

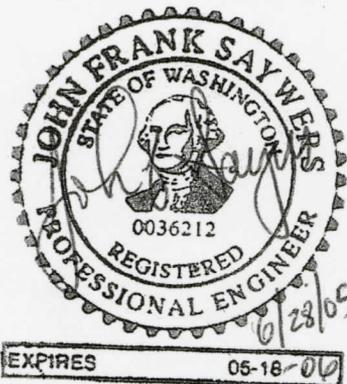
**STORMWATER CONVEYANCE
AND
'208' SWALES**

**OPERATION & MAINTENANCE
MANUAL
UPDATE**

Jesse's Bluff – 1st Addition

County File PN-1631A
SEC No. 05004

June 24, 2005



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ORIGINAL

PROJECT # P1631A - Revision #2
SUBMITTAL # 5

RETURN TO COUNTY ENGINEER

1.00 PURPOSE

This document is intended to provide general operations and maintenance guidelines for the '208' swales and other drainage facilities located within the Jesse's Bluff – 1st Addition single-family residential neighborhood. Implementation of these guidelines will ensure that the drainage facilities installed will function as intended in the plat design.

2.00 INTRODUCTION

Generally, the drainage system is intended to collect onsite stormwater runoff in the streets and convey it to the '208' swales, via concrete gutters and storm pipes. The drainage facilities consist primarily of a series of onsite drainage structures, storm pipes, and '208' swales. It is of the utmost importance to provide adequate operations and maintenance activities to ensure that the drainage facilities remain silt or dirt free, as this silt or dirt loading will affect the performance of the catch basins, storm pipes and swales. If these facilities become completely clogged, the only remedy would be to completely reconstruct the drainage facilities. Therefore, periodic maintenance is a must. A full set of engineering drawings for Jesse's Bluff – 1st Addition is available, for review at Spokane County Public Works under County file PN-1631A.

3.00 GENERAL OPERATIONAL CHARACTERISTICS

The drainage facilities for Jesse's Bluff – 1st Addition are generally very simple, functional, and have low maintenance requirements. A periodic visual inspection of the facilities will identify any required maintenance. Most maintenance will consist of keeping the pipes, structures and swales free of debris and sediment. A specific inspection schedule should be followed. See Section 4.0 for recommended maintenance schedules.

3.10 Drainage Structures and Storm Pipes

The drainage structures include concrete gutters, catch basins, manholes, and piping. The concrete gutters, catch basins, manholes and piping convey stormwater runoff from the surface of the streets to the swales where the sediment in the storm water is settled out. The outflow structures from the ponds include overflow inlet structures with restrictive orifice plates to control flow and piping to the downstream pond or the existing draw.

3.20 '208' Swales

Jesse's Bluff – 1st Addition has been designed to make use of three '208' treatment swales for treatment and disposal of storm water collected from the site. The swales have been designed to store the first ½" of runoff and discharge the excess flow with enough storage capacity over the outlet invert to prevent flooding of the 100-year storm out of the pond area.

Each swale is designed with a flat bottom and 3:1 side slopes. The volume of each swale was designed to store and discharge the 100-year runoff volume in addition to the yearly water budget volume.

Pond characteristic information is provided in Table 3.20. Additional information is provided in the engineering drawings on file at Spokane County Public Works, under file PN-1631A.

Table 3.20 - Pond Characteristics

Pond Label	Pond Btm. Elev.	Pond Btm. Area (sf)	Area of 1' Depth (sf)	Area of 2' Depth (sf)	Area of 3' Depth (sf)
Pond 1a	2387.00	33,110	35,521	37,987	40,508
Pond 1b	2385.00	68,292	72,255	76,270	80,338
Pond 2	2374.00	68,154	71,850	75,602	79,411
Pond 3-top	2392.50	480	1,040	-	-
Pond 3-middle	2390.00	1,000	1,800	-	-
Pond 3-bottom	2387.00	400	900	-	-

4.00 MAINTENANCE REQUIREMENTS AND SCHEDULES

Maintenance of the Jesse's Bluff – 1st Addition storm drainage facilities will be performed by Spokane County through the implementation of the Drain Water Accounts. Below is a maintenance description for each of the drainage system elements contained within the development, including the drainage structures, piping and '208' swales.

General

Proper maintenance procedures are necessary for the continued functioning of the drainage facilities. Improper maintenance, or lack of attentive maintenance measures, may result in negative drainage impacts.

Generally, maintenance personnel are to conduct a visual inspection of the drainage facilities immediately following a substantial rainfall event or snowmelt event. Substantial events include:

- Noticeably hard rain for a short period (30 minutes or more),
- Steady rain for a long period (6 hours or more), or
- Significant rainfall and/or snowmelt when the ground is frozen.

For long duration storms, longer than 24 hours, maintenance personnel are to inspect the drainage facilities during the storm event to identify any developing problems and correct them before they become major problems.

1. Inspect all concrete gutters and drainage structures (catch basins and manholes) to ensure they are clear of debris and obstructions.
2. Inspect all pond berms for breaches. Immediately repair any berm breaches with native sandy soil, compacted in place.

The above noted storm related visual inspections are in addition to the maintenance schedules noted for each item.

4.10 Drainage Structures and Storm Pipes

Catch basins, weirs, outlet structures, pipes and manholes should be inspected every 3 months, or after every significant storm event ($\frac{1}{2}$ ") and/or snowmelt event, whichever is more frequent. Visually inspect the pipes, inlets and outlets, making sure they are clear of debris and checking that the pipe is in good condition, without breaks or cracks. If there is any obstruction present it should be removed immediately.

A flow test in the pipe can be used 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.

All catch basins should be cleaned (vacuumed) every 6 months.

4.20 '208' Swales/Detention Ponds

The swales/ponds should be inspected every 3 months, or after every significant rainfall and/or snowmelt event, whichever is more frequent. The ponds consist of an earthen depression constructed from native soils, enclosed within soil berms or existing grade.

Routine maintenance and inspections of the ponds will include removal of any accumulated debris, such as leaves, weeds and trash. Any obstructions, which would not allow water to flow freely into the pond, should be removed. Additionally, the pond berms should be inspected to ensure that they are in good repair and structurally sound.

5.00 Recommended Set-Aside Funds for Maintenance & Future Replacement Costs

There will be annual maintenance costs, major renovation costs and future replacement costs of the drainage facilities. The Spokane County, through the implementation of the Drain Water Accounts, will pass on these costs to the homeowners. Major renovation and future replacement costs have been converted to annual costs, in the form of recommended County set-aside funds. It is assumed that ¼ of the pipe, 5 catch basins, and 3 manholes will need to be replaced within 20 years.

The estimated annual maintenance costs and recommended annual set-aside costs are listed below in Table 5.00. It is recommended that Spokane County set-aside these funds annually to ensure that adequate maintenance and replacement measures of the drainage facilities will be implemented.

Table 5.00 - Maintenance and Future Replacement Costs

Facility	Annual Costs	Annual Set-Aside Funds for Future Replacement or Major Renovation ⁽¹⁾
Catch Basins, Manholes & Pipes	\$ 7,600	\$ 1,985
Grading of Gravel Maintenance Roads	\$ 312	\$ 0
Taxes	\$2,700	\$ 0
'208' Swales/Ponds	\$ 20,000	\$ 0
Sub-Total Annual Costs	\$ 30,612	\$ 1,985

Grand Total/year = \$ 32,597
Cost per lot/year = \$ 517.41 (63 lots)

Note: (1) Assume replacement in 20 yrs, with 4% inflation and a 6% rate of return on investments for Future Replacement set-aside account.

**Jesse's Bluff – 1st Addition-Revised
Sinking Fund Calculations
June 27, 2005**

List of Quantities

24" N-12 ADS Pipe	1,045 LF
18" N-12 ADS Pipe	1,046 LF
12" N-12 ADS Pipe	594 LF
10" N-12 ADS Pipe	418 LF
Manholes	13
Catch Basins/Outlet Structures	19
Gravel Road to Maintain	2,426 LF

Annual Costs

Each catch basin needs to be flushed 2 times per year. There are 19 CB's @ \$200/CB/Flush. The yearly cost for CB maintenance is $(19)(200)(2) = \$7,600$.

Each pond needs to be cleaned and maintained 2 times per year. A pond cleaning will cost \$2,000. The yearly pond maintenance cost is then $(5)(2000)(2) = \$20,000$.

The gravel maintenance roads will require grading 2 times per year. A grader can finish blade 2,640 LF/hr and is operated at a cost of \$170/hr. The yearly gravel road maintenance cost is $(2426/2640)(170)(2) = \$312$.

The total annual maintenance cost is then \$27,912.

The 2002 taxes for the entire parcel are listed as \$2,700.

Replacement Costs

In 20 years 1/4 of the pipe will need to be replaced along with the replacement of 5 CB's, 3 MH's and 1 pond liner.

Present Value Calculations

(1/4) of 10" HDPE is	$(418/4)(\$12/ft) =$	\$1,254
(1/4) of 12" HDPE is	$(594/4)(\$18/ft) =$	\$2,673
(1/4) of 18" HDPE is	$(1046/4)(\$25/ft) =$	\$6,538
(1/4) of 24" HDPE is	$(1045/4)(\$30/ft) =$	\$7,838
5 CB's	$(5)(1200) =$	\$6,000
3 MH's	$(3)(3000) =$	<u>\$9,000</u>
Total =		\$33,303

Future Value to Replace in 20 years (pipe, CB's and MH's)

$$(33,303)(2.1911) = \$72,970$$

Annual set aside for future replacement @ 6% (pipe, CB's and MH's)

$$(72,920)(0.0272) = \$1,985$$