

DRAINAGE FACILITIES

**OPERATION AND MAINTENANCE
MANUAL**

For:

ALDERWOOD

July 2, 2004

OFFICIAL PUBLIC DOCUMENT
SPOKANE COUNTY ENGINEER'S OFFICE

ORIGINAL

PROJECT # P1923

SUBMITTAL # 3 - Final

RETURN TO COUNTY ENGINEER

Storhaug Engineering
Project #03-022

1.0 PURPOSE

This plan is intended to provide general operations and maintenance guidelines for the drainage ponds and other drainage facilities associated with the Alderwood project, managing the runoff from the private road(s), associated development, and any intercepted off site runoff. The proposed project includes the development of a residential subdivision located east of Madison Road. The project site is located within the Northwest ¼ of Section 3, Township 24 North, Range 44 East, Willamette Meridian, Spokane County, Washington. Implementation of these guidelines will help the drainage facilities function as intended in the design.

INTRODUCTION

Generally, the intent of the drainage system is to attenuate the increase of water runoff generated on-site by routing the storm water through drainage ponds / swales. The drainage facilities consist primarily of eight drainage ponds, related storm pipe system, inlet structures and type A and B drywells associated with the drainage ponds. It is therefore, of the utmost importance to provide adequate operation and maintenance activities to ensure that the drainage facilities remain in good operation following their construction. Full sets of engineering drawings are available for review at Spokane County.

2.0 GENERAL OPERATIONAL CHARACTERISTICS

The drainage facilities for the subject site are generally simple, functional, and have low maintenance requirements. A periodic visual inspection of the facilities should identify any required maintenance. Most maintenance will consist of keeping the ponds, pipes, drywells and appurtenances free of debris and sediment. However, a specific inspection schedule should be followed. See Section 3.0 for recommended maintenance schedules.

2.10 Drainage Ponds. Runoff from the road(s), lot(s), and off site will be directed into the ponds. The ponds will store and treat runoff to a depth of 0.5' before flowing out through the drywells into the subsurface. There are eight ponds which require maintenance. The location of the drainage ponds and structures are shown on the approved plans available from Spokane County. The pond elevation information is provided in table 2.10A. The purpose of this table is to provide the maintenance personnel a quick reference of relative depth.

| Pond Label | Pond Bottom Elevation | Outflow Elevation | Outflow Structure | Top of Berm Elevation |
|--------------------|-----------------------|-------------------|--------------------|-----------------------|
| 208 Swale "A" | 2023.94 | 2024.44 | 1-Type A Drywell | 2024.94 |
| 208 Swale "B" | 2025.00 | 2025.50 | 1-Concrete Inlet | 2026.00 |
| 208 Swale "C" | 2025.00 | 2025.50 | 1-Concrete Inlet | 2026.00 |
| 208 Swale "D" | 2025.00 | 2025.50 | 1-Type B Drywells | 2026.00 |
| Detention Pond "E" | 2031.75 | 2032.25 | 2-Type B Drywells | 2037.00 |
| Detention Pond "F" | 2096.00 | 2098.50 | 18" CPEP Culvert | 2101.00 |
| Detention Pond "G" | 2031.75 | 2032.25 | 11-Type B Drywells | 2037.00 |
| Detention Pond "H" | 2048.00 | 2049.25 | 30" CPEP Culvert | 2053.00 |

Table 2.10A

2.20 Inlet Structures. The inlet structures are used to collect runoff from the road(s) and associated development.

2.30 Storm Pipe. The underground piping system conveys storm water runoff from the proposed development to the ponds.

2.40 Drywells. The drywells assist in the infiltration of the storm water into the subsurface.

3.0 MAINTENANCE REQUIREMENTS AND SCHEDULES

Below is a maintenance description for each of the drainage system elements associated with the subject site, including the ponds, pipes, inlet structures and drywells. All drainage facilities serving the public road(s) and private road(s) are expected to be maintained by the property owners.

General. Proper maintenance procedures are a necessity for the continued functioning of the drainage facilities. It is essential that the Alderwood property owners be responsible for making sure the maintenance measures are implemented.

Generally, maintenance personnel are to conduct a visual inspection of the drainage facilities immediately following a substantial rainfall event or snow melt event, such as

when it has rained noticeably hard for a short period (30 minutes or less), or it rained steady for a long period (8 hours or more), or if a significant rainfall or snow melt event, associated with a "Chinook" were to occur in January, February, or March when the ground is frozen. For long duration storms, greater than 24 hours, maintenance personnel should inspect the drainage facilities during the storm event to identify any developing problems and correct them before they become major problems.

1. Inspect the ponds, inlet structures, pipes, drywells, and drainage appurtenances to make sure that they are clear of debris and obstructions.
2. Inspect the pond berms to make sure there are no breaches or breaks in the berms. Immediately repair any breaches or breaks with a sandy, loose soil, compacted in place.
3. Inspect the drywell structures in the ponds, making sure there is no clogging or damage and that the grates are not plugged with deleterious material. Immediately repair any damage to the structures. An engineer should be consulted if significant damage or degradation to any of the structures or storm water management features has occurred.

The above-noted storm event related visual inspections (no. 1, 2, and 3) are in addition to the maintenance schedules noted for each item.

3.10 Drainage Ponds. Frequency of Inspection: Every 3 months, or after every storm event and snow melt event, whichever is more frequent. Again, the drainage ponds are to be maintained by the property owners, as described in Section 3.0. The ponds consist of between 1 to 5 foot high berms and weirs constructed from native soils. The berms and weirs should be re-sodded and/or hydro-seeded with a dryland grass mixture, at a minimum if the integrity of the ponds is compromised. A lawn sod can be used if regular irrigating is implemented. Quarterly maintenance and inspections of the ponds should include removal of any accumulated debris, such as leaves, weeds and trash. Any obstructions, which would not allow water to flow freely from the ponds via the drywells should be removed or repaired. Additionally, the berms of the ponds should be inspected to ensure that they are in good repair and structurally competent and that no outflow has occurred other than at the drywells and trapezoidal weirs.

3.20 Inlet and Drywell Structures. Inspections and maintenance should be done during inspections of the ponds, making sure that each of the structures associated with the storm drain system are clear of obstructions and debris, and in good condition. If there are any obstructions present, they should be removed immediately.

3.30 Pipes. Visually inspect the CPEP pipes from the catch basins and their outlets at the rip rap locations in the drainage ponds. The inlets and outlets of the pipes should be clear of all debris. Check that the pipes are in good condition, without breaks or cracks. A flow test in the pipes can

be conducted to readily detect major obstructions or breaks in the pipe. This test requires a water source (hydrant or water truck) and a person at the downstream end of the pipe observing the flow exiting out of the pipe section being tested. Visually inspect the rip rap outfall pads at each location, making sure that each are clear of obstructions and debris, and in good working condition.

4.0 RECOMMENDED SET-ASIDE FUNDS FOR MAINTENANCE AND FUTURE REPLACEMENT COSTS

There will be annual costs to maintain the drainage facilities. Similarly, there will be replacement costs and major renovation costs of all drainage facilities, which will occur in the future. These costs are the responsibility of the property owners or its successors in interest. Future replacement and major renovation costs have been converted to annual costs, in the form of recommended set-aside funds.

The estimated annual maintenance costs and recommended annual set-aside costs are listed below in Table 4.00A. It is recommended that the property owners set aside these amounts of funds annually to ensure that adequate maintenance and replacement measures of the drainage facilities will be implemented.

| Drainage Facility | Annual Maintenance Costs | Annual Set-Aside Funds for Future Replacement or Major Renovation * |
|------------------------------|---------------------------------|--|
| Drainage ponds | \$600.00 | ** |
| Drainage Structures and Pipe | \$300.00 | \$3372.00 |
| rip-rap outfall pads | \$200.00 | *** |
| Sub-total Annual Cost | \$1100.00 | \$3372.00 |

Table 4.00A
Grand Total / year = \$4472.00

Notes:

* Assumes 50% of the storm drainage system will be replaced in 20 years, 4.00% inflation, and 6.00% of return on investments for set-aside account. See appendix C.5 of Spokane County Guidelines for Stormwater Management.

** Any renovation costs for ponds are included in the annual maintenance costs.

*** Cost has been included in drainage structures and pipe items.