Resource Damage Assessment Funds: The Natural Resource Damage Assessment (NRDA) is the federal legal process to evaluate the impacts of oil spills, hazardous waste sites, and ship groundings on natural resources and provide funds for recovery. Funds from NRDA have been utilized to create a variety of water quality improvement projects in Florida in response to the Oil Pollution Act of 1990, including projects to restore habitat, restore water quality, replenish and protect coastal and marine resources, and provide enhanced recreational opportunities (National Oceanic and Atmospheric Administration, 2020).

Farm Bill Conservation Programs: For alternative compliance systems that permit agricultural projects to generate water quality benefits, funding from programs enabled by the Farm Bill—such as the Environmental Quality Incentives Program (EQIP)—can be utilized to partially or fully fund conservation practices (Natural Resources Conservation Service, 2020).

Other Federal Grants and Programs: Periodically, federal grants are available to support the implementation of green infrastructure and storm water pollution reduction activities. These opportunities include EPA's Five Star and Urban Waters Restoration Grant Program, which offers resources for priority watersheds, and others in EPA's Water Finance Clearinghouse database (National Fish and Wildlife Foundation, 2020; USEPA, 2020a).

9.2.1.4 State Programs

There are a number of state grant and bond funds available through various California state agencies. Applicable grants for GSI and stormwater programs include those available through the State Water Resources Control Board (e.g., Prop 1, Prop 84); Department of Water Resources; and California Natural Resources Agency, among other state opportunities (e.g., https://resources.ca.gov/grants/; https://www.cfcc.ca.gov/grant-program/; https://www.waterboards.ca.gov/water_issues/programs/grants_loans/; https://water.ca.gov/Work-With-Us/Grants-And-Loans).

9.2.2 Private Funding

9.2.2.1 Regulatory Approaches

The primary source of private funding will come from private entities that must meet regulatory requirements to support water quality objectives. This will typically consist of regulated private entities whose projects have water quality impacts, including developers, industries, and wastewater treatment facilities.

9.2.2.2 Voluntary Approaches

Corporate Sustainability: For a multitude of reasons, corporate stakeholders have begun to demand more environmental responsibility from corporations. In response, funding opportunities have increased from corporations seeking to reduce the environmental footprint of their operations, facilities, and supply chain.

Beneficiary Funding: Sometimes called environmental funds or trusts, beneficiary funding refers to a funding strategy where donors invest their capital and utilize only the income from those investments to fund projects with environmental benefits. This type of funding is intended to create a sustainable, long-term source of funding for the implementation, operation, and maintenance of these types of projects (Bayon, Deere, and Smith, n.d.).

9.3 Finance

Potential financing mechanisms can aid in providing capital for the implementation, operation, and maintenance of control measures. In general, financing should not be a primary consideration; rather, financing should be considered in situations when there is an anticipated lack of upfront capital and only if there is a clear path to repayment from the investments. Financing should be supplemental to funding, emerge organically and be in-line with enabled funding sources.

9.3.1 Public Finance Mechanisms

Environmental/Green bonds: More recently, municipalities have explored environmental or green bonds to raise money for green infrastructure projects to be implemented in-lieu of traditional gray infrastructure projects. These bonds work in the same way as municipal bonds, with the bond holder lending the issuer a fixed amount of money for a certain amount of time in exchange for regularly scheduled interest payments. In 2014, DC Water issued a $25 million green bond to finance the permeable pavement and bioretention facilities in the DC Clean Rivers Project, a $2.6 billion long-term program to manage combined sewer overflows that pollute Anacostia River, Potomac River, and Rock Creek (Goldman Sachs, DC Water is Life, and Calvert Foundation, n.d.). This green bond utilized a pay-for-performance element where a contingent payment would be paid to investors if runoff reduction yielded over an expected range. Conversely, if the runoff reduction was lower than expected, investors would make a risk-share payment to help fund additional stormwater management practices.

Catalytic first-loss capital: Refers to providing early stage or pre-development capital and guaranteeing that any potential losses from these stages are covered until the project is completed. This can be used to enhance credit and/or catalyze participation of other investors that would otherwise not enter the deal.

Loan Guarantees: Refers to a promise from a guarantor to assume the debt of a borrower if the borrower defaults. Loan guarantees can be limited, meaning the guarantor is only liable for a portion of the debt, or unlimited where the guarantor is responsible for all of the debt.

Buyer-of-Last-Resort: Refers to an arrangement where an entity will offer to purchase all units of metric at a fixed price if other buyers cannot be found. This can be used to support a market with a low or uncertain level of demand from private funding sources.

Revolving Loans: Refers to arrangements where a loan amount can be withdrawn, repaid, and redrawn again. Iowa Department of Agriculture and Land Stewardship provides a state revolving loan fund to provide landowners with financing for nonpoint source pollution (Iowa Department of Agriculture & Land Stewardship, 2020). The EPA Clean Water State Revolving Fund and Drinking Water State Revolving Fund provide a wide range of water quality infrastructure projects, including stormwater and GSI (USEPA, 2020b).

9.3.2 Private Finance Mechanisms

Letters of Credit: Generally utilized in compensatory mitigation banking, a letter of credit provides financial assurance for proper operation and maintenance in the form of a performance bond for mitigation banking activities. A letter of credit can cover contingency actions in the event of a credit default or failure. The amount of the bond is determined by the estimated construction and monitoring costs and is released by the Army Corps of Engineers after documentation and approval of successful construction and monitoring (United States Army Corps of Engineers, 2014).

Joint Ventures: A joint venture can be utilized between a group of investors as a way of lowering risk and encouraging participation from investors that may not otherwise invest. With a joint venture, investors can leverage other partners to limit each investor's share of exposure and risk.

Angel Investing: An investment source from an investor interested in riskier, smaller scale projects with practices or technologies that are more nascent. In the stormwater context, angel investors would potentially invest in new stormwater technology applications.

Incubators and Venture Capital: As opposed to angel investing, incubators and venture capital is typically reserved for larger scale projects with more certainty in benefits to be generated. This type of investment tends to be more formal and requires more certainty in repayment.

Private Equity: Private equity can be offered to the generator/seller with an expectation of a higher return than debt offered.

Debt: Debt can be utilized through mechanisms such as leasing, bank loans, notes, and trade finance. In the context of projects that will benefit water quality, debt would likely not be the primary source of finance for project implementation; rather, it would provide generators with the capital to fill in any financial gaps during the implementation, operation, and/or maintenance of the project.

Capital Markets: Capital markets with long-term debt or equity-backed securities are another financing mechanism that creates an avenue for more public participation in project investment due to the lower barrier to entry provided by more organized capital markets.

9.4 Performance-based Contracting Structures

As stated in Section 4.6, performance-based delivery can be utilized as an alternative compliance system approach and/or as a contracting method. The use of performance-based contracting methods can be used in tandem with any alternative compliance system approach to mitigate performance risk for expected environmental outcomes and incentivize the private sector to provide the most cost-efficient metrics. This section examines the contracting structures that,

although often utilized in Community-Based Public Private Partnerships (CBP3s) and traditional Public Private Partnership (P3s), may be adapted as a contracting structure for any alternative compliance system approach.

Performance-based contracting structures provide a spectrum of opportunities for funding and financing based on the roles and financial risk assumed by either the public or private entities in the partnership. Below is a summary of the most common performance-based contracting structures in order from least to greatest transfer of roles and financial risk to the private entity (USEPA Region 3, 2015).

Design-Build-Finance (DBF): Combines the innovation of design-build with some amount of private sector capital (such as debt or equity). This model often combines private sector funds with existing public sources and allows private capital to fill any gaps in funding.

Design-Build-Operate-Maintain (DBOM): Similar to the DBF approach, DBOM also includes a short to medium-term operational and maintenance responsibility for the private partner.

Design-Build-Finance-Maintain (DBFM): Similar to the DBF approach, DBFM also includes short to medium-term financial and maintenance responsibility for the private partner and requires the public partner to retain the responsibility for operation.

Design-Build-Finance-Operate-Maintain-Availability Payment (DBFOM-AP): Similar to DBOM, DBFOM-AP requires the private partner to be responsible for financing while the public partner maintains control over fees and revenue collection (if applicable) and makes pre-established payments to the private entity for project delivery and performance commitments.

Design-Build-Finance-Operate-Maintain-Revenue Concession (DBFOM-RC): DBFOM-RC is a DBFOM model where the private partner assumes revenue risk. DBFOM-RCs require the private partner to develop the project and enter into a long-term lease with the public sector that allows it to collect some or all project revenues over the contract term (e.g., toll roads).

Build-Own-Operate (BOO): BOO is an approach with the greatest transfer of risk to the private partner, requiring the private partner to develop and operate a project on land that it owns or controls.

10 RECOMMENDATIONS

In addition to providing an outline of alternative compliance approaches and available options for key components of the System, this document is intended to narrow down the range of appropriate options for the System and provide recommendations for decision-making for System development.

10.1 Decision-Making Process for Contra Costa County System

The development of the Contra Costa County System is guided by three committees: the Steering Committee, the Advisory Committee, and the Technical Advisory Committees:

1. *Steering Committee* – The Steering Committee is comprised of representatives from the Cities of San Pablo, Walnut Creek and Richmond, as well as Contra Costa County. This group will ultimately guide the development of the Contra Costa County System.
2. *Advisory Committee* – The Advisory Committee includes stakeholders that have an interest in being involved in future alternative compliance projects and would therefore like to provide input. Participating committee members include representatives from Alameda County, Contra Costa County, San Mateo County, Santa Clara County, Solano/Fairfield-Suisun, Marin County, Sonoma County, Napa County, Caltrans, Port of Oakland, and San Francisco Public Utilities Commission.
3. *Technical Advisory Committees* – These ad hoc Committees consist of technical, regulatory and/or legal experts to advise on specific issues or questions that arise as part of the Project. Regulatory agencies are invited to provide guidance and input, in addition to a small subset of MRP Permittees.

These committees all have input on the development of the Contra Costa County System. Details relating to the key questions under consideration and next steps for System development are provided in the following sections.

10.2 Contra Costa County System Regulatory Considerations

This section covers next steps corresponding with Contra Costa County System considerations relating to Literature Review Section 2.

√ Establish System Legal Basis

Preliminary Findings: In the context of the development of a regional alternative compliance system, the Contra Costa County System has a legal basis in the following principles:

1. TMDLs themselves are not binding[23] (there is well established case law on this, including the Pronsolino case, which would be controlling precedent in California)[24];

[23] TMDLs are, however, adopted into Basin Plans, which serve as master policy documents for specified regions.
[24] *Pronsolino* v. *Nastri*, 291 F.3d 1123 (9th Cir. 2002)

2. However, NPDES permits must be written with limits/conditions that are consistent with the assumptions and requirements of the TMDL wasteload allocations (40 Code of Federal Regulations 122.44(d)(1)(vii)(B));
3. The MRP includes limits/conditions that specifically allow for the development of an alternative compliance program and the use of LID/GSI to meet the relevant PCBs and mercury limits.

√ Identify the appropriate approach to environmental review for subsequent projects including:

- Defining the CEQA "Lead Agency" for alternative compliance projects
- Defining the "whole of the action" where mitigation will be achieved through alternative compliance projects

Preliminary Findings/Recommendations: The CEQA Lead Agency is the agency with the principle authority for carrying out or approving a project. Where an alternative compliance project is used to provide credits for multiple projects in different jurisdictions, the lead agency is likely either a regional agency with authority at a program level, or the local jurisdiction where the alternative compliance project is located. If a Program EIR is prepared to cover the CEQA requirements for a range of projects that could be implemented under the program, the lead agency would need to be the County or other regional agency that has jurisdiction at the program level.

√ Appropriate tracking of measures for CEQA mitigation considerations

Preliminary Findings/Recommendations: The System tracking system should be defined to supply substantial evidence that, where the alternative compliance system is used as CEQA mitigation, the mitigation: is not deferred; is enforceable; is proportional to the impact being addressed; and is additional to the mitigation that would otherwise be implemented under law, regulation, or other legally required mandate.

An additional System need is a process to confirm and/or demonstrate that metrics are generated only for projects that aren't currently installed and/or wouldn't otherwise be required to be constructed to address an existing water quality compliance requirement.

10.3 Contra Costa County System Components, Approach, Metric, and Control Measure Considerations

This section covers next steps corresponding with Contra Costa County System considerations relating to Literature Review Sections 3, 4, 5, and 6.

10.3.1 Metric Considerations

Next steps for Contra Costa County System development relating to System metric include:

√ Define unit of metric(s) and an inventory of potential source control measures and/or requirements that new control measures must meet to be eligible for credit generation.

Preliminary Findings/Recommendations: Determining the alternative compliance metric(s) used in the Contra Costa County System is anticipated to be one of the most

critical decisions during Contra Costa County System development. A key issue identified during initial discussions for metric selection pertains to how metric selection may influence which projects are ultimately implemented in Contra Costa County. In particular, there is a concern that metric selection may drive projects that meet the GSI provisions of the MRP, but do not provide substantial PCBs load reductions (e.g., due to tributary land uses), and vice versa. This may occur because the type and amount of water quality benefits generated from a project can significantly vary by location and the type of control measure implemented.

Next steps for metrics decisions must consider the above and identify the metric or metrics that can maximize opportunities for water quality benefits generated by the Contra Costa County System to meet either MRP Provision C.3 or C.12.

√ Following metric determination, technical aspects of Contra Costa County System metrics must be developed:

- Establish Metric calculation method
- Establish exchange baseline calculation (if needed)
- Define uncertainties for Contra Costa County System metric

Preliminary Findings/Recommendations: The Contra Costa County System should integrate existing calculation methods for participants subject to the MRP and PCBs TMDL. Existing elements that have been reviewed and/or approved by the SFBRWQCB provide a sufficient standard for Contra Costa County System components. In particular, estimation methods for land use-based concentrations, load reductions, control measure-based load reductions, and uncertainties should utilize the methodology described in the Bay Area RAA Guidance Document (BASMAA, 2017b) and resulting third-party peer reviewed modeling methods (e.g., CCCWP, 2018).

10.3.2 Approach Considerations

Key next steps to identifying the Contra Costa County System approach include:

√ Examine legal considerations for unit of metric and determine which alternative compliance approach(es) are feasible.

Preliminary Findings/Recommendations: WQT is one of the pioneering water quality alternative compliance approaches and has influenced the development of other market-based approaches. As such, many other alternative compliance approaches have similar components and any approach(es) employed for the Contra Costa County System will likely share similarities with WQT. However, even though there may be suitable application of some WQT components for Contra Costa County System development, it is not recommended for the Contra Costa County System to adopt a formal WQT approach.

At this time, all other approaches presented in this Literature Review are considered to be legally viable for the Contra Costa County System.

√ Identify which feasible alternative compliance approach is the most effective at meeting compliance drivers/needs.

Preliminary Findings/Recommendations: If multiple metrics are ultimately identified, alternative compliance approaches that maximize the generation of the respective metrics should be employed. This may result in the Contra Costa County System using two or more different approaches in parallel. If this is employed, considerations are needed for how the Contra Costa County System can unify components when it is efficient. Additional consideration of feasible approach(es) is needed following the metric determination.

10.3.3 Components Considerations

Key questions to support the decision-making process related to identifying and defining Contra Costa County System components include:

√ Reference crosscut analysis to examine alternative compliance systems with similar alternative compliance approaches and establish the following for the Contra Costa County System:

- Eligible Entities
- Eligible Transactions
- Restrictions/Restricted Waters
- Baseline Conditions (i.e., Exchange Baseline)
- Land Use Restrictions
- Term of Trade/Stacking and Bundling

Preliminary Findings/Recommendations: When defining the *exchange baseline* for the Contra Costa County System, it will be important to consider any anticipated required practices and/or conditions that permittees may be subject to in future permit cycles. A decision should be made during system development whether control measures and associated benefits mandated by anticipated requirements should be considered as part of the exchange baseline or eligible for exchange.

√ Based on decisions and analysis conducted for metric(s) selection and the identification of components listed, develop technical aspects of Contra Costa County System:

- Determine necessary trade ratios
- Define uncertainties for Contra Costa County System components

10.3.4 Control Measure Considerations

Next steps for Contra Costa County System development relating to control measures include:

√ Identify control measures acceptable for metric generation

√ Consider whether additional control measures can be added to the System if they meet specific performance and design requirements

√ Determine calculation method to estimate metrics generated from control measure implementation

Preliminary Findings/Recommendations: See Section 10.3.1.

10.4 Contra Costa County System Compliance and Tracking Considerations

This section covers next steps corresponding with Contra Costa County System considerations relating to Literature Review Sections 7 and 8.

10.4.1 Compliance Considerations

Next steps for Contra Costa County System development relating to compliance include:

√ Establish protocols to manage risk

√ Establish protocols for credit certification and verification:

- Inspection, maintenance and evaluation
- Reporting
- Compliance and enforcement

Preliminary Findings/Recommendations: Reporting and inspection requirements related to metric verification and certification in the Contra Costa County System should mirror current verification and certification reporting conducted by Permittees to demonstrate compliance with the MRP.

10.4.2 Tracking Considerations

Next steps for Contra Costa County System development relating to tracking include:

√ Establish tracking system needs and develop tracking system

Preliminary Findings/Recommendations: Contra Costa County System tracking should be consistent with current permit accounting practices and streamlined with MRP reporting.

10.5 Contra Costa County System Funding and Finance Considerations

Next steps corresponding with Contra Costa County System considerations relating to Literature Review section 9, funding and finance considerations, include:

√ Select appropriate funding and financing options

√ Define administrative and management structure, functions and fees

√ Select delivery approach and address P3, procurement and related issues

Preliminary Findings/Recommendations: Funding for pollutant control measures will be critical to the success of a successful Contra Costa County System. Thus, enabling and harmonizing as many avenues for funding as possible should be considered early in Contra Costa County System development but can be finalized in the later stages of development. That said, the System is intended to be principally designed for municipal

permittees subject to the MRP and stormwater portion of the TMDLs. It is recommended that any System refinements aimed to enable funding from non-municipal permittee entities occur after the majority of System development decisions have been made. It is recommended that a preliminary investigation into the interest and demand from other entities (e.g., industrial permittees subject to the TMDL) be conducted at the latter stages of System development and refinements occur on the basis of investigation findings.

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GLOSSARY OF KEY TERMS

Alternative Compliance Demand Drivers: Regulatory or financial rationale for pursuing the development of an alternative compliance system.

Alternative Compliance Systems: Flexible compliance programs that allow regulated dischargers with costly or infeasible pollution control requirements to meet equivalent discharge reductions by investing in the implementation of cost-effective and feasible controls at other source locations, thereby achieving an overall environmental benefit at a reduced overall cost.

Alternative Compliance System Metric: A common measurement unit of equivalent pollutant discharge reduction that reflects both the regulatory pollution control requirement and the measurable or estimated outcome at the alternative source of control. This metric is often expressed as mass pollutant load reduction per time (e.g., pounds/year) or as a scientifically-defensible measure of equivalency between the regulatory requirement and the benefits metric from the alternative control (e.g., "acres greened", "acres treated", or "volume managed/treated"). The compliance metric in an alternative compliance system is the unit of water quality benefit, such as a pollution reduction credit or offset, that can be generated and utilized in the alternative compliance system.

Angel Investing: A method of financing for projects by an entity seeking higher returns than traditional investing. Angel investing is generally utilized in small-scale applications and for investments that involve more early stage risk, such as new technology applications.

Build-Own-Operate (BOO): BOO is an approach with the greatest transfer of risk to a private partner, requiring the private partner to develop and operate a project on land that it owns or controls.

Bundling: A method of deriving value produced on a piece of land where a variety of overlapping ecosystem services are sold as a single package. Bundled services are often represented through a very general unit of metric such as an area of forest or wetland that is assumed to be associated with a wide range of services.

Buyer: The regulated entity that purchases or provides funding for surplus units of metric generated by another entity to meet their own water quality compliance requirements.

Buyer-of-Last-Resort: A method of financing where a promise is made by an entity to purchase credits or offsets if the seller cannot identify another buyer. Buyer-of-Last-Resort is often utilized with a guaranteed purchasing price.

Catalytic First-Loss Capital: Method of credit enhancement provided by an investor who agrees to bear first losses in an investment in order to encourage the participation of co-investors.

Certification: Process that involves the formal inspection, documentation and tracking of implemented actions necessary to ensure the benefits being exchanged as credits are being achieved throughout time. Certification is a demonstration to all stakeholders that the project that is generating pollution reduction credits will meet expectations. Certification often involves third-party project reviews and physical inspections of implemented practices to ensure actions

are appropriately designed, implemented and maintained to achieve intended outcomes as defined by the alternative compliance system framework, guidelines and/or requirements.

Compliance and Enforcement: Entity that ensures that criteria for participants in an alternative compliance system are being met. In the event of non-compliance, the entity can either report to, or is, a delegated authority able to enforce water quality non-compliance provisions as necessary.

Control Measure: Structural or non-structural practices, management changes, or activities that can be implemented to generate measurable or estimated units of metric in an alternative compliance system.

Credit/Offset: The unit of metric exchanged in an alternative compliance system. A credit or offset may represent a pollutant load reduction or equivalent.

Current Conditions: An exchange baseline defined as the onsite performance, based on the selected metric(s), of an area prior to the implementation of a control measure or project. This type of exchange baseline allows for all units of water quality benefit metric generated from a control measure or project to be exchanged as surplus.

Design-Build-Finance (DBF): An approach that combines innovation of design-build with some amount of private sector capital (such as debt or equity). This model often combines private sector funds with existing public sources and allows private capital to fill any gaps in funding.

Design-Build-Finance-Maintain (DBFM): Similar to the DBF approach, DBFM also includes short to medium term financial and maintenance responsibility for the private partner and requires the public partner to retain the responsibility for operation.

Design-Build-Finance-Operate-Maintain-Availability Payment (DBFOM-AP): Similar to DBOM, DBFOM-AP requires the private partner to be responsible for financing while the public partner maintains control over fees and revenue collection (if applicable) and makes pre-established payments to the private entity for project delivery and performance commitments.

Design-Build-Finance-Operate-Maintain-Revenue Concession (DBFOM-RC): DBFOM-RC is a DBFOM model where the private partner assumes revenue risk. DBFOM-RCs require the private partner to develop the project and enter into a long-term lease with the public sector that allows the private partner to collect some or all project revenues over the contract term.

Design-Build-Operate-Maintain (DBOM): Similar to the DBF approach, DBOM also includes a short to medium-term operational and maintenance responsibility for the private partner.

Eligible Entities: The types of entities that are allowed to participate as either a buyer or seller in an alternative compliance system.

Eligible Exchanges: The types of purchases, trades, and/or sales of units of metric that are allowable in the system based on whether an entity is a point source (PS) or nonpoint source (NPS) discharger.

Environmental/Public Bonds: Type of debt security that municipalities use to finance environmental public works and improvements.

Exchange: In authorized alternative compliance systems, "exchange" refers to units of metric that can be transacted between entities to mutually achieve required pollutant reductions. Surplus cost-effective pollutant reductions (credits or offsets) achieved for one pollutant source can be exchanged with another regulated entity for their alternative compliance.

Exchange Baseline: Requirements that must be achieved by a source before generating a unit of metric. This may include meeting specific load reduction requirements before surplus load reductions may be exchanged or other requirements in the alternative compliance system.

General Obligation Funding: Debt instrument issued by state and local governments to raise money for public works projects backed in full faith by the issuing municipality.

Grants and Reserve Accounts: A fund set aside by an entity to meet future costs of green infrastructure upkeep and any unexpected future costs.

Green Stormwater Infrastructure: Infrastructure that uses vegetation, soils, and natural processes to manage water and create healthier urban environments. At the scale of a city or county, green stormwater infrastructure refers to the patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the scale of a neighborhood or site, green stormwater infrastructure refers to stormwater management systems that mimic nature by soaking up and storing water.

Growth: In the context of alternative compliance demand drivers, growth refers to stormwater regulatory requirements developed to regulate impairments related to redevelopment, new development or population growth.

Guidance: In the context of a legal basis for alternative compliance systems, guidance refers to standards or frameworks provided or approved by a Clean Water Act-delegated agency to provide advice on how best to comply with specific rules.

In-lieu Fee: An approach to compensatory mitigation for losses of aquatic resources that allows Permittees to provide funds in the form of an in-lieu fee to an administering government or non-profit conservation organization. Such fees are then pooled to build and maintain offsite mitigation sites.

Incubators and Venture Capital: A method of financing projects by an entity seeking higher returns than traditional investing. As opposed to angel investing, incubators and venture capital tend to be more formal and require a less risky path to repayment.

Joint Ventures: Business arrangements in which two or more entities agree to pool their resources to implement a project and reduce individual risk associated with project failure.

Legal Basis for Alternative Compliance: Mechanism necessary for implementing an alternative compliance system. This may include, but is not limited to rules, guidance, or plans.

Loan Guarantees: A method of financing where a promise is made by an entity to assume the debt obligation of a borrower if that borrower defaults.

Mitigation Banking: An approach to compensatory mitigation for losses of aquatic resources that allows an entity (mitigation banker) to generate, bank, and sell credits to Permittees for impacts to various wetlands and streams designated under the Clean Water Act Section 404.

Nonpoint Source (NPS): Source of water impairment that does not come from any discernable, confined and discrete conveyance including but not limited to land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrologic modification.

Offset Program: Similar to water quality trading, an offset program is a market-based alternative compliance approach in which a source can purchase pollutant reduction credits from another source to achieve a pollutant discharge requirement. Unlike water quality trading, an offset program is often utilized in contexts where regulated dischargers are interested in meeting a water quality pollutant reduction requirement, such as new development or urban growth, but may not have to meet a collective cap on water pollutant discharges.

Performance-based Contracting: Unlike traditional contracting where payment is based on control measure implementation, performance-based contracting (or "Pay-for-Performance") is an approach to alternative compliance where payment is contingent on the delivery of an outcome. Performance-based contracting can be utilized in several combinations to tie payment to different outcomes.

Plan: In the context of a legal basis for alternative compliance systems, a plan refers to a Clean Water Act-delegated agency approved course of action, such as a TMDL implementation plan, designed to meet water quality standards.

Point Source (PS): Sources of water impairment that come from any discernable, confined and discrete conveyance.

Practice-Based: An exchange baseline that is set to a particular control measure. This means that a particular control measure must first be implemented onsite before units of metric can be generated. Unit of metrics generated from the required control measure are part of the baseline and cannot be considered surplus.

Practice-To-Practice Basis: In the context of metric quantification, practice-to-practice basis refers to the process of using different quantification methods for control measure performance based on the control measure type. In the context of how control measures are approved for use in a system, this process is "ad hoc" and new control measures are individually reviewed and approved on a periodic basis.

Private Balance Sheet Financing: In the context of a Community-Based Private-Public Partnership (CBP3), this refers to a method of financing where an agreement improves the treatment balance sheet for the municipality and frees credit capacity for other municipal priorities.

Regulatory Requirements/TMDL Allocations: An exchange baseline based on regulatory requirements in the region, such as a TMDL allocation. Metric generators must meet these regulatory requirements first, before generating surplus metrics. Any additional units of metric generated beyond the regulatory requirement by the control measure or project is considered surplus and can be exchanged.

Reserve Pool: A pool of credits obtained by the administrator of the alternative compliance system to insure against unforeseen credit losses due to project failure. These credits may be set aside from an applied trade ratio.

Revolving Loans: A method of financing where a form of credit is issued that provides the borrower with the ability to draw down or withdraw, repay and withdraw again. This is considered a more flexible method of financing than a term loan which requires a borrower to follow a fixed payment schedule.

Risk Assurances: Mechanisms that can account for default of a unit of metric due to failure to meet criteria of the alternative compliance system. This may include, but is not limited to failure in design, implementation, operation, or maintenance of a pollution control measure.

Rule: In the context of a legal basis for alternative compliance systems, a rule is formal legislation approved by a state's legislative body.

Seller: Entity that generates surplus unit of metric by implementing an approved control measure in order to exchange the unit of metric with a buyer in an alternative compliance system. Sellers are also referred to as generators.

Stacking: As opposed to bundling, stacking is a method of deriving value produced on a single area of land where overlapping ecosystem services are measured separately and packaged in a range of different credit types or units of metric.

System Restrictions/Restricted Waters: Potential limitations placed on the generation or utilization of a unit of metric.

Trade Ratio: A numerical value used to convert an estimated load reduction into a tradable unit of metric. A trade ratio may include considerations for: 1) lack of information and risk associated with control measures, implementation and performance (uncertainty); 2) trading of different pollutants or different forms of the same pollutant (equivalency); 3) the distance and unique watershed features that will affect pollutant fate and transport between exchanging entities (delivery); and, 4) compliance risk reduction mechanisms (reserve and retirement).

True-up Period: A program provision that allows buyers a window of time at the end of the compliance period to purchase needed credits. True-up periods can reduce risk to regulated sources of over or under-purchasing credits.

Utility Fees: Fees administered to users of utilities used to fund services and projects.

Use Agreement: In the context of a legal basis for alternative compliance systems, a use agreement can represent an agreement between an entity and a Clean Water Act-delegated agency regarding how to comply with a water quality standard.

Verification: The part of the certification process that involves the physical inspection of control measures for proper implementation, operation and maintenance to ensure adherence to the requirements of the alternative compliance system. Verification may be performed by the entity responsible for the certification process or by a verification entity approved by the entity responsible for certification.

Water Quality Monitoring and Evaluation: Protocols within an alternative compliance system implemented to measure and/or track program success and shortcomings. This may include site-specific monitoring of control measures and practices, ambient monitoring of the watershed, or a periodic program evaluation to identify deficiencies in the system design and ensure environmental benefits are being delivered.

Water Quality Trading (WQT): Market-based alternative compliance approach in which a regulated source can purchase pollutant reduction credits from another source to achieve a pollutant discharge requirement. Water quality trading is utilized where trading is approved by a regulatory agency for alternative compliance by permitted dischargers required to meet a cap on water pollutant discharges.

APPENDIX A
Alternative Compliance System Literature Review Crosscut Summary

Components of Alternative Compliance Systems	Relevant Subcomponents of Alternative Compliance Systems	Water Quality Trading (WQT) Programs			Water Quality & Stormwater Crediting and Offset Programs				
					Water Quality Offset Programs				Similar Stormwater Compliance Programs
		Laguna de Santa Rosa Nutrient Offset Program[1]	*Virginia Nutrient Trading Program*[2]	*Maryland Water Quality Trading Program*[3,4]	*Lake Simcoe Phosphorus Offset Program*[5]	*Lake Tahoe Crediting Program*[6]	*Washington, D.C. Stormwater Retention Program*[7,8]	*North Carolina Ecosystem Enhancement Program EEP Nutrient Offset Program*[9]	*San Diego's Draft Off-site Stormwater Alternative Compliance*[10,11]
Regulatory Considerations	**Legal Basis for Alternative Compliance** *Rule, Plan, Use Agreement*	Rule	Rule	Rule	Plan	Plan	Rule	Rule	Plan
	Alternative Compliance Demand Driver *TMDL, Pre-TMDL, Water Quality Standards/Water Quality-Based Effluent Limits (WQS/WQBELs), Growth, Other*	Pre-TMDL	WQS/WQBELs	TMDL; Growth	Growth	TMDL	TMDL; Growth	Growth	Growth
Alternative Compliance Metric	**Transacted Pollutants** *Total Phosphorus (TP), Total Nitrogen (TN), Total Suspended Solids (TSS), Total Copper (TCu), Total Lead (TPb), Total Zinc (Zn), Fecal Coliform (FC), Total Selenium (TSe), Total Mercury (THg)*	TP	TN, TP, TSS	TN, TP, TSS	TP	TP, TN, TSS	TN,TP,TSS	TN, TP	TSS, TP, TN, TCu, TPb, TZn, FC, Impervious Area (Hydromodification)
	Exchange Baseline Definition *Current Conditions, Regulatory Requirements/TMDL Allocations, Practice-based*	Practice-based; Regulatory requirements based on land use	TMDL	TMDL and Tributary Strategies Reductions (agricultural generators only)	Current Conditions	Current Conditions	Current Conditions	Current Conditions	Current Conditions
	Defining Metric for Exchanges	Phosphorus Credit (load reduction lbs/year)	Nitrogen and Phosphorus Credit (load reduction lbs/year)	Nitrogen, Phosphorus, and Sediment Credit (load reduction lbs/year)	Phosphorus Offset (load reduction lbs/year)	Water Clarity Credit (load reduction lbs/year)	Stormwater Retention Credit (gallons/year)	Nitrogen and Phosphorus Credit (load reduction lbs/year)	Stormwater Pollutant Control Volume (Cubic Feet); Directly Connected Impervious Area Effectively Managed (Acres)
	Alternative Compliance Metric Calculation Methods *Specific Calculations, Model, Approved on Practice-To-Practice Basis, Other*	Approved on Practice-To-Practice Basis	Specific Calculations	Specific Calculations	Approved on Practice-To-Practice Basis	Model	Curve Number	Specific Calculations	Specific Calculations and Model
Practices to Achieve Credit	**Practices** *Agricultural, Stormwater, WWTP, Other*	Agricultural; Stormwater; WWTPs	Agricultural; Stormwater; WWTPs	Agricultural	Agricultural; Stormwater	Stormwater	Stormwater	Agricultural; Stormwater	Stormwater; Other (Land Restoration/ Preservation)
Exchanges	**Eligible Entities** *Agriculture, NPDES Permittees - Stormwater and/or WWTPs*	Agriculture; NPDES Permittees-Stormwater and WWTPs	Agriculture; NPDES Permittees-Stormwater	Agriculture; NPDES Permittees-Stormwater and WWTP	Agriculture; NPDES Permittees-Stormwater	NDPES Permittees-Stormwater	NDPES Permittees-Stormwater	NDPES Permittees-Stormwater	NDPES Permittees-Stormwater
	Eligible Exchanges *PS-PS, PS-NPS, and/or NPS-NPS*	PS-PS; PS-NPS	NPS-NPS	PS-NPS; NPS-NPS	NPS-NPS	NPS-NPS	NPS-NPS	NPS-NPS	NPS-NPS
	Trade Ratios *(Variable)*	2.5:1	1:1 - 2:1	Variable (BMP Dependent)	2.5:1	1:1	1:1	1:1	Variable (BMP/Land Use Dependent)
	System Restrictions/Restricted Waters *Upstream Metric Generation Only; Watershed Limited; Downstream Generation with Discount Factor; Limited Amount of Unit of Metric Use; Stacking/Bundling Allowed; Restrictions on Public Monies*	Credit Stacking Allowed with proportional accounting	Watershed Limited	No Use of Public Monies (agricultural generators); Downstream Generation with Discount Factor	Watershed Limited	Watershed Limited	Limited Amount of Metric Use	Watershed Limited	Variable with Pollutant and Watershed: Pollutant Control – Watershed Limited Hydromodification - Limited Amount of Metric Use; Upstream Metric Generation Only (new development)

Components of Alternative Compliance Systems	Relevant Subcomponents of Alternative Compliance Systems	Water Quality Trading (WQT) Programs			Water Quality & Stormwater Crediting and Offset Programs				
					Water Quality Offset Programs				Similar Stormwater Compliance Programs
		Laguna de Santa Rosa Nutrient Offset Program[1]	*Virginia Nutrient Trading Program*[2]	*Maryland Water Quality Trading Program*[3,4]	*Lake Simcoe Phosphorus Offset Program*[5]	*Lake Tahoe Crediting Program*[6]	*Washington, D.C. Stormwater Retention Program*[7,8]	*North Carolina Ecosystem Enhancement Program EEP Nutrient Offset Program*[9]	*San Diego's Draft Off-site Stormwater Alternative Compliance*[10,11]
Compliance Risk Considerations	**Certification and Verification** *Certification of Unit of Metric by State or Non-State Entity; Verification of Control Measure by State or Non-State Entity*	State Entity Certification; State Entity Verification	State Entity Certification; State Entity Verification	Certification Unspecified; State or Non-State Entity Verification	Non-Provincial Certification; Non-Provincial Verification	Certification Unspecified; Non-State Entity Verification	State Entity Certification; State Entity Verification	State Entity Certification; State Entity Verification	State Entity Certification; State Entity Verification
	Water Quality Monitoring and Evaluation *Ambient Monitoring; Site-Specific Water Quality Monitoring; None Specified, Program Evaluation*	Program Evaluation by Water Board	None Specified	None Specified	Site-Specific Monitoring; Program Evaluation	None Specified	None Specified	None Specified	None Specified
	Compliance and Enforcement *State-Delegated CWA Authority, WQT Program Administrator*	State-Delegated CWA Authority	State-Delegated CWA Authority	State-Delegated CWA Authority	Provincial Authority	Program Administrator	State-Delegated CWA Authority	State-Delegated CWA Authority	State-Delegated CWA Authority
	Risk Assurances *Reserve Pool; Corrective Action/Contractual; Not Stated*	Corrective Action/Contractual	Corrective Action/Contractual	Corrective Action/Contractual	Reserve Pool	Not Stated	Not Stated	Not Stated	In Development
Tracking	**Program Tracking** *Public Access vs. Non-Public Access; Agency Registry vs. Third Party Registry vs. No Registry*	Public Access; Agency Registry	Non-Public Access; Agency Registry	Public Access; Agency Registry	Public Access; Third Party Registry	Public Access; Agency Registry	Public Access; Agency Registry	Public Access; Agency Registry	Public Access; Agency Registry (In Development)
Funding and Financing Considerations	**Public Funding Utilized** *Capital Budgets; Utility fees; In-lieu fee; Supplemental Project Funding; Farm Bill Conservation Programs*; *Grant Funding; General Obligation funding*	Farm Bill Conservation Programs	Farm Bill Conservation Programs	Not Allowed	N/A	N/A	N/A	In-lieu Fee (Optional)	N/A
	Private Funding Utilized *Regulatory Approaches; Voluntary Approaches*	Regulatory Approaches	Regulatory Approaches	Regulatory Approaches	Regulatory Approaches	Regulatory Approaches	Regulatory Approaches	Regulatory Approaches	Regulatory Approaches
	Public Financing Utilized *Buyer-of-Last-Resort; Revolving Loans Grants/Fund*; *Joint Venture*	N/A	N/A	N/A	N/A	N/A	Buyer-of-Last-Resort	N/A	N/A
	Private Financing Utilized *Letters of Credit; Insurance; Venture Capital; Private Equity; Private Balance Sheet*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	P3 Options Utilized *Design-Build-Finance (DBF); Design-Build-Operate-Maintain (DBOM); Design-Build-Finance-Operate Maintain-Availability Payment (DBFOM-AP)*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Components of Alternative Compliance Systems	Relevant Subcomponents of Alternative Compliance Systems	Performance-Based Approaches		Community-Based Public-Private Partnerships (CBP3)		Wetland and Stream Compensatory Mitigation Mechanisms	Payment for Ecosystem Services		One-off and Early Market-based Approaches for Trading Non-conventional Pollutants	
		Anna Arundel County Watershed Protection and Restoration Program[12]	*California DWR Marsh Restoration Program*[13]	*Prince George's County Clean Water Partnership*[12]	*City of Salinas CP3 RFQ for Green Stormwater Infrastructure*[14]	*North Carolina In-lieu Fee Mitigation*[15]	*Denver Water Supply Agency*[16]	*Forest Resiliency Bond-Lake Tahoe*[17]	*California Grassland Area Farmers Tradable Permit Program*[18]	*Sacramento River Watershed Mercury Offset Program*[19]
Regulatory Considerations	**Legal Basis for Alternative Compliance** *Rule, Plan, Use Agreement*	Plan	N/A	Plan	Plan	Rule	N/A	N/A	Use Agreement	Plan
	Alternative Compliance Demand Driver *TMDL, Pre-TMDL, Water Quality Standards/Water Quality-Based Effluent Limits (WQS/WQBELs), Growth, Other*	TMDL	ESA Habitat Requirements	TMDL	Pre-TMDLs	CWA Section 404	WQS	WQS/WQBELS	WQS/WQBELS	TMDL
Alternative Compliance Metric	**Transacted Pollutants** *Total Phosphorus (TP), Total Nitrogen (TN), Total Suspended Solids (TSS), Total Copper (TCu), Total Lead (TPb), Total Zinc (Zn), Fecal Coliform (FC), Total Selenium (TSe), Total Mercury (THg)*	TN, TP, TSS	N/A	TN, TP, TSS	TSS	N/A	N/A	N/A	TSe	THg
	Exchange Baseline Definition *Current Conditions, Regulatory Requirements/TMDL Allocations, Practice-based*	Current Conditions	Current Conditions	Current Conditions	Current Conditions	Current Conditions	Current Conditions	Current Conditions	Current Conditions	In Development
	Defining Metric for Exchanges	Water Quality Credits (Load Reduction lbs/year) and Impervious Acres Treated	Quality Habitat (Acres)	Impervious Area Credits (Acres)	Runoff Volume; Sediment Reductions (load reduction lbs/year)	Acres of Mitigated Wetland, Feet of Mitigated Stream	Acres of Managed Forests	Acres of Managed Forests	Selenium Reduction (load reduction lbs/month)	In Development
	Alternative Compliance Metric Calculation Methods *Specific Calculations, Model, Approved on Practice-To-Practice Basis, Other*	Model	Other	Model	Other	Specific Calculations	Other	Other	Specific Calculations	In Development
Practices to Achieve Credit	**Practices** *Agricultural, Stormwater, WWTP, Other*	Stormwater	Other (Habitat Restoration)	Stormwater	Stormwater	Other (Wetland and Stream Mitigation)	Other (Forest Management)	Other (Forest Management)	Agricultural (Diverted Irrigation Drainage Related Only)	In Development
Exchanges	**Eligible Entities** *Agriculture, NPDES Permittees - Stormwater and/or WWTPs*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Irrigation and Drainage Districts	In Development
	Eligible Exchanges *PS-PS, PS-NPS, and/or NPS-NPS*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NPS-NPS	In Development
	Trade Ratios *(Variable)*	N/A	N/A	N/A	N/A	2:1	N/A	N/A	1:1	In Development
	System Restrictions/Restricted Waters *Upstream Metric Generation Only; Watershed Limited; Downstream Generation with Discount Factor; Limited Amount of Unit of Metric Use; Stacking/Bundling Allowed; Restrictions on Public Monies*	Watershed Limited	Watershed Limited	Watershed Limited	Watershed Limited	Service Area Limited	Watershed Limited	Watershed Limited	Watershed Limited	In Development

Components of Alternative Compliance Systems	Relevant Subcomponents of Alternative Compliance Systems	Performance-Based Approaches		Community-Based Public-Private Partnerships (CBP3)		Wetland and Stream Compensatory Mitigation Mechanisms	Payment for Ecosystem Services		One-off and Early Market-based Approaches for Trading Non-conventional Pollutants	
		Anna Arundel County Watershed Protection and Restoration Program[12]	*California DWR Marsh Restoration Program*[13]	*Prince George's County Clean Water Partnership*[12]	*City of Salinas CP3 RFQ for Green Stormwater Infrastructure*[14]	*North Carolina In-lieu Fee Mitigation*[15]	*Denver Water Supply Agency*[16]	*Forest Resiliency Bond-Lake Tahoe*[17]	*California Grassland Area Farmers Tradable Permit Program*[18]	*Sacramento River Watershed Mercury Offset Program*[19]
Compliance Risk Considerations	**Certification and Verification** *Certification of Unit of Metric by State or Non-State Entity; Verification of Control Measure by State or Non-State Entity*	Certification Unspecified; State Entity Verification	Certification Unspecified; State Entity Verification	Certification Unspecified; State Entity Verification	Certification Unspecified; State Entity Verification	Certification Unspecified; State Entity Verification	Certification Unspecified; Non-State Entity Verification	Certification Unspecified; Non-State Entity Verification	Certification Unspecified; State Entity Verification	In Development
	Evaluation of Control Measure Effectiveness *Ambient Monitoring; Site-Specific Water Quality Monitoring; None Specified, Program Evaluation*	None Specified	None Specified	None Specified	None Specified	None Specified	None Specified	None Specified	Ambient Monitoring	In Development
	Compliance and Enforcement *State-Delegated CWA Authority, WQT Program Administrator*	State-Delegated CWA Authority	State-Delegated CWA Authority	State-Delegated CWA Authority	State-Delegated CWA Authority	State-Delegated CWA Authority	N/A	N/A	State-Delegated CWA Authority	In Development
	Risk Assurances *Reserve Pool; Corrective Action/Contractual; Not Stated*	Corrective Action/Contractual	Corrective Action/Contractual	Corrective Action/Contractual	Corrective Action/Contractual	Corrective Action/Contractual	N/A	Corrective Action/Contractual	Not Stated	In Development
Tracking	**Program Tracking** *Public Access vs. Non-Public Access; Agency Registry vs. Third Party Registry vs. No Registry*	No Registry	No Registry	Third Party Registry	Public Access, Third Party Registry (In Development)	Public Access; Agency Registry	N/A	N/A	No Registry	In Development
Funding and Financing Considerations	**Public Funding Utilized** *Capital Budgets; Utility fees; In-lieu fee; Supplemental Project Funding; Farm Bill Conservation Programs*; *Grant Funding; General Obligation funding*	Utility Fee	Capital Budgets	Utility Fee; Grant Funding; General Obligation Funding	Utility Fee (Under Consideration)	In-lieu Fee	Utility Fee	Utility Fee; Grant Funding	N/A	In Development
	Private Funding Utilized *Regulatory Approaches; Voluntary Approaches*	N/A	N/A	N/A	N/A	Regulatory Approaches	N/A	N/A	N/A	In Development
	Public Financing Utilized *Buyer-of-Last-Resort; Revolving Loans Grants/Fund*; *Joint Venture*	N/A	N/A	Revolving Loans Funds	N/A	N/A	Joint Ventures	N/A	N/A	In Development
	Private Financing Utilized *Letters of Credit; Insurance; Venture Capital; Private Equity; Private Balance Sheet*	N/A	N/A	Letter of Credit; Private Equity; Private Balance Sheet	N/A	Letter of Credit	N/A	Venture Capital	N/A	In Development
	P3 Options Utilized *Design-Build-Finance (DBF); Design-Build-Operate-Maintain (DBOM); Design-Build-Finance-Operate Maintain-Availability Payment (DBFOM-AP)*	DBFOM-AP	DBFOM-AP	DBFOM	DBFOM	N/A	DBF	DBF	N/A	In Development

Endnotes for Appendix A: Alternative Compliance System Literature Review Crosscut Summary

[1] https://www.waterboards.ca.gov/northcoast/board_decisions/adopted_orders/pdf/2018/18_0025_Laguna_WQT_Framework_approved.pdf

[2] https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/ANR/ANR-173/ANR-173-PDF.pdf

[3] https://mde.maryland.gov/programs/Water/TMDL/TMDLImplementation/Documents/Webinars/May/Nutrient_Trading_and_Ecosystem_Markets.pdf

[4] https://mde.maryland.gov/programs/Water/WQT/Pages/guidance.aspx

[5] https://www.lsrca.on.ca/Shared%20Documents/reports/offset-program.pdf

[6] https://clarity.laketahoeinfo.org/FileResource/DisplayResource/d72cb51f-b929-429c-8f6c-5d5fdd043650

[7] https://www.michigan.gov/documents/deq/deq-tou-GLSL-GIC-Hoffman-DCstormwater_578495_7.pdf

[8] https://doee.dc.gov/node/1283036

[9] https://deq.nc.gov/about/divisions/water-resources/planning/nonpoint-source-management/nutrient-offset-information#approved-nutrient-reduction-practices

[10] https://www.sandiego.gov/stormwater/regulations

[11] https://www.casqa.org/asca/offsite-storm-water-alternative-compliance-program

[12] https://dukespace.lib.duke.edu/dspace/bitstream/handle/10161/14145/Masters%20Project%20-%20Full%20Document_FINAL.pdf?sequence=1

[13] California Department of Water Resources. 2016. Request for proposal #10127576. Accessible online at: http://www.bidnet.com/bneattachments?/426443459.pdf

[14] https://cdn2.hubspot.net/hubfs/5002046/GWI%20Oct19%20(web)_Salinas.pdf

[15] https://deq.nc.gov/blog/2019-03-15/north-carolinas-lieu-fee-program-gains-national-attention

[16] https://www.hcn.org/issues/44.3/communities-help-pay-for-ecosystem-services-provided-by-forests

[17] https://www.wri.org/news/2018/11/release-forest-resilience-bond-help-fund-46-million-restoration-project-mitigate

[18] https://www3.epa.gov/npdes/pubs/wqtradingtoolkit_appendices.pdf

[19] https://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/delta_hg/2017_0612_dhg_prog_update.pdf