Preparing Landscape Management Plans for Seattle Green Factor Compliance

Seattle Department of Planning and Development

OVERVIEW

Landscaping requirements in Seattle are changing to incorporate the Seattle Green Factor, www.seattle.gov/dpd/greenfactor, a new program designed to create more and better landscaped areas. In most cases, the Green Factor increases the amount of landscaping required for new projects, but it also increases flexibility to meet that requirement. To improve the urban landscape and decrease the ecological impacts of development, the Green Factor encourages the use of layered vegetation, tree preservation, green roofs and vegetated walls. Bonuses are provided for rainwater harvesting, plantings visible to the public, and plants with low water requirements.

The Green Factor requires a Landscape Management Plan (LMP) to ensure that landscapes are successfully established and continue to function well over time. The LMP is distinct from more typical Grounds Maintenance Plans which may stress the "look" of the landscape; the Landscape Management Plan is intended to address safety and the successful implementation of environmental goals. Given that Green Factor landscapes may include elements that are unfamiliar to many property owners and/or maintenance crews, it is important for the designer to leave the owner with a clear sense of how to take care of their investment.

While not a requirement, there is an opportunity in preparation of an LMP to employ a more natural approach to management of the landscape, such as Integrated Pest Management. Sustainable landscaping practices are highly consistent with the Green Factor principles.

Landscape Management Plans should include the following elements when applicable:

A. Landscape Management Approach – An overview of priorities and special considerations for the landscape. This section may vary widely from one project to the next; a design may place an emphasis on security, for example, or address how the site minimizes impacts on a nearby creek.

B. Landscape Management Schedule – A detailed schedule of regular upkeep tasks.

C. Landscape Management Areas – A summary of important issues for the landscape, organized by type of landscape element.

D. Integrated Pest Management - Approved methods for preventing or controlling unacceptable levels of weed, pest, or disease damage.

E. Irrigation - Annual and monthly inspections, scheduling and maintenance.

F. Special Landscape Areas - street trees, green roofs, swales, pervious paving, etc.

ACKNOWLEDGEMENTS

The following Landscape Management Plan provides an example LMP for a hypothetical site. It was prepared by Karen Kiest Landscape Architects (KK|LA) and Seattle Department of Planning and Development, with input from several sources including:

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Teufel Landscape - www.teufel.com

High Point Community Landscape Maintenance Guidelines by SvR Design Company - www.svrdesign.com

The Highridge Corporation - www.highridge.com/

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Example Landscape Maintenance Plan

This Landscape Management Plan is a generalized example, intended to be edited and improved by the designer to meet the particular needs of each project.

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A. LANDSCAPE MANAGEMENT APPROACH

Example:
In addition to meeting the Seattle Green Factor criteria, the landscape plan for this mixed-use (restaurant/retail/residential) development is designed to:

- Provide an enjoyable outdoor environment for patrons and an aesthetic amenity for residents and passers-by. Lush at-grade plantings, raised planters, and a green roof terrace compliment the building with a variety of attractive public and private outdoor areas.

- Ensure public safety for residents, commercial tenants, and customers. Sight lines are maintained on all sides of the site, with low (2 to 3 foot) shrubs and open, limbed-up trees.

- Protect the health of residents, workers, and customers, as well as the environment, by minimizing use of pesticides (herbicides, insecticides, fungicides, and rodenticides). Plant selection emphasizes native plants and hardy ornamental cultivars to prevent pests and the use of harmful chemicals, especially where they may contact people or wash off in surface water. Pest, weed, and disease problems that arise are managed through "Integrated Pest Management" (IPM) methods described below.

B. LANDSCAPE MANAGEMENT SCHEDULE

See Sections C through F for definitions and specific practices required by this landscape management plan.

January:

- Prune any tree branches that interfere with public safety or sight lines. Prune all street trees yearly to encourage strong upward growth. Do not top trees.

- Mulch mow all turf areas once per month. (Use mulching mower that chops clippings finely and blows mulch down into turf to decompose and feed soil.)

February:

- If specified in contract, apply granular fertilizer around trees or shrubs in late February. Make application prior to a moderate rainfall so the rain will wash the fertilizer in. Do not fertilize swale plantings. (See "Fertilization" section for recommended products.)

- Mulch mow all turf areas once per month.

- Add new mulch to planters where the mulch depth has been reduced to less than 2 inches (5 cm) thick. Mulch not required where shrubs or groundcover completely hide the soil surface from view.

March:

- Mulch mow all turf areas twice per month.
- Flush out irrigation systems as needed, run and check for proper operation of each valve zone. Test sensors (rain, soil, or weather sensors).
- Remove and clean WYE filter screens.
- Clean or replace plugged sprinkler nozzles. Replace plugged drip emitters.
- Replace irrigation controller program back-up batteries.

April:

- Mulch mow all turf areas weekly.
- Fertilize all landscape areas except for swale. The fertilization of shrubs/groundcover areas may be eliminated when the plants reach maturity or completely fill the planters, without space between them. Written authorization from the owner's representative is required before the fertilization may be eliminated from the required work.
- Add new mulch to planters where the mulch depth has been reduced to less than 2 inches (5 cm) thick. Mulch not required where shrubs or groundcover completely hide the soil surface from view.

May:

- Mulch mow all turf areas weekly.
- Submit receipts to owner's authorized representative as proof of fertilizer purchase.
- Turn on irrigation system, run and visually inspect for proper zone coverage. Set ET-based, weather or soil sensor-based, or seasonal programs to adjust irrigation up in July-August, and down for May-June and September.

June:

- Mulch mow all turf areas weekly.
- Prune spring & winter-flowering shrubs as needed to maintain proper shape (natural, touching, not hedged or topiary except where specified by owner).
- Add new mulch to planters where the mulch depth has been reduced to less than 2 inches (5 cm) thick. Mulch not required where shrubs or groundcover completely hide the soil surface from view.
- Prune perennial bulbs back to ground level as soon as leaf blades yellow and wilt (June-Oct. depending on bulb type).

July:

- Mulch mow all turf areas weekly.
- Prune vines as needed to keep out of window recesses or if vines are extending above the first story (12 feet above street level).
- Water green roof as needed for the first two years after installation (until plants are fully established).

August:

- Mulch mow all turf areas weekly.
- Add new mulch to planters where the mulch depth has been reduced to less than 2 inches (5 cm) thick. Mulch not required where shrubs or groundcover completely hide the soil surface from view.
- Water green roof as needed for the first two years after installation (until plants are fully established).

September:

- Mulch mow all turf areas weekly.
- Prune vines as needed to keep out of window recesses or if vines are extending above the first story (12').
- Fertilize all landscape areas except for swale in September or early October. The fertilization of shrubs/groundcover areas may be eliminated when the plants reach maturity or completely fill the planters, without space between them. Written authorization from the owner's representative is required before the fertilization may be eliminated from the required work.
- Inventory all plant materials. Inventory shall include an exact count of all shrubs and trees, itemized by planter. Replace any dead or missing plants subject to the terms of these specifications.
- Prune perennial bulbs back to ground level as soon as leaf blades yellow and wilt (from June through October, depending on bulb type). Maintain 2 inches of mulch on ground surface over bulbs to insulate from cold and prevent winter weed growth.

October:

- Mulch mow all turf areas twice per month.
- Have backflow preventer (on irrigation water supply) tested annually by approved plumbing technician.
- Turn off and prepare irrigation system for winter. Make sure backflow preventer is well-insulated or drained prior to first freeze. Blow out pipes using compressed air in areas where freezing could result in breakage. Drain drip irrigation lines as

recommended by manufacturer. Any winter damage to irrigation system due to insufficient winterization shall be the responsibility of the contractor to repair.

- Add new mulch to planters and swale where the mulch depth has been reduced to less than 2 inches (5 cm) thick. Mulch additions are not required where shrubs or groundcover completely hide the soil surface from view.

November:

- Mulch mow all turf areas twice per month.

December:

- Mulch mow all turf areas once per month.
- Prune any tree branches that interfere with public safety. Prune all parking lot and street trees yearly as needed to remove dead and crossing branches and to encourage spreading and upward growth that fits the available space. Do not top trees.
- Prune summer and fall-blooming shrubs as needed to maintain proper shape.

C. LANDSCAPE MANAGEMENT AREAS

C.1. Grounds maintenance – all outdoor areas

Clean-up:

- Remove biodegradable landscape debris to a yard waste recycling facility, including turf clippings (limited to only those times when mulch mowing is not possible), leaves, branches, annuals, dead plant material, potting soil, etc.. Acceptable facilities include composting facilities, topsoil producing facilities or other facilities which utilize yard waste for landscape purposes. No biodegradable material should be disposed of in garbage to land fill sites.
- All trash and sticks are to be picked up from lawn strips and bed areas prior to mowing.
- A weekly general clean-up program will be performed. The clean-up program shall include a policing of all maintained areas for the removal of trash (paper, cans, bottles etc.) and landscape waste such as fallen sticks and limbs.
- All trash and landscape debris shall be removed and disposed of off site.
- Mulch is to be maintained clear of building foundations and paved areas, and off utility covers.
- Debris shall not be carried into patios, entryways or doorways.

- Debris deposited by typical weather occurrences will be cleaned up.

- Sweep patios and sidewalks at least weekly.

Fall leaf removal – September through January

- On a weekly basis remove leaves from lawn areas to prevent heavy build-up and damage to turf by smothering. A single layer of leaves may be mulch-mowed into the turf. Thicker accumulations should be removed.

- Leaves may be raked or shredded by mower and blown into shrub beds for mulch as directed by Owner's Agent, or accumulated leaves will be raked and/or blown from lawn, plants, high maintenance bed areas and collected and removed from property and disposed of off site.

- Sweep leaves from patio at least weekly, to avoid clogging paver pores.

C.2. Pruning – Trees, Shrubs, Vines and Groundcovers

Trees

- Trees shall be maintained in a healthy, vigorous growing condition, free from disease and large concentrations of pests.

- Prune trees only to remove dead, diseased, broken, dangerous, or crossing branches, and as required below.

- Prune in accordance with generally accepted standards for proper pruning. Use of a certified arborist, particularly with significant trees, is recommended.

- Discard all tree trimmings off-site using a legal method.

- Any tree found to be dead or missing shall be replaced with plant material of identical species at the landscape maintenance contractor's expense, unless the loss was due to excluded damage. Replacement trees shall be approved for size and appearance by the owner's authorized representative prior to planting.

- Remove tree stakes from trees after two growing seasons. Check tree ties to adjust and loosen as needed after the first growing season. Remove stakes from site and dispose of by a legal method. Recycle used stakes if possible.

- Once a year, prune all trees to encourage a high-branching structure. Remove all non-structural branches between the ground and a point half the tree's total height (for tall trees don't remove branches higher than 20' [6 m] above the ground). Exception to the above: trees planted for screening purposes, such as

those at rear perimeters of many sites shall not be pruned except as needed to remove dead, diseased, broken, dangerous, or crossing branches.

- All sucker growth from trunk and base of trees shall be removed monthly or as required up to twelve feet (12') from the ground to maintain a clean appearance.
- The cutting blades on pruning shears, clippers, blades, saws, etc. shall be sterilized after pruning each tree to minimize the possibility of spreading disease. When pruning trees known or suspected to be diseased, cutting blades shall be sterilized (with 10% bleach solution or other approved) after each cut.
- A vertical clearance of 114 inches is required above all parking spaces. A vertical clearance of 80 inches is required above all walkways. Trim trees to remove all limbs within these areas.

Shrubs

- Shrubs shall be kept in a healthy, vigorous condition, free from disease and large concentrations of pests.
- Shrubs shall be pruned monthly only as needed to remove branches that are dead, broken, extending beyond the face of curbs or sidewalks, or are climbing building walls (not applicable to specified vines). Formal hedges and topiary shall be regularly pruned to maintain a uniform height and width. Except as noted previously, allow the shrubs to grow in their natural form to their mature sizes.
- Shrubs uniformly planted around the perimeter of tree pits shall be pruned so as to encourage a continuous planting where individual plants are not identifiable. Prune to encourage a dense, continuous planting, with natural shape and branches reaching fully to the ground.
- All other shrubs shall be pruned only as required for safety, visibility, and plant health, and allowed to develop into the natural shapes expected of the plant variety. Do not shear shrubs into topiary (shapes) unless specifically instructed.
- Allow shrubs two (2) months to rejuvenate following a hard frost prior to pruning or replacing.
- Any shrub found to be dead or missing shall be replaced with plant material of identical species at the landscape maintenance contractor's expense, unless the loss was due to excluded damage.
- When pruning shrubs known or suspected to be diseased, the cutting blades shall be sterilized after each cut.

Vines

- Vines shall be maintained as per "Shrubs" above. They shall be encouraged to climb in appropriate areas (*example:* designated by support wires around the

southeast corner of the building). They shall be pruned to keep free from window recesses and shall climb no higher than the first story (12').

Groundcovers

- Groundcover shall be maintained in a healthy, vigorous growing condition.
- Any groundcover found to be dead or missing shall be replaced with plant material of identical species at the landscape maintenance contractor's expense, unless the loss was due to excluded damage.
- Keep groundcover trimmed to edge of sidewalks, curbs, and paved areas on a monthly basis. Do not create vertical edges when pruning groundcover. Cut the edges at an angle /--\ for a more natural appearance and healthier plants. Prune so groundcover just overlaps adjoining paving; an open mulch strip here allows weeds to take hold and trash to accumulate.
- If regular foot traffic through a planter is preventing the groundcover from reaching full coverage of the soil, contact the owner's authorized representative to discuss options for redirecting the foot traffic. Consider installing pavers, stepping stones, a concrete walk, a gravel path, and/or barriers to redirect pedestrians.

C.3. Fertilizer - Trees, Shrubs, Vines and Groundcovers

- Do not fertilize plantings in the swale (rain garden).
- Fertilizers shall be either organically derived or slow-release synthetic products, to minimize water pollution and feed plants over a longer period of time.
- Granular slow release or organic fertilizer shall be 5-5-5 formulation or similar, applied per label rate for plant type. Water immediately after applying to move the fertilizer into the soil and wash the fertilizer off of plant surfaces.
- When applying granular fertilizers to drip-irrigated areas, the fertilizer must be washed in by hand or rainfall before turning on the drip system. Running the drip system immediately after application will push the fertilizer away from the emitters, resulting in a high concentration of fertilizer at the edge of the wetted zone. This highly-concentrated fertilizer can kill or damage plants. It is recommended that granular fertilizers be applied to drip-irrigated areas only in early spring, just prior to a moderate rainfall.

C.4. Mulch layer - Trees, Shrubs, Vines and Groundcovers

Maintaining a deep layer of mulch greatly reduces the labor and materials needed to control weeds, reduces water use, and helps the plants stay healthy.

- Add additional mulch regularly to maintain a layer no less than 2 inches (5 cm) deep at all times in shrub planters, tree wells, and beds where plants have not yet closed in over soil surface. Decomposition of organic mulch is considered normal wear and tear, and replacement of decomposed mulch is required seasonally. Mulch is not required in areas where plant foliage completely covers the soil surface, such that the soil is not visible through the foliage. Any mulch found outside planter areas shall be returned to the planter on a weekly basis.

- Mulch shall be uniform in color and appearance, and free of sticks or trash. Mulch may be compost, shredded fall leaves (with Owner's permission), or chipped or shredded wood, such as arborist chips, hog fuel, or play chips. Bark is less preferable, because it does not feed the soil as readily, may seal the surface preventing water entry, and may inhibit some plants' growth. When replacing existing mulch, use a mulch product that is similar in appearance to that already at the site.

C.5. Turf care

C.5.1. Mowing - Turf

- Mowing schedule: Mow weekly during active growth periods (April-October) and at least once a month during winter. Keep mower blades sharp.

- Clippings should always be left on lawn areas ("mulch-mowing" or "grasscycling"), except if this will create a large surface buildup, for instance if saturated soft soils have prevented mowing for several weeks in spring and the grass is very tall. Grasscycling returns about 2 lb. nitrogen per 1000 sq. ft. per year, and improves resistance to drought damage and weed invasion.

- Modern "mulching" mowers are preferred because they chop clippings finely and blow the resulting mulch down to ground level, leaving a clean surface which is preferable, especially around building entrances where track-in can be a problem. Effective mulching requires about 20% more engine power, and it may be necessary to slow down in heavy areas or wet weather to get the best mulching results. For these reasons, equipment that converts easily from mulching to side-throw (leaving clippings on surface) is the most adaptable to varying conditions and mowing schedules.

- Mowing height: 2 to 2.5 inches high.

- Mowing frequency: to cause the least stress on the grass plant, mow often enough to remove only one-third of the blade length (e.g., when the grass is 3" high mow it down to 2"). Also, mow un-irrigated summer-dormant turf regularly enough to remove weed seed heads before they mature. Start mowing in late winter as soon as grass begins to grow. On most lawn areas these rules will result in mowing

every 5-7 days through the height of the spring growth spurt, tapering to weekly on irrigated summer lawn or 10 days to 2 weeks on dormant lawn, weekly through the fall growth spurt, and once a month during winter. Avoiding overfertilization and soluble "quick release" fertilizers is key to reducing mowing frequency.

C.5.2. Fertilization - Turf

- Natural organic fertilizers or "bridge" (organic plus slow-release synthetic) fertilizers shall be used. Soluble fertilizers, though less expensive, wash off site, volatilize, require more frequent application, and are toxic to beneficial soil life, so tend to be more expensive over time.

- Mid to late fall applications are the key to building carbohydrate reserves in the grass root system over the winter. Early spring applications should be avoided because they promote rapid top growth (requiring more mowing) and can exhaust stored nutrient reserves. If spring applications are desired, they should be in late spring.

C.5.3. Aeration and De-thatching - Turf

- While aeration is most important on high-use areas (such as playfields and building entrance areas) any lawn area should be considered for annual or more frequent aeration if it shows signs of thin turf, weed invasion, poor irrigation penetration, or soil compaction.

- Thatch buildup (beyond the 1/2 inch that is healthy) is usually a sign of over-fertilization, over use of broadcast pesticides, over-watering, soil compaction, or other causes of diminished soil biota to break down thatch. Excess thatch prevents water penetration and promotes shallow rooting. Good maintenance practices will generally prevent thatch buildup, but where present it should by reduced by regular aeration or a vertical mowing (de-thatching), followed by adjusting cultural practices to prevent recurrence.

C.5.4. Overseeding - Turf

- In addition to aeration, spring or fall lawn renovations should include overseeding of thin or weed infested areas, or entire areas subject to heavy wear. This is a key weed control practice.

- Select certified seed appropriate for the site (perennial rye for sport lawn, rye and fescue blends for general lawn: contact the Cooperative Extension Service for site-adapted varieties, or buy from a reputable local supplier).

- Generally overseeding is practiced after aeration and before topdressing. A slice-seeding machine allows seed to be placed in the ground at the end of the dry

season to await fall rains, and greatly improves seed germination and survival.

C.5.5. Topdressing - Turf

- After aeration and overseeding, high-use or worn lawn areas should be topdressed in spring or fall for greatest improvement.

- General lawn should be topdressed with pure compost or a compost-sand mixture, 1/4 to 1/2 inch thick, to improve both drainage and soil fertility. Use a weed-free mature compost from a reputable supplier, screened to 3/8 inch minus particle size. Dragging or raking after application can help get compost down into the aeration holes and break up aeration cores and compost clumps.

- Take soil plugs annually to verify that the compost is being incorporated into the soil profile below the aeration depth by earthworms and other soil biota, rather than accumulating on the surface where it could limit water infiltration. (This is a possible problem in cases of low soil biota due to overuse of fertilizers or pesticides, poor drainage, or conditions of acidic or compacted soils. Correct these problems to improve compost incorporation.)

D. INTEGRATED PEST (WEED, INSECT, AND DISEASE) MANAGMENT

Definition: "Integrated Pest Management, or IPM, is an approach to pest control [weeds, insects, and diseases] that uses regular monitoring to determine if and when treatments are needed, and employs physical, mechanical, cultural, and biological tactics to keep pest numbers low enough to prevent intolerable damage or annoyance. Least-toxic chemical controls are used as a last resort."

Daar, Olkowski & Olkowski: IPM Training Manual for Landscape Gardeners, 1992

D.1. Weed Control for Trees, Shrubs, Vines, and Groundcovers

- Weeds in planted areas, sidewalks, curbs, gutters, or pavement shall be removed or killed weekly as the weeds emerge. Weeds shall be removed (not just killed) if they are larger than 2 inches (5 cm) in height or diameter. Dispose of weeds off-site. The cost of all weed control work shall be included in the contract price for landscape maintenance. Regular maintenance of the mulch layer will help minimize weeds in shrub and groundcover areas.

- Contractor is strongly encouraged to use Integrated Pest Management techniques for controlling weeds. Techniques include mulching, pulling, allowing plantings to grow densely and shade ground, heat and hot water controls. If herbicides must be used, choose the least toxic available and spot apply on weeds. Pre-emergent herbicides are not allowed – maintaining a thick mulch layer combined with mechanical weeding is as effective.

D.2. Weed, Insect, and Disease Control for Turf

- Weed invasion can be effectively prevented or reversed by growing dense lawn, through the above recommended practices. Tolerate some broad-leaved plants in lawn areas. Identify problem (invasive) weeds and target only those species.

- Control weeds in turf by removal where practical (long-handled weed-pullers do this quickly), and remove them regularly before they go to seed. If weeds have over-run an area, spot-application of the least-toxic herbicide is permitted.

- No broadcast herbicide or "weed-and-feed" products may be applied.

- Moderately fertilized turf on well drained organic-rich soils rarely has serious disease problems. Correcting poor soil conditions or cultural practices (like over-watering or overfertilization) will prevent diseases.

- Insects are rarely a problem on lawn in Seattle—the European crane fly is the only one in this area. IPM techniques of monitoring, setting tolerance levels, and least-toxic control can be applied effectively. Proper fertilization and overseeding will reduce crane fly damage.

D.3. General IPM Steps and Methods

IPM Steps Include:

1) Prevention first: plant vigorous, pest-resistant, site-adapted varieties. Plan cultural practices to minimize pests (watering, mulching, pruning, etc.).
2) Identify/know the pest (weed, etc.) life cycle.
3) Set action thresholds – tolerate some damage.
4) Monitor regularly (keep records of monitoring).
5) When pests exceed threshold, use control method with the least non-target impact. (Try cultural, physical, or biological methods first. As a last resort, use spot applications of least toxic chemical.) Only treat when the pest is most vulnerable and its natural enemies are in their least susceptible life stage.
6) Keep records of control methods and results, evaluate, and adapt cultural practices.
7) Replace problem plants/designs with more pest, disease, and weed-resistant varieties.

Weed Control Methods – General Guidelines:

- Crowd out weeds with dense healthy plantings, ground covers and shade canopies.

- Accept a few weeds – target the problem ones.
- Mulch beds in fall, winter, or early spring.
- Control weeds before they go to seed.
- Hoe, pull, mow, or till (mulch makes hoeing easier).
- Use flame or radiant heat weeders over pavement, cracks, fencelines, and building edges, or over mulch on rainy days (use fire precautions as per equipment labeling).
- Use barriers: newspaper or cardboard covered with mulch, root barriers for spreading plants. Landscape fabric can create problems as weeds grow through it – paper or cardboard is better.
- Don't over-fertilize – it promotes weeds and pests.
- Spot apply the least-toxic chemical (e.g. soap and vinegar-based weed killers, or cut-and-paint stems with systemic herbicides) to minimize non-weed impacts.
- If a pesticide must be used, post signs for at least 24 hours stating: area affected; date/time applied; specific pesticide used; re-entry cautions (from label); and phone number to call with questions. Always follow label for application and protection. Professional appliers (including users of "weed & feed," or even low-risk herbicides like vinegar) must be licensed by State law, see http://agr.wa.gov/PestFert/Pesticides/ .

E. IRRIGATION

All Areas

- Monitor the moisture levels around all ornamental plants including, but not limited to trees, lawn, shrubs, perennials, groundcovers and annuals. Report problems (including brown spots or saturated areas) to on-site management during normal maintenance visits.

- Fix irrigation system leaks and broken or misdirected heads as needed on every site visit.

- Hand watering of any ornamental plants not under irrigation is not assumed.

Spring start-up

- Open the main valve(s), inspect and adjust all sprinkler heads, re-program and check battery backup in controller, and troubleshoot the entire system.

- Test sensors (rain, soil moisture, weather) and zone coverage while running.

- Set ET-based, seasonal, or weather–based manual or automatic programs. Post spring/summer/fall schedules (runtimes x days / zone) and train staff as needed to monitor through season.

Checks and repairs

- Once per month inspect entire irrigation system. Irrigation inspections shall include the following:
    - Activation of each zone to inspect for valve function, lateral breaks, damaged heads, coverage or anything else that would indicate any malfunction of the irrigation system.
    - Adjust irrigation heads for proper coverage.
    - Adjust automatic controller to establish frequency and length of watering periods for seasonal requirements and water restrictions.
    - Runoff of water from irrigation systems into or onto streets, sidewalks, stairs, or gutters is not permitted. Immediately shut down the irrigation system and make adjustments, repairs, or replacements as soon as possible to correct the source of the runoff.
- Do not over-water plantings. Use multiple-start times and short run times to prevent runoff. Drip systems should be left on for sufficient time to allow for saturation of the root zone. Shorter runs with drip irrigation do not provide sufficient water penetration for healthy root development. Avoid multiple-start times with drip systems if possible. Do not allow run-off from any irrigation.
- Rain sensors/weather sensor/soil moisture sensors: Install rain shut-off devices where possible. If no rain shut-off device, building manager shuts off irrigation at first sign of rain.
- Maintain the irrigation system, including cleaning of filter screens yearly or more often as needed, and flushing pipes.
- Drip irrigation systems need periodic flushing to remove sediment. Systems shall be flushed at least once a year. Open ends of drip lines and run for at least 15 minutes at full flow to flush. It may be necessary to install flush outlets in order to flush the drip system.

System repair

- Regardless of the cause of damage, take immediate action to prevent further damage by shutting off the damaged part of the irrigation system and commencing

with hand watering as needed. The following items are considered to be minor repairs: damaged or clogged sprinkler nozzles, adjustment of sprinkler patterns or arcs, adjustment of sprinkler position (reorient; raise, lower, or straighten sprinkler head), replacement of clogged, broken, or missing barbed-style drip emitters, replacement or repositioning of drip distribution tubing smaller than 1/2 inch or 15 mm diameter. Any replacement of irrigation system components shall be made with materials of the same manufacturer and model as the original equipment.

- All repairs to the system shall be identical to the original installation, unless approved otherwise in advance by the owner's authorized representative. If a change to the installation will result in lower future maintenance costs, less frequent breakage, or an increase in public safety, request authorization to make the change from the owner's authorized representative.

- For safety, do not install sprinklers on risers above the ground level, even if the risers are flexible. Always use spring-operated, pop-up style, sprinkler heads. Sprinkler heads are available with pop-up heights up to 12 inches (30 cm) above ground level. If the existing sprinklers are mounted on above-ground risers, the replacements shall be pop-up type sprinklers. No exceptions.

- Annually submit recommendations for changes to system that would improve water efficiency while meeting the plants' needs.

Winterization

- Completely drain the sprinkler system (blowout) to prevent freeze damage to underground pipes and sprinkler heads. Close all valves and shut down the controller(s) for the winter.

F. SPECIAL LANDSCAPE AREAS

Street trees and R.O.W. plantings

- These areas have additional stress of vehicular, pedestrian (and dog) traffic, and in this plan are not included in the irrigation system. To avoid compaction and prolong tree life, it is necessary to keep underplantings full and healthy. If low shrubs or groundcovers are damaged, replace them immediately to prevent further damage.

Green roof

- Weeds may be introduced by birds or wind-dispersed seeds. This area will require low but ongoing maintenance after it is established, and may need frequent weeding until desired vegetation covers the planted surface.

- Green roofs are exposed to extremes of wind, sun, and temperature. The green roof planting plan uses hardy, drought-resistant plants, but some initial irrigation will be required in this harsh microclimate. Manual watering about every two weeks will be necessary during the first two summers after installation.

Bioretention areas

- Swales and rain gardens, designed to capture and hold roof runoff, will not maintain optimal drainage rates if soils become compacted. Minimize foot traffic in this area, although occasional walking for maintenance is fine.

- In addition to preventing weeds, regular applications of mulch will maximize the swale's ability to capture and break down contaminants. In order to prevent runoff of excess nutrients, rain garden plantings should not be fertilized. Plant selection, a rich soil mix at time of installation, and regular mulching should provide sufficient nutrients to plantings in these areas.

Permeable pavers

- The permeable paving areas (sidewalk and patios) need periodic maintenance to avoid getting clogged with debris over time. Regular sweeping and low-pressure washing 3-4 times a year will keep the area free of organic material and fine particles, maintaining permeability.

- Similarly, avoid using salt and sand on this area in the winter (in any case, permeable paving does not tend to accumulate ice since it does not hold puddles).

- Additional gravel may occasionally be necessary to refill the pores between pavers. Gravel supplements are needed if the gravel channels drop more than 1.5" below the paver surface.