# Yesler Terrace
# Preliminary Plat
# Basis of Design Report

June 20, 2012

*Prepared for:*


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# CITATION

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June 2012.

*SvR prepared this report under contract to GGLO, SHA's development planning lead.

# CERTIFICATION

June 20, 2012

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer or landscape architect licensed to practice as such, is affixed below.


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# ABBREVIATIONS

## DEPARTMENT ABBREVIATIONS USED IN THIS DOCUMENT:

| | |
|---|---|
| Seattle City Light | SCL |
| Seattle Department of Transportation | SDOT |
| Seattle Housing Authority | SHA |
| Seattle Public Utilities | SPU |
| Seattle Urban Forestry Commission | UFC |
| US Department of Justice | DOJ |
| Washington Administrative Code | WAC |
| Washington State Department of Ecology | WA DOE |
| Washington State Department of Transportation | WSDOT |

## TERM ABBREVIATIONS USED IN THIS DOCUMENT:

| | |
|---|---|
| American Association of State Highway and Transportation Officials | AASHTO |
| Best Management Practice | BMP |
| City of Seattle Right-of-Way Improvement Manual (2011) | COS ROWIM |
| Yesler Terrace Redevelopment Environmental Impact Statement | EIS |
| Environmentally Critical Area | ECA |
| Green Stormwater Infrastructure | GSI |
| Manual on Uniform Traffic Control Devices | MUTCD |
| Planned Action Ordinance | PAO |
| Public Rights-of-Way Accessibility Guidelines | PROWAG |
| Right-of-Way | ROW |
| Seattle Fire Code | SFC |
| Uniform Federal Accessibility Standards | UFAS |
| US DOJ 2010 ADA Standards for Accessible Design | ADA |

# 1) INTRODUCTION

The new Yesler Terrace is envisioned as a dynamic and welcoming urban, mixed-use community with convenient connections to nearby neighborhoods. The initial impetus for redevelopment was the deteriorating condition of the housing at Yesler. However, the vision for the new community goes beyond replacement of the housing stock. It imagines a place where people live in healthier housing that is part of a wider, healthier community - a place where the renewed physical environment is matched by strong social connections, access to education and economic opportunity.

Proposed development includes up to 5,000 units of housing, 900,000 square feet of office space, medical services, and/or lodging, 150,000 square feet of other non-residential uses, more than six acres of open space and cutting-edge green buildings and green infrastructure. The intent is also to strengthen public realm connectivity within and beyond Yesler Terrace with new streets and pedestrian connections.

## Preliminary Plat

The purpose of a Preliminary Plat is to provide City of Seattle departments information on how the configuration of rights-of-way, lots, and public easements is appropriate to meet the long term programmatic and infrastructure needs of the future Yesler Terrace community. The Preliminary Plat is a tool for dialog with City departments that leads to a Final Plat where the final property configuration is delineated dimensionally and recorded. In the case of Yesler Terrace, the Preliminary Plat is one part of an entitlement process that includes many other elements, including an Environmental Impact Statement, changes to the Land Use Code to create a new zone for Yesler Terrace, called Master Planned Community – Yesler Terrace zone, a legislative rezone of the site to that new zone, a Planned Action Ordinance, Street Vacation conditions of approval and Street Improvement Plans.

## Basis of Design – Preliminary Plat Level

This basis of design report documents key assumptions in terms of regulations and design criteria that have shaped planning efforts to date. This report also summarizes the diverse analyses developed in the preparation of the Yesler Terrace Preliminary Plat. This document serves both as a reference to help understand the Preliminary Plat drawings and as a design guide for use in the development of permitting and construction documents.

## Basis of Design – Outline

This basis of design report has been organized into the following study areas:

- Earthwork
- Street Geometry
- Power, Communications and Energy
- Storm and Sewer
- Water
- Streetscape

# 2) EARTHWORK

## 2.1 BACKGROUND

The Yesler Terrace site generally slopes from north to south. Broadway provides an east-west grade break where the NE and SE portions of the site slope to the east-southeast toward Boren Ave and 12th Ave S. The NW and SW portions of the site slope to the west-southwest toward the Interstate 5 ROW. The site has an elevation change of approximately 150 feet from its highest point near the Harborview Medical Center complex to its lowest point located south of the S Main St ROW. Numerous rockeries and small retaining walls are present across the site resulting in benched yards and open spaces interspersed with steep flights of stairs.

The Earthwork Technical Report prepared by Landau Associates for the EIS and dated October 2010 provided the following review on the ECA located in the southern portion of the site: steep slopes of over 30 percent were created by 1) the Jackson Street Regrade, a large earthworks project undertaken by the City between 1907 and 1910 to provide flatter grades between the Central Business District and the Rainier Valley; and 2) subsequent landslide activity on a portion of the cut slopes down to S Jackson St.

A detailed land survey was completed by Bush, Roed & Hitchings, Inc. (BRH) in 2009 and updated in 2011 to support the Yesler Terrace project. The site-specific topographic data (with 1-foot contours) was used to identify those areas of the site with existing slopes greater than or equal to 2.5 Horizontal:1 Vertical (2.5H:1V, or 40 percent) with a vertical change in elevation of at least 10 feet. Under certain conditions, such slopes are delineated as “steep slope areas” where development can be regulated by the City’s regulations for ECAs under Seattle Municipal Code (SMC) 25.09.

## 2.2 ASSUMPTIONS

### 2.2.1 Codes, Regulations and Guidelines

**Seattle Municipal Code Title 25 –** Environmental Protection and Historic Preservation (copied from website on 2/8/2012)

25.09 Regulations for Environmentally Critical Areas
25.11 Tree Protection

### 2.2.2 Design Criteria

**Structural Fill** – COS Type 17 structural fill will be used in the ROW.

**Existing Building Crawl Space** – Existing buildings typically have a 3-foot deep crawl space, but there are a few with partial basements.

**ECA Steep Slope Development Exemption Decision** – A small portion of proposed development is located on steep slope areas, potential slide areas and known slide areas. See Figures 2.1, 2.2 and 2.3 below for DPD GIS Maps of these areas and Preliminary Plat for these areas overlaid on proposed grading. See

Appendix A for an ECA Steep Slope Development Exemption Letter issued by DPD.


**Figure 2.1 – DPD GIS Map of Steep Slope Areas**


**Figure 2.2 – DPD GIS Map of Potential Slide Areas**


**Figure 2.3 – DPD GIS Map of Known Slide Areas**

## 2.3 ANALYSIS

### 2.3.1 Grading

**Existing Surface** – A digital surface was created in Civil 3D with the topographic data provided by BRH on December 2011.

**Roadway Profile Review** – Preliminary grading of streets was based on transitions to the profiles and sections of existing roadways to be retained. See Section 3.3.1 for additional roadway information.

**Private Property Development / Proposed Building Grade** – Mass grading approach included filling of existing crawl spaces and grading to adjacent rights-of-way. Structural excavation was estimated based on SHA's May 2011 Development Plan.

**Existing Trees to be Preserved** – Preliminary grading was also influenced by existing trees to be preserved, in accordance with the Tree Protection Plan in Exhibit C to the PAO. See Existing Tree Survey and Tree Preservation Plan in Preliminary Plat.

# 3) STREET GEOMETRY

## 3.1 BACKGROUND

Yesler Terrace sits at the intersection of two different street grids. To the northwest lies the northwest-southeast grid that services downtown Seattle and aligns with the waterfront. To the south and east the street grid is more typical of Seattle streets with a north-south, east-west grid alignment. Over time, the original street grids have been interrupted by the addition of Boren Ave S and Interstate 5 to form the complex street network that exists today. However, the historic street grids continue to be influential since the conflicting grids meet at the center of Yesler Terrace.

Per Appendix B: Seattle Arterial Classifications Planning Map, four arterials surround, intersect or enter Yesler Terrace. Boren Ave S and 12th Ave S are principal arterials that create the eastern boundary of the site. Yesler Way, E Yesler Way, Broadway and 8th/9th Ave are minor arterials that enter or bisect the site. The remaining streets within Yesler Terrace are classified as access streets. Access streets included within Yesler Terrace are 8th Ave S, 10th Avenue S, Terry Ave, S Washington St, Fir St and Spruce St.

The First Hill Streetcar is being built by the City of Seattle and the track improvements will impact Yesler Terrace frontages along E Yesler Way and Broadway. Construction began in late April 2012 and is anticipated to be complete in early 2014.

## 3.2 ASSUMPTIONS

### 3.2.1 Codes, Rules and Regulations

**Roadway Design Criteria** – COS ROWIM copied from city website on May 7, 2012. Includes ROW and roadway existing and required widths for all existing streets. City documents incorporate AASHTO and MUTCD guidelines by reference.

**Streets, Alleys and Easements** – Seattle Municipal Code Chapter 23.53 Requirements for Streets, Alleys and Easements copied from the Seattle Municipal Code website on May 11, 2012; draft Land Use Code amendments for private access drives at Yesler Terrace, and street vacation conditions of approval.

**ADA for HUD Funded Housing Projects** –UFAS dated August 4, 1982 (update pending).

**ADA in Right-of-Way** – The US Access Board's PROWAG, July 26, 2011.

**U.S. Department of Justice (DOJ) 2010 ADA Standards for Accessible Design**

**DR 5-2009, Street Opening and Restoration** – This document lays out rules for improvements to existing streets.

**Seattle Municipal Code Title 23** – Land Use Code and draft amendments, PAO, and street vacation conditions of approval

### 3.2.2 Design Criteria

**Horizontal Alignment** – Yesler Terrace roadway centerlines were developed assuming a minimum horizontal radius of 125 feet based on a 20 mph design speed per COS ROWIM Section 4.4.2. However, there are several locations where a smaller horizontal radius has been proposed. Street geometry is shown in Preliminary Plat.

**Cross-Section** – ROW cross-sections were developed with the purpose of providing safe, accessible routes of travel for all modes while allowing for the desired streetscape character. Cross-sections for individual streets showing roadway and ROW widths are shown in Preliminary Plat.

**Curb Bulbs** – All proposed curb bulbs are 6 feet wide. The curb radii used for the 6-foot bulbs is 10 feet for the radius nearest to the travel lane and 10 feet for the radius closest to the ROW margin. This approach will require a variance since it is tighter than the 10- and 20-foot radii indicated in COS ROWIM Section 4.10.2.

**Sidewalk Width** – A minimum sidewalk width of 6 feet is required when there is a planter between a curb and edge of walk per COS ROWIM Section 4.11.2. However, a minimum sidewalk width of 7 feet is proposed at Yesler Terrace due to the anticipated densities.

**Bike Lane** – The existing bike lane located on Broadway north of Yesler Way is being replaced with a cycletrack as part of the First Hill Streetcar project. The Yesler Terrace project proposes to improve the cycletrack by providing a wider landscape buffer between the roadway and the cyclist. The eastbound bike lane on Yesler Way will be maintained, but widened to provide a 2-foot buffer zone from Interstate 5 to Broadway. The westbound bike sharrow will also be maintained west of Broadway. East of Broadway, the First Hill Streetcar project will be installing 5-foot bike lanes.

**Profile/Vertical Alignment** – There are several portions of existing streets to be maintained at Yesler Terrace. The profiles of the proposed streets have taken into account the vertical curve requirements and the maximum and minimum roadway grades of COS ROWIM Section 4.4.2. However, the minimum vertical curve lengths, 90 feet, and the maximum roadway grades, 10 percent for minor arterials and 17 percent for residential roadways, could not be met at all locations due to the existing grading of streets to be retained.

**Benching/Intersections** –Benching is required to allow for accessible curb ramps, crosswalks and corner building entrances. Benching the proposed intersections involves minimizing the roadway profile grades at these intersections. Benching may not be feasible at intersections that tie into portions of the existing roadways. An SDOT exemption may be required. See Section 3.3.2 for discussion of grading at each intersection.

**Bus Routes** – Future development should be coordinated with King County Metro regarding bus route #60 that runs on Terry Ave and Spruce St which are to be vacated. A new #60 bus stop may be required on Fir St west of Broadway.

## 3.3 ANALYSIS

### 3.3.1 Roadways

A brief description of each street is provided below. See Preliminary Plat sheets for plans and sections of these streets. Also, see Appendix C for the Yesler Terrace Tree Impact Study regarding the modifications of roadway layout and profiles to accommodate preserved trees. Existing tree numbers are referenced on Existing Tree Survey and Tree Preservation Plan in Preliminary Plat.

**8th Ave (North of Yesler Way)** – The ROW is proposed to be widened by 3 feet on each side to 66 feet except along the Steam Plant frontage on 8th Ave. The existing roadway pavement is to remain between the intersection grade breaks. Sidewalks and related streetscape improvements are proposed along the entire length of 8th Ave. The profile of this street is to match the existing profile with some modifications at each end to tie into intersections.

**S Washington St** – A 66-foot ROW is proposed for this street. Full street improvements are proposed. The profile of this street has been designed to match Yesler Way intersection grades and to save existing trees #167 and #200.

**9th Ave** – Minor revisions to the existing ROW are proposed at the south end of the street. The existing ROW width of 66 feet is to remain. Full street improvements are proposed on this street. The proposed roadway profile includes steeper grades in order to accommodate a benched area at the intersection with 8th Ave and Fir St. The proposed roadway profile has also been adjusted to accommodate existing tree #27.

**10th Ave (North of Yesler Way)** – The proposed ROW is widened from 18 feet to 66 feet. Full street improvements are proposed on this street from Fir St to Yesler Way. The proposed profile of this street is intended to closely align with the existing profile. The proposed sidewalk on the west side just south of E Fir St has been routed around existing tree #358 to limit impacts to this tree.

**10th Ave S (North of Washington St)** – A 54-foot ROW is proposed for this street. The existing west boundary of the ROW is at the existing curb. The west side of 10th Ave S landscape and sidewalk will be restored on the Seattle Parks and Recreation property. The profile of this street has been designed to match the grades at the intersection with Yesler Way and to match the grades along the Yesler Community Center on the west road edge and to save trees #320 and #328 on the west edge and tree #321 on the east road edge. In order to save tree #321, a wall located at the curb line fronting the tree is proposed and the sidewalk is to be graded to minimize the impact to the tree.

**10th Ave S (South of Washington St)/S Main St** – A 66-foot ROW is proposed for this street. Full street improvements are proposed.

**Alder St** – No changes to the existing 66-foot ROW are proposed on this street. Half street improvements are proposed. The profile of this street will match the existing profile.

**Boren Ave** – No changes to the existing 70-foot ROW are proposed. The existing roadway pavement is to remain. New landscaping and sidewalk are proposed along the west side of Boren Ave from Fir St to Main St.

**Broadway** – No changes to the existing 80-foot ROW are proposed. The existing roadway pavement is to remain. New curb, gutter, landscaping and sidewalk are proposed along the west side of Broadway from Alder St to Yesler Way. Existing tree #116 is to remain in the landscaping area on the west side of Broadway north of Fir St. Existing curb, gutter, landscape strip and sidewalk are to remain along the east side of Broadway from Alder St to Fir St. New curb, gutter, landscaping, cycletrack and sidewalk are proposed along the east side of Broadway from Fir St to Yesler Way.

**Fir St/E Fir St** – A new 66-foot ROW is proposed between 9th Ave and Broadway. Between Broadway and Boren Ave, the existing 56-foot ROW was increased by 4 feet on the south side for a total ROW width of 60 feet. Full street improvements are proposed between 9th Ave and 10th Ave. New roadway surface, curb, gutter, landscaping and sidewalk are proposed along the south side between 10th Ave and Boren Ave. The proposed sidewalk at this location has been routed around existing trees #351, #353, #355 and #356. The proposed profile of this street is relatively flat and is designed to match the existing cross-street grades.

**Yesler Way** – Between Interstate 5 and 8th Ave, the ROW is proposed to be widened by 17 feet along the south side for a total width of 83 feet. Between 8th Ave and Broadway, the ROW is proposed to be widened by 23 feet along the south side to a total width of 89 feet. No changes to the existing 66-foot ROW are proposed between Broadway and Boren Ave. Full street improvements are proposed between the west end of the project and Broadway. Street improvements between Broadway and Boren Ave are to be designed and constructed as part of the First Hill Streetcar project. Sidewalk and landscaping improvements will be included with the Yesler Terrace project. The profile and hardscape layout should be developed to preserve existing trees #173, #176, #291, #294, #295, #296, #329, #333, #336, #337, #338, #341, #399 and #400.

### 3.3.2 Intersections

A brief description of each intersection is provided below.

**8th Ave and Yesler Way** – The grading of this intersection is controlled by the existing grades for Yesler Way and 8th Ave (north of Yesler Way). This intersection will be signalized.

**9th Ave, 8th Ave and Fir St** – The grading of this intersection is controlled by the existing grades of the steam plant.

**10th Ave and Yesler Way** – The grading of this intersection is controlled by the existing grades for Yesler Way.

**Alder St and 9th Ave** – The grading of this intersection is controlled by the existing grades for Alder St.

**Broadway and Fir St** – The grading of this intersection is controlled by the existing grades for Broadway.

**Broadway and Yesler Way** – The grading of this intersection is controlled by the existing grades for Broadway and Yesler Way.

**E Fir St and 10th Ave** – The grading of this intersection is controlled by the existing grades for E Fir St.

**E Fir St and Boren Ave** – The grading of this intersection is controlled by the existing grades for E Fir Street and Boren Ave.

**S Washington St and 10th Ave S** – This is a fully improved intersection. This intersection has been designed to be benched to improve pedestrian access.

# 4) POWER, COMMUNICATIONS AND ENERGY

## 4.1 BACKGROUND

SHA reviewed two options for power and franchise utilities: underground and overhead approaches. SHA, in discussion with Seattle City Light (SCL), decided that a new overhead system provided more certainty in construction costs and charges.

There are existing SCL poles and overhead wires located within SHA property that will need to be relocated to allow for future redevelopment. SCL engineering will relocate overhead feeder, distribution and service lines between Alder St and S Main St to accommodate the redevelopment of Yesler Terrace. These overhead distribution lines will provide service for the commercial and residential buildings within the development.

Communications networks, such as Wave Broadband, Comcast and Century Link will be installed along the same overhead pole routing as SCL. Per correspondence with Comcast, conduits will be installed entirely overhead and any ground-mounted infrastructure will be located beyond the boundaries of Yesler Terrace. Wave Broadband will place controller cabinets and other at-grade infrastructure within easements at development areas. Century Link will also require ground-mounted infrastructure, likely located within the ROW, or within easements at development areas.

Department of Information Technology (DoIT) provides communications networks for government buildings. DoIT conduits will not be needed for service to the residences of Yesler Terrace, but existing DoIT infrastructure, which provide services for buildings downtown and on First Hill, will need to be rerouted as part of the infrastructure installation. DoIT network infrastructure will be rerouted with the overhead infrastructure along Alder, 9th Ave, 8th Ave N and Yesler Way.

Puget Sound Energy (PSE) has identified their existing underground infrastructure in the area with which to potentially serve Yesler Terrace. They are unable to determine, at this time, the extents to which this existing infrastructure will need to be re-sized and/or expanded for service to new development. The changes to this infrastructure may include the upsizing of existing mains, the extension of service lines around the community and potentially the installation of a district regulator. As development moves forward, PSE engineers will provide designs for service to the new commercial and residential buildings.

The City of Seattle Office of Sustainability and Environment is considering a district energy system for the First Hill neighborhood. The feasibility of locating district energy conduit within Yesler Terrace has been considered in the Preliminary Plat and there may be potential for a heating loop within the sidewalk zone of the ROW.

## 4.2 ASSUMPTIONS

### 4.2.1 Codes, Rules and Regulations

**SCL Construction Guidelines and Material Standards** – SCL clearances, details, etc.

**DR 5-2009, Street Opening and Restoration** – This document lays out rules for improvements to existing streets.

### 4.2.2 Design Criteria

**Seattle City Light** – SCL overhead infrastructure design criteria are outlined in the SCL standard guidelines for design, construction and materials. Overhead infrastructure is carried on vertical poles, typically 40-50 feet high, supporting cross arms on which the primary electrical distribution is mounted. Transformers are mounted beneath the primary electrical distribution. Below the transformers are mounted the primary neutral and secondary distribution. Guy wires and poles are used to distribute the loading forces of the conduits. Glulam poles, large wooden rectangular poles, buried deeply into the ground, can be installed in locations where guying is not possible or not preferred. Conventional and glulam poles must be placed a minimum of 3.5 feet from the face of the curb. Typically poles are no further than 160 feet apart. No permanent or temporary structures, including roof overhangs, can occur within ten feet of overhead power conduits without review and approval from SCL.

**Seattle Department of Transportation** – Utility poles installed for the purposes of overhead electrical infrastructure and lighting must be placed a minimum of 3.5 feet from the face of the curb and must leave a 4-foot clear path of travel for pedestrians within the ROW.

**Communications Infrastructure (Wave Broadband, Comcast, Century Link)** – Communications infrastructure will be mounted on the utility pole alignment determined by SCL infrastructure requirements. Communications conduits are mounted below the primary neutral and secondary distribution on the utility poles. At- and below-grade infrastructure includes controller cabinets and some service distribution.

**Puget Sound Energy** – PSE infrastructure will be located in an underground utility trench within the ROW. Gas infrastructure shall have 36 inches minimum cover and shall have a minimum of 1-foot separation from adjacent underground utility infrastructure.

**District Energy** – Compass Resource Management through the City of Seattle provided planning-level information for the conceptual layout of the proposed district energy infrastructure. District energy piping networks shall have a minimum of 36 inches of cover, a minimum of 6 inch separation from adjacent utilities, a twelve inch separation from adjacent district energy piping and a 4 inch buffer of compacted backfill and sand along the trench edges. Yesler Terrace district energy piping is assumed to be a two pipe heating loop. The addition of a cooling loop would require a non-standard configuration or the acquisition of easements beyond the ROW.

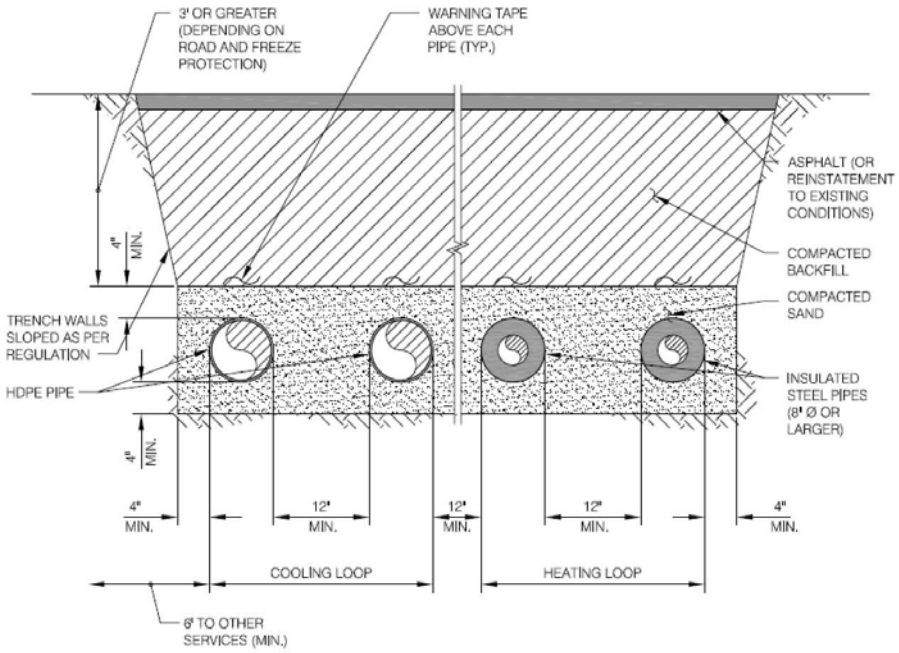



**Figure 4.1 – Typical Cross Section of Heating and Cooling Loops (figure courtesy of Compass Resource Group).**

## 4.3 ANALYSIS

### 4.3.1 Input and Coordination

Coordination between the utility service providers and the design team will be required for integrated infrastructure design and layout.

**Seattle City Light** – SCL engineers and staff will provide designs and design support for the overhead power infrastructure layout.

**Seattle Department of Transportation** – SDOT engineers and staff will provide design input for placement of power, communication and district energy infrastructure within the public ROW.

**District Energy** – The City of Seattle Office of Sustainability and Environment has released a Request for Qualifications for a First Hill district energy study. Compass has provided some initial parameters, but the decision by the City to move forward with a project has not yet been made.

**Communications Infrastructure (Wave Broadband, Comcast, Century Link)** – Communications infrastructure engineers and staff will provide the design input of the infrastructure along the SCL overhead alignment and for at-grade facilities related to their communications distribution.

**Department of Information Technology (DoIT)** – DoIT staff has provided initial input and will provide design input as the project moves forward.

**Puget Sound Energy** – PSE engineers and staff will provide design underground gas infrastructure within the ROW.

### 4.3.2 Feasibility

The current planning includes overhead electrical and communications infrastructure, and underground PSE and district energy infrastructure.

**Seattle City Light** – An initial overhead power layout was completed by SCL based on information provided by the design team and SCL. SCL engineers reviewed the layout and provided comments. Comments primarily related to pole locations and pulling angles have been addressed in Preliminary Plat. Pole locations will be confirmed through the design process. SCL will provide guy wire and guy pole design. In certain locations power lines may require building setbacks or special protective measures for construction and maintenance equipment and personnel.

**Seattle Department of Transportation** – SDOT will review infrastructure related to power and communication infrastructure as the design moves into the Street Improvement Plan process.

**District Energy** – Underground alignment of the district energy heating loop within the public right-of-way has been studied. Locating two 12-inch heating conduits under the sidewalk appears to be feasible. Where there are existing trees, boring may be required. Adding cooling or larger heating conduits may require easements.

**Communications Infrastructure (Wave Broadband, Comcast, Century Link, DoIT)** – Communications infrastructure will be mounted along the alignment of the new SCL overhead infrastructure at pole locations identified by SCL standards for design, construction and materials (noted above). Site specific load requirements will guide the communications design approaches for each service provider.

**Puget Sound Energy** – The design team coordinated the location of the proposed gas connection across Yesler Way with PSE engineers and the First Hill Streetcar project. The design team provided an initial horizontal control layout for PSE's review. Comments provided by PSE were incorporated into the design and a follow-up distribution was provided to PSE for their review.

# 5) STORM AND SEWER

## 5.1 BACKGROUND

Yesler Terrace is in a capacity-constrained combined sewer basin that is served by SPU. A combined sewer means that both stormwater and sewage are served by the same pipe system for conveyance. For the Yesler Terrace neighborhood, this means that combined flows are conveyed through the SPU system to King County combined sewer pipes and eventually to West Point Treatment Facility for treatment and discharge into Puget Sound.

Yesler Terrace is currently divided into an East Basin and a West Basin, roughly divided by Broadway. The proposed development will maintain the basin split with slightly less going to the West Basin. Maps of the basin split of existing and development conditions were provided to SPU for their review and are available upon request.

The project proposes to increase the housing density and provide commercial uses within the redevelopment. Using published data, sewer flows from each new building based on its proposed use were determined. These sewer flow values have been used in the downstream analysis of the combined sewer system. They were provided to SPU and are available upon request.

The project proposes to meet the SPU code that Green Stormwater Infrastructure (GSI) be used to the maximum extent feasible and will be providing upgrades to the combined sewer system as required to meet combined sewer flow demands. Low permeability soils limit the effectiveness of stormwater infiltration using GSI. Due to the dense urban setting of the development, there are many demands for space. The allocation of space for GSI must be balanced with other uses of the public realm and private space. The GSI system must also be integrated below ground to fit into the fabric of existing and proposed utilities that are critical to development above. Hillside topography also complicates the application of standard GSI tools that use relatively level bottoms. With these issues in mind, the Yesler Terrace project may implement the following types of GSI:

- Green Roofs
- Permeable Pavements with Underdrain
- Bioretention Swales with Underdrain
- Bioretention Planters with Underdrain

In general, other types of GSI are less practical for general use across the site, but they may be evaluated on a site-specific basis as additional information becomes available.

## 5.2 ASSUMPTIONS

### 5.2.1 Codes, Rules and Regulations

**Seattle Municipal Code (SMC) 22.805.020.J** – This document sets forth the conveyance requirements for the project. The project will discharge to the combined sewer system and therefore is required to perform capacity analysis for discharges to the combined sewer system based on peak flows with a 20 percent annual probability (5-year recurrence interval).

**Seattle Municipal Code (SMC) 22.800-22.808** – This document sets forth the stormwater and drainage requirements for the project. The project will discharge to the combined sewer system and therefore is required to meet the numerical Peak Flow Control Standard.

**Standard Plans for Municipal Construction** – Detail drawings for standard elements in the ROW.

**Standard Specifications for Road, Bridges and Municipal Construction** – Provides guidance for materials and construction methods of standard elements within the public right-of-way.

**Director's Rules (DR) 15,16,17,18 – 2009, (Stormwater Manual)** – This document provides interpretation and clarification to the SMC. The primary guiding document for this work is Volume 3 which is DR 17-2009. The project is required to use GSI to the maximum extent feasible to meet the numerical flow control standard (0.15 cfs/acre for 2-year storm, 0.4 cfs/acre for 25-year storm). This document provides guidance for design of GSI systems.

**DR 13-2010, Groundwater/Dewatering** – This document states that the public drainage system has not been designed to convey groundwater flows and is, therefore, capacity constrained. Sites which discharge groundwater to the public drainage system must meet the Peak Flow Control Standard.

**DR 5-2009, Street Opening and Restoration** – This document lays out rules for improvements to existing streets.

**COS ROWIM**– This document provides guidance regarding the following topics:

Section 6.4 – Natural Drainage Systems
Section 4.15 – Introduction to Utilities Design Criteria
Section 4.17 – Street Drainage, Storm Drains and Sewers.

**CAM 1101** – Drainage and Wastewater: Regulation of Development

**CAM 1180** – Design Guideline for Public Storm Drain Facilities (includes minimum easements widths)

**CAM 234** – Landscaping Information

**CAM 242** – Tree Protection Regulations in Seattle

**Plan Reviewer Guidance for Stormwater Code Compliance** – These checklists are available on the City's GSI web page. They are used as a reference to provide

guidance. They are also used to interpret the preference of the City reviewers where several options may be available.

**Uniform Plumbing Code –** Governs the installation and inspection of plumbing systems as a means of promoting the public's health, safety and welfare.

### 5.2.2 Design Criteria

**Groundwater/Dewatering** – Groundwater characteristics are typically evaluated during project design phases of the project through detailed geotechnical investigation. For the purposes of the Preliminary Plat concept, ground dewatering is assumed to be required.

**Existing Capacity** – The existing combined sewer system was modeled per the SPU requirements using a continuous system model, EPA-SWMM5. Based on modeling assumptions, the calibrated existing condition model indicates that there are segments in the existing system that are currently surcharged during some storm events, however, per records from SPU staff, there are no reported back-ups or system overflows at these locations. Therefore, it is the goal of the project to match or reduce the modeled peak combined sewer flow values at these locations so that the project can effectively demonstrate that the project has no adverse impact on the downstream combined sewer system.

**WPA Drains** – Record information indicates that there may be groundwater issues in some locations. Works Progress Administration (WPA)-era drains were installed in the early 1900's to collect groundwater and reduce slides. The exact location and condition of the drains is not known. Further geotechnical investigation should determine if slope stability mitigation measures are required for the site.

**Infiltration** – Due to the steep slopes and history of slides, it is assumed the GSI bioretention facilities will be constructed with an impervious liner to prevent infiltration into native soils. If geotechnical investigations indicate that native soil stormwater infiltration is possible without negative impacts on downgrade areas, then the GSI facilities may be designed to incorporate native soil infiltration.

**Trees** –The Preliminary Plat was developed in accordance with the Tree Protection Plan in Exhibit C to the PAO. The proposed utilities and roadway grading and alignment take into account these preserved trees, as well as proposed tree planting. Utilities and trees will be designed to provide required separation per City standards.

**Grading** – The street cross-slopes and cross-sections were based on the grading plan developed for SHA's May 2011 Development Plan.

**Dry Utilities and Water Mains** – The topographic survey commissioned for the Yesler Terrace Redevelopment does not identify depths of existing dry utilities and water lines. Storm and sewer around or over these utilities was assumed to follow standard cover based on COS Standard Plan 030. Potholing as necessary could be conducted to confirm depths.

**First Hill Streetcar Project** – Crossing and parallel utilities have been coordinated with the First Hill Streetcar alignment. The streetcar track and related improvements will be completed prior to the project development along the

impacted streets. Considerations have been given to the capacity of existing utilities and to providing appropriate sleeving so that proposed utilities may cross under the streetcar track.

**GSI and Human Experience** – GSI systems should contribute to the Priority Design Issues outlined in the Yesler Terrace Master Planned Community Design Guidelines: Interactive Streets, Residential Character, A Mix of Public and Private Outdoor Spaces and Variety. Additionally, the GSI systems will "cascade down the slopes adding visual interest." Natural drainage features (including those in parks) should provide educational benefits, offer space for exploration and provide stormwater treatment. For more discussion of the relationship of GSI to public open space see Chapter 7 of this report.

**Green Roofs** – For preliminary runoff calculations, green roofs were modeled using the default green roof parameters in MGS Flood, the preferred stormwater facility modeling software of SPU staff.

**Bioretention** – The location of bioretention features are noted in Preliminary Plat and bypass mitigation is described in Table 5.2. Parameters used for runoff calculations are available upon request.

Example bioretention plans and details were developed for the Preliminary Plat with some review and input from City staff. In light of the anticipated densities and the multi-functional settings, bioretention features in the ROW at Yesler Terrace have been characterized as either Urban Bioretention Swales or Urban Bioretention Planters. These are illustrated in Preliminary Plat. They represent the planning-level intent, but will have to go through the SDOT Street Improvement Permitting Design Guidance process prior to use in the ROW.

In order to more evenly distribute stormwater between cells, overflow between adjacent cells will occur when the water level in the uphill cell rises up and over the weir walls. An overflow riser will be set at the water surface of the lowermost cell in a series to collect overflows. Where feasible the overflow will be connected to the next series of cells to maximize flow control efficiency. Otherwise the overflow will tie back into the combined sewer system. In some locations it may be preferred to discharge the overflow near the surface. In these locations runnels, grated trenches or slot drains may be used.

The Yesler Terrace bioretention cells will retain stormwater as surface storage. The flow to the combined sewer system will be restricted by the rate at which water can infiltrate through the bioretention soil. In some instances an underdrain orifice control may be desired. Orifice controls can potentially increase the storage potential of a bioretention system but ease of maintenance and subsurface water storage elevations should be considered.

**Permeable Pavement Facilities** – Permeable pavements are more feasible on wider and more level areas and may be applicable for private parcel and open space development.

## 5.3 ANALYSIS

### 5.3.1 Evaluation of Applicable GSI BMPs for Yesler Terrace

The Yesler Terrace Redevelopment will reduce the flow rate of stormwater runoff by collecting and detaining the runoff in stormwater planters and pervious pavement facilities. Additionally, green roof systems, permeable pavement surfaces and rainwater harvesting may be applied to particular parcel developments which would also reduce the rate and quantity of stormwater runoff. Each development project will be responsible for providing flow control in accordance with the COS Stormwater Manual.

In the ROW, the project will provide a GSI system of bioretention swales and planters that are connected by a combination of underground and near surface (e.g. runnels, grated trenches or slot drains) conveyance. The GSI system will collect stormwater runoff and detain the water as it infiltrates through the bioretention soil. The goal of the GSI system is to reduce the peak runoff discharge rate to the combined sewer system. A list of recommended BMPs by the City of Seattle is shown below along with how they may be implemented within Yesler Terrace.

**Table 5.1 – BMPs planned for Yesler Terrace**

| BMP | Parcel Based | ROW Based |
|---|---|---|
| Soil Amendment | Implement throughout | Implement throughout |
| Maintain Existing Trees and Protect Critical Root Zones | Implement to the maximum extent feasible. See Tree Preservation Plan in Preliminary Plat. | Implement to the maximum extent feasible. See Tree Preservation Plan in Preliminary Plat. |
| Dispersion | Not feasible due to dense urban setting. | Not feasible due to curb and gutter. |
| Plant New Trees with Medium to Large Canopy | Implement to the maximum extent feasible. | Implement to the maximum extent feasible. See Streetscape and GSI Plans in Preliminary Plat. |
| Bioretention Cells (without Underdrain) | Due to potential for low permeability soils, application of this BMP should be considered on a cases-by-case basis as site specific geotechnical information is available. | Due to potential for low permeability soils, application of this BMP should be considered on a cases-by-case basis as site specific geotechnical information is available. |
| Bioretention Cells (with Underdrain or Detention) | Implement to the maximum extent feasible. | Implement to the maximum extent feasible. |
| Rainwater Harvesting | Implement to the maximum extent feasible. | Not applicable. |

| | | |
|---|---|---|
| Permeable Pavement Facilities (with Storage Reservoir and Overflow) | Implement to the maximum extent feasible. | Not feasible due to low permeability soils and road slopes. |
| Green Roof | Implement to the maximum extent feasible. | Not applicable. |
| Permeable Pavement Surfaces | Due to potential for low permeability soils, application of this BMP should be considered on a case-by-case basis as site specific geotechnical information is available. | Due to potential for low permeability soils, application of this BMP should be considered on a case-by-case basis as site specific geotechnical information is available. |

### 5.3.2 Green Roofs

Runoff calculations assumed that 30% of new building roof area as green roof. As the design of individual parcel development becomes more refined, more detail can be added to the green roof assumptions.

### 5.3.3 Park Bioretention Features

A 2500-7500 square foot portion of the Neighborhood Park is being set aside for a bioretention feature to provide flow control for Yesler Way (8th Ave to Broadway), 9th Ave (Alder St to Fir St), the east side of 8th Ave (Fir St to Yesler Way) as well as the park development. The facility will also provide educational and recreational benefit to the open space. Smaller bioretention features to control flows from adjacent streets will be incorporated into the Northeast and Southeast Pocket Parks.

### 5.3.4 Permeable Pavement

Permeable pavements are best-suited to wide and level areas and have been assumed for runoff calculations from a portion of private parcel hardscape. As the design of individual parcel development becomes more refined, more detail can be added to the design of permeable pavement facilities.

### 5.3.5 Bypass Mitigation

It may not be feasible to route all surface runoff from the replaced ROW to bioretention swales and/or planters. If this is the case, underground detention pipes or vaults may be used to meet flow control requirements. Detention tanks for the ROW shall be designed in accordance with COS Standard Plan 272. Where detention tanks are used to mitigate runoff from sidewalks only, the buried detention could be located under the sidewalk.

In these cases the runoff will flow undetained into the combined sewer system and will be considered bypass. Flow control mitigation for these areas will need to be provided by either reducing the runoff from other areas (over-detaining) or providing detention for an equivalent area of off-site impervious area (area

swap/bypass mitigation). When providing over-detention or area swap, the areas must be in the same subbasin in order to provide the mitigation in the correct part of the combined sewer system. Similarly it may not be feasible to accommodate enough GSI on a given block in order to provide flow control for the entire area. In these cases runoff from areas exceeding the flow control potential would be considered bypass. In accordance with COS Stormwater Manual Section 4.4.5.2 the area tributary to a GSI shall be less than two times the area for which it is sized.

Table 5.2 below summarizes the mitigation for each of the public streets that will be improved as part of the overall development. This table includes the areas that will likely bypass the GSI system and areas where over-detention or area swap may be used to mitigate them. The Percent of Area Mitigated by GSI Column is calculated as the square footage of GSI bottom area available over the square footage of GSI bottom area required. At the Preliminary Plat level any street with at least 110% is considered self-mitigating.

**Table 5.2 – Proposed Bypass Mitigation**

East Combined Sewer Basin  West Combined Sewer Basin

| Street Name | Cross Streets | Side | Percent of Area Mitigated by GSI | Mitigation | Bypass (sf) | Area Swap (sf) |
|---|---|---|---|---|---|---|
| 10th Ave | E Fir St to E Yesler Way | | 136% | Self-mitigating | 0 | 0 |
| 10th Ave S | E Yesler Way to S Washington St | | 151% | Overflow to SE Park GSI (175 sf) | 0 | 0 |
| 10th Ave S | S Washington St to S Main St | | 147% | Self-mitigating | 0 | 0 |
| 12th Ave S | Boren Ave S to S Main St | West sidewalk only | 0% | Buried detention for sidewalk. | 1,000 | 0 |
| 8th Ave | Fir St to Yesler Way | West side | 100% | Self-mitigating plus 3,400 sf of area swap | 0 | 3,400 |
| 8th Ave | Fir St to Yesler Way | East side | 113% | 3,400 sf of area swap. Overflow to Neighborhood Park Bioretention | 0 | 3,400 |
| 8th Ave S | Yesler Way to S | | 91% | Additional 1,700 sf bypass. | 1,700 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Washington St | | | | | |
| 9th Ave | Alder St to Fir St | West side | 77% | Overflow to Yesler Community Park Bioretention | 0 | 0 |
| **Street Name** | **Cross Streets** | **Side** | **Percent of Area Mitigated by GSI** | **Mitigation** | **Bypass (sf)** | **Area Swap (sf)** |
| 9th Ave | Alder St to Fir St | East side | 123% | Overflow to Yesler Community Park Bioretention | 0 | 3,560 |
| Alder St | 8th Ave to 9th Ave | South side + offsite | 87% | Self-mitigating. Up to 4,400 sf of additional area swap available. | 0 | 10,770 |
| Alder St | 9th Ave to Broadway | South side + offsite | 101% | Self-mitigating. | 0 | 16,330 |
| Boren Ave | E Fir St to E Yesler Way | West sidewalk only | 0% | Buried detention for sidewalk. | 490 | 0 |
| Boren Ave S | Yesler Way to 12th Ave S | West sidewalk only | 0% | Buried detention for sidewalk. | 350 | 0 |
| Broadway | Alder St to Fir St | West sidewalk only | 65% | Additional 3,020 sf bypass. | 3,020 | 0 |
| Broadway | Fir St to Yesler Way | West sidewalk only | 149% | Self-mitigating | 0 | 0 |
| Broadway | Fir St to Yesler Way | East sidewalk only | 0% | Buried detention for sidewalk. | 0 | 0 |
| Fir St | 9th Ave to Broadway | | 95% | Additional 880 sf bypass. | 880 | 0 |
| E Fir St | Broadway to 10th Ave | | 0% | Detention provided by NE Park (800 sf). | 0 | 0 |
| S Main St | S Washington St to 12th Ave S | | 176% | Self-mitigating | 2,180 | 0 |
| S Washington St | 8th Ave S to 10th Ave S | West basin side | 155% | Self-mitigating | 0 | 0 |
| S Washington St | 8th Ave S to 10th Ave S | East basin side | 188% | Self-mitigating | 0 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Yesler | I-5 to 8th Ave | North side | 45% | Additional 5,490 sf bypass. | 11,490 | 0 |
| Yesler | I-5 to 8th Ave | South side | 82% | Additional 1,830 sf bypass. | 6,330 | 0 |
| **Street Name** | **Cross Streets** | **Side** | **Percent of Area Mitigated by GSI** | **Mitigation** | **Bypass (sf)** | **Area Swap (sf)** |
| Yesler | 8th Ave to Broadway | North side | n/a | Detention provided by Yesler Community Park Bioretention | 0 | 0 |
| Yesler | 8th Ave to Broadway | South side | n/a | Detention provided by Yesler Community Park Bioretention | 0 | 0 |
| E Yesler Way | Broadway to 10th Ave | North sidewalk only | 0% | Buried detention for sidewalk. | 0 | 0 |
| E Yesler Way | Broadway to 10th Ave | South side, no improve-ments | n/a | No Improvements | 0 | 0 |
| E Yesler Way | 10th Ave to Boren Ave | North sidewalk only + some intersection | 0% | Buried detention for sidewalk. | 2,700 | 0 |
| E Yesler Way | 10th Ave to Boren Ave | South sidewalk only | 0% | | 3,490 | 0 |
| | | | | East Basin Total | 14,110 | 16,330 |
| | | | | West Basin Total | 19,520 | 21,130 |

### 5.3.6 Sewer Flows

Based on the scenario illustrated in SHA's May 2011 Development Plan, sewer flows were estimated for residential (70 gallons per day per person) and commercial (300-500 gallon per day per 1000 sf) use based on published values. The analysis yielded a 451,500 gpd total flow with an estimated peak flow of 1,081,500 gpd using a peaking factor of 3. These parameters were reviewed and approved by SPU.

### 5.3.7 Combined Sewer and Downstream Analysis

Based on early project review by SPU, the Yesler Terrace team performed 6 months of flow monitoring and developed a site-wide hydrologic model to estimate the effects of the Yesler Terrace project with regards to the existing combined sewer system within the project limits as well as the near downstream system. The results of this analysis indicated that Yesler Terrace would decrease the peak runoff flow rates due to the implementation of GSI for stormwater control, but overall sewer flows would increase due to the increase in residential density and added commercial and office uses. A full description of the site-wide model development and results can be found in the Aqualyze, Inc. Technical Memo "SWMM5 Modeling to Evaluate Yesler Terrace Development" dated October 19, 2011, Memo "SWMM5 Modeling to Evaluate Yesler Terrace Development Impacts Downstream," dated March 22, 2012 with Addendum "SWMM5 Modeling to Evaluate Yesler Terrace Development Impacts Downstream: Additional Information," dated April 20, 2012. These documents are available upon request.

The results of the expanded downstream model indicated that the Yesler Terrace project does not have adverse impacts on the downstream systems in either the East or West Combined Sewer Basins.

# 6) WATER

## 6.1 BACKGROUND

SPU supplies water to Yesler Terrace through an existing 20-inch feeder pipeline on 12th Ave and Yesler Way from Lincoln reservoir. Yesler Terrace is in the 430 pressure zone (NAVD88 datum). North of Alder St is the 530 pressure zone and the two zones are separated by closed water main valves. The first cast iron public water mains in Yesler Terrace were installed over 100 years ago. Most of the private water service lines are from the original Yesler Terrace development in the 1940s. The southern portion of the site, south of Yesler Way, does not have adequate fire hydrant coverage for the new development due to the number and placement of existing hydrants and being served by only a 6-inch main. Based on the age and size of the current system, the proposed Yesler Terrace project will provide new water mains.

## 6.2 ASSUMPTIONS

### 6.2.1 Codes, Rules and Regulations

**Seattle Municipal Code Title 20** – Public Works, Improvements and Purchasing

20.16 Reconstruction of Water mains

**Seattle Municipal Code Title 21** – Utilities

21.04 Water Rates and Regulations
21.08 Corrosion Prevention
21.12 Miscellaneous Provisions

**Seattle Municipal Code Title 22** – Building and Construction Codes

22.600 Seattle Fire Code

**Seattle Fire Code(SFC)** – 2009 International Fire Code as amended by the City of Seattle

**DR 5-2009, Street Opening and Restoration** – This document lays out rules for improvements to existing streets.

**Appendix D – Email Communication with Fire Department Regarding Required Fire Flow**

### 6.2.2 Design Criteria

**Location of Water mains** – City of Seattle Standard Plan 030 provides the typical location for water mains within the ROW. Water mains are typically located 10 feet off the sewer main to the north or east side of the sewer. Also, SPU requires all water mains to be located at least 5 feet from trees. The minimum water main size is 8-inch, and 12-inch for commercial zones.

The City of Seattle is constructing the First Hill Streetcar project along Broadway and Yesler Way. So as to not interrupt streetcar operations, it is assumed that any replacement of water mains under streetcar tracks will occur with that project.

**Fire Flow** – The fire flow required is a function of the size of a building and the type of construction as shown in Seattle Fire Code Appendix B. Fire flow is required for buildings by SFC 508.3. Seattle Fire Code Appendix B allows for reductions in fire flow with automatic sprinklers system and certain uses of the building. Factoring the reductions, the analysis assumed the minimum fire flow at hydrants for even the largest sprinklered building to be 2000 GPM at 20 psi. The team assumed that the proposed buildings would have sprinklers and meet the requirement for fire flow reductions.

## 6.3 ANALYSIS

### 6.3.1 Current Water Usage

Water meter reading from the Yesler Terrace housing development data was obtained for the period from March 17, 2009 to February 11, 2010. This information was analyzed and an Average Daily Demand (ADD) of approximately 100,000 gallon per day in the Yesler Terrace Redevelopment was estimated. With an existing population of 1,175 persons the average daily consumption was estimated at 85 gallon per person.

### 6.3.2 Water Demand

The SPU Water Division was consulted to verify the existing water facilities and design requirement. The Seattle Fire Department was also consulted for required fire flow for hydrants.

Water demand for the redevelopment is estimated using SHA's May 2011 Development Plan with block by block breakdowns of residential units and bed counts, as well as commercial and institutional space. Conventional fixtures were used for water demand calculations. Emerging technologies, such as graywater reuse and rainwater harvesting, were not included as sources for potable water. Assumptions for water demand use for the units were based on Water System Design Manual December, 2009, Washington State Department of Health (DOH). The water demands for all uses were combined to provide the Average Daily Demand (ADD), Maximum Daily Demand (MDD) and Peak Hourly Demands (PHD). In addition to domestic water use demand, fire hydrant flow requirements and irrigation demand were also studied to verify water conveyance main size. EPAnet water modeling software was used to confirm fire hydrants have a minimum of 2000 gallons per minute (gpm) and a minimum pressure of 20 psi while the system supplies PHD.

**Average Day, Maximum Day, and Peak Hour Demands** – The average day demand values used in the analysis were based on available existing facility data and the proposed land and building units by sector/blocks for each alternative. To simulate PHD and MDD conditions, the Water System Design Manual by WA DOE was referenced.

### 6.3.3 Water System Capacity

**Hydraulic Modeling Process** – A simplified water system model was created using EPAnet software that models water distribution piping systems. This program was developed by EPA's Water Supply and Water Resources Division.

**SPU Simulation** – In September of 2011 and February of 2012, SPU conducted a hydraulic network modeling analysis to confirm the available fire flow in the Yesler Terrace area with the proposed water main layout. Their results are available upon request.

**Minimum Fire Hydrant Flow** – SPU simulation confirmed required minimum fire flow would be available at any fire hydrant locations in the project area. The simulation confirmed 2,000 GPM at 20 psi would be available throughout the project site. See Appendix D for email communication with Fire Department regarding required fire flow dated March 24, 2010.

### 6.3.4 Minimum System Pressure

Each model for sizing the piping distribution was modified to improve capability of the system and to meet the technical requirement including the minimum service pressure of 30 psi at meters during PHD.

### 6.3.5 Required Fire Flow

Based on fire flow assumptions (see 6.1.3), the water main network was determined to have capabilities to provide a minimum of 2,000 gpm flow and a minimum residual pressure of 20 psi at the same time it is supplying the maximum daily demand.

### 6.3.6 Fire Hydrant Spacing

All development sites are within a 300-foot walking distance of an existing fire hydrant to be retained or a proposed fire hydrant. Proposed hydrants are spaced no more than 250 feet apart along each street. SPU is responsible for determining final hydrant spacing.

### 6.3.7 Irrigation Demand

Typically irrigation takes place during off-peak water demand hours; therefore, irrigation demands were not included in the modeling of water mains. While assuming the maximum irrigation demand of 1-inch per week, the daily demand estimated for irrigation was determined to be only a small percentage of the total water demand for the Yesler Terrace, in the range of 1 to 3 percent. Rainwater harvesting on private parcels may also be considered for irrigation use.

# 7) STREETSCAPE

## 7.1 BACKGROUND

SHA's Yesler Terrace Master Planned Community Design Guidelines envision Yesler Terrace streetscapes as a major contributor to the character and vitality of the community. The streetscape portion of the Preliminary Plat work focused on elements of the streetscape (outside the roadway) that have the potential to influence ROW dimensions by their impact on desired infrastructure and amenities.

Specifically, areas for seating, gathering, exercise, bicycle parking, etc. in the ROW were studied for their compatibility with GSI, parking access and pedestrian circulation. Proposed trees were studied in terms of their spacing from utilities and street lights, their relationship to curb bulbs and their required soil root volumes. These studies influenced the layout of street and GSI elements in Preliminary Plat. They demonstrate that the trees, amenities and infrastructure envisioned in earlier planning can be accommodated in the property configuration described by the Preliminary Plat.

## 7.2 ASSUMPTIONS

### 7.2.1 Codes, Rules and Regulations

**Seattle Municipal Code Title 15** – Street and Sidewalk Use

**Seattle Municipal Code Title 23** – Land Use Code and draft amendments, PAO, and street vacation conditions of approval

**Seattle Municipal Code Title 25** – Environmental Protection and Historic Preservation

**U.S. Department of Justice (DOJ) 2010 ADA Standards for Accessible Design**

**COS Bicycle Master Plan 2007**

**COS Pedestrian Master Plan 2009**

**COS Transit Master Plan 2012**

**ADA in Right-of-Way** – The US Access Board's PROWAG, July 26, 2011

**Internation Building Code (IBC) 2009**

Chapter 10 – Means of Egress
Chapter 11 – Accessibility

**DR 5-2009, Street Opening and Restoration** – This document lays out rules for improvements to existing streets.

### 7.2.2 Design Criteria

**Sidewalk Paving** – Paving is assumed to be predominantly concrete. Final design will review the possibility of using the following:

- Permeable Pavers
- Pervious Concrete

- Color
- Sandblasting

*Scoring* – Standard sidewalk jointing is assumed to be 2 feet by 2 feet in accordance with COS standard plan 420 with some shifts to a larger grid to demarcate seating areas or larger activity zones.

*Continuity* – High quality paving can help provide a cohesive feel and character for the neighborhood.

**Parking & Curbside Access**

*On-Street Parking Locations*. Some on-street parking will be provided throughout the neighborhood. In general, parking for residents and employees, and to some extent visitors, will be provided in structures below proposed buildings. Locations for on-street parking will be limited by locations of driveways, hydrants, and no parking zones, as well as curb bulbs for trees and power poles.

*Clear Zones Adjacent to Parking.* See Streetscape GSI and Crossing Concepts in Preliminary Plat.

*Pedestrian Access from Parking to Sidewalks.* See Streetscape GSI and Crossing Concepts in Preliminary Plat.

*Informal Loading Areas.* See Streetscape GSI and Crossing Concepts in Preliminary Plat.

*Bicycle Parking*. On-street bicycle parking should be provided in accordance with the City's Complete Streets policy. The National Association of Pedestrian and Bicycle Professionals (APBP) issued an updated edition of their Bicycle Parking Guidelines in 2010. See Figure 7.1 below for sample layouts of curbside bicycle parking. Bicycle parking is also required by the Land Use Code in conjunction with new buildings.

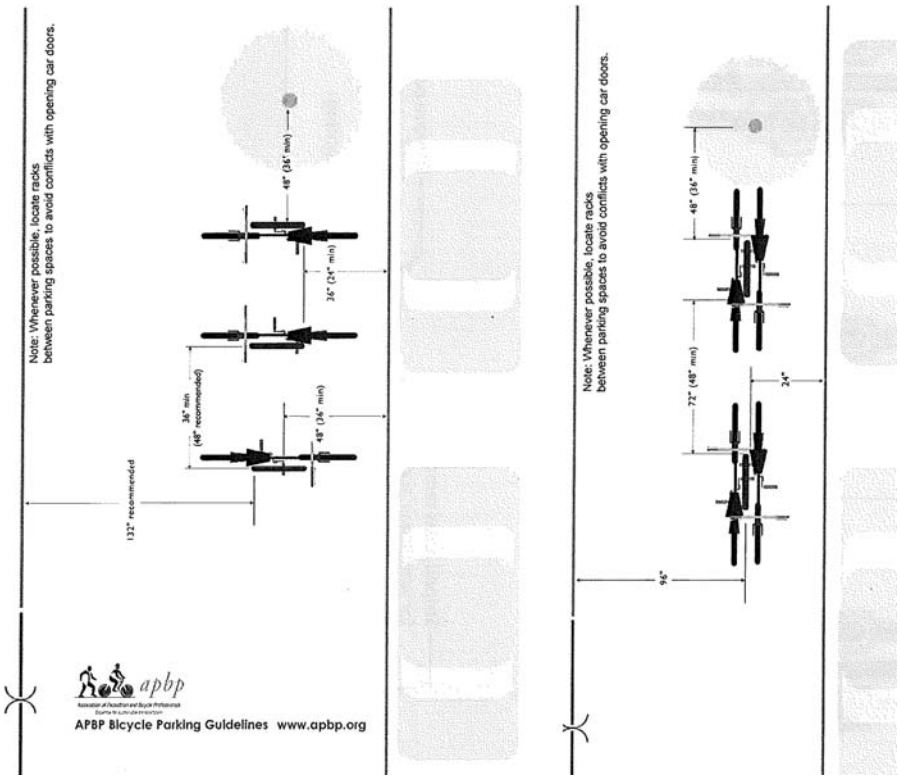



**Figure 7.1 – Sample Layout, Racks Perpendicular to Curb (left); Racks Parallel to Curb (right)**

## Seating

*Seating Opportunities*. Seating opportunities should be provided along the streetscape, for social and community benefit as well as to provide resting points for those navigating the often steep streets. Typical seat dimensions are shown in Figure 7.2 below.

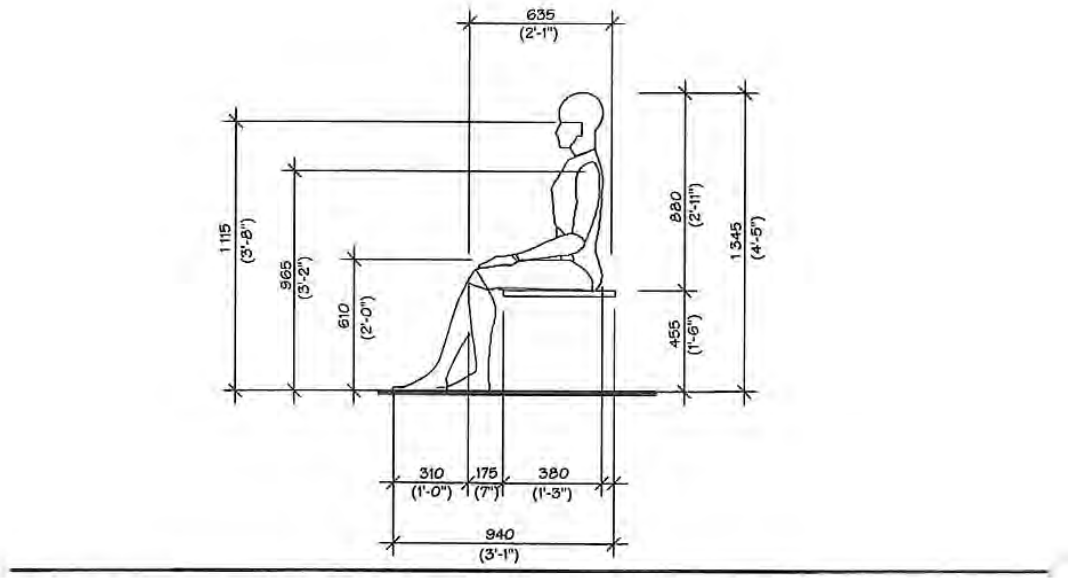



**Figure 7.2 – Seated Figure (courtesy of Time-Saver Standards for Landscape Architecture, Second Edition)**

Design should typically allow for a 24-inch clear zone (for legs, feet, and personal space) between the front of any seats or benches and an intended pedestrian path of travel. SDOT gives limited guidance on the location of seating within the streetscape. See COS ROWIM Section 4.25.

**Driveways**

*Location of Driveways.* The tested locations of driveways are based upon the Yesler Terrace Vehicle Access Easement and Parking Access sketch by GGLO dated May 1, 2012.

*Driveways Crossing Pedestrian Zone.* Driveways are currently anticipated to be 20-foot wide plus wings. Driveways will cross the pedestrian zone at the sidewalk level.

**Street Character & Materials**

*Railings.* It is assumed that stormwater planters and swales with vertical walls adjacent to pedestrian areas (e.g. sidewalk, walkways from curb to sidewalk, etc) should include low railings on streets over 5 percent (the drop to the bioretention is recommended to be less than what would require safety railings per IBC).

*Continuity*. Railings and other materials should be applied on at least a per-street length basis, to provide continuity along the streetscape. Ideally materials will be applied throughout the site to provide a unified character for the neighborhood.

**Lighting** – Roadway lighting is assumed to be provided by City of Seattle standard cobrahead streetlights, typically mounted to power/utility poles. Pedestrian-scale lighting along the sidewalks is encouraged.

**Safety** – Principles for safe streets and public space aim to provide a safe and enjoyable experience for users. Guidelines include Crime Prevention Through Environmental Design (CPTED) as well as sight clearance guidelines. Applicable sight clearance guidelines include COS ROWIM Chapter 4 – Design Criteria, AASHTO 2004 Sight Distance & Sightlines, WSDOT Pedestrian Facilities Guidebook, as well as other municipal standards.

**Trees**

*Street Tree Clearances*. Street tree locations in relation to other street elements are regulated by SDOT; see section 4.14 of the COS ROWIM as well as COS Standard Plan No 030. The standard clearance from underground utilities is 5 feet.

The standard minimum planting strip width is 5 feet, which would allow a street tree to be placed per the clearance requirements from sidewalk and curb face. Tree pits should be constructed per Standard Plan 424, providing a minimum of 24 square feet open area (typically 6 feet by 4 feet or 5 feet by 5 feet). The open area should provide a soil surface 2 inches below adjacent sidewalk or curb and filled to grade with aggregate or wood chips, or covered with a tree grate.

*Species Selection and Spacing*. SDOT maintains an Approved Street Tree List with recommended species and cultivars. The tree list is organized by size. SDOT also recommends tree spacing "to provide optimum canopy cover for the streetscape" on their webpage entitled "Street Tree Planting Procedures." Recommended spacing (shown in Table 7.1) is as follows:

**Table 7.1 – SDOT Recommended Tree Planting Spacing**

| Tree size | Recommended spacing |
|---|---|
| Small/Medium | 20-25 feet |
| Medium/Large | 30-35 feet |
| Large | 35-40+ feet |

Spacing listed is center to center of trees, and SDOT notes that ultimately "spacing shall be a function of mature crown spread, and may vary widely between species or cultivars."

*Clearance for Overhead Utilities*. The SDOT street tree list calls out which recommended trees may be used under overhead wires; the trees listed as acceptable generally have a listed mature height of 30 feet or less. The SCL Construction Guideline, standard number D9-80 dated September 10, 2008 also lists typical vegetation and pruning clearances. These are 10 feet clear for primary distribution conductors and transformers, switchgear, etc. Secondary conductors are pruned to maintain 3- to 5-foot vegetation clearance; non-City Light services (fiber optic, cable, and telephone) are also pruned to maintain 3- to 5-foot clearance, but City Light only maintains that clearance if those are incidentally within a secondary zone. SCL does not trim out streetlights for maintenance of illumination.

*Soil Approaches*. The standard dimensions used for tree pits will not provide enough soil volume for healthy growth and longevity of medium to large urban trees. Therefore the designs should provide additional soil volume beyond the typical tree pit that may be utilized by a tree's roots. Two methods for achieving this under paved areas are by using structural soils (e.g. CU Structural Soil) or a proprietary structural support system filled with planting soil, such as Silva Cells, manufactured by Deep Root.

The City of Seattle's Urban Forestry Commission (UFC) has recommended providing a minimum of 300-500 cubic feet of soil volume per tree in the UFC Position Paper on Tree Standards for Species Selection, Planting, Maintenance, and Protection, Adopted September 7, 2011.

**Plantings**

*Sight Clearances*. See COS ROWIM Chapter 4 Design Criteria for maximum plant height; 24-inch plant height near intersections, 30-inch plant height elsewhere along street.

**Utilities**

*Location coordination.* See Chapter 4 and Chapter 5 in this document.

*Vault Locations.* Vaults will impact soil space availability for tree roots, and should be accounted for when planning tree root zones. In addition, vault lids can create impacts to aesthetics and accessibility in the streetscape, and their locations should be considered in relation to urban design goals.

**Sustainability –** Various sustainability ratings systems and award criteria could potentially be appropriate for this project, including the following:

*LEED Neighborhood Development.*
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=148

*Greenroads*.
http://www.greenroads.org/1/home.html

*Sustainable Sites Initiative*.
http://www.sustainablesites.org/

*EPA's National Award for Smart Growth Achievement.*
http://www.epa.gov/dced/awards.htm

## 7.3 ANALYSIS

### 7.3.1 Mobility

**Curb-to-Sidewalk Access Walks or Pathways** – Where street parking or loading zones are proposed there should be access walks or pathways between the curb and the main sidewalk. These access walks will provide clear pedestrian access around stormwater planters, utility poles, trees and other streetscape elements that would otherwise hinder or block access between curb and sidewalk. These should be spaced a minimum of every 40 feet along the curb in parking or loading zones. These access walks should be a minimum of 4 feet wide per PROWAG requirements. At least two wider (minimum of 6 feet) walks should be provided per block for moving furniture or other objects from street to sidewalk.

**Sidewalk Rest Zones** – Areas to step out of the path of travel and rest should be provided approximately every 100 feet. These resting points may include benches or leaning rails. These zones are illustrated on Streetscape GSI Crossing Concepts in Preliminary Plat.

### 7.3.2 Activity Zones

Activity zones ranging in size from 8 feet to 16 feet will provide places to interact and recreate along the streets. These will be prioritized for inclusion on the Neighborhood Circulation Loop. See page 12 of SHA's May 2011 Development Plan for discussion of the priority pedestrian connections. These activity zones may include trees, seating, bike racks, plantings, exercise stations, art, wayfinding and lighting. These zones will need to be coordinated with required GSI and are illustrated on Streetscape GSI Crossing Concepts in Preliminary Plat.

### 7.3.3 Seating

A variety of seating options will be provided that consider the physical needs of users, optimizing opportunities to have street furnishings provide multiple uses and contributing to street identity and placemaking. Selection of materials and design will take into consideration long-term maintenance, durability and replacement.

### 7.3.4 Trees

**Proposed Trees** – Street trees will generally fall into three categories of large, medium, and small. Large trees will be located in curb bulbs and wider planter strips where more soil is available. These trees will provide emphasis at the ends and midpoints of the streets, providing large canopies and scale to the future surrounding buildings. Medium trees will be planted where space and overhead conditions allow. Small trees will be

selected for use under powerlines. Trees planted in tree pits (small and medium trees) will need additional rooting soil provided under adjacent paving through the use of structural soils or structural paving supports with planting soil (such as Silva Cells or custom-designed systems). Large trees may ideally need additional soil volume provided under adjacent pavement for optimum healthy growth as well depending on the size of the planting area.

**Existing Tree Preservation** – A Tree Preservation Plan is part of the Preliminary Plat. See Appendix C: Yesler Terrace Tree Impact Study for a survey of mitigation measures for preservation of trees with high potential for impact by streetscape improvements.

### 7.3.5 Plantings

**Landscape Plantings (non-bioretention)** – Landscape plantings for the streetscape will be selected with the following parameters: meet visual clearance guidelines, include drought tolerant species, minimize long-term maintenance, provide seasonal interest, and reinforce placemaking and street identity.

**Bioretention Plantings** – Biorention plantings will be developed for Urban Bioretention Swales and Urban Bioretention Planters, as illustrated in Preliminary Plat. Selection for plant species will includes parameters noted for landscape plantings as well as tolerance of stormwater flows.

### 7.3.6 Soils

**Tree Soil Under Paving** – Based on soil research by James Urban, Nina Bassuk and Deep Root, opportunities and costs for providing Silva Cell or structural soil have been studied. Diagrams of potential structural soil configurations are provided in Preliminary Plat.

# APPENDIX A

ECA Steep Slope Exemption Letter
October 19, 2010

City of Seattle
**Department of Planning & Development**
700 Fifth Avenue, Suite 2000, P.O. Box 34019, Seattle, WA 98124-4019



**DPD Project No.** 3011305

# REQUEST FOR RELIEF FROM PROHIBITION ON STEEP SLOPE DEVELOPMENT OR MODIFICATION TO ECA SUBMITTAL REQUIREMENTS

TO BE COMPLETED BY APPLICANT

## ECAS AND/OR BUFFERS MAPPED OR IDENTIFIED ON SITE

***Geologic Hazard Areas***

- [x] Steep Slope
- [x] Potential Slide due to Geologic Conditions
- [x] Known Slide
- [ ] Liquefaction-prone
- [ ] Peat Settlement-prone

***Fish and Wildlife Habitat Conservation Areas***

- [ ] Shoreline Habitat*
- [ ] Riparian Corridor (includes Riparian Management Area )
- [ ] Shoreline Habitat Buffer*
- [ ] Other Fish and Wildlife Habitat Area

***Other***

- [ ] Wetland
- [ ] Wetland Buffer
- [ ] Flood-prone
- [ ] Abandoned landfill

## TYPE OF APPLICATION

[x] ***Relief from Prohibition on Steep Slope Development under Section 25.09.180B. Choose any that apply (Not an ECA exemption. Project subject to ECA review**.)***

- [ ] Proposed development is located where existing development is located, with no increase in impact on the steep slope [B2a]
- [x] Proposed development is located on steep slope areas created through previous legal grading activities [B2b]
- [ ] Proposed development is located on steep slope areas that are less than 20 feet in vertical rise and that are 30 feet or more from other steep slope areas, and no adverse impacts on the ECA will occur [B2c]
- [ ] Application of development standards would prevent necessary stabilization of a landslide prone area [B2d]

[ ] **Modification to submittal requirements (not an ECA exemption. Project subject to ECA review**).** Request for modification to application submittal requirements per Director's Rule 3-2007. If more than one ECA is mapped or identified on the site, indicate applicable ECA for which modified submittal requirements are requested.

_____

_____

_____

*For Shoreline Habitat and buffer, regulations in SMC 23.60 also apply. A Shoreline Substantial Development Permit (SSDP) or Exemption may be required. See CAM 209A for information about exemptions from SSDP.

**FORM CONTINUES**

**Development may also be subject to SEPA. See CAM 208, *When Environmental Review is Required in the City of Seattle.*

## SITE, PROJECT, AND OWNER/AGENT INFORMATION

Site Address: 102 Broadway, Suite 616, Seattle, Washington (On-site Seattle Housing Authority Management Office)

Description of proposed project: The Seattle Housing Authority (SHA) is proposing redevelopment of Yesler Terrace, a public housing community located around the intersection of Yesler Way and Broadway on the south slope of First Hill. Additional information regarding the Yesler Terrace Redevelopment Project is provided in Attachment 1 and the Draft EIS.

Please describe the reasons for your request: SHA requests relief from the prohibition on steep slope development. The steep slope areas identified on-site were created through previous legal grading activities associated with the Jackson Street regrade and construction of the Yesler Terrace development, including rockeries and retaining walls constructed as part of right-of-way improvements. See Attachments 1 and 2.

Request must be part of a specific development proposal submitted for DPD review and apply only to that proposal. Please provide the assigned DPD project number for the proposal:
3011305

**Property Owner's Name:** Seattle Housing Authority, Attn: Ryan Moore

Residence Address: 120 Sixth Avenue North P.O. Box 19028

City/State/Zip Code: Seattle, WA 98109-1028

Telephone: 206-615-3548

**Agent's Name:** Harold Moniz, CollinsWoerman

Address: 710 2nd Avenue, Suite 1400

City/State/Zip Code: Seattle, WA 98104

Telephone: 206-245-2016

Applicant's Signature: Harold Moniz

Date of Application: September 30, 2010

## TO BE COMPLETED BY DPD STAFF

☒ Meets Criteria ☐ Does Not Meet Criteria

Reviewer JAM Date 10/19/10

Explanation or Conditions:

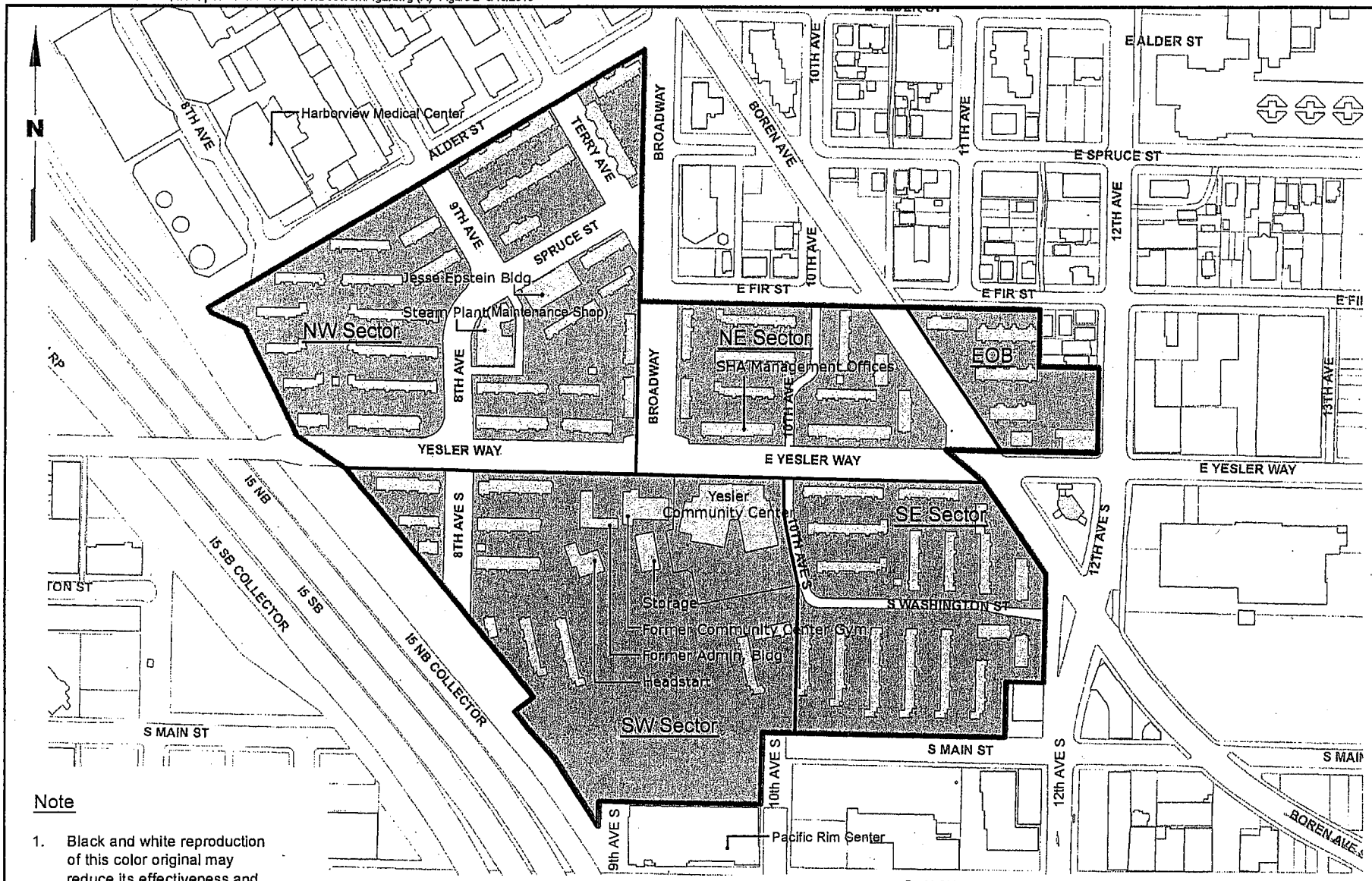
See attached for decision

**To obtain review of a decision on an application under SMC 25.09.180B, an interpretation must be requested under SMC 23.88.020.**

Harold Moniz
710 2nd Avenue, Suite 1400
Seattle, WA 98104

1. 3011305; 102 Broadway; **ECA review is required**. Based on a review of the submitted information and the City GIS system, DPD concluded that the Yesler Terrace Redevelopment project appears to qualify for the criteria established in the Critical Areas Regulations, SMC 25.09.180.B2b. Specifically, the City GIS system and the submitted information for the steep slope developmental allowance application demonstrated that steep slopes at the Yesler Terrace Redevelopment Site Plan (plan attached) appeared to have been created by previous grading activities associated with site development and street improvement. For this reason, DPD will waive the required ECA Steep Slope Variance associated with DPD Application No. 3011305. This approval is conditioned upon the following: (1) submittal of a geotechnical engineering report at the intake appointment for the building permit applications that include an evaluation of potential adverse impacts to steep slope stability relative to the proposed development and, (2) approval of building permits for a design that demonstrates the proposed development project will be completely stabilized in accordance with provisions of the ECA code. All other ECA Submittal, General, and Landslide-Hazard, and development standards still apply for this development. Note that this site is also designated as potential landslide due to geologic conditions and as a known landslide area. Building permit applications submitted under other addresses but within the Yesler Terrace Redevelopment Site Plan should be considered part of this exemption decision. October 19, 2010; JAM.

LANDAU ASSOCIATES, INC. | V:\818\003\040.044\Geotech\Fig2.dwg (A) "Figure 2" 6/15/2010




Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Adapted from: Collins Woerman, 2010

ECA Exemption decesions under 3011305 at 102 Broadway 10/19/10

LANDAU ASSOCIATES

0 300 600
Scale in Feet

Yesler Terrace Redevelopment Seattle, Washington

**Site Plan**

Figure 2

# APPENDIX B

Seattle Arterial Classifications Planning Map
2003


December 11, 2003

# APPENDIX C

Yesler Terrace Tree Impact Study*
April 26, 2012

*This study was prepared based on an early draft of Exhibit C to the PAO (Tree Protection Plan) which utilized three tiers of trees. This Exhibit and Plan were subsequently revised by DPD to include just two tiers of trees. See Preliminary Plat for the proposed Tree Preservation Plan. This appendix is included to illustrate the ways that typical right-of-way designs may need to be modified to accommodate preserved trees.

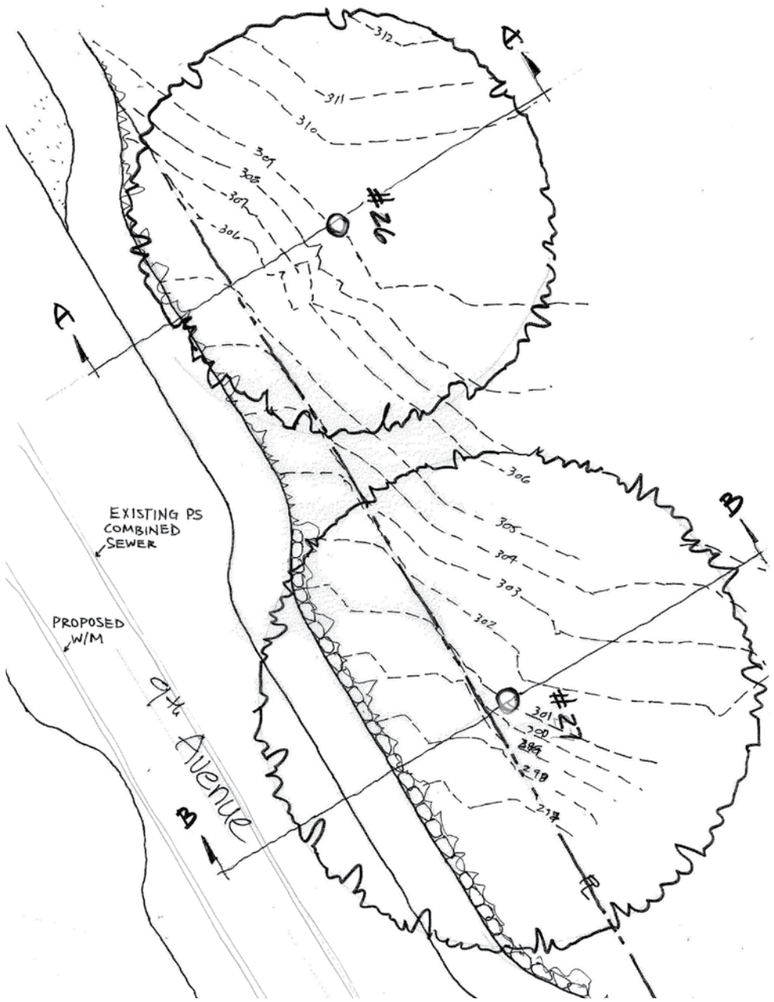
# YESLER TERRACE REDEVELOPMENT

## STUDY OF EXISTING TREES WITH HIGH POTENTIAL FOR IMPACT BY STREETSCAPE IMPROVEMENTS

SvR APRIL 26, 2012

LEGEND

- TIER 1 TREES
- TIER 2 TREES
- TIER 3 TREES
- TREES TO BE RELOCATED
- TREES THAT HAVE BEEN REMOVED
- TREES STUDIED

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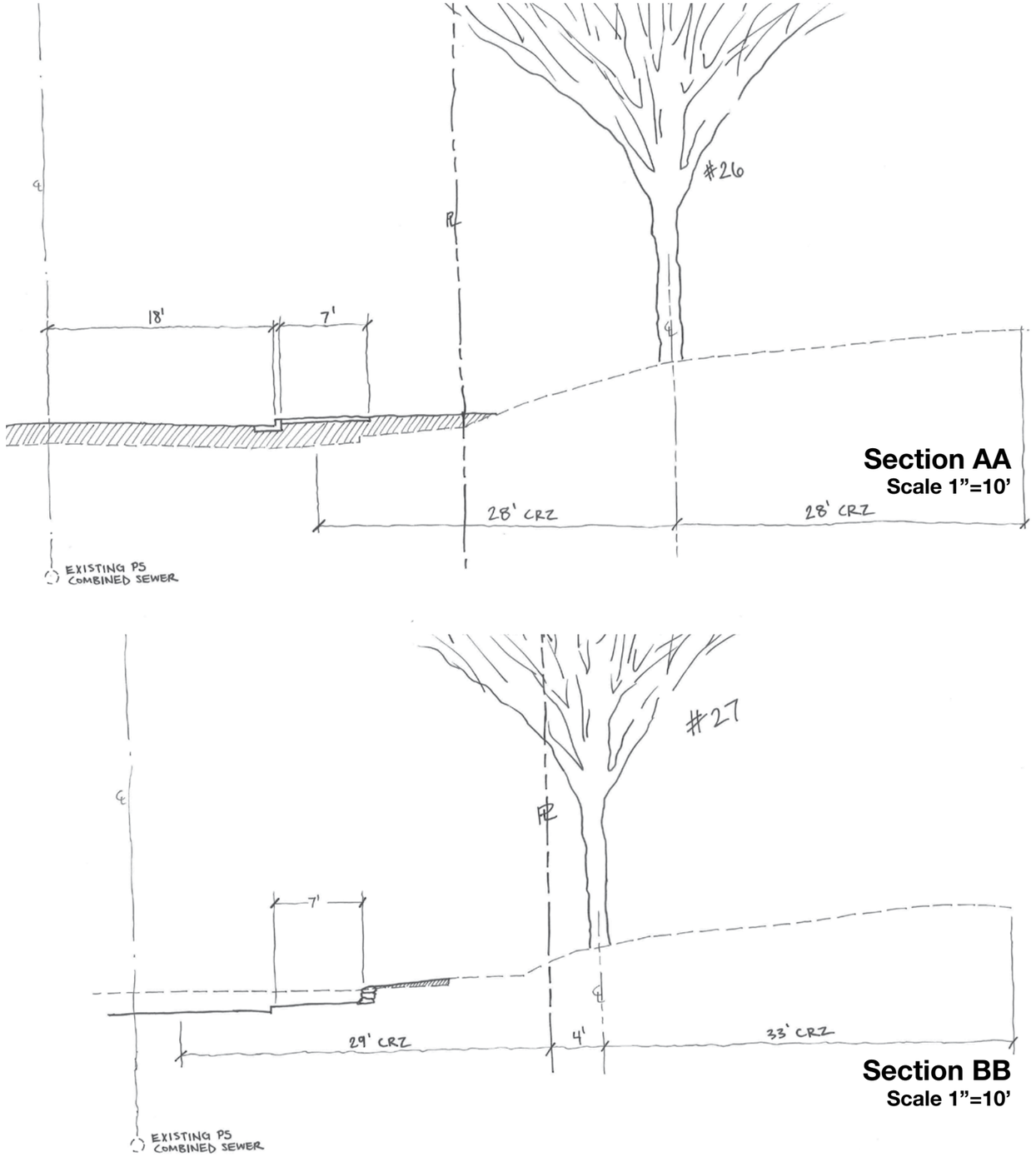


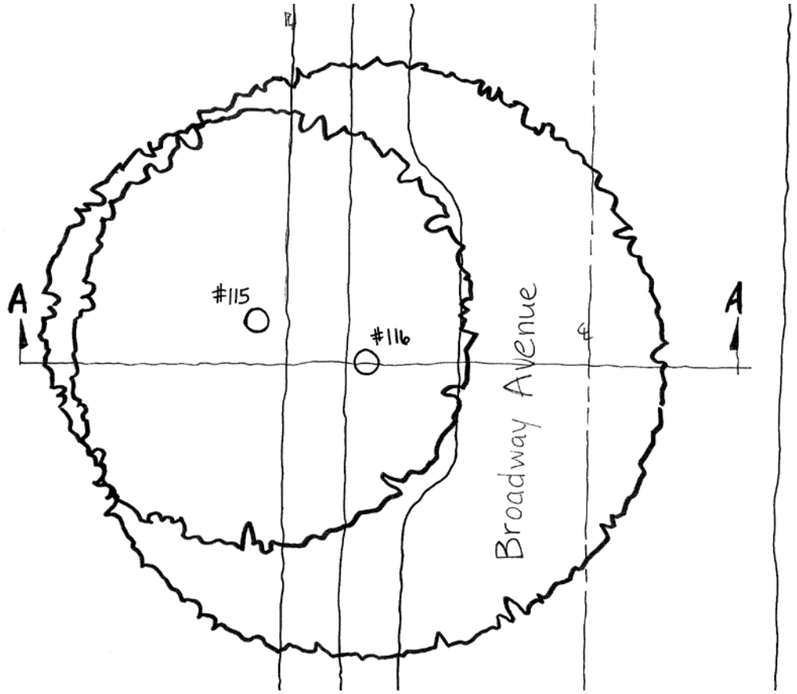

**Section AA**
**Scale 1”=10’**




**Section BB**
**Scale 1”=10’**

# Trees 26, 27

Yesler Terrace Redevelopment
Study of Existing Trees With High Potential for Impact by Streetscape Improvements
April 26, 2012

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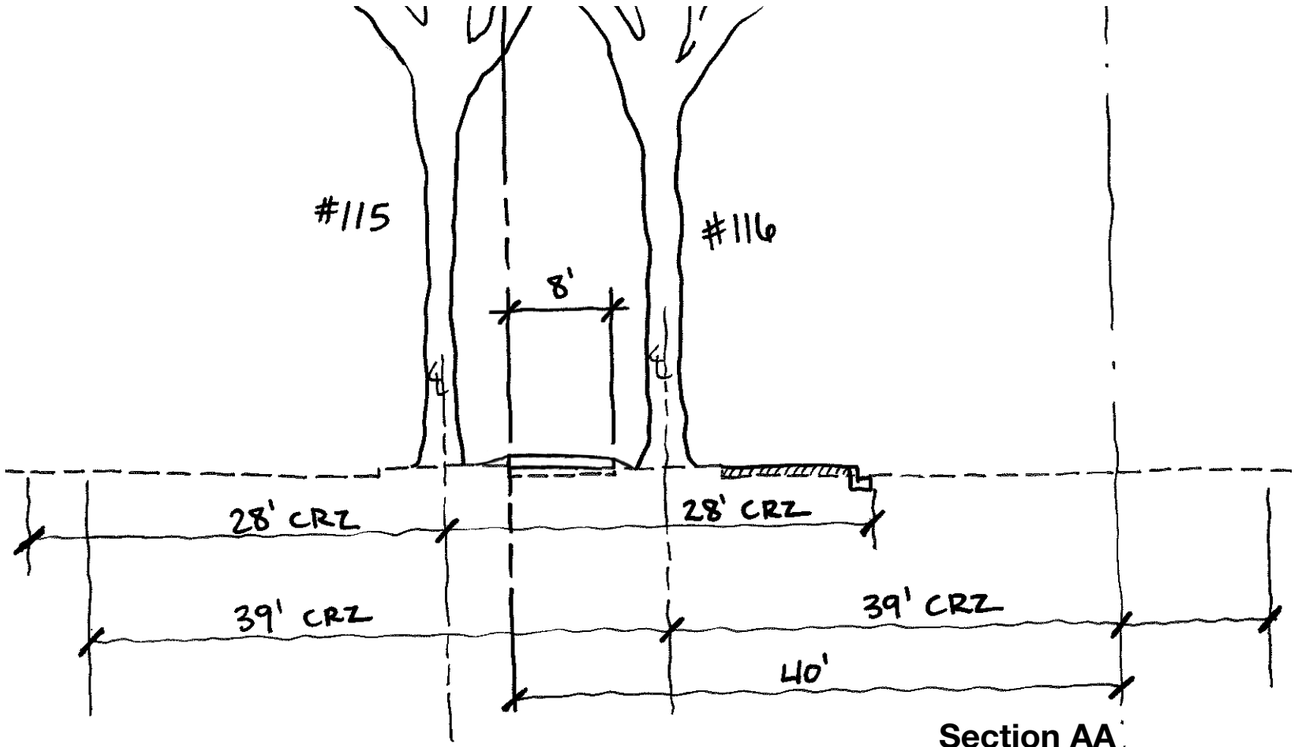


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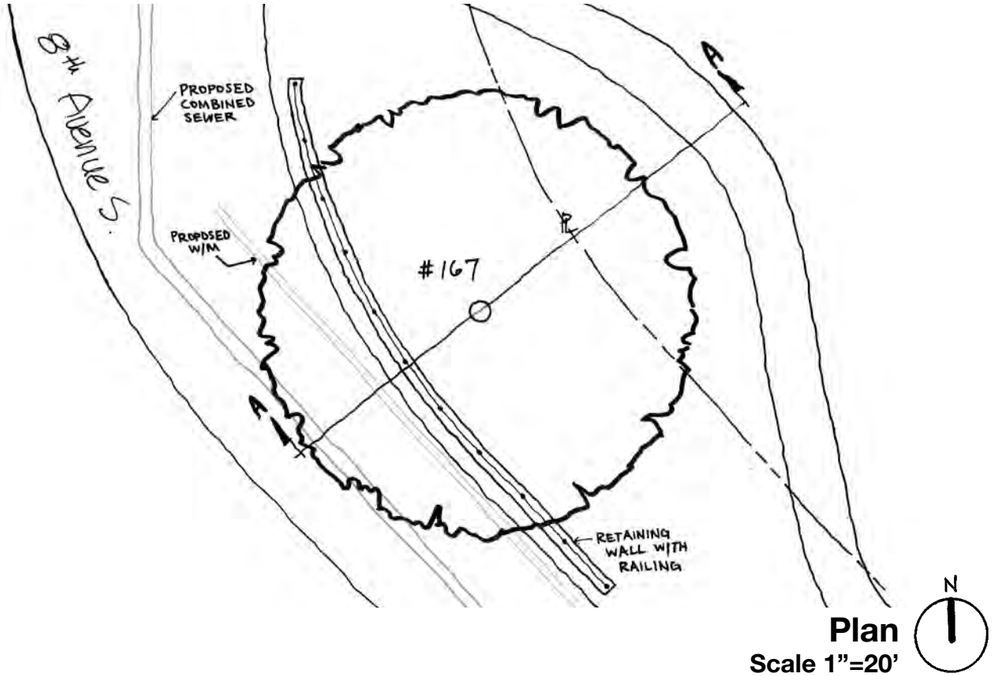
**Tree 116**

Yesler Terrace Redevelopment
Study of Existing Trees With High Potential for Impact by Streetscape Improvements
April 26, 2012

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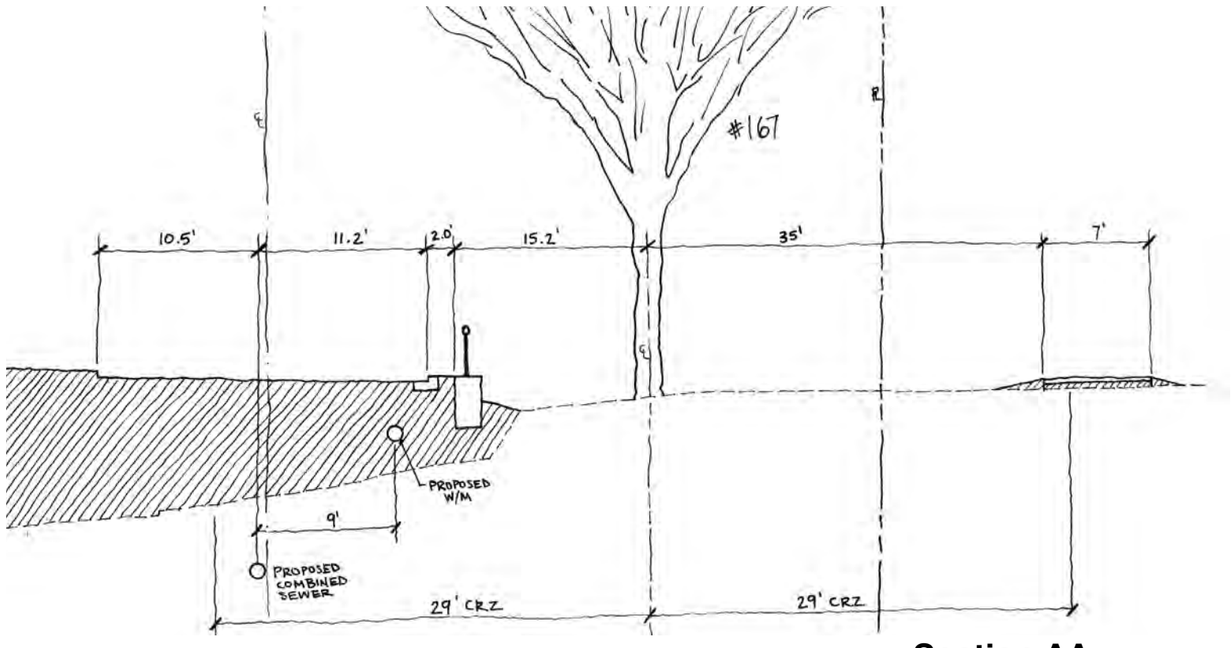


**Section AA**
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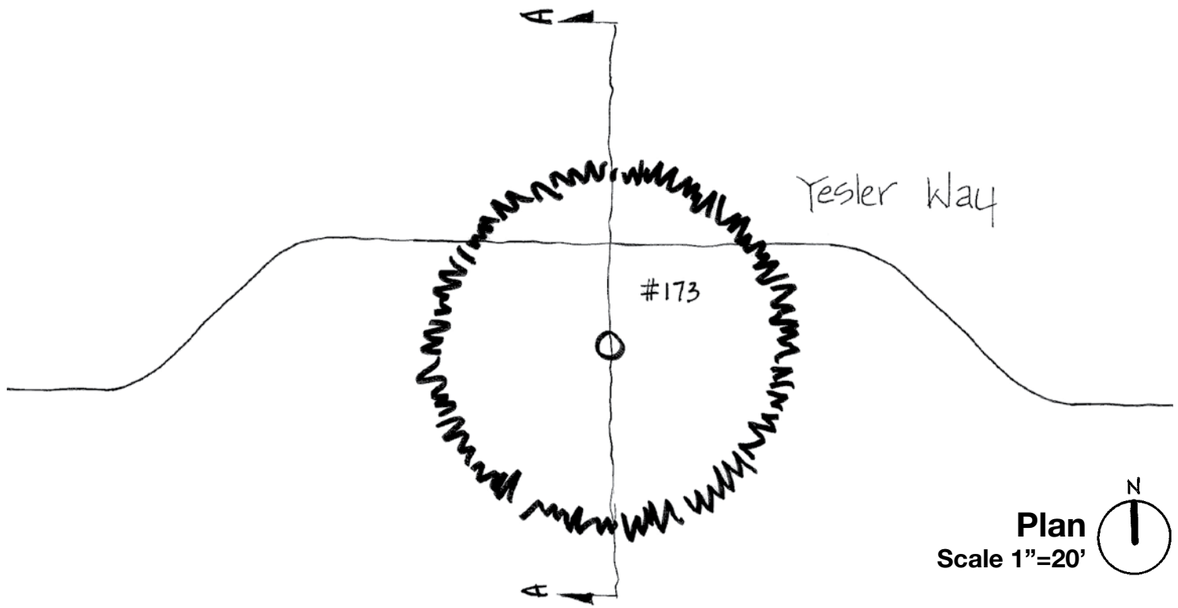
**Tree 167**
Yesler Terrace Redevelopment
Study of Existing Trees With High Potential for Impact by Streetscape Improvements
April 26, 2012

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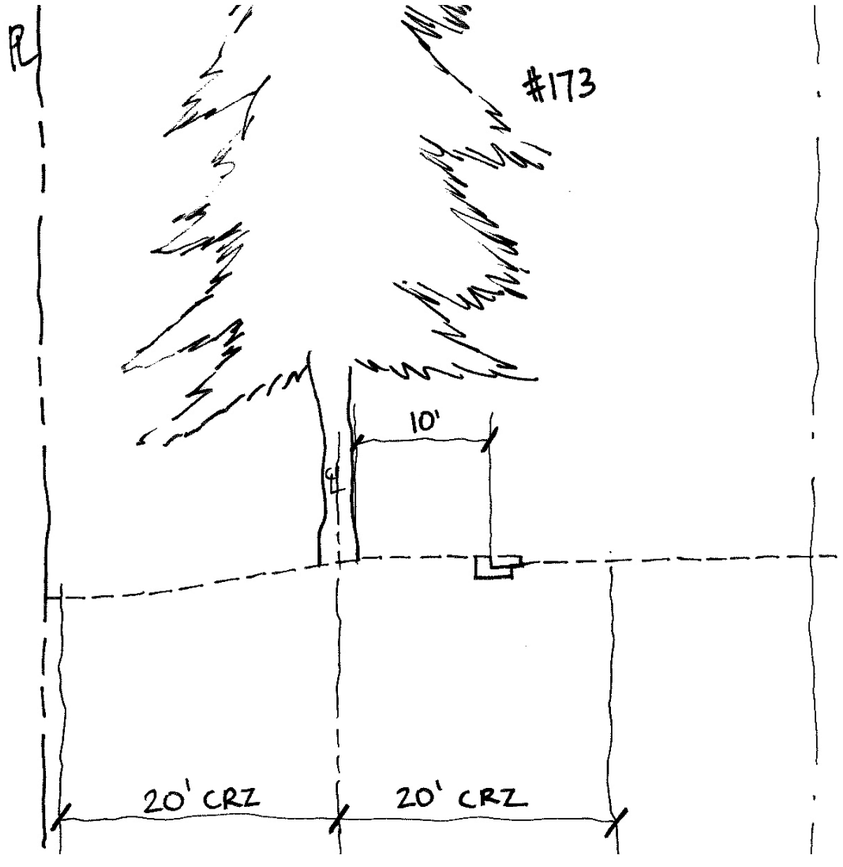
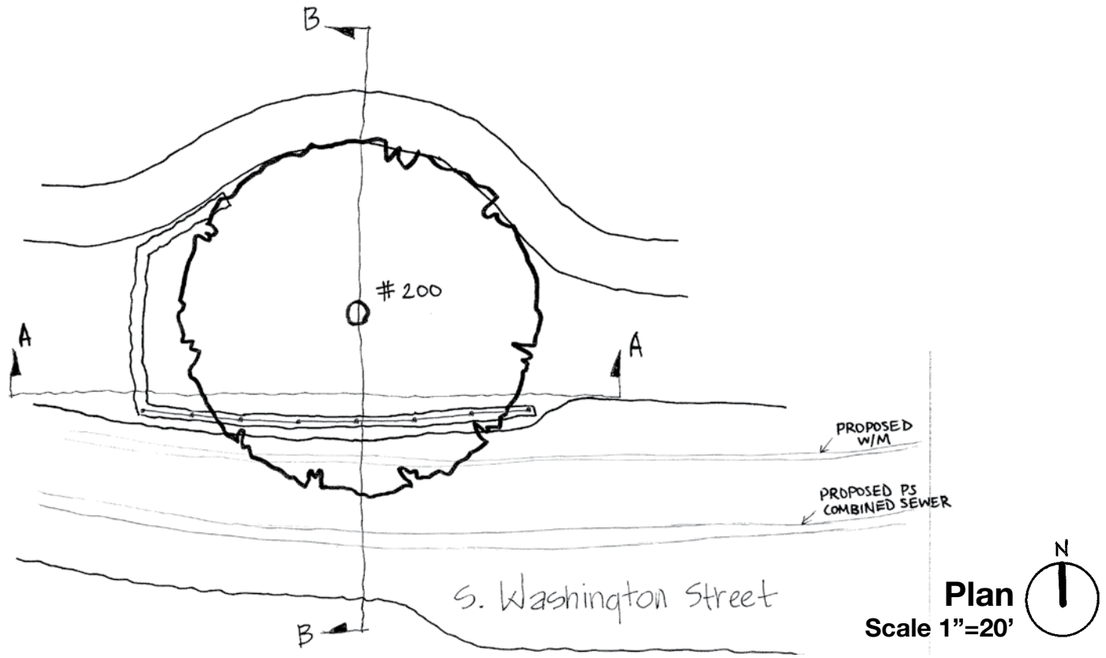



**Section AA**
**Scale 1”=10’**

**Tree 173**
Yesler Terrace Redevelopment
Study of Existing Trees With High Potential for Impact by Streetscape Improvements
April 26, 2012

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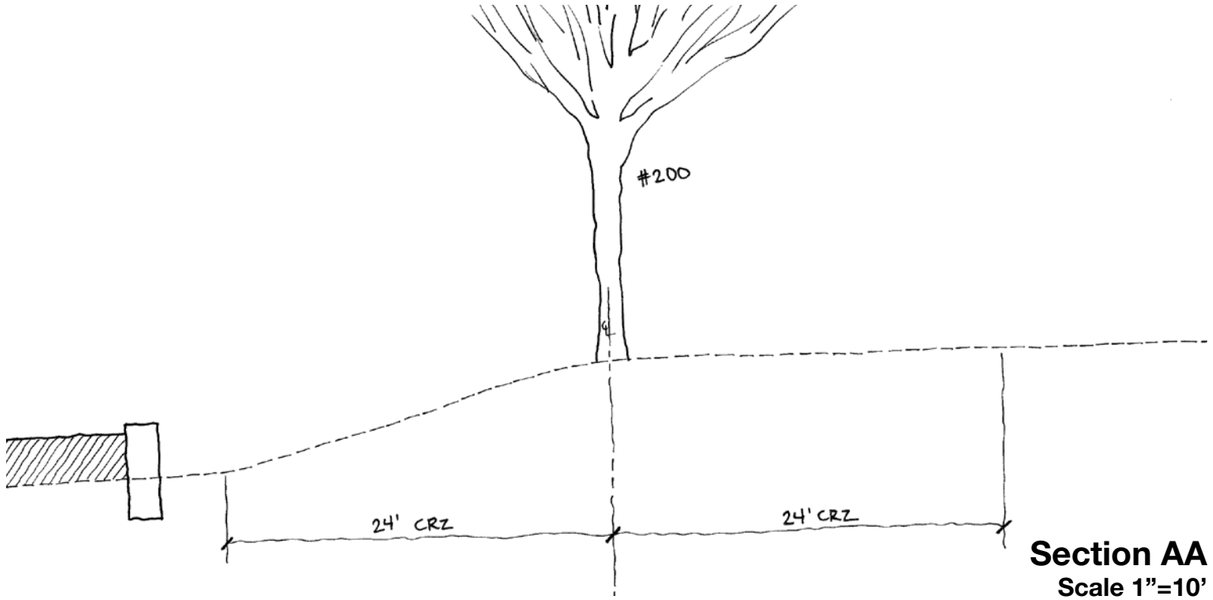


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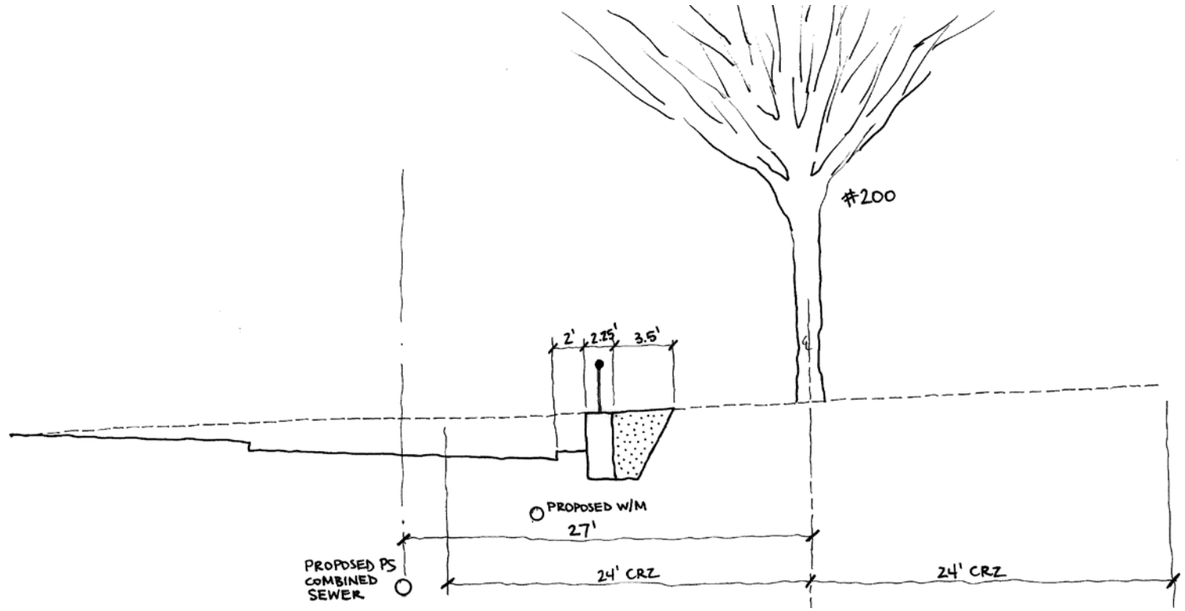


**Section BB**
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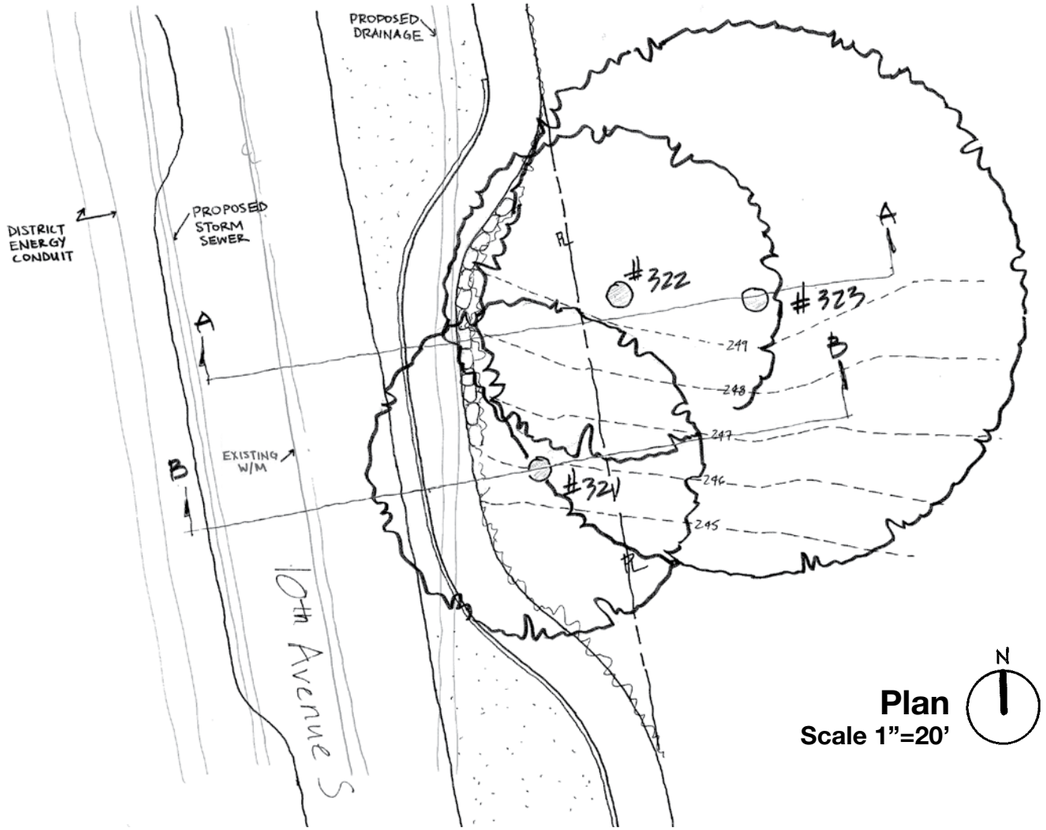
# Tree 200

Yesler Terrace Redevelopment
Study of Existing Trees With High Potential for Impact by Streetscape Improvements
April 26, 2012

SvR

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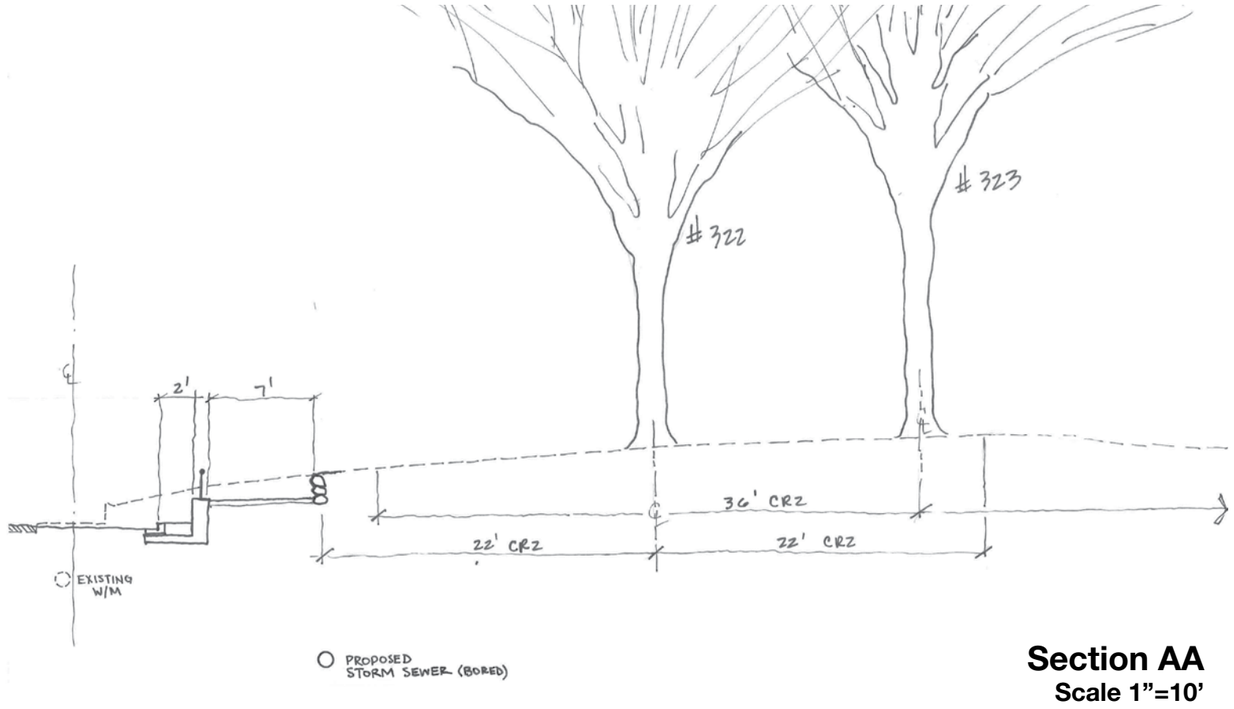


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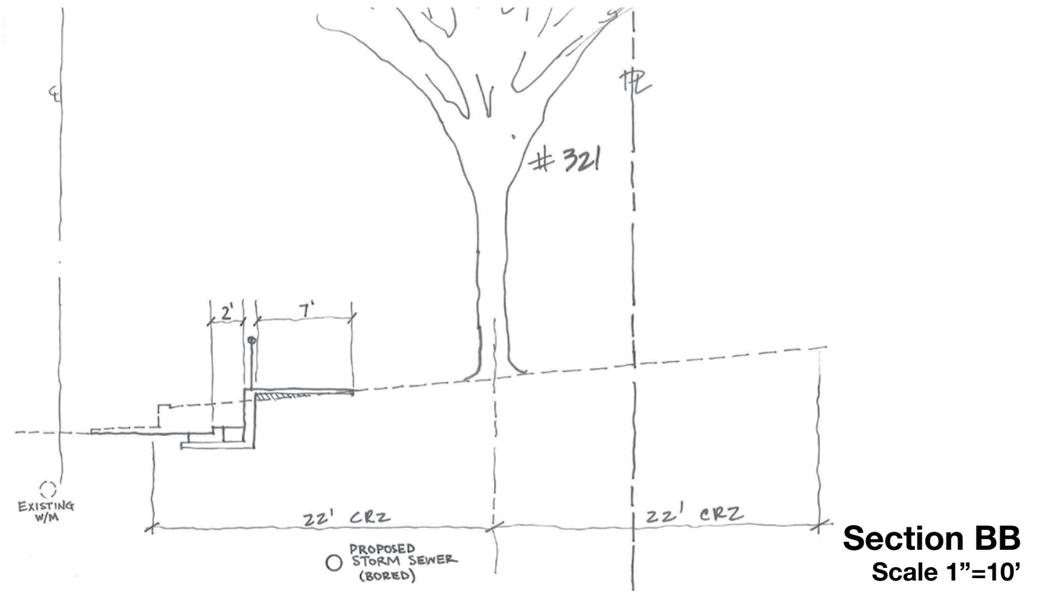


**Section BB**
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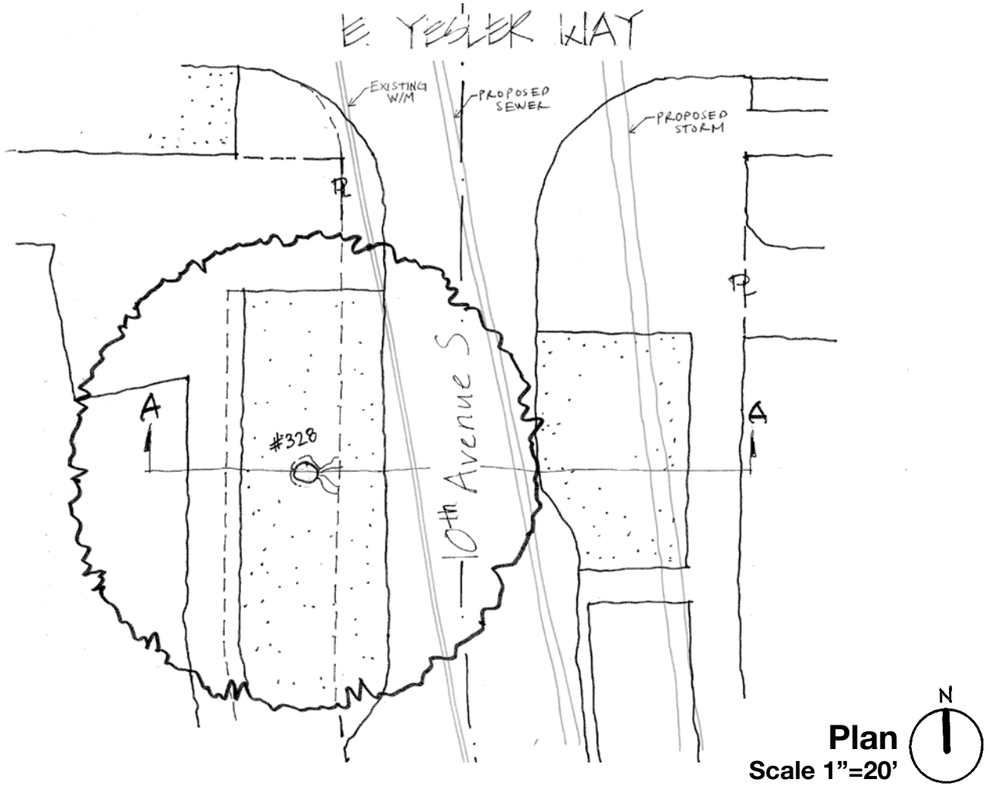
# Trees 321, 322, 323

Yesler Terrace Redevelopment
Study of Existing Trees With High Potential for Impact by Streetscape Improvements
April 26, 2012

SvR

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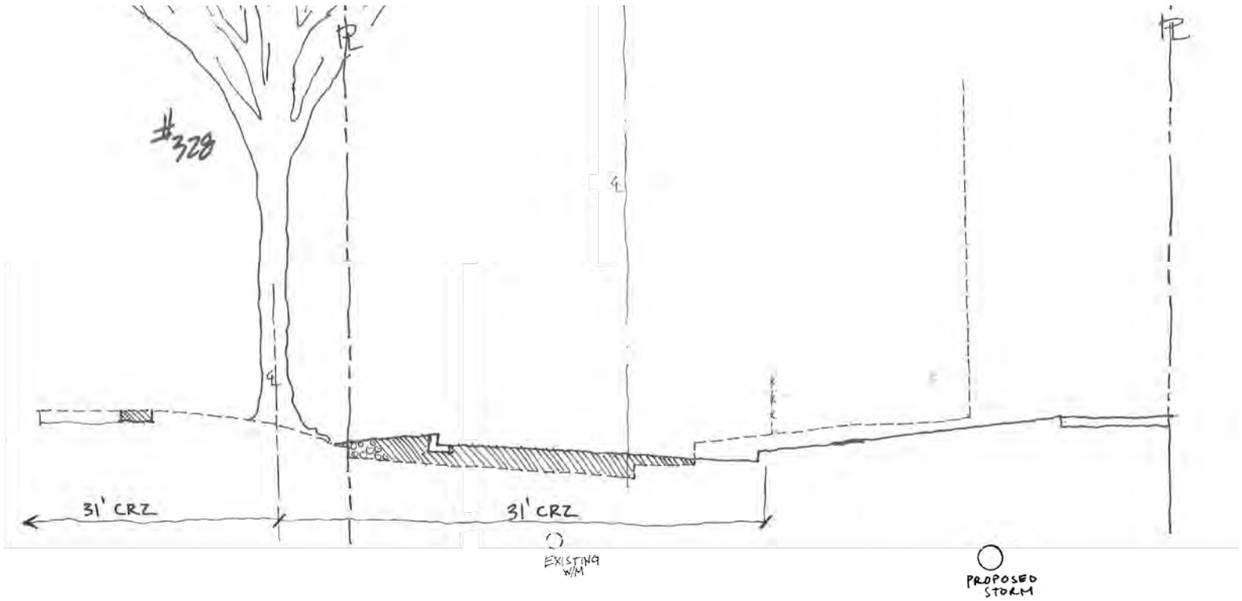


**Section AA**
**Scale 1”=10’**

**Tree 328**
Yesler Terrace Redevelopment
Study of Existing Trees With High Potential for Impact by Streetscape Improvements
April 26, 2012

| TREE | SPECIES | EVALUATION * | | | | IMPACTS | | | | ADDITIONAL COST OF RIGHT-OF-WAY IMPROVEMENTS | POTENTIAL FOR SURVIVAL W/ RIGHT-OF-WAY IMPROVEMENTS ** | SHA DIRECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CALIPER | VIGOR | STRUCTURE | PRESERVATION VALUE | NONSTANDARD ROAD ALIGNMENT | NONSTANDARD SIDEWALK | NONSTANDARD WALLS/ ROCKERY | NONSTANDARD UTILITY CONDITIONS | | | |
| 26 | Red oak<br>*Quercus rubra* | 28 in | Fair | Fair | Moderate | | X | | | $ | High | No change in Tier 2.<br>Will mitigate if not retained. |
| 27 | Red oak<br>*Quercus rubra* | 32.7 in | Fair-Good | Good | High | X | X | X | | $$ | High | No change in Tier 1.<br>Will mitigate if not retained. |
| 116 | English oak<br>*Quercus robur* | 39 in | Poor-Fair | Poor-Fair | Moderate | | X | | | $$ | Moderate | No change in Tier 1.<br>Will mitigate if not retained. |
| 167 | Horsechestnut<br>*Aesculus hippocastanum* | 29 in | Good | Good | Special Exception | X | X | X | X | $$$ | High | No change in Tier 1.<br>Will mitigate if not retained. |
| 173 | Douglas fir<br>*Pseudostuga menzeisii* | 19.8 in | Fair-Good | Fair-Good | Moderate | X | X | | | $$ | Moderate | No change in Tier 1.<br>Will mitigate if not retained. |
| 200 | Red oak<br>*Quercus rubra* | 23.3 in | Fair-Good | Fair | Moderate-High | X | X | X | X | $$$ | Moderate | No change in Tier 1.<br>Will mitigate if not retained. |
| 321 | Purple-leaf sycamore maple<br>*Acer pseudoplatanus 'Atropurpureum'* | 21.3 in | Fair-Good | Fair | High | X | X | X | X | $$$ | Moderate | No change in Tier 1.<br>Will mitigate if not retained. |
| 322 | Silver maple<br>*Acer saccharinum* | 21.7 in | Good | Poor-Fair | Moderate | X | X | X | X | $$$ | Moderate | No change in Tier 1.<br>Will mitigate if not retained. |
| 323 | Silver maple<br>*Acer saccharinum* | 36 in | Good | Poor-Fair | Moderate | | | | | $ | High | Change to Tier 2 due to development impacts, not a right-of-way issue. Will mitigate if not retained. |
| 328 | Sweet gum<br>*Liquidambar styraciflua* | 30.6 in | Fair | Poor-Fair | Moderate | | | | | $ | High | Change to Tier 1 due to decision to go with overhead power.<br>Will mitigate if not retained. |

* Per Urban Forestry Services Report dated June 12, 2010.

** Private improvements may have additional impacts.

# APPENDIX D

Email Communication with Fire Department Regarding Required Fire Flow
March 24, 2010

From: Goodall, George [George.Goodall@seattle.gov]

Sent: Wednesday, March 24, 2010 1:41 PM

To: Sakaru Tsuchiya

Cc: Phan, Joe

Subject: RE: General question on required fire flow from hydrant on water mains

Fire flow is a function of the size of a building and the Building Code type of construction used for the building as is shown in Seattle Fire Code Appendix B. (Note that fire flow is required for buildings by SFC 508.3.) Appendix B allows for reductions in fire flow if the building is protected by automatic sprinklers and if the building is for residential use. The minimum adjusted fire flow for all but the smallest residential uses (single family residences and duplexes) is 1500 GPM at 20 psi residual pressure. The reductions allow the minimum fire flow for even the largest sprinklered building to be 2000 GPM at 20 psi.

Fire hydrant spacing is generally up to SPU requirements (this is why SFC Appendix C is not adopted by the City of Seattle), but SFC 508.5 also requires that all portions of the exterior of a building be within 500 feet walking travel distance of a fire hydrant. The travel distance may increase to 600 feet if the building is protected by sprinklers.

The result here is if there is good street access to the buildings at the site and if the fire hydrants on those streets can provide at least 2000 GPM at 20 psi, the fire flow and hydrant location requirements of the SFC will be met. If you need additional direction, you may call me at 206-386-1454.

George Goodall

Seattle Fire Department

From: Sakaru Tsuchiya [mailto:SakaruT@svrdesign.com]

Sent: Wednesday, March 24, 2010 11:35

To: Goodall, George

Cc: Phan, Joe

Subject: General question on required fire flow from hydrant on water mains

Mr. Goodall,

Good morning,

Joe Phan, Engineer, Seattle Public Utilities, introduced your name to me.

SvR is currently working on planning of Yesler Terrace Project.

I have general questions regarding required fire flow for the proposed buildings in Yesler Terrace project area.

Pleas see the attached copies of Fire Code City of Seattle 2003.

I like to ask about

a.. Required fire flow

b.. Spacing of hydrants

Please have me call you.

SakaruTsuchiya | civil engineer

SvR Design Company 1205 Second Avenue, Suite 200 Seattle, WA 98101

t. 206.223.0326 ext. 1043 f. 206.223.0125

www.svrdesign.com tw. @svrdesign fb. www.facebook.com/svrdesign