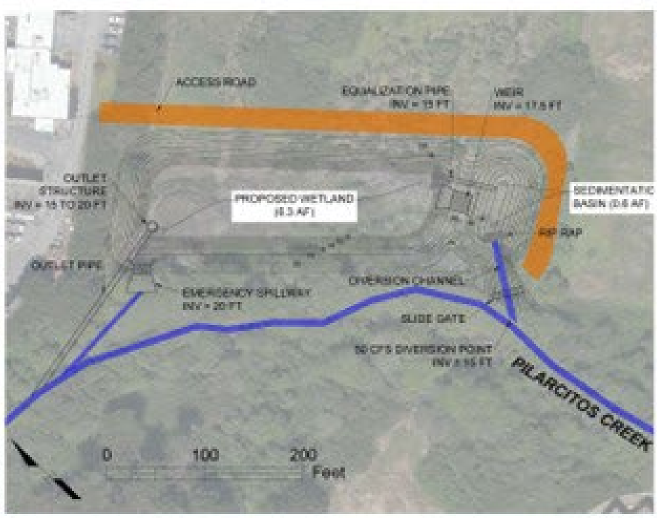
Concept Design Report

Half Moon Bay Sewer Authority Mid-Coastline

May 31, 2022



San Mateo County Office of Sustainability (OOS)
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ADVANCING REGIONAL STORMWATER MANAGEMENT IN SAN MATEO COUNTY

CONCEPT DESIGN REPORT

HALF MOON BAY SEWER AUTHORITY MID-COASTSIDE REGIONAL PROJECT

May 31, 2022

PRESENTED TO

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
ac-ft	acre-feet
BMP	Best Management Practice
cfs	cubic feet per second
EPA	Environmental Protection Agency
EWMP	Enhanced Watershed Management Program
ft	feet
GIS	Geographic Information System
hr	hour
in	inch
LACDPW	Los Angeles County Department of Public Works
LACFCD	Los Angeles County Flood Control District
LiDAR	Light Detection and Ranging
LSGR	Lower San Gabriel River
LSGR WMP	Lower San Gabriel River Watershed Management Program
LSPC	Loading Simulation Program C++
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NSF	National Sanitation Foundation
O&M	Operations and Maintenance
RAA	Reasonable Assurance Analysis
RWL	Receiving Water Limit
SUSTAIN	System for Urban Stormwater Treatment and Analysis IntegratioN
TMDL	Total Maximum Daily Loads
WMMS	Watershed Management Modeling System
WMP	Watershed Management Program
WQBEL	Water Quality-Based Effluent Limit
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION AND EXISTING CONDITIONS

To address the requirements of the Municipal Regional Permit (MRP), the County of San Mateo, City/County Association of Governments of San Mateo County (C/CAG) and other agencies are collaborating to determine the most impactful and effective ways to capture stormwater and improve water quality in managed watersheds that include their jurisdiction. The MRP, a Phase I municipal stormwater permit, was issued by the San Francisco Bay Regional Water Quality Control Board and includes requirements for Pacific Ocean side Permittees to address regional water quality issues including trash loading. To provide required pollutant reductions and contribute to other regional watershed management goals (flood management, green infrastructure, water reuse, etc.), C/CAG has taken a progressive approach to achieve compliance with the MRP in a cost-efficient manner by promoting multi-benefit projects and leveraging collaboration and funding sources. C/CAG's recently completed Regional Collaborative Program Framework White Paper (C/CAG, 2022) provides a cost-benefit analysis of regional project implementation and countywide programmatic implementation of distributed green infrastructure (GI). The White Paper identifies regional projects as a more cost-effective and optimized approach to achieving multi-benefit objectives. An additional outcome of the White Paper is the identification and prioritization of the next round of regional project opportunities throughout the County.

Figure 1-1. Project location.

A regional stormwater capture project is proposed at Half Moon Bay within the City of Half Moon Bay jurisdiction. The map above (Figure 1-1) shows the location of the proposed project. The proposed project is a surface wetland that restores and extends the flood plain to the existing stream to enhance flood protection and treat stormwater through wetland processes. Stormwater will be diverted from Pilarcitos Creek flowing adjacent to the open space parcel controlled by the City of Half Moon Bay that presently serves as a mitigation site for a historic Caltrans project. The site location proposes several technical design decisions that will be addressed in this document, including the following:

- Stormwater Diversion Location
- Best Management Practice (BMP) Type and Configuration

Each of these components of design for this project have been evaluated with emphases on feasibility, constructability, cost-effectiveness, and water quality impact. The full range of options for this project has been assessed to ensure that final design recommendations best match desired outcomes for the project and provide the maximum benefit given site constraints. Additional considerations for the project have been evaluated to ensure that the final design considers community impact and enhancement, regional water reuse efforts, and ongoing operations and maintenance costs. Details of this process and the findings can be found herein.

1.1 PROJECT OBJECTIVES

The objective of this report is to provide concept design-level documents that will ultimately guide the development of the 100% detailed design documents and project implementation. The project concepts presented herein will be optimized to meet the needs of the region, as demonstrated by supporting technical design, hydrologic, hydraulic, and water quality analytics. This document demonstrates preliminary consideration of the technical challenges for this project as well as creative solutions that overcome these challenges by ensuring the technical feasibility of the project and positioning the design for future grant-funding with a clear demonstration of effectiveness and constructability.

1.2 EXISTING SITE CONDITIONS

This Half Moon Bay property (Bev Cunha's Country Road, Half Moon Bay, CA 94019) is an open-space 10.3-acre parcel owned by the City of Half Moon Bay. The site is accessed from a dirt path off Bev Cunha's Country Road. There have been historic issues of encampments within the area and signs were placed to restrict access to the location, but no physical barrier exists to block entry. An access roadway to the stie does not presently exist and any improvement would need to incorporate a pathway for construction and long-term maintenance.

Pilarcitos Creek runs south to north on the southwest side of the parcel and eventually discharges into the Pacific Ocean at Elmar Beach and Dunes Beach. Overall, the slopes within the parcel are mild but topographic relief is evident on the site. The south end is elevated, and a berm exists on the east side of the parcel to contain flooding events. The low point of the parcel is the northwest corner. The parcel and associated Caltrans restoration work is in a sump condition and only overflows back to the creek during high flow events. The creek is highly channelized and has a levee on both banks to restrict entry of flows to the surrounding parcels. The levee is only overtopped during significant events (the exact flow capacity was not available during this study). The existing sump basin between the creek levee and east side parcel berm will be graded into the proposed wetland running parallel to the creek.

The area is heavily vegetated with primarily native shrubs and grasses. Alder trees line the creek and were placed as a part of the Caltrans restoration efforts. Some invasive species have moved into the area but are actively managed by local volunteers to try to keep the area native.

1.2.1 Utility Information

The location did not appear to have any visible utilities within the area with no overhead lines and no ground markings, manholes, or cleanouts. Immediately to the north is the SAM WWTP but no visible sewer lines were observed within the parcel. A utility search will be conducted during the design phase.

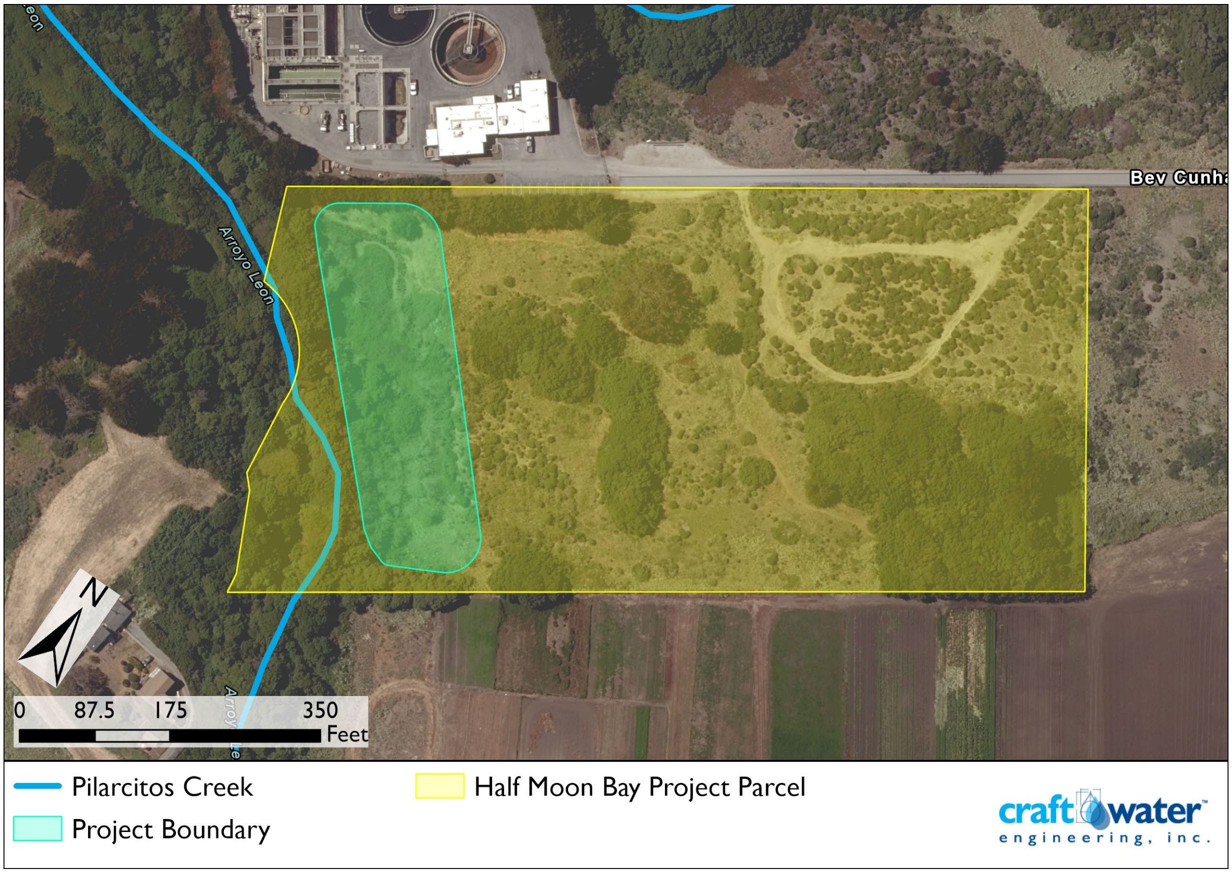


Figure 1-2. Site location and project boundary.

1.2.2 Geotechnical Investigation Constraints

The project is located within the Half Moon Bay Terrace groundwater basin that is mostly filled by sedimentary materials. Infiltration data is presently unavailable for the project location, but the Soil Survey Geographic database (SSURGO) indicates a slow infiltration rate (Hydrologic Soil Group C). The soils at the project site are classified as Denison clay loam, Denison loam, and Gullied land. Well data within 20 miles of the site within the last decade shows an average groundwater depth of less than 100 ft. While this information is sufficient to develop preliminary design concepts, it is recommended that additional geotechnical investigation be conducted given the results of this report to further develop geotechnical design recommendations in support of final design documents.

1.2.3 Stormwater Diversion Location

The Half Moon Bay site provides the opportunity for a single diversion point on Pilarcitos Creek that runs southeast to northwest on the southwest side of the proposed wetland. The potential location was identified (Figure 1-3), and will require careful future analysis of hydraulic capacity of the diversion channel, costs related to diversion length, erosion under high flows, as well as the environmental impacts of diversion on the natural channel. Pilarcitos Creek is a coastal stream that varies in width and depth, originating from Pilarcitos Lake and discharges into the Pacific Ocean.

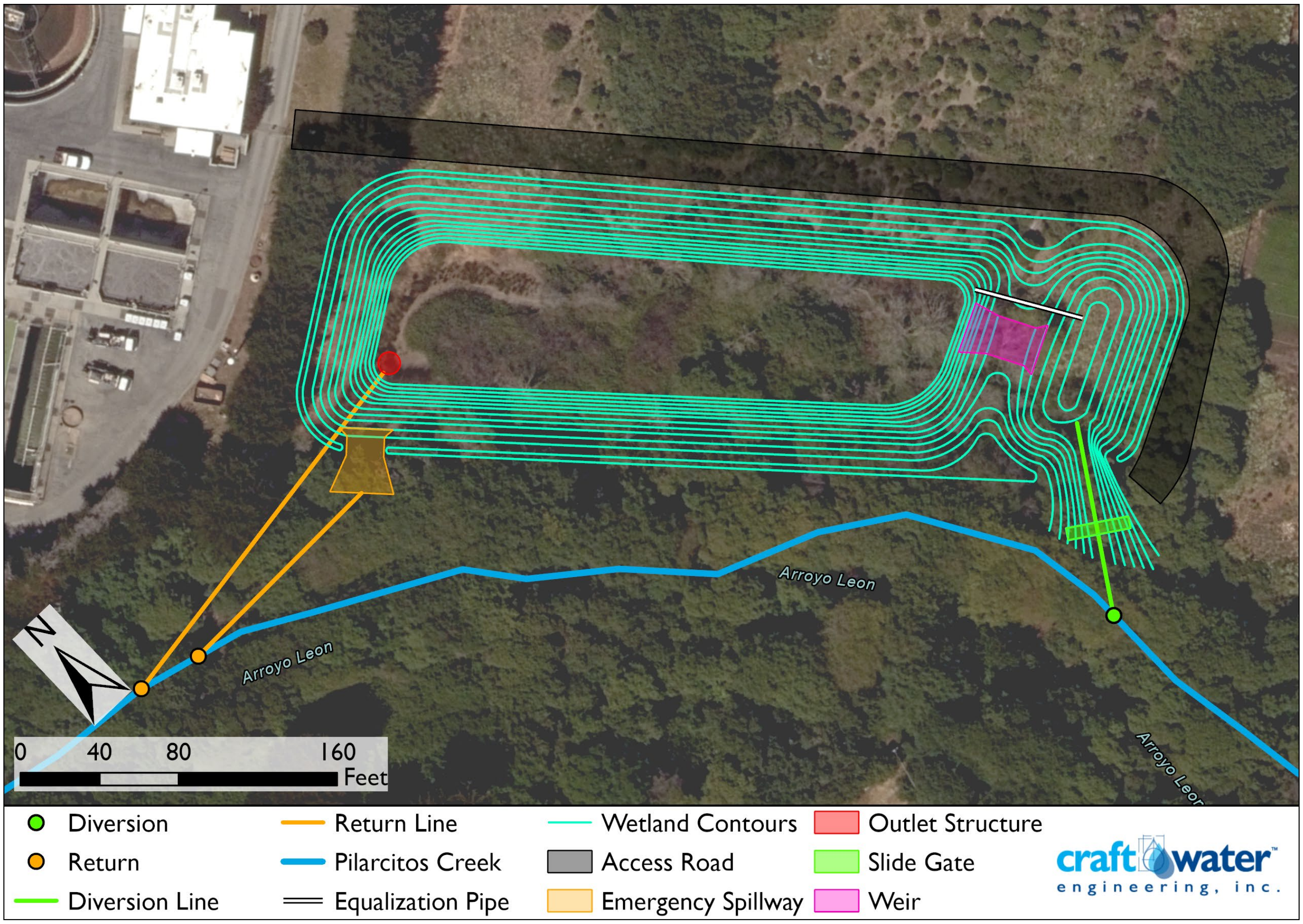


Figure 1-3. Map of diversion locations.

2.0 DECISION SUPPORT MODELING

The purpose of the Half Moon Bay project is to maximize pollutant removal and stormwater capture for groundwater recharge to improve downstream water quality while replenishing groundwater resources. Alternative system configurations were modeled to quantify potential performance and provide design options and considerations for advancing this project concept. An alternative concept that can be modeled and considered in the future is the storage and diversion to the WWTP. The performance of the project as a whole is dependent on a number of configuration options as well as site constraints that determine the range of options available for the stormwater capture unit. The following sections briefly summarize the strategy to most accurately simulate these realistic engineering constraints while optimizing the system configuration to provide the most cost-effective recommendation that best meets the goals of runoff capture, water quality benefit, and water supply augmentation and reuse.

2.1 BASELINE CONDITIONS AND CONSTRAINTS

The following subsections summarize the performance targets, baseline runoff and pollutant loading, onsite non-potable water demand, and groundwater considerations used to inform modeling.

2.1.1 Stormwater Performance Targets

In accordance with the MRP sizing requirements and other countywide multi-benefit stormwater goals, the goal of capturing 80% of annual runoff over the long term has been established for regional projects. This target follows the regional goal of maximizing stormwater treatment by effectively treating the water quality design runoff volume for a project's drainage area. Long-term baseline hydrology from the Reasonable Assurance Analysis (RAA) was utilized to assess how different project options contribute to this goal at the project site. Runoff capture was also paired with water quality reductions to contextualize the multi-benefits offered by different design options for this project. By assessing different project alternatives based on long-term runoff capture and pollutant reduction, final design recommendations can be based on the performance of the BMP across a range of climate conditions to provide a more robust demonstration that the project configuration will attain comprehensive yet cost-effective performance.

2.1.2 Watershed Characterization

For this study, the Loading Simulation Program C++ (LSPC) from the RAA (C/CAG 2020) was used to simulate the sediment-bound pollutant loading, runoff volume, and flow rate associated with a long-term, 10-year continuous time series (Water Year 2006 to Water Year 2015). This model was developed and calibrated to meet criteria established by the *Bay Area Reasonable Assurance Analysis Guidance Document* (BASMAA 2017).

The drainage area delineation for the project site (see Figure 2-1) was developed using geospatial data associated with the RAA modeling subwatersheds and verified/corrected slightly using further geographic information system (GIS) analysis where full subwatersheds did not coincide with project locations. Digital storm drain inventories and high-resolution Light Detection and Ranging (LiDAR) elevation data were used to accomplish subwatershed splitting. Developed drainage areas were used to model runoff and water quality that was then utilized to optimize the BMP decision variables. The overall drainage area size and impervious fraction are summarized in Table 2-1.

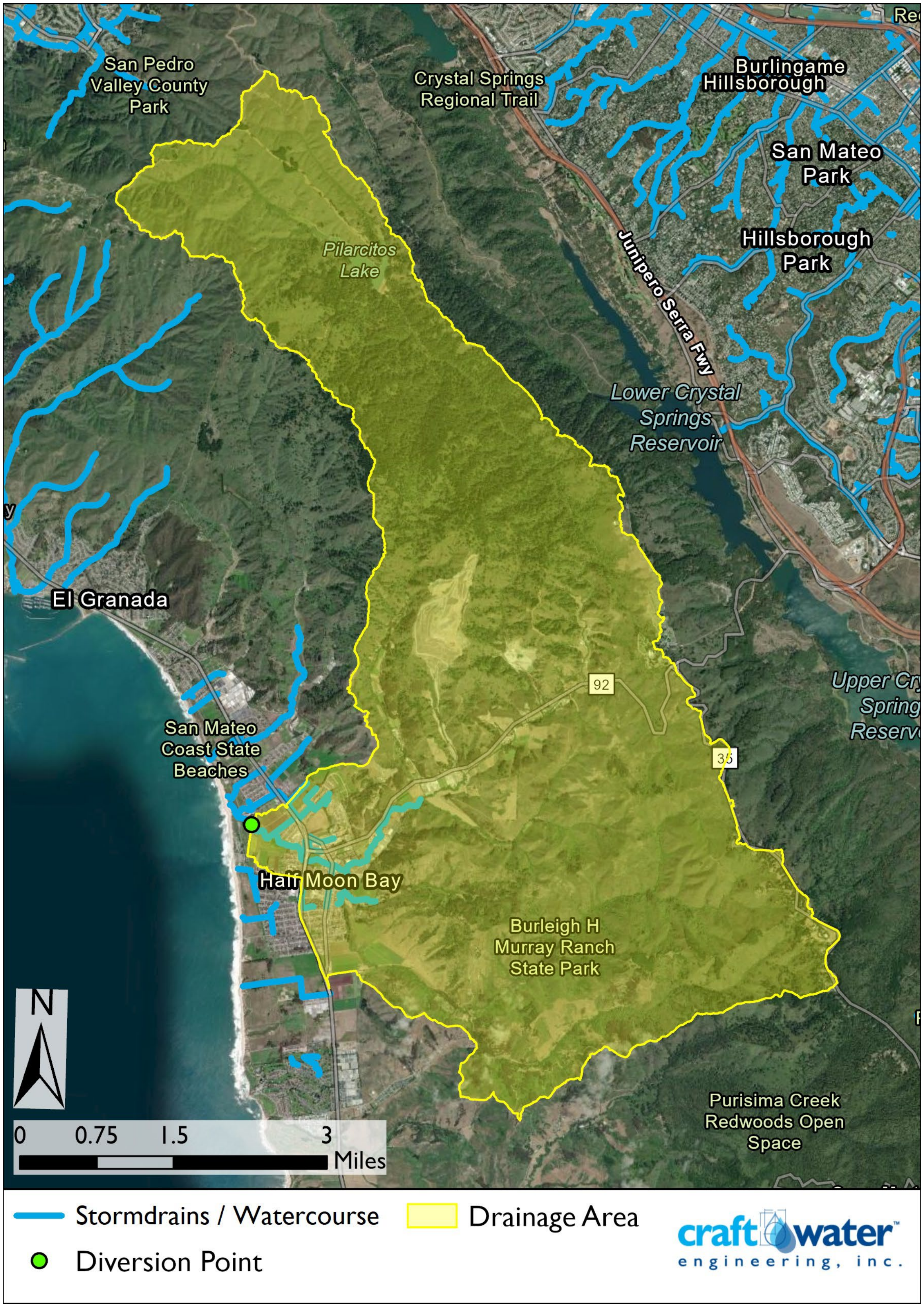


Figure 2-1. Project drainage area.

Table 2-1. Summary of modeled watershed hydrologic and water quality conditions for the Project drainage area.

Total Drainage Area (ac)	Impervious Drainage Area (ac)	Average Annual Runoff (ac-ft)	80% Avg. Annual Runoff Capture Target (ac-ft)	Average Annual TSS Loading (lbs)	Average Annual PCB Loading (g)	Average Annual Hg Loading (g)
17,811	793 (4.5%)	5,048	4,038	1.37 million	7.7	266

2.1.3 Hydrologic Considerations

Long-term baseline flows and pollutant loads to the site using the 2020 RAA model are summarized in Table 2-1. The annual loadings presented in this table represent the maximum possible reductions that could be achieved by control measures at the project site. However, pragmatic diversion limitations, space constraints, and subsequent treatment mechanisms will ultimately limit how much runoff and associated pollutant levels can potentially be diverted into the BMP. The 80% long-term runoff capture target is also identified in the table and will serve as a design consideration in sizing the BMP and making a final recommendation for this site.

2.1.4 Primary BMP Treatment/Discharge Alternatives

Multiple fates for the discharge of captured stormwater have been considered for the Half Moon Bay Project. They are detailed here with acknowledgement of specific constraints and parameters that have been used in BMP modeling to accurately simulate the differences among the alternatives.

2.1.4.1 Detention/Wetland Flow

The Half Moon Bay Project has been initially conceived of as a wet/dry detention area that provides storage for stormwater capture, detention, and slow release back to the channel. Treatment of captured runoff would occur via pretreatment and the detention of water within the wetland to allow for settling of remaining sediments within the storage basin. The ultimate design for this basin should define detention times for water related to final configurations and should design the outlet orifice that will return flow to the channel with this detention time in mind. As this is an initial concept, these details will be reserved until further site information and configuration decisions have been made as they are highly sensitive to other components and constraints of design. For purposes of this initial concept report, wetland detention time has been modeled according to benchmarks throughflow rates of 2, 4, 6, and 8 cfs to represent a range of potential performance that could be realized at this site. In further stages of design, detention and treatment rates can be defined and designed to meet the ideal throughflow for the wetland basin subject to other site-specific considerations and configurations.

2.1.4.2 Infiltration

Typical stormwater wetland design often entails sealing off the basin to native soils to ensure the wetland maintains a standing pool of water and baseflow. However, wet/dry detention basins in more seasonally dry climates can utilize a detention basin that is only seasonally inundated and use infiltration as a primary treatment mechanism in addition to detention and settling when the basin experiences wet-weather flows. No local geotechnical investigations for the project site have been conducted, so subsurface infiltration rates are currently unknown. Local soil types indicate mostly urban soils exist at the site in HSG C. Most of San Mateo County's soils are either in HSG C or undefined, and these soils are not typically associated with high infiltration rates. Modeling in the RAA (C/CAG 2020) utilized an infiltration rate of 0.5 in/hr for projects with similar soil types. This infiltration rate was utilized in modeling this site but will need to be verified in future design stages due to the high sensitivity of BMP performance and sizing recommendations related to this important performance variable. A more conservative infiltration rate of 0.2 in/hr was also modeled which represents average rates for HSG C soils identified by a large review of national studies (MSSC 2005) and documents relating this property to the HSG.

2.1.4.3 On-site non-potable use

Capture, storage, and filtration of stormwater is increasingly utilized for on-site non-potable use as stormwater offers an attractive supplemental water source where water demands can be met by dry-weather flows. Coordination with the City, County, and/or the Sewer Authority Mid-Coastside Partners can identify other non-contact uses including municipal tree watering, street sweeping, or other on-site non-contact uses through City/County operations This option will require a treatment system that filters and sanitizes stormwater so that it is safe for irrigation and able to meet or exceed National Sanitation Foundation NSF-350 standards for non-potable water, as well as any local water quality standards. An assessment of expected monthly irrigation demand and average monthly dry-weather flows will provide further information whether this practice would be warranted at this site.

2.1.4.4 Filtration / Return to Channel

As an enhancement to detention and wetland processes, the Half Moon Bay Project site could be designed to capture stormwater and filter it, using a proprietary stormwater filtration unit before returning captured flows to the channel. This option typically offers an alternative discharge in areas where infiltration is infeasible or limited in throughput and provides assurance that captured water will be treated effectively and that the BMP will operate efficiently. Based on current regulatory interpretations in the area, filtration of captured stormwater and return to storm drains using proprietary devices is not currently acceptable practice to receive full credit for treatment via regional BMPs. This option was still considered, and performance results will be shared herein as an alternative treatment if necessary in the future.

2.1.4.5 Sanitary Sewer/Waste Water Treatment Plant Discharge

The final possible discharge alternative is the release of captured stormwater to the sanitary sewer system. The project site sites immediately south of the SAM WWTP and could route captured flows to the plant. Significant coordination would be required with the SAM personnel to ensure proper discharge windows and conditions. There are also current discussions and interest at the WWTP on increasing the wet weather storage of the treatment plant to account for significant inflow and infiltration issues currently experienced. This additional storage would augment the existing wet weather storage system north of the plant recently installed. Additionally, there might be interest in developing recycled water at the plant, which could include stormwater supplies, but additional analysis on potential contaminants and flow rates would be needed. The diversion to sewer ensures full trash capture and counts towards the County goal of ‘greened acres’ to help meeting green infrastructure retrofit targets. An evaluation of the capacity of the lines would identify the opportunity to discharge into the system. White this alternative was not explored through the course of this concept design as it requires modeling coordination with the sewer authority to determine capacity and discharge windows, this option should be further explored during the pre-design phase of the project.

2.2 WATER QUALITY OPTIMIZATION STRATEGY

The primary design goal of the Half Moon Bay Project is to capture runoff and reduce long-term annual loading of pollutants to the watershed and downstream receiving waters. To ensure that the system will be sized to maximize load reductions in a cost-effective manner, optimization modeling was performed.

The purpose of optimization modeling is to balance design components (including BMP volume and inflow diversion rates) such that no one component limits the performance of the system subject to potential discharge options (see Figure 2-2 at right). Optimization supports decision making throughout the design process by guiding selection of the most cost-effective system design.

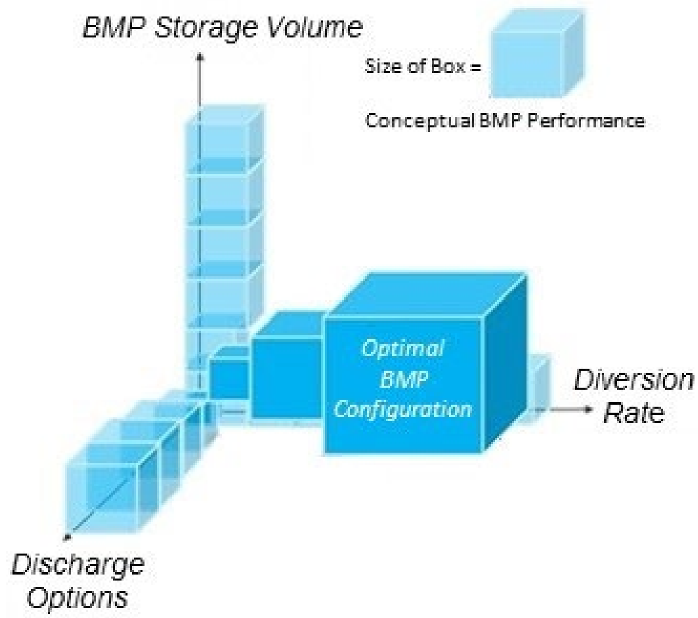


Figure 2-2. Conceptual graphic representing BMP configuration optimization.

The model setup for water quality simulation and optimization is complex, involving several modeling systems and iterative feedback from design engineers. In this approach, sediment pollutant loading capture is a useful surrogate for overall water quality cost-optimization as significant pollutants of concern (metals, PCBs, nutrients) are typically sediment bound. The general methodology is discussed below, and the results are presented thereafter.

2.2.1 Preliminary Size and Diversion Optimization

The first step of the modeling was to predict BMP performance for a range of potential BMP sizes, diversion points and inflow rates, and discharge alternatives. A custom BMP model was used to improve upon certain modeling limitations in EPA's System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN). This custom model is grounded in the physical BMP representations used in SUSTAIN, and it provides built-in optimization algorithms to more systematically automate the process of evaluating many different BMP configurations to select a cost-effective solution related to project goals. The model was run using 10 years of runoff and pollutant loading time-series data generated by LSPC at an hourly time step. During this preliminary decision-support modeling, the discharge alternatives were simulated using certain site constraints to capture approximate BMP throughflow rates at the same time as varying the diversion rate and storage volume. These preliminary optimization model runs produced a point cloud from which the optimal cost-effectiveness curves were extracted. Subsequent targeted modeling then provided a clear decision pathway for the development of optimal project alternatives. Modeling efforts investigated the range of BMP configurations as detailed in the following subsections.

2.3 OPTIMIZATION MODELING RESULTS

The optimization analysis aimed to maximize the long-term runoff capture and pollutant load reduction by simultaneously varying the diversion rate, BMP size, and discharge rates related to options previously discussed. Each of these design features has an associated range of options that were modeled to assess alternatives against long-term water quality benefits and identify the most effective alternative. By optimizing based on these variables, multiple pathways to achieve maximum water quality benefit were identified and the most cost-effective alternatives were determined. Different configuration alternatives and modeling parameters are presented below to demonstrate the cost-effectiveness associated with these options and narrow them down to a few key recommended project configurations that will provide the most cost-effective range of benefits in line with regional stormwater management goals.

2.3.1 Diversion Rate

Multiple diversion rates were modeled for this project from 10 to 60 cfs by 10 cfs increments. The design diversion rate should be selected with care. The diversion rate should be large enough to direct a substantial amount of the expected runoff into the BMP, especially runoff during the first flush of storm events which often carries a large amount of the pollutant load for a given watershed. It should also not be sized too large that it is out of balance with BMP storage and outflows causing the BMP to fill too fast during wet weather and limit overall BMP capture or require oversized infrastructure given the runoff dynamics in the watershed. Plots of diversion rate versus sediment capture for the proposed BMP show that pollutant reduction should increase with diversion rate substantially until the diversion rate reaches 50 cfs (see Figure 2-3). For higher diversion rates, only modest improvements in pollutant reduction should be expected. Because of this, a maximum diversion rate of 50 cfs is recommended for this project.

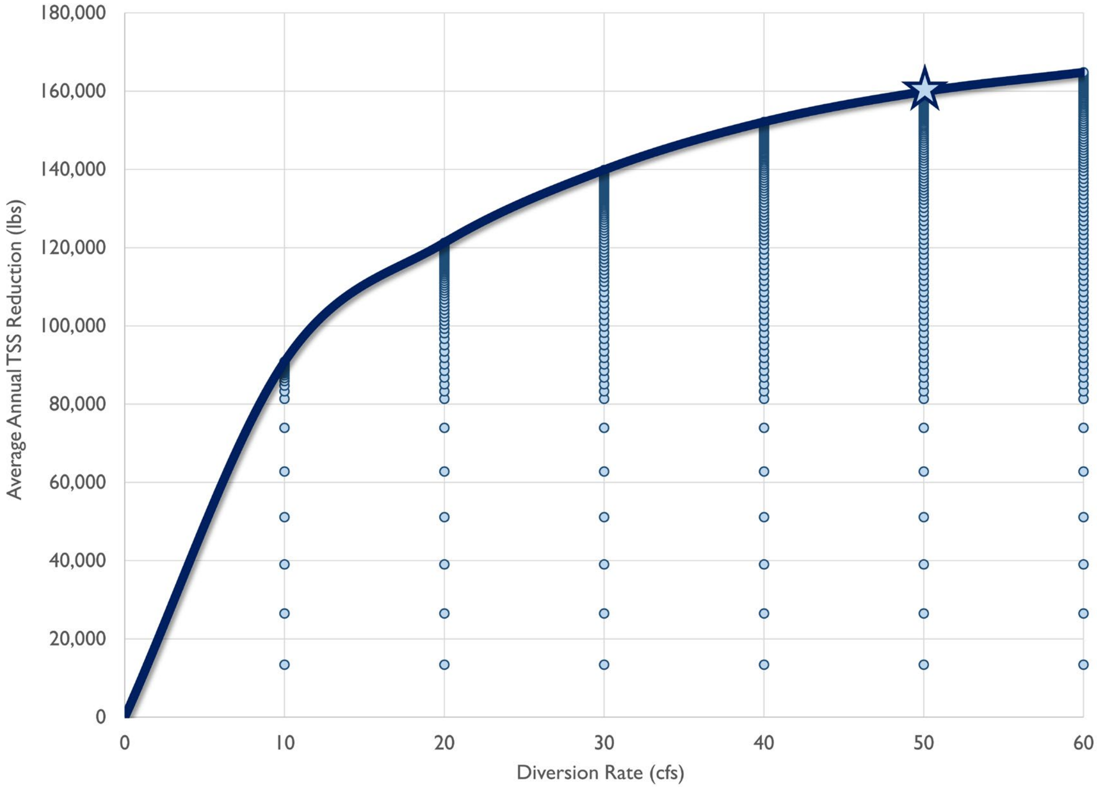


Figure 2-3. Pollutant capture and diversion rate at the project site.

2.3.2 Sizing for Runoff Capture Volume Targets

The ultimate water quality goal for the Half Moon Bay Project would be to size the BMP so that it is able to capture 80% or more of the long-term estimated annual runoff. The BMP was modeled across different treatment rates and storage sizes up to 10.0 ac-ft to assess the relationship between these variables and runoff volume capture. Figure 2-4 shows how runoff capture varies with storage volume for a BMP with a 50 cfs diversion rate at this site. Because of the large drainage area and predicted flow regime, the BMP is not able to meet the 80% runoff reduction target for the modeled range of BMPs at this site. While the 80% runoff capture target might be infeasible to accomplish for this site, a regional BMP at Half Moon Bay would still offer substantial runoff capture and water quality benefit for the drainage area.

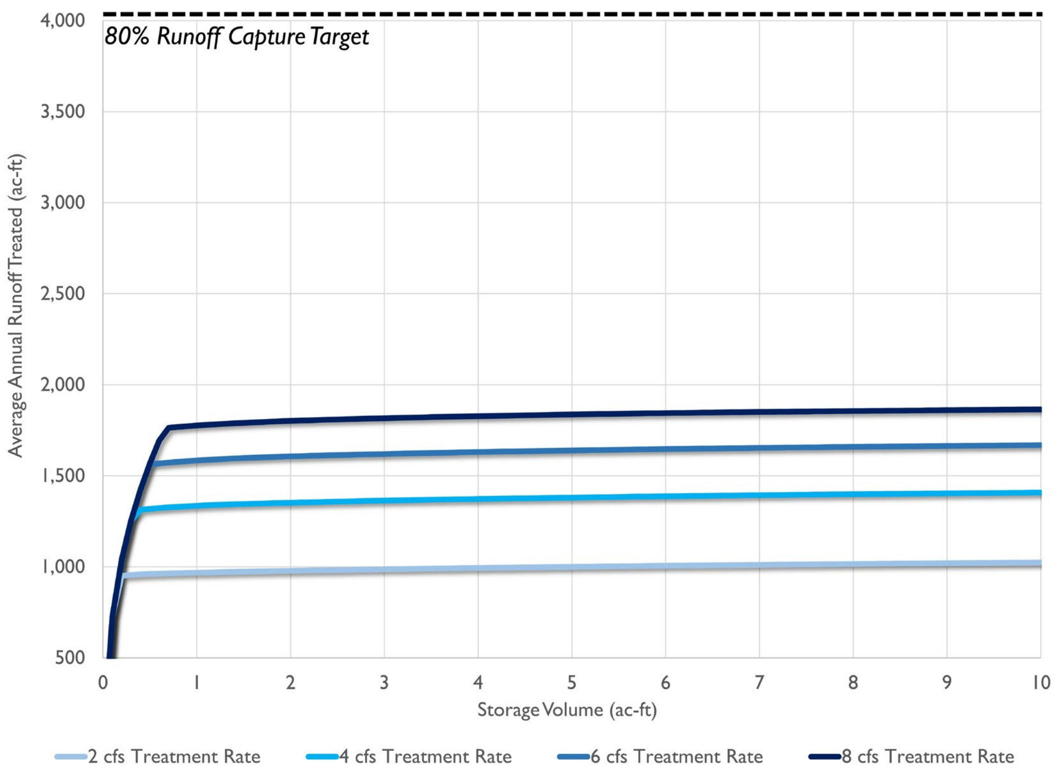


Figure 2-4. Runoff capture as a function of storage volume for the project.

2.3.3 Sizing for Water Quality Benefits

Often regional BMPs have very large drainage areas and only a modest portion of annual runoff can be captured. If sized correctly, these practices can still be very impactful in terms of pollutant reductions. Assessing the modeling results across BMP storage volumes for a BMP with a 50 cfs diversion rate, it is evident that this is the case at the Half Moon Bay Project site (Figure 2-5). It can be seen by the shape of these curves that runoff capture and pollutant reduction do not occur in sync and that these dynamics are related to storage volume in a somewhat different manner due to the different dynamics in the watershed related to rainfall-runoff responses and pollutant generation. In lieu of meeting runoff capture targets, it is useful to size a BMP to maximize water quality benefits as a secondary criterion at a storage volume along these curves before they show diminishing returns (ie, only slight increases in water quality benefit for increased storage volumes). This sizing will be revisited in the following section to highlight multiple potential BMP endpoints for this site.

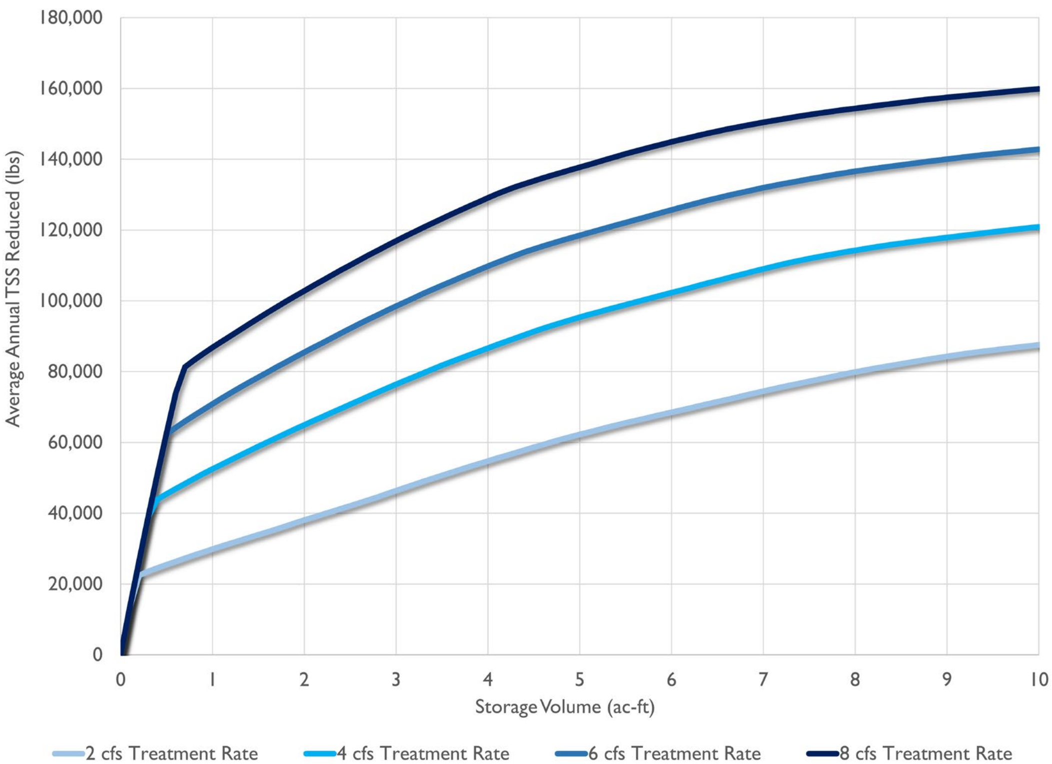


Figure 2-5. Water quality benefit as a function of storage volume for the project.

2.3.4 Considering On-site Irrigation Reuse

The use of captured stormwater for irrigation use was not explicitly modeled. This is because this reuse option would accompany filtration options as an ancillary benefit and would not have a significant additional impact on overall annual water quality benefit estimates. Dry-weather flows are typically tapped as a resource for irrigation reuse because the volume is more manageable, reliable, and appropriate for use as an irrigation water source. Because of the large drainage area treated by this Project, dry-weather flows are likely to be larger and more reliable than most urban sites. This is of not because irrigation does not typically occur during wet-weather events, and the large runoff volumes collected during these events would not likely be used on-site within recommended storage volume drawdown time periods (72 hours). There is typically adequate available storage in the BMP during dry conditions to capture all dry-weather flows and either filter them for irrigation use or allow them to discharge normally. To better understand on-site irrigation demands, monthly estimates for the Half Moon Bay site were calculated based on average monthly evapotranspiration data (CIMIS 2019) using the SLIDE rule (Simplified Landscape Irrigation Demand Estimation; ANSI 2017). These results are displayed in Figure 2-6, and they indicate that average monthly irrigation demand (here presented for up to 30 acres of turf area) is exceeded by dry-weather runoff for most of the year. For these purposes, dry-weather runoff here has been defined as modeled runoff on days when rainfall is less than 0.1 inches. While it is not known if water for irrigation of local vegetation is desired, this could be a valuable option for water reuse in the vicinity of this BMP. While dry-weather flows should always be verified through monitoring, the size of the drainage area is likely to support enough flow to be utilized to meet local irrigation demands nearby this site if desired.

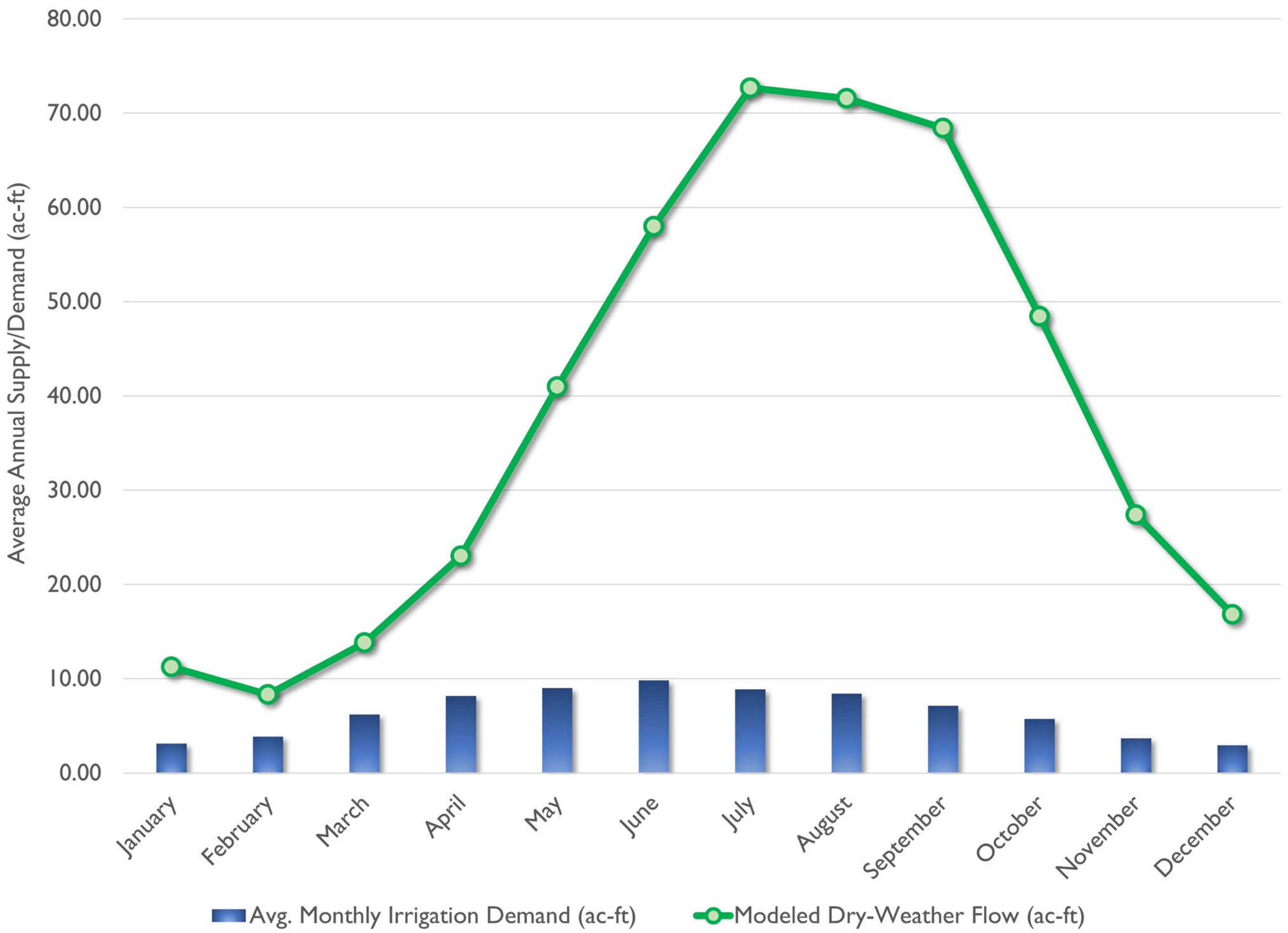


Figure 2-6. Estimated irrigation water demand and potential dry weather supply for the project.

2.3.5 Considering Wastewater Treatment Plan Integration

There is a potential to divert wet weather flows to the Sewer Authority Mi-Coastside Wastewater Treatment Plant (WWTP), or use the proposed wetland as a holding basin for the WWTP. The storage provided by the wetland could also be integrated with the WWTP's recycling water development. The benefits from these WWTP integration components would be considered in future modeling once more information about the WWTP is available.

2.3.6 Cost Considerations and Final Project Sizing

To make final recommendations, water quality benefits predicted for the different BMP configuration options must be weighed against capital construction and operations and maintenance costs (O&M; 20 years included) to determine the optimal choice for the Half Moon Bay Project. Planning level costs typically do not incorporate all project costs (i.e. design, permitting, environmental), but they do form a strong basis to weigh alternatives against one another in determining the best project for the site. Table 2-2 details key aspects that are both consistent among and differentiate the various modeled options.

Table 2-2. Summary of key cost components for different discharge options.

Cost applicable to….	Key Cost Components	O&M Cost Components
All Options	Diversion Infrastructure, Pretreatment	Inspection, Sediment Removal
Wetland Basin	Excavation/Grading, Planting, Outlet Control	Plant Upkeep, Outlet Cleanout
Irrigation Reuse	Filtration Unit, Irrigation System	Filter Operation, Cleaning/Replacement
Auxiliary Filtration	Excavation, Filtration Unit(s)	Filter Cartridge Cleaning

2.3.6.1 Project Sizing Decisions

Right sizing a BMP storage for a given project site is typically done to one of two endpoints; (1) being the most cost-effective size related to a certain performance metric or (2) to the maximum feasible size given site footprint constraints if the cost-effective size exceeds this maximum. Investigation of the existing topography at the Half Moon Bay site indicated a maximum storage size of 6.3 ac-ft for this project to avoid raised site features in the vicinity of the project location. Based on the curves for water quality benefit at this site (shown in Figure 2-7), points of diminishing returns are right in the vicinity of the maximum feasible project size for the site. Thus, building this Project out to this maximum size is advisable. Performance details for the four modeled treatment rates is summarized in Table 2-3.

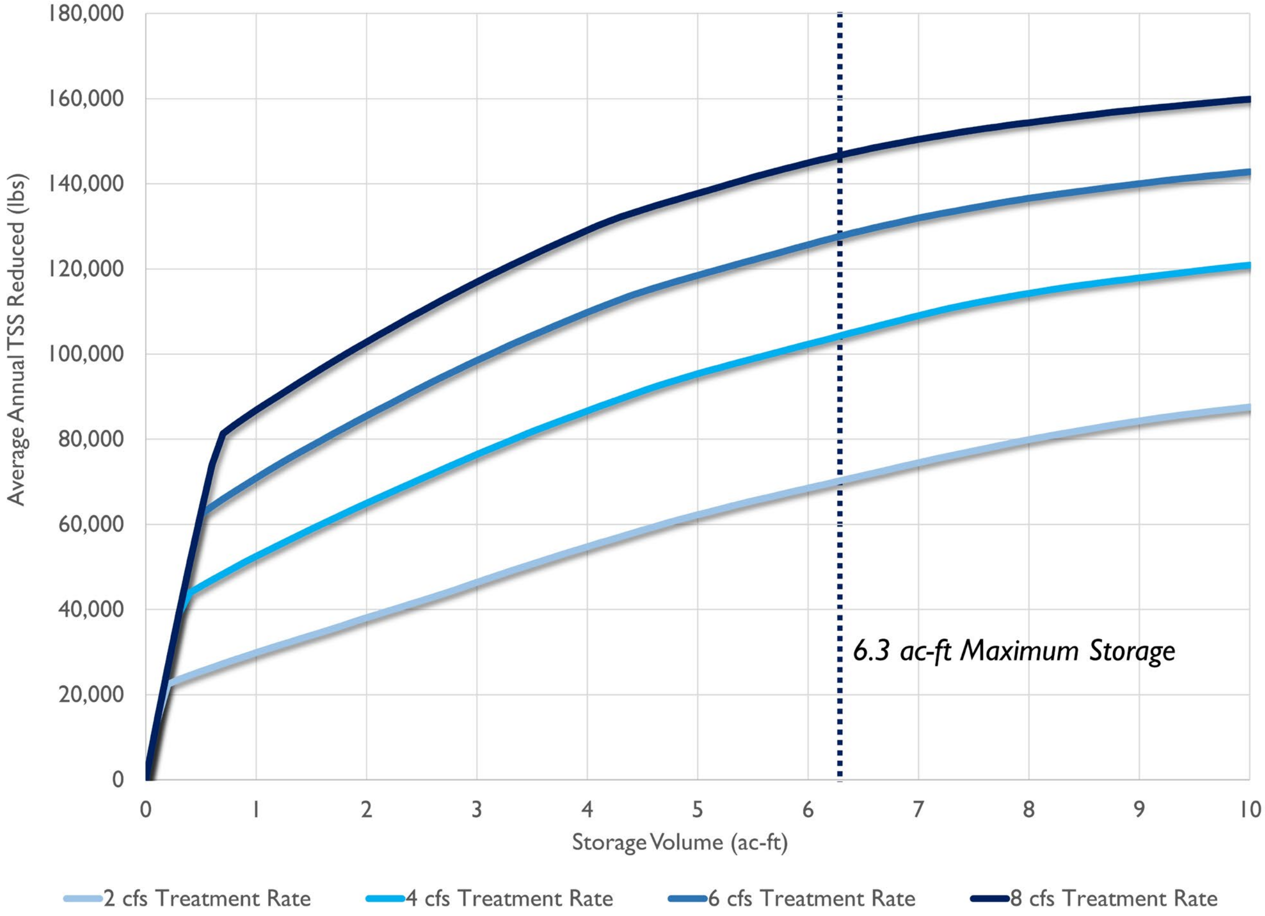


Figure 2-7. Project storage volume vs pollutant reduction for a BMP with a 50 cfs diversion rate at the site.

BMP Size Options

The following BMP sizes and diversion rates are recommended based on different endpoints of design and with the range of performance that might be realized using different discharge options.

Capture of 80% of Long-Term Annual Runoff

Feasible capture of 80% of average annual runoff is not possible across modeled BMP storage volumes with the diversion rate of 50 cfs that was identified, nor any other project size or configuration considered. Because of the large drainage area treated by this project, this goal is not practical with a project at this site alone for this drainage. However, a BMP at Half Moon Bay will provide capture and treatment of lower baseflows and wet-weather for smaller rain events, and this water can be targeted for reuse if desired as well.

Most Cost-Effective Pollutant Reduction

Because capture of 80% of the long-term annual runoff at this site would be difficult and cost-prohibitive, a more cost-effective sizing approach would be to right-size the BMP to maximize water quality benefits up to a BMP size of diminishing returns. Since this sizing would be at or beyond the maximum feasible storage size for the site, a BMP with the maximum of 6.3 ac-ft of storage is recommended. The expected benefits for this BMP size have been summarized in Table 2-3 for different treatment rate endpoints that will need to be further defined in later stages of design. These are also displayed in Figure 2-7.

Table 2-3. Summary of cost-effective BMP performance for each discharge option

Treatment Rate	Avg. Annual Runoff Capture (%)	Avg. Annual TSS Reduction (%)
2 cfs Total	20%	5.1%
4 cfs Total	28%	7.6%
6 cfs Total	33%	9.3%
8 cfs Total	37%	10.7%

Most cost-effective BMP size for the Half Moon Bay site

Based upon the performance analysis, it will be best to size the BMP to the maximum 6.3 ac-ft size with a 50 cfs diversion rate. As far as the treatment rate goes, capture seems to start to diminish after a 6 cfs treatment rate based on the results in Table 2-3, so this is the recommended treatment rate to aim for. Further iterations and levels of detail of design should focus on designing detention, the use of infiltration, a combination of the two, and the potential diversion to the WWTP. These recommendations can be revisited once site infiltration rates are verified to ensure that this sizing is still the most cost-effective and that a 6 cfs treatment rate still makes sense. The integration with the WWTP will be evaluated once more information about the plant is available.

3.0 BMP DESIGN COMPONENTS

This section presents the engineering and design components recommended for the Half Moon Bay project based on the preceding decision support modeling to capture both dry weather and wet weather flows from the channel. An off-stream wetland system is proposed at the project location (see Figure 3-1 and Figure 3-2). The system consists of four major components: inlet structures, a sedimentation basin, a treatment wetland, and outlet structures. Floodplain modeling will need to be performed to refine the current profile design once detailed survey data of the creek and surrounding parcels becomes available.

Treatment wetlands are treatment systems that mimic the physical, biological, and chemical treatment processes occurring in natural wetlands. They are designed to enhance treatment processes found in natural wetlands to remove fine sediments, nutrients and other pollutants (e.g. pesticides, heavy metals). While not currently supported by the MRP in terms of LID management and pollutant reduction goals, treatment wetlands are used extensively to treat primary and secondary municipal sewage, landfill leachate, industrial wastewaters, and urban stormwater run-off.

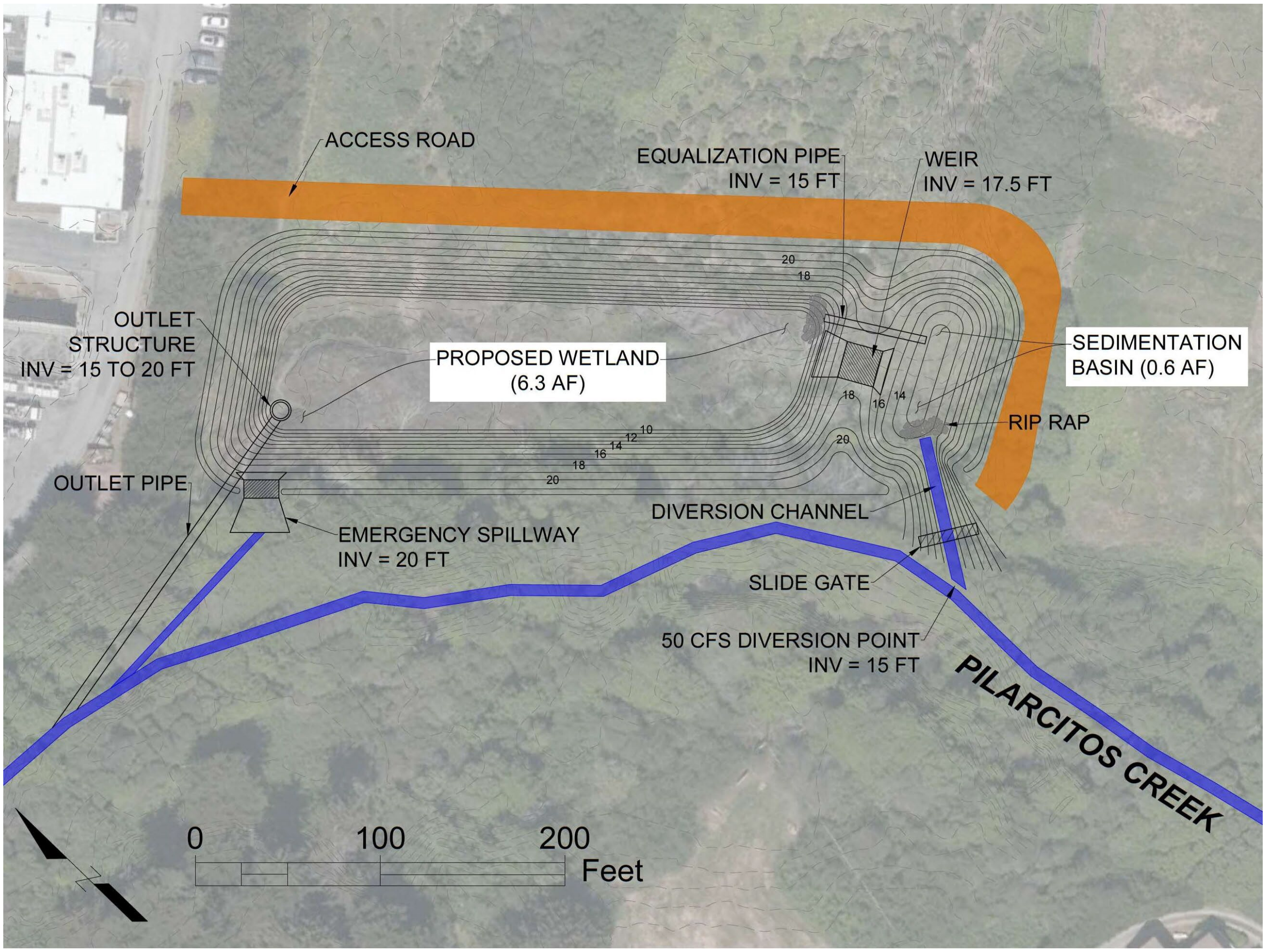


Figure 3-1. Half Moon Bay BMP Layout

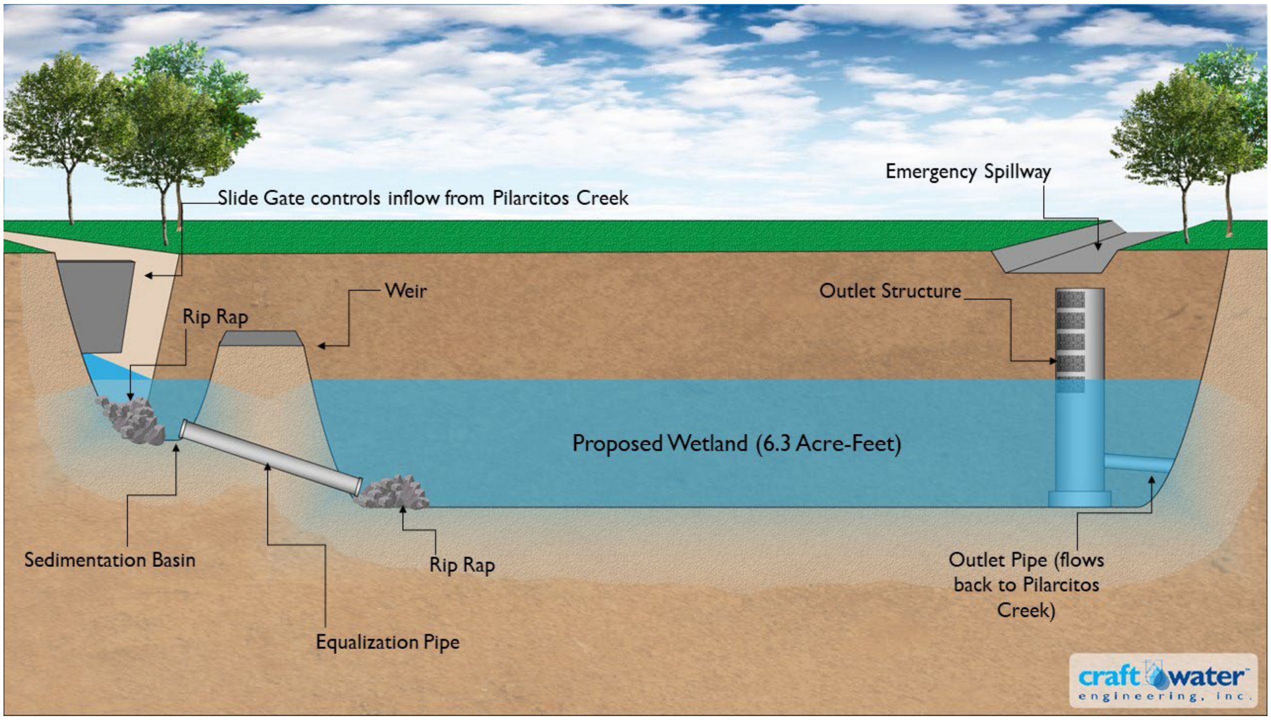


Figure 3-2. Half Moon Bay BMP Preliminary Concept Profile

3.1 DIVERSION STRUCTURE

A diversion channel will send a portion of the water in Pilarcitos Creek to a sedimentation basin for treatment. The diversion point will be set at an elevation to avoid diverting all the natural flows, so that low flows can remain in the creek to serve its environmental functions. Flow in the diversion channel will be controlled by a slide gate for two purposes. First, the inflow needs to be completely stopped for maintenance to take place in the sedimentation basin and the wetland. Second, since the design seeks to maximize the use of natural materials, diversion should be controlled to prevent high flows from eroding the wetland system, especially when the system has reached its capacity. The area where the channel connects to the sedimentation basin will be protected by rip rap to reduce scouring.

3.2 SEDIMENTATION BASIN

The sedimentation basin has a depth of 7 ft and a capacity of 0.6 ac-ft. The diverted water will slow down in the basin, allowing trash, sand, and other coarse suspended solids to settle. Water enters the basin on the west side and leaves on the east side. The sedimentation basin is separated from the treatment wetland by a berm. The basin and the wetland are connected by an equalization pipe that runs through the berm. To protect the berm from erosion, an overflow concrete weir spillway is designed on the berm to provide additional discharge capacity when water level is higher. Since sediment is expected to accumulate at the bottom of the sedimentation basin over time, it will need to be removed by maintenance equipment that can access the basin through an access road along the northeastern side of the site.

3.3 TREATMENT WETLAND

Treated water in the sedimentation basin will enter a treatment wetland where it will be further treated through sedimentation, filtration, plant uptake, and anaerobic/aerobic wetland zones. The proposed wetland has a depth of 10 ft and a capacity of 6.3 ac-ft. The slope of the wetland will have native vegetation that can improve water quality and serve as habitats. Water enters the wetland from the south side and leaves from the north side. During high flows, water level may be high enough to submerge the berm, in which case the sedimentation basin and the wetland will be connected to increase the flow capacity of the system. Additional information on treatment wetlands can be found on the US EPA website: https://www.epa.gov/wetlands/constructed-wetlands.

3.4 OUTLET RISER AND PIPE

The outlet of the wetland will be a concrete riser structure connected to a pipe. The riser will have weir openings at 15 to 20 feet elevations (corresponding to 5 to 10 feet water depth) to allow for higher discharge rates at higher water levels. The bottom of the riser will be connected to a culvert that runs through the wall of the wetland and discharges to Pilarcitos Creek. Under low flows, water in the wetland will flow through the weir into the riser structure; under high flows, water can also enter the structure through the top, or spill through the concrete emergency spillway at the rim of the wetland. The riser structure can be combined with a CDS hydrodynamic separator to provide additional treatment.

Figure 3-3 demonstrates an outlet structure similar to the one proposed.

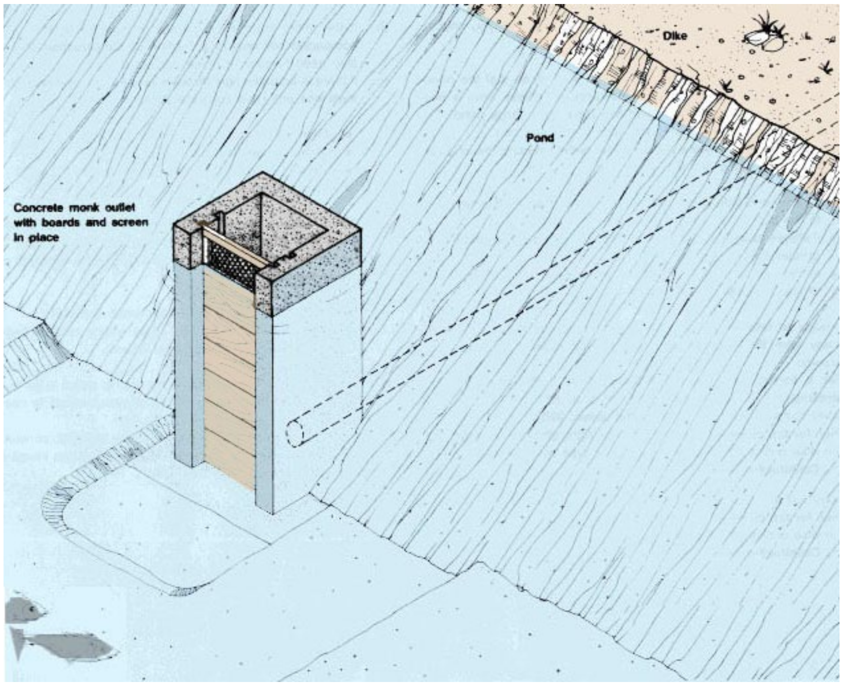


Figure 3-3. Wetland outlet riser and pipe

4.0 ANTICIPATED PERMITS AND COORDINATION

Consultation with regulatory agencies and acquisition of permits is required before the project components can be constructed. The following table summarizes the plan checks, regulatory permits and approvals relevant to the project (Table 4-1). Additionally, a full Phase I environmental study should be performed at the site.

Table 4-1: Listing of Anticipated Required Permits.

Agency	Permit/Notification Name	Rationale	Initial Steps
United States Army Corps of Engineers	Section 404 Permit	Potential discharge of dredged or fill material into waters of the United States	File a permit with the Army Corps of Engineers
State Water Resources Control Board	CWA Section 401, Water Quality Certification	Potential discharge of dredged or fill material to waters of the State	File a permit with the Regional Board
State Water Resources Control Board	Construction General Permit	One or more acres of soil will be disturbed during construction.	Develop a Storm Water Pollution Prevention Plan (SWPPP).
California Department of Fish & Wildlife	Streambed Alteration Notification 1601	Diversion of flow and alteration of the bed of any river	Submit Lake and Streambed Alteration (LSA) Notification CA DFW
CA Natural Resources Agency	CEQA Initial Study	State mandated environmental review	Prepare the Initial Study and associated documentation (Mitigated Negative Declaration [MND] or Environmental Impact Report [EIR])
AB52 Tribal Resources Consultation	Consultation with Native American representatives	Required per AB 52	Identify tribes that have asked to be notified by the County and prepare letters for submission to the surrounding indigenous tribes
Bay Area Air Quality Management District	Regulation 6, Rule 1	Prevent, reduce, or mitigate fugitive dust emissions from construction activities.	Construction in the Bay Area Air Basin must incorporate best available control measures in conformance with Regulation 6, Rule 1
HMB Public Works Department	Erosion and Sediment Control Plan	Project will require grading and site disturbance	Preparation of the erosion control plan in conjunction with the SWPPP development
San Mateo County Mosquito & Vector Control District	Mosquito & Vector Abatement District	Potential mosquito concerns.	Provide Vector Control District conceptual project plans for review.
HMB Community Development	Tree Permit	Removal of trees with a trunk diameter of 12” or more	File a permit with the Community Development Department
HMB Planning Department	Coastal Development Permit	Development in Coastal Zone established under the California Coastal Act	Meet with Planning staff to determine if a permit is required

5.0 COST ESTIMATE AND SCHEDULE

The cost estimate and project schedule have been created to validate that the project concept may be built within the specified budget and within the time allocated to use the funds.

5.1 PROJECT COST ANALYSIS

The cost analysis is utilized as a tool to ensure the project concept is within the amount of funds available to the project. If the cost analysis indicates that the project is not feasible, then the design will need to be adjusted to bring it within the project budget while still meeting the project goals. The cost analysis was developed using various sources of information, as well as the Cost Estimator's judgment.

5.1.1 Construction Costs

The construction cost entails the various components of the project that a Contractor would construct. Construction costs do not include items of work not directly performed by the Contractor, such as the County's construction management during construction. The construction costs were developed using various sources of cost information. The estimated total construction cost is $3,041,295 for the recommended BMP configuration. Table 5-1 lists the respective breakdowns of the items required to complete the project. A more detailed cost estimate can be found in Appendix B.

Table 5-1. Estimated Construction Costs, Optimal BMP Configuration.

PLANNING LEVEL COST ESTIMATE				
Description	Quantity	Unit	Unit Price	Total
Diversion from Creek	1	EA	$49,170	$49,170
Pretreatment	1	EA	$111,300	$111,300
Diversion Channel	240	CY	$236.33	$56,720
Excavation & Site Demo	17,593	CY	$41.28	$726,255
Wetland Detention Basin	17,511	CY	$36.68	$642,358
Overflow Pipe & Spillway	1	EA	$124,226	$124,226
Surface Restoration	14,000	SF	$22.68	$317,500
CAPITAL SUBTOTAL				$2,027,529
Mobilization (10% capital)				$202,753
Contingency (15% capital)				$304,130
Design (15% of Capital, Mobilization, and Contingency)				$380,162
Environmental Documentation & Permitting (10%)				$253,442
CONSTRUCTION TOTAL				$3,168,016
Assumptions: -Full itemized cost estimate included in Appendix B -Rough order of magnitude preliminary opinion of costs. Actual costs may vary -Diversion can be achieved through grading and rip-rap. No concrete required in stream.				

5.1.2 Operations & Maintenance Costs

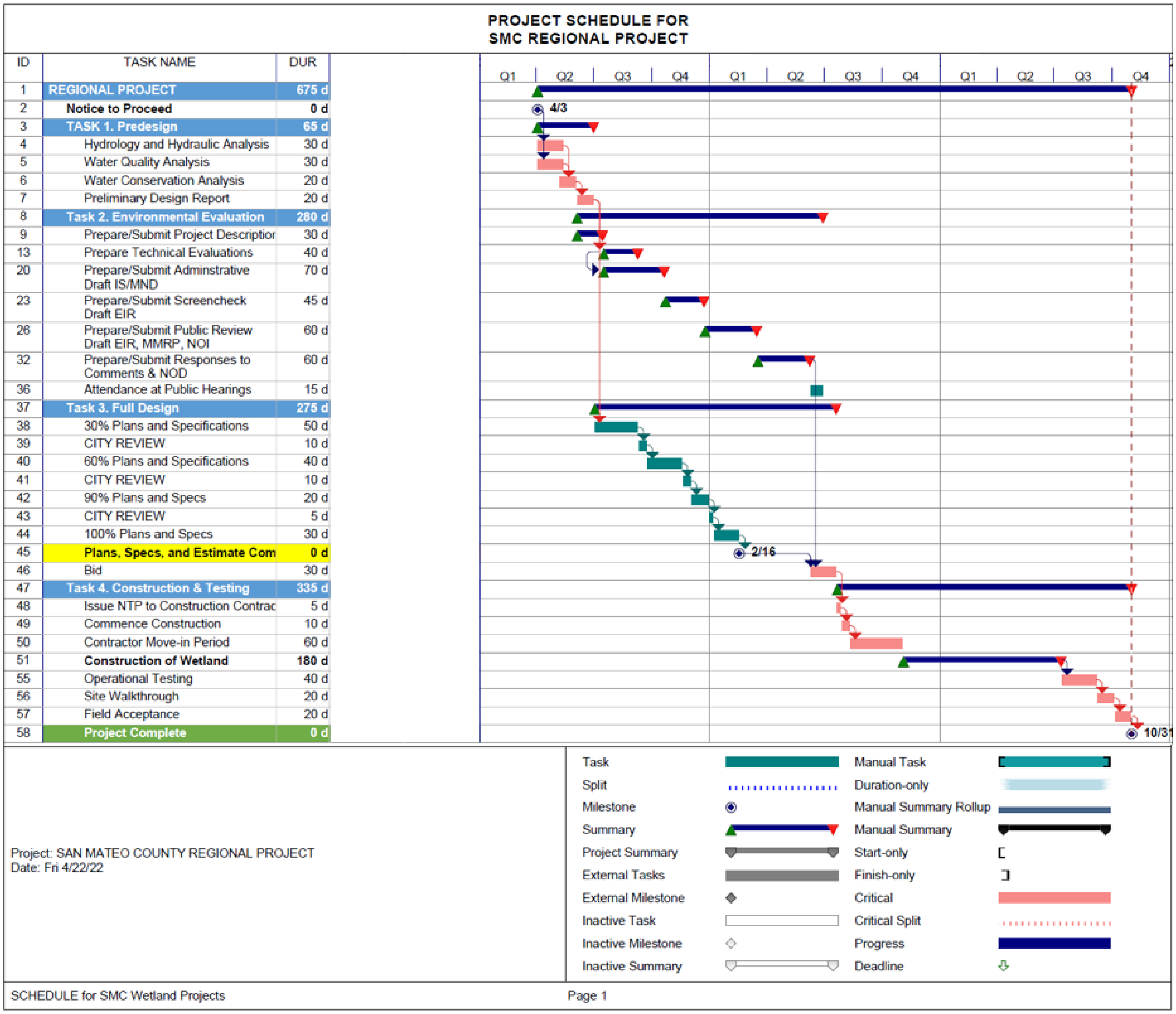
Long-term maintenance of the system is vital to its operation. The operations and maintenance costs were developed on the basis that a service contractor would maintain the various components of the system. Estimated total annual operations and maintenance costs are presented in Table 5-2.

Table 5-2. Annual Estimated Operations & Maintenance Costs.

PLANNING LEVEL OPERATIONS & MAINTENANCE ESTIMATE				
Description	**Frequency**	**# Times per Year**	**Unit Price**	**Total**
Diversion Protection – Inspection	Monthly	12	$4,000	$48,000
Sedimentation Basin – Excavation	Annually	1	$100,000	$100,000
Slide Gate Maintenance	Annually	1	$5,000	$5,000
Plant Maintenance & Invasive Species Removal	Semi-Annual	2	$10,000	$20,000
TOTAL (Annual)				$173,000

5.2 IMPLEMENTATION SCHEDULE

The preliminary project implementation schedule is provided in Figure 5-1. The schedule includes finalizing the design plans, environmental planning and permitting, bid and award, and construction.



ID	TASK NAME	DUR
1	REGIONAL PROJECT	675 d
2	Notice to Proceed	0 d
3	TASK 1. Predesign	65 d
4	Hydrology and Hydraulic Analysis	30 d
5	Water Quality Analysis	30 d
6	Water Conservation Analysis	20 d
7	Preliminary Design Report	20 d
8	Task 2. Environmental Evaluation	280 d
9	Prepare/Submit Project Descriptior	30 d
13	Prepare Technical Evaluations	40 d
20	Prepare/Submit Adminstrative Draft IS/MND	70 d
23	Prepare/Submit Screencheck Draft EIR	45 d
26	Prepare/Submit Public Review Draft EIR, MMRP, NOI	60 d
32	Prepare/Submit Responses to Comments & NOD	60 d
36	Attendance at Public Hearings	15 d
37	Task 3. Full Design	275 d
38	30% Plans and Specifications	50 d
39	CITY REVIEW	10 d
40	60% Plans and Specifications	40 d
41	CITY REVIEW	10 d
42	90% Plans and Specs	20 d
43	CITY REVIEW	5 d
44	100% Plans and Specs	30 d
45	Plans, Specs, and Estimate Com	0 d
46	Bid	30 d
47	Task 4. Construction & Testing	335 d
48	Issue NTP to Construction Contrac	5 d
49	Commence Construction	10 d
50	Contractor Move-in Period	60 d
51	Construction of Wetland	180 d
55	Operational Testing	40 d
56	Site Walkthrough	20 d
57	Field Acceptance	20 d
58	Project Complete	0 d

Figure 5-1. Project schedule.

6.0 CONCLUSIONS & RECOMMENDATIONS

While there are many options for the Half Moon Bay Regional Project, the recommended option given the full range of identified outcomes and constraints for this project is a 6.3 ac-ft wetland that will provide stormwater capture and treatment. The wetland will feature the following key components:

- 50 cfs diversion from Pilarcitos Creek through a channel into a sedimentation basin,
- A 0.6 ac-ft sedimentation basin that allows sand and other coarse suspended solids to settle,
- A 6.3 ac-ft treatment wetland that further stores and treats the diverted stormwater,
- Outlet riser structure and emergency spillway for the wetland.

This BMP will provide substantial pollutant reduction for runoff to Pilarcitos Creek and will carry an estimated construction cost of $3,168,016 and an estimated annual operation and maintenance cost of $173,000 per year. Configuration details and costs will be refined at further stages of design and may be subject to change.

7.0 REFERENCES

Bay Area Stormwater Management Agencies Association (BASMAA). 2017. *Bay Area Reasonable Assurance Analysis Guidance Document*. June 2017.

California Stormwater Quality Association (CASQA). 2003. *California Stormwater BMP Handbook – New Development and Redevelopment.*

City/County Association of Governments of San Mateo County (C/CAG). 2020*. San Mateo County-Wide Reasonable Assurance Analysis Addressing PCBs and Mercury: Phase I Baseline Modeling Report.* September 2020*.*

City/County Association of Governments of San Mateo County (C/CAG). 2022. *Advancing Regional-Scale Stormwater Management in San Mateo County: Regional Collaborative Program Framework White Paper*. January 2022.

San Francisco Public Utilities Commission. 2020. *2019 Annual Groundwater Monitoring Report Westside Basin San Francisco and San Mateo Counties, California.*

Minnesota Stormwater Steering Committee (MSSC), 2005. "The Minnesota Stormwater Manual". Developed by Emmons and Olivier Resources for the Stormwater Steering Committee, Minnesota Pollution Control Agency, St. Paul, MN. http://www.pca.state.mn.us/pyria84.

APPENDIX A: CONCEPTUAL DESIGN FACT SHEET

Note: The site configuration may be modified during final design.

HALF MOON BAY REGIONAL STORMWATER PROJECT – PROJECT CONCEPT DESIGN

OFFICE OF SUSTAINABILITY
COUNTY OF SAN MATEO

ADVANCING REGIONAL STORMWATER MANAGEMENT IN SAN MATEO COUNTY

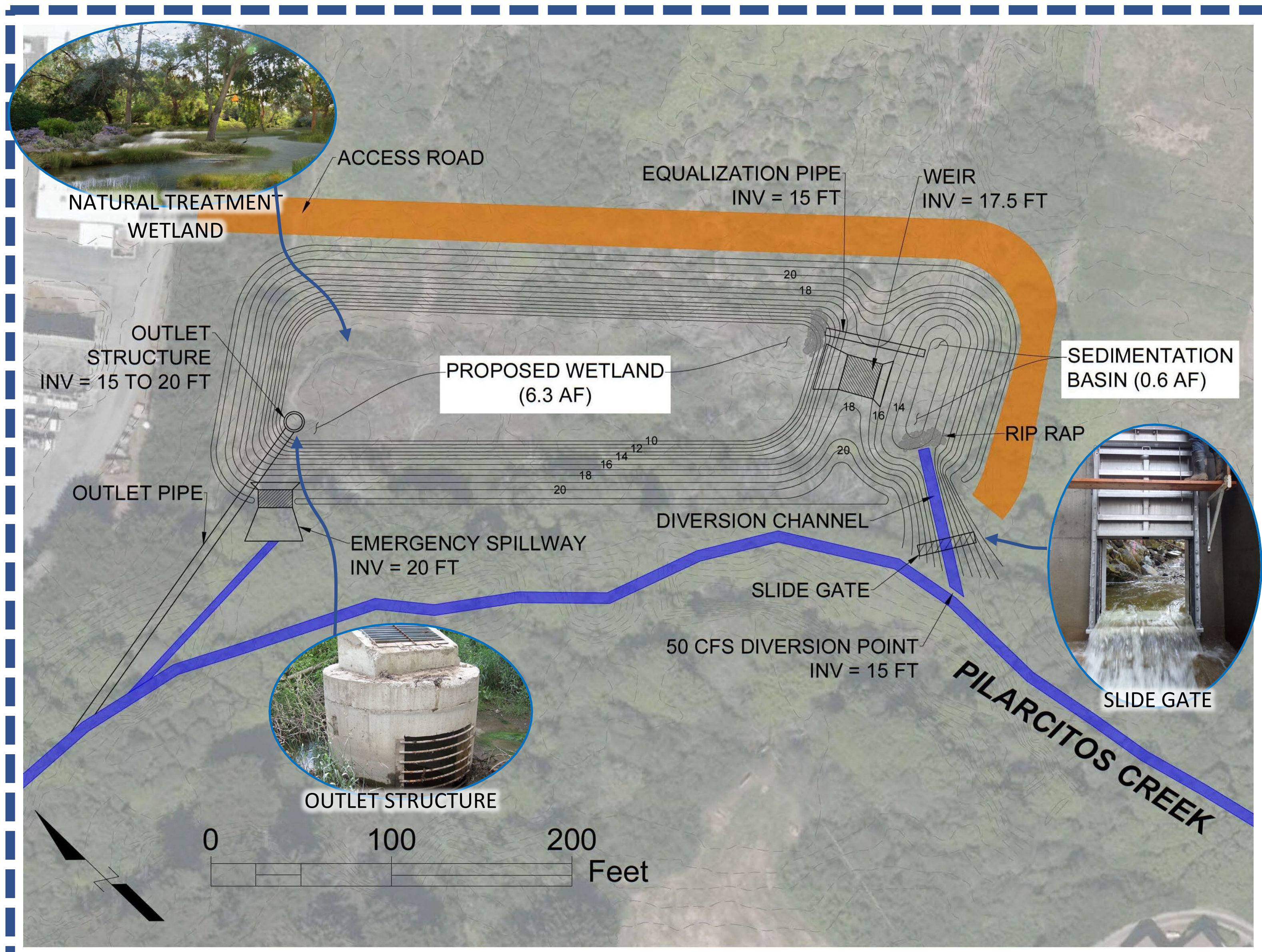
C/CAG
City/County Association of Governments of San Mateo County

PROJECT LOCATION, DESCRIPTION, & PURPOSE

LOCATION: Bev Cunha's Country Road, Half Moon Bay, CA 94019	**LAT**: 37°28'19.4"N, **LONG**: 122°26'37.1"W	**SITE OWNER**: City of Half Moon Bay

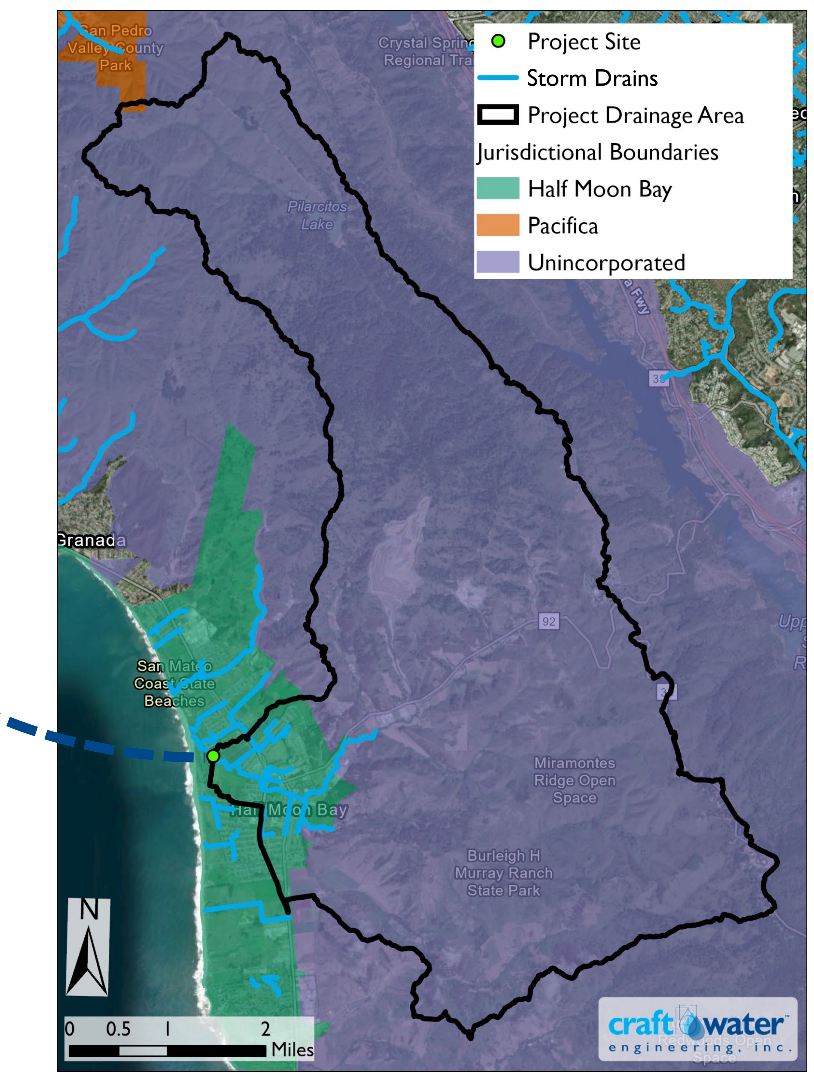
DESCRIPTION: Pilarcitos Creek flows adjacent to the open space parcel controlled by the City of Half Moon Bay that presently serves as a high flow mitigation site for a historic Caltrans project. The proposed project is a surface wetland that serves as a flood plain to the existing stream to maintain flows and treat stormwater. Flows up to 50 cfs will be diverted from the creek through gravity to a sedimentation basin where gravel and sand are removed. Diversion channel controlled by a slide gate will be designed so that low flow stays in the creek. Treated water then enters a 6.3 acre-feet wetland and returns to the creek through an outlet structure. Emergency spillway will be designed to prevent overtopping. The project is sized to optimize the TSS reduction as a retrofit project with the most cost-effective sizing balancing pollutant removal and cost.

PURPOSE & NEED: San Mateo County is required to improve water quality, per the MS4 permit, in addition to providing flood protection to the residents. The most recent iteration of the Municipal Regional Permit (MRP) focuses water quality benefits on trash removal, pollutant reduction, and impervious areas managed, while the County is also interested in water supply augmentation and flood risk reduction. Targeted projects that manage significant runoff volume and help with flood control and climate change are proposed to meet the goals for the County and OneShoreline. The project at Half Moon Bay can provide significant runoff volume management and impervious area treated as illustrated by the project benefits table on this page.



PROJECT BENEFITS

Volume Managed	1,842 ac-ft/yr
Volume Reduction of 10yr, 24hr	22.4 ac-ft/yr
Peak Reduction of 10yr, 24hr	0 cfs
Water Supply Volume	0 ac-ft/yr
Site Water Demand Offset	0%
WPP Trash Generation Area Treated	22 ac
CALTRANS Trash Capture Area	139 ac
Population in Walking Distance (1/2 mi)	11 people



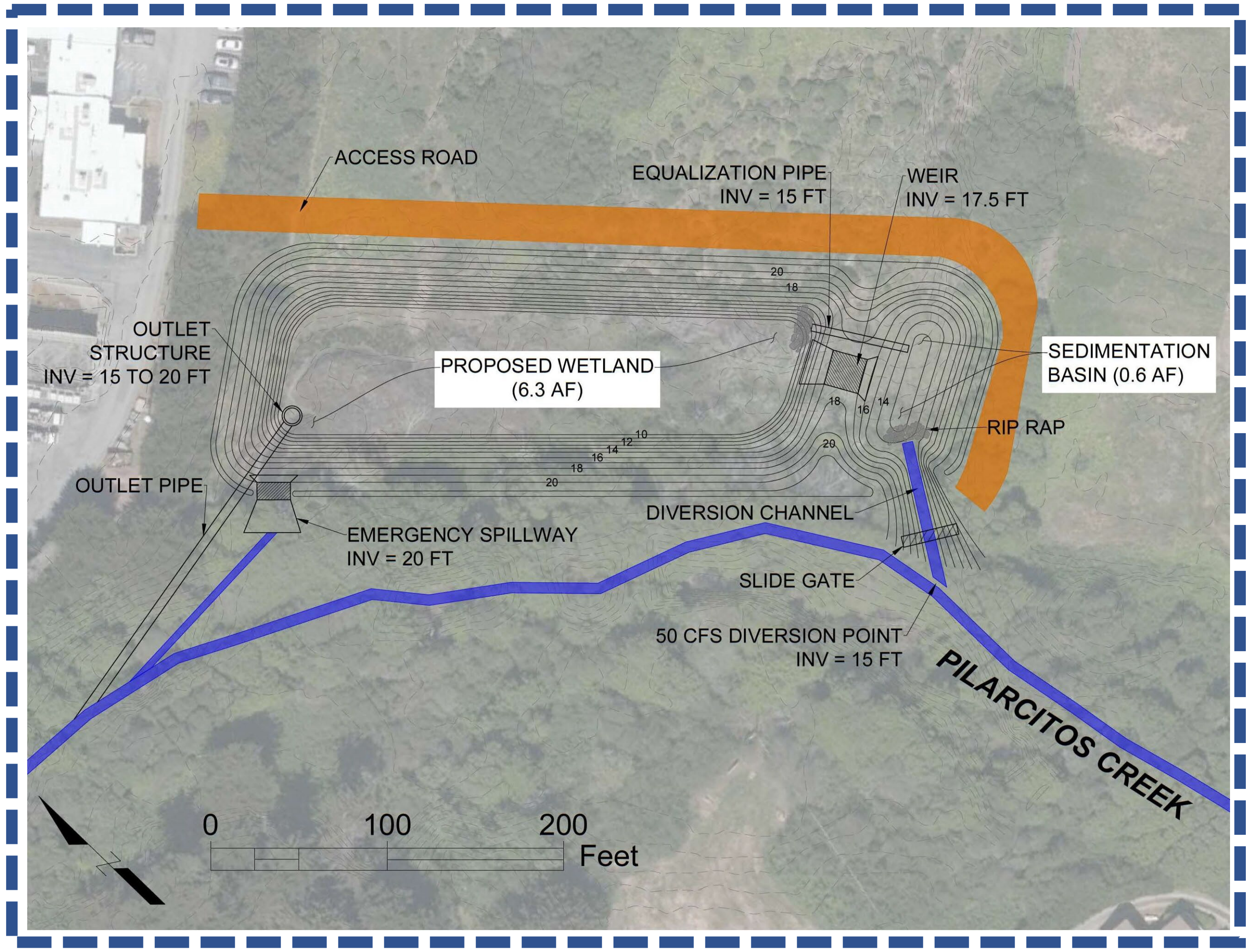
ACKNOWLEDGEMENT

This project was funded by the EPA San Francisco Bay Water Quality Improvement Fund

Concept Prepared by: craft water engineering, inc.

HALF MOON BAY REGIONAL STORMWATER PROJECT – PROJECT CONCEPT DESIGN

ADVANCING REGIONAL STORMWATER MANAGEMENT IN SAN MATEO COUNTY



SITE DESIGN VALUES	
PROJECT TYPE	Wetland
TREATMENT METHOD	Wetland
INFILTRATION RATE	0 in/hr (assumed)
FOOTPRINT	1.74 acres
MAXIMUM DEPTH	10.0 ft
DIVERSION RATE & TYPE	50 cfs (Gravity)
CAPACITY	6.9 ac-ft

DRAINAGE CHARACTERISTICS	
RECEIVING WATER	Pilarcitos Creek
TOTAL DRAINAGE AREA	17,808 ac Half Moon Bay (5.2%) County (94.8%) Pacifica (0.1%)
TOTAL IMPERVIOUS AREA	765 ac
SIZING CRITERIA	Cost-effective PCB reduction
BASELINE RUNOFF (Avg)	5,048.4 ac-ft/yr
BASELINE PCB (Avg)	7.7 g/yr
EXISTING STORM DRAIN	Natural channel

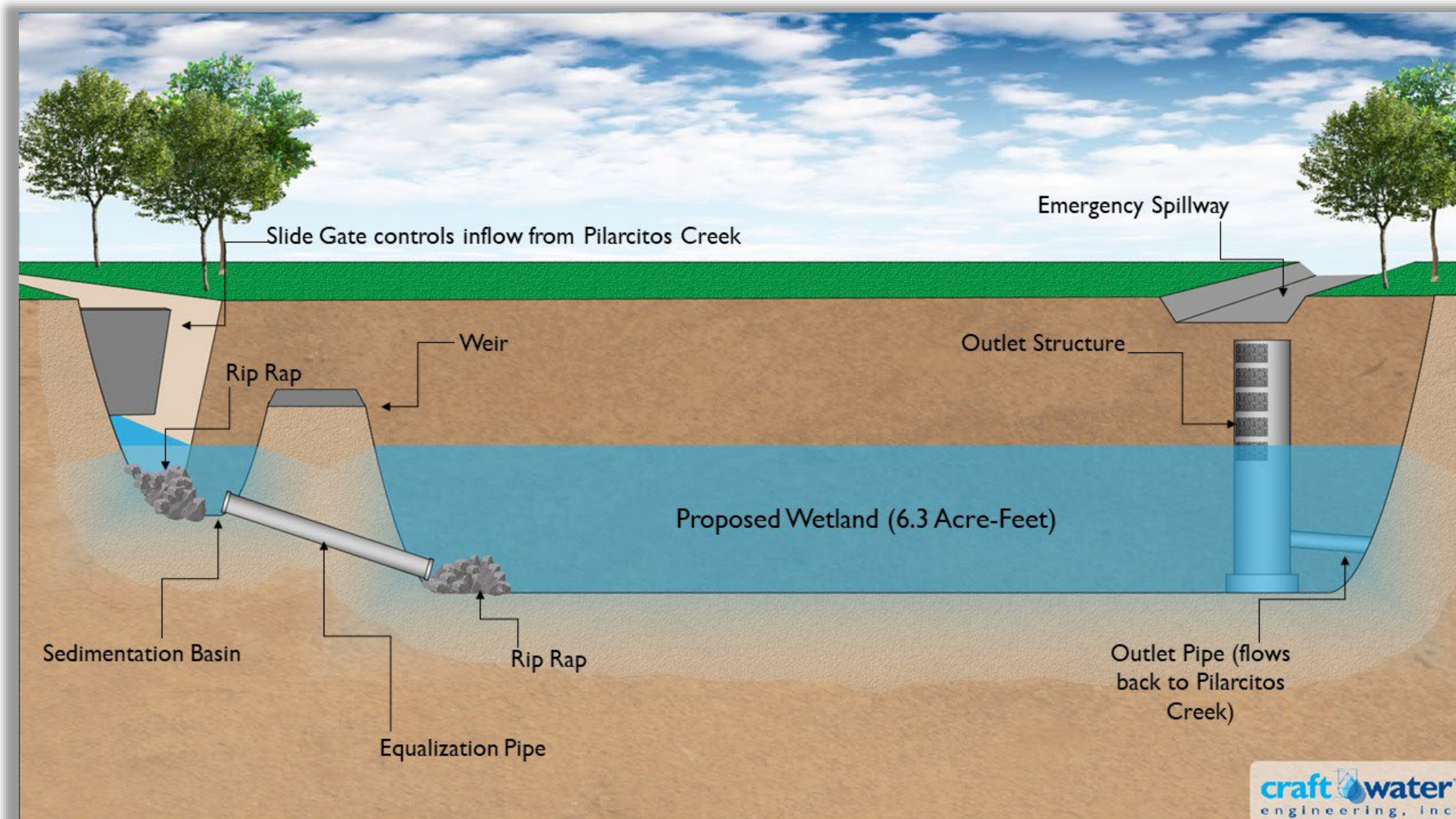
KEY PROJECT ASSUMPTIONS

The area is assumed to have HSG C soil with an infiltration rate of 0.2 - 0.5 in/hr. The system is a wetland and is not intended to infiltrate.

Design and cost estimate are based on assumed topography using the highest-resolution data available.

Water level in the creek is assumed to be at 15 ft during low flows and 20ft during high flows.

Existing Conditions



Typical Section

HALF MOON BAY REGIONAL STORMWATER PROJECT – PROJECT CONCEPT DESIGN

ADVANCING REGIONAL STORMWATER MANAGEMENT IN SAN MATEO COUNTY

PLANNING LEVEL COST ESTIMATE

Description	Quantity	Unit	Unit Price	Total
Diversion from Creek	1	EA	$48,170	$48,170
Pretreatment	1	EA	$111,300	$111,300
Diversion Channel	240	CY	$236.33	$56,720
Excavation & Site Demo	17,593	CY	$41.28	$726,255
Wetland Detention Basin	17,511	CY	$36.68	$642,358
Overflow Pipe & Spillway	1	EA	$124,226	$124,226
Surface Restoration	14,000	SF	$22.68	$317,500
			CAPITAL SUBTOTAL	$2,027,529
Mobilization (10% capital)				$202,753
Contingency (15% capital)				$304,130
Design (15% of Capital, Mobilization, and Contingency)				$380,162
Environmental Documentation& Permitting (10% total)				$253,442
			GRAND TOTAL	$3,168,016

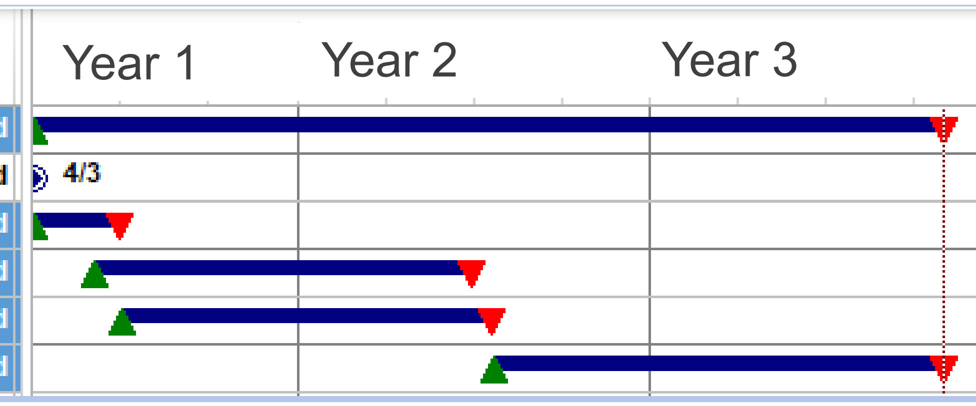
Assumptions:
-Full itemized cost estimated included in Appendix B
-Rough order of magnitude preliminary opinion of costs. Actual costs may vary
-Diversion can be achieved through grading and rip-rap. No concrete required in stream

PLANNING LEVEL OPERATIONS & MAINTENANCE ESTIMATE

Description	Frequency	# Times per Year	Unit Price	Total
Diversion Protection – Inspection	Monthly	12	$4,000	$48,000
Sedimentation Basin – Excavation	Annually	1	$100,000	$100,000
Slide Gate Maintenance	Annually	1	$5,000	$5,000
Plant Maintenance & Invasive Species Removal	Semi-Annually	2	$10,000	$20,000
			TOTAL (Annual)	$173,000

PRELIMINARY PROJECT SCHEDULE

TASK NAME	DUR
REGIONAL PROJECT	675 d
Notice to Proceed	0 d
TASK 1. Predesign	65 d
Task 2. Environmental Evaluation	280 d
Task 3. Full Design	275 d
Task 4. Construction & Testing	335 d



ADDITIONAL CONSIDERATIONS

This project concept is planning-level and requires further analysis and review for full design.

Site Topography: The topography of the site and nearby parcels will dictate several design parameters, including the sizing and configuration of the wetland and sedimentation basin, the elevations of weirs and pipes, and the location of diversion and discharge points. Survey data of the area near the project site will be required during design to conduct floodplain modeling.

Geotechnical Investigation: The infiltration rates, groundwater depths, and soil suitability require a full evaluation to determine infiltrative capability of the project.

Utilities: Minimal utility conflicts are anticipated at the site. A full utility investigation will be required during design.

Environmental Documentation: The project will require CEQA efforts due to the natural state of the parcel and the adjacency to the natural creek. An Environmental Impact Report is required during design.

Sizing Criteria: As a stormwater capture and pollutant removal project, the MRP designated design goal is to capture 80% of the annual runoff. As such, the project is intended to maximize pollutant removal while minimizing overall costs. Project sizing used 10-years of continuous simulation to estimate the average annual PCB loading and removal by various combinations of diversion and storage.

APPENDIX B: ENGINEER'S 10% COST ESTIMATE

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COSTS

Client:	**San Mateo County**	Prepared by:	**YW**
Project:	**Half Moon Bay Open Parcel Site**	Checked by:	**MMT**
Status:	**10% Cost Estimate**	Date	**6/10/2022**

Description	Qty	Unit	Unit Price	Total
Diversion From Creek				**$49,170**
Temporary Diversion	1	EA	$20,000.00	$20,000
Diversion Protection (Rip-rap)	15	CY	$278.00	$4,170
Slide Gate	1	EA	$25,000.00	$25,000
Pretreatment				**$111,300**
Sedimentation Basin (Excavation)	1,670	CY	$15.00	$25,050
Equalization Pipe (30" RCP)	60	LF	$335.00	$20,100
Concrete Spillway	90	CY	$735.00	$66,150
Diversion Channel				**$56,720**
Diversion Channel	40	CY	$28.00	$1,120
Rip-rap	200	CY	$278.00	$55,600
Excavation & Site Demo				**$726,255**
Excavation	17,593	CY	$35.00	$615,755
Tree Removal	45	EA	$1,500.00	$67,500
Clearing & Grubbing	86,000	SF	$0.50	$43,000
Wetland Detention Basin (6.3 AF)				**$642,358**
Backfill and Compaction	82	CY	$25.00	$2,050
Hauling	17,511	CY	$28.00	$490,308
Construction Dewatering	1	LS	$150,000.00	$150,000
Outflow Pipe & Spillway				**$124,226**
Graduated Outflow Structure	1	EA	$6,500.00	$6,500
Piping (18" RCP) to Outfall (Includes excavation & shoring)	168	LF	$307.00	$51,576
Concrete Spillway	90	CY	$735.00	$66,150
Surface Restoration				**$317,500**
Tree Replacement	45	EA	$2,500.00	$112,500
Shrubs, Perennials, and Grasses	14,000	SF	$5.00	$70,000
Maintenance Accesss Road	5,000	SF	$9.00	$45,000
90-Day Plant Establishment Period	1	LS	$90,000.00	$90,000
SUBTOTAL				**$2,027,529**
Mobilization / Demobilization (10% capital)	1	LS	$202,753.00	$202,753
Contingency (15% capital)	15%	LS	$304,130.00	$304,130
			Construction Subtotal	**$2,534,412**
Design (15% Total)	15%	LS	$380,162.00	$380,162
Environmental Documentation & Permitting (10% total)	10%	LS	$253,442.00	$253,442
	GRAND TOTAL			**$3,168,016**

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COSTS

Client:	**San Mateo County**	Prepared by:	**YW**
Project:	**Half Moon Bay Open Parcel Site**	Checked by:	**MMT**
Status:	**10% Cost Estimate**	Date	**6/10/2022**

Description	Qty	Unit	Unit Price	Total

Assumptions and Exclusions

1 This is a rough order of magnitude preliminary opinion of probable construction costs only. Actual costs may vary.
2 The unit cost data is derived from inhouse sources, recent bids on similar construction, and RSMeans current construction cost data.
3 This opinion of cost is based on the project program and plans made available at the time of preparation.
4 Material prices are based on current quotations and do not include escalation.
5 This opinion of cost assumes that all improvements will be constructed at one time.
6 Quantity take offs were performed when possible and parametric estimates and allowances are used for items that cannot be quantified at this stage of the design.
7 This opinion has been based on a competitive open bid situation with a recommended 5 - 7 bonafide reputable bids from general contractors and a minimum of 3 bidders for all items of subcontracted work.
8 All unit costs take into account sales tax, general conditions, bonding and insurance, and subcontractor and general contractor overhead and profit.
9 Where applicable, unit costs include the cost of freight.

The following are excluded:

1 Environmental clearances and permits
2 Hazardous spoil disposal, if encountered
3 Property and Right of Way acquisition or easements
4 Legal and accounting fees
5 Plan check, building permit fees
6 Utility Connection Fees
7 Testing and inspection
8 Fire and all risk insurance
9 Removal of unforeseen underground obstructions
10 Relocation of unforeseen subsurface utilities
11 Signage and wayfinding
12 Additional fill or import
13 Loose furniture and equipment
14 Utility connection fees
15 Tel/data system
16 Construction contingency
17 Work done after business hours
18 Design, engineering and consulting fees other than those specifically listed in the above estimate

Items that may affect the cost estimate:

1 Modifications to the scope of work included in this estimate
2 Unforeseen sub-surface conditions
3 Restrictive technical specifications or excessive contract conditions
4 Any other non-competitive bid situations
5 Bids delayed beyond the projected schedule

OPERATIONS AND MAINTENANCE ESTIMATE

Client: **San Mateo County**
Project: **Half Moon Bay Open Parcel Site**

Prepared by: **MT/ODG**
Checked by: **ODG**

Operations and Maintenance (Annual Estimate)

Date: **June 10, 2022**

Description	Frequency	No. of Times per Year	Unit Price	Total
Diversion Protection - Inspection	Monthly	12	$4,000	$48,000
Sedimentation Basin - Excavation	Annually	1	$100,000	$100,000
Slide Gate Maintenance	Annually	1	$5,000	$5,000
Plant Maintenance & Invasive Removal	Semi-Annual	2	$10,000	$20,000

TOTAL (Annual) **$173,000**