

THE VILLAGE AT CAIN ROAD

Integrated Pest Management Plan

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I. INTRODUCTION

Background

When urban development covers the land with buildings, houses, streets and parking lots, much of the native topsoil, duff, trees, shrubs and grasses are replaced by homes, asphalt, concrete and landscaping. Along with the development, people come bringing the potential for contamination to area lakes, streams and groundwater supplies.

Much of Thurston County is classified as an "Aquifer Sensitive" area. That is to say that the groundwater resource, upon which the vast majority of Thurston County residents rely for water, is vulnerable to contamination from land activities. Many of the aquifers serving Thurston County are relatively shallow and largely unprotected by intervening impermeable layers of soil. Consequently, activities on the surface can have an impact on the water supply.

In addition to protecting the aquifer, this project drains to the Indian Creek/Moxlie Creek basins. Because this plat is over ten units, within a Critical Aquifer Recharge Area, an IPMP is required. This Integrated Pest Management Plan (IPMP) seeks to address potential sources of contamination of both surface and groundwater. Moreover, it provides guidance to future homeowners of this project to identify actions and activities that can be mitigated to reduce the potential for contamination.

Responsible Parties

All property owners within this subdivision are members of the Homeowners' Association (HOA). The HOA is responsible for many of the mitigation measures discussed herein. However, most of the responsibility for protection of our water resources lies with each individual property owner. The common areas within the subdivision will be managed by the HOA and they may hire outside contractors where needed. This IPMP is conditional to the Final Plat Approval and is attached to and a part of the Covenants, Conditions and Restrictions for this subdivision and, as such, is recorded against the title for all properties within the subdivision. Enforcement of the recommendations of this IPMP lies with the underlying jurisdictions, and the property owners and the HOA should strive to incorporate them in their daily activities. All parties below shall read the IPMP plan:

Specific Responsibilities

Landscape Maintenance	Developer / HOA and Maintenance Contractors / Home Owner's
Common Facilities	Developer / HOA and Maintenance Contractors
Stormwater Facilities	Developer / HOA and Maintenance Contractors
Household activities	Home Owner's (proper landscape maintenance, water use, & disposal of products)

Project Description

The Village at Cain Road preliminary plat proposes to create 24 dwelling units on approximately 5 acres at a density of 6.36 units per acres, located within the City of Olympia. The project is located on the undeveloped land located near the southeast quadrant at the intersection of Cain Road and 22nd Avenue SE. The project lies within city limits, on tax parcel numbers 09940068005 and

09940069000 in Section 24, Township 18 North, Range 2 West, W.M. The parcel is zoned Residential R 6-12. As part of the 1.39 acres of open space, 0.39 acres has been designated as tree tract for the preservation of forested area, and 0.85 acres has been designated for stormwater facilities. An additional 0.15 acres of the site will provide landscaping, tree retention and pedestrian access.

Road construction includes frontage improvements along Cain Road SE and 22nd Avenue SE, both Major Collectors along the north and west boundaries, and the addition of approximately 435 feet of Local Access street through the property connecting to Cain Road SE. Other improvements include installing associated utilities and building storm water facilities including a regional storm pond. Both Major Collector and Local Access street construction will include 5-foot sidewalks and 6-foot planter strips. The completed Local Access cul-de-sac will have a landscaped internal island.

Installation of utilities includes street lighting, dry utilities, sewer and water. The entire site will be served by a gravity sanitary sewer main extended from an existing main in 22nd Avenue SE through the property and along Mayes Road SE. Utilities will be stubbed to the future single-family lots of the plat.

The existing site is rectangular in shape and gently sloping from east to west, ranging from 180 along the east line, to 170 at the existing intersection. A small kettle exists in the northwest corner of the site roughly 10 feet in depth. Slopes on the site are generally 3%, with steeper slopes of 7-10% within the depression.

Onsite soils are consistent with Yelm fine sandy loams. Permeability is variable and poor, resulting in a relatively low infiltration rate. The stormwater facilities will include a combined detention and wetpool for treatment and storage, with a metered release to the existing storm system at the intersection of 22nd Avenue and Cain Road SE.

Local Environmental Concerns

The project is located in the Indian-Moxlie Basin flowing to Budd Inlet. No special requirements for treatment were identified for the basin; the project will provide basic treatment as required in the Drainage Manual.

Installation of the Detention BMP's proposed by this project will reduce peak runoff from the site. The proposed stormwater mitigation measures for this project meet the intent of the recommended solution provided in the Basin Plan by reducing the peak runoff amounts contributing to off-site stormwater system and downstream watershed. Residents can reduce the risk of contaminating the aquifers in this area by following the provisions established within this report.

Landscape, Pest Control & Maintenance Activities

All areas of the Village at Cain Road subdivision not used for homes, roads and driveways, walks, utilities, etc., will be fully landscaped with ornamental and native plantings. Landscape installation and long-term maintenance for common areas and stormwater facilities will be the responsibility of the developer (initially) and HOA (after build-out). Landscaping on the individual lots will be the responsibility of the Home Builder or homeowner. The long-term maintenance of the landscaping

on individual lots will be the responsibility of the homeowner or resident. All landscape installations should be implemented by experienced professional contractors, concurrent with the construction of the subdivision and/or with home construction prior to occupancy. The landscape design should include trees, shrubs, and groundcovers that are endemic to the Pacific Northwest or proven to be adapted to the local climate.

Management activities will change over time, as houses age and landscape areas mature. Landscape maintenance activities will include culture and pruning, removal/replacement of plants, fertilizing for turf areas, and operation of irrigation systems. Key to successful establishment and long-term performance of the landscaped areas is the monitoring and identification of disease and pest problems and proper management thereof.

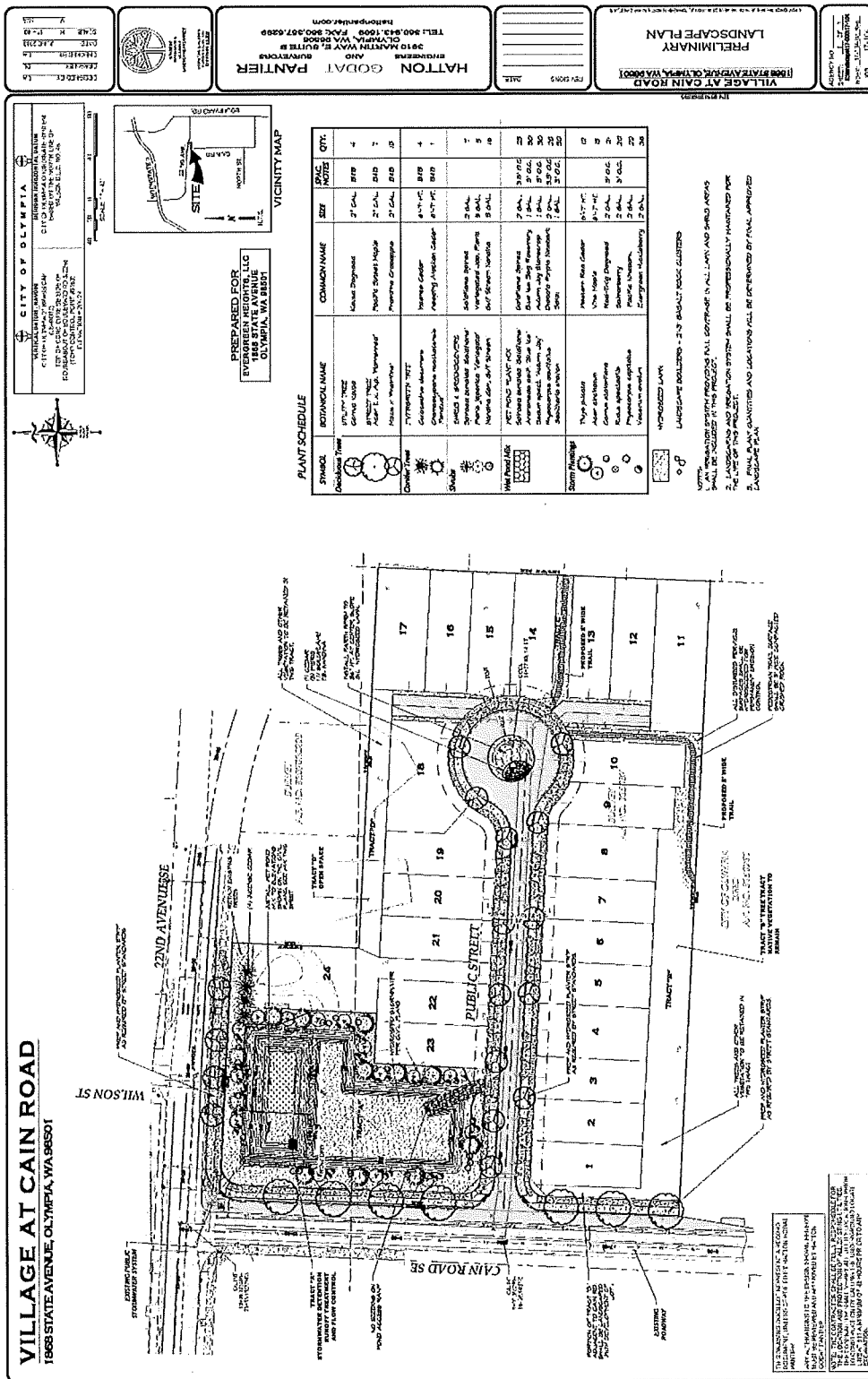
Other maintenance activities within the subdivision that could impact soil and ground water include utility and storm water maintenance, cleaning or repainting homes, and resurfacing or restriping roads.

Landscape Zones in the Project

The following portions of the completed project will be landscaped:

1. Public Rights of Way (dedicated to City)
 - a. Street planter strips, including turf areas, street trees, and/or groundcovers.
 - b. Landscape island in cul-de-sac.
2. Stormwater Tract
 - a. General erosion control seeding
 - b. Woody plantings at facility perimeters
3. Common open space tracts
 - a. Tree Tracts (Not Planted; no IPMP maintenance proposed)
 - b. Private driveways (Not Planted; no IPMP maintenance proposed)
 - c. Open space and pedestrian access (general seeding or other plantings)

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II. INTEGRATED PEST MANAGEMENT PRINCIPALS

General

Pesticides¹ and fertilizers are commonly used, and often overused, by homeowners. These chemicals are often overused. Many times, homeowners apply too much chemical or apply the right amount but at the wrong time, such as before heavy rains or any time the plants will not be able to absorb the chemicals. Excess chemicals are easily introduced into stormwater runoff and can cause algae blooms (fertilizers) or kill off aquatic organisms (pesticides) in surface waters. Large quantities of fertilizer can negatively impact nitrate levels in drinking water supplies as well.

The Developer and the HOA are responsible to implement a system incorporating the following principals to reduce impacts on surface or ground waters, be they Point or Non-Point Source Pollutants. The HOA shall either contract with a professional and reliable landscape maintenance contractor familiar with IPM principals, or ensure in-house maintenance personnel are fully trained with IPMP techniques. Contracted firms shall include provisions for specific IPM tasks incorporated into their routine maintenance program, along with IPM strategies, treatment thresholds, and a hierarchy of control measures.

Planning/Prevention

Careful planning by the HOA, their Contractor, and the design professionals can prevent many pest and disease problems. The landscape design has many built-in features to reduce maintenance and prevent issues requiring IPM action. These include:

Plant selection- The plant palette for the approved landscape design includes a combination of well-adapted ornamental species and native plants, most with proven resistance to pest and disease issues.

Soil Amendment- The initial installation will attend to replacement of A-horizon soils to provide better root development and nutrient quality for landscape materials. Topsoil type is required to meet Post-Construction Soil Quality per the Drainage Manual in conjunction with the stormwater design.

Plant Locations and Methods- The planting plan optimizes plant species in terms of their ultimate size and function in the landscape, as well as solar exposure/tolerance. Planting amendments and methods of installation are detailed and should be followed for any subsequent replacements that may be required.

Mulching- All landscape areas call for mulching which decreases evapotranspiration and water use, and generally assists with control of transient weeds/grasses. Periodic maintenance of the mulch surfacing is recommended. Ideally, establishment of contiguous groundcovers will reduce the potential for weeds and associated controls.

Resources- Consult the following sources and references listed in Part IV. for other IPM strategies for prevention: http://www.co.thurston.wa.us/health/ehipm/ipm_homeowner.html and <http://www.co.thurston.wa.us/health/ehcsg/guides.html>

¹ As used here, the word pesticide can mean any herbicide, insecticide, rodenticide, miticide or other chemicals used in a similar manner.

Identify Problems

Pests (insect and herbaceous) and disease problems need proper identification before choosing an appropriate control action. Consult the references listed in Part IV for common disease and plant problems with Northwest landscape materials. Also contact WSU/Thurston County Cooperative Extension or local pest control professionals for assistance when needed. A basic recommended list of IPM issues will include attention to biotic and abiotic symptoms. Look for plant stress, leaf discoloration or patterns, and known pest vectors during the appropriate life-cycle or stage.

Inspection/Monitoring

The IPM approach relies on frequent monitoring of the landscape for the occurrence diseases and pests. Monitoring should be the responsibility of a combination of the management personnel, tenants, and the Landscape Maintenance Contractor. Monitoring methods can include careful plant examination/observation, pheromone traps, sticky colored traps, and pitfall traps. Time of year and weather/temperature will affect monitoring initiation and frequency. General monitoring of plant health/problems during the growing season is recommended on a weekly basis for the Facility Management who may lack detailed knowledge of the vectors, and on a monthly basis (or during weekly mowing) for specific pest pressure, by the Landscape Contractor. The contractor should also monitor nutrient adjustments needed on a seasonal basis.

Establish Control Thresholds

The mere presence of a pest or disease issue does not automatically dictate control responses. The appropriate Economic or Aesthetic Thresholds should be determined prior to implementing a hierarchical system of treatment. For a commercial facility that relies on professional-looking grounds the aesthetic threshold may be lower, at a point where problems will not impact marketing or customer (tenant) perceptions.

Appropriate Control Actions

Four general methods to manage insect, disease, and weed problems involve cultural, biological, mechanical, and chemical approaches. These tactics may be implemented incrementally (hierarchical), concurrently, or at different times depending on the pressure encountered. Generally, reducing chemical (pesticide) treatments may reduce potential impacts to water resources. Pick control measures that are cost-effective and use proper rotational controls to reduce resistance/tolerance. See detailed Best Management Practices (BMP's) in Part III, below.

Evaluate Results

Assess the results of control measures soon after implementation. An IPM program is not static, and must be adjusted based on the efficacy of the least-impactive control measures needed to reduce problems below the set thresholds. Use post-treatment evaluation to adjust Preventative and Inspection/Monitoring measures.

See specific BMP's in Part III, below for recommended IPM responses to various Landscape related issues.

III. RECOMMENDED BEST MANAGEMENT PRACTICES

General

Care must be taken when using pesticides, fertilizers, and other household hazardous substances so as not to contaminate the stormwater runoff that leaves your property. The following ideas should help you reduce the risks of stormwater and groundwater contamination from many common products or practices.

Fertilizing a lawn can be done in an environmentally sensitive manner. Also, rather than bringing out the sprayer whenever a pest infestation occurs in the garden, consider using other alternatives. Evaluate all factors that might affect the garden, including environmental effects, before chemicals are applied. Pesticides should only be used as a last resort. Some of the tactics that can be used to decrease or eliminate the use of pesticides are discussed below.

Landscape Design and Maintenance

The homeowners, HOA and Landscape Maintenance Contractor are responsible for applying IPMP techniques to maintain landscaped areas. This includes Pest Control, Pesticide Management, and watering. The following techniques shall be applied.

1. Use of Native Plants: One of the best methods of reducing impacts to water resources is by using landscaping materials that do not require extensive care. Native plants have adapted themselves to our region, particularly their root structure and water needs. These plants have also built tolerances over the centuries to local pests and disease. By using native plants in the landscape, we are less likely to need fertilizers, herbicides and pesticides. Native plants are also more tolerant of drought conditions and typically require less water. The Developer shall install the native plant materials called out on the Landscape Plan. Additional plantings may be installed by individual home owners.

Native plants come in all shapes and sizes so there is probably one that will fit into your landscape plans. There are deciduous and evergreen varieties of trees, shrubs and groundcovers. Some suggested species of native plants are listed below. Contact your local garden supply store for more ideas on use of native plants in your garden.

Evergreen Plants

Trees: Western red cedar, Douglas-fir, Western hemlock

Shrubs: rhododendron, evergreen huckleberry, tall Oregon-grape

Ferns: lady fern, sword fern, deer fern

Groundcover: manzanita, kinnikinnik, common juniper

Deciduous Plants:

Trees: big leaf maple, Pacific dogwood, bitter cherry

Shrubs: western azalea, Nootka rose, red huckleberry

2. Grasses for Lawns: Both the developer and individual home owners will install lawns. The lawn is a major component of the landscape. Selection of a grass well suited to our area is an important step in reducing the impact to water resources. The *National Turfgrass Evaluation* studies various types of grasses for their resistance to insects, drought tolerance, seasonal appearance, density, the strength of their sod and leaf texture. Based

upon these characteristics, specific grass types are recommended for specific areas throughout the country. Fescue and perennial rye grass are recommended for this area.

3. **Mulching:** Use of native plants will greatly reduce the need for fertilizer. Use of mulch may eliminate the need altogether. Mulch acts as a physical barrier to weeds and is an excellent alternative to herbicides. Mulch can be compost, bark or wood chips, or leaves and grass clippings. It should be spread around the base of plants and within flowerbeds. The recommended depth of mulch varies between plant varieties but should typically be 2- to 4 inches.
4. **Use of Fertilizers:** Proper use of fertilizers yields better plants and reduces negative impacts to our water resources. Fertilizers typically contain high levels of nitrogen and phosphorus, both of which can damage ground and surface waters. The following are a few tips to optimize the use of fertilizers in your garden.
5. **Soil Testing:** The first step in fixing a problem is to know what that problem is. Therefore, before applying any fertilizer, test your soil. Existing soil conditions, particularly nitrogen, phosphorus, potassium and pH levels, can be easily determined by using kits available at garden stores or from the WSU Cooperative Extension. Applying fertilizer before knowing the components of the soil could lead to over loading certain areas that may impact our water resources.
6. **Proper Fertilization:** Proper fertilization is important in maintaining a healthy lawn that resists environmental stress, including competition with weeds and moss and drought stress. Because Spring and Fall are periods of optimal growth, these are the most important times to fertilize. The use of slow release fertilizers is recommended. Natural organic and synthetic organic fertilizers (such as IBDU, sulfur or polymer coated urea, or methylene urea) behave similarly once they are applied to the soil.

Although some people feel that natural organic fertilizers provide added benefits to soil health, research has not shown this to be true as a general rule. The natural organic nutrient sources in these products are often supplemented with synthetic plant nutrients anyway. The most important thing to remember is to use a slow release fertilizer. Extensive research around the country has shown that when these materials are applied properly there is very little risk of surface or groundwater contamination, and they provide an even feeding, which is better for your lawn. Remember to sweep granules off pavement to prevent washing into storm drains.

Many soils can benefit from the use of organic fertilizers such as compost or peat. These substances add nutrients to soil and increase the porosity of the soil as well as its ability to hold water.

7. **Fertilizing the Lawn:** Turf fertilization practices for the entire year are built around what is done in the fall. Apply fertilizer in early to mid-September to promote regrowth from summer stress. Another application in November is important in keeping the grass competitive with moss through the winter. If you fertilize in November, you probably don't need an early spring fertilization. If not, your lawn will probably be ready for fertilizer in the spring. Again, use a slow release fertilizer so that you don't promote a big flush of growth. Fertilize again in early June so that the grass has the nutrients it needs to grow at a moderate rate through the summer stress period.

If you want to maintain a lawn of moderate quality, a minimum of three fertilizations through the year is needed. Additional light fertilizations can be added if you are looking for a higher quality lawn. In general, you should apply no more than one pound of actual fertilizer nitrogen per 1,000 square feet at a time, although this rate can be increased to 1.5 pounds in the fall when using slow release products. (If the fertilizer analysis is 24-4-12, for example, it contains 24% nitrogen. To apply 1 pound of Nitrogen per 1,000 square feet, apply 4.2 pounds of fertilizer: $1 \div 0.24 = 4.2$).

Return clippings (grasscycle) when you mow to recycle nutrients into the lawn. Use mulching mowers to return grass clippings directly to the lawn. Essential nutrients from the decomposed grass can then be retained in the soil thereby reducing the need for fertilizer.

8. Water Before Fertilizing: Water plants and lawns before fertilizing. Water enough to dampen the ground thoroughly, but not enough to cause surface runoff. Dampening the soil prevents fertilizer from being washed from the surface of dry soil in the first rain or watering after application.
9. Proper Watering: Proper watering can help build strong plants resistant to drought, pests and disease. Water infrequently but enough to dampen soil down to 10 inches. Be careful not to water so rapidly that water runs off the surface. Frequent, shallow watering promotes shallow root depths making the plants susceptible to damage during periods of drought. Unhealthy plants are easy targets for pests and disease. Also, water during early morning hours rather than during the day or at night. Irrigating during the day loses a sizable amount of water to the atmosphere through evaporation. Watering at night can lead to mold and fungi growth on plants left damp over a cool night.

The irrigation system should be programmed to provide about 1" of water per week during the growing season. This includes normal precipitation. The system shall be provided with rain sensors which can suspend watering, and soil moisture sensors which can automatically adjust watering intervals and run times (e.g. Cycle-Soak).

10. Weed Control: Use of mechanical means for weed control is typically less attractive due to the cost. However, non-chemical controls for transient and invasive weed problems shall be emphasized in the IPM program in efforts to reduce overall environmental impacts. The quick establishment of a thick, healthy, native or ornamental groundcover planting will reduce the need for weed control. Implement measures to reduce this establishment time by increasing plant spacing, adding/replacing groundcovers, and using groundcover species that are spreading or widely-mounding. Reduce compaction to mulch to encourage groundcover establishment and cover-rate.

The initial establishment of groundcovers may require more weed control. When the need for chemical treatment is necessary over woody groundcovers, carefully determine the target broadleaf or grass species, and choose a selective herbicide that specifically labeled for application over the type of planting. Use labeled rates and ensure proper training for applicators and handlers for proper coverage.

Reduce the need for selective broadleaf herbicide treatments in lawn areas by using clean soil amendment and turf seed, proper installation, and appropriate nutrient applications for the lawn area. Use selective mechanical measures to remove broadleaf weeds in newly seeded lawn areas. Proper watering and mowing height will increase vigor and reduce broadleaf pressure in lawn areas established with turf.

Pest Control

Some of the tactics that can be used to decrease or eliminate the use of pesticides include:

1. Use of Natural Predators or Pathogens: Because chemical sprays generally kill many beneficial insects instead of just the target pest, it may be necessary to introduce natural predators back into the garden. Ladybugs, lacewings, predatory wasps and nematodes are all commercially available. Garter snakes and toads are also predators and should not be eliminated from the garden.

There are some bacteria, viruses and insect parasites that are specific to pests and will not harm other insects or animals. A commonly used bacterium in the Puget Sound area is *Bacillus thuringiensis* (Bt), which is intended to control infestations of tent caterpillars.

2. Habitat Changes: Many times a change of habitat can control pest infestations. Removal of any item that will pond water, like buckets or tires, can cut down on the mosquito population by removing a convenient location for them to breed in. Removing last year's leaves from under rose bushes can cut down on the incidence of mildew and blackspot, as these fungi overwinter in dead leaves.
3. Timing: Crops that can overwinter (such as leeks or carrots) should be planted in the fall. This gives them time to become established before pests arrive in the spring.
4. Mechanical: Many eggs, larvae, cocoons and adult insects can be removed by hand. Be sure that the insect is properly identified prior to removing it so those beneficial insects are not destroyed in error. Drowning insects in plain water or spraying them with soapy water are alternatives to squashing them.
5. Resistant Plants: Plants that are native to this area are often more resistant to pests and tolerant of the climate than are introduced plants. Many plant cultivars have been developed which are resistant to such diseases as verticillium wilt and peach leaf curl. Grass seed mixes are also available for lawns that need much less watering, mowing and chemical use.
6. Growing Conditions: Plants, such as hostas, that require some shade are more susceptible to pests when they are growing in the sun. Improperly fertilized or watered plants are less vigorous in growth and tend to attract pests. Plants that prefer an acid soil, such as azaleas, will perform better and be less susceptible to pests when they are grown in soil with the proper pH.
7. Chemicals: Chemicals are a small part of the IPM plan and should be applied only as needed after reviewing all other alternatives. Avoid the use of broad-spectrum pesticides which may kill beneficial insects.

Pesticide Management

When use of a chemical is the best or only option, follow the basic guidelines below. Maintenance Contractors shall be licensed commercial applicators and shall always follow the Pesticide Label.

1. Know your target pest before spraying. Use the pesticide according to the manufacturer's instructions, and buy only the needed quantity. Many pesticides have a limited shelf life and may be useless or degrade into even more toxic compounds if stored for extended periods of time.

2. Do not apply more than the specified amount. Overuse can be dangerous to your health as well as the health of wildlife and the environment. If more than one chemical can be used to control the pest, choose the least toxic. The word "caution" on the label means that the chemical is less toxic than one that is labeled "warning".
3. Do not spray on windy days, in the morning of what will be a very hot day or when rain is likely. Herbicides can drift and injure valuable ornamental plants. Do not water heavily after application. Plants should be lightly watered before application to prevent burning of the foliage and to help evenly spread the chemical.
4. Never apply pesticides near streams, ponds or wetlands (exception: approved applications for aquatic weeds). Do not apply pesticides to bare eroded ground. Many pesticides bind to soil particles and can be easily carried into a stream or storm drain.
5. Pesticides should be stored well away from living areas. Ideally, the storage area should have a cement floor and be insulated from temperature extremes. Always keep pesticides in their original containers with labels intact. Labels often corrode and become illegible in this climate and may have to be taped onto the container.
6. Federal law now requires that all pesticides be labeled with the appropriate disposal method. Leftovers should never be dumped anywhere, including a landfill. Take unwanted pesticides to Hazo House located at the former landfill at 2420 Hogum Bay Road NE, Lacey. Call the Thurston County Hazardous Waste Section at (360) 867-2664 for more information.
7. Empty pesticide containers should be triple rinsed and the rinse water used in the same manner as the product. Once containers are rinsed they can be disposed of as regular garbage.
8. If a pesticide is spilled onto pavement, it can be absorbed using kitty litter or sawdust. The contaminated absorbent should be bagged, labeled and taken to Hazo House.
9. If the pesticide is spilled onto dirt, dig up the dirt, place it in a plastic bag and take it to Hazo House.
10. Many pest control companies and licensed applicators have access to pesticides that are more toxic than those available to the consumer. Check with the company before they spray indoors or outdoors to find out what spray they will be using and what precautions, if any, are necessary after the operator leaves.
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Stormwater Control

The Village at Cain Road has a stormwater control system that includes pre-settling wet ponds to treat stormwater runoff and lined detention ponds to store runoff prior to release into City storm pipes. Both facilities require certain types of maintenance to assure that they function as intended. A Stormwater Maintenance Agreement has been recorded with the title on all properties within your subdivision, binding the Homeowners Association to implementing the specified maintenance. A copy of the maintenance agreement is included in the covenants filed with the plat and should be included as part of the title policy on your lot.

Precipitation falling on roads, alleys, driveways and sidewalks can become contaminated with automotive fluids, deicers, and other road grime. Precipitation falling on lawns can become

contaminated with lawn chemicals, pesticides, and fecal coliform bacteria from pet wastes. These areas are considered pollutant generating surfaces (PGS). Stormwater runoff from PGS, precipitation that accumulates and drains above ground during rainy weather, may be the largest source of pollutants to nearby water resources, and needs to be treated before being discharged to surface waters or infiltrated to underground aquifers. Precipitation falling on undeveloped areas and home roof tops isn't likely to become contaminated with the above mentioned contaminants. These areas are considered non-pollutant generating surfaces (NPGS). Stormwater runoff from NPGS does not require treatment unless mixed with runoff from PGS prior to discharge. The stormwater control system features designed into your development include catch basins to collect stormwater runoff and route to settling basins to pretreat runoff prior to discharging into the lined ponds for infiltration into the ground.

Stormwater runoff from the roof tops in your development does not need treatment and where the onsite soils allow, the runoff from the roof tops will be routed through the gutters on your home to individual infiltration trench/drywells located on each lot.

Stormwater Facility Maintenance

All stormwater control systems require regular maintenance. Each portion of the system (catch basins, culverts, roof drains (gutters), piping, infiltration ponds, access roads, etc.) has a maintenance checklist found in the Stormwater Maintenance Plan. These maintenance tasks should be performed at the frequency shown in the checklists. Care must be taken when using pesticides, fertilizers, and other household hazardous substances so as not to contaminate the stormwater runoff that leaves your property.

This development has the following stormwater components:

1. Wet Ponds – Lined earth cell planted with aquatic emergent vegetation
2. Detention Ponds – Lined earth cell seeded to grass species tolerant of wet soils

Integrated Pest Management shall be used during periodic maintenance of the stormwater facilities. IPM principally applies to maintenance activities involving vegetation management within the drainage components. The stormwater ponds are designed to function with the vegetation originally specified in the drainage design. As ponds and their vegetative component mature, transient plants and noxious weeds may become established affecting the operation of the system. Noxious weeds like Scotch Broom and Himalayan Blackberry may occur on the pond perimeters. Transient (or volunteer) species may include Common cattail (*Tyhus latifolia*), Western Spirea or Hardhack (*Spirea douglasii*), and Red Alder (*Alnus rubra*).

Trees that volunteer or encroach on pond areas should be removed if they could become a hazard to structural berms or slopes. Tree species are best removed by hand (prune off just below ground level) in summer or fall, when the trees are very young (1 or 2-year old saplings). Upland species like blackberry and Scotch Broom can be sprayed with a selective herbicide during the fall period when water is not present in the ponds. Use care to avoid drift and damage desirable vegetation that provides cover and biodiversity on the pond perimeter. Removal of aquatic emergents (like cattail) shall be addressed when they have been identified as an impact to the function of the stormwater system. The presence of cattail in the stormwater facility does not mean the system is failing, but this species can quickly out-compete other aquatic species forming a monolithic stand and reducing the hydrodynamic and bio-diversity of the system. Physical removal of cattail and other undesirable aquatic species depends on the type of liner system used in portions of the pond

components. Where certain pond components are built with an impervious membrane (like PVC, HDPE, etc.) or a soil-based liner (like clay or bentonite) care must be taken to maintain the liner integrity. Aquatic formulated herbicides should be used with caution and in accordance with the Label; generally, chemical treatments are not recommended except for spot treatments. Monolithic stands can be removed with equipment (like dozers or excavators with non-serrated buckets), but vegetative matter must be removed completely, and success is limited to the degree tubers can be completely removed from the soil. This type of mechanical work within the stormwater system should be performed with guidance from the Stormwater Maintenance Plan, approval from the jurisdiction, and under direction from the Engineer.

Follow IPMP principles in terms of pest control for the proposed vegetation within the stormwater system. Monitor pond vegetation for insect and predation issues and implement a planned approach before damage can impact the plantings requiring a need to reestablish them.

Adjust management strategies for lawn areas within storm pond components like infiltration areas that do not double as seasonal recreation amenities. Watering, feeding and mowing can all be significantly reduced in pond areas where the level of performance and aesthetics do not require them to be on par with more ornamental portions of the site. Some seeded areas within ponds that have seasonably variable water levels may be slow to establish or require seasonal stabilization. Follow the recommendations in the engineered drainage report and the Stormwater Maintenance Plan.

Table 1 - Best Management Practices, Summary	
Planning/Prevention	Design and use pest-resistant species & varieties Use native or naturalized plant materials Use quality nursery grown materials from reliable sources
Identify Problems	Biotic factors: bacteria, fungi, insects/mites, slugs, rodents Abiotic factors: weather, fertility, water management, location/exposure
Inspection/Monitoring	Annually: Soil Health- soil nutrient and pH testing Seasonally: Observe growth factors for proper response; tree and shrub architecture (canopy/limbs/etc.) to determine pruning Monthly: Look for disease expressions on foliage, plant vigor, insect or slug damage, structural problems; Weekly: Adjust irrigation timing as needed for precipitation; grass height (mowing); insect pest presence On Occurrence: Examine diseased plant material for root diseases; take unidentified pest problems to outside resources like WSU Extension field office, or Master Gardeners
Establish Thresholds	"Unacceptable damage" is pest or disease pressure negatively impacting more than one plant or species of plant, <u>and/or</u> a pest or disease presence that has the <u>potential</u> to negatively impact more than one plant or species of plants "Negative impact" means injure, kill, and/or harmful to plants to a point it can no longer fulfill its role in the landscape (including aesthetically)
Appropriate Controls	Use the least toxic controls; use pesticides that are narrow-spectrum and "selective" Use predatory/beneficial biologicals when possible Use mechanical or hand-removal of pests where cost effective See other BMP's listed above in this Chapter
Evaluate Treatment	Watch for secondary outbreaks following treatment/controls, follow-up treatment; keep records on efficacy of control methods used;

IV. RELATED DOCUMENTS

Resource Listing

If you suspect a problem exists, please contact your local jurisdiction at one of the numbers below and ask for Technical Assistance.

CONTACT NUMBERS

Lacey Water Resources	(360) 491-5600
Thurston County (Storm & Surface Water)	(360) 754-4681
Washington State University (WSU) Cooperative Extension	(360) 867-2177

DEVELOPER INFORMATION

Summit Land Development LLC
1868 State Avenue SE
Olympia, WA 98506
(360) 754-7010

ENGINEER'S INFORMATION

HATTON GODAT PANTIER
3910 Martin Way E., Suite B
Olympia, WA 98506
(360) 943-1599

Reference Material

Puget Sound Water Quality Authority, Managing Nonpoint Pollution - an Action Plan for Puget Sound Watersheds, 88-31, June 1989.

Washington State Dept. of Ecology, Water Quality Guide - Recommended Pollution Control practices for Homeowners and Small Farm Operators 87-30, revised June 1991.

Washington State Dept. of Ecology, Hazardous Waste Pesticides, 89-41, August 1989.

Washington State University Cooperative Extension, Pacific Northwest Landscape Integrated Pest Management Manual, Problem Diagnosis and Management Options, 1999.

Washington State University Cooperative Extension, Landscape Plant Problems, 1996.

Gardening with Native Plants of the Pacific Northwest by Arthur Kruckeberg