TREASURE ISLAND INFRASTRUCTURE PLAN

June 28, 2011

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1. INTRODUCTION / PROJECT DESCRIPTION

1.1 Purpose

This Infrastructure Plan is an attachment to the Disposition and Development Agreement (DDA) between the Treasure Island Development Authority, a public body, corporate, and politic of the State of California, together with any successor public agency, (the Authority) and Treasure Island Community Development, a California limited liability corporation, together with its successors (Developer), and is an exhibit to the Interagency Cooperation Agreement (ICA) between the City and County of San Francisco (City) and the Authority. This Infrastructure Plan defines the Public Infrastructure for those portions of Naval Station Treasure Island (NSTI) that are being redeveloped pursuant to the DDA (the Development Plan Area). For the purposes of this report, “Treasure Island” will refer to both Treasure Island and Yerba Buena Island, collectively, and “TI” or “YBI” will be used when referring to a specific Island. Capitalized terms used but not otherwise defined shall have those meanings set forth in the DDA.

The overall Project description, location, and the nature of the Development within the Development Plan Area are described fully in the DDA. For convenience, a summary of land uses that will be served by the Infrastructure to be developed on Treasure Island is provided here. Not all of these uses are part of the Project, as some are existing uses to remain or be developed separately.

The definitions of development-related terms as defined in the DDA shall apply to this Infrastructure Plan.

1.2 Land Use Program for the Infrastructure Plan

The following land use table is used to determine infrastructure demands in this document only. These numbers do not represent the final land use program and may be adjusted in the future. Adjustments will not significantly change the utility demands.

LAND USE	LOCATION / DESCRIPTION	PROGRAM
Residential	Treasure Island	7,700 – 7,850 units
	Yerba Buena Island	150 - 300 units
	Residential Totals	**Up to 8,000 units**
Hotel	Treasure Island	450 rooms
	Yerba Buena Island	50 rooms
	Hotel Totals	Up to 500 rooms
Office	Treasure Island	**100,000 s.f.**
New Construction Retail	Neighborhood Serving	45,000 s.f.
	Other Retail	95,000 s.f.
	New Construction Retail Totals	**Up to 140,000 s.f.**
Adaptive Reuse*	Building 1	76,000 s.f.
	Building 2	85,000 s.f.
	Building 3	150,000 s.f.
	Adaptive Reuse Totals	**311,000 s.f.**
Parking Structures		**2,479,750 s.f.**
Open Space		**300 acres**
Miscellaneous Structures	YBI Historic / Open Space Structures	**75,000 s.f.**
Marina		**400 slips**
Community / Civic Facilities	Treasure Island School Police/Fire Misc. small community facilities Pier 1 community center TI Sailing Center Museum **Community / Civic Total**	105,000 s.f. 30,000 s.f. 13,500 s.f. 35,000 s.f. 15,000 s.f. 75,000 s.f. **273,500 s.f.**
Job Corps		**777,029 s.f.**
Coast Guard Facility		Existing Square Feet to Remain
Utility Facilities	Wastewater Treatment Plant	10,000 s.f.
	Corporation Yard Buildings at Treatment Plant and Water Tanks	4,000 s.f.
	Utility Facility Buildings Totals	14,000 s.f.

* Of this 311,000 SF total, 67,000 is proposed for retail use.

1.3 Infrastructure Plan Overview

This Infrastructure Plan will govern the construction and development of Infrastructure in the Development Plan Area and site work needed to support the Project. This Infrastructure Plan may be modified to the extent such additional Infrastructure is mutually agreed to by the Authority and the Developer consistent with the terms of the DDA and the ICA.

This Infrastructure Plan defines Infrastructure improvements to be provided by the Developer for the Development Plan Area, as well as off-site and on-site work that may be provided to support development of the Development Plan Area by the San Francisco Public Utilities Commission (SFPUC). While some Infrastructure improvements to be provided by City Agencies and other governmental agencies are described, their inclusion herein is not intended to be inclusive of all improvements to be provided by City Agencies and other governmental agencies.

This Infrastructure Plan and the Treasure Island / Yerba Buena Island Subdivision Regulations (to be developed separately) will establish the design standards, criteria and specifications of Infrastructure in the Project, including streets, potable water, recycled water (including back-up firefighting source), supplementary bay water hydrants and fireboat manifolds for firefighting, joint trench, street lighting, street furniture, separated storm and sewer systems, storm water treatment features, open space parcels, and other Infrastructure. During subdivision processing and approval by the City, including the review and approval of subdivision improvement plans, the final design of Infrastructure will be consistent with this Infrastructure Plan and the other regulations and agreements applicable to Treasure Island.

This Infrastructure Plan focuses on the Infrastructure required to build the Project as described in the Project Environmental Impact Report (EIR). The EIR also includes a number of Project variants, which may or may not be implemented; these variants are also described, but are not required components of the Infrastructure.

1.4 Property Acquisition, Dedication, and Easements

The Mapping, Street Vacations, property acquisition, dedication and acceptance of streets and other Infrastructure improvements will occur through the Subdivision Map process in accordance with the Treasure Island / Yerba Buena Island Subdivision Code and Subdivision Regulations. Except as otherwise noted, all Infrastructure described in this Infrastructure Plan shall be constructed within the public right-of-way or dedicated easements to provide for access and maintenance of Infrastructure facilities. In the event property necessary to provide the rights-of-way or easements for construction of improvements shown herein cannot be acquired by the Authority or Developer, alternate Infrastructure designs will be submitted by the Developer for consideration by the City.

Public Service Easements will be allowed within the Project as may be necessary to service the Project. Utilities in these areas will be installed in accordance with the standards in this Infrastructure Plan and applicable City Regulations for public acquisition and acceptance within public utility easement areas, including provisions for maintenance access; however, such areas shall not be required to be dedicated as public right-of-ways or improved to public right-of-way standards.

1.5 Project Datum

All elevations referred to herein are based on North American Vertical Datum of 1988 (NAVD 88).

1.6 Technical Memoranda

The Technical Memorandums that have been submitted separately to the City provide additional technical requirements for the each Infrastructure system. These Technical Memoranda form the basis of the conceptual plans developed for this Infrastructure Plan and Major Phase applications. Approval of this Infrastructure Plan does not imply approval of the respective utility system Technical Memoranda. Refinements to the Technical Memoranda are not anticipated to substantially change the descriptions in the Infrastructure Plan. Revisions to the Infrastructure Plan based on the changes to the Technical Memoranda will be made upon mutual agreement between the Authority, City, and the Developer. The Technical Memoranda will be finalized prior to the approval of the first Sub-Phase Application.

1.7 Conformance with EIR & Entitlements

This Infrastructure Plan has been developed to be consistent with Project mitigation measures required by the Environmental Impact Report (EIR) and other entitlement documents. Regardless of the status of their inclusion in this Infrastructure Plan, all mitigation measures of the EIR shall apply to the Project.

1.8 Interagency Cooperation Agreement

Under California Community Redevelopment Law Section 33220(e), certain public bodies, including the City, are authorized to aid and cooperate in the planning, undertaking, construction, or operation of redevelopment projects. To promote development in accordance with the objectives and purposes of the Treasure Island/Yerba Buena Redevelopment Plan and the Disposition and Development Agreement, the City and the Authority are entering into an Interagency Cooperation Agreement (ICA) to provide for the City's cooperation in administering the control and approval of subdivisions, and all other land use, development, construction, improvement, infrastructure, occupancy, and use requirements applicable to the Project, in accordance with this Infrastructure Plan and the other Redevelopment Documents. Signatories to the ICA include the Mayor, the Clerk of the Board of Supervisors, the Controller, the City Administrator, and the Director of Public Works. City Agencies consenting to the ICA and the Infrastructure Plan include the SFPUC, the Planning Commission and Department the Department of Building Inspection, the Arts Commission, and the San Francisco Fire Department. City Permits reviewed and issued by applicable City Agencies will require conformance with this Infrastructure Plan and the other Redevelopment Documents.

1.9 Applicability of Uniform Codes and Infrastructure Standards

Future modifications to this Infrastructure Plan and/or existing City Standards, Guidelines, and Codes are subject to the provisions of sections 2.4.3 and 2.4.4 of the Development Agreement.

1.10 Project Phasing

It is anticipated that the Project will be developed in 4 or 5 Major Phases. Each Major Phase will be further divided into Sub-Phases. The Developer will submit an application for the development of each Major Phase. Major Phase applications will include illustrative concept plans for utilities and transportation improvements within the Major Phase and the infrastructure required to serve the Major Phase that may be outside of the Major Phase limit. Following a Major Phase application, the Developer may submit applications for one or more Sub-Phases. The information provided with each Major Phase and Sub-Phase application will be consistent with the Design Review and Document Approval Procedure (DRDAP).

1.11 Phases of Infrastructure Construction

The infrastructure improvements for Treasure Island will be constructed in phases in accordance with approved Major Phase and Sub-Phase applications.

Each phase of infrastructure construction will provide the new infrastructure necessary to serve the associated Sub- Phases. The amount of the existing infrastructure systems replaced with each Sub-Phase will be the minimum necessary to serve the Sub-Phase. The new Sub-Phases will connect to the existing infrastructure systems as close to the edge of the new Sub-Phase as possible with permanent and/or temporary systems while maintaining the integrity of the existing system for the remainder of the Islands. Any existing land uses remaining during each Sub-Phase will continue to utilize the existing infrastructure systems with temporary connections to the new systems where required to maintain the existing service until the existing uses are demolished. The conceptual limits of the existing infrastructure to be demolished as well as conceptual layouts of the permanent and/or temporary infrastructure systems for each Major Phase will be provided with the Major Phase application. As defined by the DRDAP, 50% plans for the permanent and/or temporary infrastructure systems for each Sub-Phase as well as the capacities and conditions of the existing infrastructure to remain that will serve the Sub-phase will be submitted with the Sub-Phase application. Repairs and/or replacement of the existing facilities necessary to serve the sub-phase will be designed and constructed by the Developer.

The Authority or the City will be responsible for maintenance of existing infrastructure facilities until demolished by the Developer. The City will be responsible for the new facilities once construction of the Sub-Phase or the new facility is complete and accepted by the City.

All stormwater treatment facilities necessary to comply with the current SFPUC stormwater management requirements will be operational at the time of completion of each Sub-Phase, prior to City acceptance of the Sub-Phase. All planted stormwater treatment systems will be established and functional at the time of connection.

2. SUSTAINABILITY

2.1 Sustainable Infrastructure

A key component of Treasure Island's redevelopment is its sustainable infrastructure. This Infrastructure Plan incorporates various strategies that support the long term sustainable vision for this new urban community. Innovative street designs, efficient land planning, and modern efficiently-sized infrastructure serve as the cornerstones for this new sustainable community.

A summary of the key sustainable strategies that are to be incorporated into the infrastructure to be installed on Treasure Island are as follows:

Section 3 - Environmental Remediation

- Environmental remediation and clean up of Treasure Island to satisfy all applicable statutory and regulatory requirements for redevelopment uses

Section 4 - Demolition and Deconstruction

- Deconstruction and abatement of unusable and dilapidated structures
- Rehabilitation and re-use of historic structures
- Demolition of sub-standard utility infrastructure
- Re-use of recycled materials on-site where feasible

Section 5 – Sea Level Rise and Adaptive Management Strategy

- Initial grading and utility infrastructure designs to provide long term protection and adaptability for sea level rise
- Sea level rise adaptation plan put in place to allow monitoring and adaptation
- Financing mechanism put in place to fund future monitoring and improvements to adapt to varying amounts of sea level rise

Section 6 – Geotechnical Conditions

- Geotechnical improvements to significantly improve seismic stability of Treasure Island and provide for stable development platform

Section 7 – Site Grading and Drainage

- Grading plans designed to remove the new proposed development areas from existing FEMA flood plain designation
- Initial grading and drainage designs to provide long term protection and future adaptability to accommodate potential sea level rise
- Grading design to minimize the need to import soil to Treasure Island from offsite locations while accommodating grades adjacent to existing historic structures and minimizing the impact to natural environment on YBI
- Erosion and sedimentation control measures during construction will be utilized consistent with an approved Storm Water Pollution Prevention Plan for the site.

Section 8 – Transportation and Street Design

- New infrastructure to support alternative transit modes such as bicycles, busses, and a new ferry system.
- Innovative new street grid designed to provide solar and wind benefits
- Walkable community designed to optimize the pedestrian experiences throughout the island and intermodal transit hub
- New public bicycle and pedestrian paths to provide connection to open spaces and the new East Span of the Bay Bridge

Section 9 – Potable Water System

- New reliable, robust and efficient potable water system including expanded on-island storage
- Use of state of the art water conservation fixtures to reduce potable water demands

Section 10 – Wastewater System

- New wastewater collection system to reduce the amount of groundwater intrusion and chance for system overflow
- New and/or upgraded on-site wastewater treatment facility
- New low flow fixtures generating reduced discharge into the wastewater system

Section 11 – Recycled Water System

- New Recycled Water Treatment Facility will provide recycled water to Title 22 standards for unrestricted use
- All non-potable demands intended to be met with recycled water. Will reduce potable demand by over 420,000 gallons per day
- All new recycled water distribution system (except on YBI)
- Recycled water also used for backup fire water source in case of emergency conditions

Section 12 - Stormwater System

- New stormwater collection system designed for long term protection from flooding and adaptability for sea level rise
- Designed to provide stormwater treatment prior to outfall to the Bay
- Innovative Low Impact Development (LID) system wide designs and treatment wetlands included in street designs and open spaces

Section 13 – Dry Utility Systems

- New power, gas and communication systems to serve the development
- Project will generate 5% of peak energy demand on-site
- Use of energy efficient fixtures to reduce energy demands

Section 14 - Project Infrastructure Variants

- Project has also been designed with enough flexibility to consider the addition of the following large scale sustainable facilities into the infrastructure program for the development;
    - District heating/cooling
    - Automated waste collection systems
    - Additional on-site energy generation (solar farms)

All of the features above are intended to support achieving a Gold certification level under the United States Green Building Councils LEED (Leadership in Energy & Environmental Design) for Neighborhood Development (ND) rating system. (July 2010 version).

3. ENVIRONMENTAL REMEDIATION

3.1 Background

NSTI was selected for closure under the Base Closure and Realignment ("BRAC") program in 1993, and was subsequently decommissioned in 1997. Prior to operational closure, a base wide environmental baseline survey ("EBS") was completed in 1994, which was required as part of the BRAC program. The EBS is a broad evaluation of all known and suspected hazardous materials that were handled, stored, or potentially released into the environment from base operations. The results of the EBS confirmed that portions of the Development Plan Area contain soil and groundwater that have been impacted by hazardous materials.

Since first identified for base closure, a substantial amount of work has been performed by the Navy regarding the identification and cleanup of subsurface contamination. A Finding of Suitability for Transfer (FOST) has been completed for approximately 170 acres of the former naval base. The Navy is continuing to conduct remedial actions, the goal of which is to eliminate the contamination, reduce it to acceptable levels, or, if residual contamination is left in place, to limit exposure pathways that may pose a risk to human health and the environment.

3.2 Status of Land at Transfer from Navy to TIDA

The Navy will transfer NSTI to the Authority, under the terms of an Economic Development Conveyance Agreement ("EDC Agreement"). The EDC Agreement contemplates that the Navy will satisfy all applicable statutory and regulatory requirements for its remediation responsibilities, and issue a FOST, or multiple FOSTs, prior to conveyance of the property.

Sites will be transferred from the Navy to the Authority as FOSTs are issued. The Authority will subsequently transfer the land in phases to the Developer, in accordance with the terms of the DDA.

3.3 Developer Obligations

The Developer will be responsible for completing any additional remediation work that may be required after the Navy's completion of its obligations in accordance with applicable regulatory requirements. Generally, the following types of additional work are currently anticipated:

- *Removal of any Hazardous Building Materials.* Where the Project requires demolition or renovation of structures containing hazardous building materials such as lead-based paint or asbestos, additional remediation would be required.

- *Compliance with, Alteration, or Removal of a Land Use Covenant.* There may be areas where land use controls on the property are imposed by covenant as part of the Navy's remediation process, and such land use controls are inconsistent with the final reuse. For these areas, the Developer and the Authority will need to obtain approval for the proposed land use from the appropriate regulatory agencies.

3.4 Potential Additional Scope of Work

While the EDC Agreement presumes that all sites will be transferred by the Navy to the Authority following a FOST, the EDC Agreement does allow the Navy and the Authority to enter into negotiations for an Early Transfer (also known as a Finding of Suitability for Early Transfer, or FOSET) for any individual parcel. A FOSET documents the remediation that has not been completed at the time of transfer and the protections to human health and the environment that will be implemented until all action necessary to protect human health and the environment have been taken. Under a FOSET, the Navy would not complete the full remediation prior to transfer and the Authority and Navy would coordinate to complete the remediation in accordance with applicable regulatory requirements.

In addition, the EDC Agreement also provides an election for the Navy and the Authority to enter into a Lease in Furtherance of Conveyance ("LIFOC") for any parcel. In this case, the Navy would continue to retain responsibility for environmental remediation, unless the Navy and the Authority were to agree otherwise, and the land would be leased from the Navy to the Authority until such time that a FOST was issued and land was suitable for transfer.

In the event of either a FOSET or a LIFOC where the Authority assumed some of the Navy's remediation responsibilities, the Authority and Developer would meet and confer to discuss which of those responsibilities, if any, would be carried out by Developer.

4. DEMOLITION AND DECONSTRUCTION

4.1 Scope of Demolition

The Developer will be responsible for the demolition and deconstruction of all non-retained existing buildings and infrastructure features. This includes all non-historic buildings not intended for long-term reuse, site structures (retaining walls, utility buildings), streets and pavements, existing utilities, relocation of existing utilities as needed subject to SFPUC approval, and landscape elements that are unable to be included in the proposed design.

The buildings to be demolished or deconstructed are primarily of wood and concrete construction and were formerly used for administration, storage, classrooms, shops, dormitories, housing and a variety of other purposes. To the extent practical, existing structures will be "deconstructed", allowing for maximum re-use of materials. The feasibility of materials reused or recycled may be limited by the requirements for abatement of hazardous materials and the potential value of the recycled material.

Building demolition and deconstruction will start with the abatement of hazardous materials including lead paint, asbestos and other materials identified as part of a building survey. Hazardous materials will be removed pursuant to a work plan agreed to by the Developer, the Authority, and Federal, State, and local regulators. In addition to hazardous material removal, appropriate methods of vector control will be used to mitigate any possible vermin infestations from the existing buildings.

In addition to the demolition and deconstruction of structures as addressed above, all existing pavements, underground utilities, and overhead utilities in the demolition and deconstruction areas will be abandoned in place, removed or, subject to SFPUC approval, relocated (permanently or temporarily) by the Developer. Where feasible, concrete and asphalt pavements will be recycled and used on site or made available for use elsewhere. This could be accomplished by setting up a concrete/asphalt crushing plant operation on TI. The location of the plant will consider the need for efficiency throughout the construction phases and the need to minimize the impact on existing residents and business. The recycled concrete/asphalt materials will be allowed for pavement and structural slab sub-base material, utility trench backfill, and, where feasible, concrete and asphalt mixes, as approved by the City.

Utility materials, primarily metals, will be recycled as feasible. Where transite pipe (asbestos-cement pipe) is encountered, appropriate abatement methods will be used to satisfy applicable regulatory agency requirements.

As part of a standard vegetation grubbing and clearing operation, trees and other plant materials will be protected in place, relocated, or removed as needed from future grading areas. All trees and plants to be removed will be recycled by composting for on-site uses associated with replanting and erosion control to the extent feasible.

4.2 Phases of Demolition/Deconstruction

The demolition will occur in phases to match the Sub-Phases of the Project. The amount of demolition will be the minimum necessary for the Sub-Phase. The demolition of smaller areas will allow the existing utility services, vehicular access areas, and vegetation to remain in place as long as possible in order to reduce disruption of existing uses on the Islands.

5. SEA LEVEL RISE AND ADAPTIVE MANAGEMENT STRATEGY

5.1 Sea Level Rise (SLR)

The State of California's 2009 Draft Climate Adaptation Strategy Report includes guidance to State agencies addressing climate change adaptation. In addition, BCDC has proposed Bay Plan amendment language, which includes guidance for addressing future SLR scenarios associated with planning and permitting development in potentially susceptible areas. Both recommend using the following SLR forecast for planning purposes:

- 16 inches by 2050
- 55 inches by 2100

SLR has the potential to increase flooding along shoreline areas as the 100-year high tide (Base Flood Elevation) increases over time. The Project will be built to protect against a reasonable amount of SLR and designed to accommodate higher SLR through an Adaptive Management approach that allows the Project infrastructure to be adjusted over time in response.

5.2 Adaptive Management Approach

Because the actual rate of future SLR is uncertain, the Adaptive Management approach will embrace a pro-active adaptive management strategy that can respond to changes that will come about in the future as a result of additional scientific study and monitoring of SLR conditions.

The Adaptive Management plan will include four basic fundamentals:

1. Initial infrastructure designs to accommodate reasonable SLR scenarios
2. Infrastructure designs that can easily be adjusted in the future in response to actual SLR
3. Monitoring of scientific updates and actual SLR data
4. Funding mechanism to implement the necessary improvements

The following is a description of how the Project will implement these four basic fundamentals.

5.3 Initial Infrastructure Design

5.3.1 Grading (refer to Section 7 for more detailed information)

The FEMA requirements for setting coastal flooding elevations include two components; 1) perimeter shoreline areas, and 2) inland areas. The flood elevations for the perimeter shoreline areas are dictated by the still water, 100-year tide elevation (Base Flood Elevation), plus the potential for wave run-up. The potential wave heights and geometry of the perimeter shoreline will dictate the horizontal extent of the area considered to be "shoreline". Because the inland areas are protected from wave run-up by the perimeter shoreline, the flood elevations for the inland areas are dictated by the Base Flood Elevation (BFE) only.

Figure 5.1 shows the perimeter area and inland areas for Treasure Island. Descriptions of the different areas are as follows.

5.3.1.1 Perimeter Protection

The perimeter shoreline area of TI will function as a berm to protect the interior of the Island from wave run-up. The height of the existing perimeter will be adjusted such that there is only a 1% chance of wave overtopping due to a combination of high tides, swell, wind, waves, tsunami, and shoreline geometry. The elevation and types of perimeter protection designs will vary around the Island based on the orientation of the shoreline (i.e. wave heights) and the proposed adjacent land plan. The designs in each location will be based on the current tide conditions to meet the FEMA wave protection standards plus an additional 16-inches to accommodate the potential 2050 SLR estimates.

As described below, the proposed building areas on TI will be raised to accommodate 36-inches of potential SLR. Therefore, the perimeter of the island will not be considered a levee under current BFE conditions, and would not be in the future unless more than 36-inches of SLR occur.

5.3.1.2 Development Area Grading

As described above, the perimeter designs will protect the development areas from wave run-up and, therefore, the designs for the interior development areas will be based on the BFE.

There are three different types of development areas located on TI; 1) proposed new building and roadway areas, 2) open space areas, and 3) remaining historic buildings and Job Corps. A description of the proposed grading for each of these conditions is as follows:

5.3.1.2.1 Proposed Building and Roadway Areas

The finished floors and garage entrances for all new structures will be built a minimum of 42-inches above the current Base Flood Elevation (BFE). This will accommodate up to 36-inches of SLR while maintaining 6-inches of freeboard to the new structures.

The minimum roadway elevations will be designed to meet the freeboard requirements for the Hydraulic Grade Line (HGL) of the storm drain system as described in Section 12.

5.3.1.2.2 Open Space Areas

The minimum elevations for the open space areas will be built at the existing BFE. The lowest points in the open space areas may experience minimal amounts of rainwater ponding during large rainstorms occurring simultaneously with 100-year tides, depending on their locations and watershed area. The depth of rainwater ponding during these infrequent events will be minimal for the peak high tide duration (approximately 2 hours) and will drain once the tide subsides. As described below, the stormwater system will be constructed with tide gates at the outfall structures so bay water does not enter the on-site system during high tide events. The horizontal limits and depth of ponding in the open space areas will be developed in coordination with the SFPUC prior to approval of the Major Phase and Sub-Phase applications as consistent with the DRDAP.

5.3.1.2.3 Historic Buildings, School Site, and Job Corps Structures to Remain

Historic Buildings 1, 2, and 3, as well as the Job Corps buildings and School buildings will remain on TI. The existing finished floor elevations for these structures range from elevation 8.5 to 13.2. These finished floors as well as the ground adjacent to the buildings will not be raised as part of the Project. The new street improvements adjacent to these facilities will be constructed to grades of 12 to 15. The grade difference between the lower areas of the existing buildings and proposed improvements will be mitigated by grading transition areas or with low walls, ramps, stairs and/or planters. These improvements will be designed with grades to protect the lower finished floor areas from the current BFE plus 16-inches of SLR. Local storm drain systems will be installed for these lower areas with small pump stations to connect to the main systems within the streets. The Developer will be responsible for the design and installation of the grading transition and pumps, if required. Ownership and maintenance of the local stormwater system on public land will be by SFPUC or TIDA.

5.3.1.2.4 Wastewater Treatment Plant

The existing grades for the existing wastewater treatment plant vary from approximately 10.4 to 12.6. The proposed surrounding grades of the open space area will be lower than the WWTP area. The existing grades of the facility will remain until the WWTP is upgraded/replaced by the SFPUC.

5.3.2 Stormwater System (refer to Section 12 for more detailed information)

The existing storm drainage collection system on Treasure Island will be replaced in phases that correspond to the Sub-Phases of the Project. The new stormwater system will be designed to accommodate the 100-year storm during the 100-year tide with a maximum of ponding to top of curb at low points in the streets. The system will be constructed with tide gates at the outfall structures so bay water does not enter the on-site system. The system will be designed to gravity flow to the outfalls. New inline lift stations may be required at certain locations due to the depth of the stormwater system or crossing conflicts with other utilities.

5.4 Infrastructure Adjustments for Future SLR

5.4.1 Grading

5.4.1.1 Perimeter Protection

As described above, the perimeter protection will be designed to accommodate up to 16-inches of SLR. The perimeter designs will also provide the ability to make future changes to the perimeter if more than 16-inches of SLR occurs and over topping of the perimeter becomes a nuisance or hazardous at some locations. The appropriate type of adjustments will be determined through the decision making framework described below. If more than 36-inches of SLR occurs, the perimeter area will need to be improved to FEMA levee standards.

5.4.1.2 Development Area Grading

5.4.1.2.1 Proposed Building and Roadway Areas

As described above, the finished floors and garage entrances of the new structures will be set at elevations to accommodate up to 36-inches of SLR and maintain a 6-inch freeboard. SLR beyond 36-inches will require perimeter and stormwater system improvements to protect the structures.

The roadway grading will be designed to limit ponding to the top of curb elevation during the 100-year storm, 100-year tide, and up to 16-inches of SLR. Stormwater system improvements will be required if more than 16-inches of SLR occurs.

5.4.1.2.2 Open Space Areas

As described above, the minimum grade in the open space areas will be the current BFE. Future SLR will increase the amount of rainwater ponding during high tides and larger rain events but will not impact the building areas. As described below, the pump stations added to the stormwater outfalls after 16-inches of SLR will reduce the ponding in the open space areas to levels and durations equal to the current BFE conditions described above. The horizontal limits and depth of ponding in the open space areas will be developed in coordination with the SFPUC prior to approval of the Major Phase and Sub-Phase applications as consistent with the DRDAP.

5.4.1.2.3 Historic Buildings, School Site, and Job Corps Structures to Remain

As described above, the elevations of the historic building, school site buildings, and Job Corps structures will not be adjusted. Grading transitions and other improvements will be installed around the lower finished floor areas to protect these buildings from the current BFE with 16-inches of SLR. As described below, the pump stations added to the stormwater outfalls after 16-inches of SLR will continue to protect these structures from flooding. Additional improvements may be required around these structures if the 100-year high tide becomes higher than the existing finished floors due to SLR.

A summary of the Adaptive Management approach for grading to accommodate SLR scenarios on TI is show in Table 5.1.

5.4.1.2.4 Wastewater Treatment Plant

The wastewater treatment plant is intended to be updated/replaced by the SFPUC, subject to future negotiation and agreement. The SFPUC will adjust the grades of the new/upgraded facility or protect the plant from flooding through the use of local storm drainage improvements.

5.4.2 Stormwater System

The new stormwater system will also be designed to accommodate modifications in the future for SLR. Modifications will include the addition of pump stations near the development area outfalls to maintain flows during larger storms and high tide events. Details of the new stormwater system and outfalls are described in Section 12.

A summary of the stormwater system design criteria for current tides and potential SLR scenarios is shown in Table 5.2.

5.5 SLR Monitoring Program

As part of the proposed Project, the Authority will create a monitoring program to review and synthesize SLR estimates prepared for San Francisco Bay by the National Oceanic Atmospheric Administration and/or a State agency. The Authority will also conduct a periodic review of scientific literature for updated SLR estimates.

5.5.1 Decision-Making Framework

If the data from the monitoring program demonstrate that SLR in San Francisco Bay has exceeded (or will soon exceed) the allowances designed for in the initial improvements, or if flooding issues on Treasure Island due to SLR occur on a regular basis, a range of additional improvements can be made to protect the island from flooding and periodic wave overtopping. Decisions on which improvements to make will be made by the Authority at the time improvements are required. The decision as to which solutions to implement would likely depend on a variety of factors, including, but not limited to;

- Consultation with the SFPUC and other local agencies
- Any new local, State, or Federal requirements about how to address SLR
- Available technology and industry best practices at the time
- Both the observed rate of actual SLR and updated estimates of future SLR.

5.5.2 Sea Level Rise Monitoring and Implementation Report

The Authority will be responsible for periodically preparing a report on the progress of the adaptive management strategy. The report will be prepared no less than every 5 years, or more frequently if required by regulators. The report will include:

- The publication of the data collected and literature reviewed under the monitoring program.
- A review of any changes in the local, State, or Federal regulatory environment related to SLR, and a discussion of how the Project is complying with any applicable new regulatory requirements.
- A discussion of the improvements recommended to be made if sea levels reach the anticipated thresholds identified above in “Decision-Making Framework” within the next 5 years.
- A report of the funds collected for implementation of the adaptive management strategy, and a projection of funds anticipated to be available in the future.

5.5.3 Funding Mechanism

The Project's Financing Plan includes a mechanism to create project-generated funding that will be dedicated to paying for the flood protection improvements necessary to implement the Adaptive Management plan.

5.6 Yerba Buena Island

Because of natural topography on YBI, the site grades for the proposed buildings, as well as the existing grades for the historic structures, are significantly above both the BFE and SLR allowances.

Table 5.1 – Adaptive Management Approach for Grading on TI

		Minimum Design Criteria				
	Tide/SLR Condition	**Perimeter Shoreline**	**Parks & Open Space**	**New Finished Floor**	**Existing Buildings**	**New Roads**
Initial Design	**Current Tide Condition** **100 year high tide: 9.2-feet NAVD 88** (Determined in 2009 Coastal Flooding Study)	Accommodate current 1% chance of flooding + SLR (16-inches)	Minimum Elevation:9.2' (NAVD 88) Current 100-year high tide (ponding allowed during large rain and high tide events)	Minimum Elevation:12.7' (NAVD 88) Current 100-year high tide + SLR (36-inches) + 6-inches of freeboard	No change to Finished Floor. Retaining walls and/or landscape berms, and local storm drainage improvements may be required to protect against flooding.	Minimum Elevation: Minimum elevation that meets stormwater system freeboard criteria.
Adjustments for Future SLR	**SLR Condition: up to 16-inches** **100 year high tide: 9.2-feet + 16- inches = 10.53-feet NAVD 88** (Estimated to occur by 2050)	No change needed	No change needed	No change needed	No change needed	No change needed
Adjustments for Future SLR	**SLR Condition: 16-inches to 36-inches** **100 year high tide: 9.2-feet + 36-inches = 12.2-feet NAVD 88** (Estimated to occur between 2050 and 2100)	***Adaptive Management Strategy: adjust perimeter to address wave overtopping.*** Accommodate 1% chance of flooding at that time + SLR (guidance at that time)	No change needed	No change needed	No change needed	***Adaptive Management Strategy: When SLR Monitoring Report (Section 5.5.2) determines 16-inches of SLR (mean sea level 3.29-feet + 16-inches = 4.62-feet NAVD 88) has occurred implement modifications to storm drainage system.***
Adjustments for Future SLR	**SLR Condition: greater than 36-inches** **100 year high tide: 9.2-feet + 36-inches = 12.2-feet NAVD 88** (Estimated to occur after 2100)	***Adaptive Management Strategy: implement modifications to perimeter protection zone when 100-year tide projection is greater than project's lowest finished floor. (12.7 NAVD 88)*** Accommodate 1% chance of flooding at that time + SLR (guidance at that time)	No change needed	No change needed	No change needed	No change needed. Adaptive Management strategy implemented at 16-inches SLR.

Note: SLR conditions based on current Treasure Island mean sea level of 3.29 feet (NAVD 88) documented in the 2009 Coastal Flooding Study

Table 5.2 – Adaptive Management Approach for Stormwater System on TI

		Minimum Design Criteria	
		Stormwater System	
I Infra struct ure Desig	**Tide/SLR Condition**	**5-year storm**	**5 to 100-year storm**
	Current Tide Condition Mean sea level: 3.29-feet NAVD 88 (Determined in 2009 Coastal Flooding Study)	<u>Flow in Pipes</u> Design Storm: 5-year event Design Tide: Current 100-year high tide Minimum Freeboard (Streets): 2.67-feet Minimum Freeboard (parks/open space): Ponding allowed	<u>Overland Flow</u> Design Storm: 5 to 100-year event Design Tide: Current 100-year high tide Minimum Freeboard (Streets): Allowed to flow in street, 6-inches of ponding depth Minimum Freeboard (parks/open space): Ponding allowed
Infrastructure Adjustments for Future SLR	**SLR Condition: up to 16-inches Mean sea level: 3.29-feet + 16- inches = 4.62-feet NAVD 88 (Estimated to occur by 2050)**	***Adaptive Management Strategy: reduce freeboard allowance***	***Adaptive Management Strategy: reduce freeboard allowance***
		<u>Flow in Pipes</u> Design Storm: 5-year event Design Tide: Current 100-year high tide + SLR (16-inches) = 10.53 NAVD 88 Minimum Freeboard (Streets): 16-inches Minimum Freeboard (parks/open space): Ponding allowed	<u>Overland Flow</u> Design Storm: 5 to 100-year event Design Tide: Current 100-year high tide + SLR (16-inches) = 10.53 NAVD 88 Minimum Freeboard (Streets): Allowed to flow in street, 6-inches of ponding depth Minimum Freeboard (parks/open space): Ponding allowed
	SLR Condition: 16-inches to 36-inches	***Adaptive Management Strategy: When SLR Monitoring Report (Section 5.5.2) determines 16-inches of SLR has occurred implement modifications to storm drainage system.***	***Adaptive Management Strategy: When SLR Monitoring Report (Section 5.5.2) determines 16-inches of SLR has occurred implement modifications to storm drainage system.***
	Mean sea level: 3.29-feet + 36-inches = 6.29-feet NAVD 88 (Estimated to occur between 2050 and 2100.)	<u>Flow in Pipes</u> Design Storm: 5-year event Design Tide: 100-year high tide at that time + SLR (guidance at that time) Minimum Freeboard (streets): 2.67-feet Minimum Freeboard (parks/open space): Ponding allowed	<u>Overland Flow</u> Design Storm: 5 to 100-year event Design Tide: 100-year high tide at that time + SLR (guidance at that time) Minimum Freeboard (streets): Allowed to flow in street, 6-inches of ponding depth Minimum Freeboard (parks/open space): Ponding allowed
	SLR Condition: greater than 36-inches	***Adaptive Management Strategy: When SLR Monitoring Report (Section 5.5.2) determines 16-inches of SLR has occurred implement modifications to storm drainage system.***	***Adaptive Management Strategy: when freeboard violates minimum allowance 8-inches, implement modifications to storm drainage system.***
	Mean sea level: 3.29-feet + 36-inches = 6.29-feet NAVD 88 (Estimated to occur after 2100.)	<u>Flow in Pipes</u> Design Storm: 5-year event Design Tide: 100-year high tide at that time + SLR (guidance at that time) Minimum Freeboard (streets): 2.67-feetMinimum Freeboard (parks/open space): Ponding allowed	<u>Overland Flow</u> Design Storm: 5 to 100-year event Design Tide: 100-year high tide at that time + SLR (guidance at that time) Minimum Freeboard (streets): Allowed to flow in street, 6-inches of ponding depth Minimum Freeboard (parks/open space): Ponding allowed

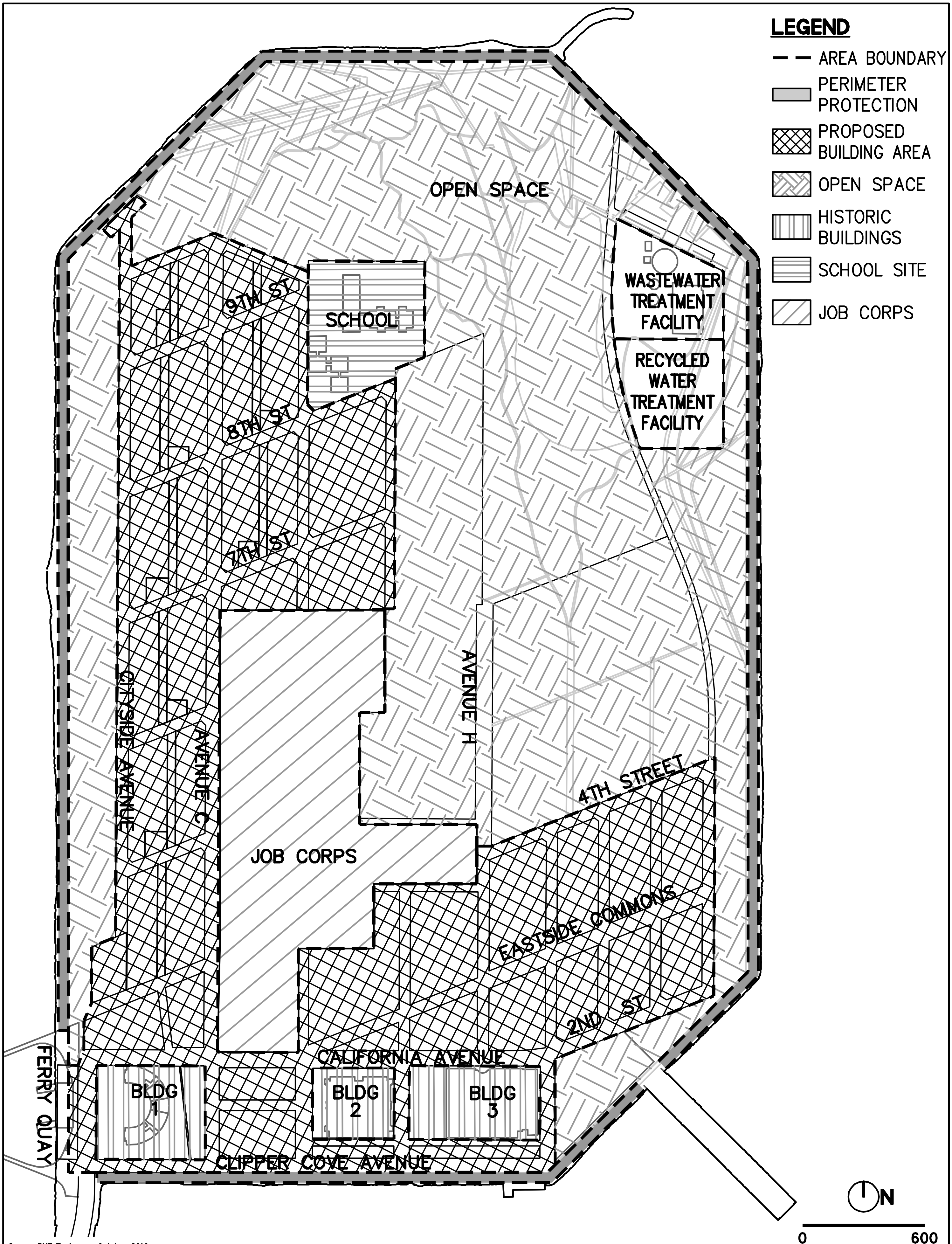


Figure 5.1: TI Perimeter and Inland Areas

6. GEOTECHNICAL CONDITIONS

The information presented in this chapter includes two sections, one on TI and one on YBI, as the two Islands present different geotechnical conditions and require different solutions.

The information presented on TI is based on the Engeo "Geotechnical Conceptual Design Report, Treasure Island, San Francisco, CA" dated February 2009. This report is based on a review of existing geotechnical data and preliminary geotechnical analyses conducted by ENGEO Incorporated in collaboration with BKF Engineers, Moffat and Nichol, SMWM, SOM, and Treadwell & Rollo. The draft findings of the report were reviewed by an Independent Review Panel (IRP) composed of four world-renowned experts in geotechnical engineering:

Professor Izzat M. Idriss, Phd - University of California, Davis (Emeritus)
Professor Raymond B. Seed, Phd - University of California, Berkeley
Professor James K. Mitchell, Phd - Virginia Tech (Emeritus)
Professor Ross W. Boulanger, Phd - University of California, Davis

The IRP evaluated the proposed alternative solutions for the geotechnical constraints involved in developing TI, and their input has been incorporated in the final geotechnical conceptual design report. In addition, review comments provided by URS Corporation on behalf of the City and County of San Francisco (CCSF) were incorporated in the report.

The section on YBI is based on the Engeo "Geotechnical Conceptual Design Report, Yerba Buena Island, San Francisco, CA" dated November 2008, which includes a description of the existing conditions at YBI, a summary of the geological and geotechnical conditions at the site, and potential solutions for the geotechnical challenges that face the proposed development. The YBI report is based on a review of existing geotechnical data and a preliminary geotechnical reconnaissance conducted by ENGEO Incorporated. The intent of this report is to provide preliminary geotechnical guidance for project planning; it is not intended as a design document.

6.1 Treasure Island (TI)

TI was constructed in the late 1930s by placing approximately 30 million cubic yards of dredged sand fill over a sand shoal located north of YBI. From a geotechnical perspective, there are three primary issues for any new development at TI.

- Liquefaction/Settlement of Sand Layers. The combined thickness of the sand shoal and the dredged sand fill ranges from about 30 to 50 feet. These sands are at best medium dense and are thus subject to liquefaction and settlement during earthquakes. Liquefaction is a phenomenon where saturated, cohesionless soil (such as sand) experiences a temporary reduction in strength during the cyclic loading of an earthquake. The result is immediate settlement and possibly lateral movement of the sand material.

- Settlement of Young Bay Mud. Beneath the sand layers is a layer of compressible Young Bay Mud that ranges in thickness across the site from 20 to 120 feet. The rate of settlement of the Young Bay Mud from the load of the dredged sand fill is now very small, but any further increase in loads, whether due to placement of new fill or the construction of buildings, will initiate a new cycle of consolidation settlements. The Young Bay Mud is underlain by firmer soils that do not pose significant geotechnical challenges.
- Seismic Stability of Perimeter and Causeway. The stability of the perimeter of the island and the causeway connecting TI to YBI may be affected by earthquake-induced liquefaction or a deep-seated failure in the underlying Young Bay Mud layer. Additionally, the perimeter of the island and the causeway may be subject to cumulative damage over time due to slumping and erosion under the combined effects of storm and earthquake loadings.

Without mitigation, the above factors may make it difficult to maintain the grades necessary to prevent flooding due to extreme storms or global sea-level rise. However, a variety of proven soil improvement techniques are available to mitigate all three of these concerns and enable the Project to maintain grades above flood levels over time.

6.1.1 Overall Geotechnical Approach

The geotechnical approach for the current development plan has been developed based on the need to elevate the interior of the island in anticipation of sea-level rise and the desire to reduce damage to surface and subsurface improvements during seismic events.

The approach consists of three parts:

(1) The sands will be densified throughout the development area to minimize liquefaction and earthquake-induced settlements, creating a long-term stable platform for development;

(2) Additional fill will be added to compensate for the loss of elevation caused by densification and to raise the site grades in developed areas above the expected flood level, taking an allowance for long-term sea level rise into account; Settlement of the compressible young

Bay Mud deposits triggered by the additional fill will be accelerated by the use of surcharging, thereby allowing future settlement to occur prior to construction of new improvements; and

(3) The perimeter will be similarly improved to be seismically stable and to provide protection against overtopping under extreme combinations of tide and storm activity.

(4) Utility corridors for critical utilities outside of the new development footprint area will be similarly improved for seismic stability and to reduce long term settlement. The final location and width of the utility corridors to be stabilized will be developed in conjunction with the SFPUC during the Major Phase and Sub Phase application process. It is anticipated the utility corridors will include water, recycled water, sanitary sewer, gas, electric, and stormwater main lines and will be located within/near Eastside Avenue and potentially a connection from the western neighborhood to the Wastewater Treatment Plant.

6.1.1.1 Creation of a Long-Term Stable Platform

The purpose of densification is to improve the sand fill within the planned development area to serve as a long-term stable platform for buildings, roads, and utilities. A variety of proven techniques are available for densification; the most likely to be used on TI are deep dynamic compaction (DDC), which consists of repeatedly dropping a large weight onto the soil, and vibro-compaction, in which a vibrating probe is repeatedly inserted into the soil. With either of these techniques, the objective is to take the medium-dense sands and transform them into dense sands that are no longer susceptible to significant liquefaction and seismic settlement. Since the entire development area of approximately 100 acres will be densified, roads, utilities, and buildings will benefit, the expected differential settlement between these systems will be minimized and the expected damage after earthquakes will be significantly reduced. The final techniques for densification will be selected after conducting field tests of the alternatives to confirm the effectiveness of each, and to optimize production.

6.1.1.2 Elevation of the Ground Surface as Long-Term Protection Against Flooding

Densification of the sands throughout the development area will cause a lowering of the current ground surface. Fill will be needed to compensate for this loss and to bring the ground surface elevation of the developed areas to a level that provides long-term protection against flooding and sea-level rise. On a block-by-block basis, design finished floor elevations will be increased to allow for long-term site settlement that results from any residual primary consolidation, from secondary compression and from any remaining settlements that might result from earthquake loadings. The depth of the new fill will vary across TI, with smaller amounts on the southern side of the island and the greatest thicknesses required in the northwest corner. To minimize the impact of gradual settlement resulting from new fill, the development areas will likely be surcharged with temporary fill, supplemented by the installation of pre-fabricated vertical (wick) drains in order to speed the settlement. Fill will be obtained from excavation of basements, grading of undeveloped portions of the island and from off-site sources.

6.1.1.3 Strengthening of the Perimeter Berm and Causeway

The sands underlying the perimeter of the island may also be densified by proven densification techniques such as vibro-compaction or DDC, in order to minimize deformation of the perimeter berm in earthquakes. The potential for a deeper-seated slope failure through the underlying Young Bay Mud, especially in the northwest corner of the island where the Young Bay Mud is as much as 120 feet thick will be evaluated by conducting a study involving field work, laboratory testing and analysis. Should the deep-seated stability of the perimeter be shown to be a concern, it can be addressed either by placing a surcharge fill to increase the strength of the Young Bay Mud, or by using deep soil mixing or jet grout techniques to create vertical soil-cement columns within the Young Bay Mud.

Most of the existing Young Bay Mud was removed from under the causeway during construction; however, the sand fill of which it is composed will require densification in order to provide a reliable access route and minimal damage to lifeline utilities following a major earthquake.

From a flood-control standpoint, if final design grades for the development area are high enough to accommodate extreme tide levels and sea-level rise, structures are set back far enough from the Bay's edge, and adequate drainage is provided along the shoreline to accommodate infrequent wave overtopping, the perimeter need only be high enough to limit overtopping to extreme wave events, eliminating the need to treat the perimeter berms as FEMA-certified levees. The perimeter elevation will be set based on an analysis of tides, storm surges, waves and other factors; however, it is likely that the perimeter will need to be raised on the north and west sides of the island. The perimeter berm height can also be increased in the future if necessary in response to increased wave heights coupled with sea-level rise. Conceptual berm heights for the perimeter adjacent to each Major-Phase will be identified with each Major-Phase Application. Final berm heights and geotechnical stabilization techniques for perimeter adjacent to each Sub-Phase will be provided with the Sub-Phase application.

6.1.2 Building Foundations

As noted above, to minimize the amount of long-term settlement triggered by raising grades, much of the developed area will also be surcharged, or pre-loaded. In addition, it would be beneficial for new building loads to be mostly compensated (or off-set) by excavating full basements for all buildings, except possibly for lighter townhome structures. Based on engineering calculations, when the site is surcharged, the magnitude of differential settlements will generally be within acceptable tolerances for buildings up to 8 to 10 stories on shallow foundations with full basements. In general, buildings greater than 10 stories will need to be pile supported and provided with basements. These basements will be necessary to reduce downdrag forces on the piles and provide lateral support during seismic events. Additionally, for high-rise buildings of 22 stories or greater, at least two basement levels may be required to help resist lateral and overturning loads. Any differential settlements between the pile-supported buildings and adjacent improvements can be accommodated by separating them and using flexible utility connections and transition slabs.

When constructing basements, a generalized interpretation of the groundwater conditions at TI indicates that (1) construction dewatering will be required during full basement excavations throughout the development area, and for half-level basement excavations depending on location, and (2) waterproofing should be provided for all basements assuming full hydrostatic conditions. Dewatering practices will comply with the current Stormwater Pollution Prevention Program at the time of construction.

6.2 Yerba Buena Island (YBI)

Yerba Buena Island has a long history of past development dating to the late 1800s. Site access from the San Francisco Bay Bridge is provided by Macalla Road and Treasure Island Road. Much of Treasure Island Road is elevated on viaduct structures that also carry utilities from the San Francisco Bay Bridge to Treasure Island. Other existing improvements include access roads and utilities serving approximately 80 existing residential units and the Coast Guard's facilities. Past development has created a series of graded benches bounded by hillside cuts and fills. Site topography is moderately steep to steep, with elevations ranging from 350 feet to sea level. The island perimeter is bounded by steep (1.5:1 to 1:1) natural slopes extending up from the wave-cut shoreline as high as 240 feet.

The geology of the island can be characterized as a bedrock ridge whose flanks are mantled with unconsolidated sandy soils thought to be windblown sand and alluvium. The thickest soil deposits are located on the western, northern and eastern slopes. The thickness of the unconsolidated sandy deposits ranges across the island; the sands reach a maximum depth of greater than 90 feet under Macalla Road on the northern side of the island. Existing fill associated with roads and building pads appear to consist of sandy or rocky material excavated from adjacent cuts.

The proposed development at YBI will consist primarily of two- to four-story townhomes and apartments located generally in areas of current residences. Current plans also include an option for a multi-unit 7-story structure with one level of below grade parking, located in a relatively flat area on the eastern side of the island. Several historic structures located on the northeastern corner of the island will remain in place to be reused for commercial and/or visitor uses. Development plans include lodging and hotel facilities at the southwestern corner of the development area. YBI infrastructure improvements will include: (i) new water tanks, (ii) streets generally following the existing roadway alignment, (iii) open space, including a hilltop park and pocket parks within residential blocks, (iv) pedestrian walks and pathways providing access to a hilltop park.

The proposed redevelopment of YBI must recognize the nature of the island, while at the same time providing a well-engineered framework for new improvements. Development constraints include historic structures, existing vegetation, site topography, and planning and circulation considerations. Geotechnical considerations include:

1. Foundation design issues associated with existing cut slopes and hillside fills.
2. Existing retaining walls.
3. Slope stability issues associated with the steep perimeter slopes, especially along the existing alignments of Macalla Road.
4. Treasure Island Road Viaduct.

6.2.1 Foundation Design

Successful site development will require engineering design and project construction methods that account for the existing soil conditions. Construction on existing fills may require deepened foundations or re-grading to remove weak soils.

The major considerations in foundation design for the structures proposed at YBI include the effects of potential differential movement of on-site soils as a result of their shrink-swell characteristics, settlement associated with deep fills, and the distance of the proposed structures from the top of slopes. Proposed two- to four-story wood-frame buildings located sufficiently back from the tops of slopes or located in areas with less than 10 feet differential fill can generally be supported on one of the following foundation systems: (i) conventionally reinforced structural mat, (ii) stiffened ribbed mat, (ii) post-tensioned slab, (iv) shallow continuous spread footing with slab on grade, or (v) drilled piers with raised floors.

The proposed multi-unit 7 story structure is located in an area of the YBI where Dune Sand and Terrace deposits of various thicknesses are underlain by Franciscan rock. The building structure can generally be supported on one of the following foundation systems: (i) footings bearing in bedrock with slabs on grade, (ii) shallow footings bearing in bedrock combined with footings supported on drilled piers extending into bedrock, or (iii) thickened mat foundation.

6.2.2 Existing Retaining Walls

Existing retaining walls typically consist of cast-in-place concrete or concrete crib walls. Most retaining walls appear to be visibly in serviceable condition, although many existing concrete walls show evidence of past water seepage at the face, indicating that they may be nearing the end of their design life.

It is anticipated that several of the existing retaining walls within the proposed development footprint will be modified or rebuilt due to grade changes and road realignment. The condition of retaining walls proposed to remain in place will be evaluated on a case-by-case basis during final design. These walls may be seismically retrofitted or replaced to comply with City and County of San Francisco and CBC codes and the design-level geotechnical report.

6.2.3 Perimeter Slopes

The island perimeter slopes are mantled with sandy colluvium and landslide deposits. Historic slope instabilities have typically consisted of relatively shallow debris flows, on the order of less than ten feet in depth that have reportedly been triggered by a combination of rainfall and utility leaks.

The highest and most continuous area of steep perimeter slopes occurs along Macalla Road. The presence of a deep deposit of unconsolidated sandy soil adjacent to the existing steep (1.5:1) slope, presents a potential slope stability hazard to existing or proposed buildings close to the top of the slope. Potential slope-stability hazards along Macalla Road can be addressed by limiting construction of new buildings to at least 100 feet from the existing top of slope. Conceptual improvement setbacks from top of slope will be identified in the Major Phase submittals. Final setbacks will be provided with the Sub-Phase applications.

6.2.4 Strengthening of the Viaduct

The Viaduct structures are part of the vehicular access routes on YBI connecting TI to YBI, and by extension to San Francisco and the Greater Bay Area. The Viaduct structure extends from the San Francisco-Oakland Bay Bridge, along the western edge of YBI, and terminates at the start of the causeway. In addition to being part of the primary vehicular access route, the Viaduct also contains utility mains (domestic/fire water and telecommunications) serving TI via the Causeway.

Improvements to the viaduct structures are currently being studied by the City and will be carried out separately from the Project.

6.3 Phase of Geotechnical Stabilization

Geotechnical stabilization will occur in phases to match the Sub-Phases of the Project. The amount of stabilization will be the minimum necessary for the Sub-Phase. The stabilization of smaller areas will allow the existing utility services and vehicular access areas to remain in place as long as possible in order to reduce disruption of existing uses on the Islands.

6.4 Schedule for Additional Geotechnical Studies

The Conceptual Design reports described above will be submitted with the Major Phase applications. Conceptual setbacks required for the stabilization activity to protect the existing structures and utility systems scheduled to remain will be identified with the Major Phase application.

The Developer will complete the necessary site testing to confirm the geotechnical approach described above for each Sub-Phase area during the Sub-Phase application process. The Developer will then prepare Final Geotechnical Reports for each Sub-Phase. The Final Reports will be submitted with each Sub-Phase application. Final Reports are not expected to substantially change the approach described here. The Final Geotechnical Reports for each Sub-Phase will identify the required setbacks for the stabilization activity to protect the existing structures and utility systems scheduled to remain.

7. SITE GRADING AND DRAINAGE

7.1 Existing Site Conditions

7.1.1 Existing Site Elevations

The existing grades on TI are relatively flat from end to end. The ground elevations range from approximately 6 (NAVD 88) in the northwestern edge of the island to approximately 14 (NAVD 88) near the southern edge. The existing perimeter shoreline area around TI generally ranges from elevation 10 to 14 (NAVD 88).

The existing grades on YBI vary dramatically across the island. The ground elevations range from 0 (NAVD 88) near the water's edge up to 340 (NAVD 88) at the peak near the middle of YBI.

7.1.2 Existing FEMA Flood Plain Areas

The Federal Emergency Management Agency (FEMA) prepared preliminary Flood Insurance Rate Maps ("FIRMs") for the City, including Treasure Island, in September 2007. The preliminary FIRM for Treasure Island identified existing special flood hazard areas described as "Zone V" (perimeter shoreline areas subject to additional hazards that accompany wave action) and "Zone A" (inland areas subject to 100-year flood). Figure 7.1 shows the approximate extent of the existing 100-year special flood hazard area, which are likely to be adopted by FEMA.

As shown in Figure 7.1, Yerba Buena Island is located outside of the proposed 100-year special flood hazard zone.

7.2 Proposed Grading Requirements

The FEMA requirements for setting coastal flooding elevations include two components; 1) perimeter shoreline areas, and 2) inland areas. The flood elevations for the perimeter shoreline areas are dictated by the still water 100-year tide elevation (Base Flood Elevation) plus the potential for wave run-up. The potential wave heights and geometry of the perimeter shoreline will dictate the horizontal extent of the area considered to be "shoreline". Because the inland areas are protected from wave run-up by the perimeter shoreline, the flood elevations for the inland areas are dictated by the Base Flood Elevation (BFE) only.

Figure 5.1 shows the perimeter area and inland areas for TI.

7.2.1 100-Year Design Tide Elevations (Base Flood Elevation)

Based on FEMAs standard, the 100-year design tide elevation, or Base Flood Elevation (BFE) is based on a combination of coincident events including tides, storm surges, and waves that result in a 1% annual chance of flooding. Moffatt & Nichol completed an Extreme High Water Level Analysis to determine the BFE as part of their April 2009 “Coastal Flooding Study for Treasure Island”. Based on their review of the historic tide data for the San Francisco Bay the BFE for Treasure Island is 9.2 (NAVD 88) under current tide conditions.

7.2.2 Potential Sea Level Rise

The potential for sea level rise induced by global warming could increase the BFE in the future. The State of California’s 2009 Draft Climate Adaptation Strategy Report includes guidance to State agencies addressing climate change adaptation, and BCDC has proposed Bay Plan amendment language, which includes guidance for addressing future sea level rise (SLR) scenarios associated with planning and permitting development in potentially susceptible areas. Both recommend using the following SLR forecast for planning purposes:

- 16 inches by 2050
- 55 inches by 2100

A description of Sea Level Rise and the Adaptive Management strategy proposed for the Treasure Island grading design is included in Section 5.

7.2.3 Long Term Settlement

As described in Section 6, geotechnical stabilization techniques will be utilized to create a stable platform for the proposed development. The stabilization techniques will mitigate the potential for settlement due to liquefaction in the sandy soils and compression of the bay mud below the site. The final grading plans will be developed to accommodate the additional minimal amounts of long term settlement anticipated due to secondary compression of the soils or minimal amounts of remaining liquefaction due to seismic events.

7.3 Site Grading Designs

The Developer will be responsible for the design and construction of the proposed grading plan for Treasure Island. A description of the grading design for the different areas of the Island is included below. The conceptual grading plans for TI and YBI are shown on Figures 7.2 and 7.3, respectively.

7.3.1 TI Perimeter Wave Protection

As described below, the minimum internal site grades will assure that the new structures within the development area are at least 36-inches plus 6-inches of freeboard above the current BFE. Therefore, the perimeter shoreline is not considered a levee under current tide conditions, and would not be in the future until more than 36 inches of sea level rise occurs. Instead, the perimeter area will function as a berm to protect the interior of the Island from wave run-up.

The final elevations for the perimeter shoreline areas will be set such that there is only a 1% chance of wave overtopping due to a combination of high tides, swell, wind waves, tsunami, and shoreline conditions. The final design heights and types of shoreline protection designs at each location along the perimeter will depend on the orientation of the shoreline (i.e. wave heights) and the proposed adjacent land plan. The perimeter designs in each location will be based on the current tide conditions to meet the FEMA wave protection standards plus 16-inches to accommodate the potential 2050 sea level rise estimates, plus additional elevation to accommodate minor long term settlement amounts. In addition, the perimeter designs will provide the ability to make future changes to adjust the height of the perimeter, and/or convert it to a levee, if merited because of sea level rise.

7.3.2 Proposed Building and Roadway Areas

As described above, the minimum grades for the site beyond the perimeter shoreline areas are only influenced by the BFE and are not affected by wave run-up. According to the FEMA requirements, in order for the proposed building areas to be above the Zone A flood plain, the proposed finished floor elevations and below grade garage entrance elevations must remain above the BFE (elevation 9.2). While FEMA does not require an allowance for sea level rise, the building elevations will be set to accommodate up to 36-inches of sea level rise as well as an additional 6-inches of freeboard. Therefore, the minimum finished floor elevations and garage entrances for the proposed buildings will be set at 12.7 (9.2 BFE + 36” SLR + 6” freeboard) plus additional elevation to accommodate minor long term settlement amounts where applicable. In general, the final building finished floor elevations and garage entrances will increase as they move away from the shoreline. The grades will vary between 12.7 and 14.5 (NAVD 88) in order to provide overland release to the perimeter of the island.

7.3.2.1 Saw Tooth Grading Scheme for Streets

To minimize the amount of fill required for TI, the streets will be graded in a “saw tooth” fashion with a minimum 0.5% slope between grade breaks. Sawtoothed grading alternates between high and low points creating a “saw” like grading pattern. This pattern allows for positive drainage in the streets while maintaining minimal elevation differences between the high and low points.

The “saw tooth” grading plan will be developed in conjunction with the design of the stormwater system. The runoff from a 100-year storm during a 100-year tide with 16-inches of SLR will be stored within the street curb lines. The stormwater runoff during these extreme events will be allowed to pond to a maximum depth equal to top of curb at low point and then flow into the piped system as capacity becomes available.

The “saw tooth” grading plan will provide overland release paths by increasing the elevation of the high points at a slope of approximately 0.2% away from the shoreline/open space towards the center of the Island. Low points will be placed in between the high points so that the downstream high point elevation is equal to or lower than the top of curb elevation at the upstream low point. The downstream high point may be raised to the back of walk/right of way line if an acceptable wastewater vent trap detail, backwater valve, or other alternate design solution is approved by the SFPUC. This overland release design will protect the new building finished floors from storms/tides larger than the 100-year event or system maintenance issue such as blocked catch basins or pipes. During either of these unlikely events, stormwater may pond up to the top of curb (or back of walk/right of way if approved by SFPUC) elevation before releasing to the downstream drainage basins. This will continue through the downstream basins until there is capacity in the storm system or storm water is released to the open space. The new building finish floor elevations will be above the back of walk/right of way elevation and therefore protected from flooding. The ponding depth and overland release occurrence for various storm events are summarized below. The typical sawcut grading profile is shown on Figure 7.5 and the potential ponding at catch basins is shown on Figure 7.6.

Table 7.1: Street Ponding Depth and Overland Release Summary

Storm Event	**Ponding Depth for:**		
	Current Tide	**16-inches SLR**	**Maintenance Concerns**
Treatment	No Ponding (0 inches)	No Ponding (0 inches)	Up to Top of Curb
5-Year	No Ponding (0 inches)	No Ponding (0 inches)	Up to Top of Curb
100-Year	Top of Curb (6- inches)	Top of Curb (6- inches)	Up to Top of Curb

7.3.3 Open Space Areas

The minimum elevations for the open space areas will be set at the existing BFE (elevation 9.2) plus additional elevation to accommodate minor long term settlement amounts where applicable. The open spaces will be graded to support the open space vision and program for the Project. Lower portions of the open space areas may experience minimal amounts of ponding during large rainstorms occurring simultaneously with 100-year tides, depending on their locations and rain watershed area. The depth of ponding during these events will be minimal for the peak high tide duration (approximately 2 hours) and will drain once the tide subsides. Future sea level rise will increase the amount of ponding during the larger rain events and high tides but will not impact the building areas. As described in Section 12, the pump stations added to the storm water outfalls after 16-inches of sea level rise will reduce the ponding in the open space areas to levels and durations equal to the existing BFE conditions. The horizontal limits and depth of ponding in the open space areas will be developed in coordination with the SFPUC prior to approval of the Major Phase and Sub-Phase applications.

The open space areas may include localized landscape mounding to create wind breaks and overlook areas. These landforms may range in height above surrounding grades from a few feet to 35 feet at their highest points.

7.3.4 Historic Buildings, School Site, and Job Corps Structures to Remain

Historic Buildings 1, 2, and 3, as well as the Job Corps buildings and School buildings will remain on TI. The existing finished floor elevations for these structures range from elevation 8.5 to 13.2. These finished floors as well as the ground adjacent to the buildings will not be raised as part of the Project. The new street improvements adjacent to these facilities will be constructed to grades of 12.0 to 15. The grade difference between the existing buildings and proposed improvements will be mitigated by grading transition areas or with low walls, ramps, stairs and/or planters. The Developer will design and install the grading transition and pumps, if required. Ownership and maintenance of the local stormwater system on public lands will be by SFPUC or TIDA.

7.3.5 Wastewater Treatment Plant

The existing grades for the existing wastewater treatment plant vary from approximately 10.4 to 12.6. The proposed surrounding grades of the open space area will be lower than the WWTP area. The existing grades of the facility will remain until the WWTP is upgraded/replaced by the SFPUC.

7.3.6 YBI Site Grading

Because of the natural topography on YBI, the site grades for the proposed buildings, as well as the existing grades for the historic structures, are significantly above both the BFE and sea level rise allowances. Grading on YBI is instead influenced by construction, maintenance, and access. The grading improvements for YBI will include demolition of existing structures, reshaping portions of the roads for better access, regrading of development pads, and reshaping portions of hillsides for erosion control and landscaping. Retaining walls and grading operations associated with street improvements will be minimized as much as possible, in an effort to retain existing topography. The conceptual grading plan for YBI is shown on Figure 7.3 and the approximate total area for grading activity on YBI is shown on Figure 7.4.

7.4 Cut/Fill Quantities

The combination of the geotechnical stabilization described in Section 6, the site grade elevations for TI based on the approach described above, and landscape mounding in the open space, will require approximately 400,000 cubic yards (cy) of cut and 2-million cy of fill. In addition, basement excavations for the new buildings will generate approximately 500,000 cy of soil that can be used as fill. Therefore, for the purposes of this Infrastructure Plan, the Project is estimated to require approximately 1.1-million cubic yards of net soil import to complete the grading activity.

The import soil required may be barged and/or trucked to TI. The barges anticipated to be used can move up to 1,000 cubic yards of dirt. Therefore, approximately 1,110 barge round trips would be required to complete the total import operation, if used solely. Trucks can typically carry approximately 10 to 15 cubic yards in one load. Therefore, approximately 110,000 truck trips will be required to complete the total import operation, if used solely. The Project anticipates a combination of barges and trucks. The final number of trips for each mode will depend on the location of the soil source and will be spread over the construction period of the Project.

The grading activity on YBI will be a combination of cuts and fills to develop the proposed roadway alignments and building pads. The grading activity on YBI will yield approximately 80,000 to 100,000 cubic yards of export. This material will be trucked to TI and used as fill.

7.5 Proposed Phases of Grading and Drainage Construction

The geotechnical stabilization and the proposed grading will be completed in phases to match the Sub-Phases of the Project. The amount of grading will be the minimum necessary for the Sub-Phase. The phasing of grading will allow the Project to minimize the disruption to the existing uses on Treasure Island and to limit the amount of import needed for any given phase.

Impacts to improvements installed with previous Phases of development do to the designs of the new Phase will be the responsibility of the Developer and addressed prior to approval of the construction drawings for the new Phase.

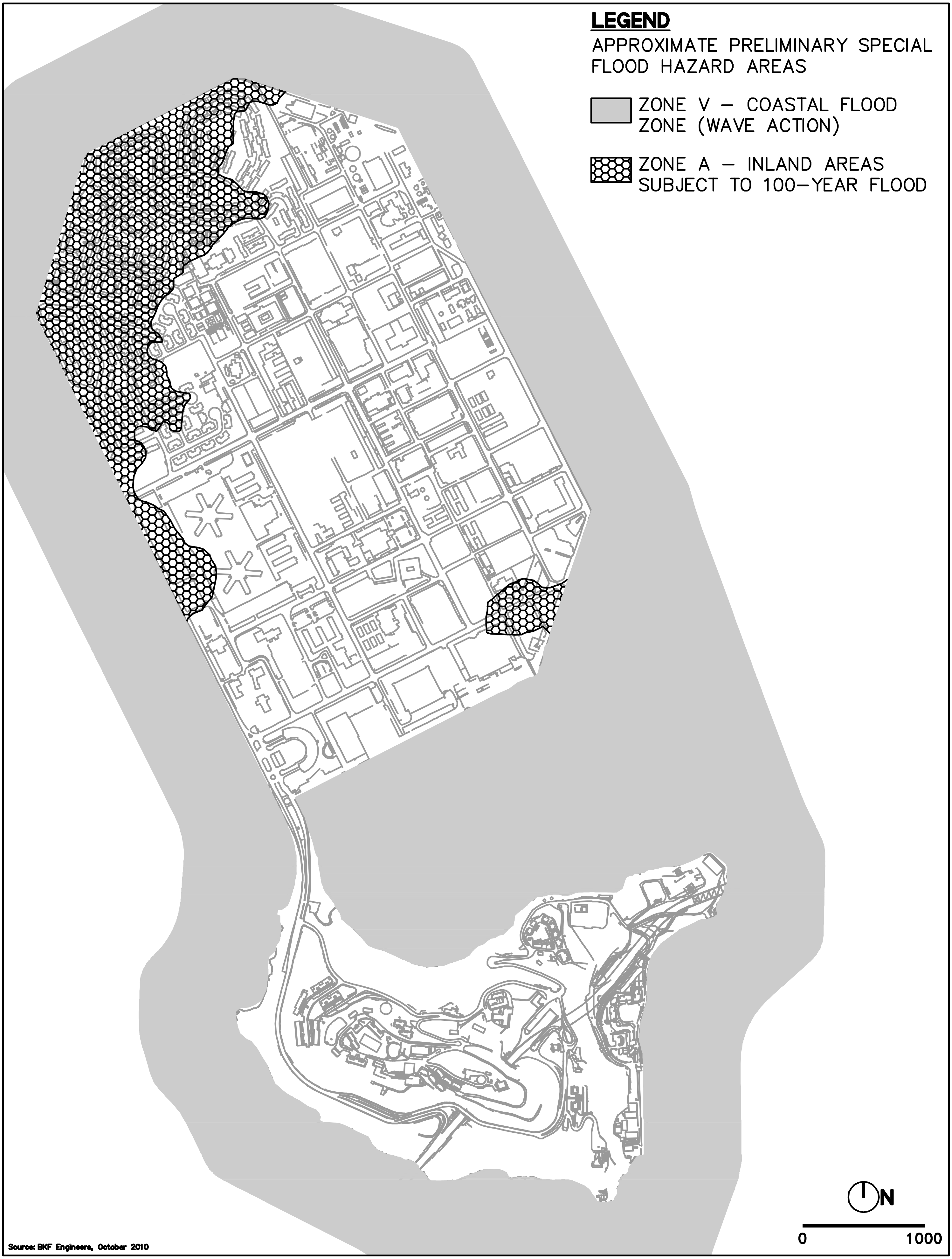
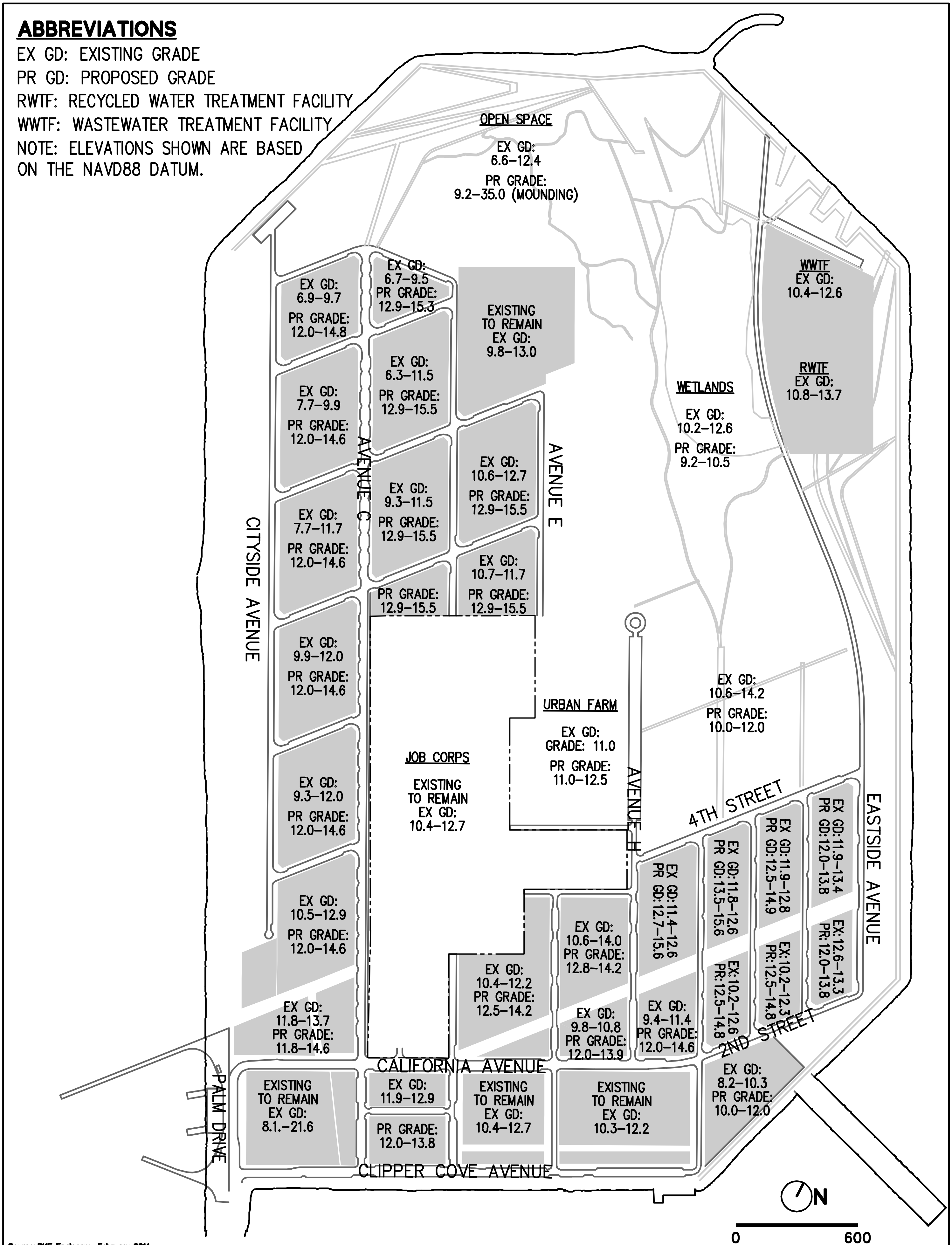
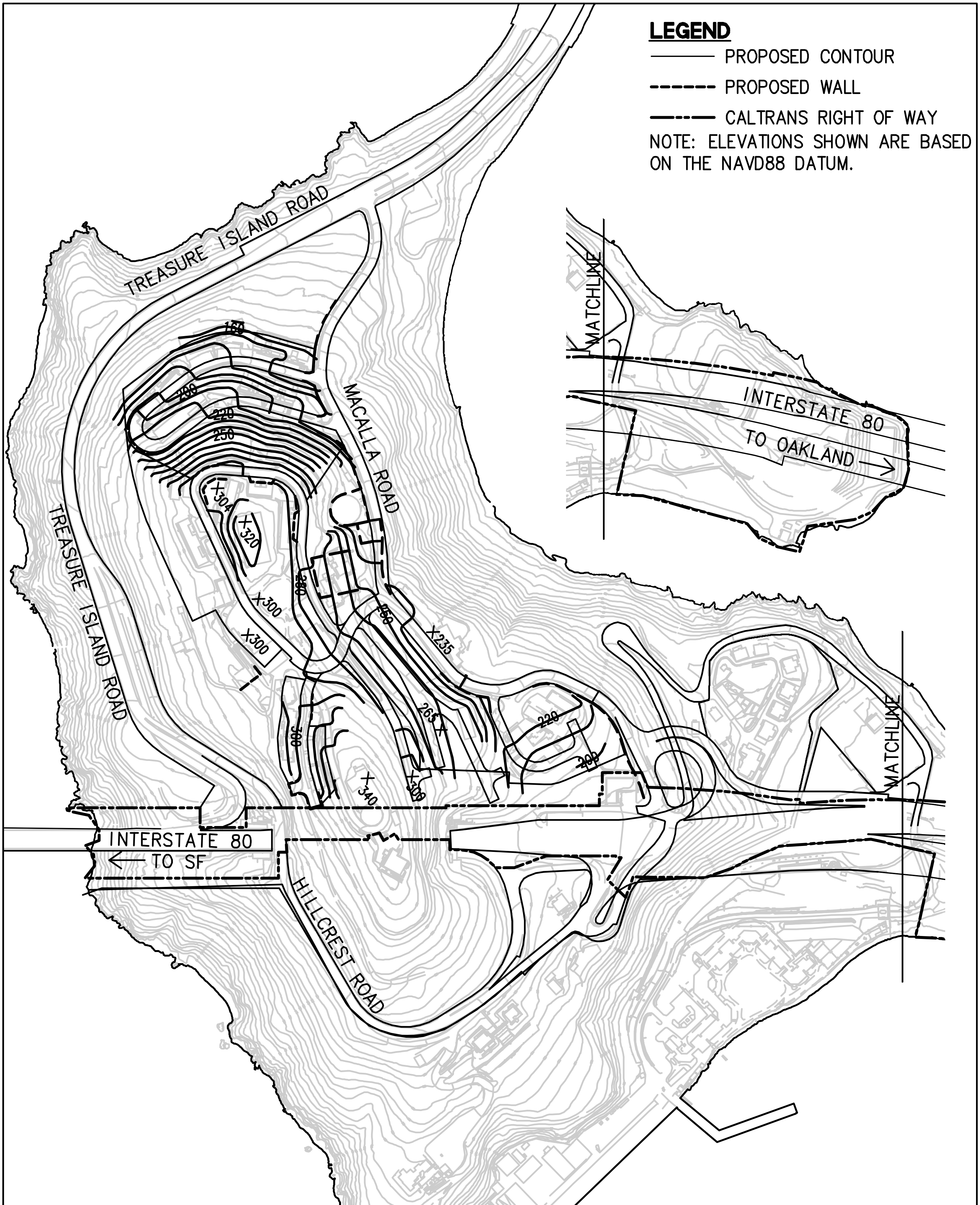


Figure 7.1: FEMA Preliminary 100-Year Special Flood Hazard Area



Source: BKF Engineers, February 2011

Figure 7.2: TI Conceptual Grading Plan



Source: BKF Engineers, February 2011

Figure 7.3: YBI Conceptual Grading Plan

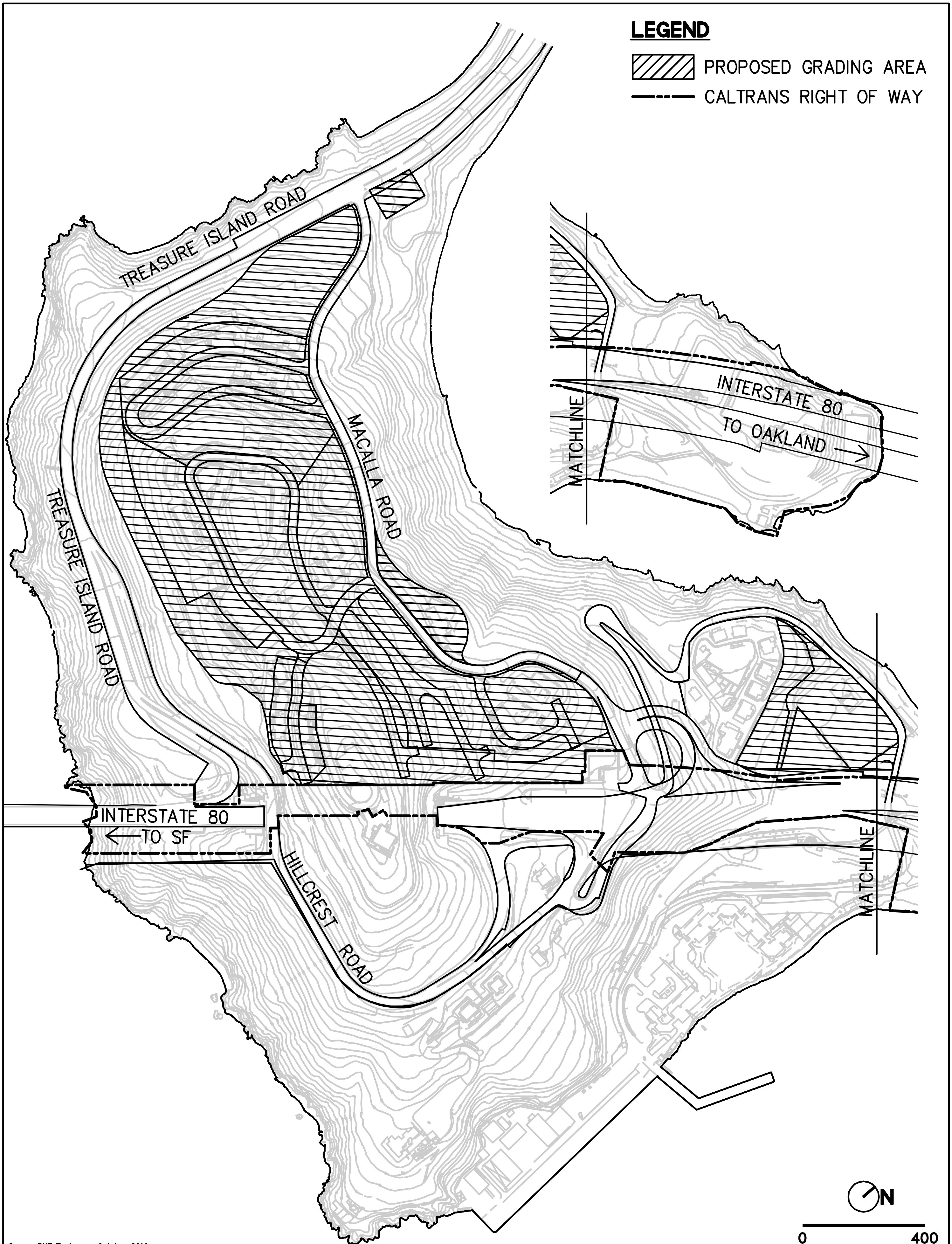
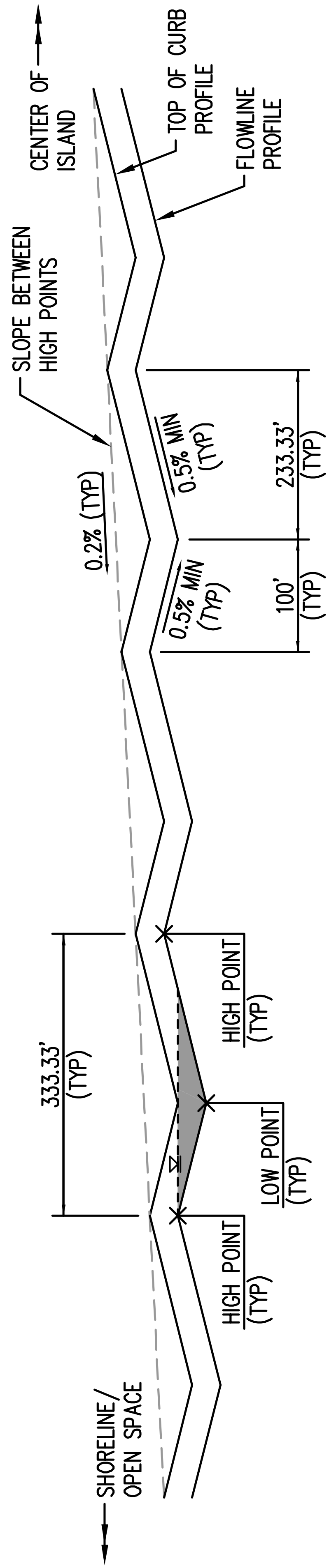


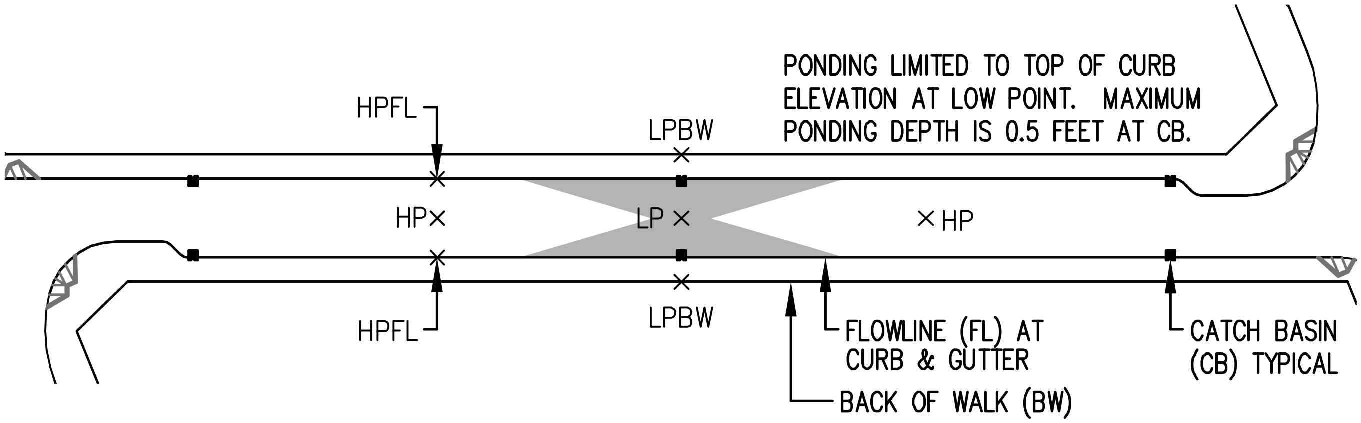
Figure 7.4: Approximate Area of Grading Activity on YBI



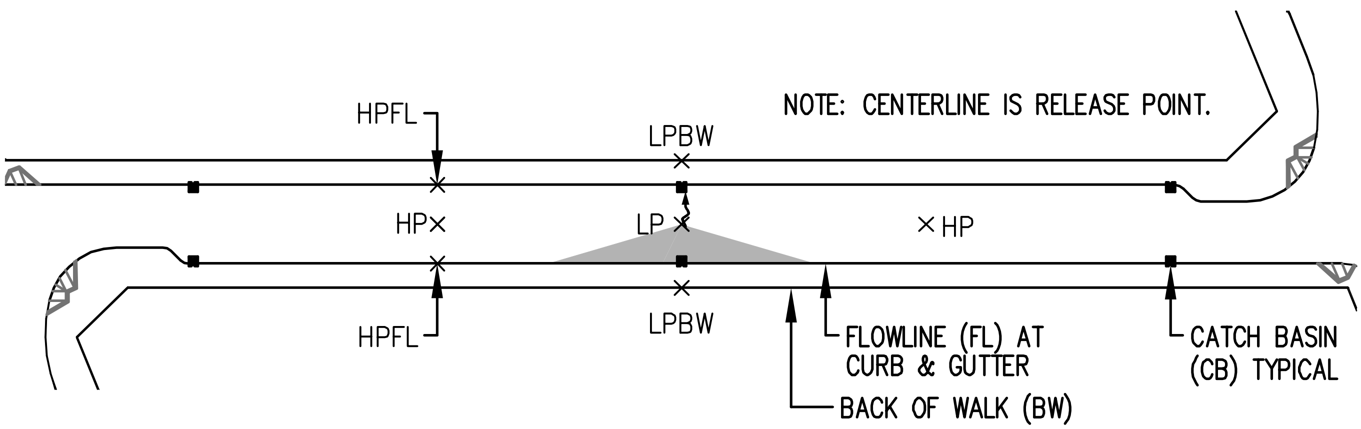
NOTE: HIGH POINT ELEVATIONS ARE LOWER THAN THE TOP OF CURB ELEVATIONS AT THE UPSTREAM LOW POINT.

SCHEMATIC PROFILE OF TYPICAL "SAWTOOTH" GRADING

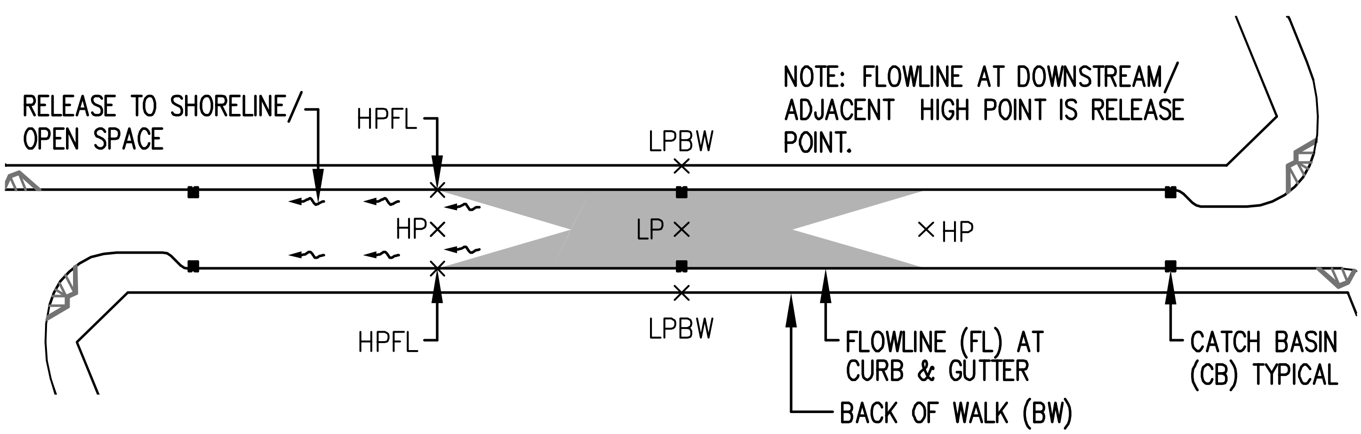
Source: BKF Engineers, February 2011



MAXIMUM PONDING FOR 100-YEAR STORM DURING 100-YEAR TIDE WITH 16" SLR



ONE BLOCKED CATCH BASIN OR PIPE (MAINTENANCE ISSUE)



TWO BLOCKED CATCH BASINS OR PIPE (MAINTENANCE ISSUE)

LEGEND:
HPFL = FLOWLINE ELEVATION AT HIGH POINT
LPBW = BACK OF WALK ELEVATION AT LOW POINT

NOTE: MAX HPFL ELEVATION IS EQUAL TO LOW POINT TOP OF CURB ELEVATION.

Source: BKF Engineers, February 2011

Figure 7.6: Potential Ponding at Catch Basin

8. TRANSPORTATION AND STREETS DESIGN

The transportation program relies on the use of alternative transit modes (buses and ferries) for off-Island trips and shuttle/pedestrian/bike facilities for on-Island travel. One of the key elements of the transportation program is the construction of a new ferry quay and terminal on the western shore of TI in front of historic Building One. Immediately adjacent to the ferry quay is a new bus transit facility. These two uses anchor the “Transit Hub”. The Land Use Plan for TI is centered on this Transit Hub and Building One with the new street system radiating out to the surrounding neighborhoods and open space.

8.1 Transit System

The Ferry Terminal and bus transit facility will be key elements of the Island's Intermodal Transit Hub, providing a focus for ticket sales, travel and tourist information. Bus stops and facilities for East Bay and San Francisco bus service providers, shuttle service stops, bicycle parking, a pool of shared bicycles (“Bicycle Library”), a car share pod, and administration/office space for the new Treasure Island Transportation Management Agency (“TITMA”) would be located at or near the Transit Hub.

8.1.1 Bus Service

Buses from San Francisco and the East Bay would arrive and depart from the Transit Hub. Figure 8.1 shows the proposed SFMUNI and AC Transit bus routes from the Bay Bridge to Treasure Island and the potential future bus routes around TI. Figure 8.2 shows the Transit Hub area with the dedicated bus route and bus services (stops, layovers, etc.). Upon completion of the proposed westbound on/off ramps on the eastern side of YBI, the existing west bound on ramp to San Francisco on the western side of the YBI tunnel will be restricted to buses only.

8.1.2 Island Shuttle Service

The Project will include a fleet of up to four electric or alternative fuel shuttles for circulation around the Islands. The shuttles would be free to all users and would serve residential, commercial, and open space areas on TI and YBI. The shuttles would operate primarily on three routes: one would serve the west side of TI, another would serve the east side of TI, and the third would serve YBI. The proposed routes are shown on Figure 8.3.

8.1.3 Ferry Service

Ferry service between the west side of Treasure Island and the San Francisco Ferry Building is proposed as part of the Project. This Plan makes a basic distinction between “landside” and “waterside” functions of the ferry terminal and service. “Landside” includes all the functions of ferry service and multi-modal exchange that will occur over stable land which is not subject to fluctuations and movement due to the tides and wave action of the bay. “Waterside” includes all the functions of ferry service that will occur on or over the water and that are subject to the fluctuations and movement due to the tides and wave action of the bay. Generally the passenger waiting area, passenger services, staff facilities and light maintenance are considered “landside”, while any gangways, transfer spans, floats, piles, seawall, breakwater and vessels are considered “waterside”.

8.1.3.1 Waterside Improvements

The Developer will be responsible for the design and initial construction of the ferry quay, docks, breakwaters, and basin.

The ferry quay will include two ferry slips for side-loading ferries. The design will allow for the side-loading slips to be replaced with bow-loading slips in the future, but the improvements made by Developer will not address this shift.

The ferry slips would be in a basin protected by angled breakwaters made of precast concrete sheet piles. The basin would have a generally trapezoidal shape created by the angled breakwaters, with a waterside entry about 200 to 300 feet wide. The breakwaters would be asymmetrical, with the longer one on the north side of the basin and the opening directed slightly southward (see Figure 8.4).

The ferry improvements would be constructed in two phases. The first phase would construct the northern, longer breakwater first, along with the ferry slips and passenger facilities. The southern breakwater would be constructed several years later, depending on a range of factors including desired frequency of service and routine maintenance dredging requirements.

Navigation lights would be provided on the breakwaters to mark the harbor entrance. The southern breakwater would have additional lighting for safety and accessibility if it is open to public access. Public access on the northern breakwater is not proposed, as it could occasionally be overtopped by high waves.

To construct the basin, about 4.9 acres (about 227,000 sq. ft.) would have to be dredged to a depth of about 16-feet at the basin shoreline.

The two angled concrete sheet pile breakwaters, about 350 and 800 feet long, would be constructed, and riprap would be installed along the shore of the basin and the shore ends of the breakwaters for wave suppression. Piles for hydraulic supports for the two transfer spans and aprons leading to each ferry would be installed, as would guide piles to support the boarding float. Additional piles for wingwalls and guide piles, with mooring dolphins or fender walls, would also be installed. The transfer spans would be constructed and installed. In addition, the shoreline would be improved and some existing riprap would be replaced. The total area of embankment affected by this shoreline treatment (from the Bay floor to the mean high water level) would be about 1.12 acres.

8.1.3.2 Landside Improvements

The Developer will be responsible for the design and initial construction of the landside improvements. Interim improvements will be provided with initial ferry operations and be sufficient to support basic passenger needs. The permanent improvements will be designed in accordance with the Design for Development and with TIDA approval. Final permanent improvements will be provided with the second phase of the waterside improvements, construction of the southern breakwater.

Interim improvements will include the following elements:

- **Landscape/Hardscape/Streetscape**. Asphalt hardscape areas, including the waiting areas for the shuttle and transbay bus services and initial bicycle storage and bicycle library facilities.
- **Passenger Waiting Areas.** Weather protected shelter for up to 199 passengers.
- **Gangways.** The gangways should be constructed of materials which are inherently resistant to rust and decay from exposure to the salt water environment. The gangways should accommodate multiple railing/queuing configurations to accommodate normal and special event use.

Permanent improvements will include the following elements:

- **Landscape/Hardscape/Streetscape**. The hardscape should be abuse resistant, allow for easy maintenance and if necessary allow removal to access changing or evolving program requirements for utilities and future modifications. This area would accommodate non-ferry transit and transportation connections, including the waiting areas for the shuttle and transbay bus services, bicycle storage, the bicycle library, and kiss-and-ride facilities.
- **Passenger Waiting Areas.** *(15,000-20,000 SF)* The passenger waiting areas should provide shelter from the elements, primarily rain and wind. Seating and other amenities for passenger waiting to board the ferry should be designed easy to clean, abuse resistant materials. Includes primary passenger waiting areas, overflow waiting areas, and circulation requirements.
- **Passenger Services.** *(approximately 750 SF)* Ticket Vendors, Newspaper, ATM and other vending equipment should be collected at areas along primary circulation routes.
- **Staff Facilities and Maintenance/Operations Area.** *(1,000 – 1,500 SF)* Staff facilities would include a security office and storage for crew and general operations. Staff restrooms could be provided either in the terminal building or in Building 1. Staff parking would not be provided; staff needing parking would use other Island parking facilities. The operations areas should be located adjacent to service vehicular access points with direct routes to the float and vessels. Operations functions include maintenance storage, mechanical equipment, and trash/janitorial.
- **Gangways.** The gangways should be constructed of materials which are inherently resistant to rust and decay from exposure to the salt water environment. The gangways should accommodate multiple railing/queuing configurations to accommodate normal and special event use.

8.2 Public Street System

The Developer will be responsible for the design and construction of the public streets shown on Figure 8.5. Improvements will generally include the following:

- pavement section
- concrete curbs/gutters
- concrete sidewalk and curb ramps
- traffic control signs and striping

- traffic signals
- street lighting
- street landscaping and trees
- stormwater treatment facilities
- street furnishings (includes, but are not limited to, benches, trash cans, bike support facilities and pedestrian scale lighting)

8.2.1 Street and Block Numbers

A system of street and block numbers has been created to facilitate planning and design coordination, see Figure 8.6. Most street names on YBI are current names and are expected to remain in use. Almost all street names on TI are considered temporary and solely for planning use. Final names will be selected in the future.

8.2.2 Roadway Dimensions

The vehicular lane widths are dictated by the proposed bus routes (see Figure 8.1). Vehicular lanes will be 12-feet wide for street segments where buses travel in two directions past each other, 11-feet where buses travel in one direction and do not pass, and 10-feet for streets with no SFMUNI or AC Transit service. Lane widths are measured from face of curbs and center line of lane striping.

The minimum vehicular travel way dimension will be 20-feet to accommodate fire truck access. The minimum 20-feet will not include parking on any of the streets including the Shared Public Way, but will include bike lanes on the one-way portion of Macalla Road.

Class II bike lanes will be 5-feet wide measured from face of curb to the center line of lane striping.

Parallel parking stalls within the street right of way will be 7-feet wide when adjacent to vehicular travel ways and 8-feet wide when adjacent to Class II bike lanes.

Planting areas and pedestrian sidewalks will vary depending on location.

8.2.3 TI Public Street System

The proposed public street network for TI is shown on Figure 8.7. Typical cross sections for these streets are included on Figure 8.8. There are four major classifications for the proposed public street system. A typical description for each type of street follows:

Major Arterial Streets (Primary Access)

Major Arterial streets will comprise the main west/east and north/south streets on TI, which will provide access between the new neighborhoods and open space and the intermodal transit hub adjacent to the Ferry Terminal, as well as to the Causeway and the Bay Bridge.

Secondary Arterial Streets (Primary Access)

Secondary Arterial Streets will comprise the remaining bus routes around TI. This includes the bus route around the Transit Hub and the potential future bus routes along the western and southern edges of TI.

Collector Streets (Neighborhood Access)

Collector streets will comprise the second level of roadways. They provide circulation loops to facilitate movement through and around the urban core, developed neighborhoods, Job Corps campus, and to the island's open space zones including access to the island's perimeter.

Shared Public Way (Pedestrian Focused)

Shared Public Ways are proposed for TI within both the Cityside and Island Center neighborhoods that will prioritize pedestrian use of the entire right-of-way while allowing occasional slow-moving vehicles to access local land uses and parking (both on-street and off-street but never within the 20-foot emergency vehicle access path) and provide necessary services. Working collaboratively with City Departments like Department of Public Works, Municipal Transportation Agency and the Mayor's Office of Disability to adopt the Shared Public Way as a "Dedicated Public Street" in the City's Subdivision code, this right-of-way is designed from property line to property line as a single surface between street and sidewalk areas that gives pedestrians priority and shares space among pedestrians, bicycles, occasional slow-moving vehicles, and public space uses. Shared

Public Ways may be designed with special paving, a variety of amenities, landscaping, and seating, and pockets of on-street parking, to create an environment that encourages public space use and slows occasional vehicles.

8.2.4 Angled Intersections on TI

The Project utilizes angled streets to maximize access to sunlight and views while minimizing the effects of wind on neighborhood public spaces. Where angled intersections occur, the east/west streets will cross the north/south streets at a 68-degree angle as shown in Figure 8.9. The angled intersections will be designed to provide the required vehicular site distance triangles as defined by the American Association of State Highway and Transportation Officials (AASHTO).

8.2.5 YBI Public Street System

The street locations on YBI will generally remain in existing locations with improvements for improved fire truck access and added connections for pedestrian and bicycle paths to the new east span of the Bay Bridge and TI. The proposed public street network for YBI is shown on Figure 8.10. Typical cross sections for these streets are included on Figure 8.11. Similar to TI, there are four main levels for the hierarchy of streets on YBI. A typical description for each type of street follows:

Major Arterial Streets (Primary Access)

Major Arterial streets on YBI will comprise the access from the Bay Bridge down to TI. On the western side of YBI this will include Treasure Island Road. On the eastern side this will include the one way Macalla Road.

Secondary Arterial Streets (Primary Access)

The Secondary Arterial Street on YBI will be the two-way Yerba Buena Road up to the central development area and open space at the top of the island.

Collector Streets (Neighborhood Access)

The Collector Street on YBI will be a one-way section of Yerba Buena Road starting at the hotel and traveling around the western side of the island.

Private Streets

The primary access to homes within the main western and eastern residential districts will be private streets.

8.2.6 YBI Private Street System

The primary access to homes within the main western and eastern residential districts on YBI will be private streets. The private streets will be designed and developed in concert with the private development. Final locations and configuration of the private streets will be developed in conjunction with detailed development plans for these residential districts. Public Service Easements (PSE) will be recorded over these private streets for the public utilities needed to serve the units.

8.2.7 North Gate Road

The improvements to North Gate Drive will be limited to a 2-inch overlay from Macalla to the Coast Guard entrance once all of the utility systems have been installed.

8.2.8 Retaining Walls within Public Street Right of Way

The construction of the Public Right of Ways may require retaining walls. As described in Section 6.2.2, it is anticipated that several of the existing retaining walls within the proposed development footprint will be modified or rebuilt due to grade changes and road realignment. The condition of retaining walls proposed to remain in place will be evaluated on a case-by-case basis during final design. These walls may be seismically retrofitted or replaced to comply with City and County of San Francisco and CBC codes and the design-level geotechnical report.

8.3 Fire Department Access

The primary fire department access streets are shown on Figure 8.12. Fire trucks will utilize the entire travel way for turning movements at intersections. Intersections will be designed to provide 7-feet clear when fire trucks enter on-coming travel lanes as shown on Figure 8.13.

Fire truck turnaround locations will be coordinated with the SFFD and constructed consistent with the Fire Code at dead-end street locations.

The final street layouts and cross sections will be developed during the Major Phase and Sub Phase applications. The final configurations will be reviewed by the SFFD for conformance to the Fire Code.

8.4 Structural Street Sections

The structural cross section for all new on-grade roadways will comply with the requirements of the San Francisco Subdivision Code. Roadway cross sections will consists of eight inches of Portland Cement Concrete and a two-inch asphalt concrete wearing surface for Collector Streets, and a three-inch asphalt concrete wearing surface for Arterials. Alternative cross sections such as asphalt concrete wearing surface over Class 2 aggregate base, porous paving, and decorative pavement (patterned concrete, patterned asphalt, paving stones, etc.) may be used if approved by SFDPW.

8.5 Traffic Signals and Street Lights

The Developer will design and construct four traffic signals along California Avenue and Palm Avenue as shown in Figure 8.2. One additional pedestrian crossing signal may be constructed at a mid-block pedestrian crossing on California Avenue if required. A traffic signal may also be constructed at the intersection of Hillcrest and South Gate Road. Where possible, the electrical service for the Traffic signals will be located within the joint trench (refer to Section 13). All traffic signals shall be designed and constructed to the specifications and approvals of the San Francisco Municipal Transportation Agency (SFMTA).

The Developer will design and construct street lights. Street lighting shall comply with City of San Francisco standards for light levels and acceptable fixtures. Alternative street light fixtures will be allowed as approved by the SFPUC and SFDPW. Where possible, the electrical service for the street lights will be located within the joint trench (refer to Section 13).

The Developer will design and construct all street and traffic signs as well as pavement markings to the specifications and approvals of the SFMTA.

8.6 Public Bike and Pedestrian Paths

The Developer will design and construct public bike and pedestrian paths throughout Treasure Island. The conceptual location of bike and pedestrian paths are shown on Figure 8.14.

8.7 Bay Bridge Access

As part of the new eastern span of the Bay Bridge, Caltrans will be constructing a new east-bound on-ramp on the eastern side of the YBI tunnel. The east-bound off-ramp at this location will remain in substantially the same existing configuration upon completion of the new bridge.
The City and Caltrans are currently designing replacement westbound on- and off-ramps on the eastern side of the YBI tunnel. This Infrastructure Plan assumes that these new ramps will be completed as part of the construction of the new eastern span of the Bay Bridge.

On the western side of the YBI tunnel, the exiting east-bound off-ramp and west-bound on-ramp will remain. Upon completion of the new west-bound on-ramp on the eastern side of the tunnel, the existing west-bound on-ramp on the western side of the tunnel will be dedicated to SF MUNI bus only, providing a means of queue-jumping for the busses.

8.8 Acceptance and Maintenance of Public Street Improvements

The Authority or SFDPW will be responsible for maintenance of the existing roadways until replaced by the Developer.

Upon acceptance of the new and/or improved public streets by San Francisco Department of Public Works (SFDPW), responsibility for the operation and maintenance of the roadway, streetscape elements, and retaining walls will be designated as defined in the various City of San Francisco Municipal Codes. Responsibility for accepted street improvements for streets within the Public Trust, as shown in Figure 8.15, will be determined separately.

Upon acceptance of the private streets by SFDPW, responsibility for the operation and maintenance will be by the neighborhood homeowners association.

8.9 Acceptance of Public Bike and Pedestrian Paths

Upon acceptance of the public bike and pedestrian paths by SFDPW, responsibility for the operation and maintenance of the paths will be designated as defined in the various City of San Francisco Municipal Codes. Responsibility for accepted path improvements for paths within the Public Trust, as shown in Figure 8.15, will be determined separately.

8.10 Coast Guard and Job Corps

The Developer will not replace the roadways within the Coast Guard and Job Corps properties. The Developer will construct the new roadway systems up to the boundary of these two property owners and connect to their existing roadway network to maintain the existing access points.

8.11 Phasing of New Roadway Construction

The Developer will construct the new roadway system in phases to match the Sub-Phases of the Project. The amount of the existing roadway repaired and/or replaced will be the minimum necessary to serve the Sub-Phase. The Sub-Phase will connect to the existing roadways as close to the edge of the Sub-Phase area as possible while maintaining safe access to the new development and the remainder of the Island. The existing land uses on Treasure Island will continue to utilize the existing roadways until the existing uses are demolished. Repairs and/or replacement of the existing facilities necessary to serve the sub-phase will be designed and constructed by the Developer. Fire truck turnaround areas will be coordinated with the SFFD and constructed by the Developer consistent with the Fire Code.

The Developer will provide an existing conditions report for the existing streets scheduled to remain adjacent to the Sub-Phase prior to the geotechnical mitigation activity. The report will include the conditions of the original street system on TI as well as the new system constructed with previous phases adjacent to the new Phase. The report will be updated at the end of the geotechnical mitigation activity and again at the end of the construction of the Sub-Phase. The limit of the report and how the conditions of the systems are determined will be coordinated with the SFPUC and/or SFDPW. The Developer will be responsible for damage to the existing streets, and/or newly installed streets on previous phases, due to geotechnical mitigation activity and/or construction of the proposed improvements. The Developer will make the necessary repairs as required and be responsible for any permit violations due to the damage.

The Authority or SFDPW will be responsible for maintenance of existing roadways until replaced by the Developer. The SFDPW will be responsible for the new roadways once construction of the Sub-Phase or new roadway facility is complete and accepted by the SFDPW.

8.12 SFMTA Infrastructure

SFMTA Infrastructure is defined as:

- Security monitors and cameras
- Signals and Signal Interconnects
- TPS signal preempt detectors
- Conduit containing TPS signal cables
- Shelters (with Vendor)
- Paint – poles and asphalt delineating coach stops
- Asphalt painting for transit lanes
- Departure prediction (“NextBus”) monitors and related communications equipment
- Bicycle racks
- Crosswalk striping
- Bike lane and facility striping
- APS/Pedestrian crossing signals
- Street Signs"

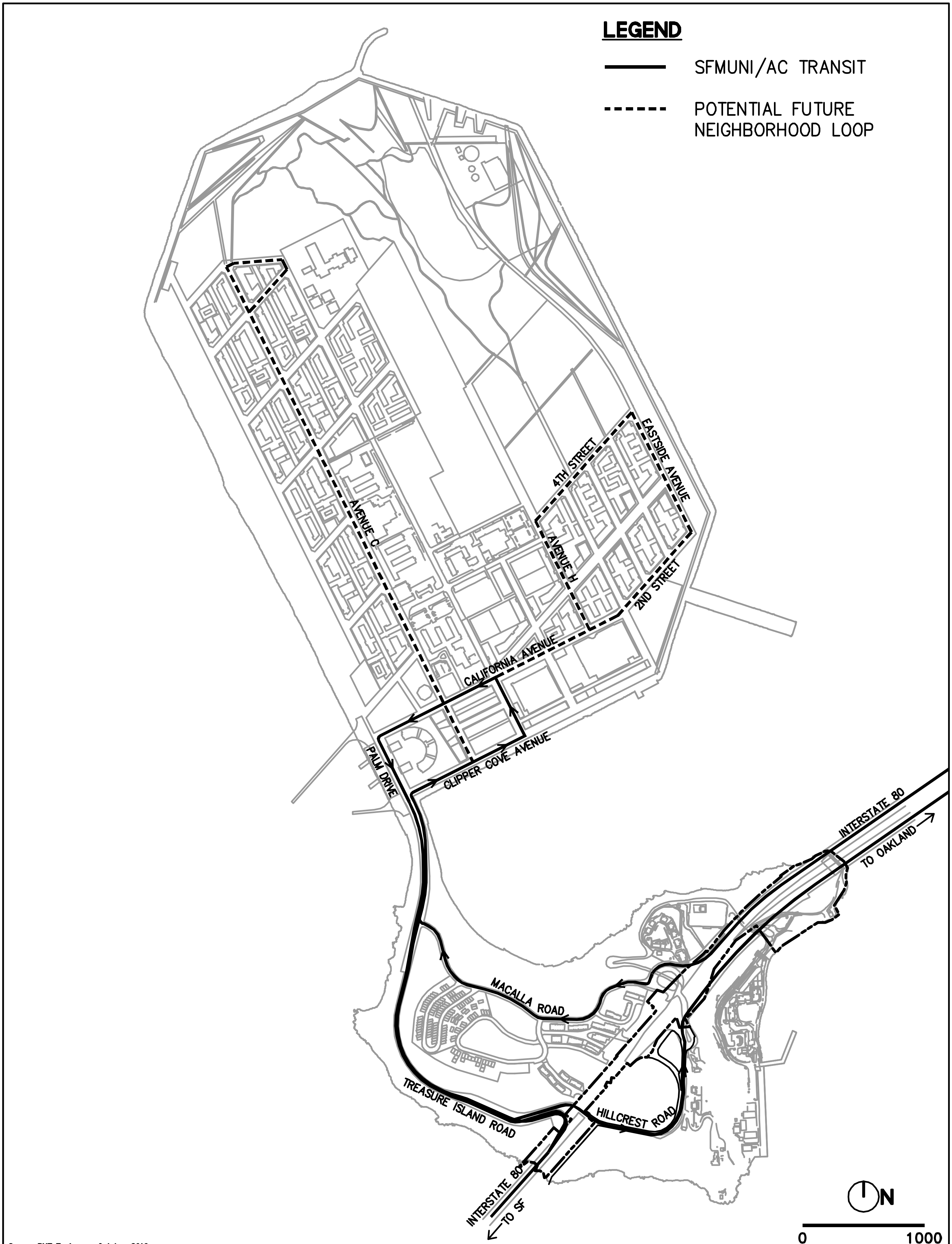
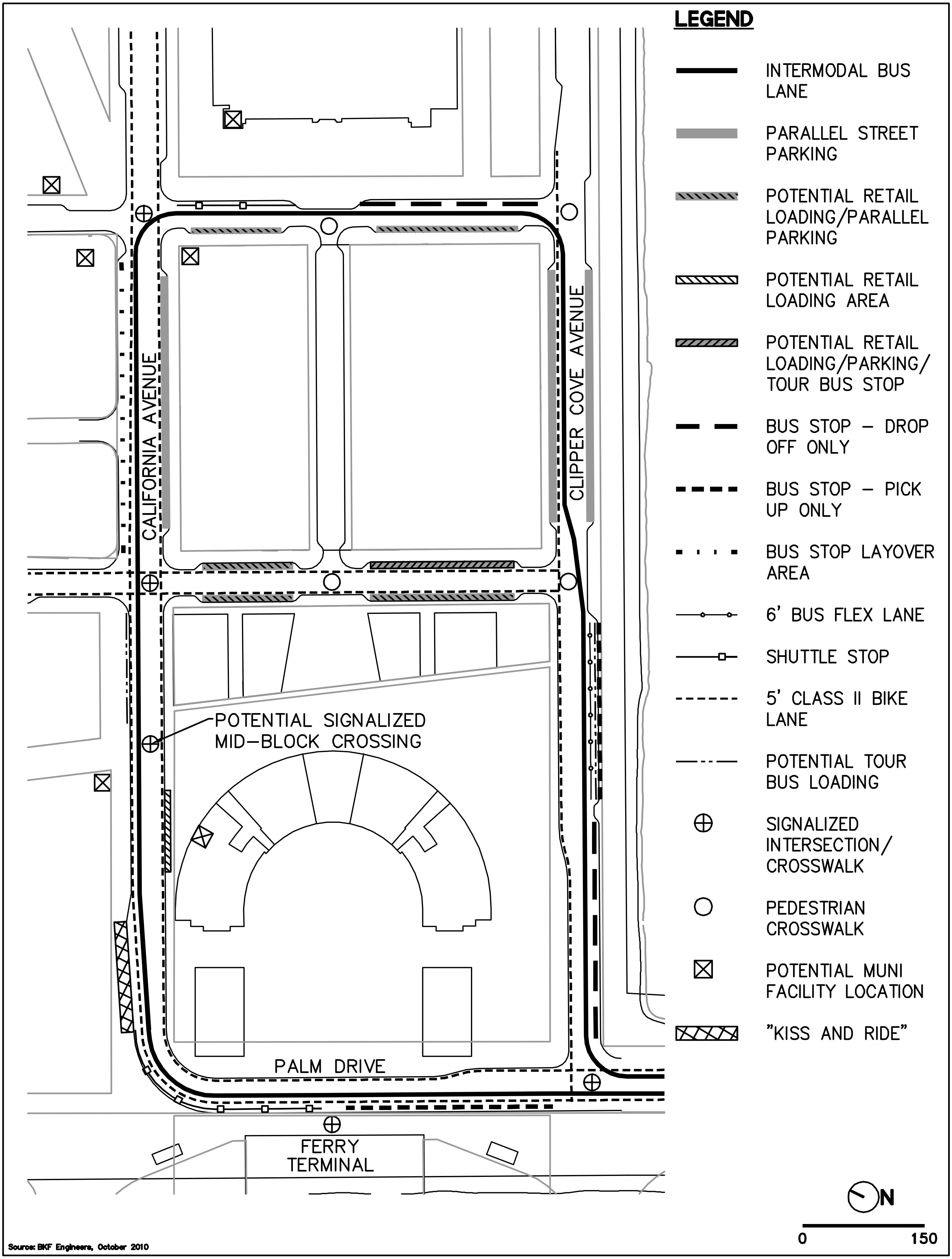


Figure 8.1: SFMUNI/AC Transit Bus Routes


LEGEND
INTERMODAL BUS LANE
PARALLEL STREET PARKING
POTENTIAL RETAIL LOADING/PARALLEL PARKING
POTENTIAL RETAIL LOADING AREA
POTENTIAL RETAIL LOADING/PARKING/ TOUR BUS STOP
BUS STOP – DROP OFF ONLY
BUS STOP – PICK UP ONLY
BUS STOP LAYOVER AREA
6' BUS FLEX LANE
SHUTTLE STOP
5' CLASS II BIKE LANE
POTENTIAL TOUR BUS LOADING
SIGNALIZED INTERSECTION/ CROSSWALK
PEDESTRIAN CROSSWALK
POTENTIAL MUNI FACILITY LOCATION
"KISS AND RIDE"
CALIFORNIA AVENUE
CLIPPER COVE AVENUE
POTENTIAL SIGNALIZED MID-BLOCK CROSSING
PALM DRIVE
FERRY TERMINAL
N
0
150
Source: BKF Engineers, October 2010

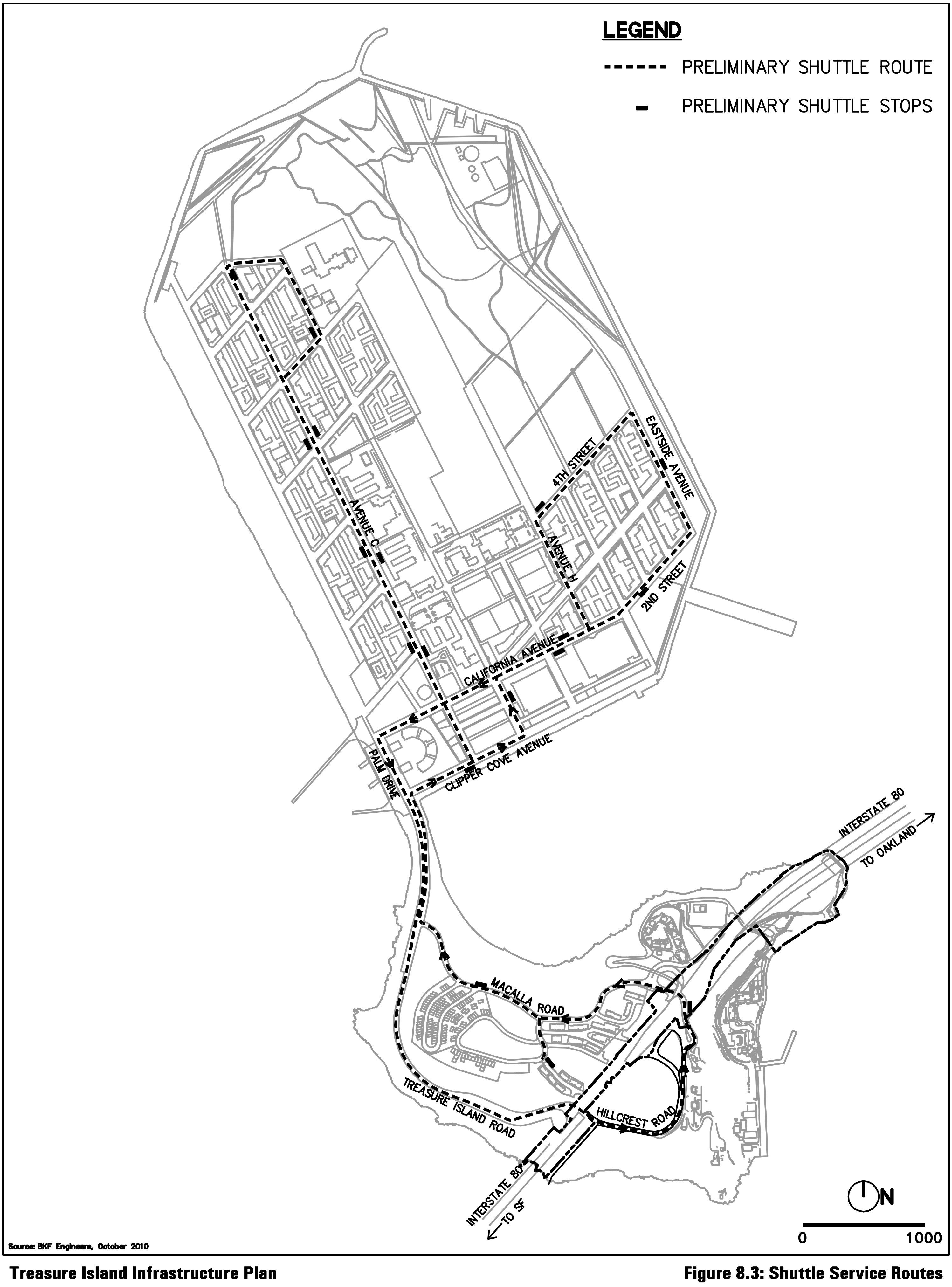
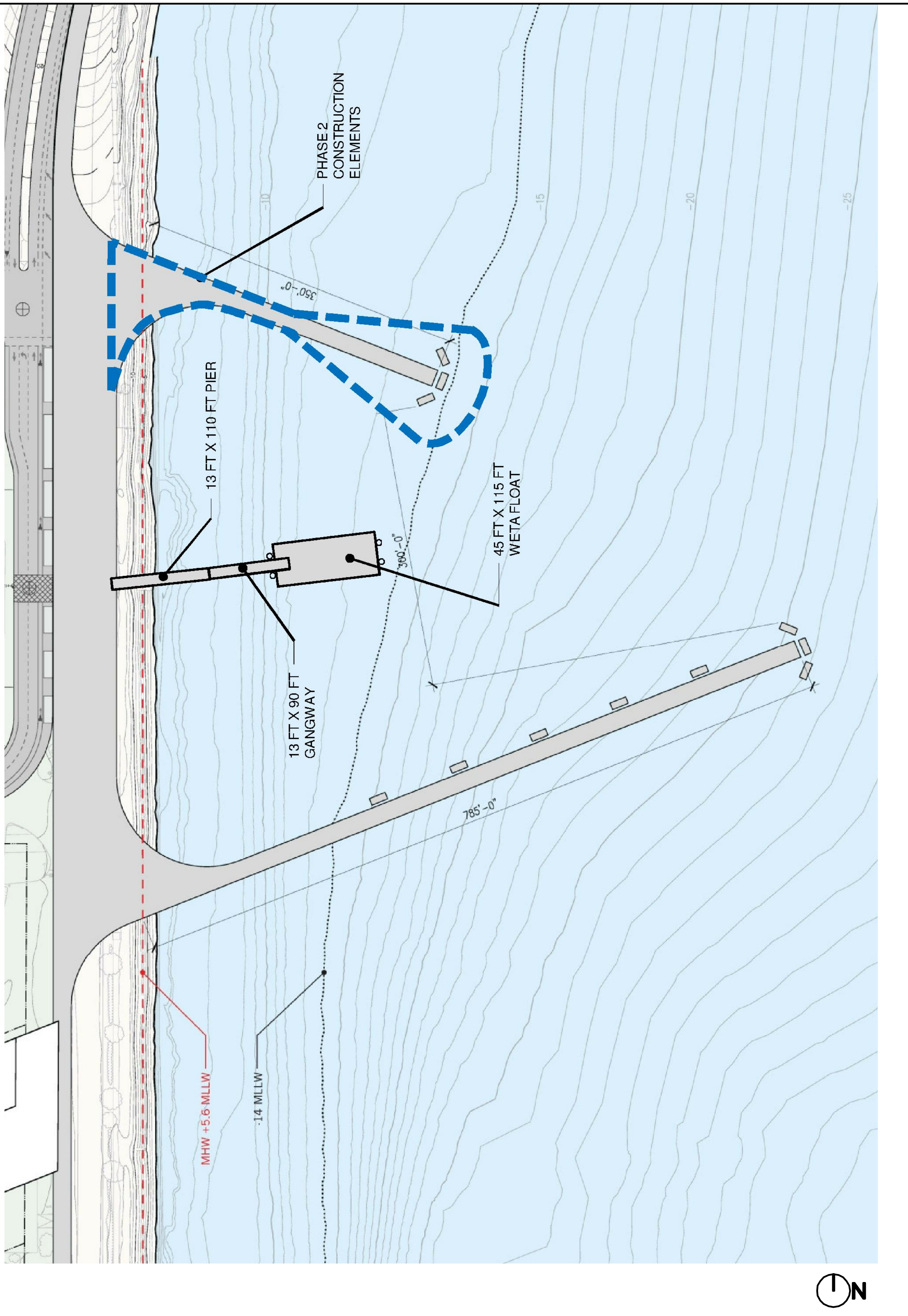


Figure 8.3: Shuttle Service Routes



Source: Moffatt & Nichol, 2010

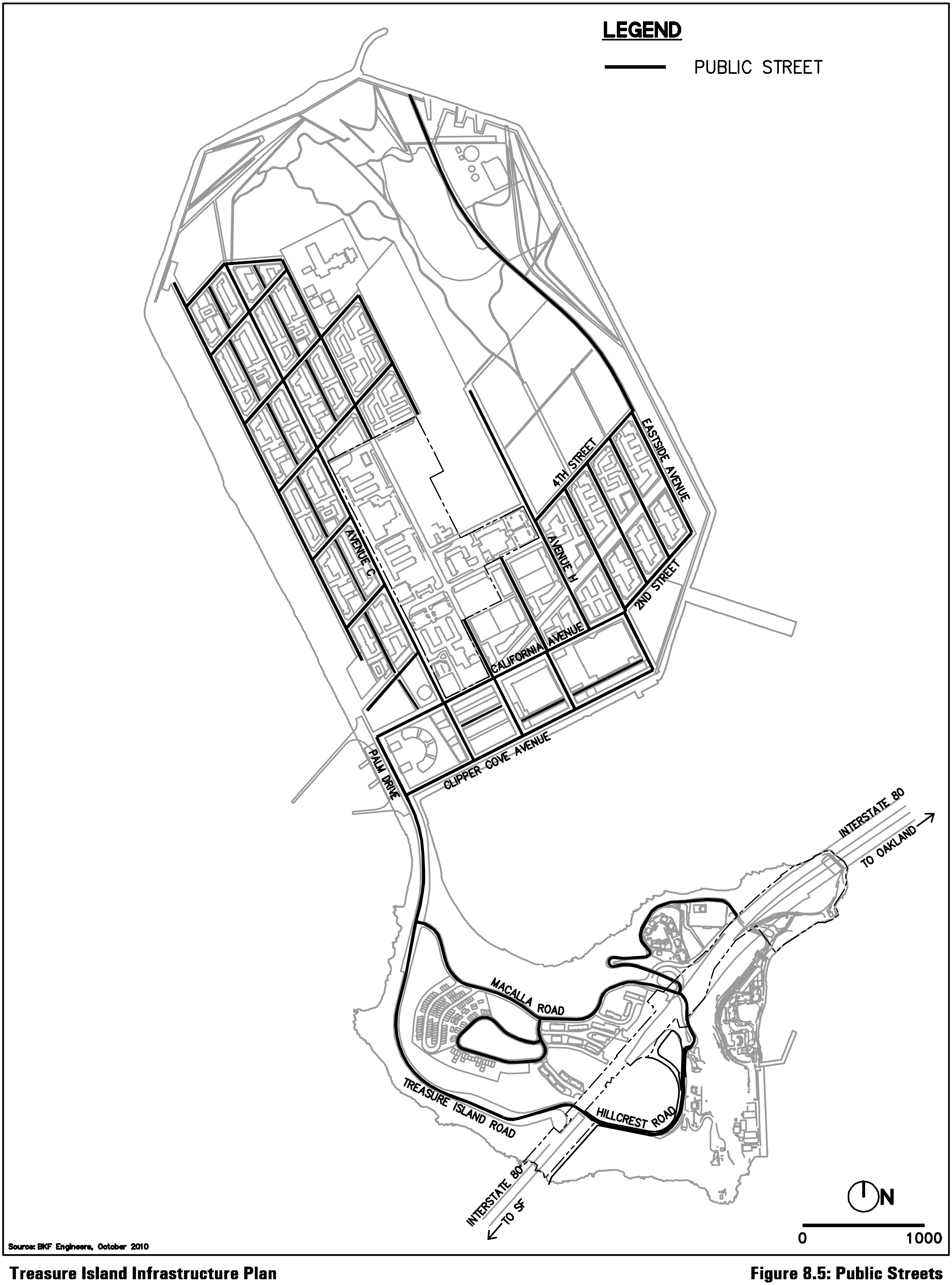


Figure 8.5: Public Streets

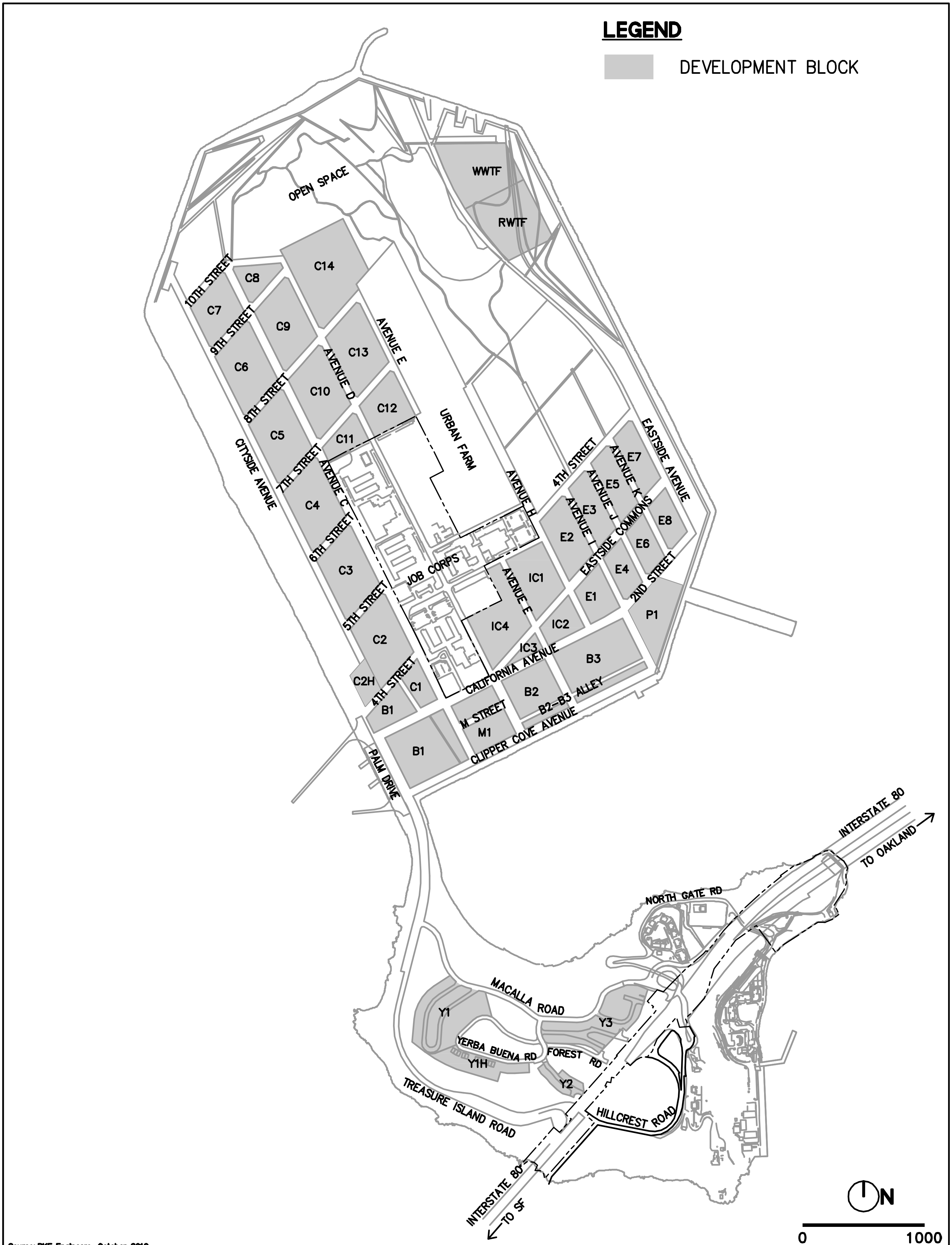


Figure 8.6: Street Names and Block Numbers

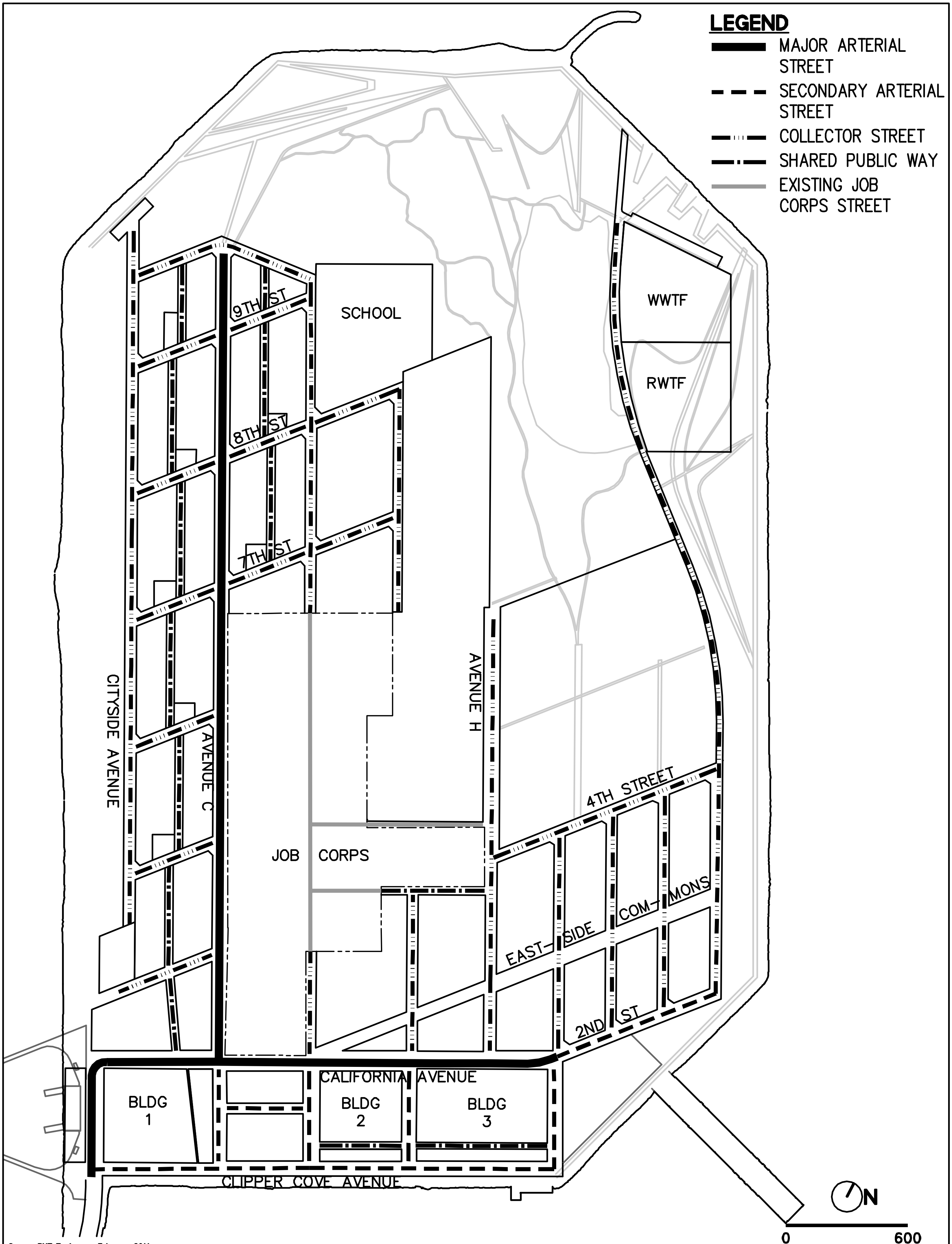
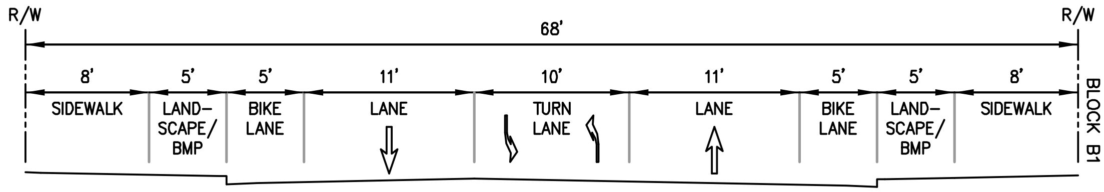
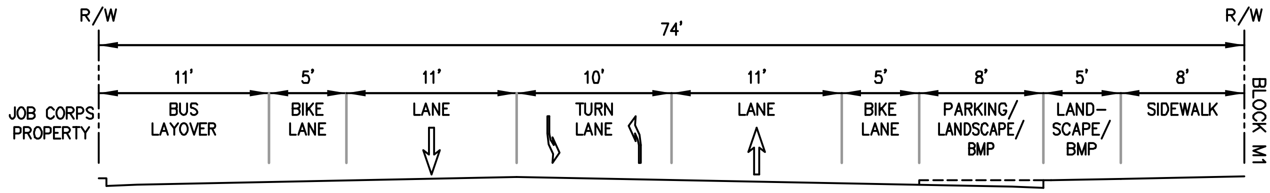


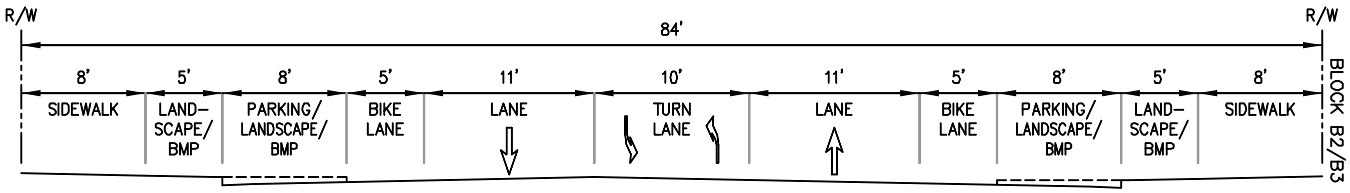
Figure 8.7: TI Street Plan



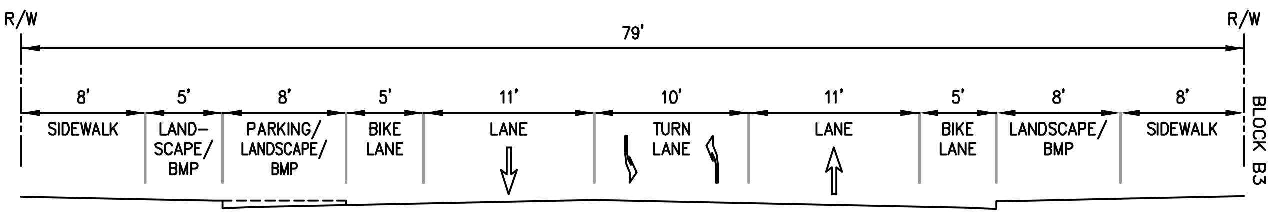
CALIFORNIA AVENUE (B1 BLOCK)



CALIFORNIA AVENUE (M1 BLOCK)



CALIFORNIA AVENUE (B2/B3 BLOCK)



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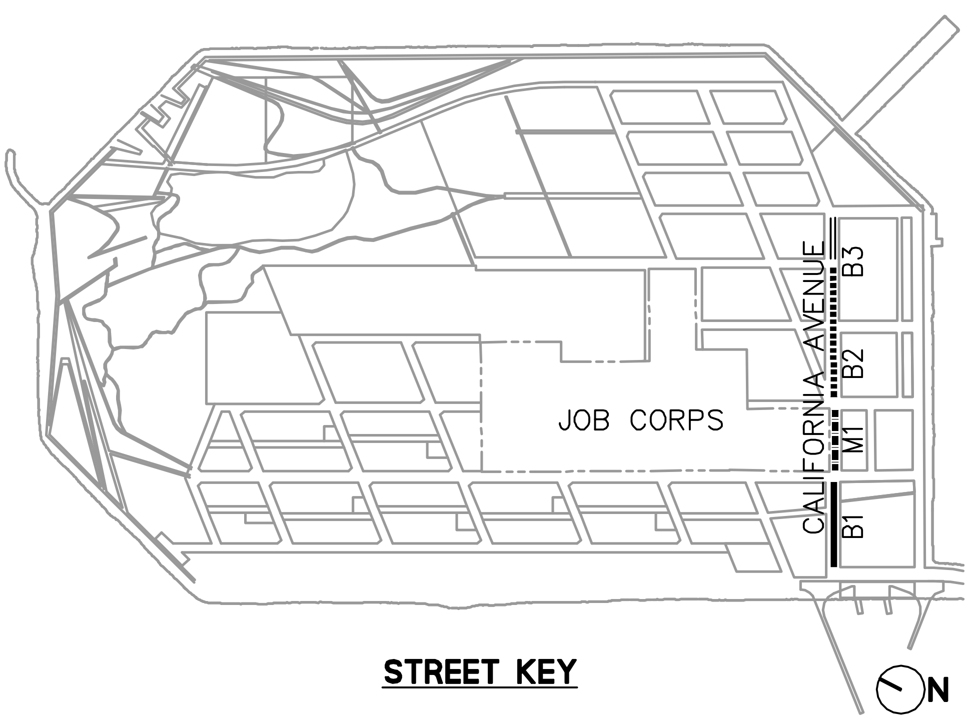
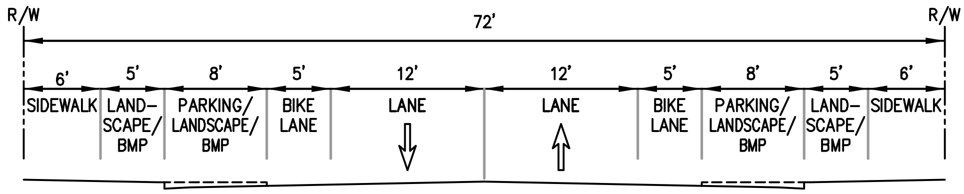


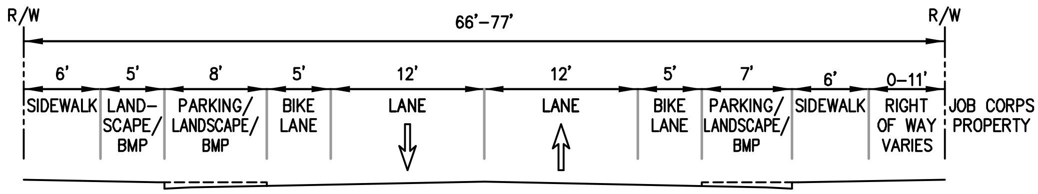
STREET KEY

Source: BKF Engineers, February 2011

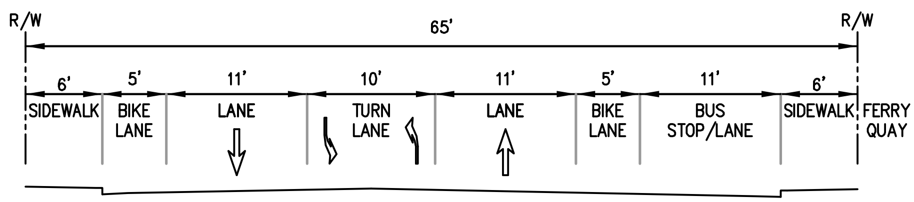
Figure 8.8.1.A: Major Arterial Street - California Avenue



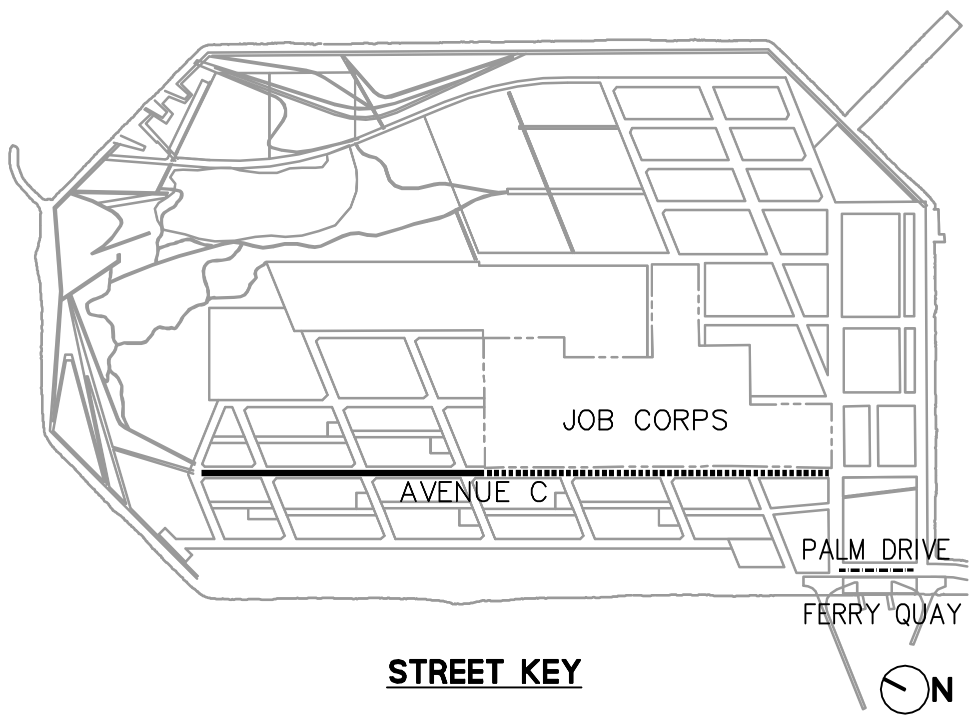
AVENUE C (NORTH)



AVENUE C (ADJACENT TO JOB CORPS)



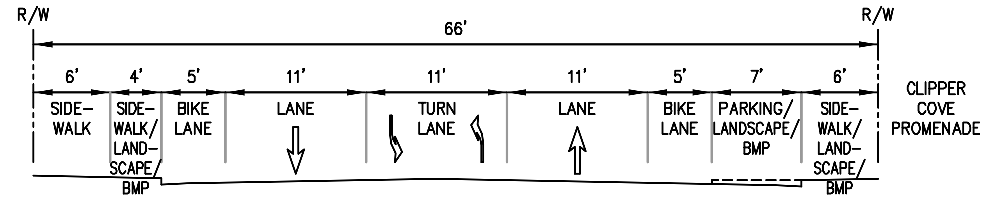
PALM DRIVE (ADJACENT TO FERRY QUAY)



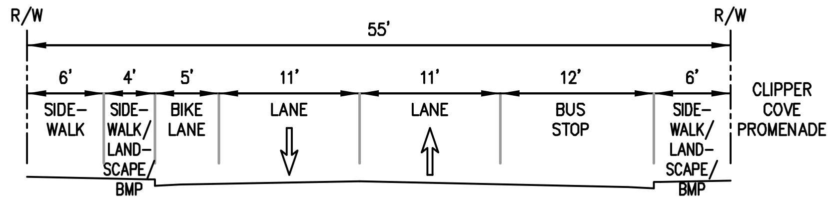
STREET KEY

Source: BKF Engineers, February 2011

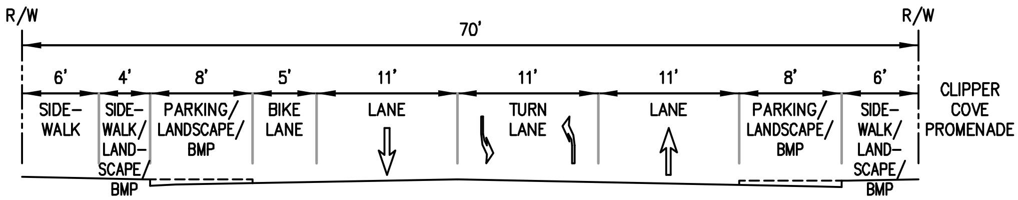
Figure 8.8.1.B: Major Arterial Street - Avenue C and Palm Drive



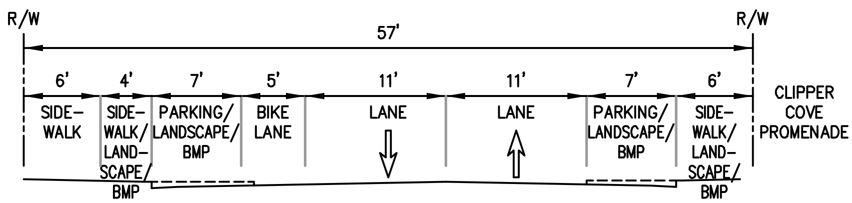
CLIPPER COVE AVENUE (B1 BLOCK - WEST)



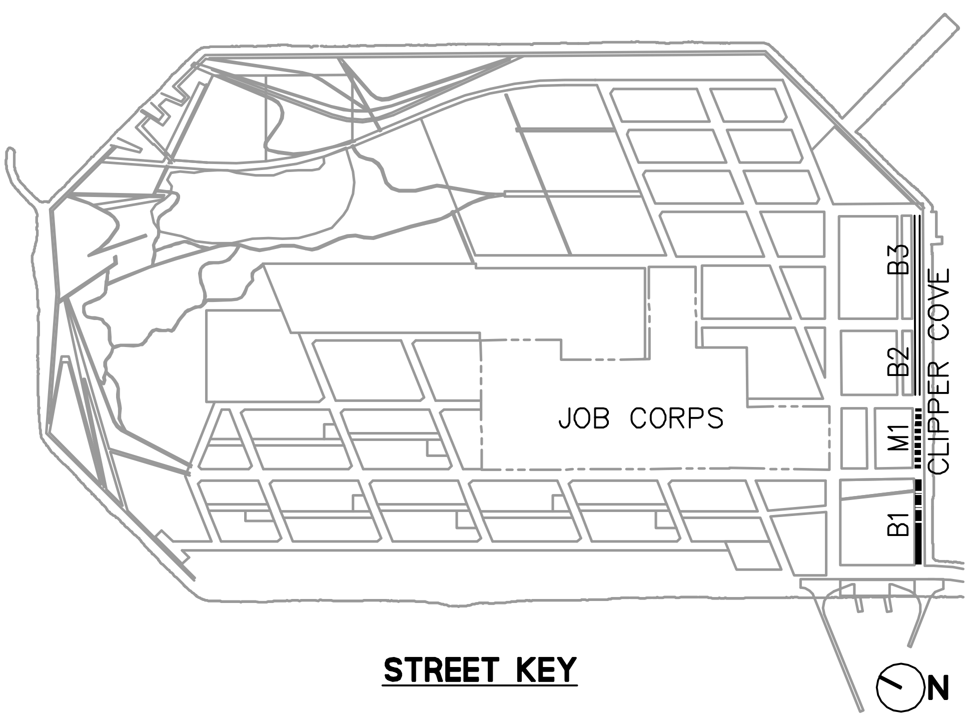
CLIPPER COVE AVENUE (B1 BLOCK - EAST)



CLIPPER COVE AVENUE (M1 BLOCK)



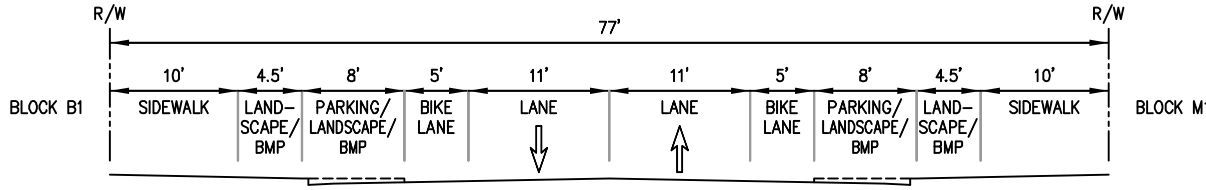
CLIPPER COVE AVENUE (B2 & B3 BLOCKS)



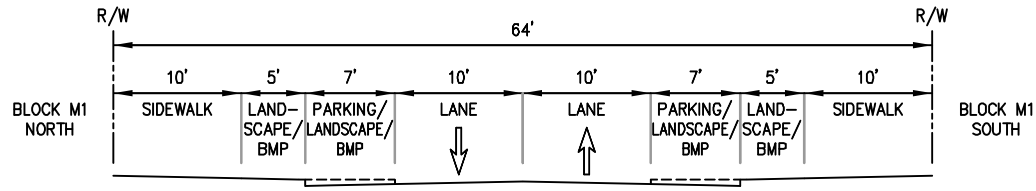
STREET KEY

Source: BKF Engineers, February 2011

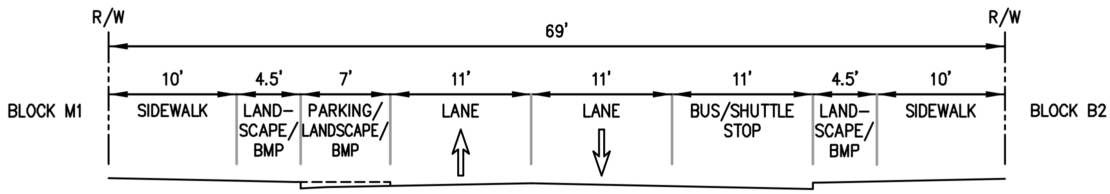
Figure 8.8.2.A: Secondary Arterial Street - Clipper Cove Avenue



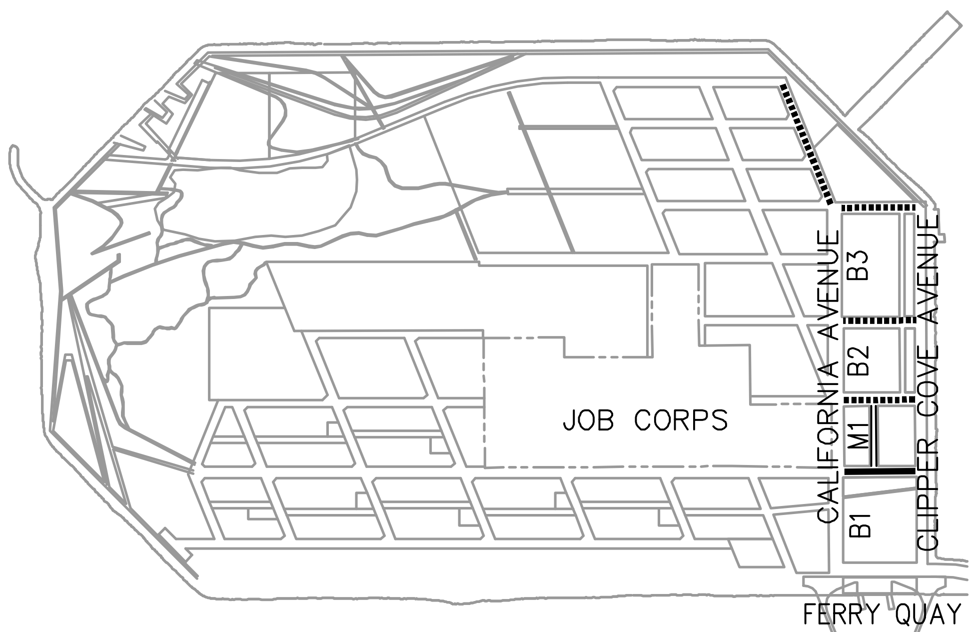
RETAIL STREET (BETWEEN B1 & M1)



RETAIL STREET (MID-BLOCK M1)



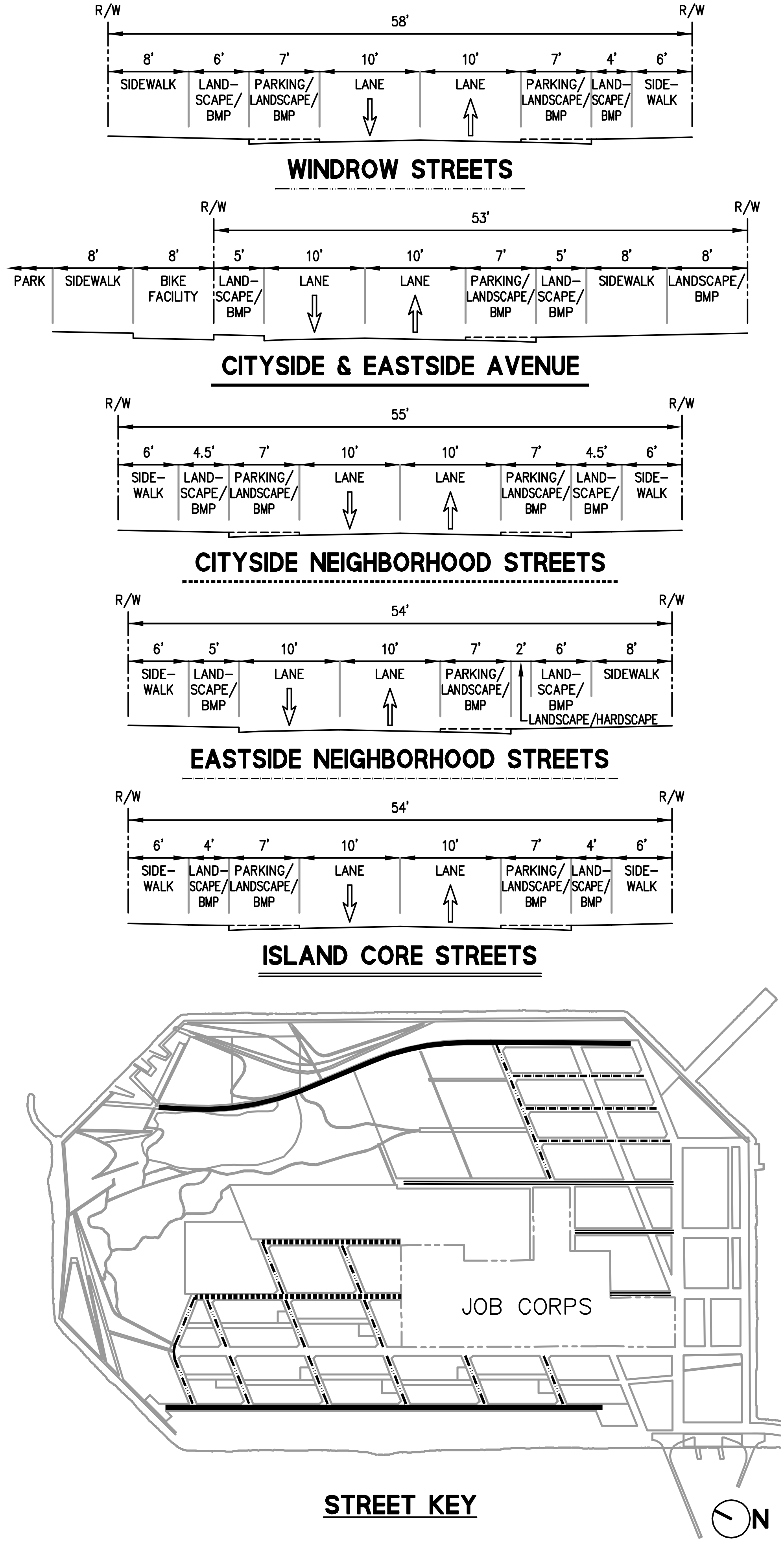
SECONDARY ARTERIAL



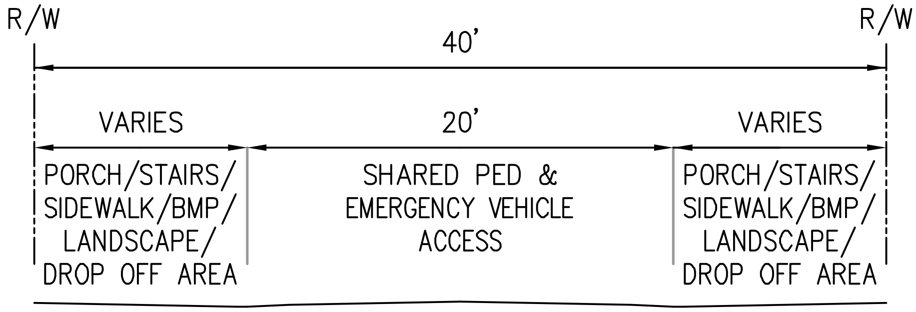
STREET KEY

Source: BKF Engineers, February 2011

Figure 8.8.2.B: Secondary Arterial Street - Retail Streets



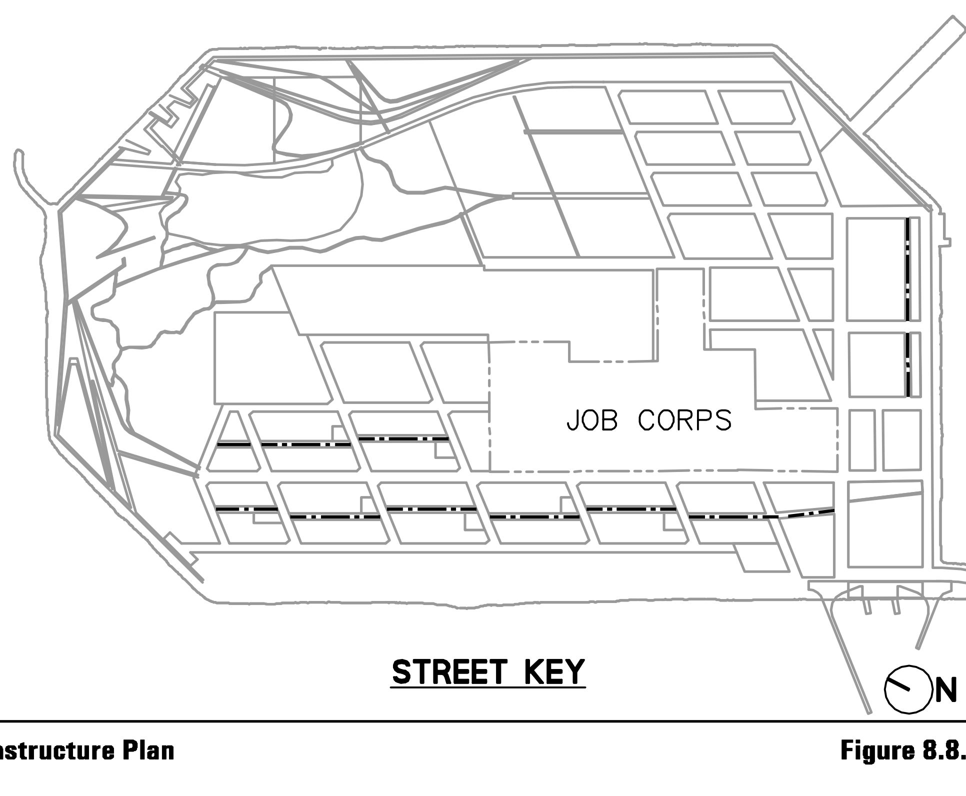
Source: BKF Engineers, February 2011



SHARED PUBLIC WAY

SHARED PUBLIC WAY (PEDESTRIAN FOCUSED)

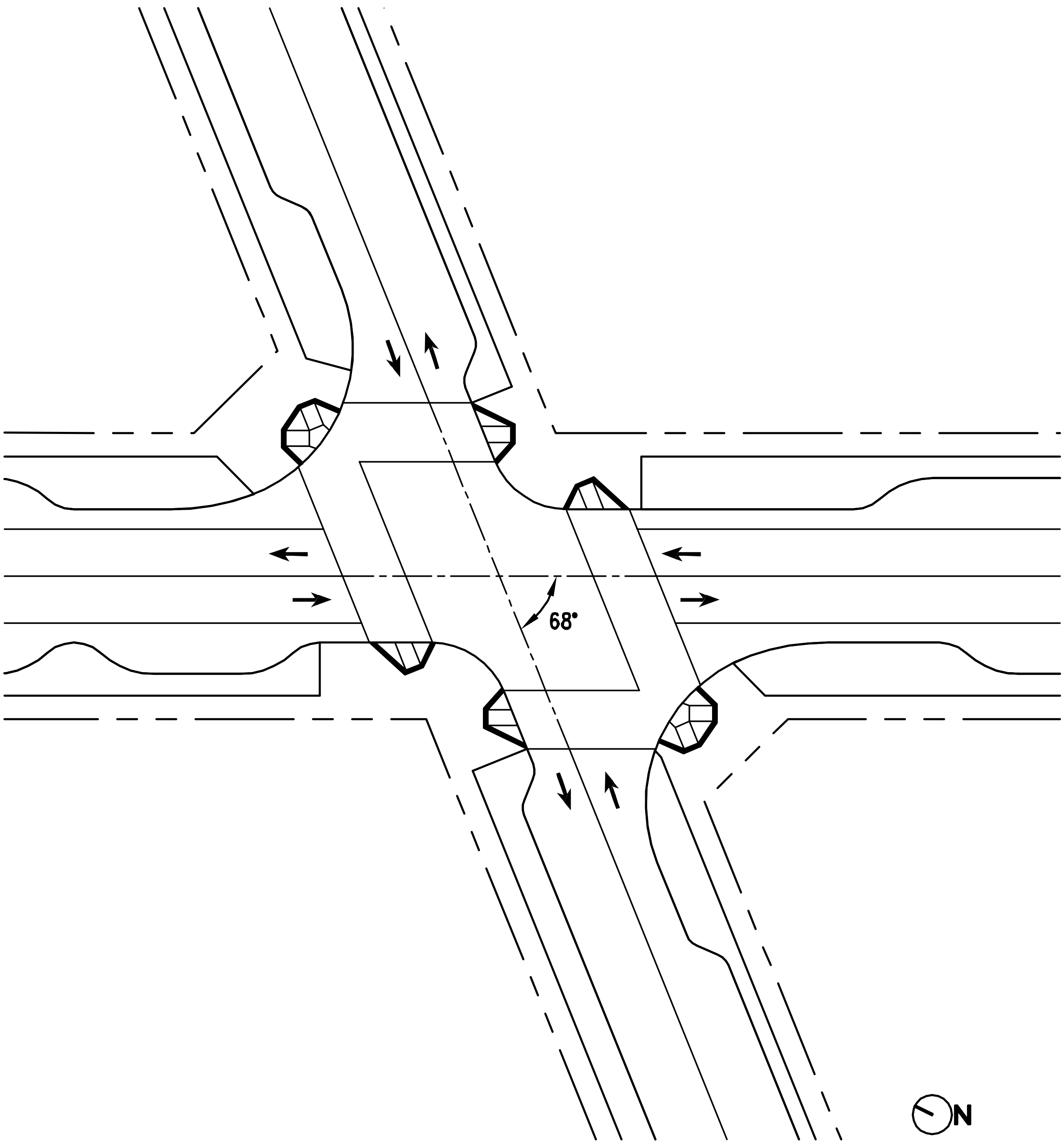
The Shared Public Way is a new street typology for the City of San Francisco being implemented on Treasure Island. It is meant to favor pedestrian activity with limited vehicular access and low vehicle speeds. Shared Public Ways prioritize pedestrian use of the entire right-of-way while allowing occasional slow-moving vehicles to access local land uses and parking, and provide necessary services. Treasure Island Shared Public Ways will be designed with special paving, a variety of amenities, landscaping, seating, and pockets of on-street loading (not parking), to create an environment that encourages public space use and slows occasional vehicles.



STREET KEY

Source: BKF Engineers, February 2011

Figure 8.8.4: Shared Public Way



ANGLED INTERSECTION

Source: BKF Engineers, 2010

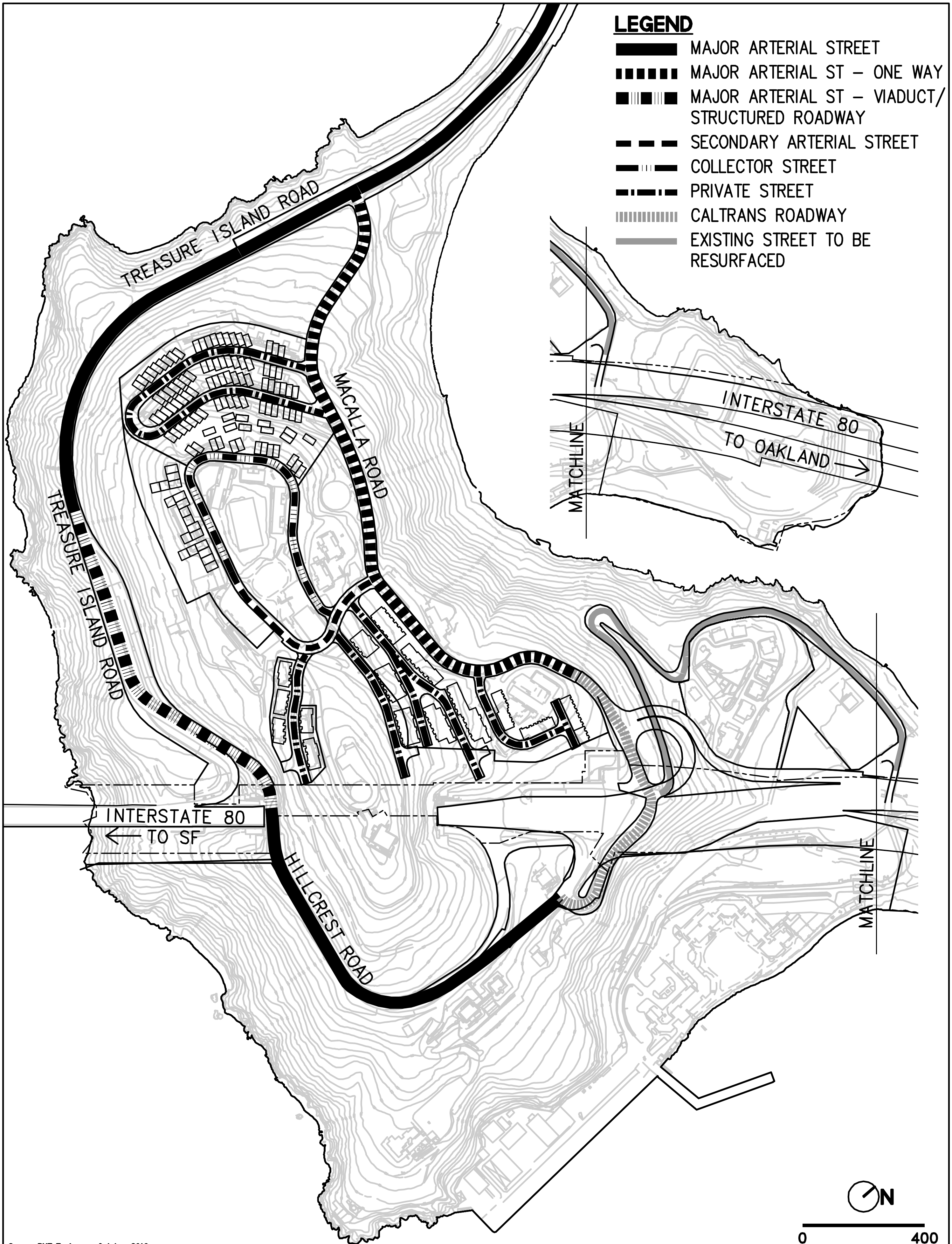
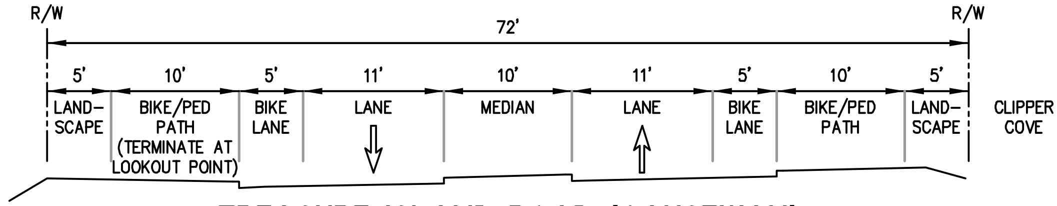
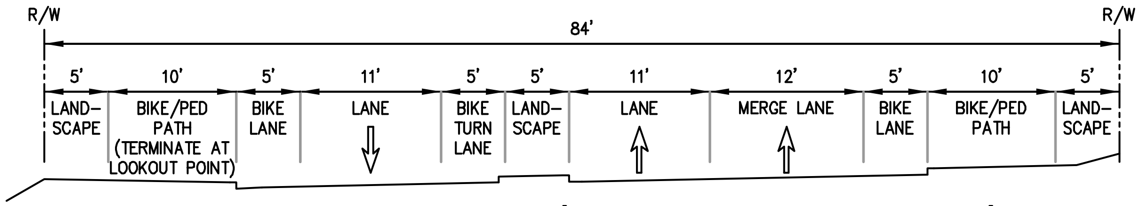


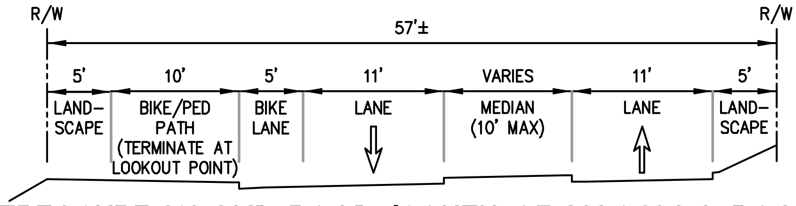
Figure 8.10: YBI Street Plan



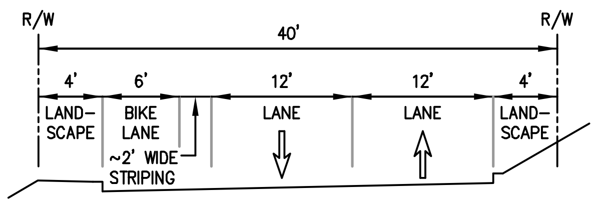
TREASURE ISLAND ROAD (CAUSEWAY)



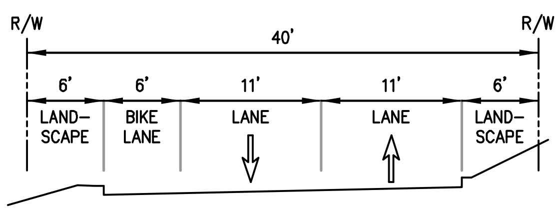
TREASURE ISLAND ROAD (NORTH OF MACALLA ROAD)



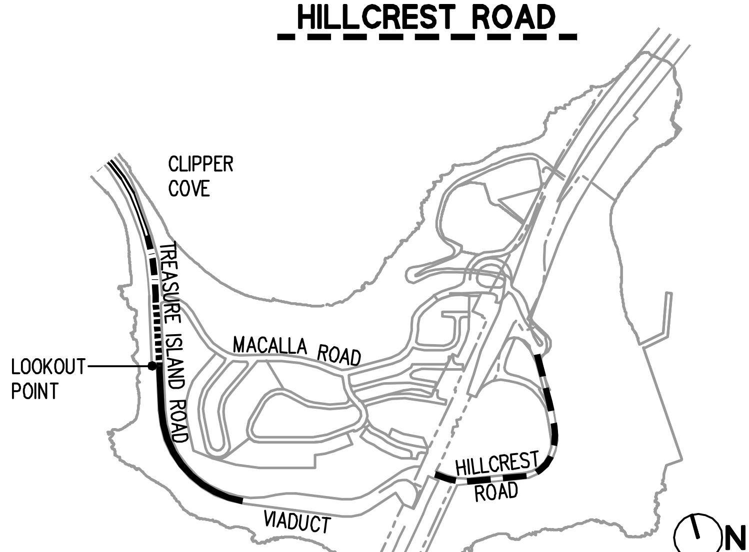
TREASURE ISLAND ROAD (SOUTH OF MACALLA ROAD)



TREASURE ISLAND ROAD (NORTH OF VIADUCT)



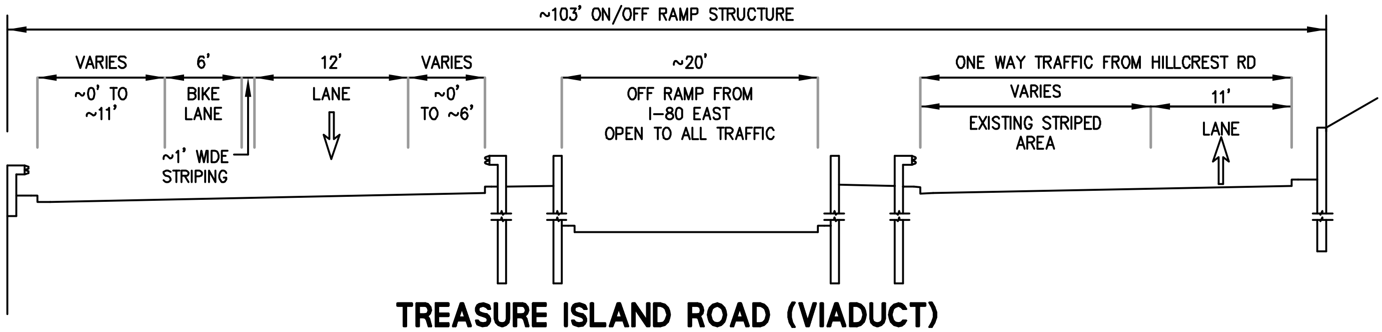
HILLCREST ROAD



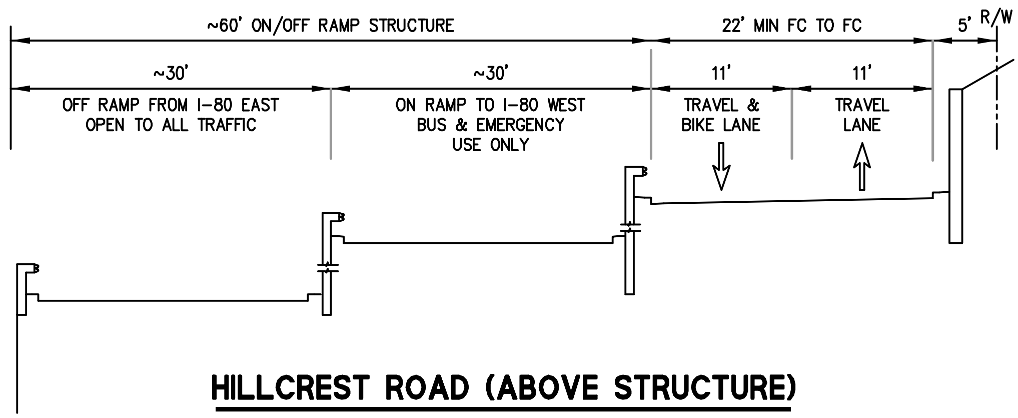
STREET KEY

Source: BKF Engineers, February 2011

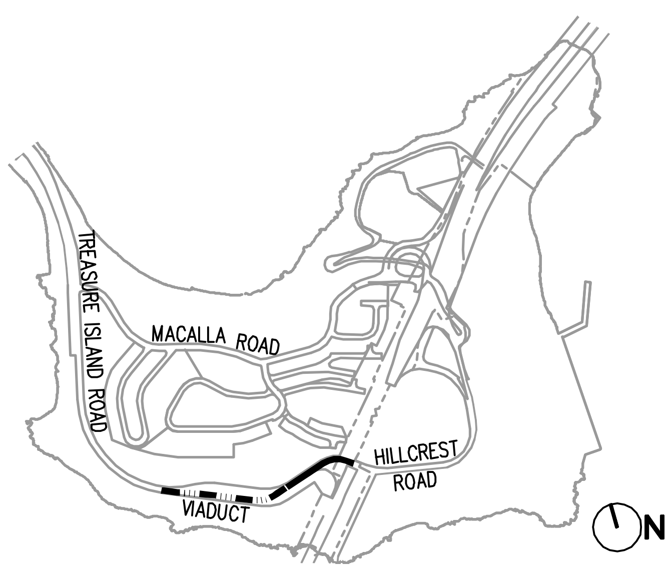
Figure 8.11.1.A: Major Arterial Street - Treasure Island Rd & Hillcrest Rd



TREASURE ISLAND ROAD (VIADUCT)

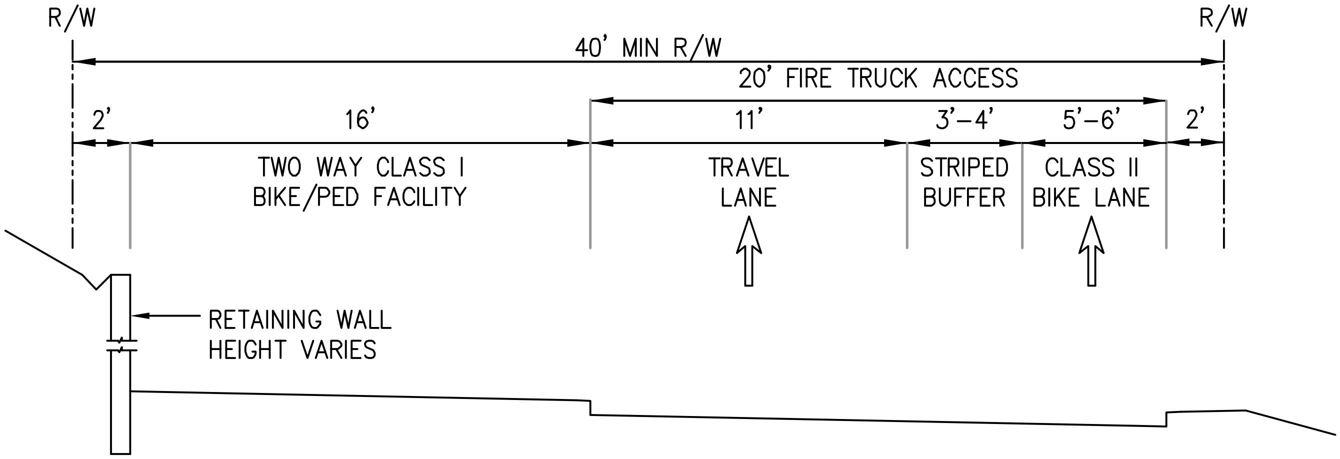


HILLCREST ROAD (ABOVE STRUCTURE)

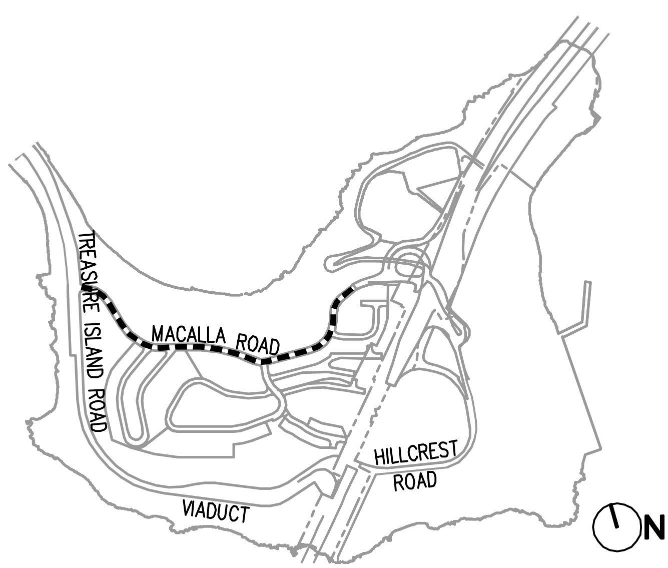


STREET KEY

Source: BKF Engineers, October 2010



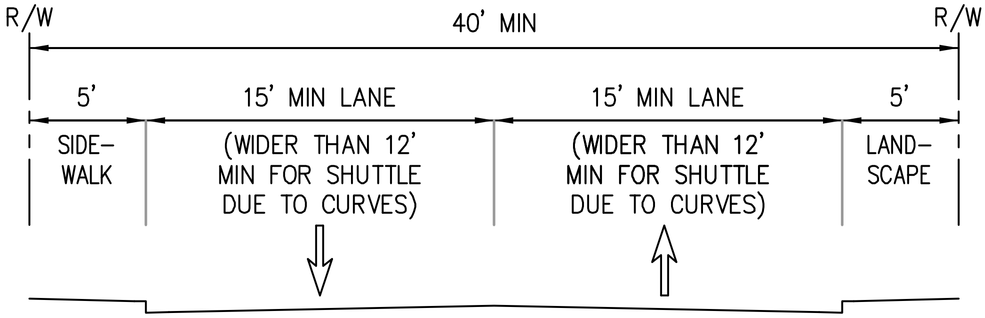
MACALLA ROAD (ONE WAY)



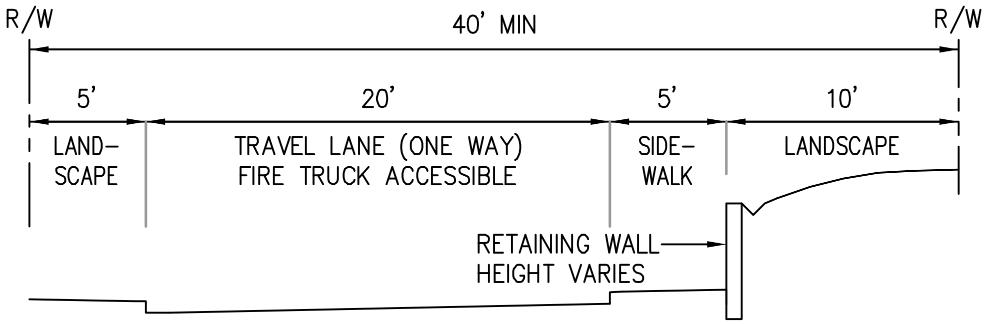
STREET KEY

Source: BKF Engineers, October 2010

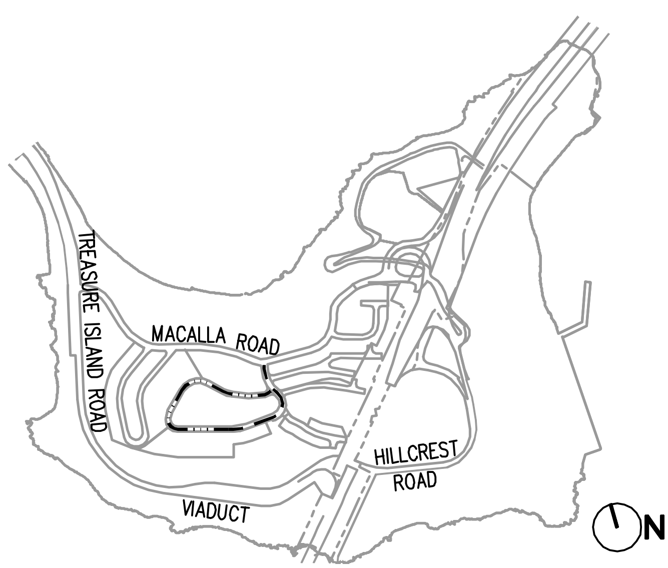
Figure 8.11.1.C: Major Arterial Street - One Way - Macalla Road



SECONDARY ARTERIAL STREET



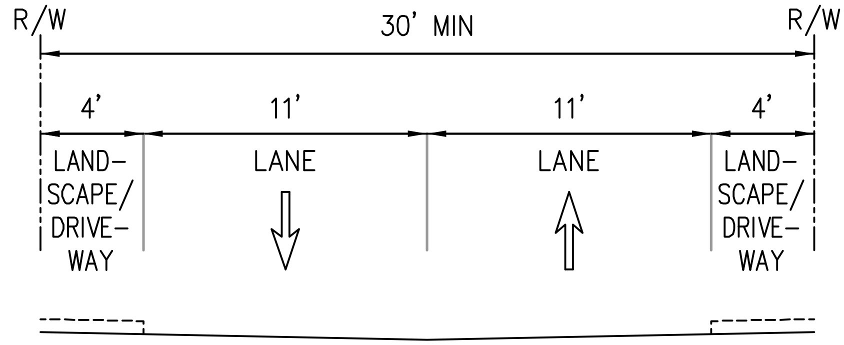
COLLECTOR STREET



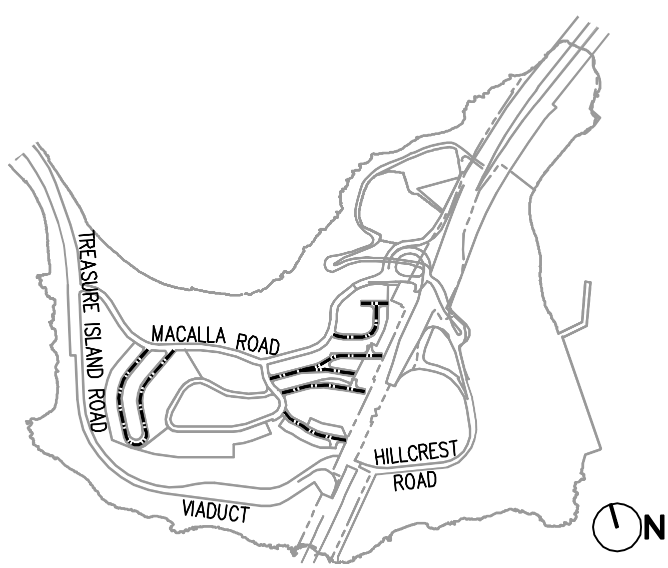
STREET KEY

Source: BKF Engineers, February 2011

Figure 8.11.2: Secondary Arterial Street & Collector Street



PRIVATE STREET



STREET KEY

Source: BKF Engineers, October 2010

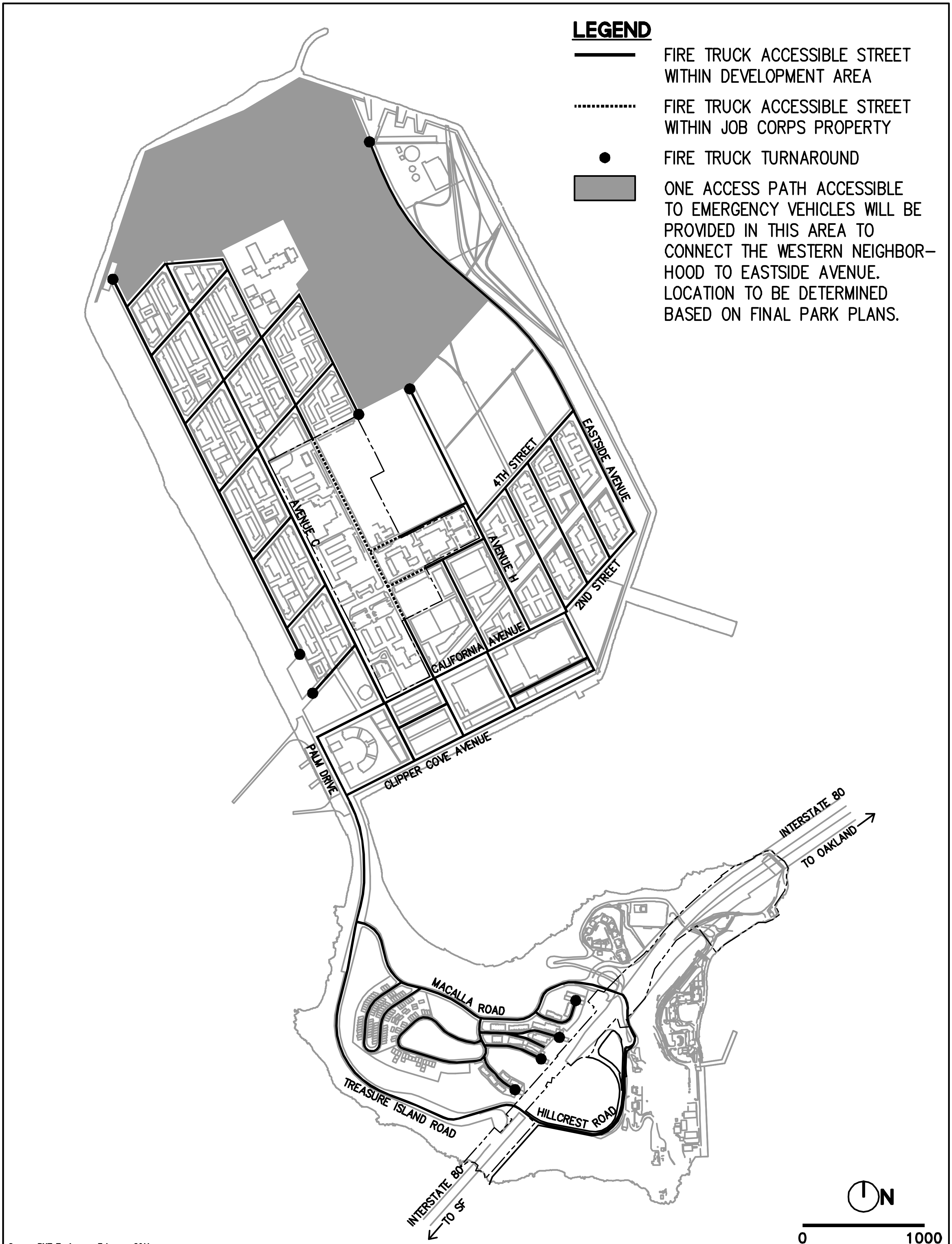
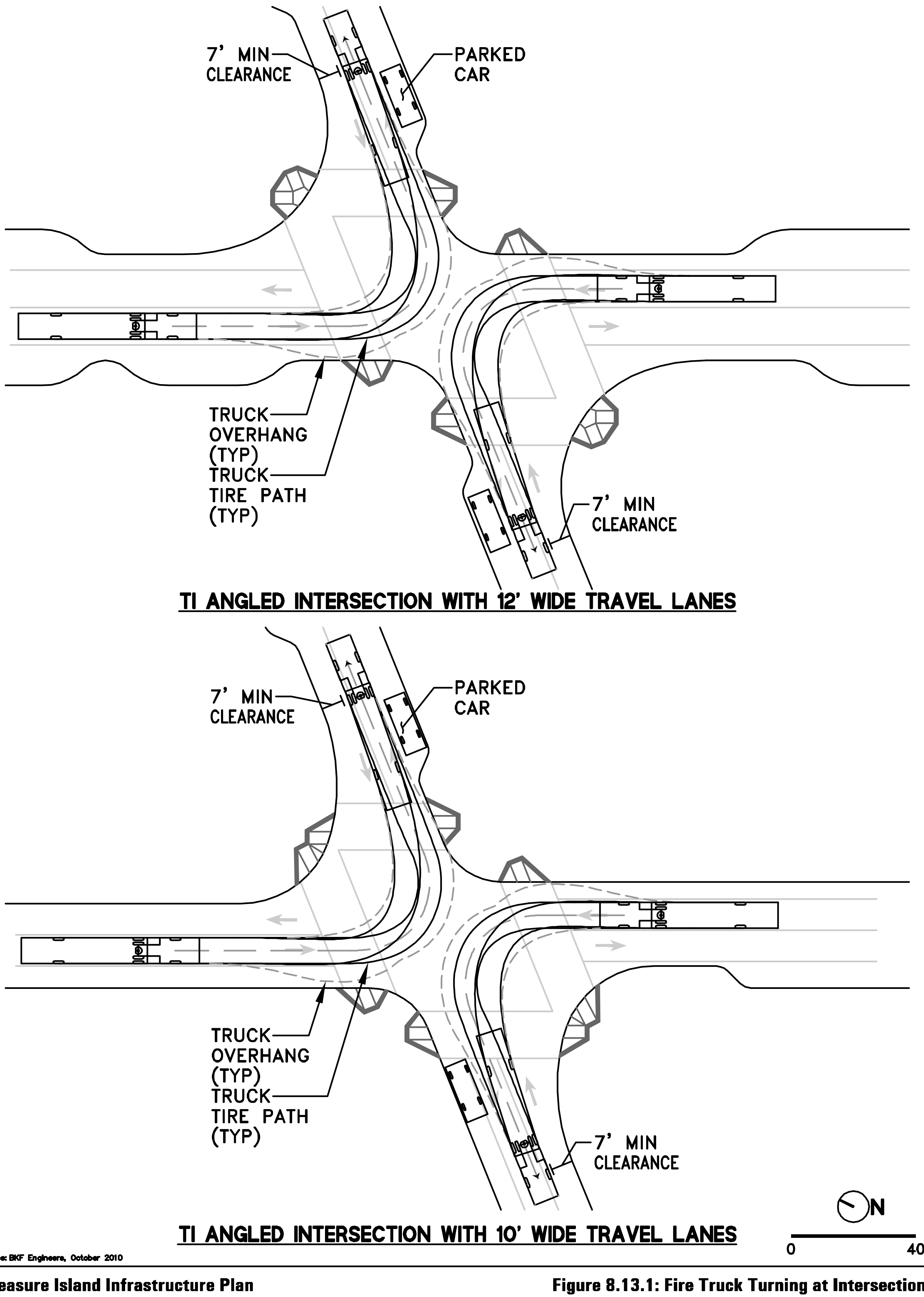
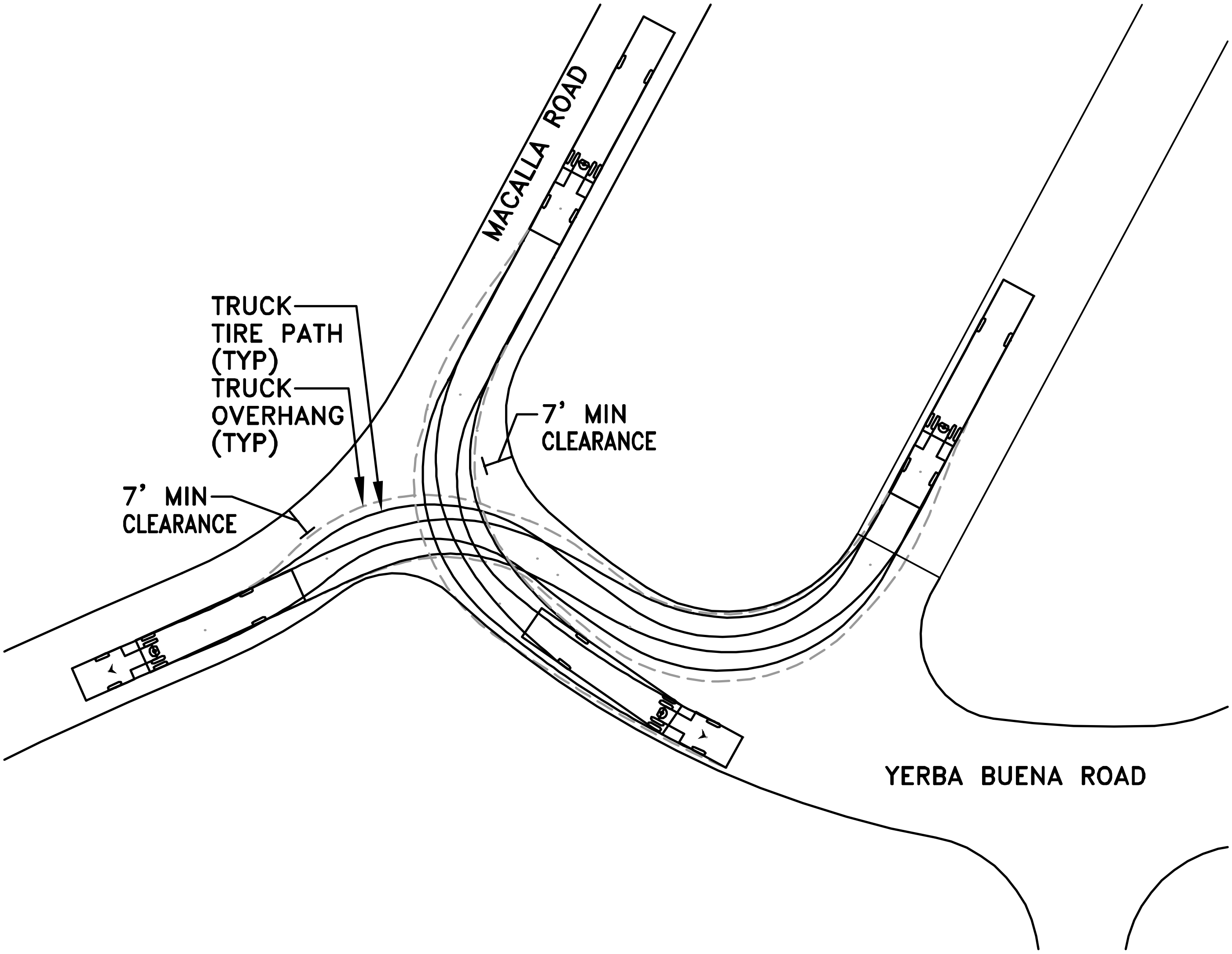


Figure 8.12: Primary Fire Department Access

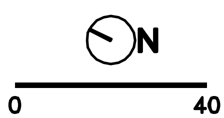


Source: BKF Engineers, October 2010

Figure 8.13.1: Fire Truck Turning at Intersections



INTERSECTION AT MACALLA RD AND YERBA BUENA ROAD ON YBI



Source: BKF Engineers, October 2010

Figure 8.13.2: Fire Truck Turning at Intersections

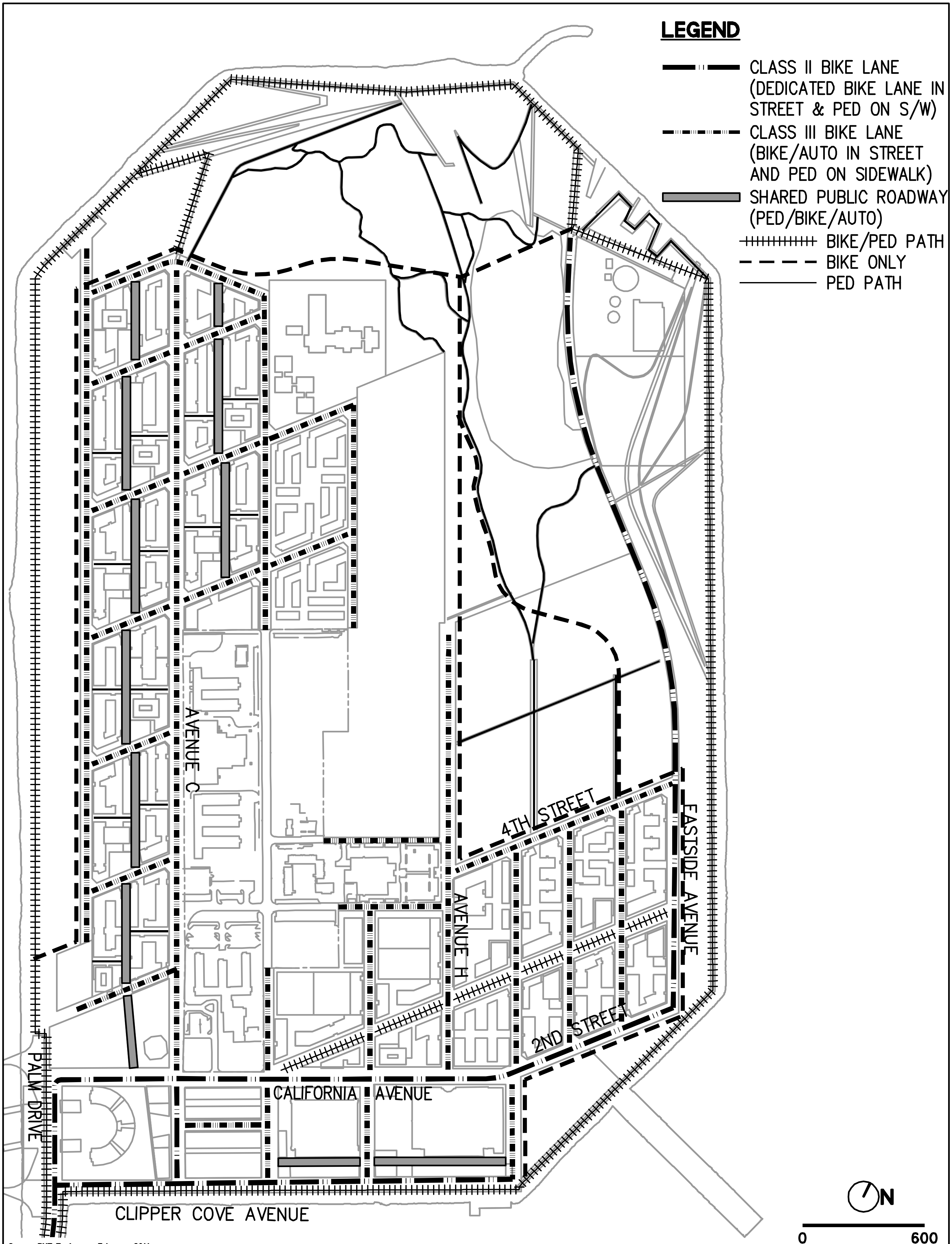


Figure 8.14.1: Treasure Island Bicycle and Pedestrian Paths

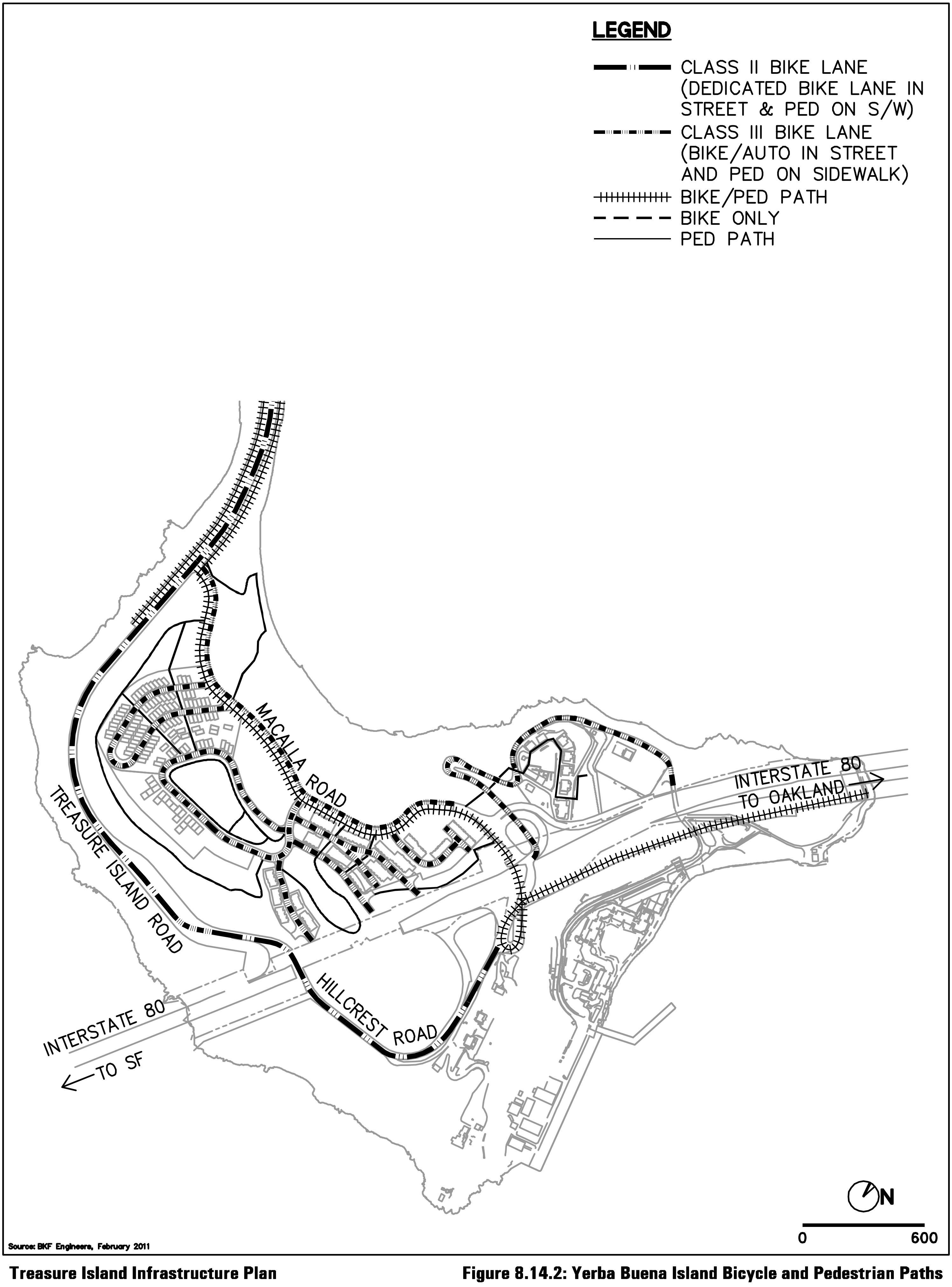


Figure 8.14.2: Yerba Buena Island Bicycle and Pedestrian Paths

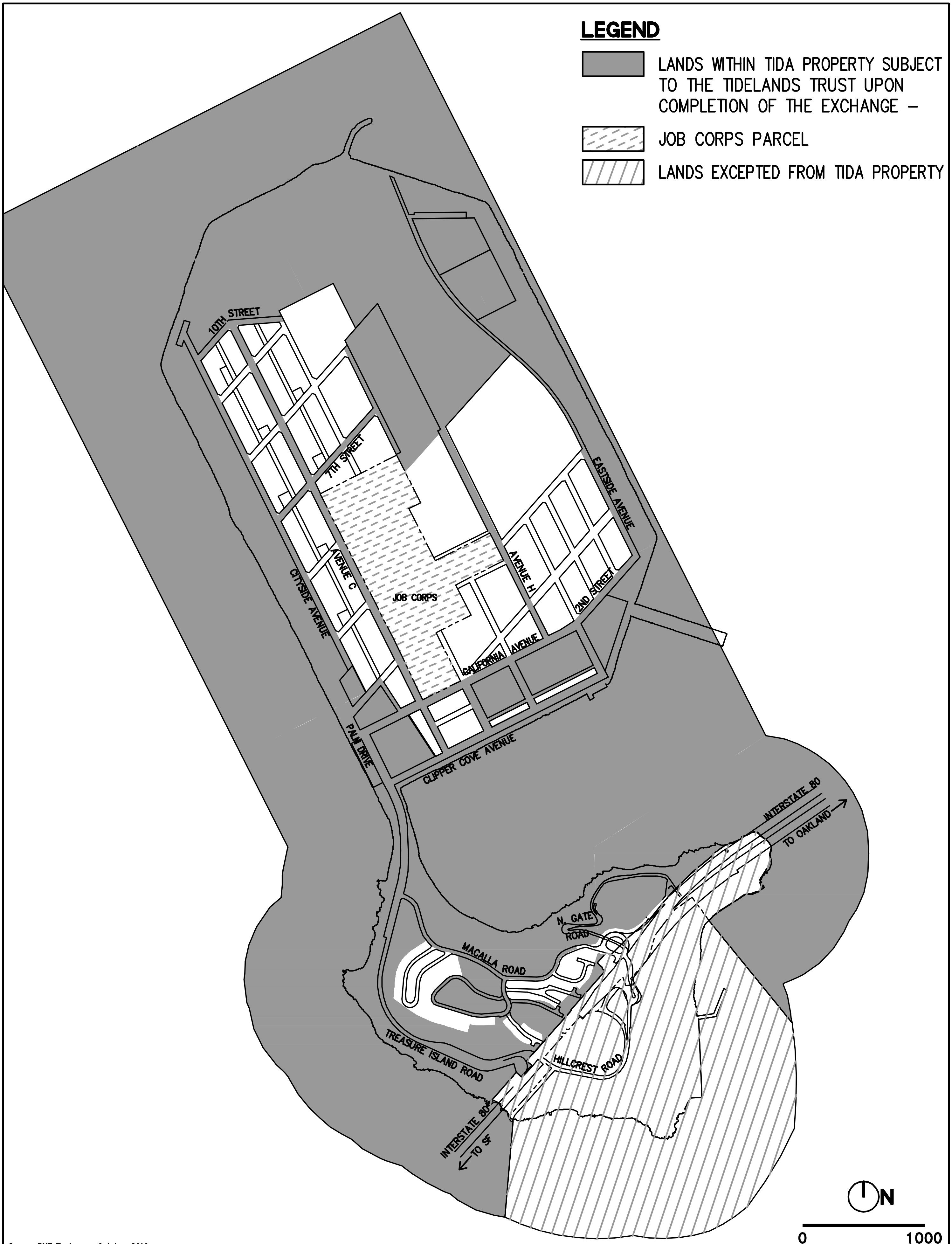


Figure 8.15: Streets and Paths within Public Trust Areas

9. POTABLE WATER SYSTEM

9.1 Existing System

9.1.1 Existing Water Supply

There are two existing sources of water supply serving Treasure Island. The primary supply is provided by the San Francisco Public Utilities Commission (SFPUC) through an existing 10-inch diameter steel pipe attached to the western span of the Bay Bridge. Water is pumped across the bridge by a pumping station located at 475 Spear Street in San Francisco. The station contains four pumps each rated at 900 gallons per minute (gpm). The station can run a maximum of two pumps at a time for a maximum station output of 1,800 gpm.

The East Bay Municipal Utility District (EBMUD) provides the existing emergency supply of water. The Navy's emergency water line begins at an EBMUD meter located in Beach Street in Emeryville. From the EBMUD meter location, the Navy's 12-inch diameter ductile iron main runs to an existing pump station located at Pier E23 of the existing Bay Bridge in Oakland. Water is then pumped through a 12-inch diameter steel pipe attached to the eastern span of the Bay Bridge. This water supply charges the fire hydrants on the Bridge and is connected to the existing water tanks on YBI for an emergency backup water supply. The maximum flow rate for this system is reported to be 1,500 gpm. There is currently an agreement in place between EBMUD and the Navy that limits the average annual flow 61 gallons per minute to maintain water quality in the line on the bridge. Actual average annual flows are well below that limit, at approximately 35 gpm. The SFPUC will provide emergency water supply services to the Project. The Navy's emergency water line is intended to be transferred first to the Authority and ultimately to the SFPUC, subject to future negotiation and agreement. Once transferred the SFPUC will be responsible for the ownership and maintenance of the line and the agreement with EBMUD, as well as other improvements as necessary to provide emergency water supply services to the Project.

9.1.2 Existing Water Storage

There are currently four existing concrete reservoirs on Yerba Buena Island that service both Yerba Buena Island and Treasure Island. Combined they have a total design capacity of approximately 6.5 million gallons to serve as both the potable and fire protection water supplies for Treasure Island and Yerba Buena Island. However, all of the tanks are in varying states of disrepair and cannot operate to their full design capacity. The actual operating storage capacity is approximately 1.9 million gallons with another 0.5 million gallons dedicated for fire protection. The design capacities, operating capacities, and operating elevations of the existing reservoirs are shown in Table 9.1.

Table 9.1 – Existing Reservoir Data

Reservoir Number	Design Capacity (million gallons)	Current Operating Capacity (million gallons)	Operating Elevation Range (NAVD88)	Primary Service
227	3.0	0.0	252.5 to 255.5	TI
162	2.0	1.3	322.0 to 327.0	YBI
168	0.5	0.5	356.0 to 359.0	Fire Reserve
242	1.0	0.6	247.0 to 251.0	TI/YBI

The elevations of the existing reservoirs provide an operating pressure of approximately 100-115 pounds per square inch (psi) on TI and 80 psi on YBI (pressures at the higher areas of YBI are achieved with booster pumps).

The existing operational water storage tanks will be utilized on an interim basis during the initial phases of the Project but will be replaced by the Developer before projected demands exceed the existing capacity.

9.1.3 Existing Water Distribution System

The two original piping systems for potable water and fire protection for the Islands was constructed in 1939 out of copper, galvanized steel, and asbestos cement pipe. In 1990, the Navy combined the two systems and replaced the pipe material with PVC pipe. Many of the individual building services and irrigation services originally constructed out of galvanized steel, however, have not been replaced. The relatively new PVC pipe system will be utilized on an interim basis during the initial phases of the Project, but will eventually be replaced at the full build out of the project.

9.2 Proposed Potable Water System

9.2.1 Proposed Water Demands

The potable water demand factors used for the Projects various land uses are shown in Table 9.2. The potable demands account for the use of water conserving fixtures in all buildings, the use of recycled water for toilet flushing and other non potable water uses in commercial buildings, and the use of recycled water for irrigation uses where appropriate. The project will also use recycled water for appropriate plumbing fixtures in residential buildings to the extent permitted at the time of construction. Therefore two residential demand factors have been included; 1) without recycled water for toilet flushing in residential buildings, and 2) with recycled water for toilet flushing in residential buildings.

The total estimated water demands for the Project land uses are shown on Table 9.3 (without recycled water use in residential units for toilet flushing) and Table 9.4 (with recycled water use in residential units for toilet flushing). These tables include the demands for the Project as well as the existing demands for the Department of Labor and the Coast Guard.

Table 9.5 includes a summary of the average daily demands and maximum day demands for potable water with, and without, the use of recycled water in the residential units. Because of the size of the proposed Project, the relatively homogeneous use, and the use of recycled water for the irrigation needs, the project will use a maximum day demand factor of 1.2 times the average daily demand.

Table 9.2 – Treasure Island Project Potable Water Demand Factors

Land Use	Potable Water Demand Factor	Notes
Residential (w/o recycled water)	116.5 gallons per day per unit (50 gallons per resident per day * 2.33 residents per unit)	SFPUC 2030 water conserving projections Resident./unit based on SFPUC Demands Report
Residential (w/ recycled water)	101.6 gallons per day per unit (additional 14.9 gpd/u of rec. water for toilet flushing) (43.6 gallons per resident per day * 2.33 residents per unit)	SFPUC 2030 water conserving projections Resident/unit based on SFPUC Demands Report
Hotel	265 gallons per day per room (additional 7gpd/room of rec. water for toilet flushing)	AWWA Standard
Office / Retail / Commercial	0.07 gallons per day per square feet (additional 0.0344 gpd/sf of recycled water) ((30 persons per acre * 100 gallons per person per day) / (43,560 square feet per acre))	
Adaptive Reuse	0.07 gallons per day per square feet (additional 0.0344 gpd/sf of recycled water) ((30 persons per acre * 100 gallons per person per day) / 43,560 square feet per acre))	
Open Space	100 gallons per day per acre (additional 180,000 gpd for irrigation demand)	Includes misc. drinking fountains, bathrooms, etc.
Misc. Structures	0.07 gallons per day per square feet (additional 0.025 gpd/sf of recycled water) (1 person per 200 square feet * 15 gallons per person per day)	Includes miscellaneous structures in open space, and YBI historic structures
Marina	50 gallons per day per slip	Day use only (no live-aboard)
School	0.20 gallons per day per square feet (1 student per 100 square feet * 20 gallons per student per day)	
Police/Fire Station	0.13 gallons per day per square feet (additional 0.067 gpd/sf of recycled water) (400 persons per day for 30,000 square feet * 10 gallons per person per day)	
Misc. Small Community Facilities	0.07 gallons per day per square feet (additional 0.0344 gpd of recycled water) ((30 persons per acre * 100 gallons per person per day) / (43,560 square feet per acre))	
Pier 1 Community Center	0.07 gallons per day per square feet (additional 0.034 gpd/sf of recycled water) ((30 persons per acre * 100 gallons per person per day) / (43,560 square feet per acre))	
Sailing Center	0.07 gallons per day per square feet (additional 0.034 gpd/sf of recycled water) ((30 persons per acre * 100 gallons per person per day) / (43,560 square feet per acre))	
Museum	0.07 gallons per day per square feet (additional 0.034 gpd/sf of recycled water) ((30 persons per acre * 100 gallons per person per day) / (43,560 square feet per acre))	
Department of Labor	111,254 gallons per day (Based on actual demands provided by SFPUC)	
Coast Guard Facility	17,000 gallons per day (Based on actual demands provided by SFPUC)	
Utility Facilities	0.07 gallons per day per square feet (additional 0.034 gpd/sf of recycled water) ((30 persons per acre * 100 gallons per person per day) / (43,560 square feet per acre))	
Urban Farm	100 gallons per day per acre	

Table 9.3 - Treasure Island Project Water Demand (without recycled water for residential toilet flushing)

DESCRIPTION OF USE			POTABLE WATER DEMAND			RECYCLED WATER DEMAND	
Land Use	**No.**	**Unit**	**Average Daily Demand (gpd)**	**Average Daily Demand (gpm)**	**Maximum Daily Demand (gpm)**	**Average Daily Irrigation Demand (gpd)**	**Average Daily Building Demand (gpd)**
Residential	8,000	Units	932,000	647	777	30,000	0
Hotel	500	Rooms	132,500	92	110		3,500
Office	100,000	sf	7,000	5	6		3,500
Retail	140,000	sf	9,800	7	8		4,900
Adaptive Reuse, General	244,000	sf	17,080	12	14		8,540
Adaptive Reuse, Retail	67,000	sf	4,690	3	4		2,345
Open Space	300	ac	30,000	21	25	180,000	0
Miscellaneous Structures	75,000	sf	5,625	4	5		1,875
Marina	400	Slips	20,000	14	17		0
Treasure Island School	105,000	sf	21,000	15	18		0
Police/Fire	30,000	sf	4,000	3	3		2,000
Misc. Small Community Facilities	13,500	sf	945	1	1		473
Pier 1 Community Center	35,000	sf	2,450	2	2		1,225
TI Sailing Center	15,000	sf	1,050	1	1		525
Museum	75,000	sf	5,250	4	4		2,625
Department of Labor (DOL)			111,542	77	93		0
Coast Guard Facility			17,000	12	14		0
Utility Facilities	14,000	sf	980	1	1		490
Urban Farm	20	ac	2,000	1	2	60,000	0
Totals			**1,324,912**	**920**	**1,104**	**270,000**	**31,998**

Table 9.4 - Treasure Island Project Water Demand (with recycled water for residential toilet flushing)

DESCRIPTION OF USE			POTABLE WATER DEMAND			RECYCLED WATER DEMAND	
Land Use	No.	Unit	Average Daily Demand (gpd)	Average Daily Demand (gpm)	Maximum Daily Demand (gpm)	Average Daily Irrigation Demand (gpd)	Average Daily Building Demand (gpd)
Residential **(with toilet recycled water)**	8,000	Units	812,704	564	677	30,000	119,296
Hotel	500	Rooms	132,500	92	110		3,500
Office	100,000	sf	7,000	5	6		3,500
Retail	140,000	sf	9,800	7	8		4,900
Adaptive Reuse, General	244,000	sf	17,080	12	14		8,540
Adaptive Reuse, Retail	67,000	sf	4,690	3	4		2,345
Open Space	300	ac	30,000	21	25	180,000	0
Miscellaneous Structures	75,000	sf	5,625	4	5		1,875
Marina	400	Slips	20,000	14	17		0
Treasure Island School	105,000	sf	21,000	15	18		0
Police/Fire	30,000	sf	4,000	3	3		2,000
Misc. Small Community Facilities	13,500	sf	945	1	1		473
Pier 1 Community Center	35,000	sf	2,450	2	2		1,225
TI Sailing Center	15,000	sf	1,050	1	1		525
Museum	75,000	sf	5,250	4	4		2,625
Department of Labor (DOL)			111,542	77	93		0
Coast Guard Facility			17,000	12	14		0
Utility Facilities	14,000	sf	980	1	1		490
Urban Farm	20	ac	2,000	1	2	60,000	0
Totals			**1,205,616**	**837**	**1,005**	**270,000**	**151,294**

Table 9.5 Summary of Average and Maximum Daily Potable Water Demands

Description of Demand	w/o Recycled Water in Residential Units mgd (gpm)	w/ Recycled Water in Residential Units mgd (gpm)
Average Daily Demand	1.32 (920)	1.21 (837)
Maximum Daily Demand	1.59 (1,104)	1.45 (1,005)

9.2.2 Proposed Water Supply

9.2.2.1 Primary Water Supply

The existing SFPUC pump station in San Francisco and 10-inch line on the western span of the Bay Bridge are adequate to provide the required water supply to the project at full build out and will continue to be the primary supply of water to Treasure Island. As with other water systems in the City, the SFPUC will continue to monitor the condition of this system and perform routine maintenance and repairs to ensure reliable service to the islands.

9.2.2.2 Emergency Water Supply

The emergency water supply to Treasure Island will continue to be from the EBMUD service in Oakland. Caltrans' construction of the new eastern span of the Bay Bridge, the Eastern Span Seismic Safety Project (ESSSP), is requiring modifications to the EBMUD service near the bridge abutment in Oakland and across the bridge. The new improvements will include:

- Relocation of the water main to the new Bay Bridge abutment.
- New pump station near the new Bay Bridge abutment in Oakland.
- New 12-inch diameter water line on the new Bay Bridge
- New stub and shut off valve on YBI near column W-2 of the new Bay Bridge structure.

The SFPUC will provide emergency water supply services to the Project. Subject to future negotiation and agreement, it is intended that the SFPUC will construct, or reimburse Caltrans, for all of these items separately and they are not considered part of this project. The Developer will construct the extension of the emergency water line from column W-2 to the water tanks on YBI.

The EBMUD emergency system will be capable of delivering approximately 1,800 gpm during emergency conditions. The system will continue to operate within the existing limit of 61 gpm in average annual flow. This modest routine use is needed to maintain the water quality in the line across the Bay Bridge. If transferred to the City, the

SFPUC will continue to monitor the condition of this system and perform routine maintenance and repairs to ensure reliable service to the Islands.

9.2.3 Proposed Potable Water Storage

For the following discussion, all tank volumes described refer to "operational storage" that can be drawn from the tank at any given time. All tanks will require an additional amount of "dead storage" that cannot be accessed under normal operations.

The storage volume requirement for Treasure Island will be 2 days of maximum daily demand plus 4 hours of fire flow. The existing water storage tanks will be utilized on an interim basis during the initial phases of the Project but will eventually be replaced by the Developer before the project storage requirements exceed the existing volume available. The new water storage tanks will be sized to serve both the proposed new uses, as well as the existing uses that will remain.

Based on the maximum daily demand of 1.59 mgd and a fire flow of 3,500 gpm, the total water storage required for the full build out of the project is 4.02 million gallons. This volume assumes recycled water will not be allowed in the residential buildings. If recycled water is allowed within the residential buildings at the time the water tanks are constructed, the total volume will be reduced to 3.73 million gallons (1.45 mgd maximum daily demand plus 4 hours of fire flow).

In addition to the normal storage requirements described above, the storage design will also need the ability to accommodate the maintenance of storage tanks. During maintenance, one tank, or portions of a tank, will need to taken out of service. During these regularly scheduled maintenance periods the SFPUC requires the Treasure Island project to maintain a minimum storage of 1 day maximum daily demand plus 4 hours of fire storage, or approximately 2.43 million gallons of storage, at all times.

In order to meet the emergency and maintenance storage requirements, the Developer will design and construct two tanks on YBI pursuant to SFPUC standards. The proposed tank locations are shown on Figure 9.1. The existing 1.0 million gallon, circular, steel water storage tank adjacent to Macalla Road will be replaced with a new 1.0 million gallon, above grade, circular, steel water storage tank in the existing location. The remainder of the storage will be in a 3.02 million gallon water storage tank located at a higher elevation on YBI. Two locations are being considered for this tank as shown on Figure 9.1. The final location of this tank will be determined with the Sub-Phase application that requires the addition of the tank. The 3.02 million gallon tank will be divided into two 1.51 million gallon cells to accommodate maintenance and provide a minimum of 2.51 million gallons of storage at all times during maintenance. Together, the two tanks will provide 4.02 million gallons of storage.

The upper storage tank (3.02 million gallons) will be supplied by water pumped directly from the 10-inch supply line from San Francisco, and the back up supply from EBMUD during emergencies. Supply to the lower, 1.0 million gallon tank will flow from the 3.02 million gallon tank by gravity. Because of the elevation of the 1.0 million gallon tank, it is likely that there will need to be a pressure-reducing valve between the tank and the Treasure Island service area. The upper storage tank is not high enough to provide service with adequate pressure to the upper portions of YBI. Therefore, the Developer will design and construct a booster pump station with redundant pumps, alarm system, emergency generator, and hydropneumatic tank near the upper tank to provide fire flow and potable demands to these YBI areas.

9.2.4 Proposed Potable Water Distribution System

The Developer will be responsible for the design and construction of the proposed potable water distribution system. The California Code of Regulations, Title 22, requires that the water distribution system be capable of delivering the maximum daily demand coincident with the required fire flow. Based on the demand calculations described above, the proposed water system will be designed to deliver the maximum daily demand of 1,104 gpm (assumes no recycled water for toilet flushing in residential units) along with the design fire flow of 3,500 gpm with a minimum residual pressure of 20 pounds per square inch at the fire hydrant outlets on the Island. Because of the elevations of the water tanks on YBI, the distribution system will include pressure-reducing valves at strategic locations to control the pressures at the lower elevations.

The Developer will replace the existing water distribution system in phases with a new water system. The pipe material for the new mains will meet the SFPUC standards but alternative pipe materials such as High Density Polyethylene (HDPE) or polyvinyl chloride (PVC) may be used if approved by the SFPUC. A conceptual layout of the proposed potable water distribution system is shown on Figure 9.2.

Flexible connections or other flexible system designs will be utilized where differential settlement may be of concern due to long term settlement anticipated due to secondary compression of the soils or minimal amounts of remaining liquefaction due to seismic events. Final designs to be reviewed by SFPUC.

9.2.4.1 Location of Distribution System within New Streets

Figure 9.3 shows the typical alignment of the new water system within the proposed streets.

9.2.4.2 Potable Water System Design Criteria

The design criteria used for the development of the potable water system is based upon established industry operations and regulatory agency requirements described in the Treasure Island Potable Water Technical Memorandum submitted by the Developer. In subdivision processing, including the review and approval of subdivision improvements plans, the precise location and final design of the potable water system will be generally consistent with this Infrastructure Plan and the Potable Water Technical Memorandum.

9.3 Potable Water Fire Protection

The potable water system will be the primary fire water supply for the Island. The recycled water system will provide a supplemental fire water supply as described in Section 11.

The potable water system will be designed to provide the maximum daily demand plus a design fire flow of 3,500 gpm. The 3,500 gpm fire flow will provide adequate fire protection for the new construction. The existing historical structures to remain will be retrofitted with appropriate fire protection systems when they are remodeled for commercial use and will be designed based on the 3,500 gpm flow available. The 3,500 gpm fire flow is more than the existing system provides to the Job Corps and Coast Guard. Upgrades to existing building systems on the Job Corps and Coast Guard campus are not part of this project.

The Developer will coordinate with the SFFD for the final location of potable water fire hydrants around the Project.

9.4 Coast Guard and Job Corps

The Developer will not replace the water facilities within the Coast Guard and Job Corps properties. The Developer will construct the new systems, including connection and/or transition facilities, up to the boundary of these two property owners and connect to their existing systems to maintain the existing water services.

9.5 Phases for Potable Water System Construction

The Developer will design and install the new potable water system in phases to match the Sub-Phase of the Project. The amount of the existing system replaced with each Sub-Phase will be the minimum necessary to serve the Sub-Phase. The new Sub-Phase will connect to the existing systems as close to the edge of the Sub-Phase area as possible while maintaining the integrity of the existing system for the remainder of the Island. The existing land uses on Treasure Island will continue to utilize the existing water distribution system with interim connections to the new system where required to maintain the existing service until the existing uses are demolished. Repairs and/or replacement of the existing facilities necessary to serve the sub-phase will be designed and constructed by the Developer.

The existing operational water storage tanks will be utilized during initial phases of the Project. The Developer will replace and/or add storage tanks to meet the projected demand before the phases of the Project result in water demand that exceeds the operational capacity of the existing storage tanks. The Authority or the SFPUC will be responsible for maintenance of existing potable water facilities until replaced by the Developer. The SFPUC will be responsible for the new potable water facilities once construction of the Sub-Phase or new potable water facility is complete and accepted by the SFPUC.

The Developer will provide an existing conditions report for the existing water mains scheduled to remain adjacent to the Sub-Phase prior to the geotechnical mitigation activity. The report will include the conditions of the original system on TI as well as the new system constructed with previous phases adjacent to the new Phase. The report will be updated at the end of the geotechnical mitigation activity and again at the end of the construction of the Sub-Phase. The limit of the report and how the conditions of the systems are determined will be coordinated with the SFPUC. The Developer will be responsible for damage to the original water mains, and/or newly installed water mains on previous phases, due to geotechnical mitigation activity and/or construction of the proposed improvements. The Developer will make the necessary repairs as required and be responsible for any permit violations due to the damage.

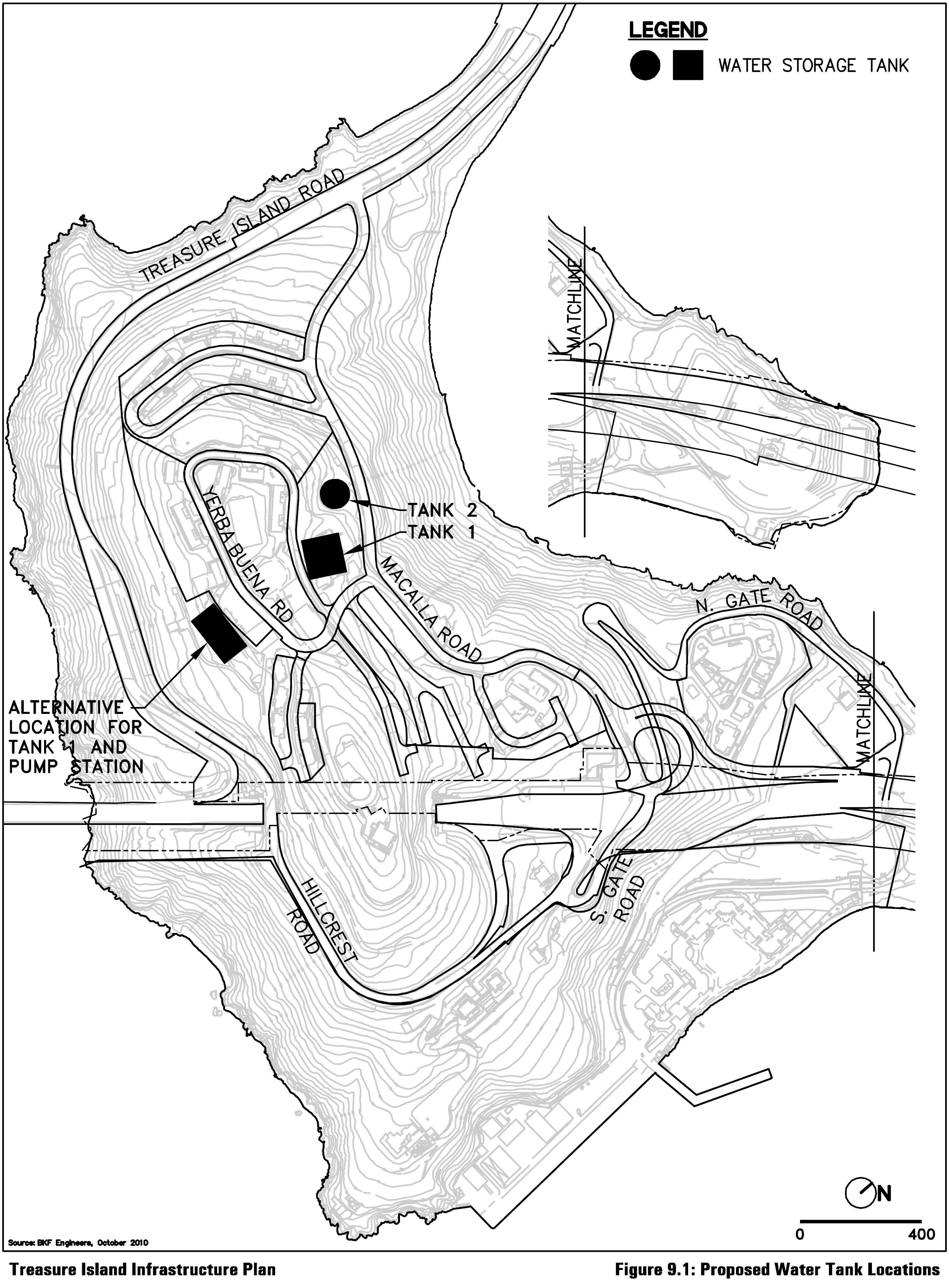
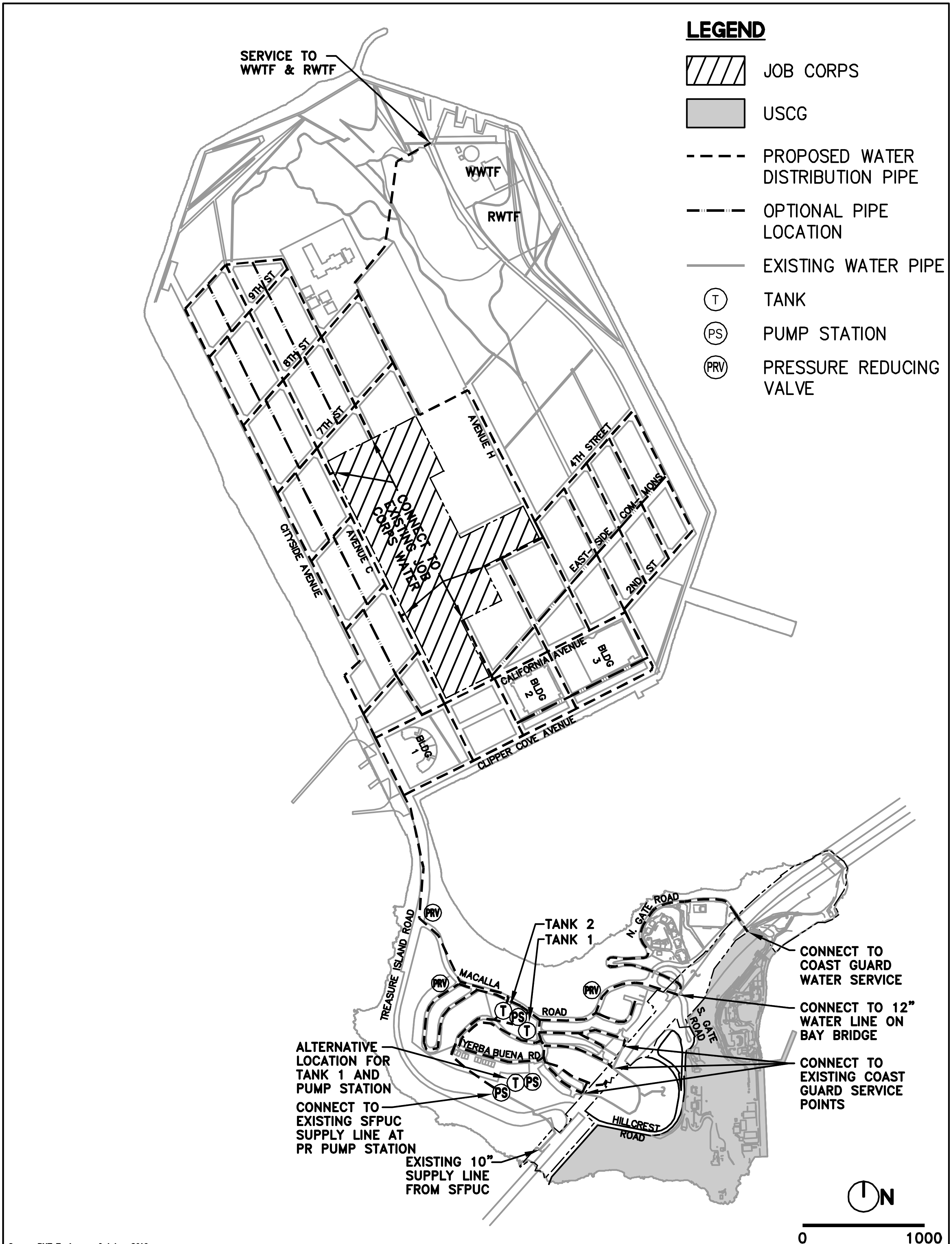


Figure 9.1: Proposed Water Tank Locations



Source: BKF Engineers, October 2010

Figure 9.2: Proposed Potable Water Distribution System

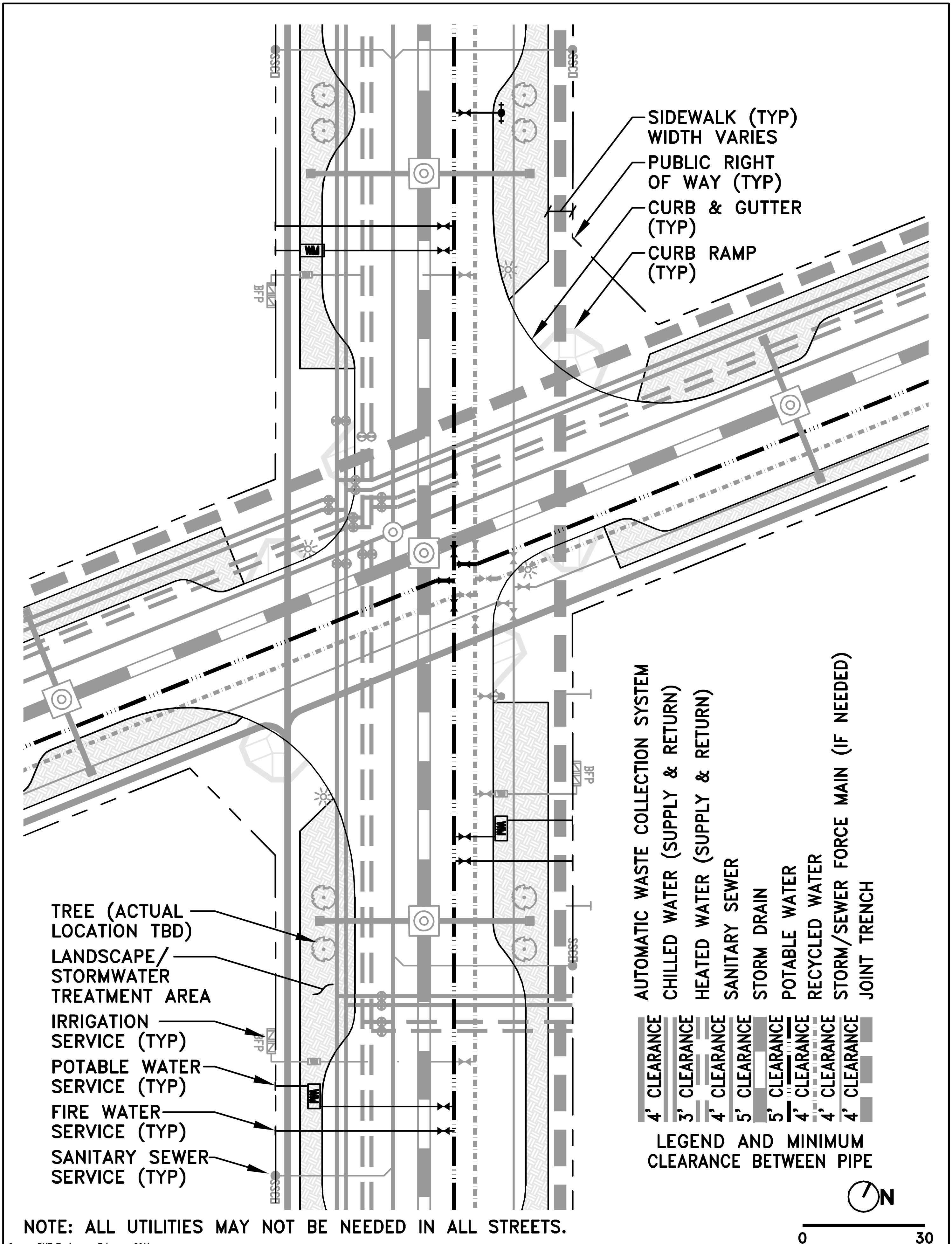
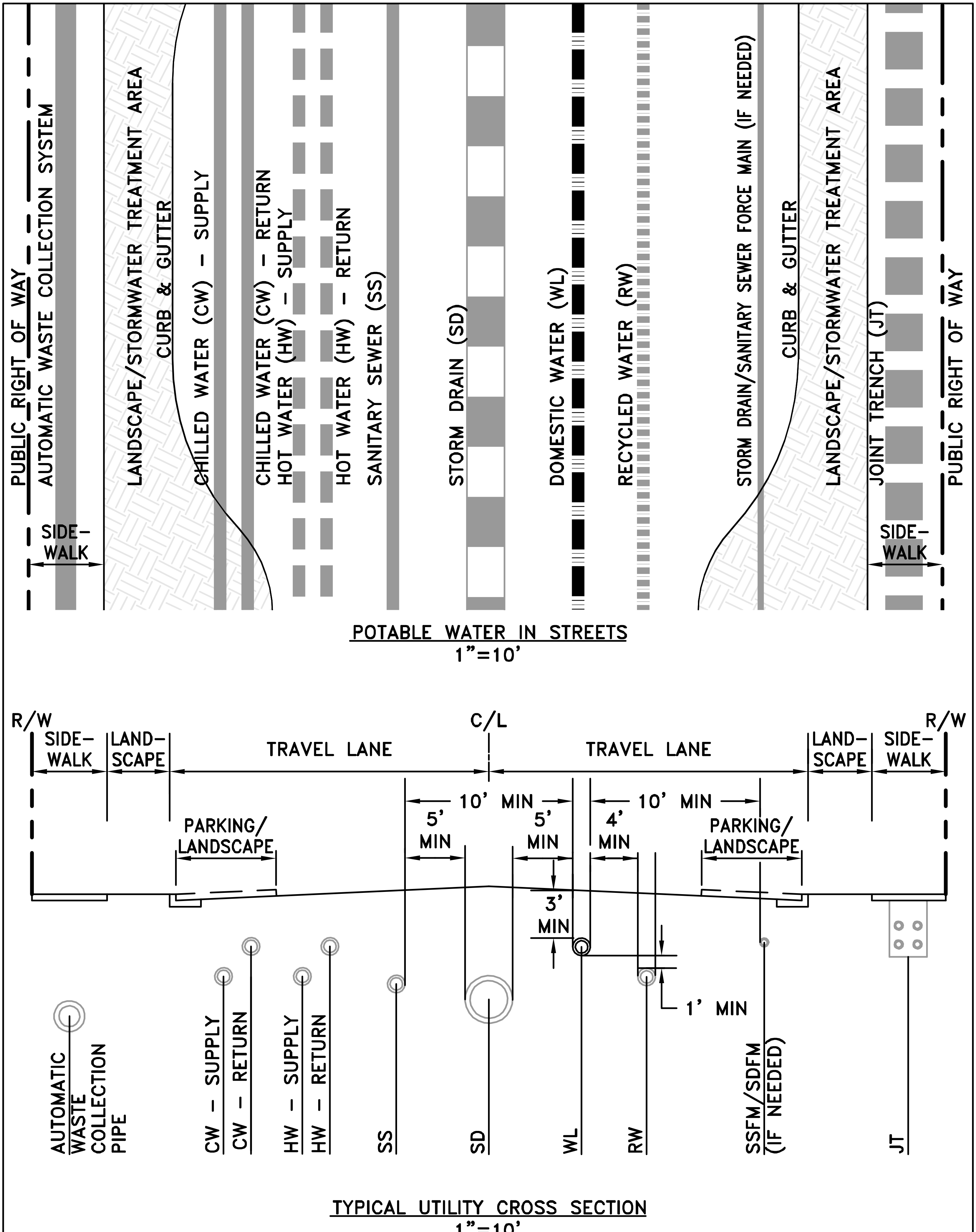


Figure 9.3.1: Detail of Potable Water System Location in Streets



Source: BKF Engineers, February 2011

Figure 9.3.2: Detail of Potable Water System Location in Streets

10. WASTEWATER SYSTEM

10.1 Existing Wastewater System

10.1.1 Existing Wastewater Collection System

Unlike most of San Francisco, the existing wastewater system on Treasure Island is a separate system from the storm drain system. The existing wastewater collection system for the Island consists of 4-inch to 12-inch diameter gravity lines, approximately 29 sewage pump/lift stations, and force mains ranging from 6- to 16-inch diameter. Pipe materials include PVC, asbestos cement, cast iron, steel, and vitrified clay. The pump/lift stations consist of both dry well and wet well systems.

The existing wastewater system on TI consists of 11 main drainage areas that pump into one force main trunk line. In general, each of these main drainage areas includes a combination gravity/lift station system that directs flow to its own central pump station. These pump stations then connect to the existing main trunk line that delivers the wastewater flow to the existing wastewater treatment facility located at the northeast corner of TI. The existing main trunk line begins in the southwest corner of TI near the Officers Club and follows California Avenue to the east and Avenue M to the north until it connects to the existing treatment facility. The total length of the main trunk line is approximately 5,300 feet and consists of 6- to 16-inch asbestos cement pipe.

The existing wastewater service on YBI is split into two systems. The eastern side of the Island, including the Coast Guard base, gravity drains to an existing pump station located under the Bay Bridge at the eastern tip of the Island. This pump station delivers the wastewater to the southern shore of TI via a 6-inch submarine force main. The western side of YBI gravity drains across the Causeway and connects to the TI system near the main entrance to TI.

10.1.2 Existing Wastewater Treatment Facility (WWTF)

The existing WWTF is located at the northeastern corner of TI and treats wastewater from the existing development on Treasure Island. The WWTF was constructed in 1961 to provide primary treatment, and was upgraded to secondary treatment in 1969. A second upgrade came in 1989 to bring the WWTF to its current treatment capacity of 2.0 million gallons per day (mgd) average dry weather flow, with a peak wet weather capacity of 8.0 mgd. The SFPUC will monitor the existing facility and upgrade/replace the system as necessary to meet the existing demands and increasing Project demands.

The discharge from the existing WWTF is governed by NPDES Permit No. CA0110116, Order No. R2-2010-001, issued by the California Regional Water Quality Control Board. The permit/order was adopted on January 10, 2010, became effective on March 1, 2010, and expires February 28, 2015. The permit allows a discharge of 2.0 mgd with a permitted peak flow, providing secondary treatment under west weather conditions of 4.4 mgd.

The permit was issued to the Navy as the owner and discharger. The WWTF is currently operated by the SFPUC Wastewater Enterprise, under an agreement with the Navy. The Authority and SFPUC will negotiate a separate utilities memorandum of understanding that will provide for the SFPUC to continue its activities as a contract provider of utility services during the interim period between the conveyance of the Project Site to the Authority and the installation of new utility infrastructure, including but not limited to the WWTF and its permit.

10.2 Proposed Wastewater System

10.2.1 Proposed Wastewater Demands

The total estimated wastewater demands for the Project land uses are shown on Table 10.1 (without recycled water use in residential units for toilet flushing) and Table 10.2 (with recycled water use in residential units for toilet flushing). The wastewater demands are based on 95% of the potable water demands plus 100% of the recycled water used for non-irrigation purposes.

Table 10.3 includes a summary of the Average Dry Weather Flow (ADWF), Peak Dry Weather Flow (PDWF), and Peak Wet Weather Flow (PWWF), for the Project with, and without, the use of recycled water in the residential units.

The PDWF is 1.8 times the ADWF.

The PWWF is the PDWF plus an allowance for groundwater infiltration. The assumed infiltration rate required by the SFPUC is 0.003 cfs (1,925.36 gpd) per acre for the development area. The Project development area where wastewater lines will be installed is approximately 300-acres (including the developed portions of TI, Department of Labor, YBI development area, and Coast Guard) for a total infiltration volume of 577,608 gpd.

Table 10.1 - Treasure Island Project Wastewater Demand (without recycled water for residential toilet flushing)

DESCRIPTION OF USE			POTABLE WATER DEMAND	RECYCLED WATER DEMAND	SEWER DEMAND
Land Use	No.	Unit	Average Daily Demand (gpd)	Average Daily Building Demand (gpd)	Average Daily Demand (gpd)
Residential	8,000	Units	932,000		885,400
Hotel	500	Rooms	132,500	3,500	129,375
Office	100,000	sf	7,000	3,500	10,150
Retail	140,000	sf	9,800	4,900	14,210
Adaptive Reuse, General	244,000	sf	17,080	8,540	24,766
Adaptive Reuse, Retail	67,000	sf	4,690	2,345	6,801
Open Space	300	ac	30,000		28,500
Miscellaneous Structures	75,000	sf	5,625	1,875	7,219
Marina	400	Slips	20,000	0	19,000
Treasure Island School	105,000	sf	21,000	0	19,950
Police/Fire	30,000	sf	4,000	2,000	5,800
Misc. Small Community Facilities	13,500	sf	945	473	1,370
Pier 1 Community Center	35,000	sf	2,450	1,225	3,553
TI Sailing Center	15,000	sf	1,050	525	1,523
Museum	75,000	sf	5,250	2,625	7,613
Department of Labor (DOL)			111,542	0	105,965
Coast Guard Facility			17,000	0	16,150
Utility Facilities	14,000	sf	980	490	1,421
Urban Farm	20	ac	2,000		1,900
Totals			**1,324,912**	**31,998**	**1,290,664**

Table 10.2 - Treasure Island Project Wastewater Demand (with recycled water for residential toilet flushing)

DESCRIPTION OF USE			POTABLE WATER DEMAND	RECYCLED WATER DEMAND	SEWER DEMAND
Land Use	No.	Unit	Average Daily Demand (gpd)	Average Daily Building Demand (gpd)	Average Daily Demand (gpd)
Residential (with toilet recycled water)	8,000	Units	782,880	149,120	892,856
Hotel	500	Rooms	132,500	3,500	129,375
Office	100,000	sf	7,000	3,500	10,150
Retail	140,000	sf	9,800	4,900	14,210
Adaptive Reuse, General	244,000	sf	17,080	8,540	24,766
Adaptive Reuse, Retail	67,000	sf	4,690	2,345	6,801
Open Space	300	ac	30,000	0	28,500
Miscellaneous Structures	75,000	sf	5,625	1,875	7,219
Marina	400	Slips	20,000	0	19,000
Treasure Island School	105,000	sf	21,000	0	19,950
Police/Fire	30,000	sf	4,000	2,000	5,800
Misc. Small Community Facilities	13,500	sf	945	473	1,370
Pier 1 Community Center	35,000	sf	2,450	1,225	3,553
TI Sailing Center	15,000	sf	1,050	525	1,523
Museum	75,000	sf	5,250	2,625	7,613
Department of Labor (DOL)			111,542	0	105,965
Coast Guard Facility			17,000	0	16,150
Utility Facilities	14,000	sf	980	490	1,421
Urban Farm	20	ac	2,000	0	1,900
Totals			**1,175,792**	**181,118**	**1,298,120**

Table 10.3 - Treasure Island Total Project Wastewater Demand Summary

Description of Flow	w/o Recycled Water in Residential Unit (gpd)	w/ Recycled Water in Residential Unit (gpd)
ADWF	1,290,664	1,298,120
PDWF	2,323,195	2,336,616
PWWF	2,900,803	2,914,224

10.2.2 Proposed Wastewater Collection System

The Developer will be responsible for the design and construction of the proposed wastewater collection system. The pipe material for the new system will meet the SFPUC standards but alternative pipe materials such as High Density Polyethylene (HDPE) or polyvinyl chloride (PVC) may be used if approved by the SFPUC. All of the existing pump/lift stations will be removed or replaced with new stations in phases designed to SFPUC standards as needed to serve the Project. The pump stations will include redundant pumps, alarm systems and emergency backup power supplies to run the pump stations when the power is out.

For YBI, the proposed wastewater collection system for the eastern side of the Island will designed and constructed to flow by gravity to the existing pump station located under the Bay Bridge near the Coast Guard facility. This existing pump station currently serves the eastern side of YBI and the Coast Guard. The Developer will coordinate with the SFPUC to evaluate the existing pump station and determine if it needs to be repaired or replaced. There are two alternative routes from the discharge of this pump station; 1) the station will pump wastewater up to the top of the YBI into a structure (manhole or vault) where it will transition from a force main to a gravity system and flow down to the TI system, or 2) the station will pump flows to the existing submarine force main that currently serves the eastern side of YBI and connect to the TI gravity sewer system. The Developer will coordinate with the SFPUC to determine the preferred route during the Sub-Phase Application process. The western half of YBI will utilize a gravity system to serve the residential units and connect to the TI system within the Causeway.

A conceptual layout of the proposed wastewater collection system is shown on Figure 10.1. The final designs shall optimize wastewater flows to ensure maximization of efficiency, and minimization and consolidation of required pump stations. The final number of pump stations will be based on a system layout that follows reasonable engineering standards and is economically feasible. Concurrent with each Major Phase Application, the overall design will be evaluated by the SFPUC to determine if additional feasible opportunities to increase efficiency or reduce the reliance on pump stations exist.

The gravity system will be designed to accommodate long term settlement anticipated due to secondary compression of the soils or minimal amounts of remaining liquefaction due to seismic events. Final designs to be reviewed by the SFPUC.

10.2.2.1 Location of Wastewater System within New Streets

Figure 10.2 shows the typical alignment of the new wastewater system within the proposed streets.

The angled orientation of the streets on TI will result in wastewater to flow in and out (through) manholes at a 68-degree reverse angle at many intersections. (see Figure 10.1).

10.2.2.2 Wastewater System Design Criteria

The design criteria used for the development of the wastewater system is based upon established industry operations and regulatory agency requirements described in the Treasure Island Wastewater Technical Memorandum submitted by the Developer. In subdivision processing, including the review and approval of subdivision improvements plans, the precise location and final design of the wastewater system will be generally consistent with this Infrastructure Plan and the Wastewater Technical Memorandum. The wastewater system shall be designed to SFPUC design standards and regulation, as modified in this Infrastructure Plan, with exceptions to case-by-case scenarios as approved by the SFPUC.

The following design criteria will be used to design the new stormwater collection system:

1. Velocity: Wastewater system velocity will be not less than 2 feet per second when flowing half full.
2. Minimum Depth of Cover: Minimum depth of cover shall be 4.0 feet. 3.0 feet minimum cover may be approved by SFPUC on a case-by-case basis.

10.2.2.3 Sanitary Sewer Overflow Mitigations

The State of California has recently adopted a Sanitary Sewer Overflow (SSO) Policy to eliminate, to the extent possible, the potential for sewer overflows into the San Francisco Bay. The potential for SSO occurs when pump stations fail, or if lines become plugged and the sewer flows enter the storm drainage system. To prevent potential SSOs, the pump stations proposed for the Project will include redundant pumps, alarm systems and emergency backup power supplies to run the pump stations when the power is out. In addition, the Developer will coordinate with the SFPUC and prepare an evaluation of the need for diverting stormwater first flush volumes to the sewer system for review and approval by the SFPUC prior to the approval of the first Major Phase application.

The elevations for the service lateral sewer vents will be above the 100-year storm event HGL.

10.3 Proposed Wastewater Treatment Facility (WWTF)

The SFPUC will provide wastewater treatment services to the Project. Subject to future negotiation and agreement between the Authority and the SFPUC on the provisions and terms upon which the SFPUC will provide such services it is intended that the SFPUC may finance, design, build, own, and operate a new Wastewater Treatment Facility (WWTF) on Treasure Island or provide for other improvements and/or agreements as necessary to provide wastewater treatment services to the Project. The existing WWTF would be upgraded and its capacity increased in order to meet projected demands in each Major Phase as the Project progresses. The new or upgraded WWTF would have the capacity to treat the estimated average dry-weather build out flow of 1.3 mgd (based on 95 percent of potable water demand and all of the recycled water demand except that used for irrigation) and the estimated peak wet-weather flow of 2.9 mgd (based on SFPUC standard peaking factors and inflow and infiltration allowance).

The treatment process will start with primary and secondary treatment. The specifics of these processes will be determined by the SFPUC. The volume of effluent needed for recycled water would then undergo further treatment to meet the requirements for use as recycled water in appropriate plumbing fixtures and for irrigation.

Two variants in the wastewater treatment process, each involving wetlands, are under consideration by the SFPUC. These wetlands, if constructed, would be separate from the 10-15 acre wetland proposed to treat stormwater before discharge to the Bay (see Section 12).

Under the first variant, treated effluent to be used for recycled water would be discharged to a wetlands designed and constructed for tertiary treatment before additional treatment to meet the recycled water quality standards. The wetlands would occupy about 5-acres and would include both open water areas and planted areas, with the water depth varying from 1.5 to 4 feet.

Under the second variant, effluent would undergo treatment to meet recycled water standards and then would be discharged to constructed wetlands prior to being discharged through the outfall. The

recycled water needed for the Project, however, would not pass through these wetlands. These wetlands would occupy about 2 to 4 acres of land, with water depth varying from 1.5 to 4-feet.

10.3.1 Revisions to Existing NPDES Permit

If the SFPUC agrees to construct and operate the new WWTF, the SFPUC will process amendments to the existing NPDES permit described above for the new/upgraded WWTF. The new permit will reflect the treatment processes that will be constructed, and the projected/permitted flows.

10.4 Coast Guard and Job Corps

The Developer will not replace the wastewater facilities within the Coast Guard and Job Corps properties. The Developer will construct new systems, including connection and/or transition facilities, up to the boundary of these two property owners and connect to their existing systems to maintain the existing wastewater collection services.

10.5 Phases for Wastewater System Construction

The Developer will design and install the new wastewater collection system to match the Sub-Phases of the Project. The amount of the existing system replaced with each Sub-Phase will be the minimum necessary to serve the Sub-Phase. The new Sub-Phases will connect to the existing systems as close to the edge of the new Sub-Phase as possible while maintaining the integrity of the existing system for the remainder of the Island. The existing land uses on Treasure Island will continue to utilize the existing wastewater collection system with interim connections to the new system where required to maintain the existing service until the existing uses are demolished. The existing wastewater pump/lift stations will continue to be used during the initial Sub-Phases of the Project. The existing pump/lift stations located within each Sub-Phase will be removed or replaced with that Sub-Phase. Repairs and/or replacement of the existing facilities necessary to serve the sub-phase will be designed and constructed by the Developer.

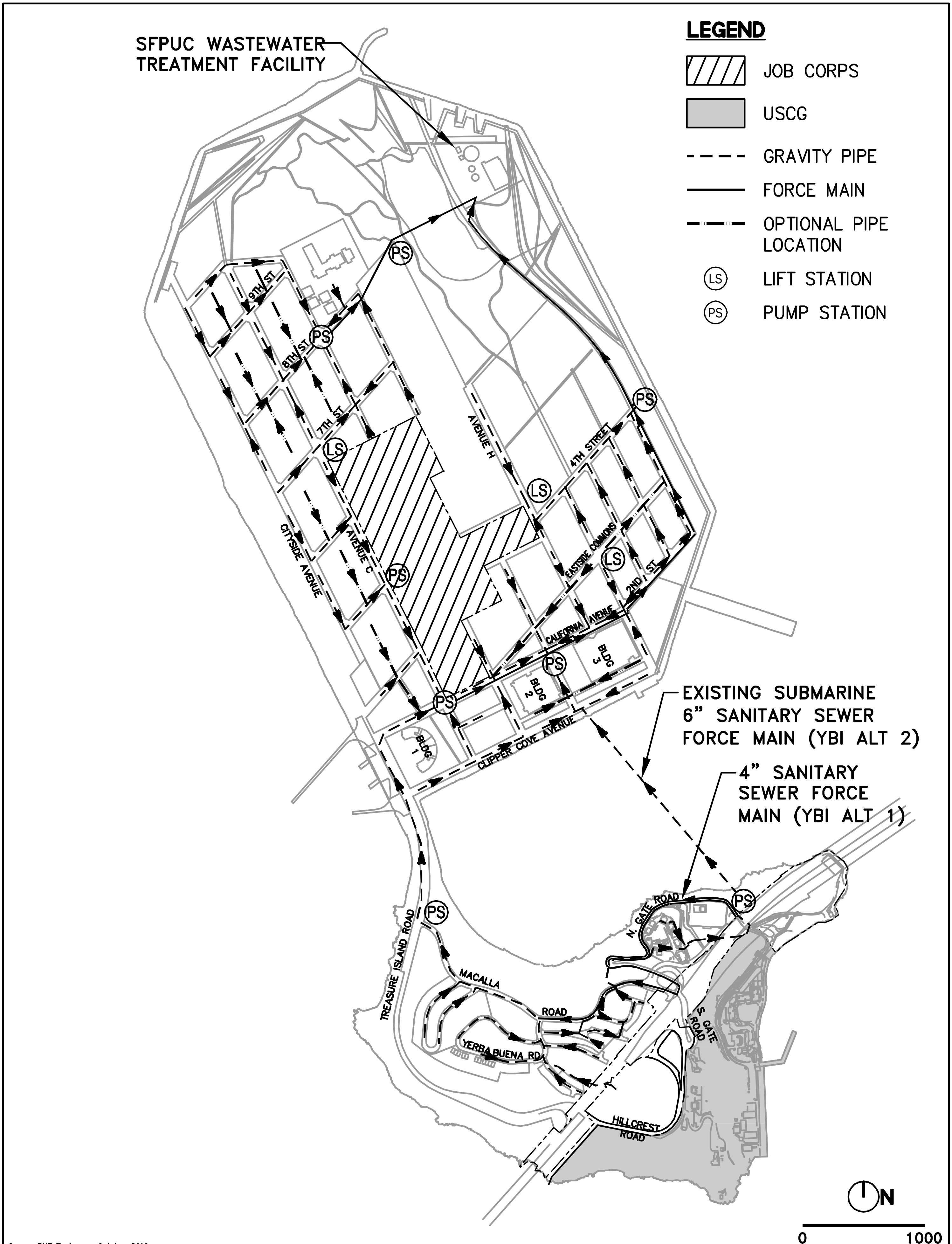
Subject to negotiating a separate utilities interim operations memorandum of understanding between the Authority or the SFPUC, either the Authority or the SFPUC will be responsible for maintenance

of existing collection facilities until replaced by the Developer. The SFPUC will be responsible for the new wastewater collection facilities once construction of the Sub-Phase or new wastewater collection facility is complete and accepted by the SFPUC.

The Developer will provide an existing conditions report for the existing wastewater mains scheduled to remain adjacent to the Sub-Phase prior to the geotechnical mitigation activity. The report will include the conditions of the original system on TI as well as the new system constructed with previous phases adjacent to the new Phase. The report will be updated at the end of the geotechnical mitigation activity and again at the end of the construction of the Sub-Phase. The limit of the report and how the conditions of the systems are determined will be coordinated with the SFPUC. The Developer will be responsible for damage to the original wastewater mains, and/or newly installed wastewater mains on previous phases, due to geotechnical mitigation activity and/or construction of the proposed improvements. The Developer will make the necessary repairs as required and be responsible for any permit violations due to the damage.

Subject to negotiating a separate utilities interim operations memorandum of understanding between the Authority and the SFPUC, either the Authority or the SFPUC will be responsible for operating and maintaining the existing WWTF.

The SFPUC will provide on-going wastewater treatment services to the Project. Subject to future negotiation and agreement between the Authority and the SFPUC on the provisions and terms upon which the SFPUC will provide such services, it is intended that the SFPUC will maintain, upgrade, design, replace and/or construct wastewater treatment facilities by the SFPUC during each phase of the Project to meet the ongoing and increasing flow requirements of the Project. The Developer will provide the Authority and the SFPUC with the anticipated Sub-Phase schedule and wastewater demands.



Source: BKF Engineers, October 2010

Figure 10.1: Proposed Wastewater Collection System

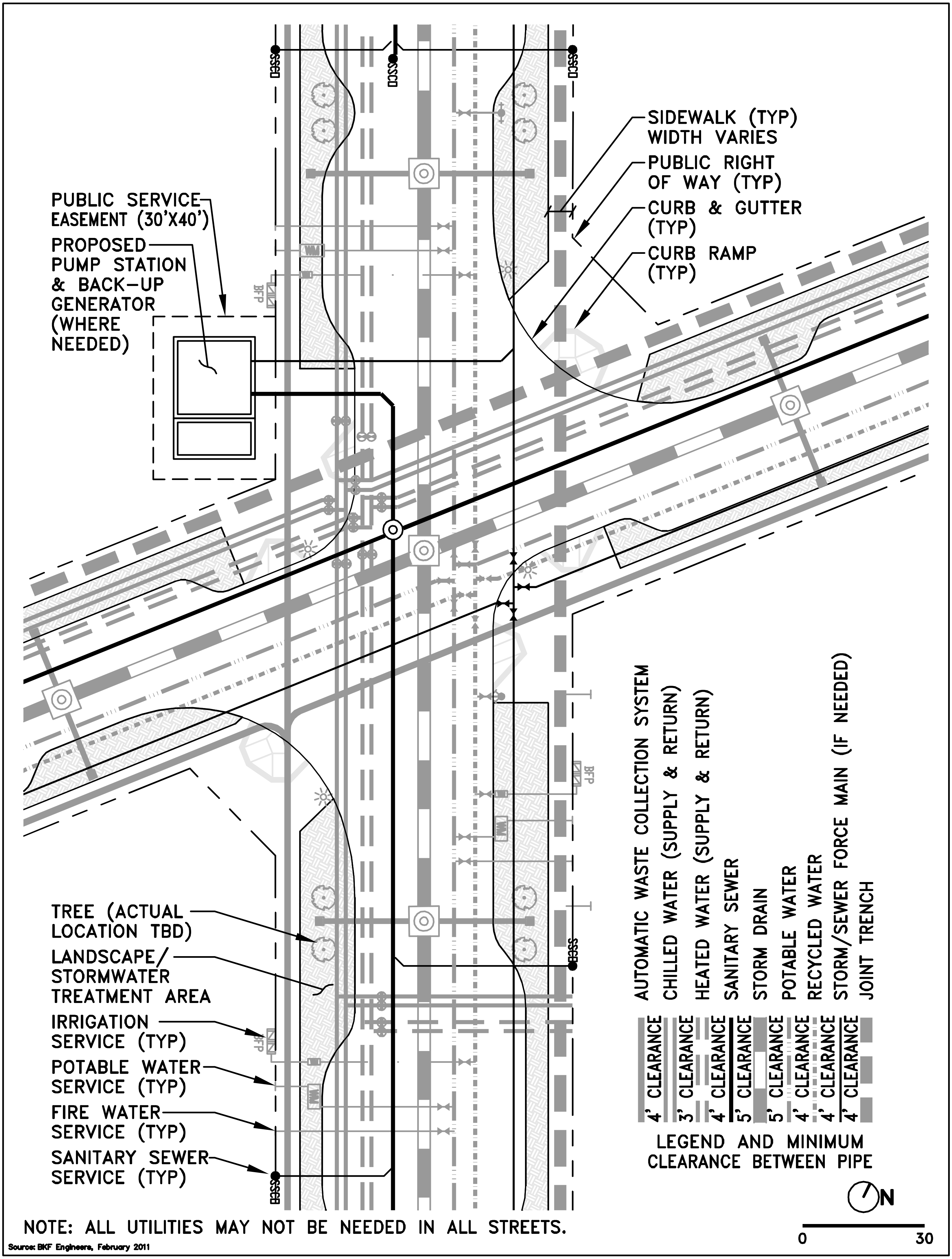
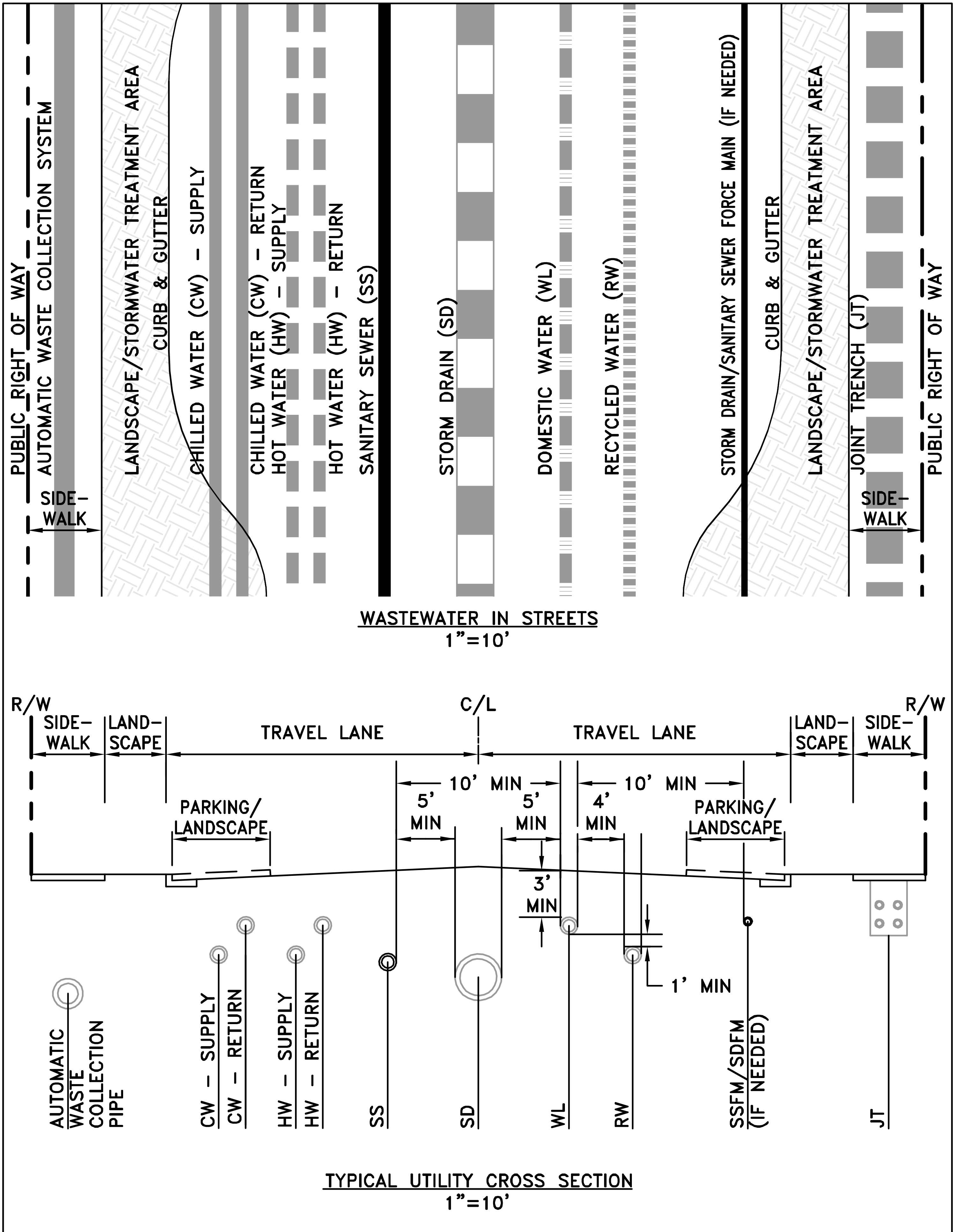


Figure 10.2.1: Detail of Wastewater Collection System in Streets



Source: BKF Engineers, February 2011

Figure 10.2.2: Detail of Wastewater Collection System in Streets

11. RECYCLED WATER SYSTEM

11.1 Existing System

Treasure Island does not currently have a recycled water system.

11.2 Proposed Recycled Water System

11.2.1 Proposed Recycled Water Demands

Recycled water will be used on TI for irrigation of the open space areas, urban farm, roadside planter areas, landscape water features, and appropriate plumbing fixtures within commercial buildings. Recycled water may also be used to maintain water levels in the stormwater treatment wetlands during the dry season. In addition, recycled water will be used on TI for appropriate plumbing fixtures in residential buildings to the extent permitted at the time of construction. Recycled water will not be used on YBI due to its distance from the recycled treatment plant and the pumping that would be required to meet the elevation change.

The recycled water demands for the various uses are shown in Table 11.1. Two residential demand factors have been included; 1) without recycled water for residential toilet flushing, and 2) with recycled water for residential toilet flushing. The total estimated demands are shown on Table 11.2 (without recycled water use in residential units for toilet flushing) and Table 11.3 (with recycled water use in residential units for toilet flushing).

11.2.2 Supplemental Source for Fire Protection

In addition to the recycled water demands described above, the recycled water system will also provide a supplemental source of water for fire protection in case of emergency. Fire protection will not increase the average daily demand for recycled water but will increase the storage requirements and require a more robust distribution system as described below.

In addition to the recycled water system for a supplemental source of fire protection, the Developer will install two fire boat manifolds (one near the new Ferry Quay and one near Pier 1) and two wharf hydrants (one near each historic hangar building). These items will allow the SFFD to draw bay water on to TI in case of emergency. The locations of these facilities are shown on Figure 11.1.

11.2.3 Proposed Recycled Water Treatment Facility (RWTF)

The SFPUC will provide recycled water treatment and/or delivery services to the Project. Subject to future negotiation and agreement between the Authority and the SFPUC on the provisions and terms upon which the SFPUC will provide such services, it is intended that the SFPUC will finance, design, build, own, and operate the new Recycled Water Treatment Facility (RWTF). The RWTF would be sized to meet the average long-term recycled water demand of 0.42 million gallons per day (mgd) and would provide recycled water treated to meet the requirements for use as recycled water in appropriate plumbing fixtures and irrigation as well as the stormwater wetlands to maintain seasonal flows.

If the recycled water demand exceeds the recycled water supply during the first Sub-Phases of the Project, the excess demand will be provided by the potable water system. A permanent potable water connection to the recycled water tanks will be provided and will include a backflow prevention device approved by the SFPUC. This permanent connection will provide a supplemental supply of water to the recycled system if needed during the initial phases of the project or in the future during maintenance of the recycled water tanks or if the production of recycled water is interrupted.

Table 11.1 – Recycled Water Demand Factors

Land Use	Recycled Water Demand Factor	Notes
Residential (w/o recycled water)	0 gallons per day per unit for toilet flushing 30,000 gpd total for irrigation within the development area	
Residential (w/ recycled water)	14.9 gpd/u of recycled water for toilet flushing 30,000 gpd total for irrigation within the development area	SFPUC 2030 water conserving projections Resident/unit based on SFPUC Demands Report
Hotel	7 gpd/room of rec. water for toilet flushing Assumes no grounds around the hotel for irrigation demand	AWWA Standard
Office / Retail / Commercial	0.035 gpd/sf of recycled water for appropriate plumbing fixtures	
Adaptive Reuse	0.035 gpd/sf of recycled water for appropriate plumbing fixtures	
Wetlands	30,000 gpd to maintain water level	
Open Space	150,000 gpd for irrigation demand	
Misc. Structures	0.025 gpd/sf of recycled water for appropriate plumbing fixtures	Includes miscellaneous structures in open space, and YBI historic structures
Marina	0 gallons per day	
School	0 gallons per day	
Police/Fire Station	0.067 gpd/sf of recycled water for appropriate plumbing fixtures	
Misc. Small Community Facilities	0.035 gpd of recycled water for appropriate plumbing fixtures	
Pier 1 Community Center	0.035 gpd/sf of recycled water for appropriate plumbing fixtures	
Sailing Center	0.035 gpd/sf of recycled water for appropriate plumbing fixtures	
Museum	0.035 gpd/sf of recycled water for appropriate plumbing fixtures	
Department of Labor	0 gallons per day	
Coast Guard Facility	0 gallons per day	
Utility Facilities	0.035 gpd/sf of recycled water for appropriate plumbing fixtures	
Urban Farm	60,000 gpd for irrigation demand.	

Table 11.2 - Treasure Island Project Recycled Water Demand (without recycled water for residential toilet flushing)

DESCRIPTION OF USE			RECYCLED WATER DEMAND	
Land Use	**No.**	**Unit**	**Average Daily Irrigation (Seasonal) Demand (gpd)**	**Average Daily Building (Year Round) Demand (gpd)**
Residential (with toilet recycled water)	8,000	Units	30,000	0
Hotel	500	Rooms		3,500
Office	100,000	sf		3,500
Retail	140,000	sf		4,900
Adaptive Reuse, General	244,000	sf		8,540
Adaptive Reuse, Retail	67,000	sf		2,345
Wetlands	15	ac	30,000	0
Open Space	285	ac	150,000	0
Miscellaneous Structures	75,000	sf		1,875
Marina	400	Slips		0
Treasure Island School	105,000	sf		0
Police/Fire	30,000	sf		2,000
Misc. Small Community Facilities	13,500	sf		473
Pier 1 Community Center	35,000	sf		1,225
TI Sailing Center	15,000	sf		525
Museum	75,000	sf		2,625
Department of Labor (DOL)				0
Coast Guard Facility				0
Utility Facilities	14,000	sf		490
Urban Farm	20	ac	60,000	0
Totals			**270,000**	**31,998**

Table 11.3 - Treasure Island Project Recycled Water Demand (with recycled water for residential toilet flushing)

DESCRIPTION OF USE			RECYCLED WATER DEMAND	
Land Use	**No.**	**Unit**	**Average Daily Irrigation (Seasonal) Demand (gpd)**	**Average Daily Building (Year Round) Demand (gpd)**
Residential (with toilet recycled water)	8,000	Units	30,000	119,296
Hotel	500	Rooms		3,500
Office	100,000	sf		3,500
Retail	140,000	sf		4,900
Adaptive Reuse, General	244,000	sf		8,540
Adaptive Reuse, Retail	67,000	sf		2,345
Wetlands	15	ac	30,000	0
Open Space	285	ac	150,000	0
Miscellaneous Structures	75,000	sf		1,875
Marina	400	Slips		0
Treasure Island School	105,000	sf		0
Police/Fire	30,000	sf		2,000
Misc. Small Community Facilities	13,500	sf		473
Pier 1 Community Center	35,000	sf		1,225
TI Sailing Center	15,000	sf		525
Museum	75,000	sf		2,625
Department of Labor (DOL)				0
Coast Guard Facility				0
Utility Facilities	14,000	sf		490
Urban Farm	20	ac	60,000	0
Totals			**270,000**	**151,294**

11.2.4 Proposed Recycled Water Storage and Pumps

For the following discussion, all tank volumes described refer to "operational storage" that can be drawn from the tank at any given time. All tanks will require an additional amount of "dead storage" that cannot be accessed under normal operations.

Storage tanks for the recycled water system will be constructed near the RWTF.

The storage volume requirement for recycled water will be 1 day of average daily demand plus 4 hours of fire flow. Based on the average daily demand of 0.42 mgd and the required fire flow of 3,500 gpm, the total recycled water storage for full build out is 1.26 million gallons. Multiple tanks may be used to separate the fire demand from the average daily demand, or to accommodate the phased Project schedule.

The recycled water tank designs will include the ability to supplement the recycled water supply with the potable water supply if the recycled supply is interrupted or for scheduled maintenance on the recycled storage tanks.

A pump station capable of delivering the recycled demand through the distribution system will be constructed adjacent to the recycled water storage tanks. The pump station design will include redundant pumps, alarm system, emergency backup power and a hydropneumatic tank.

The Developer will finance, design, build, and own the recycled water tanks and pump station.

11.2.5 Proposed Recycled Water Distribution

The Developer will be responsible for the design and construction of the proposed recycled water distribution system. The recycled water distribution system will be designed to deliver the average daily demand coincident with the required fire flow of 3,500 gpm with a minimum residual pressure of 20 pounds per square inch to the recycled water fire hydrants on TI.

The Developer will install the recycled water system in phases to match the Project phasing. Alternative pipe materials such as High Density Polyethylene (HDPE) or polyvinyl chloride (PVC) may be used if approved by the SFPUC. A conceptual layout of the proposed recycled water system is shown on Figure 11.1.

Flexible connections or other flexible system designs will be utilized where differential settlement may be of concern due to long term settlement anticipated due to secondary compression of the soils or minimal amounts of remaining liquefaction due to seismic events. Final designs to be reviewed by SFPUC.

11.2.5.1 Location of Distribution System within New Streets

Figure 11.2 shows the typical alignment of the new recycled water system within the proposed streets. The Developer will coordinate with the SFFD for the final location of the fire hydrants.

11.2.5.2 Recycled Water System Design Criteria

The design criteria used for the development of the recycled water system is based upon established industry operations and regulatory agency requirements described in the Treasure Island Recycled Water Technical Memorandum submitted by the Developer. In subdivision processing, including the review and approval of subdivision improvements plans, the precise location and final design of the recycled water system will be generally consistent with this Infrastructure Plan and the Recycled Water Technical Memorandum.

11.3 Recycled Water Fire Protection

The recycled water system will be used for a supplemental source of water for fire protection in case of emergency. As described above, the recycled distribution system will be sized to deliver the average daily demand coincident with the required fire flow of 3,500 gpm with a minimum residual pressure of 20 pounds per square inch to the recycled water fire hydrant outlets on TI. The conceptual location of the recycled water hydrants are shown on Figure 11.1. The hydrants are spaced around TI to provide approximately 750-foot hose lengths along the street from the recycled hydrant to the farthest building. The conceptual location of the hydrants will be coordinated with the SFFD prior to approval of the Major Phase Applications.

11.4 Coast Guard and Job Corps

The Developer will not construct the recycled water system on the Coast Guard or Jobs Corps property.

11.5 Phases for Recycled Water System Construction

The Developer will design and install the new recycled water distribution system in phases to match the recycled water use demands of each Sub-Phase of the Project. The amount of the system constructed with each Sub-Phase will be the minimum necessary to serve the Sub-Phase.

The Developer will construct the recycled water storage tanks and pump station in phases to meet the Sub-Phase requirements. If the recycled water demand exceeds the recycled water supply during the first phases of the Project, the excess demand will be provided by the potable water system. A permanent potable water connection to the recycled water tanks will be provided and will include a backflow prevention device approved by the SFPUC. This permanent connection will provide a supplemental supply of water to the recycled system if needed during the initial phases of the project or in the future during maintenance of the recycled water tanks or if the production of recycled water is interrupted.

The SFPUC will be responsible for the recycled water system once the Sub-Phase or new recycled water system is complete and accepted by the SFPUC.

The Developer will provide an existing conditions report for the newly installed recycled water mains adjacent to the new Sub-Phase prior to the geotechnical mitigation activity. The report will be updated at the end of the geotechnical mitigation activity and again at the end of the construction of the Sub-Phase. The limit of the report and how the conditions of the system are determined will be coordinated with the SFPUC. The Developer will be responsible for damage to the newly installed recycled water mains on previous phases, due to geotechnical mitigation activity and/or construction of the proposed improvements. The Developer will make the necessary repairs as required and be responsible for any permit violations due to the damage.

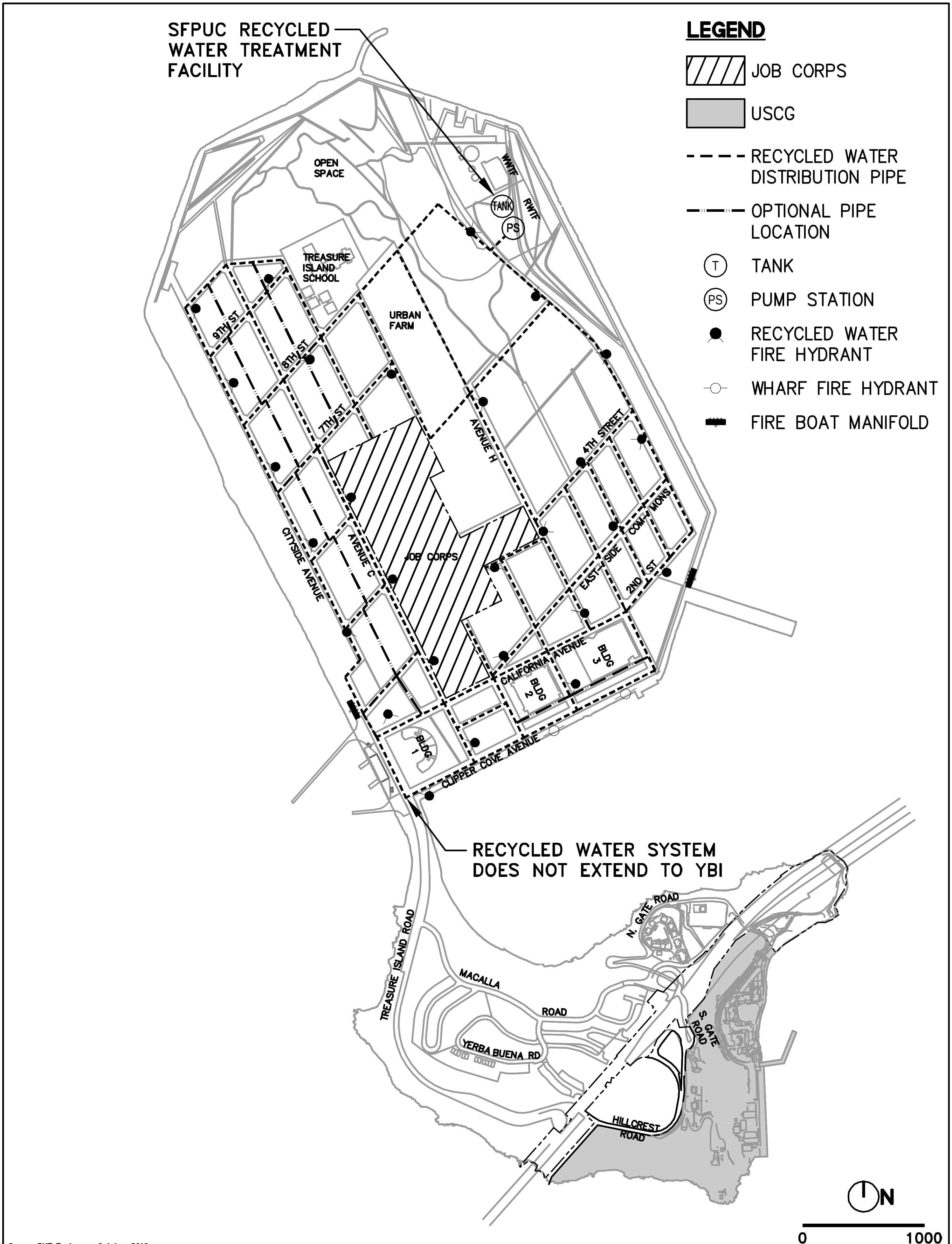


Figure 11.1: Proposed Recycled Water Distribution System

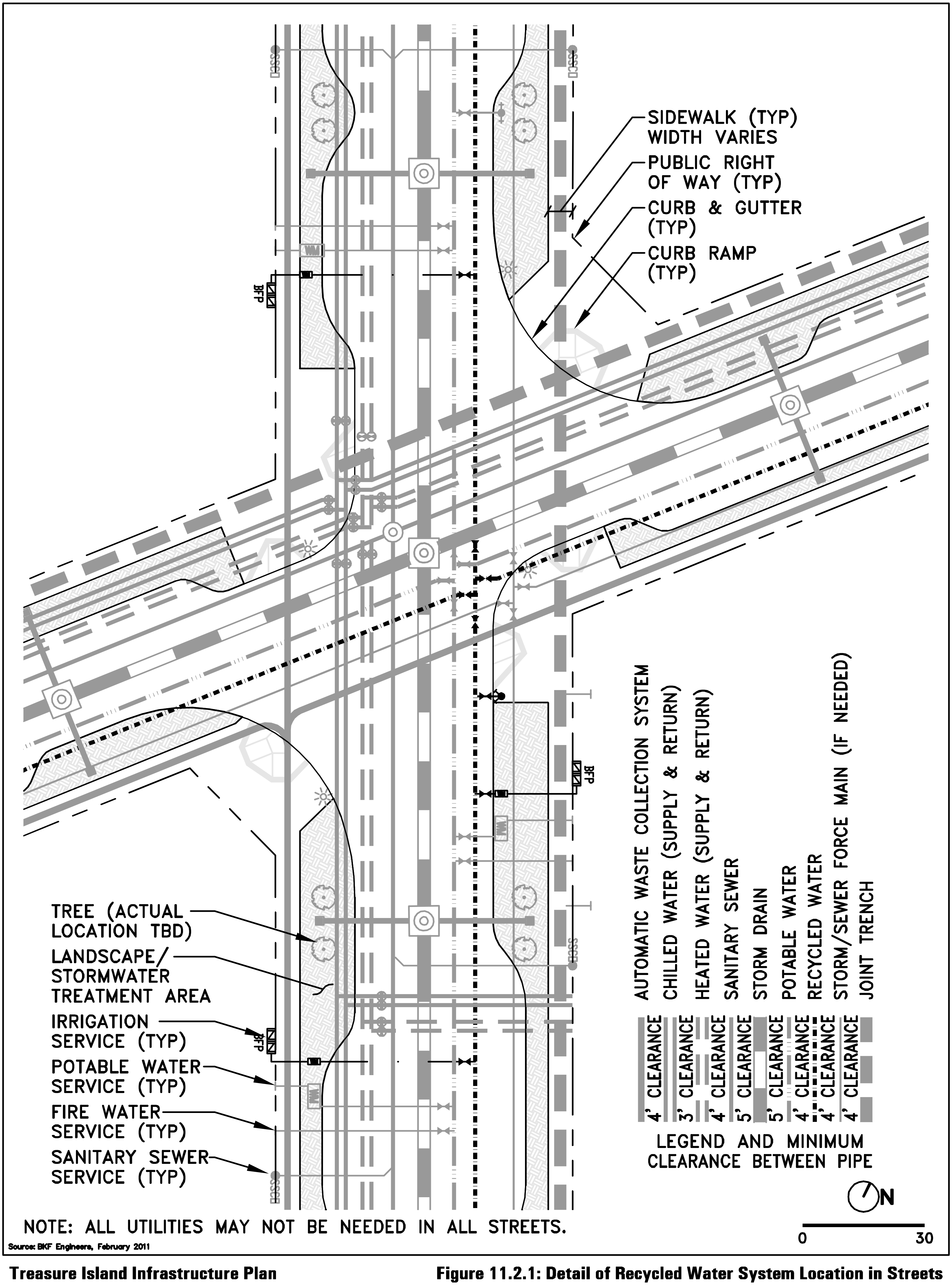
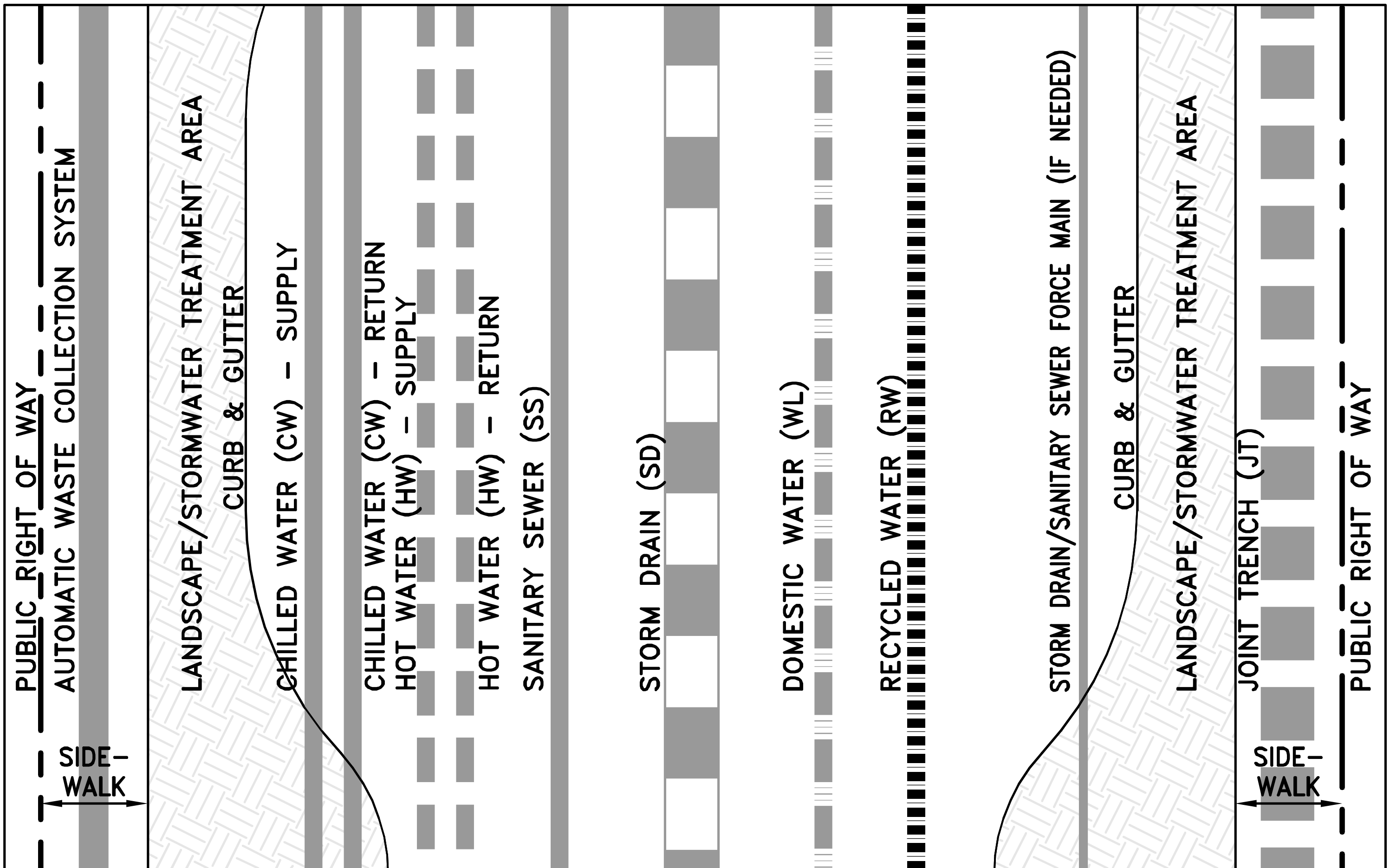
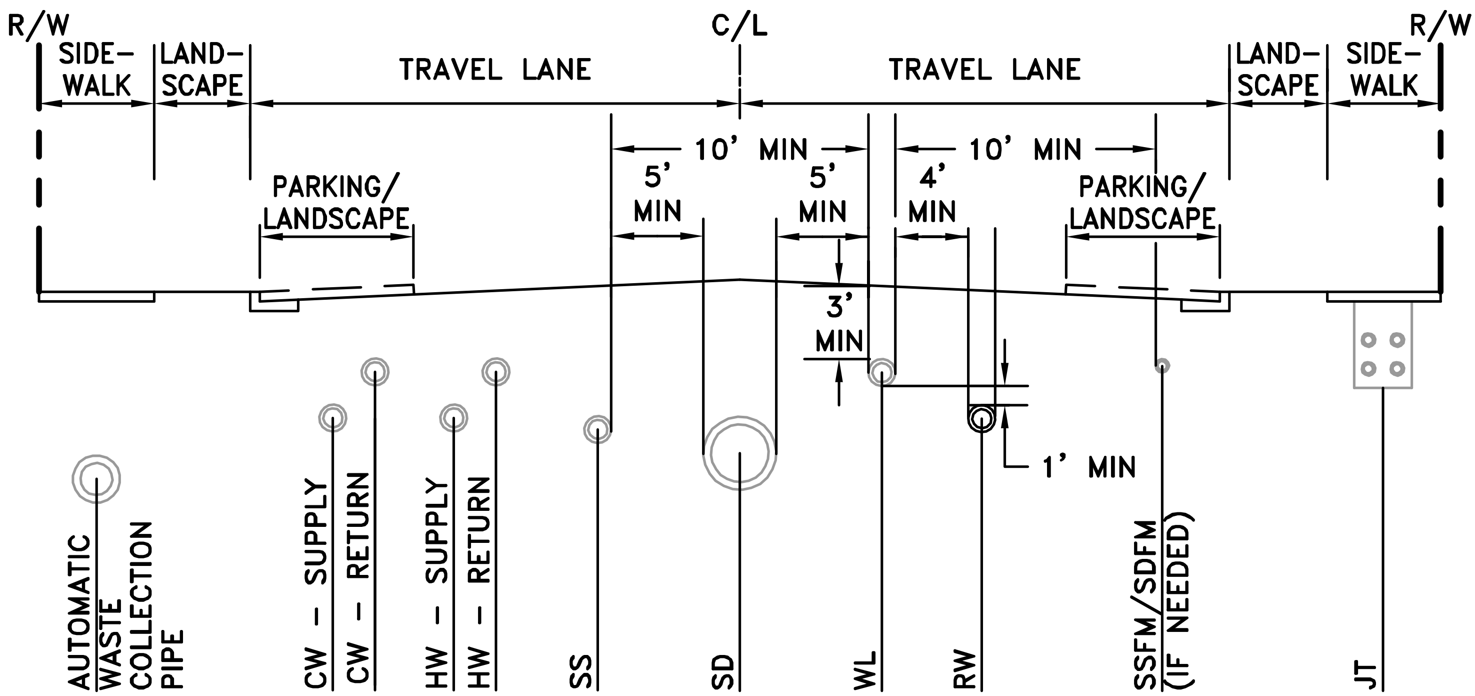


Figure 11.2.1: Detail of Recycled Water System Location in Streets



RECYCLED WATER IN STREETS
1"=10'



TYPICAL UTILITY CROSS SECTION
1"=10'

Source: BKF Engineers, February 2011

Figure 11.2.2: Detail of Recycled Water System Location in Streets

12. STORMWATER SYSTEM

12.1 Existing Stormwater Collection System

The existing stormwater system on Treasure Island is separated from the wastewater collection and treatment system. The existing stormwater system for the two islands consists of 6- to 42-inch diameter gravity pipes and lift stations with various-sized outfalls along the perimeter of the Islands that discharge directly into the San Francisco Bay. Existing pipe materials include PVC, asbestos cement, VCP, RCP and steel. There are approximately 31 existing outfalls on TI and approximately 32 outfalls on YBI.

12.1.1 Existing Stormwater Treatment Systems

There is currently no treatment of stormwater prior to discharge to the Bay.

12.2 Proposed Stormwater System

12.2.1 Proposed Stormwater Collection System

The Developer will be responsible for the design and construction of the proposed stormwater collection system. The proposed stormwater system will be a combination of gravity lines, lift stations, pump stations and outfalls to the Bay. The pipe material for the new system will meet the SFPUC standards but alternative pipe materials such as High Density Polyethylene (HDPE) or polyvinyl chloride (PVC) may be used if approved by the SFPUC. All of the existing pump/lift stations will be removed or replaced with new stations in phases designed to SFPUC standards as needed to serve the Project. Pump stations required to convey the 5-year storm event will include redundant pumps, alarm system, and emergency power if needed to prevent flooding beyond the depths described in Table 12.1. Pump stations required to deliver treatment flows to the treatment areas will not include redundant pumps or emergency power but will include an alarm system to notify if the pump station requires maintenance.

A conceptual layout of the proposed stormwater collection system is shown on Figure 12.1. The final designs shall optimize stormwater flows to ensure maximization of efficiency, and minimization and consolidation of required pump stations, including the potential wetland pump station. The final number of pump stations will be based on a system layout that follows reasonable engineering standards and is economically feasible. Concurrent with each Major Phase Application, the overall design will be evaluated by the SFPUC to determine if additional feasible opportunities to increase efficiency or reduce the reliance on pump stations exist.

The gravity system will be designed to accommodate long term settlement anticipated due to secondary compression of the soils or minimal amounts of remaining liquefaction due to seismic events. Final designs to be reviewed by the SFPUC.

12.2.1.1 Location of Stormwater System within New Streets

Figure 12.2 shows the typical alignment of the new stormwater system within the proposed streets.

The angled orientation of the streets on TI will result in stormwater flow in and out (through) manholes at a 68-degree reverse angle at many intersections. (see Figure 12.1).

12.2.1.2 Stormwater System Design Criteria

The design criteria used for the development of the stormwater system is based upon established industry operations and regulatory agency requirements described in the Treasure Island Stormwater Technical Memorandum submitted by the Developer. In subdivision processing, including the review and approval of subdivision improvements plans, the precise location and final design of the stormwater system will be generally consistent with this Infrastructure Plan and the Stormwater Technical Memorandum. The stormwater system shall be designed to SFPUC design standards and regulation, as modified in this Infrastructure Plan, with exceptions to case-by-case scenarios as approved by the SFPUC.

The following design criteria will be used to design the new stormwater collection system:

1. Design Storm Frequency:
   A 5-year rain event as defined by the "San Francisco Rainfall Rate Table 1941 Plan I-3903.4" will be maintained within the stormwater system. Storm frequency larger than 5-years will be allowed to run in the streets as overland flow.

2. Design Tide:
   The stormwater collection system will be designed to accommodate 100-year tide elevations. Moffatt & Nichol has completed an Extreme High Water Level Analysis to determine the 100-year high tide as part of their April, 2009 "Treasure Island

Coastal Flooding Study". Based on their review of the historic tide data for the San Francisco Bay the 100-year high tide, or Base Flood Elevation (BFE), for Treasure Island is 9.2 (NAVD88).

A description of the Adaptive Management strategy for SLR is included in Section 5.

3. Hydraulic Grade Line:

   The hydraulic grade line criteria will be based on the City of San Francisco Subdivision Code;

   > "Sewer sizes shall be selected so that the hydraulic grade line shall, in general, be four feet below the pavement or ground surface, and at no point less than two feet. The tidal elevation to be used in hydraulic computations, where applicable, shall be -3.5, City datum"

   The tidal elevation of -3.5 City Datum is equal to 7.81 NAVD 88 Datum. The design tide for this infrastructure plan will be the current 100-year high tide of 9.2 NAVD 88. Therefore the City of San Francisco Subdivision Code requirement for depth of hydraulic grade line below pavement surface will by adjusted by 1.39 feet (9.2-7.81=1.39) to 2.61 feet below the pavement surface. Hydraulic grade line criteria does not supersede the Minimum Depth of Cover.

   The minimum hydraulic grade line for the different tide events, locations around the Island, and SLR are described in Table 12.2.

4. Velocity:

   The velocity in the stormwater system shall not be less than 3 feet per second flowing by gravity and discharging against mean high tide with 16-inches of sea level rise (elevation 4.62-feet NAVD 88).

5. Minimum Depth of Cover:

   Minimum depth of cover shall be 4.0 feet. 3.0 feet minimum cover may be approved by SFPUC on a case-by-case basis.

A hydrologic model (SWMM or equivalent) for all of the development will be developed prior to approval of the Major Phase and Sub-Phase applications in coordination with the SFPUC consistent with the DRDAP.

12.2.1.3 Stormwater System Performance in New Development Area

The Hydraulic Requirements listed in Table 12.2 are the minimum performance criteria for the project. The TI grading plan and stormwater system within the new development area, however, will be designed to accommodate the 100-year storm during the 100-year tide with 16-inches of sea level rise (SLR) without relying on flow within the streets. Instead, during these extreme events, the stormwater runoff will pond in the street to a maximum depth equal to the top of curb at the low point and then flow into the piped system as capacity becomes available.

This overland release grading design described in Section 7 will protect the new building finished floors from storms larger than the 100-year event or system maintenance issue such as blocked catch basins or pipes. During either of these unlikely events, stormwater may pond up to the top of curb (or back of walk/right of way if approved by the SFPUC) elevation before releasing to the downstream drainage basins. This will continue through the downstream basins until there is capacity in the storm system or storm water is released to the open space. The new building finish floor elevations will be above the back of walk/right of way elevation and therefore protected from flooding. The ponding depth and overland release occurrence for various storm events are summarized below.

Table 12.1: Street Ponding Depth and Overland Release Summary

Storm Event	Ponding Depth for:		
	Current Tide	16-inches SLR	Maintenance Concerns
Treatment	No Ponding (0 inches)	No Ponding (0 inches)	Up to Top of Curb
5-Year	No Ponding (0 inches)	No Ponding (0 inches)	Up to Top of Curb
100-Year	Top of Curb (6- inches)	Top of Curb (6- inches)	Up to Top of Curb

12.2.1.4 Sanitary Sewer Overflow Mitigations

The State of California has recently adopted a Sanitary Sewer Overflow (SSO) Policy to eliminate, to the extent possible, the potential for sewer overflows into the San Francisco Bay. The potential for SSO occurs when pump stations fail, or if lines become plugged and the sewer flows enter the storm drainage system. To prevent potential SSOs, the sewer pump stations proposed for the Project will include redundant pumps, alarm systems and emergency backup power supplies to run the pump stations when the power is out.

12.2.2 Proposed Outfall Structures

The stormwater outfall structures will be located at the perimeter of the Island and discharge to the Bay. See Figure 12.1 for approximate locations. The outfall structure will include the combination of an inlet sized to accommodate the 100-year overland release flows from the development area, a structure containing a "Tideflex" device that will keep the Bay water from backing up into the Island system during high tides, and the outfall structure in the Bay. The outfall elements will be sized to accommodate the 100-year storm flow volumes plus anticipated wave overtopping. See Figure 12.3 for a conceptual plan view and section of the outfall structures.

Table 12.2-Hydraulic Requirements

		Minimum Design Criteria	
	Tide/SLR Condition	**Stormwater System**	
		5-year storm	**5 to 100-year storm**
Initial Infrastructure Design	**Current Tide Condition Mean sea level: 3.29-feet NAVD 88 (Determined in 2009 Coastal Flooding Study)**	Flow in Pipes Design Storm: 5-year event Design Tide: Current 100-year high tide Minimum Freeboard (Streets): 2.67-feet Minimum Freeboard (parks/open space): Ponding allowed	Overland Flow Design Storm: 5 to 100-year event Design Tide: Current 100-year high tide Minimum Freeboard (Streets): Allowed to flow within street, 6-inch of ponding depth Minimum Freeboard (parks/open space): Ponding allowed
Infrastructure Adjustments for Future SLR	**SLR Condition: up to 16-inches Mean sea level: 3.29-feet + 16-inches = 4.62-feet NAVD 88 (Estimated to occur by 2050)**	***Adaptive Management Strategy: reduce freeboard allowance***	***Adaptive Management Strategy: reduce freeboard allowance***
		Flow in Pipes Design Storm: 5-year event Design Tide: Current 100-year high tide + SLR (16-inches)=10.53 NAVD 88 Minimum Freeboard (Streets): 16-inches Minimum Freeboard (parks/open space): Ponding allowed	Overland Flow Design Storm: 5 to 100-year event Design Tide: Current 100-year high tide + SLR (16-inches)=10.53 NAVD 88 Minimum Freeboard (Streets): Allowed to flow in street, 6-inches of ponding depth Minimum Freeboard (parks/open space): Ponding allowed
	SLR Condition: 16-inches to 36-inches	***Adaptive Management Strategy: When SLR Monitoring Report (Section 5.5.2) determines 16-inches of SLR has occurred implement modifications to storm drainage system.***	***Adaptive Management Strategy: When SLR Monitoring Report (Section 5.5.2) determines 16-inches of SLR has occurred implement modifications to storm drainage system.***
	Mean sea level: 3.29-feet + 36-inches = 6.29-feet NAVD 88 (Estimated to occur between 2050 and 2100.)	Flow in Pipes Design Storm: 5-year event Design Tide: 100-year high tide at that time + SLR (guidance at that time) Minimum Freeboard (streets): 2.67-feet Minimum Freeboard (parks/open space): Ponding allowed	Overland Flow Design Storm: 5 to 100-year event Design Tide: 100-year high tide at that time + SLR (guidance at that time) Minimum Freeboard (streets): Allowed to flow in street, 6-inches of ponding depth Minimum Freeboard (parks/open space): Ponding allowed
	SLR Condition: greater than 36-inches	***Adaptive Management Strategy: When SLR Monitoring Report (Section 5.5.2) determines 16-inches of SLR has occurred .***	***Adaptive Management Strategy: When SLR Monitoring Report (Section 5.5.2) determines 16-inches of SLR has occurred implement modifications to storm drainage system.***
	Mean sea level: 3.29-feet + 36-inches = 6.29-feet NAVD 88 (Estimated to occur after 2100.)	Flow in Pipes Design Storm: 5-year event Design Tide: 100-year high tide at that time + SLR (guidance at that time) Minimum Freeboard (streets): 2.67-feet Minimum Freeboard (parks/open space): Ponding allowed	Overland Flow Design Storm: 5 to 100-year event Design Tide: 100-year high tide at that time + SLR (guidance at that time) Minimum Freeboard (streets): Allowed to flow in street, 6-inches of ponding depth Minimum Freeboard (parks/open space): Ponding allowed

Note: SLR conditions based on current Treasure Island mean sea level 3.29 feet (NAVD 88) documented in the 2009 Coastal Flooding Study

12.3 Proposed Stormwater Treatment System

The project treatment BMPs described below will be designed to comply with the San Francisco Stormwater Design Guidelines. Upon review, the SFPUC may accept either a volume-based or acceptable flow-based calculation method to provide compliance with the Stormwater Design Guidelines.

In addition, the Developer will coordinate with the SFPUC and prepare an evaluation of the need for diverting stormwater first flush volumes to the sewer system for review and approval by the SFPUC prior to the approval of the first Major Phase application.

Figure 12.4 shows the different approximate water shed areas for Treasure Island. A description of the stormwater treatment for each of the watershed is as follows:

12.3.1 Treasure Island Stormwater Treatment Areas

Watershed Area A & B

These watershed areas will utilize outfall structures into Clipper Cove to discharge runoff. These areas will utilize Low Impact Development (LID) type measures for the treatment of runoff. BMPs in this area could include such things as:

- Bioretention Planters
- Street Planters
- Swales
- Subgrade Infiltration Areas
- Permeable Paving

The development parcels within this watershed area will be responsible for treating their storm water runoff prior to discharging their runoff into the public stormwater system.

Watershed Area C & D

These watershed areas will utilize outfall structures located along the western shoreline to discharge runoff. The combined treatment areas for these watersheds will be located within the City Side Park prior to the outfall. The treatment flows from these watershed areas will be split off from the larger flows near the outfall and pumped up to the treatment area. Stormwater treatment BMPs will be integrated with the park design to ensure aesthetic and programmatic consistency. The BMPs in the City Side Park could include:

- Bio-retention Planters
- Street Planters
- Raingardens
- Swales

The stormwater runoff from the public streets within these watershed areas will be pre-treated with bio-retention/infiltration planters or bio-swales within the landscape strips along the roadway section. The street flows will then be treated again in the combined treatment area.

The development parcels within these watershed areas will not be required to pre-treat their storm water runoff prior to discharging to the public stormwater system.

Watershed Area D2

This watershed area will utilize an outfall structure located along northwestern shoreline to discharge runoff. The combined treatment area for this watershed will be located in the northwestern open space area. Stormwater treatment BMPs will be integrated with the park design to ensure aesthetic and programmatic consistency. The treatment flow from this watershed will be split off from the larger flows near the outfall and pumped up to the treatment area. The BMPs could include:

- Bio-retention Planters
- Street Planters
- Seasonal Wetland
- Swales

The stormwater runoff from the public streets within this watershed area will be pre-treated with bio-retention/infiltration planters or bio-swales within the landscape strips along the roadway section. The street flows will then be treated again in the combined treatment area.

The development parcels within this watershed area will not be required to pre-treat their storm water runoff prior to discharging to the public stormwater system.

Watershed Area E

The Authority will construct, own and maintain a seasonal and/or perennial stormwater treatment wetland system shall be located in the open space area west of the WWTF. The stormwater treatment wetland shall be integrated with both the Wilds area (refer to Open Space plan) and the WWTF layout. The wetland shall be 10-15 acres in size. The wetlands shall include retention and flow control structures as required to regulate stormwater flows and ensure slope stability and erosion control. Watershed Area E will utilize outfall structures into the wetland area. The wetland area will then discharge through an outfall located along the eastern shoreline near the WWTF. The wetland area will be designed to meet regulated treatment standards for the runoff prior to discharging to the Bay. The wetland area will include seasonal and/or perennial stormwater treatment areas.

The stormwater runoff from the public streets within this watershed area will be pre-treated with bio-retention/infiltration planters or bio-swales within the landscape strips along the roadway section. The street flows will then be treated again in the combined treatment area.

The development parcels within this watershed area will not be required to pre-treat their storm water runoff prior to discharging to the public stormwater system.

Watershed Area E2

The SFPUC will be responsible for the construction of the WWTF in this watershed area. The WWTF area will utilize an outfall structure into the wetland area or an outfall along the eastern shoreline. Portions of treatment flows may be directed to the wetland area for treatment. The other areas will emphasize Low Impact Development (LID) type measures for the treatment of runoff. BMPs in this area will be selected by the SFPUC as part of the design of the treatment facility. The stormwater treatment wetland will be constructed by the Developer.

Watershed Area F

This watershed area will utilize outfall structures along the eastern shoreline or the wetland area. The urban farm and sports fields have been identified as specific treatment areas to address specific pollutants of concern associated with garden/farming activities and field maintenance. Appropriate BMPs will be incorporated within these areas to address these concerns.

Watershed Area G & H

Watershed H will be combined with G and will utilize an outfall structure located along eastern shoreline to discharge runoff. The combined treatment area for these watersheds will be located along the northern edge of Watershed G near the recreation fields. The treatment flow from these watersheds will be split off from the larger flows near the outfall and pumped up to the treatment area. Stormwater treatment BMPs will be integrated with the park design to ensure aesthetic and programmatic consistency. The BMPs could include:

- Bio-retention Planters
- Street Planters
- Swales

The stormwater runoff from the public streets within these watershed areas will be pre-treated with bio-retention/infiltration planters or bio-swales within the landscape strips along the roadway section. The street flows will then be treated again in the combined treatment area.

The development parcels within these watershed areas will not be required to pre-treat their storm water runoff prior to discharging to the public stormwater system.

Existing School Site

As a distinct use with ample open space adjacent to buildings this area will be treated as a discrete treatment area. BMPs will be selected with an emphasis on ecological and educational opportunities associated with the green schoolyard concept. Selected BMPs may include Bioretention/Infiltration Planters, Raingardens, Swales, Subgrade Infiltration Areas and/or Permeable Paving. The outfall for the school site will be directed towards the wetland area.

Centralized Treatment Areas

Many of the watershed areas included centralized treatment areas where a single treatment feature treats stormwater from the entire watershed including private parcels and TIDA controlled property. Private vertical development and TIDA controlled property will not be required to implement any stormwater treatment measures on their parcels if the stormwater treatment is provided in designated off-parcel, centralized treatment areas as approved by the SFPUC. Stormwater Control Plans will be submitted as per the DRDAP.

12.3.2 Yerba Buena Stormwater Treatment Areas

Watershed Area Y1

This watershed area will utilize an outfall located near the intersection of Macalla Road and Treasure Island Road. The treatment areas for this watershed will be a combination of areas along Macalla Road. The treatment flow from this watershed will be split off from the larger flows and directed to the treatment areas with gravity diversion structures where possible or with pump stations prior to the outfall. Stormwater treatment BMPs will be integrated with the YBI Habitat Plan and open space design. The BMPs could include:

- Bio-retention/Infiltration Planters
- Raingardens
- Swales

The development parcels within these watershed areas will not be required to pre-treat their storm water runoff prior to discharging to the public stormwater system.

Watershed Area Y2

This watershed area will utilize an outfall located on the northern shoreline of YBI at the lower elevations below the Great White historic buildings. The treatment area for this watershed will be located in the open space area below the Great Whites. The treatment flow from this watershed will be split off from the larger flows and directed to the treatment areas with gravity diversion structures where possible or with pump stations prior to the outfall. Stormwater treatment BMPs will be integrated with the YBI Habitat Plan and open space design. The BMPs could include:

- Bio-retention/Infiltration Planters,
- Raingardens
- Swales

The development parcels within these watershed areas will not be required to pre-treat their storm water runoff prior to discharging to the public stormwater system.

Centralized Treatment Areas

Many of the watershed areas included centralized treatment areas where a single treatment feature treats stormwater from the entire watershed including private parcels and TIDA controlled property. Private vertical development and TIDA controlled property will not be required to implement any stormwater treatment measures on their parcels if the stormwater treatment is provided in designated off-parcel, centralized treatment areas as approved by the SFPUC. Stormwater Control Plans will be submitted as per the DRDAP.

Typical treatment cross sections for the street planters and bio-retention planters are shown on Figure 12.5. These BMPs will be designed to meet the stormwater control requirements of the Stormwater Design Guidelines at all times during the treatment storm at Mean Higher High Water (MHHW) conditions, with 16-inches of SLR. Stormwater treatment BMPs required to meet the Stormwater Design Guidelines shall be designed such that the system hydraulic grade line during the treatment storm, at MHHW (6.22 NAVD 88) conditions, with 16-inches of SLR shall have a 6-inch clearance below the bottom of the treatment and/or storage zones, unless approved by the SFPUC on a case-by-case scenario. The final sizing and elevations of the stormwater treatment devices will be developed in coordination with the SFPUC prior to approval of the Major Phase and Sub Phase applications and will meet the San Francisco Stormwater Design Guidelines treatment requirements.

Maintenance of the Stormwater Management Controls for Treasure Island / Yerba Buena Island Development Project will be as follows:

Homeowners Association or TIDA: The development homeowners association or TIDA will maintain all Stormwater Management Controls required to meet SFPUC stormwater management requirements to treat runoff from private development (buildings, courtyards, parks and open space, private alleys, etc.) or TIDA controlled property (TIDA owned trust streets, TIDA owned facilities, etc.) as defined within the property legal descriptions. At no time will this runoff discharge to stormwater management controls located within the public right of way. This maintenance obligation includes all necessary stormwater lift stations and other ancillary infrastructure required for the Stormwater Management Controls to properly function.

SFPUC or other City Agency: The SFPUC or other City Agency will be responsible for maintenance of Stormwater Management Controls within the public right of way designed to only treat runoff from the public right of way. This maintenance obligation includes all infrastructure required for the Stormwater Management Controls located in the public right-of-way to properly function.

"Stormwater Management Controls" means the facilities, both those to remain privately-owned and those to be dedicated to the City, that comprise the infrastructure and landscape system that is intended to manage the stormwater runoff associated with the Project, as required by the San Francisco stormwater management standards, the applicable NPDES permit, and/or state and federal law, and as described in this Infrastructure Plan. Stormwater Management Controls include but are not limited to: (i) swales and bio-swales (including plants and soils), (ii) bio-retention and bio-filtration systems (including plants and soils), (iii) constructed ponds and/or wetlands (vi) permeable paving systems, and (v) other facilities performing a stormwater control function constructed to comply with the San Francisco stormwater management standards, the applicable NPDES permit, and/or state and federal law. Stormwater Management Controls shall not mean Infrastructure that is part of the traditional collection system such as catch basins, stormwater pipes, stormwater pump stations, outfalls, etc, that are located in the public right-of-way.

12.4 Coast Guard and Job Corps

The Developer will not replace the stormwater facilities within the Coast Guard and Job Corps properties.

The Coast Guard facility is a separate system on YBI and no connections to the new system are required.

The existing Job Corps stormwater system crosses their property line at several locations along their western and southern property line and connects to the existing TI system. The Project will coordinate with the Job Corps and re-connect their system at one location on Avenue C. The Project

will then provide one of the following two alternatives for connecting the Job Corps stormwater system to the existing outfall along the western shoreline that currently serves the Job Corps site:

1. Install a new gravity line from the Job Corps connection point on Avenue C to the existing outfall. The gravity line would be sized to match the existing drainage conditions on the Job Corps campus.
2. Install a new pump station at the connection point and provide a dedicated force main to the existing outfall. The pump station and force main would be designed to match the existing drainage conditions on the Job Corps campus.

No improvements to the existing outfall are proposed and the Job Corps will be responsible for any required storm water treatment on their site.

12.5 Phases for Stormwater System Construction

The Developer will design and install the new stormwater collection and treatment systems to match the Sub-Phases of the Project. The amount of the existing system replaced with each Sub-Phase will be the minimum necessary to serve the Sub-Phase. The existing land areas on Treasure Island will continue to utilize the existing stormwater collection system with interim connections to the new system where required to maintain the existing service until the existing areas are demolished. The existing stormwater pump/lift stations will continue to be used for the existing land areas to remain during the initial Sub-Phases of the Project. The existing pump/lift stations located within each Sub-Phase will be removed or replaced with that Sub-Phase. Repairs and/or replacement of the existing facilities necessary to serve the sub-phase will be designed and constructed by the Developer.

Subject to negotiating a separate utilities interim operations memorandum of understanding between the Authority and the SFPUC, either the Authority or the SFPUC will be responsible for maintenance of existing collection facilities until replaced by the Developer. Once construction of the Sub-Phase or new collection/treatment facilities are complete and accepted by the SFPUC, the SFPUC will be responsible for the new public stormwater collection system, including pump stations, located in public right of way areas. The Authority will be responsible for the stormwater treatment facilities in public areas. Private stormwater systems, including pump stations and treatment areas, located on private property will be maintained by the property owner.

The Developer will provide an existing conditions report for the existing stormwater system scheduled to remain adjacent to the Sub-Phase prior to the geotechnical mitigation activity. The report will include the conditions of the original system on TI as well as the new system constructed with previous phases adjacent to the new Phase. The report will be updated at the end of the

geotechnical mitigation activity and again at the end of the construction of the Sub-Phase. The limit of the report and how the conditions of the systems are determined will be coordinated with the SFPUC. The Developer will be responsible for damage to the original stormwater system, and/or newly installed stormwater mains on previous phases, due to geotechnical mitigation activity and/or construction of the proposed improvements. The Developer will make the necessary repairs as required and be responsible for any permit violations due to the damage.

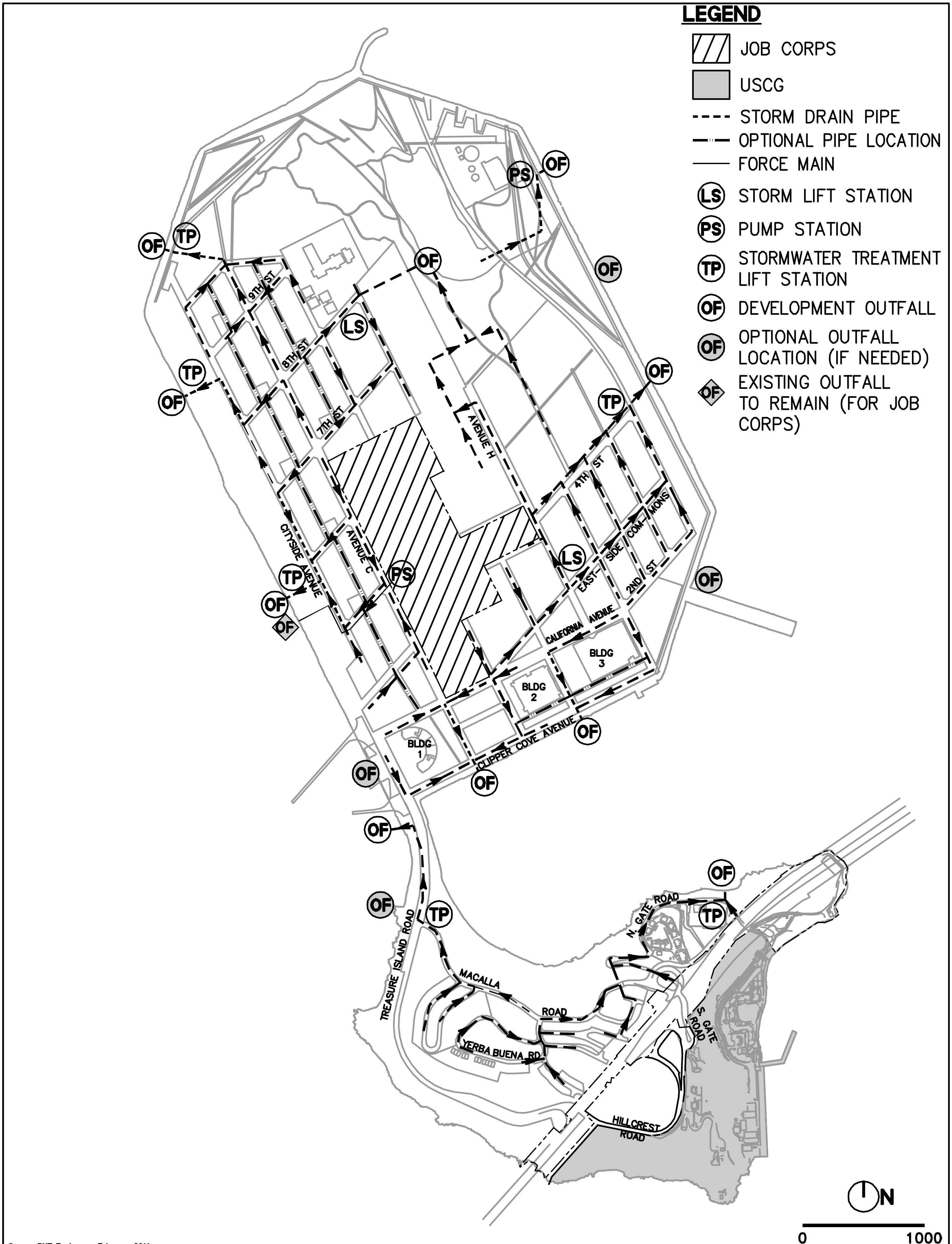
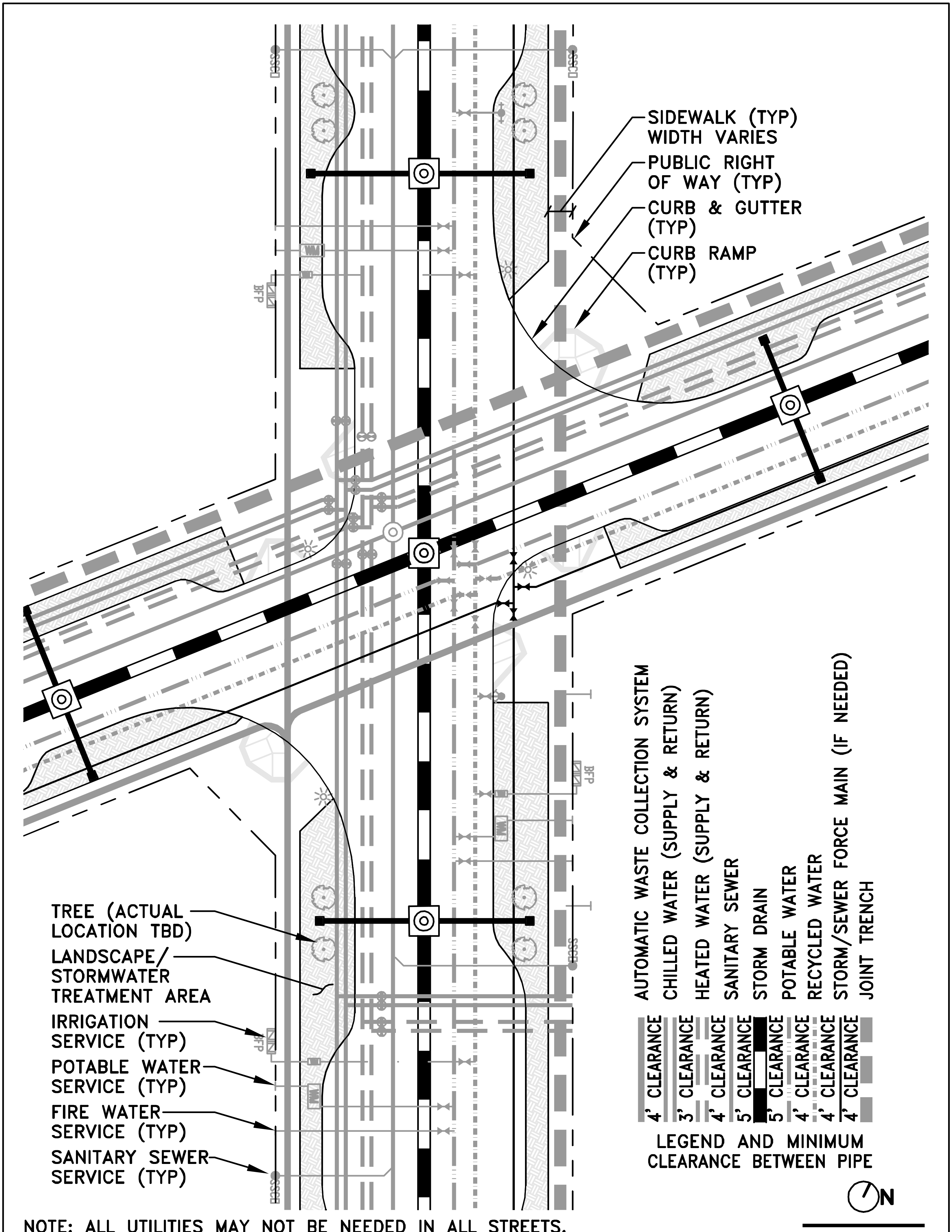
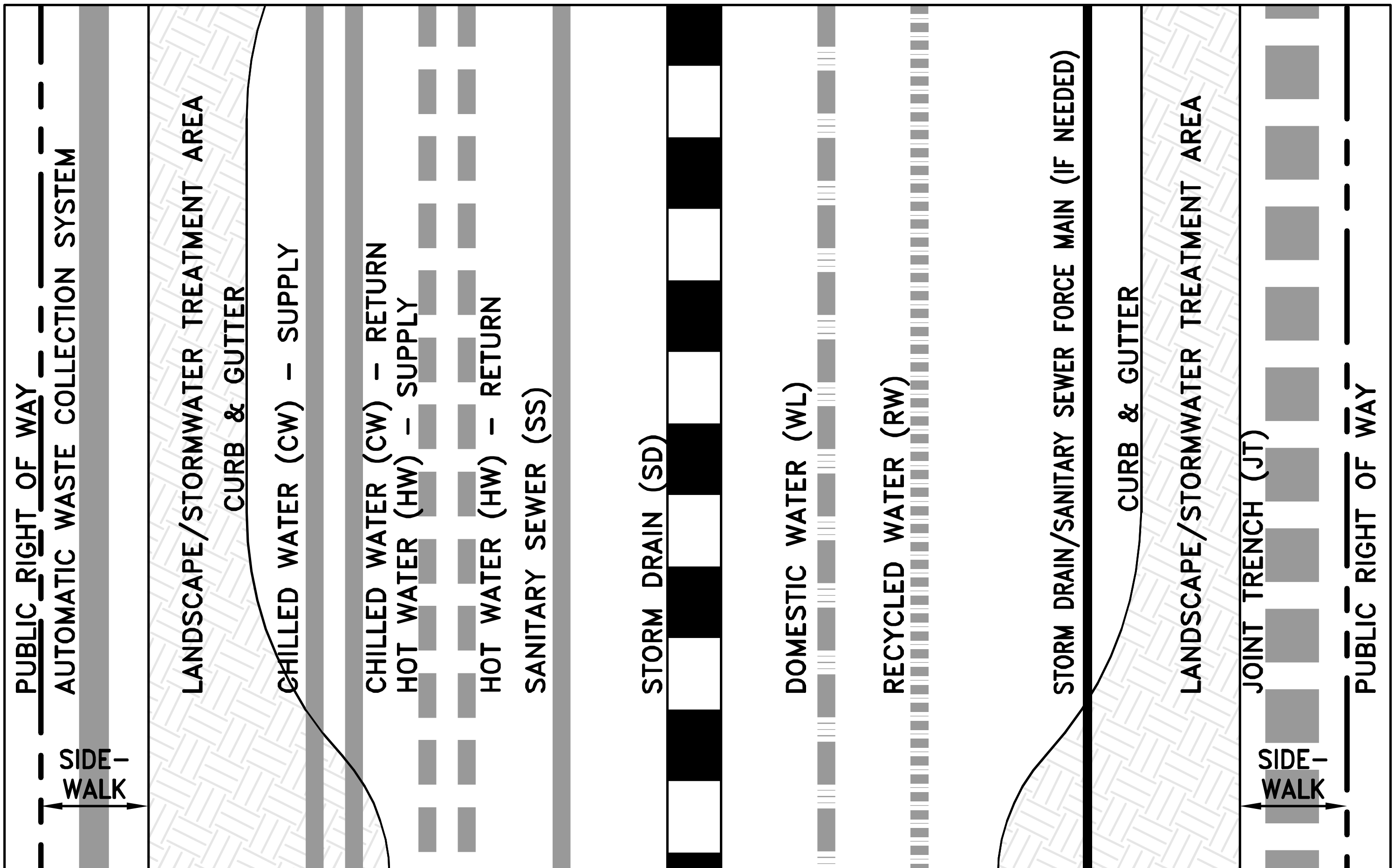


Figure 12.1: Proposed Stormwater Collection System

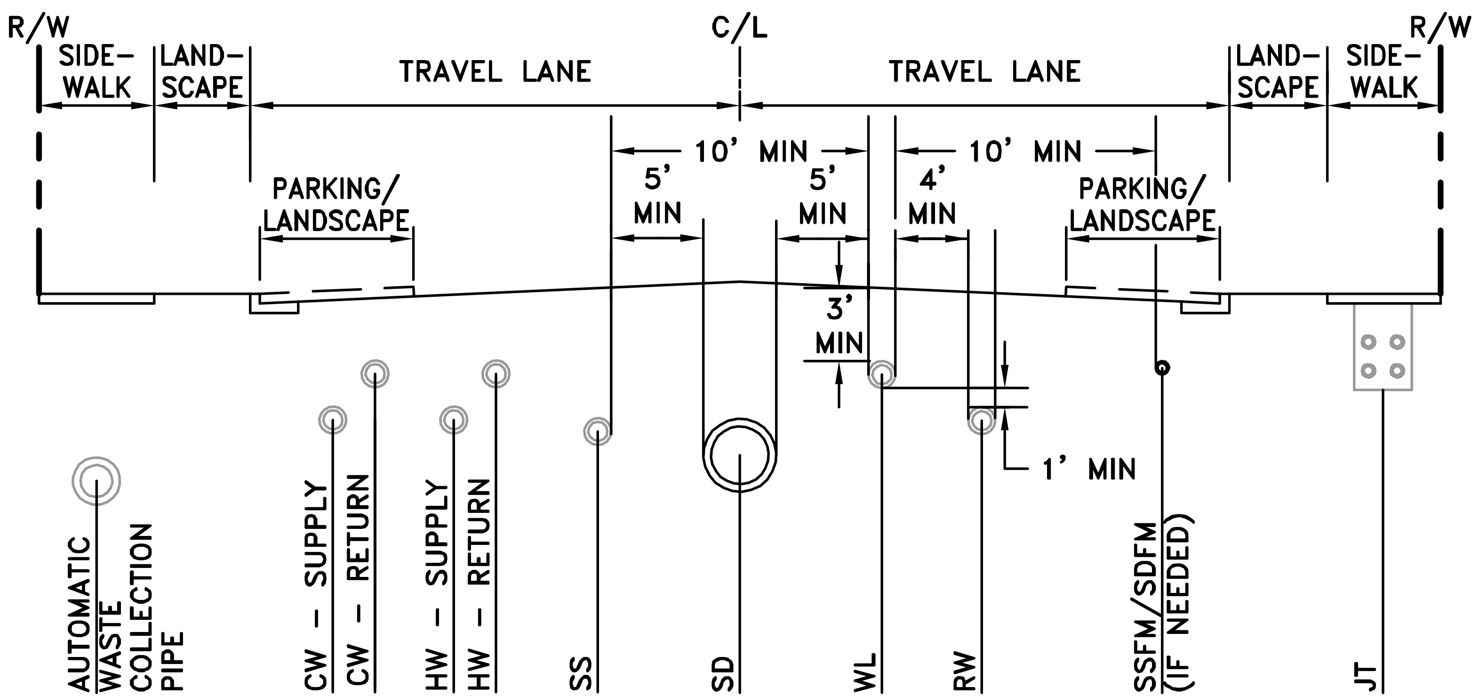


Source: BKF Engineers, February 2011

Figure 12.2.1: Detail of Stormwater Collection System Location in Streets



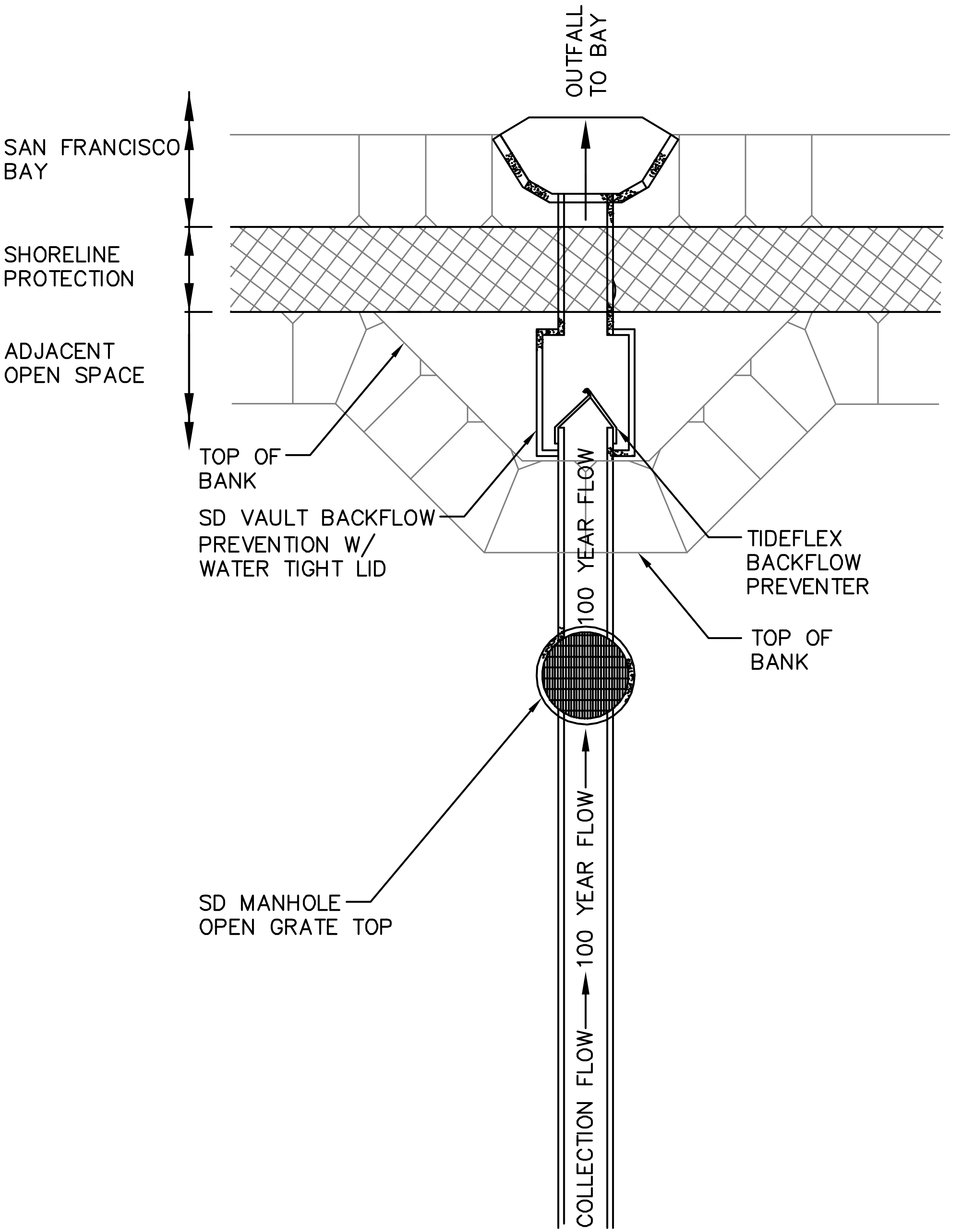
STORMWATER SYSTEM IN STREETS
1"=10'



TYPICAL UTILITY CROSS SECTION
1"=10'

Source: BKF Engineers, February 2011

Figure 12.2.2: Detail of Stormwater Collection System in Streets

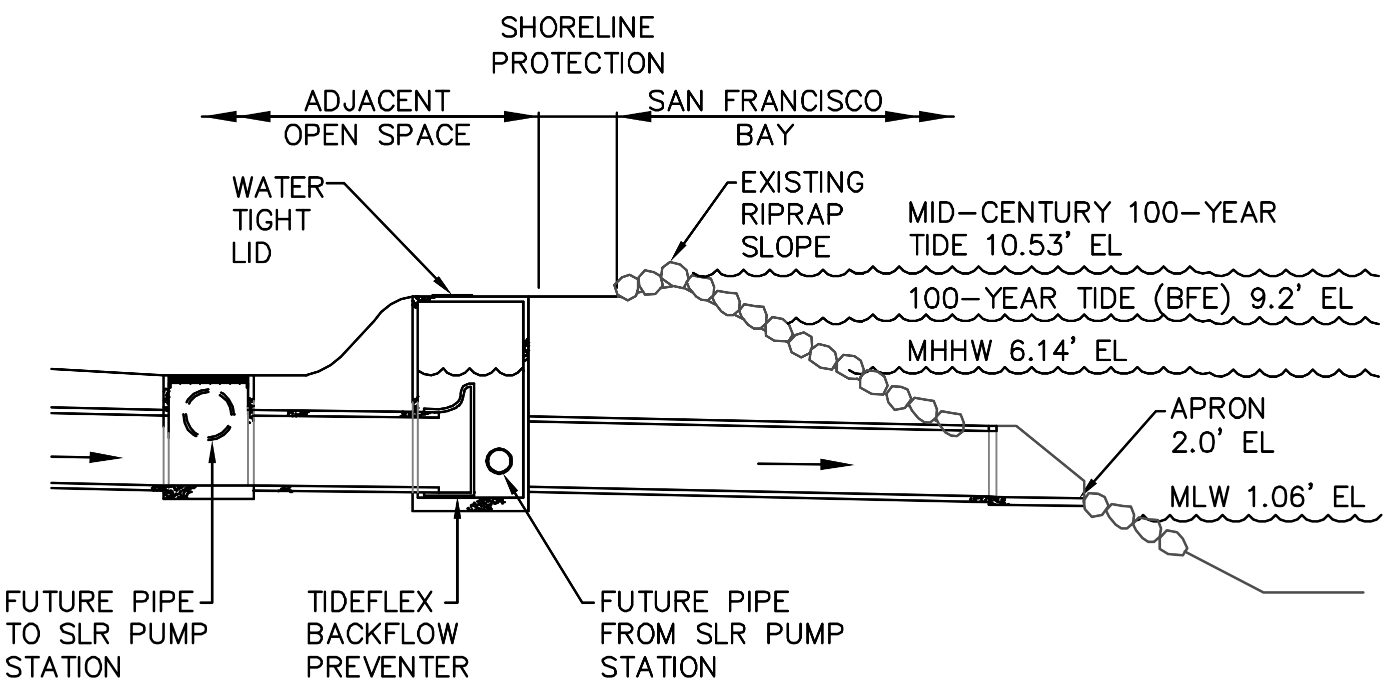


STORM DRAIN OUTFALL AT CONSTRUCTION

NOT TO SCALE

Source: BKF Engineers, 2010

Figure 12.3.1: Conceptual Outfall Structure



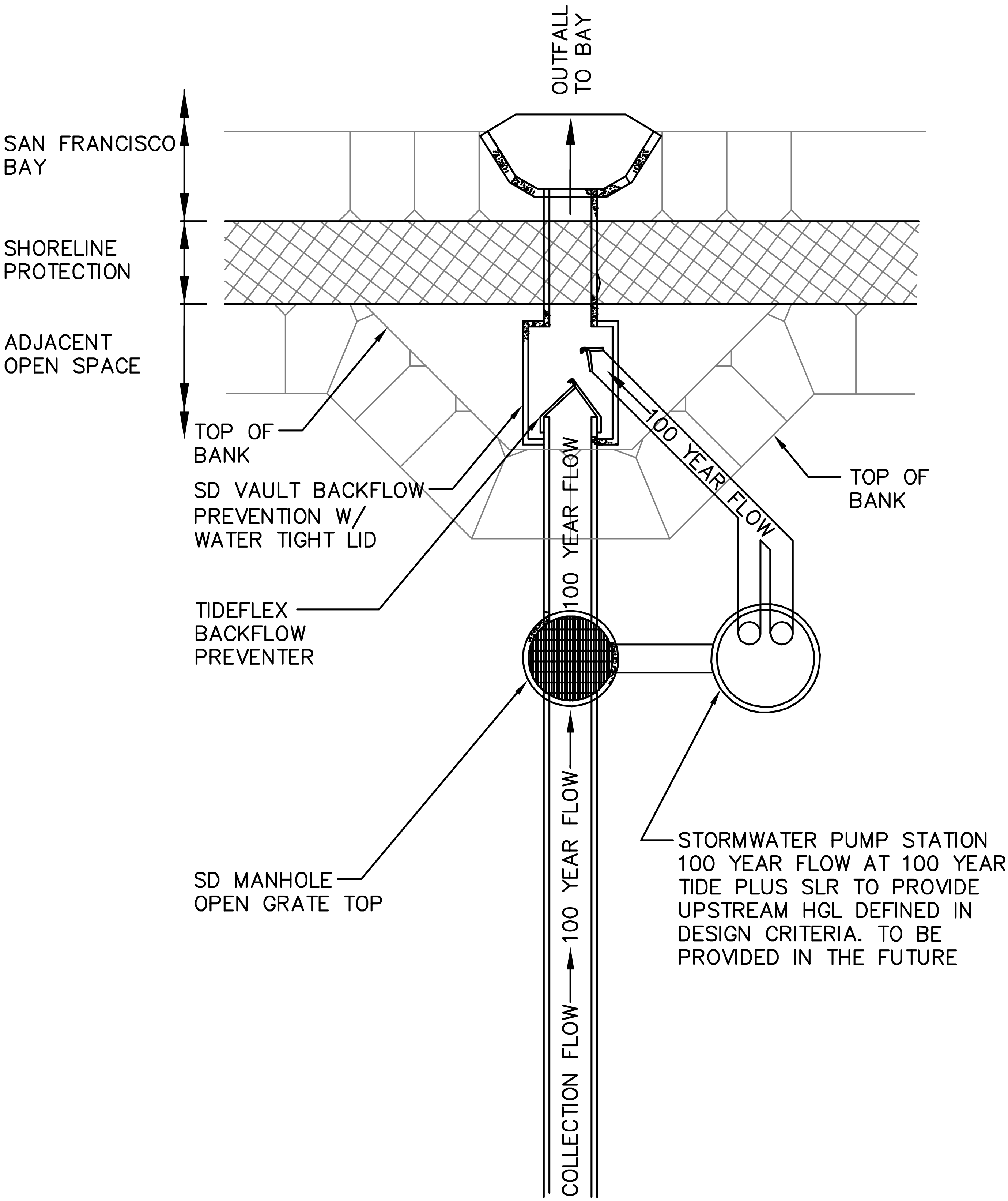
STORM DRAIN OUTFALL – SECTION

NOT TO SCALE

PROJECTED TIDE ELEVATIONS WITH SEA LEVEL RISE

TIDE BENCHMARK	SLR	100–YR	MLW	MHHW
CURRENT	–	9.20'	1.06'	6.14'
MID–CENTURY (~2050)	16"	10.53'	2.39'	7.47'
3/4 CENTURY (~2075)	36"	12.20'	4.06'	9.14'
END CENTURY (~2100)	55"	13.78'	5.64'	10.72'

Source: BKF Engineers, February 2011



STORM DRAIN OUTFALL WITH SLR

NOT TO SCALE

Source: BKF Engineers, 2010

Figure 12.3.3: Conceptual Outfall Structure

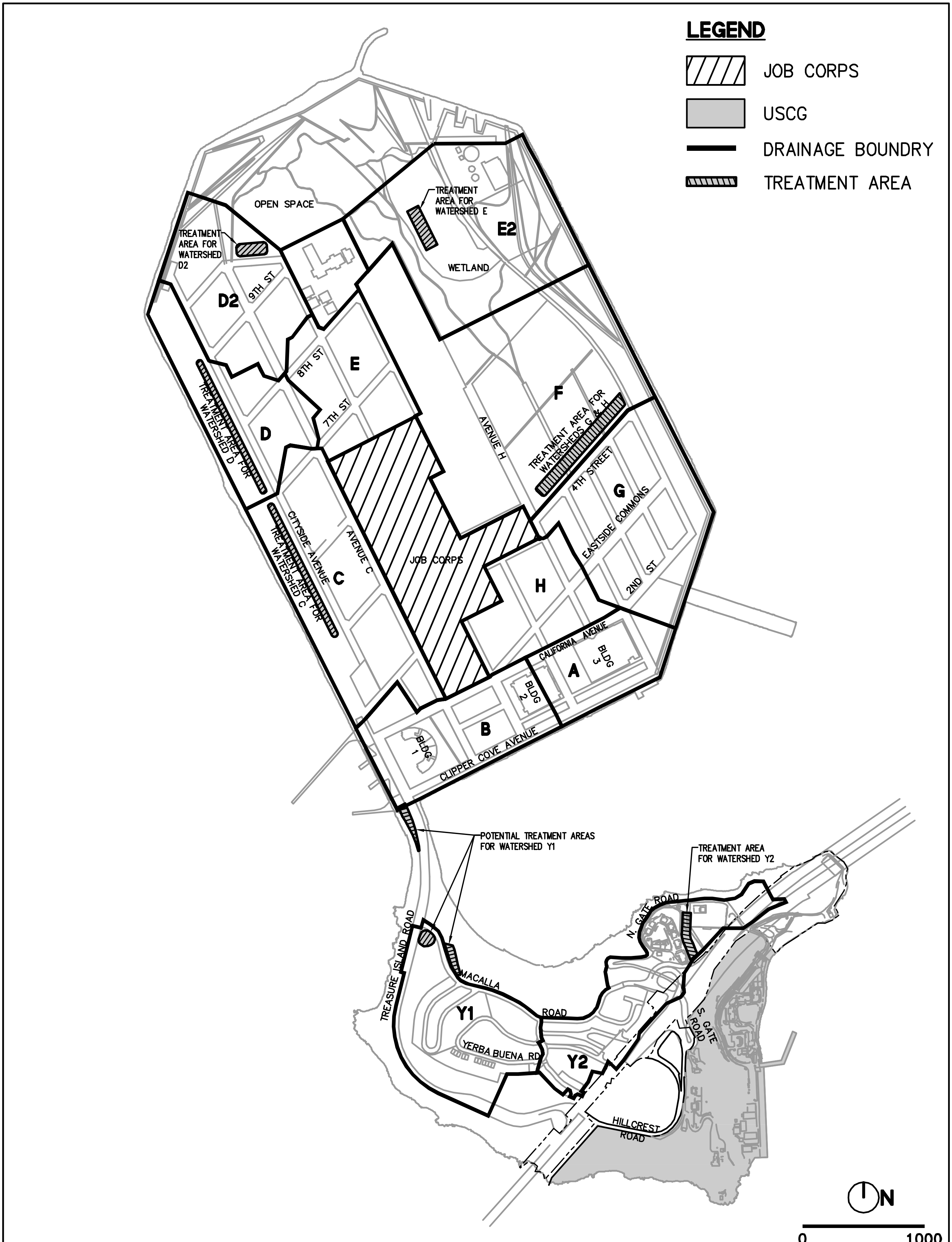
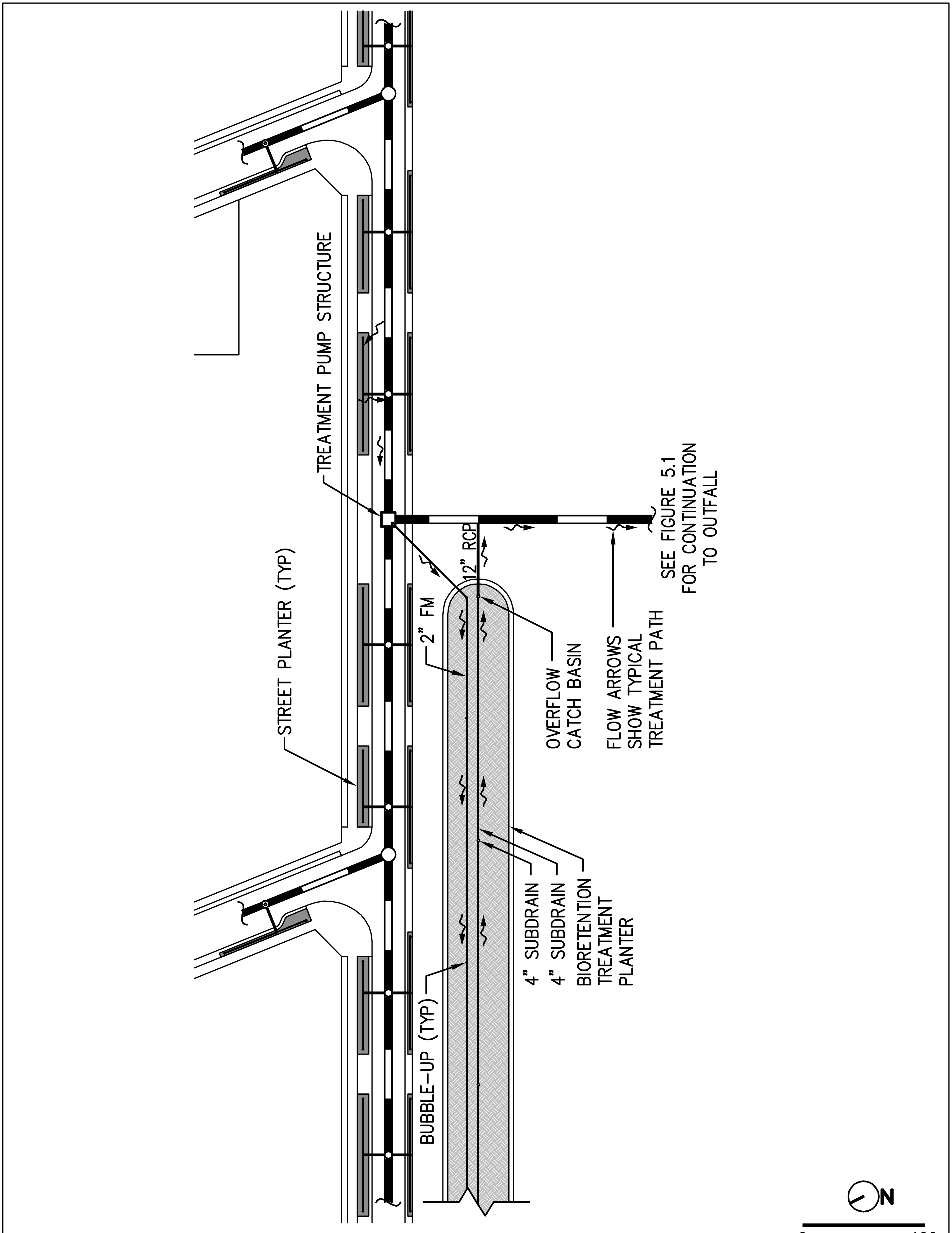
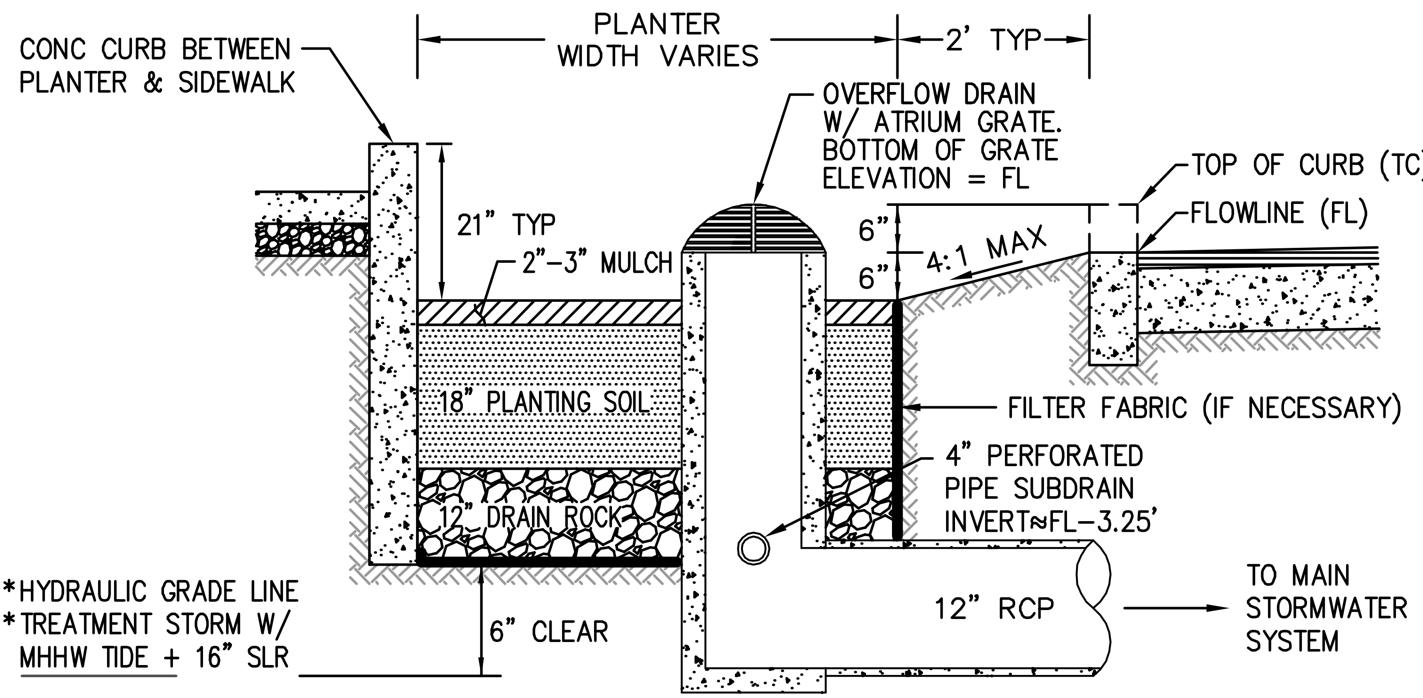


Figure 12.4: Watershed and Treatment Areas



Source: BKF Engineers, February 2011

Figure 12.5.1: Typical Stormwater Path

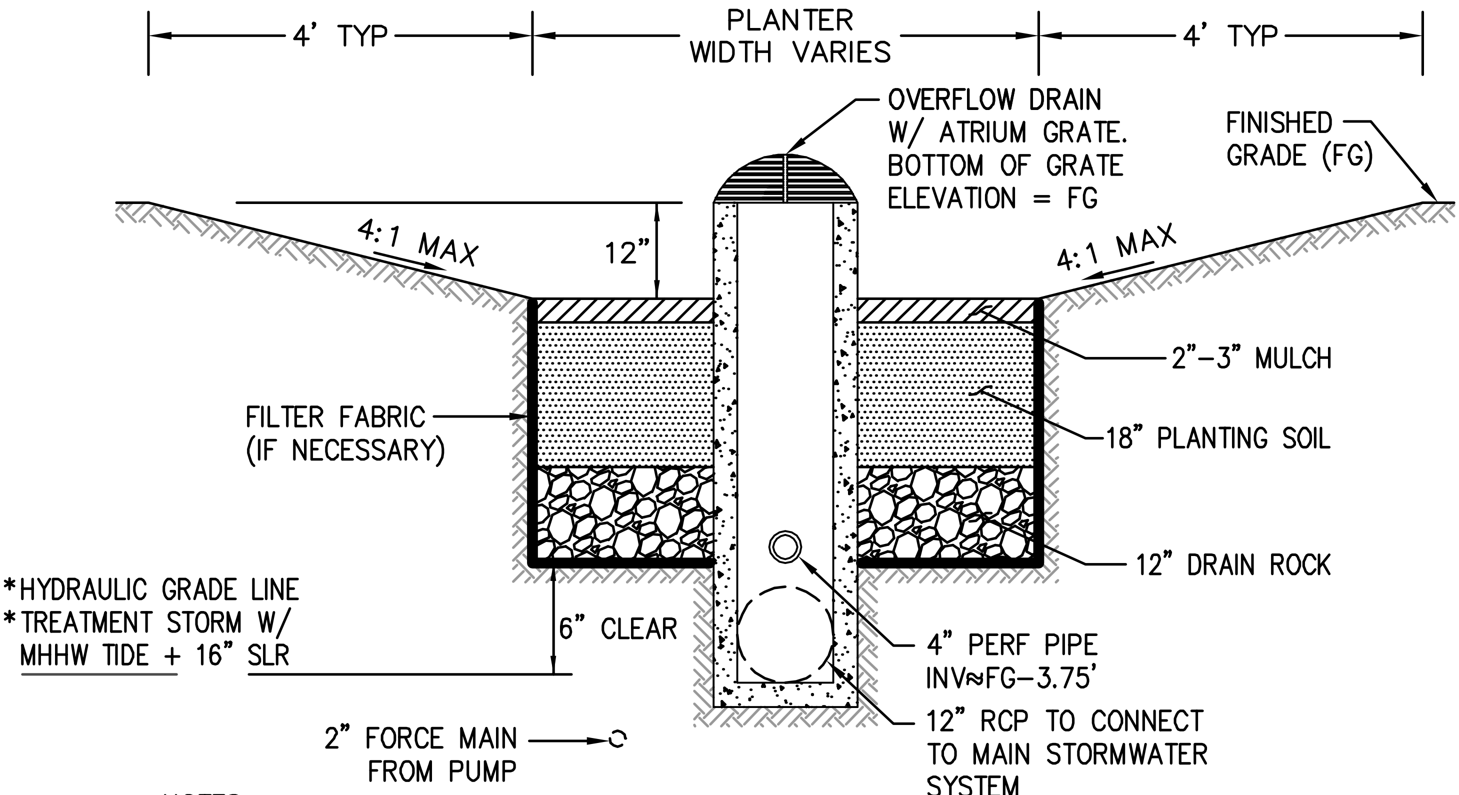


*INDICATES THE HYDRAULIC GRADE LINE (HGL) OF THE STORM EVENT AND TIDE CONDITION (STORM EVENT/TIDE CONDITION) ASSUMING PLANTER LOCATED AT MOST UPSTREAM DRAINAGE STRUCTURE AND FL = 12.0 (NAVD 88).

TYPICAL STREET PLANTER

NOT TO SCALE

Source: BKF Engineers, February 2011



NOTES:

1. *INDICATES THE HYDRAULIC GRADE LINE (HGL) OF THE STORM EVENT AND TIDE CONDITION (STORM EVENT/TIDE CONDITION) ASSUMING PLANTER LOCATED IN SHORELINE PARK JUST UPSTREAM OF TIDEFLEX STRUCTURE AND FG = 12.0 (NAVD 88).

TYPICAL BIORETENTION TREATMENT PLANTER

NOT TO SCALE

Source: BKF Engineers, February 2011

Figure 12.5.3: Typical Bioretention Treatment Planter

13. DRY UTILITY SYSTEMS

Dry utilities on Treasure Island include electrical, natural gas, cable TV and telecommunications services.

13.1 Electrical System

13.1.1 Existing Electrical Service to Treasure Island

TIDA, or the Power Provider will own, operate, and maintain the existing electrical system once the Navy transfer is complete. They will be responsible for updating/executing/maintaining all related agreements for the continued electrical service to Treasure Island.

13.1.2 Existing Electrical System on Treasure Island

The existing submarine cables from Oakland land on TI near the end of 3rd Street. These lines connect to a series of existing 15kV switches located within Building 3. The existing switches provide sectionalizing capability to various parts of the Island. The existing distribution system on Treasure Island is a mix of underground cables and overhead lines. The rated capacities of the existing systems on Treasure Island are unknown. YBI is served by an existing 12 kV submarine cable running from Treasure Island to Yerba Buena Island under Clipper Cove.

To provide redundant power in case of emergency, the SFPUC owns two portable, diesel-fueled 2 MW generators that serve Treasure Island. The generators are kept outside of Building 3 and connect to the main 12 kV switchgear at TI. In the event of a power outage from an off-Island event, the power is manually switched to the portable generators. The portable generators are currently tested every other week. Each unit has a double-contained storage tank that holds approximately 2,100 gallons of diesel fuel that is adequate to run each generator at 70 percent load for about 20 hours.

13.1.3 Proposed Electrical System

13.1.3.1 Proposed Electrical Demand

The Project's estimated electrical peak demand is 11.4 MW and annual electrical energy consumption is 58,500 Megawatt-hours (MWh). This includes the proposed land uses, existing facilities to remain, infrastructure demands, and the WWTF.

13.1.3.1.1 Proposed Renewable Energy Generation

The Developer will provide 5 percent of peak electric demand with on-site renewable sources. The Project is anticipated to include photovoltaic panels to meet the goal. This would include the ability to provide roof-mounted photovoltaic systems on all buildings, including historic Buildings 1, 2, and 3.

13.1.3.2 Proposed Treasure Island Electrical Distribution System

The Developer will be responsible for the design and construction of the proposed electrical distribution system. The existing electrical distribution will be replaced in phases as the Project builds out. . The new system will be designed and constructed to PG&E standards. The on-island system will include new 15kV class switchgear (outdoor gear in a fenced enclosure) located near the southeast corner of the Project with bus and breakers for protection and sectionalizing load on the island. The submarine cables will be connected to this new switchgear through separate breakers, providing a redundant supply to the Island. The switchgear will include connection points for the two existing trailer mounted generators (to be relocated in close proximity to the switchgear yard) to provide additional redundancy. The distribution system throughout the Project will consist of a looped 600 amp, 12kV, main underground feeder system with fuses to protect radial and looped 200 amp circuits feeding transformers and service cables to residential and commercial developments. Distribution equipment will be installed subsurface or pad mounted as approved by the Power Provider. The existing 12kV submarine cable to YBI will remain and will be reused to provide service to the existing uses on YBI.

The new permanent electric distribution system will be underground in a joint or common trench which shall include gas, communication, and cable TV facilities as described below. The joint trench will also include electrical service for other infrastructure items such as street lights, traffic signals, and pump stations.

13.1.3.2.1 Location of Electrical Distribution System within New Streets

Figure 13.1 shows a conceptual layout of the joint trench system. Figure 13.2 shows the typical alignment of the joint trench system within the proposed streets.

13.1.3.3 Phases for Electrical System Construction

The Developer will design and install the new electrical system in phases to match the Sub-Phases of the Project. The amount of the existing system replaced with each Sub-Phase will be the minimum necessary to serve the Sub-Phase. The Sub-Phase will connect to the existing systems as close to the edge of the new Sub-Phase as possible while maintaining the integrity of the existing system for the remainder of the Island. Repairs and/or replacement of the existing facilities necessary to serve the Sub-Phase will be designed and constructed by the Developer.

The existing land uses on Treasure Island will continue to utilize the existing electrical distribution system with interim connections to the new system where required to maintain the existing service until the existing uses are demolished. These interim connections may be on overhead pole lines to facilitate ease of relocation to accommodate construction. The Power Provider will be responsible for maintenance of existing facilities until replaced by the Developer and will be responsible for the new power facilities once the Sub-Phase or new power facility is complete and accepted by the Utility Provider.

The Developer will provide an existing conditions report for the existing electrical system scheduled to remain adjacent to the Sub-Phase prior to the geotechnical mitigation activity. The report will include the conditions of the original system on TI as well as the new system constructed with previous phases adjacent to the new Phase. The report will be updated at the end of the geotechnical mitigation activity and again at the end of the construction of the Sub-Phase. The limit of the report and how the conditions of the systems are determined will be coordinated with the SFPUC. The Developer will be responsible for damage to the original electrical system, and/or newly installed electrical system on previous phases, due to geotechnical mitigation activity and/or construction of the proposed improvements. The Developer will make the necessary repairs as required and be responsible for any permit violations due to the damage.

13.2 Natural Gas System

13.2.1 Existing Natural Gas Demand

The existing natural gas demand at the Islands, including the Job Corps campus and the Coast Guard, is roughly 1.5 million therms per year.

13.2.2 Existing Natural Gas Distribution System

The SFPUC provides the existing natural gas supply to Treasure Island through a contract with the State of California Department of General Services ("DGS"). DGS has a contract with PG&E to use its distribution system and convey natural gas to TI through its 10" diameter submarine pipeline from Oakland. A portion of the existing pipe was recently replaced by Caltrans and PG&E due to conflicts with the construction of the new East Span of the Bay Bridge. There is no existing back-up gas supply.

The existing PG&E submarine gas line lands on the southeast corner TI. This line terminates at a large PG&E meter. Service lines radiate out from this meter to serve the uses on TI and YBI. The existing natural gas distribution system on the Island consists of 10 psi distribution lines using multiple types of pipe, including PVC and steel. The Gas Provider will own, operate, and maintain the existing natural gas service lines after the existing PG&E meter once the Navy transfer is complete.

13.2.3 Proposed Natural Gas System

13.2.3.1 Proposed Natural Gas Demand

The Project's peak natural gas demand is estimated at 42.6 million British Thermal Units per hour (Btu/hr) and annual gas consumption at approximately 1.3 million therms per year.

13.2.3.2 Proposed Natural Gas Distribution

The Developer will be responsible for the design and construction of the proposed gas distribution system. The new gas distribution system on Treasure Island will be constructed to PG&E standards and owned and maintained by the Gas Provider. The new distribution lines will be included in the joint trench facility shown in Figure 13.1 and 13.2.

13.2.3.3 Phases for Natural Gas System Construction

The Developer will install the new natural gas system in phases to match the Sub-Phases of the Project. The amount of the existing gas system replaced with each Sub-Phase will be the minimum necessary to serve the Sub-Phase. The new Sub-Phases will connect to the existing systems as close to the edge of the new Sub-Phase as possible while maintaining the integrity of the existing system for the remainder of the Island. Repairs and/or replacement of the existing facilities necessary to serve the sub-phase will be designed and constructed by the Developer.

The existing land uses on Treasure Island will continue to utilize the existing gas distribution system with interim connections to the new system where required to maintain the existing service until the existing uses are demolished. The Gas Provider will be responsible for maintenance of existing facilities until replaced by the Developer. The new gas system will be owned, operated and maintained by Gas Provider.

The Developer will provide an existing conditions report for the existing gas system scheduled to remain adjacent to the Sub-Phase prior to the geotechnical mitigation activity. The report will include the conditions of the original system on TI as well as the new system constructed with previous phases adjacent to the new Phase. The report will be updated at the end of the geotechnical mitigation activity and again at the end of the construction of the Sub-Phase. The limit of the report and how the conditions of the systems are determined will be coordinated with the SFPUC. The Developer will be responsible for damage to the original gas system, and/or newly installed gas system on previous phases, due to geotechnical mitigation activity and/or construction of the proposed improvements. The Developer will make the necessary repairs as required and be responsible for any permit violations due to the damage.

13.3 Telecommunications and Cable TV

The existing telecommunication facilities and cable TV on Treasure Island are outdated and in a poor state of repair. The entire system will need to be replaced with the Project.

The Developer will be responsible for the design and construction of the new services for the Project. The new services will be constructed in phases. The amount of the existing systems replaced with each Sub-Phase will be the minimum necessary to serve the Phase. The Sub-Phase will connect to the existing systems as close to the edge of the Sub-Phase as possible while maintaining the integrity of the existing system for the remainder of the Island. The existing land uses on Treasure Island will continue to utilize the existing system with interim connections to the new system where required to maintain the existing service until the existing uses are demolished.

The new system will be included in the joint trench facility shown in Figure 13.1 and 13.2.

13.4 Coast Guard and Job Corps

The Developer will not replace the dry utility facilities within the Coast Guard and Job Corps properties. The Developer will construct the new systems, including connection and/or transition facilities, up to the boundary of these two property owners and connect to their existing systems to maintain the existing services.

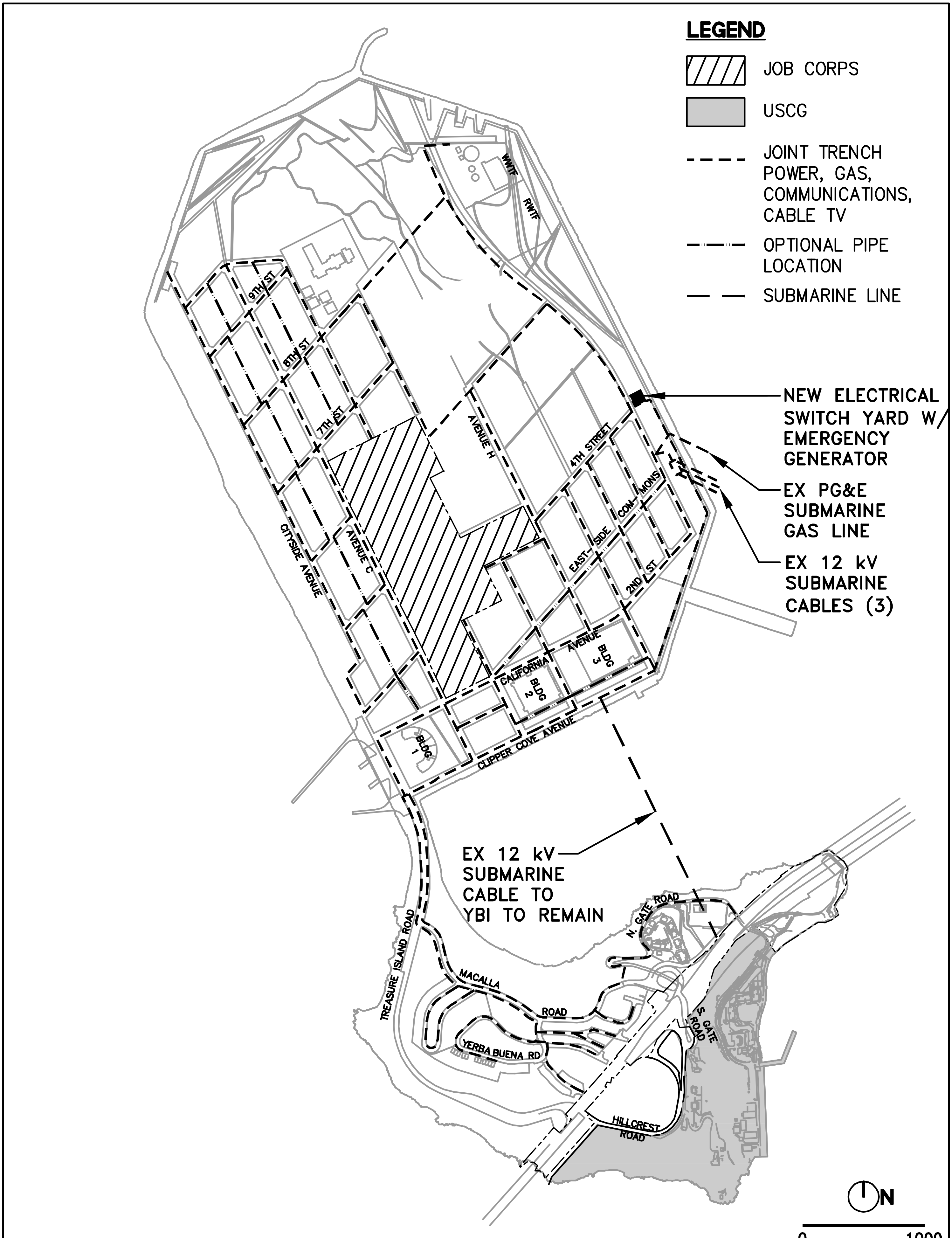


Figure 13.1: Proposed Joint Trench Distribution System

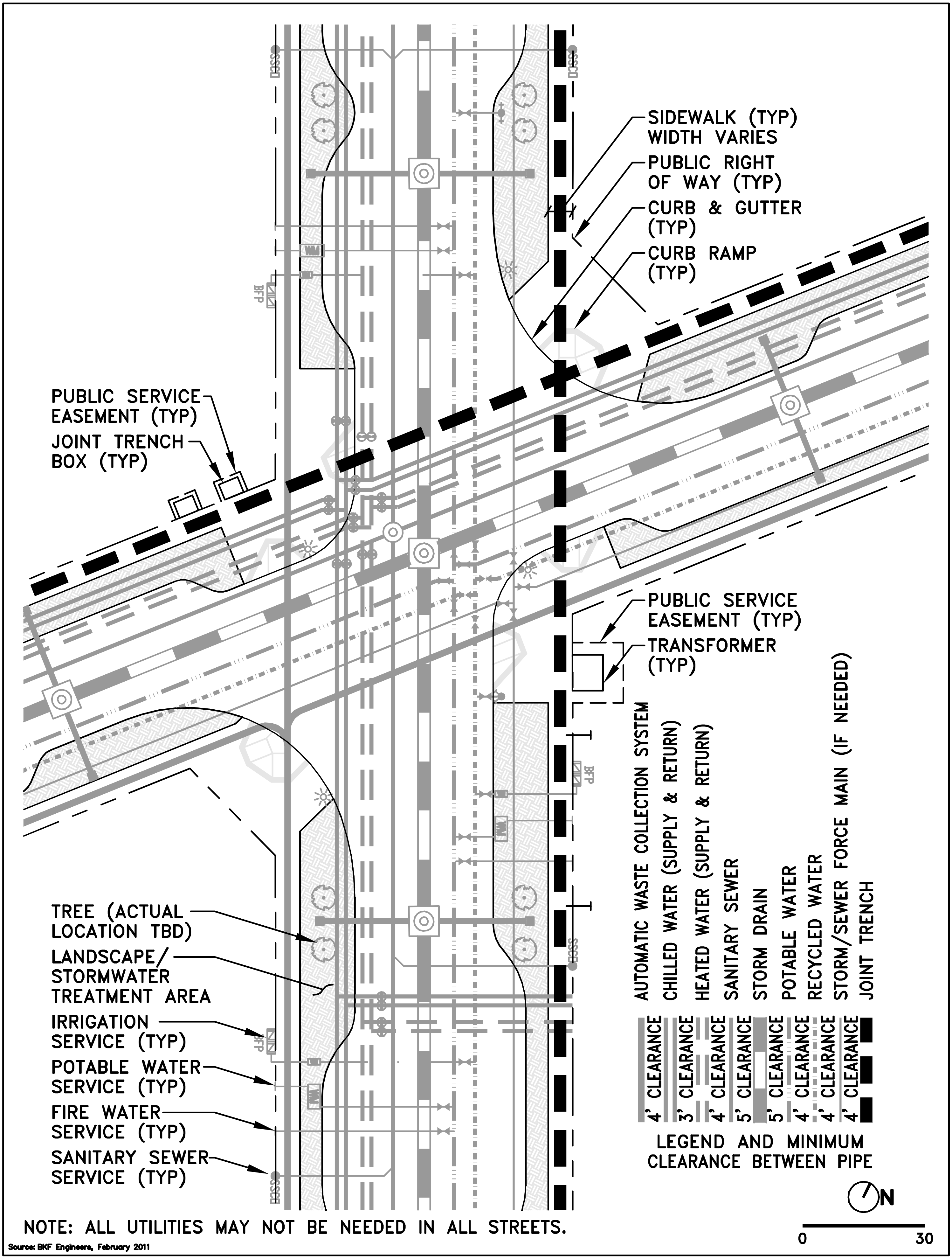
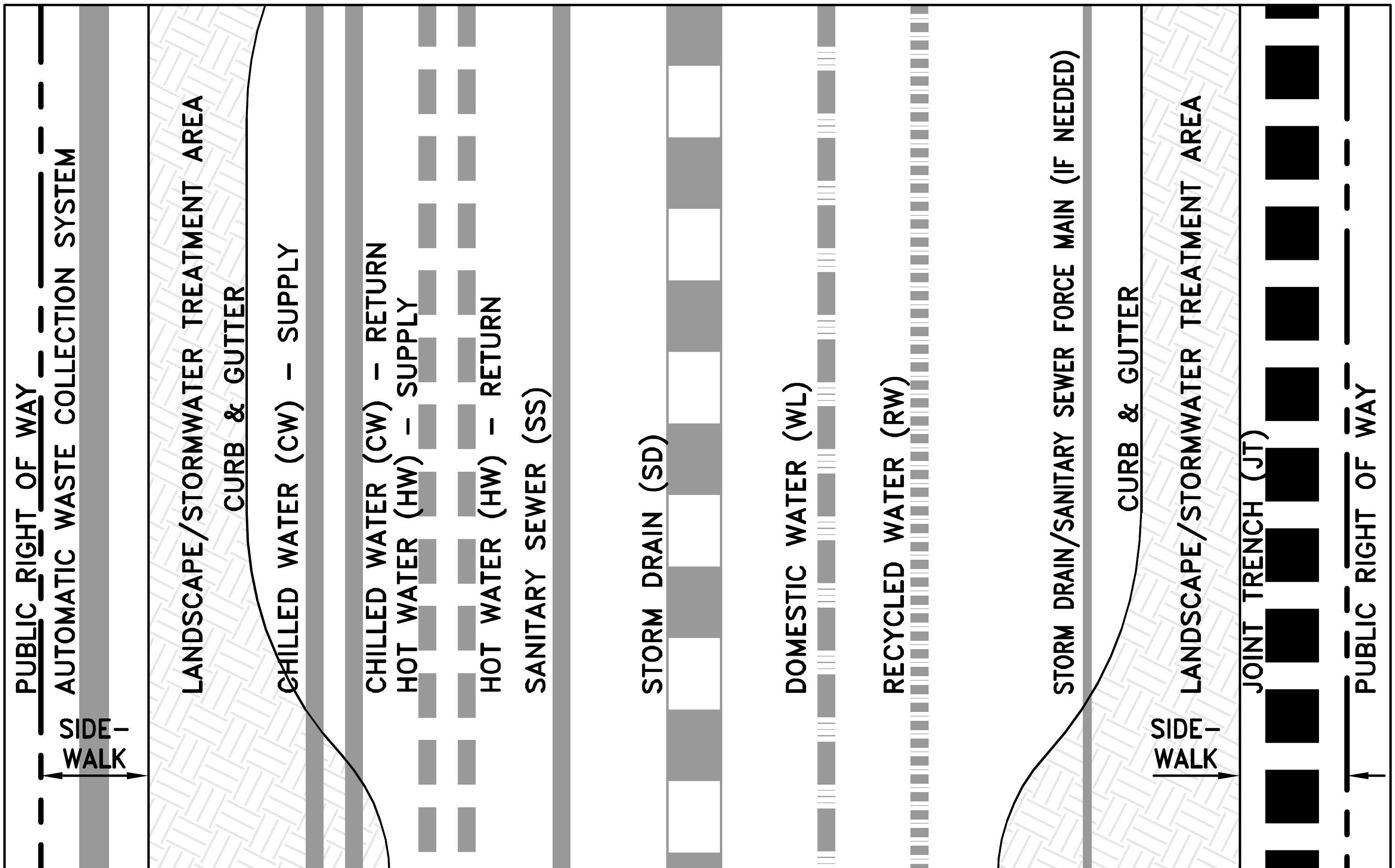
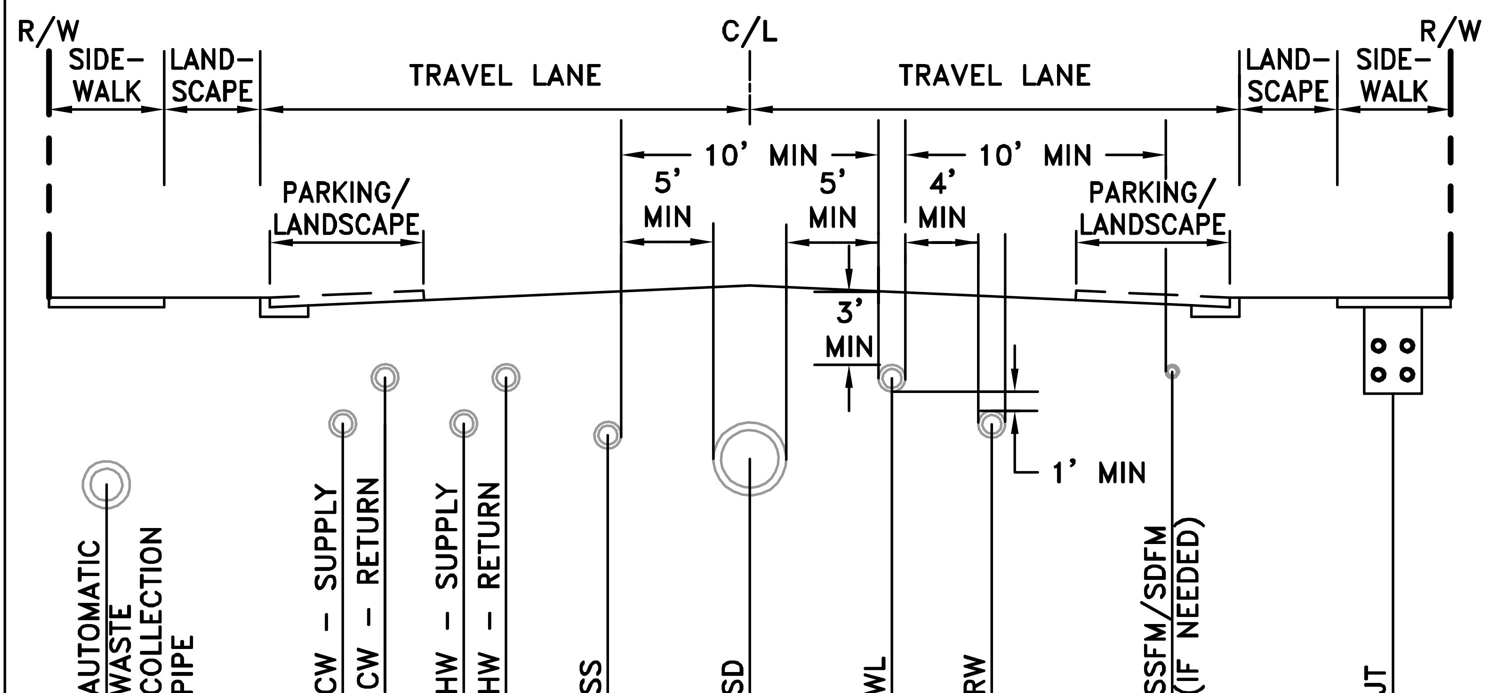


Figure 13.2.1: Detail of Joint Trench System Location in Streets



JOINT TRENCH IN STREETS
1"=10'



TYPICAL UTILITY CROSS SECTION
1"=10'

Source: BKF Engineers, February 2011

14. PROJECT INFRASTRUCTURE VARIANTS

A number of alternative infrastructure utilities have been considered as variants in the EIR for the project, including district heating and cooling, automated waste collection, and on-site renewable energy generation. These systems have been evaluated for use on the project, but have not been confirmed for implementation as of the date of this Infrastructure Plan. Upon mutual agreement between the City and the Developer, future implementation of any of these systems could be integrated into the project design as project approvals progress. Implementation and maintenance of these systems may be by the SFPUC, the Authority, or third party providers, or in combination between such parties. The infrastructure presented in this Infrastructure Plan would not preclude the future implementation of any of these systems.

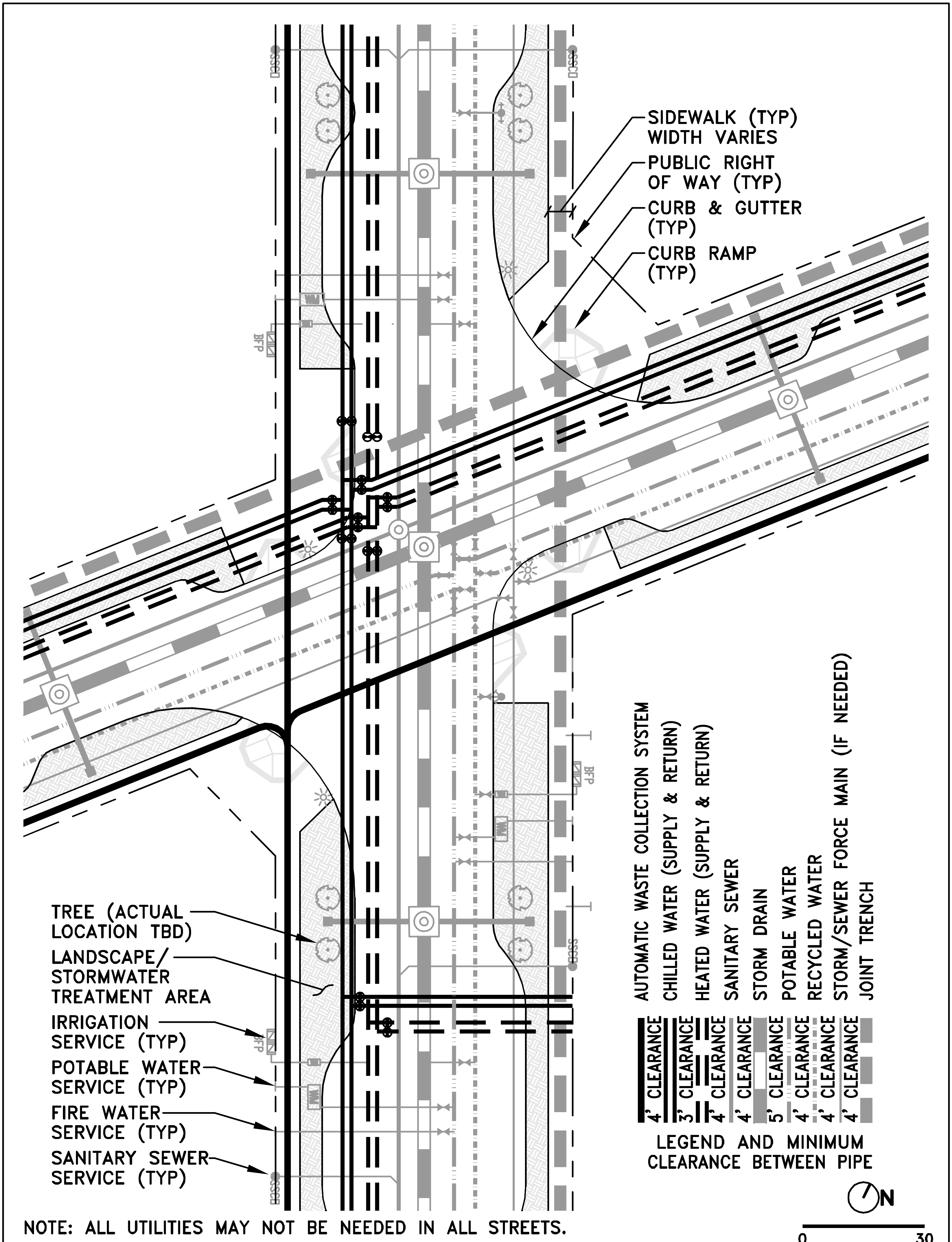
14.1 Location of Alternative Utilities

Figure 14.1 shows the potential pipe locations within the public street sections for the district heating and cooling, and automated waste collection systems.

14.2 Phasing

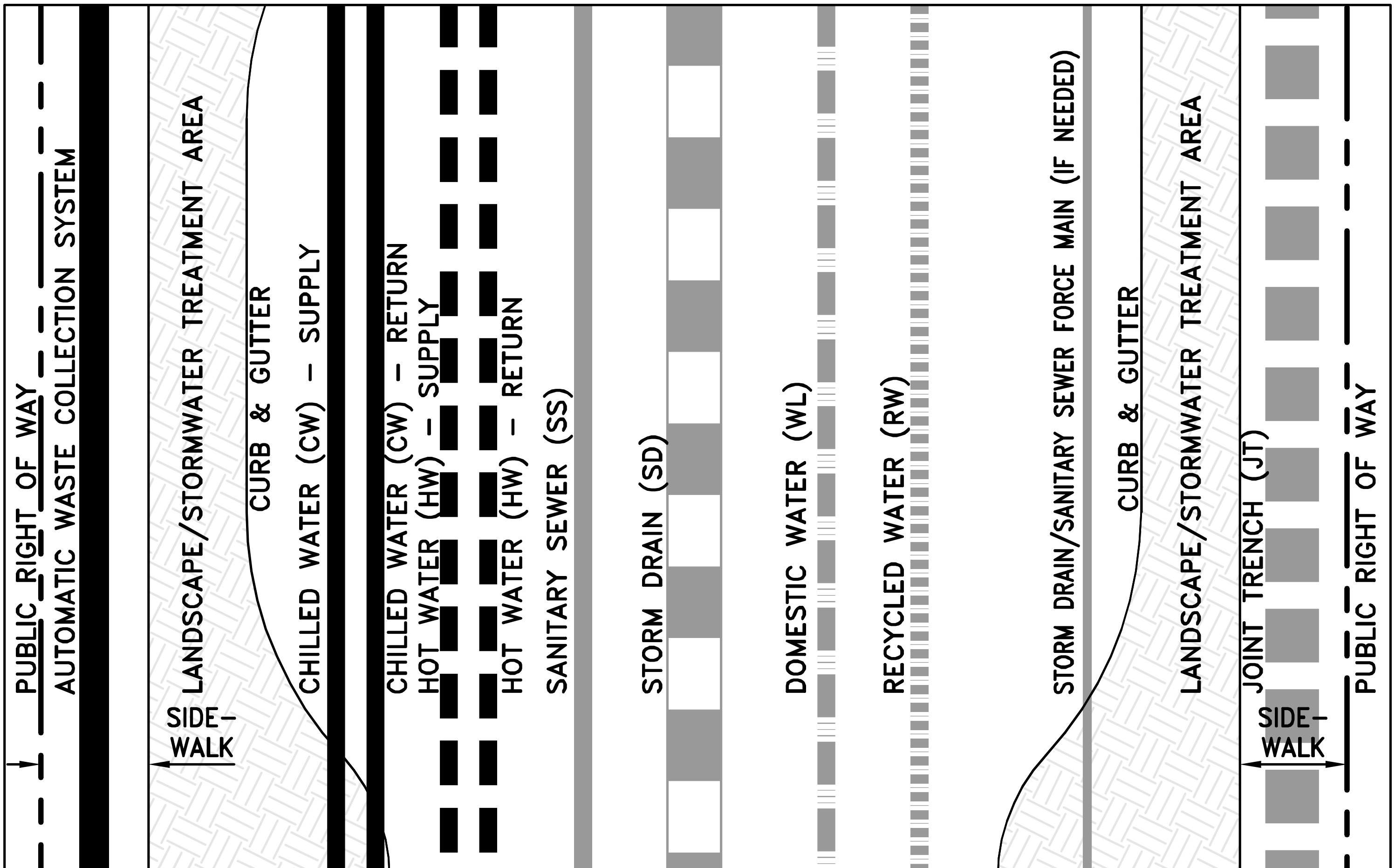
Any such alternative infrastructure utilities selected for implementation will be developed in conjunction with the phased buildout of the project. In cooperation with the Authority and the party responsible for implementation of such system(s), the Developer shall coordinate the submittal of design plans as part of the applicable Major Phase or Sub Phase Application.

Impacts to improvements installed with previous Phases of development do to the designs of the new Phase will be the responsibility of the Authority/System Operator/Developer and addressed prior to approval of the construction drawings for the new Phase.

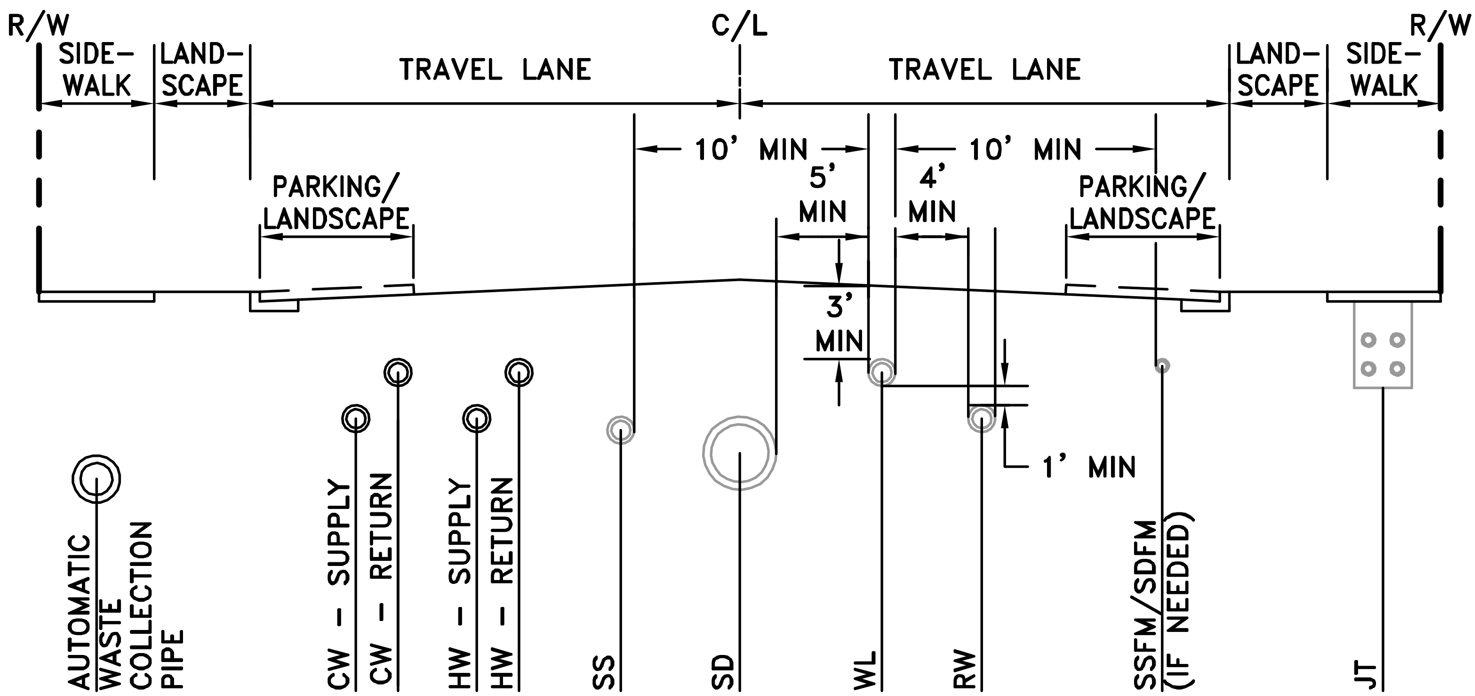


Source: BKF Engineers, October 2010

Figure 14.1.1: Detail of Heating/Cololing & Automated Waste System in Streets



POTABLE WATER IN STREETS
1"=10'



TYPICAL UTILITY CROSS SECTION
1"=10'

Source: BKF Engineers, October 2010

Figure 14.1.2: Detail of Heating/Cololing & Automated Waste System in Streets