Garfield High School
Landscape Renovation Proposal
Fall 2000

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Selection and Management of Landscape Plants
Center for Urban Horticulture
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Introduction

The students in Linda Chalker-Scott's fall, 2000 Landscape Plant Selection and Management (EHUF 480) class developed a landscape renovation proposal for Garfield High School. This renovation will be carried out in spring, 2001 by students taking the field portion of the class. The site to be renovated is located on the western side of the Garfield High School building, bordered by the sidewalks leading to the two main entrances to the school, the building's west-facing wall and 23rd Avenue East. This proposal contains recommendations for the design, installation, and maintenance of a landscape on public school grounds that we hope to develop in conjunction with Garfield High School and the neighboring community.

The following landscape rehabilitation proposal has several goals. Paramount among these goals is to provide the framework for a successful installation of a healthy and sustainable landscape that the students, staff, and faculty of Garfield High School can appreciate and enjoy. This document incorporates what the authors have learned in studying the selection and management of landscape plants. In proposing an attractive landscape that requires little maintenance, we hope to have a role in producing something in which Garfield High School and the surrounding community can be proud.

Students in the EHUF 480 course studied various aspects of the site as they affect landscape conditions. From this analysis of the site, which included physical, biological, regulatory, and cost considerations, the students developed a detailed proposal that we hope will lead to the creation of an attractive and sustainable landscape at the school. The first part of the proposal discusses current site conditions in detail, specifically focusing on the existing plant material, and analysis of light and soil conditions. The second part focuses on the proposed landscape renovation. This includes the proposed design plan and a description of the goals and motivations that shaped the design. Sections covering recommendations for site preparation, methods of installation, and plant selection follow. Included in the discussion of plant selection is a comparison of the quality and costs of plant materials at local nurseries. The last section of the proposal focuses on anticipated overall costs and budget issues, and is followed by references and appendices.

Summary Abstracts of the Proposal's Contents

Site Plan Analysis: Current Site Conditions

Existing Plant Material

The project site is primarily turf grass with plantings around the bus stop and next to the west wall of the school. There are also three street trees, and three young trees growing in the lawn area. The street trees are mature and healthy, while the lawn trees are young and less vigorous. Two of the lawn trees are healthy, but the third is in declining health. Some of the shrubs are quite healthy while others have various problems. Preferred conditions, and observed and potential problems are discussed for each type of plant found at the site.

Soil and Light Analysis

City regulations require that any plantings within a given distance of the public's right of way be planned and maintained for sight and safety. These laws affect the plants' heights and distance from sidewalks and streets as well as what permits need to be obtained when removing or planting a tree near the right of way. The hydrology analysis revealed that the southern end of this site, near the bus stop, has adequate lateral drainage, but is currently over watered as shown by the constant standing water in that area. Drainage is less pronounced in the northern portion of the site and the soil nearer to the school building drains quickly. The entire area on the Western side of the school varies between full sun and partial shade due to long shadows during the winter. All plantings should be able to grow in both of these conditions. Also, the artificial light cast by the street lamps may be detrimental to plant health by disrupting their seasonal photoperiod. The texture of the top 5-7 inches of soil between the front of Garfield and 23rd Avenue is ideal for growing shrubs and perennial plants (ranging between sandy clay loam and sandy loam) and is not compacted as most urban soils are. The areas with plant beds are covered with a shallow layer of bark mulch. Below the topsoil in most areas is a soil layer with compact clay or construction fill and debris (nearest 23rd Ave.). The bulk densities of the soil range between 1.01 and 1.06 g/cm^3 with less than 10% organic material. The soil's pH level varied between 5.5 and 6.1. Levels of metals such as aluminum and lead are potentially harmful, but well within standards for human health. Raising the pH to 6.5 to decrease the ability of those metals to enter into plants is possible. Adding nitrogen to the soil would help, but is not necessary.

Site Plan Analysis: Proposed Landscape Renovation

Design Narrative

Our goal is to create an open space that is a social area within the perimeter of the school property. This intent will be accomplished by allowing a better link to the school with a pathway and defining a secure boundary of the space through plantings for the school and the community—the school being the place where people will want to be.

The design proposal consists of three elements: (1) Newly planted and formed planting bed against western face of building, (2) newly planted and newly formed planting bed near bus stop, and (3) concrete pathway connecting the bus stop with the school.

* For further design details see the section within the document under Design Narrative.

Site Preparation

Site preparation involves several steps to complete, and will require the most labor hours of any aspect of the project. Removing unwanted plants such as English ivy (*Hedera helix*), and damaged and unsalvageable plants is the first step. Several large plants can be saved and left in place or transplanted. A significant amount of grass will be removed with the creation of new beds along the west side of the school building and near the bus stop on

23rd Ave. East. Sod is to be removed during the installation of a proposed pathway from the main west entrance of the school to the crosswalk on 23rd Ave. E. This sod can be used to help smooth out the grade in the large bed near the bus stop. A small backhoe or similar equipment is necessary for ivy removal and path preparation. Three to five inches of mulch will be applied to all of the beds, and to mulch circles surrounding the trees at the site. During the entire process, steps will be taken to minimize damage to existing plants and limit any inconvenience to school users.

Plant Selection

Plant selection attempts to use the existing plants as well as incorporate new plantings to create the most aesthetically pleasing plan while acknowledging the current soil and lighting conditions of the site. The public bus stop conditions include shaded beds and poorly draining soil. The bed along the west-facing wall receives shade in the mornings but intense afternoon sun in the summers and shaded conditions throughout the winter and contains a fairly well drained soil. The plants chosen for the site include *Acer circinatum* (vine maple), *Erica carnea* 'Springwood White' (heather), *Ceanothus* sp. (California lilac), *Waldsteinia fragrarioides* (barren strawberry), *Gaultheria shallon* (Salal), and *Thymus pseudolanuginosus* (woolly thyme). Finally, we will replace an existing but badly damaged *Liquidambar styraciflua* (American sweet gum) with a healthier specimen of the same species.

Plant Installation

Four vine maples (*Acer circinatum)* are to be placed in the newly shaped bed along side of the building in front of the blank walls in between the windows, along with heath (*Erica carnea* 'Springwood'), California lilac (*Ceanothus* sp.) and wooly thyme (*Thymus pseudolanuginosus*) to create five nearly identical sections. A new concrete path is to be created connecting 23rd Avenue East to the southern entrance to the building on our site. This path will curve gently around the planting bed behind the bus stop. Underneath this path a French drain will run from the southern side of the path down to the drain at the north side of the site. This is approximately 95'. The ivy (*Hedera helix)* to the north of the bus stop will be ripped out and replaced with heath (*Erica carnea* 'Springwood White'*)*. On either side of the bus stop informal stepping-stones are to be placed to keep the social paths intact. Directly behind the stop, a vine maple (*Acer circinatum*) will be added to soften the back of the shelter. To the north, the existing *Prunus* is to be pruned and more heath added to the east. The declining sweetgum (*Liquidambar styraciflua*) will be replaced with a healthier specimen.

Site Plan Analysis:
Current Site Conditions

Existing Plant Material

Abstract

The project site is primarily turf grass with plantings around the bus stop and next to the west wall of the school. There are also three street trees, and three young trees growing in the lawn area. The street trees are mature and healthy, while the lawn trees are young and less vigorous. Two of the lawn trees are healthy, but the third is in declining health. Some of the shrubs are quite healthy while others have various problems. Preferred conditions, and observed and potential problems are discussed for each type of plant found at the site.

Existing tree species on site include the sugar maple (*Acer saccharum*) street trees, a young sweet gum (*Liquidambar styraciflua*) and two young cherries (*Prunus* sp.). Shrubs against the west side of the school include five border privets (*Ligustrum obtusifolium*), three rhododendrons *(Rhododendron* sp.), one iris (*Iris* sp.) and scattered low Oregon grape (*Mahonia nervosa*). The bus stop area is dominated by large laurel cultivars (*Prunus laurocerasus* 'Otto Luykens') and English ivy (*Hedera helix*).

Acer saccharum (sugar maple) is native to the northeastern United States, but is a common street tree due to its hardiness and the pleasing color of its autumn foliage. It does well in cool, moist climates and thrives in all but the driest or wettest of soils. There are many known pests and pathogens for the tree, but they seldom prove fatal. All three of these specimens are mature and appear quite healthy considering their urban-stressed growing conditions.

Liquidambar styraciflua (American sweet gum) is native to the southeastern United States where it is a common bottomland species. Its native range extends as far north as Connecticut along the Atlantic coast. Sweet gum is one of the most adaptable of hardwood species in its tolerance to different soils and site conditions. As could be expected due to its native habitat, it is a shallowly rooted tree and can cause problems with buckling sidewalks. There are few disease or insect problems with sweet gums. Unfortunately, the existing tree has suffered from lawnmower damage, and has a large canker at the base of the trunk. We recommend that this tree be replaced.

Rosmarinus officinalis (rosemary) is hardy evergreen shrub in our climate. It requires sun, withstands drought and takes any soil except permanently wet soil. It can handle

temperatures as low as 15 degrees F. Rosemary has no major disease or pest problems and no special nutritional requirements. The existing plant looks healthy.

Ligustrum obtusifolium (border privet) takes any but the very wettest soils and is pH adaptable. Privets tolerate sun and pollution. They are recommended for use in zones with lower minimum temperatures than our USDA zone 8, and they do well in our climate. Since privets are known to thrive on neglect, their cultural requirements should be met at this site. However, these five privets do not look healthy. Some leaves on each plant have leaf spot, which can be caused by infectious diseases or insect damage. Stippling is present on some leaves of each plant and there are signs of mites. The plants that are furthest north have powdery mildew. All the privets have some healthy leaves and are losing the leaves that exhibit problems. These plants have also been mal-pruned. Their size would be 10-12' by 12-15' under normal conditions. They have been cut off at about 5'without much regard to their form. Due to their close proximity to the rhododendrons, the laurel and the building, their widths have also been restricted.

Rhododendron sp. (rhododendron) prefers filtered sun and moist, well-drained organic soil. Rhododendrons require acid soil and need regular feeding to grow vigorously and flower. Mulching with compost decreases the need to feed rhododendrons. Rhododendron hardiness varies with species and rhododendrons may suffer winter damage in Seattle. The leaves of these three rhododendrons show some sun scorch and some mechanical injury (possibly due to pruning). There is some stippling of the leaves and evidence of mites. The leaves do not appear to be chlorotic. None of the plants' leaves are ragged, indicating root weevils are not a problem. These plants have also been poorly pruned. They have been cut off below the windows at about 5' although it looks like their natural habit would be much taller. Their form has been lost. The rhododendron that is furthest south has the best form of the plants in this location.

Mahonia nervosa (low Oregon grape) is native to Washington State. It is tolerant of many soils and prefers some shade. These Oregon grapes show no signs of pests or disease and the nutrient levels present support their growth.

Iris (*Iris* sp.) is a cold hardy perennial in zones 3-9. Irises are low maintenance plants that bloom during mid-summer. They grow to 18-27" high and 4-8" wide, prefer sandy loam to clay loam soil, a pH of 6-7, dappled to full sun, and average watering. The plants will also tend

to naturalize in an area if not restricted. Potential problems include: rust, thrips, aphids, earwigs, caterpillars, slugs, white flies, rhizactonia root & stem rot, pythium & phytophthora root rot.

Prunus lusitanica (Portuguese laurel), is an evergreen bush growing 10-20' high and 10-20' wide. *Prunus lusitanica* has small white fragrant flowers that grow on 6-10" long racemes in mid to late spring. It is hardy to -10 degrees F, and USDA zones 7-9. This laurel prefers sandy loam to some clay, part shade to full sun, and a pH of 4.5-7.5. Some problems include: fungi, scale insects, leaf miners, caterpillars and blight.

Prunus laurocerasus 'Otto Luyken' (Otto Luyken's laurel) grows to a height of 3-5' and 3-6' wide. It is does not usually require pruning. In mid-spring it has tiny white and very fragrant flowers and its fruit is inconspicuous. This species prefers sandy loams with some clay content, partial shade to full sun and a pH of 4.5-7.5. It is tolerant of heat and humidity, seashore atmosphere, slope and wind. Some problems include: aphids, leaf miners, caterpillars and blight.

The *Prunus* species (flowering cherry trees) are both young and appear slightly stressed. This is probably due to competition for limited summer moisture with the existing turf. However, they are both well established, and can probably be improved with the removal of some of the turf around their base and generous mulching.

Site Analysis of Current Conditions

Abstract

City regulations require that any plantings within a given distance of the public's right of way be planned and maintained for sight and safety. These laws affect plant heights, how far away from sidewalks and streets plantings occur, and what permits need to be obtained when removing or planting a tree near a right of way. The hydrology analysis revealed that the southern end of this site, near the bus stop, has adequate lateral drainage, but is currently over watered as shown by the constant standing water in that area. Drainage is less pronounced in the northern portion of the site and the soil nearer to the school building drains quickly. The entire area on the Western side of the school varies between full sun and partial shade due to long shadows during the winter. All plantings should be able to grow in both of these conditions. Also, the artificial light cast by the street lamps may be detrimental to plant health by disrupting their seasonal photoperiod. The texture of the top 5-7 inches of soil between the front of Garfield and 23rd Avenue is ideal for growing shrubs and perennial plants (ranging between sandy clay loam and sandy loam) and is not compacted as most urban soils are. The areas with plant beds are covered with a shallow layer of bark mulch. Below the topsoil in most areas is a soil layer with compact clay or construction fill and debris (nearest 23rd Ave.). The bulk densities of the soil range between 1.01 and 1.06 g/cm^3, with less than 10% organic material. The soil's pH level varied between 5.5 and 6.1. Potentially harmful levels of metals such as aluminum and lead are somewhat high, but well within standards for human health. Raising the pH to 6.5 to decrease the ability of those metals to enter into plants is possible. Adding nitrogen to the soil would help, but is not necessary.

City and School Ordinances

City Ordinances

The project site at Garfield High School is adjacent to 23rd Ave. E., a very busy street. When composing a planting scheme at this location, relevant traffic ordinances need to be taken into account. The most pertinent ones to be addressed deal with visibility and safety – especially important near the public bus stop at the edge of the site. Seattle schools adhere to the city zoning and Department of Transportation (DOT) code regarding planting, pruning and maintaining landscapes in the public right of way. The code states the following:

- Trees and shrubs must be maintained to provide 8ft. of clearance above sidewalks and 14ft. above roadways.
- A tree shall be planted a minimum of 3ft. from the street curb and 2 ft. from the edge of a sidewalk
- Planting material lying with 30ft. of the curb line of any intersecting street is limited to 2ft. in height, measured from ground level
- When paving or planting a strip or removing a tree in the public right of way a permit will be needed, which will be reviewed by the DOT

- Seattle City ordinance #90047 requires that all persons who prune and/or remove trees with the public right of way area obtain a street use permit
- Raised planted boxes shall be no more that 18in. in height and no more and 1ft. in height if within 3 ft. of curb

School Ordinances

We attempted to contact the grounds crew directly in relation to ordinances applying to the maintenance of school grounds. Unfortunately, at the time this document went to press, we still had yet to receive a response and were unable to address current-year concerns. In order to proceed with the proposal, we referred to the concerns addressed in last year's proposal for a similar landscape renovation at Garfield High School.

According to the school district's protocol, any landscape design proposed for installation on Seattle school grounds must receive conditional approval from a review team composed of Seattle School District representatives.[1] The most significant factors addressed last year and this year are the degree of maintenance required and safety and security. Landscapes viewed as a hindrance to the grounds crew's mowers will need to be modified. Landscapes that require high amounts of maintenance such as regular weeding and pruning are also deemed an obstacle unless an outside source of labor is provided. Concerning safety and security, landscape plantings that obstruct visibility or allow for individuals to remain hidden are deemed a security threat to the student body as a whole. In order to maintain a beautiful, but sound, campus, all plant material must be planted one foot from the buildings and kept away from doors and windows. Finally, Garfield High School has requested the previous two years that their rodent problem be addressed and that measures must be provided to deter rodent habitation of groundcovers or hardscapes.

[1] For questions concerning the self-help review process, or any other landscape design issues, the following individuals can be contacted:

Johnny Burrows, Grounds supervisor of the Seattle school district. Phone 206-298-7619
Gretchen DeDecker-Miller, Head of ground's 'self-help' improvement projects for the Seattle school district. Phone 206-298-7637

Light & Seasonal Analysis

Overall the site should be considered open and sunny. The area within 20-30 feet of the building has a western exposure. This zone benefits from the combination of warmer temperatures and afternoon light in the summer. In the winter, however, this zone will be significantly impacted by long shadows (Table 1). Thus, it would be most prudent to consider plants that can thrive in full sun *or* part-shade in this zone.

Table 1. Summer and winter shadows

Object & Height	Summer Solstice Shadow @ Noon	Winter Solstice Shadow @ Noon
45' building	16'	109'
30' st. tree	11'	72'
25' st. tree	9'	60'
20' st. tree	7'	48'
8' bus stop	3'	19'

Figure XXX: Summer & Winter Shadows

The building is a dark red-brown brick and, though it has many windows, should not reflect quantities of light sufficient to cause concern. There are streetlights along the sidewalk and above the school entryway that serve to keep the campus well lit. This implies tender species should not be planted in this area, as they may fail to winterize properly because of the artificial photoperiod. The *Prunus* sp. and *Liquidambar styraciflua* planted in the lawn may eventually grow large enough to cast shade, which serves as further reason to utilize plants tolerant of partial shade.

Hydrology Report

A simple assessment of hydrology, the ability for water to flow through the soil, was conducted to determine if conditions were optimal for plant health. A visual reading of the landscape revealed that approximately two inches of standing water exists on the grounds immediately to the south of our plot, possibly due to a damaged watering system that was left running for longer periods of time than necessary. The standing water and atypically lush grass indicate that over-watering is occurring on a regular basis and lack of drainage does exist south of our site. However, the site chosen for this year's renovation includes a berm and drainage 'swale' which slope towards a drain installed in the northern end of the lawn. This leads us to believe that water may be directed off the site, preventing permanent pooling.

In order to determine the permeability of the soil, three percolation test sites were designated. The first site was a level area directly south of the bus stop on 23rd Street, lying at

the bottom of a small incline. Upon removal of the soil it was noted that 1.5 inches of water were standing in the hole. A total of 300mg of water was added to determine if the soil would tolerate any further saturation. After a period of twenty minutes the water level had returned to it's original state of 1.5 inches of standing water. This would indicate that, while lateral draining continues to occur in the area, insufficient vertical drainage exists.

The second test site was north of the bus stop in a level area covered with English ivy, this space also lies at the bottom of an incline. The soil was temporarily removed and 300mg of water deposited into the hole. One inch of water remained standing after 20 minutes, leading us to believe there is insufficient drainage around the entire public bus stop. There appears to be a layer of hardpan just below the depth tested inhibiting proper flow. The current watering regimen needs to be adjusted to reflect actual needs of this site, reduce wasted water and ensure health of plantings.

The final test site was in front of the school building along a west-facing wall on level ground partially covered by turf. This area drained steadily and emptied entirely within the 20-minute period. We believe that the soil located here provides adequate drainage. This does mean the bed to be installed next to the school building will dry out more quickly than the bed to be installed around the bus stop, and the watering regime during the first summer after installation ought to reflect this difference.

Soil Analysis

Overview

The vigor of vegetation above ground is a reflection of the health of the soil in which it grows. Therefore, understanding soil conditions is critical before designing a landscape. After soil has been examined, plants adapted to the existing conditions may be selected and the soil amended, if necessary, to provide a favorable rooting environment.

The texture of the top 5-7 inches of soil between the front of Garfield and 23rd Avenue East is ideal for growing shrubs and perennial plants. It ranges from a sandy clay loam to a well-drained sandy loam. The soil contains adequate organic matter, around 6%, and is especially high near the bus stop where wood chips were spread in the past. Unlike most urban soils, the topsoil in this area is not compacted, showing bulk densities ideal for plant growth (Table 3).

Underlying the soil along 23rd Avenue East is an extremely compact hardpan with broken bricks, rocks, and small pieces of iron scrap 9 inches below the soil surface. This should be broken up well before plant installation to improve water percolation and root penetration. The soil at the site contains medium levels of lead so precautions should be taken to raise the pH to 6.5 and keep bare soil covered with mulch.

Soil Profiles

Three pits were dug to a depth of 20 inches in the areas to be landscaped in order to determine the soil on those sites. In natural soils, the texture is relatively similar between soil layers (horizons) and there is a gradual transition between them. The horizon near the surface tends to contain more organic matter and oxygen and be darker in color. Soil is lighter, with less organic matter and oxygen the deeper down it is located. However, in highly disturbed urban soils, a predictable pattern is often lacking. There may be abrupt changes in soil composition due to construction and the use of fill. This can cause lowered fertility, compaction, and hydrological problems for plants. The different horizons are described below, including soil color, using the Munsell Soil Color Book system.

Table 2. Soil profile descriptions

Site	*Horizon*	*Depth*	*Texture/Composition*	*Color*	*Notes:*
Ivy	O	0-1	Decomposing leaves		
	A	1-8	Dense with roots, sandy clay	10YR 4/2	
	B	8-12	Fill containing rocks, bricks...	10YR 6/4	Difficult to dig
	C	>12	Glacial till, road-cut fill	10YR 4/1	
Bus	O	0-1	Decomposing wood chips		
Stop	A	1-6	Well-drained rich soil	10YR 3/2	
	B	6-10	Cement-like clay	10YR 5/4	Impermeable
		10-11	Coarse sand		
	C	>11	Mottled sandy clay	10YR 4/2 & 4/6	Poor aeration
Along	A	0-7	Commercial topsoil	10YR 4/2	
School	B	7-10	More clay than A	10YR 5/3	
		>10	fine sand	10YR 6/2	

SOIL PROPERTIES

Table 3. Soil properties summary

	Bulk Density	*% Organic Matter*	*% Moisture*	*PH*	*Nutrients: N-P-K*	*Texture*
Ivy	1.06	5.6	34	5.5	8-7-103	Sandy Loam
Bus	1.01	9.6	31.5	5.5	8-7-103	Sandy Clay Loam
School	1.06	6.3	24.7	6.1	8-5-88	Sandy Clay Loam

*Measurements based on samples taken from the top 8-9 inches

Soil Texture

Texture is determined by the relative amounts of sand, silt and clay in a soil. Soil texture dictates drainage, aeration, and nutrient holding capacity. Thus, before installing landscape plants, it is crucial to understand in what conditions they will be planted and if the soil needs to be amended. For example, if you know that a soil has high amounts of clay and drains poorly, it would not be wise to plant a tree that prefers dry conditions, such as a Japanese maple. If a soil is extremely sandy, organic matter may be added to the surface as mulch at a depth of several inches, so that decomposing organic matter can release nutrients into this otherwise nutrient poor soil. In some sandy soils, topsoil may be added and drought tolerant plants selected.

Table 4. Textural Analysis Results

Plot	*% Sand*	*% Silt*	*% Clay*	*Texture*
Ivy	57.1	24.3	18.6	sandy loam
Bus Stop	53	25.9	21.1	sandy clay loam
School	58	20.9	21.1	sandy clay loam

The top 8 inches of soil have excellent texture for growing plants at all sites sampled (Table 4). The soil here is well-drained, lightweight, and resists compaction.

Bulk Density

A healthy soil is composed of 45% mineral material, 5% organic matter and 50% pore space. The pore space is critical to permit oxygen and water circulation to promote root and soil microorganism growth. Unfortunately, most urban soils tend to be compacted, lacking crucial pore space. Bulk density is a measure of the compaction of a soil: weight of oven-dried soil/volume of soil. Plants can root freely with bulk densities of 1.0–1.4 g/cm^3.

The school and ivy plots had the highest bulk densities, 1.06 g/cm^3. The area around the bus stop had a lower density, 1.01 g/cm^3. This was probably due to the high amount of organic matter in the soil. Near 23rd Avenue East, the compact fill 8 inches below the topsoil should be broken up to promote drainage, aeration, and plant rooting. The top layer should be mulched with organic matter following the soil alteration.

Organic Matter

Organic matter plays a crucial role in soil health. It provides a slow release source of carbon and nitrogen, nourishing microorganisms and plants. It maintains soil tilth, keeping the

soil aerated and moist. Not surprisingly, the bus stop area had the highest percent organic matter (9.6%) due to the presence of decomposing wood chip mulch. The soil beneath the ivy may have a lower organic matter content than the area along the school because the ivy keeps the soil moist and more hospitable for microbes, which break down organic matter. The commercial topsoil used along the school may have also been high in organic matter but is currently at optimal levels.

pH

Soil pH determines what mineral nutrients are available for plant uptake and what plants are able to grow on a particular site. Soil nutrients and heavy metals are more available at pH levels below 6.5. Many non-native flowers and shrubs tend to prefer alkaline to neutral soil conditions, while native plants, such as heaths and huckleberries require acidic soil. The soil at Garfield High School, along 23rd Avenue East, tends to be only slightly acidic, with pH levels ranging from 5.5–6.1.

Nutrient Analysis

Soil provides the nutrients needed to promote healthy plant growth. If nutrients are lacking in a soil, they may be supplemented either by adding a layer of organic mulch, which will slowly release nutrients into the soil as it breaks down, or by adding nutritional amendments to the topdressing. Two soil samples were analyzed at the Soil Testing Lab at the University of Massachusetts–Amherst. Both samples have similar ranges of nitrogen (N), phosphorus (P), potassium (K), and magnesium (Mg) (Table 3). However, calcium (Ca) is much higher along the school, probably due to leaching from the concrete foundation.

The soil was also tested for heavy metal content. Aluminum and cadmium are within normal levels, but lead was somewhat higher. Lead concentrations tend to be higher along buildings that once had lead paint and along well-traveled roads where leaded gasoline was once used. Lead occurs naturally in soil at 15–40 parts per million (ppm). The lead concentration along the school is 660 ppm and near 23rd Avenue East, 612 ppm. This is considered a medium concentration and poses little risk to adults with limited soil contact. Edible crops should not be grown and young children should not be involved in planting or site preparation. Good gardening practices to reduce lead risk are as follows: incorporate organic materials such as

compost, increase soil pH to 6.5 to minimize lead availability, keep dust to a minimum by maintaining a mulch layer, and wash your hands after working in the soil.

For growing deciduous trees, shrubs and vines, the University of Massachusetts Soils Lab recommends incorporating 2 cups of nitrogen fertilizer per cubic yard of soil in the early spring, and adding a thick layer of organic mulch.

Site Plan Analysis:
Proposed Landscape Renovation

Design Narrative

Abstract

Our goal is to create an open space that is a social area within the perimeter of the school property. This intent will be accomplished by allowing a better link to the school with a pathway and defining a secure boundary of the space through plantings for the school and the community—the school being the place where people will want to be.

The design proposal consists of three elements: (1) Newly planted and formed planting bed against western face of building, (2) newly planted and newly formed planting bed near bus stop, and (3) concrete pathway connecting the bus stop with the school.

Design Narrative:

Throughout the design process, we were presented with many constraints that would inevitably guide the design proposal. Maintenance concerns, soil and sunlight conditions, and budget goals were important factors taken into account in creating a design proposal that would benefit the students of Garfield, the faculty, and maintenance crew members who would be affected by the enhanced space.

Concept of design:

Our goal is to create an open area that is a social space within the perimeter of the school property. This intent will be accomplished by allowing a better link to the school with a pathway and defining a secure boundary of the space through plantings for the school and the community—the school being the place where people will want to be.

Function of Design:

The conceptualization for the design is rooted in the needs of the students. From our observation, we concluded that the students had a need for an outdoor space that would take full advantage of the existing, sunny lawn areas on the west side of the building and create better access to and from the adjacent bus stop. This is a frequented space by the students during break time and lunch hours in the warmer months of the year and a space that is traveled through quickly in the colder months. Therefore, we concluded that within the space between the

building and the bus stop there was not a need for overly emphasized seating to create space. In addition, it seemed necessary not to over emphasize the newly planted areas of the lawn and to keep a minimal approach to the design that would merely contain the social areas and brighten the face of the school.

The elements of the design are as follows:

- Revised **planting bed near west face of building**, both changing the form of the bed and replacing some of the existing plants that were assessed unmanageable. The planting scheme for this bed works to enhance the experiential change of colors in nature through the mixed use of deciduous trees, flowering evergreen shrubs, and colorful herbs. The bed takes the shape of a flowing curve that helps identify the space for the students and break up the rigid presence of the building.
- **Lower planting bed near bus stop** and 23rd Avenue East. The proposed extension of this planting bed is an attempt to soften the stark appearance of the rear side of the bus stop and to create a more comfortable space between the upper pathway and the street sidewalk. Within the bed there is also an opportunity for the reuse of excavated soil material that will be removed from the site during pathway construction. This amended material would also help to soften the steep slope of the existing planting strip that borders the 23rd Ave NE side of the property. The proposed plantings remain consistent in color composition and function than that of the upper bed but were chosen specifically to withstand the frequency of use.
  Included within this space is the extension of the existing line of trees that border the inner space of the lower lawn area. This line of deciduous trees will help to contain the space within the lawn area as well as brighten up the façade of the school for the both the passer-by and the observer through the inside window looking out.
- The **concrete pathway** is proposed as a potential second phase of the project but is none-the-less an important piece to that space. The pathway will create an important connection to the school and the street reducing the current separation. Keeping in mind that it is an important goal of the school to bridge the gap between the street and what the school has to offer, the pathway would create a necessary link for a healthy environment within school grounds. The pathway creates an opportunity for student and faculty involvement through a sculptural/mosaic feature inset into the pathway leaving a permanent statement left by the

students expressing goodwill and school pride. This could become a class project through an art class or building materials course that is currently part of the curriculum. We are in the process of creating the connections necessary within Garfield High School's community to encourage student involvement in the installation of this pathway.

***Note: There is currently a natural drainage system present within the lawn area that is carrying runoff water to an existing drain in the Northern most part of the lawn. If the pathway were to be installed, it would be difficult to predict the alteration to that flow of water. Therefore, in order to anticipate future problems, we propose a French Drain system as a possible addition to the construction of a pathway, extending to the existing catch basin and reducing the risk of possible drainage problems.

Site Preparation

Abstract

Site preparation involves several steps to complete, and will require the most labor hours of any aspect of the project. Removing unwanted plants such as English ivy (*Hedera helix*), and damaged and unsalvageable plants is the first step. Several large plants can be saved and left in place or transplanted. A significant amount of grass will be removed with the creation of new beds along the west side of the school building and near the bus stop on 23rd Ave. East. Sod is to be removed during the installation of a proposed pathway from the main west entrance of the school to the crosswalk on 23rd Ave. E. This sod can be used to help smooth out the grade in the large bed near the bus stop. A small backhoe or similar equipment is necessary for ivy removal and path preparation. Three to five inches of mulch will be applied to all of the beds, and to mulch circles surrounding the trees at the site. During the entire process, steps will be taken to minimize damage to existing plants and limit any inconvenience to school users.

Site preparation at Garfield High School for this project will be somewhat labor intensive. The site plan calls for the removal of ivy and turf grass in several areas to make way for new plantings. Additionally, if the proposed new path is accepted, turf will also be removed from an area between the crosswalk on 23rd Avenue East and the southern entrance on the west façade of the building.

English ivy is growing in the planting area near the street surrounding the bus stop. Plant growth is particularly dense in the northern portion of this bed. The area of ivy growth constitutes about 200 square feet. The ivy should be removed using heavy equipment such as a small backhoe. Careful consideration should to be taken to ensure that all of the ivy is removed. Small fragments of vine or root can easily re-establish and regain control. Additional native soil may need to be added to this bed once the biomass of the ivy roots is removed to attain the desired bed height and slope. This soil may be made available from the excavation of a pathway elsewhere on the site. If the path is not desired, topsoil obtained from an external source will be needed to finish grading this part of the site.

Where turf is to be removed, the borders of the bed will be marked, and then cut with a spade to guide turf removal. Special care needs to be taken not to damage roots of other plants that extend into this area. The site preparation team has several options for removing the sod. The turf may be dug up using flat garden spades. The spade is used to cut under the sod and separate the roots' mass from the soil below. Mechanical means may be advisable for larger areas. In the area of the proposed path, we recommend using a small backhoe, sod cutter, or other heavy equipment.

There are several shrubs in poor health at the site. Many of these are located along the western façade of the school building and should be removed. These include one *Ligustrum* and several rhododendrons. These plants are beyond recovery, and leaving them in would lead to further problems down the road. The other three *Ligustrum* shrubs are salvageable (see: Existing Plant Material) and may be moved and reused on the site.

The plants to be removed should be carefully dug out using spades. The soil at the base of the plants should be removed so that the roots are exposed; roots should then be pruned. The remaining trunk and the root ball can then be removed. Round Up may be applied to large roots that remain in the ground in order to prevent the shrubs from re-sprouting.

Some of the recently installed trees at the site are in poor health. We recommend that the *Liquidambar styraciflua* (American sweet gum) be removed and replaced with a healthy specimen, as its trunk is damaged beyond repair and cannot be salvaged (see: Existing Plant Material). The tree's crown should be removed first, followed by removal of the roots with of a shovel by cutting into the soil in a circle around the tree. The root ball and the remaining trunk of the tree will then be pulled out. A replacement tree will be installed later in this location. We will remove turf around the base of the other two existing trees in the lawn, creating protective mulch circles around the trunks. Plastic edging will then be used to define the edge of protective tree skirts around these trees at surface grade.

Weeds and other unwanted materials should be removed from the beds before plant installation begins. It may be desirable in the bed adjacent to the road to break up the hardpan 8 inches below to promote drainage, aeration, and plant rooting. A top dressing of about 3" of organic mulch will be added to the beds to help retain soil moisture and suppress weeds. This mulch will be raked away from portions of the bed where plants are to be installed, and then reapplied after installation occurs.

During all stages of site preparation, steps will be taken to protect the plants that are to remain on site. This includes tying up crown growth where necessary to prevent equipment damage to plants. It may be difficult to ensure that roots in some areas remain safe. Roots of the street trees and the trees in the lawn seem vulnerable and may suffer as we endeavor to improve the site. We will delineate potentially sensitive areas to help ensure that any potential damage is minimized.

Installation

Abstract

Four vine maples (*Acer circinatum)* are to be placed in the newly shaped bed along side of the building in front of the blank walls in between the windows, along with heath (*Erica carnea* 'Springwood'), California lilac (*Ceanothus* sp.) and wooly thyme (*Thymus pseudolanuginosus*) to create five nearly identical sections. A new concrete path is to be created connecting 23rd Avenue East to the southern entrance to the building on our site. This path will curve gently around the planting bed behind the bus stop. Underneath this path a French drain will run from the southern side of the path down to the drain at the north side of the site. This is approximately 95'. The ivy (*Hedera helix)* to the north of the bus stop will be ripped out and replaced with heath (*Erica carnea* 'Springwood White'*)*. On either side of the bus stop informal stepping-stones are to be placed to keep the social paths intact. Directly behind the stop, a vine maple (*Acer circinatum*) will be added to soften the back of the shelter. To the north, the existing *Prunus* is to be pruned and more heath added to the east. The declining sweetgum (*Liquidambar styraciflua*) will be replaced with a healthier specimen.

Plantings

Materials:
*5 vine maples (*Acer circinatum*)
*24 heaths (*Erica carnea* 'Springwood')
*80-100 wooly thyme (*Thymus pseudolanuginosus*) in 4" pots
*18 California lilac (*Ceanothus* sp.)
*36-48 Salal (*Gaultheria shallon*)
*18-24 barren strawberry (*Waldsteinia fragrarioides*)
*1 *Liquidambar styraciflua*
*Approximately 25 yards mulch
*120 ft. of soaker hose
*Staking kit

Apparatus:
*shovels
*pick axes
*rakes
*wheelbarrows

Procedure:

The vine maples, which will be planted along the building, should be at least 3' away from the wall. Each hole should be dug at least two times the size of the root ball and no deeper than current container. Remove the planting media from the roots as much as possible before placing the plant in the hole. When inserting the plants be sure not to kink the roots, but rather allow them to spread into natural directions. A mound can be added to the bottom of the hole using native soil in order to help lay the roots. When the plant is in the position desired, backfill the hole with the native soil that was removed.

Along the front edge of the bed, two rows of 50 wooly thyme should be planted, staggered so that any plant is 18" away from any adjacent plant creating equilateral triangles.

Behind the bus stop one more vine maple should be situated directly behind the shelter. On either side of the planting bed, heath should be planted, naturally staggered approximately 8" apart at least. All of the plantings use the same process as described above for the vine maple.

The *Liquidambar* in the front grass area by 23rd needs to be removed and replaced. An experienced professional should do removal of the original tree. Planting of the new tree should follow the above procedures used to plant the vine maple. All trees in the area should be mulched with 6' square skirts to avoid further damage to the trees by lawnmowers. After planting, use the staking kit to hold the tree upright, but only leave on for one year.

After plantings are completed, a layer of mulch 4-6" deep should be laid on top of the beds keeping the material away from the woody stems of the maples.

The planting bed along the building should have soaker hoses laid and buried the length of the bed.

French Drain

Materials:
*8 cu. ft. crushed gravel
*95 ft. corrugated polyethylene perforated pipe 4" in diameter
*Grass seed

Apparatus:
*pick axe
*shovel
*wheelbarrows

Procedure:

A trench, starting from roughly the edge of the west planting bed aligning with the southernmost end of the bus stop shelter, should be dug 95' long, 14" deep and 6" wide. Crushed gravel should then line the ditch in a depth of 2". Lay the corrugated polyethylene perforated pipe down the length on top of the gravel. If necessary, connect the ends of multiple pipes to achieve the length. Backfill the trench with excavated soil and sow with grass seed save for the area in which the path will go.

Concrete Path

Materials:
*Approximately 120 cu. ft. cement mix
*Water
*Approximately 120 cu. ft. crushed gravel

Apparatus:
*Shovels
*Pick axes
*Cement mixer
*Compactor
*Stiff bristle broom
*150 ft. stiff plastic for edging and stakes
*Concrete divider
*Concrete smoother
*Wheelbarrows

Procedure:

Excavate the curving path 8" deep and 7' across. Adjustments will need to be made when digging around the newly installed French drain. Using the compactor, compact the area 5' across. Line the desired path with the stiff plastic edgers. Lay crushed gravel along the base of the bed 4" deep. Next, mix the concrete according to directions in the cement mixer. Lay the concrete within the lined area being sure the area is smooth. When concrete is dry enough to hold form, use the stiff bristle broom to create texture and divide into sections of 2.5' long.

Stepping-stones

Materials:
*11 granite stepping-stones, 1-2' in diameter, 2" deep
*35 cu. ft. sand

Apparatus:
*Shovels
*Wheelbarrows

Procedure:

Excavate eleven round holes 3" deep. Line the holes with sand 1" deep and secure the granite stepping-stones within. The stones should be placed in natural positions.

Plant Selection

Abstract

Plant selection attempts to use the existing plants as well as incorporating new plantings to create the most aesthetically pleasing plan while acknowledging the current soil and lighting conditions of the site. The public bus stop conditions include shaded beds and poorly draining soil. The bed along the west-facing wall receives shade in the mornings but intense afternoon sun in the summers and shaded conditions throughout the winter and contains a fairly well drained soil. The plants chosen for the bus stop bed include *Acer circinatum* (vine maple) and *Erica carnea* (heather). The plants chosen for the bed along the school wall include *Acer circinatum, Ceanothus* sp. and *Thymus pseudolanuginosus* (woolly thyme). Finally, we shall be replacing an existing but badly damaged *Liquidambar styraciflua* (American sweet gum) with a healthier specimen of the same species.

Plant selection attempts to use the existing plants as well as incorporating new plantings to create the most aesthetically pleasing plan while acknowledging the soil conditions of the site.

The plants we chose for the Garfield High School site are:

Ceanothus sp. (California lilac)
Acer circinatum (vine maple)
Waldsteinia fragrarioides (barren strawberry)
Thymus pseudolanuginosus (woolly thyme)
Erica carnea 'Springwood White' (heather)
Liquidambar styraciflua (American sweet gum)

Some of these plants are already on site, reducing the cost and difficulty of obtaining them. The others, we feel, connect the site with existing renovated landscapes, allowing the proposed plantings to blend in more easily with the existing landscape.

To reduce the foot traffic in the under story surrounding the bus stop, we will be removing the *Hedera helix* (English ivy) (See: Site Preparation) and replacing it with *Erica carnea* 'Springwood White' (heather). This heather spreads to eight inches, with light green leaves and creamy white buds from January through April. This is one of the toughest, fastest growing heathers, making it a great plant for a low-maintenance landscape.

The existing bus stop has harsh lines that detract from the landscape. To combat this problem, an *Acer circinatum* (vine maple) will be placed on the side facing the school to soften the structure. This small tree is versatile in that it can withstand being shaded out in the spring and summer by the already present street trees, while also being adaptable to the full sun it may receive to in early fall. It is also tolerant of "wet feet," meaning it performs well in poorly drained soils. *A. circinatum* can grow to approximately twenty-five feet with multiple stems but tends to develop a shrubby growing habit in open situations. The branches are usually green to

reddish with fan-like, finely toothed leaves, and palmate lobes. In fall, the leaves turn gold or bright red before falling.

The second bed we shall be renovating runs along the westward wall of the school building. For this bed we intend to incorporate *Acer circinatum* (vine maple) and *Thymus pseudolanuginosus* (woolly thyme). There are three rhododendrons currently in the strip that are of extremely poor health and have been elected for removal (See: Existing Plant Material). The contour of the bed will change slightly to give a gentle curving appearance to the bed and will include five clusters of plants to coincide with the columns of the wall between each window grouping (See: Site Plan Description). To distinguish the clusters as they grow, five *A. circinatum* trees (vine maples) will be placed in front of the columns. This will retain the creative integrity as the clusters meld to create a hedge.

There are three ill-trimmed but potentially salvageable *L. obtusifolium* on the site (See: Existing Plant Material) that we recommend be dug up and interspersed with *Ceanothus* sp. in the five arches. The *L. obtusifolium* is widely used in hedges and should recover from some of its past improper pruning. It has abundant, showy clusters of white to creamy white flowers in the late spring or early summer that develop into small bluish-black berry-like fruits. The *L. obtusifolium* alternating with the *Ceanothus* sp. and its slightly later flowering will leave the side of the school in almost continuous bloom from late spring through early summer and create an informal hedge.

To try and reduce the amount of weeds in the mulched area *Thymus pseudolanuginosus* (woolly thyme) will be planted as a ground cover in conjuncture with the mulch. It flowers in the summer and thrives in sunny locations. The thyme will be installed in two rows along the front of the bed so it can creep underneath the other plants, forming a 1" tall mat that will spread to 18". It has soft tiny leaves with pink flowers that compliment the other somewhat Mediterranean-type plants in the bed.

There is also currently a recently planted *Liquidambar styraciflua* (American sweet gum) near the street within the lawn portion of our site. This tree has suffered severe damage to its trunk from lawnmower activity, and this has added to the decline of the tree. We recommend replacing that tree with another *L. styraciflua* and installing a protective tree skirt (See: Site Installation). This will add to the renovated and rejuvenated appearance of the site.

Aftercare And Maintenance

Abstract

The plants and landscape beds proposed for Garfield High School require minimal maintenance. All the plants require similar watering and care patterns. Pruning should be avoided and is unnecessary the first year for the *Acer circinatum* and for most of the other plants. After the first year, pruning should be limited to dead, diseased, hazard, or crossing branches, and should be done in an appropriate manner. Mulch for the beds and the lawn tree should be kept at a depth of 3"-5," and kept at a distance of 1" from the trunk or stem of any plant. Eventually, the *Erica carnea 'Springwood"* will over grow the bark mulch in one of the beds and act as a "living mulch." Watering is recommended twice a week for a couple of hours; however, depending upon climatic conditions, watering once a week is acceptable.

The First Year

New Plants

Lawn Tree: *Liquidambar styraciflua* (American sweet gum)

Watering:

Newly planted trees are subjected to additional stresses. Until a normal spreading root system develops, the tree will not be able to absorb the necessary amount of water. Therefore, proper watering is the most important aspect of aftercare. *Liquidambar styraciflua* has roots that are not very fibrous and the tree will take some time to establish a good root system. From the time the tree is planted through the first dry season the tree requires an average of 1 gallon of water per inch of trunk caliper per day. On this site, watering twice a week is recommended, but once a week during the dry season is sufficient to meet these requirements. The length of dry season will vary from year to year but often continues well into October. Usually spring and late fall are rainy and watering can be reduced accordingly. Watering in the morning is best. If water is applied at midday when temperatures and transpiration rates are higher, more water is used and wasted. Apply water slowly near the base of the tree to prevent run off. The tree will need constant moisture but do not over water.

Mulch:

Keep the root ball and planting hole covered with 3-5 inches of organic mulch. The mulch will retain moisture, inhibit weed growth and protect the tree from mechanical injury. Make sure that mulch does not touch the trunk of the tree; this could create health problems for the plant.

Pruning:

Newly transplanted trees should not be pruned its first year. During the first year the tree puts the majority of its energy into root growth. Pruning will stimulate shoot growth, taking resources away from the roots. However, it is still a good idea to remove any dead, broken or diseased branches as soon as possible. If *L. styraciflua* requires pruning, it should be done in the winter.

Staking:

Monitor the tree to make sure the tie material is not damaging the bark. Remove the ties and stakes at the end of the first growing season. If the tree needs protection from potential structural damage the stakes can be left in place for a longer period but the ties must be removed at this time.

Planting Beds

Mulch:

The site planting team will spread a layer of organic mulch 3"-5" to cover the surface of this planting bed. The mulch will retain moisture, inhibit weed growth, improve the site's appearance, decrease compaction and protect the plant from mechanical injury. The mulch should not touch the trunk or stems of any of the plants and be shallower (2"-3") around the base of the lower-growing plants. Eventually, the *Thymus pseudolanuginosus* will grow larger, spreading across the front of the bed, acting as living mulch.

Watering and Pruning Requirements for:

***Acer circinatum* (vine maple)**

Watering:

Follow first year watering guidelines for *L. styraciflua*. Keep water off foliage.

Pruning:

Follow first year pruning guidelines for *L. styraciflua*. In the future, *A. circinatum* should be pruned in the winter.

Erica carnea 'Springwood" **(heather)**

Watering:

The first year is also the critical time for root establishment in shrubs and groundcover. The plants should be watered twice a week during the dry months, but once a week is acceptable. To conserve water, water in the morning. Apply water slowly, avoiding watering the foliage. Adjust watering practices for drainage and weather conditions.

Thymus pseudolanuginosus **(wooly thyme)**

Watering:

Follow first year watering guidelines for *E. carnea* 'Springwood*'*.

Pruning:

Thymus pseudolanuginosus will require no pruning.

<u>The Second And Third Year</u>

Please also refer to the section titled Ongoing Maintenance For All Plants

Liquidambar styraciflua

Watering:

If possible continue to water the tree according to the first year guidelines during the second dry season. In the third dry season and beyond the roots should be established and the tree will be able to utilize soil moisture and nutrients from a large soil volume.

Fertilizer:

In the third growing season when the roots are established apply nitrogen fertilizer to help maximize growth.

Pruning:

In the third year a few of the lower limbs may be removed. Remove any crossing branches. A few excessive branches can be removed to reduce competition for light and nutrients. Avoid pruning several branches that are close together. Remove suckers. Please see Pruning guidelines in Ongoing Maintenance.

Acer circinatum

Watering:

See second year watering guidelines for *L. styraciflua.*

Fertilizer:

Follow second and third year fertilizing guidelines for *L. styraciflua*.

Pruning:

A. circinatum, being a multi- stemmed shrub should not need much pruning except for removing dead, diseased or crossing branches. It may be necessary to do a little thinning of the branches to maintain the desired shape. Please see Pruning guidelines in Ongoing Maintenance.

***Erica carnea* 'Springwood'**

Watering:

For the second dry season try to maintain the watering schedule described in the first year guidelines. If this is not possible, watering once per week is acceptable. In the third year and beyond the plants should have developed enough of a root system to survive with less summer water.

Pruning:

Prune after flowering in April. Cut back wood that has flowered but do not cut into leafless wood.

Thymus spp.

Watering:

Follow guidelines for *E. carnea* 'Springwood'.

<u>Beyond The Third Year</u>

Please also refer to the section titled Ongoing Maintenance for All Plants

Liquidambar styraciflua

Pruning:

Prune the lower limbs out of the way of people who will pass by. The lowest limbs are now the permanent limbs. Cut off a few branches to create even spacing.

Acer circinatum

Pruning:

Lightly prune to maintain shape.

<u>Ongoing Maintenance For All Plants</u>

<u>Established Trees and Shrubs and New Plants</u>

Watering:

The new plants were chosen in part for their ability to with stand the dry summers in Seattle once they become established. However, new and existing plants should be assessed for drought stress during unusually long dry periods. Wilted leaves or slower than expected growth are signs of drought stress. New and existing plants will need extra water under certain circumstances that would stress the plants. Construction would be an example.

Mulch:

Mulch will decompose over time and should be reapplied as needed to maintain a 3-inch layer. This is usually done in the spring. Keep mulch 1 inch away from stems and trunks of plants.

Weeding:

Weeds compete with desirable plants for water and nutrients. Remove weeds as soon as they appear. If weeds are removed before they go to seed there will be fewer weeds to deal with in the future.

Pruning guidelines:

- Someone with knowledge of proper pruning techniques should prune.
- When making any cuts use sharp tools.
- Use the correct size tool.
- Always remove broken, dead, or diseased branches immediately.
- Remove suckers immediately.
- Locate the branch collar and make a cut that is close to the branch collar. Do not cut into the branch collar but do not leave a long stub. The tree (shrub) forms a protective barrier inside the branch collar, which defends the tree after an injury. Destroying the branch collar will leave the tissues of the tree (shrub) open to invasion and infection. Leaving a stub can be harmful because stubs attract insects and disease that could enter at the base of the branch.
- Before pruning a large branch at the collar, shorten the branch to about 6 inches. This will prevent a tear.
- Be cautious pruning young trees. They have large branch collars.
- Do not remove a main leader. This is harmful for many reasons. It destroys the form of the tree. It creates a hazard tree because the new branches will have weak attachments. It removes too many leaves resulting in decreased photosynthesis and shortens the life span of the tree.
- Do not remove more than 15% of the foliage at one time and do not remove more than 30% of the foliage in one season.
- Prune broadleaf evergreens (*Prunus lusitanica, P. laurocerasus*) in the spring just before new growth starts.
- Leave pruning cuts open to the air. Do not seal cuts.

Winter Preparation:

If any berms have been constructed around root balls to retain water, they should be leveled before the winter. The berm will retain too much water in the winter, which could lead to root problems. Make sure that mulch is not in contact with any plant. Mulch should be 1 inch away from the stem or trunk of each plant. Remove leaves from deciduous trees that have fallen on the *E. carnea* 'Springwood'.

Record Keeping:

Record keeping will document plant health, site appearance, the work that has been done, treatments applied, results of treatments applied and recommendations for future action. Each entry should be signed and dated. The site should be assessed for overall appearance including presence of weeds and thickness of mulch. Make sure that overall spacing of plants is good and that no plant is becoming a safety hazard. Each plant should be assessed for growth, vigor, pests, and disease, broken or damaged parts, water needs and pruning needs. Record work that has been done including application of pesticides and herbicides. Return to the site and evaluate the success or failure of treatments. Make recommendations for future work.

References

EXISTING PLANTS:

Burns, R. and Honkala, B., Eds. 1990. *Silvics of North America, Vol. 2 – Hardwoods, Agricultural Handbook 654.* Forest Service, Unites States Department of Agriculture, Washington, D.C.

Dirr, M. 1998. *Manual of Woody Landscape Plants*. Stipes Publishing, Champaign, Illinois.

Dirr, M. 1997. *Hardy Trees and Shrubs: An Illustrated Encyclopedia.* Timber Press, Portland, Oregon.

Harris, R. W. & Clark, J. R. & Matheny, N. P. 1999 *Arboriculture: Integrated Management of Landscape Trees, Shrubs, And Vines. 3rd Ed.* Prentice Hall, Upper Saddle River, New Jersey.

Hay, R and Synge, P. 1969. *The Color Dictionary of Flowers and Plants for Home and Garden*. Crown Publishers Inc., New York.

Leigh, M. 1997. *Grow Your Own Native Landscape.* Washington State University Cooperative Extension, Pullman, Washington.

Ortho Books. 1985. *All About Azaleas, Camellias & Rhododendrons*. Chevron Chemical Company.

SITE ANALYSIS/METHODS:

Teplitski, M. and McMahon, P., 1999. *Soil Texture, Soluble Salts, and pH of Soil*. http://www.hcs.ohio-state.edu/hcs/TMI/hcs200/soil.html

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INSTALLATION:

White, F., 1998. *How to Create a French Drain.* Retrieved December 5, 2000, from the World Wide Web: http://www.repair-home.com//how_to/create_a_french_drain.htm

Milburn: New Zealand Limited. *Concrete at Home: Paths, Patios and Drives.* Retrieved December 5, 2000, from the World Wide Web: http://www.milburn.co.nz/homemake/tips/paths.htm

PLANT SELECTION:
"Taylor's Guide to Water-Saving Gardening." New York, NY: Chanticleer Press, 1990.

Brenzel, K.N., editor. "*Sunset Western Garden Book*." Menlo Park, CA: Sunset Publishing Co, 2000.

MAINTENANCE AND AFTERCARE:
Cook, A. (1993). "Pruning shrubs: two basic cuts control shape and growth." *Fine Gardening*, March/April, 50-53.

National Arbor Day Foundation. "Tale of two trees." *Tree City USA Bulletin No.1.*

Peltier, P. & Watson, G. (2000). "How to transplant a tree." *Grounds Maintenance*, August, 28-32.

Shigo, A. (1989). "Pruning trees: make the kindest cut." *Fine Gardening*, November/December, 18-23.

Watson, G. (1996/1997). "Tree transplanting and establishment." *Arnoldia*, Winter, 11-16.

Appendix A: Maintenance Issues of Existing Plants

SPECIES	LEAF	FLOWER	FRUIT/ CONE	HABIT	LANDSCAPE USES	PROBLEMS/ MAINTENANCE
Acer saccharum	Opposite, simple and deciduous, 5 lobed and about 5 inches long and wide	White, early in spring and borne on panicles	Samaroid schizocarp	Tree up to 60 feet	Street or landscape tree provides summer shade and autumn color.	Low maintenance, grows well in all but the driest and wettest of soils. Many known pests and pathogens but none pose serious problems.
Ligustrum obtusifolium (border privet)	Opposite, simple, elliptic to oblong, 1 – 2" long, , medium – dark green in summer turning russet to purple in the fall	White, early to mid June, borne in panicles that are ¾ -1 ½" long, panicles numerous on short axillary branches, unpleasant odor	Black to blue-black, slightly bloomy berry-like drupe, ¼" long, ripens in September and persists	10 - 12', multi-stemmed , semi - evergreen shrub, twiggy with wide spreading branches, broadest on top	Screen, background or hedge	Takes any soil except extremely wet and does well in dry soil, full sun to ½ shade, tolerant of pollution, prune after flowering; pest and disease problems could include anthracnose, leaf spot, powdery mildew, root rot, privet aphid, mites, whitefly, mealy bugs, nematodes
Liquidambar styraciflua (American sweet gum)	Alternate and maple like with 5 or 7 lobes and up to 7 inches across.	Inconspicuous, usually lost in the foliage	Spiny about 1.5 inch diameter	Tree up to 75 feet	Street or landscape tree. Provides summer shade and autumn color	Not appropriate for street tree use due to it's shallow roots which can buckle sidewalks. Have few disease or pest problems.
Mahonia nervosa (low Oregon grape)	Alternate, pinnately compound with 11-23 prickly holly – like leaflets	Yellow, borne in 8" long racemes, appear March to June	Blue-purple berries July – September	2', evergreen shrub with multiple erect unbranched stems, spreads by suckers	Ground cover, native to Western Washington	Takes dry to moist well drained soil, will grow in sun or shade but prefers moister shady sites, requires no pruning or special care; pest and disease problems could include leaf spot, leaf scorch, barberry aphid
Prunus lusitanica (Portuguese laurel)	Alternate, simple about 5 inches long and 2 inches wide	Small, white and fragrant on 6-10 inch long racemes	Pome, dark purple to black about 8 mm long	Evergreen bush can grow to 20 feet tall and 20 feet wide	Tall hedge plant	Grows well in slightly acidic soils, had many known pests and pathogens but is a hardy plant here.
Prunus laurocerasus 'Otto Luyken' (cherry laurel cultivar)	Alternate, simple and leathery to 7 inches long by 2 inches wide	Tiny and fragrant, blooms in mid-spring	Pome, inconspicuous	Evergreen shrub to 3-5 feet tall and 5 feet wide	border plant, usually stays small without pruning	Grows well in slightly acidic soil and it hardy in our region.

SPECIES	LEAF	FLOWER	FRUIT/ CONE	HABIT	LANDSCAPE USES	PROBLEMS/ MAINTENANCE
Rhododendron sp. (rhododendron)	Alternate, simple, appear whorled in groups of five, 2-6'' long, medium green, leathery	Varies depending on species, many species flower in spring, flowers often borne in trusses 5-6''' in diameter	Capsule	Broadleaf evergreen shrub, size varies depending on species	Foundation plantings, shrub border, groupings and massing	Most require well aerated highly organic soil that is cool and moist, soil pH of 4.5-6.0, cool humid atmosphere and shelter from wind and excessive sun (filtered light is the best); pest and disease problems could include weevils, lace bugs, scale, whitefly, dieback, root rot, chlorosis, winter cold damage
Rosmarinus officinalis (rosemary)	Needle-like, gray-green, aromatic odor when bruised	Pale to dark blue borne in leaf axils from fall to spring	Nutlet	2-4', irregular, evergreen shrub	Low hedge, border herb gardens, drought tolerant	Low maintenance, does not tolerate permanently wet soils, needs full sun, withstands pruning; no significant pest or disease problems
Prunus sp. (cherry tree)	Alternate, simple. This species' leaves are small, about 4 inches, and toothed	White or pink, flowers early and conspicuously	Pome	Small tree	Street and landscape tree generally grown for its flowers	Flowering cherries have many known pests and pathogens. Problems can include root rot, and infestations of caterpillars. Diseases can also affect specific cultivars. The identity of cultivars. at GHS were unknown (this must wait until they are in flower and have leaves).

Appendix B: Soil Analysis Methods

Soil Analysis Methods

Soil Texture

In order to measure soil texture, 40 grams of crushed, oven-dried soil was mixed with distilled water and 100 ml of a 5% sodium hexametaphosphate solution. This mixture was agitated overnight in a shaker, transferred to a graduated cylinder and increased in volume up to 1000 ml. The solution was mixed with a plunger, and a Buoyoucos hydrometer was inserted into the cylinder. Hydrometer and temperature readings were taken at 40 seconds and 1 hour and 45 minutes. The hydrometer readings were adjusted up 0.36 hydrometer units for every degree above 20 C degrees and down by 0.36 units for every degree below 20 C. The percents of sand, silt and clay were determined, using the following equations, and plotted on the soil texture triangle to determine the texture class of each sample.

% Sand = [1-(40 sec./soil weight)]*100
% Clay = (1 hr.45 min/soil weight)*100
% Silt = 100 - % Sand - % Clay

(Teplitski and McMahon, 1999).

% Organic Matter

Two soil cores were collected from each site to a depth of 8 inches. 40 grams of oven-dried soil was weighed out into ceramic crucibles. The samples were placed in a muffle furnace and cooked at 500 C for 4.5 hours. The difference between the pre- and post- incineration weights represents the carbon loss on ignition.

Bulk Density

8 inches of soil was removed with a soil auger. The volume of the soil removed was determined by measuring the volume of water filling the resulting hole. The soil was oven dried at 105 C for 25 hours, then weighed.

Appendix C: Desired Plants

Species Name	Common Name	Quantity	Size
***Ceonothus* 'Puget Blue'**	California lilac	18	1 or 2 gal.
If needed, please substitute other *Ceonothus* cultivars that are under 5' in height, or subsitute *Osmanthus delavayi* in similar size for part of the order			
Acer circinatum	vine maple	5	B&B or container
Liquidambar styraciflua	American sweet gum	1	B&B or container
***Erica carnea* 'Springwood White'**	Springwood white heath	24	4" or gallon
If needed, please substitute other purple or white *Erica* cultivars for all or part of the order			
Waldsteinia fragrarioides	barren strawberry	18-24	1 flat of 4" containers
If needed, please substitute *Fragraria chiloensis* or *F. virginiana* for all or part of the order			
Thymus pseudolanuginosis	woolly thyme	80 to 100	~5 flats of 4" containers
Gaultheria shallon	salal	36-48	2 flats of 4" containers
If needed, please substitute *Mahonia nervosa* for part of the order			

Appendix D: Proposed Design Scheme

**Note that this is a preliminary design, subject to change.