COMPREHENSIVE BASIN REVIEW AND WATERCOURSE MONITORING

VOLUME I – MAIN REPORT

City of Mercer Island

in association with GeoEngineers, Inc.

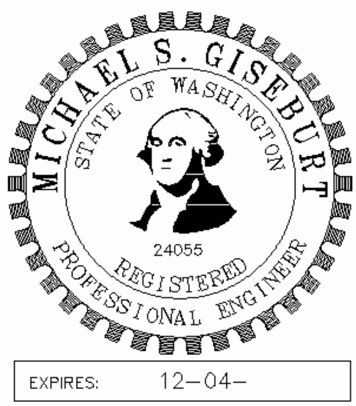
December 2006

CERTIFICATE OF ENGINEER

CITY OF MERCER ISLAND

COMPREHENSIVE BASIN REVIEW AND WATERCOURSE MONITORING

The technical material and data contained in this report were prepared under the supervision and direction of the undersigned, whose seal as a registered professional engineer licensed to practice as such in the State of Washington is affixed below.



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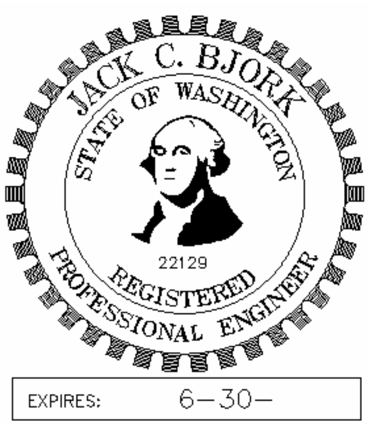

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COMPREHENSIVE BASIN REVIEW AND WATERCOURSE MONITORING

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EXECUTIVE SUMMARY

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Need for the Basin Review

This Comprehensive Basin Review (Basin Review) examines the City of Mercer Island's Storm and Surface Water Utility programs, focusing on capital needs, capital priorities, and utility policies. The need for this engineering and planning effort has increased in recent years for several reasons including:

- The need for a predictable long term Capital Improvement Program (CIP). The City has solved many of the more severe and well known watercourse/ravine problems since the creation of the Stormwater Utility in 1995. The City needs to identify where remaining problems are the worst, in particular the ravine erosion problems, and address these problems with future CIPs.
- The need for a standardized prioritization method so that when problems are identified, corrective actions can be ranked in a logical and consistent manner. This prioritization method should be simple, defensible, flexible, and easy to reproduce over time as new projects arise or additional information becomes available.
- The need for formalizing certain drainage policies that the City staff have historically used but have not been formally documented. Formalizing these policies will help define what is included in the CIP as well as manage day-to-day operation of the program.
- The need for a drainage system condition monitoring program to provide current information with which to reassess future CIP prioritization. For example, some erosion problems may worsen quickly while others are slowly worsening (e.g., those that have eroded down to hard pan and are less resistant to further erosion).

General System Description

Mercer Island is divided into four basins (north, south, east and west) and approximately 85 sub-basins (shown on Figure E-1 below). Within each sub-basin, storm water runoff is collected in some combination of public and/or private lateral and trunk storm drains, streets, gutters, and ditches and then conveyed to the Island's watercourses. The watercourses flow downslope through occasional roadway culvert crossings to Lake Washington. Many of the watercourses are located in ravines. The storm and surface water systems also include underground detention systems and stormwater treatment systems (for large parking lots such as at the Community Center). In addition, the City has also constructed a few high-flow bypass pipelines that convey high storm runoff around a ravine erosion problem area while allowing base flows to remain in the watercourse.

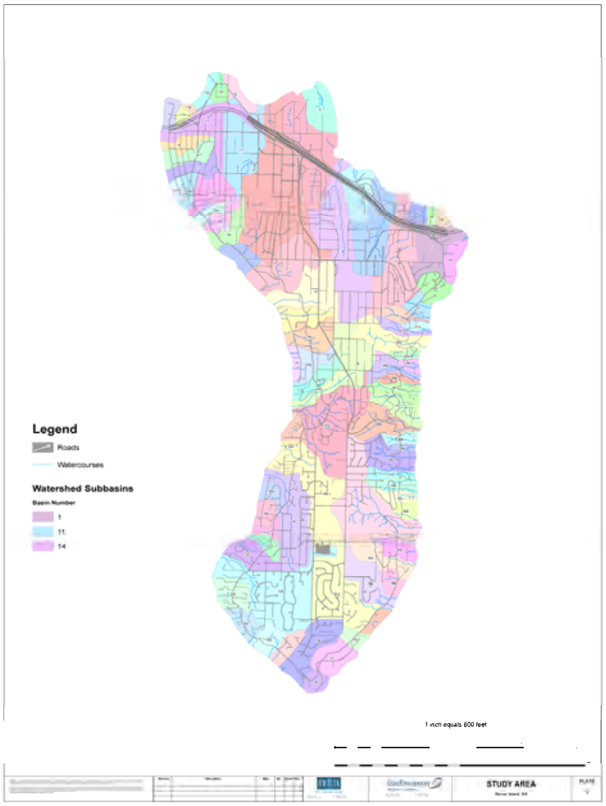

Figure E-1 Mercer Island Subbasins

There are many types of surface water problems that were generally found. While there do not appear to be any major recurrent flooding problems that result in significant property damage, there are pipe system problems that result in localized minor flooding during heavy rains. These involve both private and public substandard drainage systems that were installed long ago and which are either undersized, subject to root intrusion, inadequately maintained, or generally are in poor condition.

Several ravine watercourses are susceptible to streambank erosion and channel downcutting. Channel and streambank erosion occur where flow velocities are high and along sections in which the underlying geologic soils are more susceptible to erosion. Erosion in watercourses can result in environmental degradation, risks of damage to public and private property, and downstream sedimentation. The City has historically constructed capital improvements to address some of the worst ravine erosion problem areas.

Phased Basin Review Approach

Implementation of the Basin Review was conducted in a two-phased approach. Phase 1 included a high-level problem identification analysis and was based on a combination of interviews with City staff, review of previous documents, review and assessment of LiDAR-based topographic information, and very limited field reconnaissance. The problem identification was considered high level because it did not include detailed hydrologic or hydraulic modeling or extensive field investigations. The objective of the planning-level problem identification was to determine through a "desk top" exercise, the areas with high potential for drainage and erosion problems. Doing so allowed more efficient and cost effective direction of field work and investigation in Phase 2 to those areas as being the most severe. The Phase 1 work focused on ravine erosion problems along watercourses as well as drainage system (i.e., pipes and ditches) problems. Investigations to identify wetland, water quality, or fish habitat/passage problems were not included in this work.

The Phase 1 LiDAR analysis involved using good quality LiDAR (Light Detention and Ranging) topographic dataset obtained from Mercer Island's GIS. The objective of this analysis was to predict the susceptibility to erosion of any particular section of stream channel. Some of the factors that were considered in the analysis include stream gradient (slope), underlying geology, historical areas of erosion and landslide. These and other factors were quantified to determine an overall susceptibility ranking, which was categorized as “high”, “moderate”, or “low”.

Phase 1 also included an initial ravine erosion monitoring program. The City identified three specific erosion problem sites for periodic monitoring. The sites are located in sub-basins 26, 29, and 32b. The monitoring included taking measurements of the channel, and documenting how and where the measurements were taken. Future measurements can be taken in similar manner and the rate of erosion can be evaluated. Subsequently, as part of the Phase 2 effort, the Phase 1 sites were revisited in January 2006 and features were remeasured. During the course of the Phase 2 field investigations, several new locations were also identified that should be considered for future monitoring sites. Table 3-2 in the report (also presented below) lists these sites as well as the priority for implementation considering the observed severity of the problems.

Table 3-2
Recommended New Monitoring Sites

Problem No.	Suggested Priority for Implementation of Monitoring based on Field Investigations
45b.3	1
49b.4	2
29.2	3
52.1	4
51a.1	5
4.2	6
46.3	7
42.1	8
42.1a	9
42.3	10
42.2	11
46a.4	12
42.4	13
27a.3	14
46.2	15
49b.2	16
4.1	17

One of the main objectives of the Phase 2 effort was to carry the Phase 1 problem identification work forward and develop specific capital improvement projects (CIPs). There was insufficient budget available to investigate all of the Phase 1 projects in more detail, therefore the scope of the effort needed to be limited. For erosion-type problems, field investigations and problem solutions were conducted on those erosion problems categorized in Phase 1 as “high”. For drainage system problems, additional investigations (most often including TV’ing of pipe sections) were conducted on the systems of higher concern as determined by City staff. For these problems, solutions and conceptual cost estimates were developed.

In addition to this work, Phase 2 also included policy review and CIP prioritization. The policy review included working with the City’s Utility Board to formalize five of the most important policy areas selected by the City.

Basin Review Results and Conclusions

The major results include development of Capital Improvement Projects (CIPs), development of a CIP prioritization method, ranking of proposed CIPs using the prioritization method, and formalization of certain storm water policies. These results are discussed below.

Capital Improvement Projects

For both erosion and drainage system problems, "Project Summaries" were developed (in Appendix G). The "Project Summary" includes the following information:

- Sub-basin number, project number and title
- Problem description and a representative photo
- CIP description
- Related projects, if any
- Planning-level cost estimate
- Simple plan view graphic showing location and extent of CIP

Twenty seven (27) erosion CIP Summaries and six drainage CIP Summaries were developed. The planning level cost estimates include 30 percent contingency and an allowance for indirect cost such as surveying, design and permitting. The total cost for completing all of the CIPs is estimated to be approximately $6.3 million. The total cost for completing the erosion CIPs is $5.1 million and the total cost for completing the drainage CIPs is $1.2 million. Note that the cost for these watercourse erosion projects are only for solving problems identified in Phase 1 as "high". Additional future analysis of the problems identified in Phase 1 as "moderate" will result in additional projects. There were 40 locations where potential erosion problems in the "moderate" category were identified.

In general, these solutions should be considered preliminary for the purpose of estimating capital costs and defining priorities. As further investigations and design work proceeds on individual projects (such as field surveying and flow analysis), refinements to the projects and their estimated construction costs should be expected.

CIP Prioritization

The Basin Review team, City staff, and the City's Utility Board discussed criteria for prioritization of CIPs. With a documented process in place, it is possible to more clearly and objectively describe the merits of a particular project, and to explain and document to ratepayers and elected officials why one project gets built before another. Also, having this documented process will help to ensure that priorities are established in a consistent manner from year to year. The prioritization program includes a prioritization model in spreadsheet form. The model uses weighted evaluation criteria. The result is an effective model that scores how well the CIPs meet the criteria and gives an overall ranking or prioritization.

The criteria that were evaluated for each CIP project include the following:

- Magnitude of the problem (To help define the magnitude of problems, this criterion was further subdivided into separate criteria for risk to health and safety, risk to property, rate of degradation/project urgency, and the flows or size of the drainage area)
- Impact to water quality and stream habitat
- Cost effectiveness
- Special opportunity
- Reduction in maintenance and operation costs
- Neighborhood advocacy/complaints
- Permitting effort
- Overall project cost

The spreadsheet model is set up to automatically update the ranking when the scoring is modified. In this way, the City can update the prioritization as more information about problems becomes available or other problems arise. Using the prioritization method, a 6-year CIP implementation schedule was developed.

Six-Year Stormwater CIP (2007-2012)

	Estimated Cost (in thousands)					
Description	2007	2008	2009	2010	2011	2012
Medium/Large Basin Improvements						
Parkwood WC Stabil., trail improvement, and sewer replacement (45b.3)	$444					
Lakeview Highlands (29.1)	$95	$864				
Sub-Basin 26 Ph. 2 (26.1)		$50	$50	$961		
Basin Improvements/Conveyance System Replacement						
4905 EMW 18" culvert repl.(D47.1)	$243					
24" pipe replacement SE 65th St. btwn. 8010 and 8020 (D29.2)			$92			
7625 WMW culvert repl. (D32a.2)			$25			
EMW culvert replacements			$15	$185		
WMW culvert replacements				$15	$185	
Conveyance System Replacement 63rd Ave. SE from SE 24th St. to SE 27th St. (D15.4)						$585
Sub-basin 46a Ph. 2 conveyance				$15	$185	
Watercourse/Conveyance System Condition Assessments	$30		$30		$30	
4700 91st Ave. SE (Sub-Basin 49b.4)					$25	$175
4300 EMW WC Stabil. (Sub-Basin 52.1)					$10	$95
Neighborhood Drainage Improvements						
Annual Improvements	$50	$50	$60	$60	$70	$70
Total Per Year	$862	$964	$272	$1,236	$505	$925

Program Policies

The Basin Review documented and formalized several longstanding informal policies through discussion, input and review by the City's Utility Board. These formalized policies help define what is included in the CIP as well as manage day-to-day operation of the City's stormwater program.

The key policy issues that were identified with City staff and evaluated include:

- CIP prioritization
- Erosion, easements, and regulatory compliance
- Fee-in-lieu of detention
- Maintenance easements for storm water facilities on private property
- Filling of roadside ditches

The specific recommendations are discussed in Section 6.

Additional Recommendations

In addition to the results described above, additional recommendations are included concerning future field evaluations and monitoring. The City should continue and expand erosion problem monitoring to provide additional data that can be input into the prioritization model and to make decisions on CIP implementation.

The City should continue to investigate drainage systems (summarized on Table 5-4) to identify and correct problems. Special emphasis should be placed on inspection and monitoring of the East Mercer Way and West Mercer Way culverts because these are critical structures.

Finally, the City should continue investigation of erosion problems categorized as "moderate" in Phase 1 (shown on Plate 3 and Table 4-1). Due to limited resources, only the "high" category problems were investigated as part of this project, but as additional resources become available, the City should continue investigations of other ravines noted as having susceptibility for erosion.

Section 1

INTRODUCTION

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1.1 Purpose

This Comprehensive Basin Review (Basin Review) examines the City of Mercer Island's Storm and Surface Water Utility programs, focusing on capital needs, capital priorities, and utility policies. The need for this engineering and planning effort has increased in recent years for several reasons including:

- The need for a predictable long term Capital Improvement Program (CIP). The City has solved many of the more severe and well known watercourse/ravine problems since the creation of the Stormwater Utility in 1995. The City needs to identify where remaining problems are the worst, in particular the ravine erosion problems, and address these problems with future CIPs.
- The need for a standardized prioritization method so that when problems are identified, corrective actions can be ranked in a logical and consistent manner. This prioritization method should be simple, defensible, flexible, and easy to reproduce over time as new projects arise or additional information becomes available.
- The need for formalizing certain drainage policies that the City staff have historically used but have not been formally documented. Formalizing these policies will help define what is included in the CIP as well as manage day-to-day operation of the program.
- The need for a drainage system condition monitoring program to provide current information with which to reassess future CIP prioritization. For example, some erosion problems may worsen quickly while others are slowly worsening (e.g., those that have eroded down to hard pan and are less resistant to further erosion).

The Basin Review is intended to provide guidance for erosion and drainage system CIP planning over the next ten to twenty years, and to provide the City with the prioritization tools and methods for use when updating the prioritization of CIPs.

The Watercourse Monitoring elements of the project are intended to identify and implement approaches to physical monitoring of selected ravines suspected of ongoing erosion problems. In this way, data can be collected to assess the rate at which erosion problems are becoming worse. This can provide valuable information for determining CIP priorities.

1.2 Scope

Implementation of the Basin Review and Watercourse Monitoring was conducted in a two-phased approach. Phase 1 was completed in December 2004 ("Comprehensive Basin Review and Watercourse Monitoring – Phase 1", R.W. Beck, December 2004). Phase 1 is documented within this report in Sections 2, 3, and 4. Phase 1 included data review, conducting interviews with City staff and a LiDAR/GIS mapping assessment (described in detail in Section 3) with limited field work to identify and characterize drainage problems as well as provide initial investigations toward the watercourse monitoring. Phase 1 also included the development of planning level cost estimates to solve these problems. The focus of the Phase I work was on drainage system and watercourse (ravine) erosion problems for the development of CIP projects. Erosion problems identified in Phase 1 were classified into three categories: "high", "moderate", and "low". Investigations to identify wetland, water quality, or fish habitat/passage problems were not included in this work.

The Phase 2 effort is also summarized in this report in Sections 5, 6, and 7. Phase 2 included supplemental field and technical work to more specifically define the type and extent of the improvements and the costs for the erosion CIP projects in the "high" category in Phase 1. Phase 2 also included the identification of drainage system CIPs to the extent that information was available based on City-conducted conveyance system (pipe/culvert) inspections and "TV'ing" to assess the condition of the several systems identified as potential problems in Phase 1. The available data was used to recommend appropriate drainage system CIPs where possible. Investigations to identify wetland, water quality, or fish habitat/passage problems were not included in the Phase 2 work.

In addition to this work, Phase 2 also included policy review and CIP prioritization. The policy review included working with the City's Utility Board to formalize five of the most important policy areas selected by the City.

Section 2

STUDY AREA DESCRIPTION

Section 2
STUDY AREA DESCRIPTION

2.1 Drainage System

Mercer Island is divided into four basins (north, south, east and west) and approximately 85 subbasins[1]. Within each subbasin, storm water runoff is collected in some combination of public and/or private lateral and trunk storm drains, streets, gutters, and ditches and then conveyed to the Island's watercourses. The watercourses flow downslope through occasional roadway culvert crossings to Lake Washington. Many of the watercourses are located in ravines. The storm and surface water systems also include underground detention systems and stormwater treatment systems (for large parking lots such as at the Community Center). In addition, the City has also constructed a few high-flow bypass pipelines that convey high storm runoff around a ravine erosion problem area while allowing base flows to remain in the watercourse. The storm and surface systems also include detention basins and energy control structures.

Many areas of the island were developed before stormwater controls were implemented which has resulted in increases in the volume of stormwater runoff and peak flow rates to watercourses.

2.2 Geology

Geology is a major factor in determining the nature of the Mercer Island drainage basins. Like most of Puget Sound, the geology of Mercer Island is dominated by glacially-derived sediments. In the following paragraphs, the geology of the island will be described beginning from the oldest unit and going to the most recent unit.

Prior to the last phase of glaciation, fine grained silt was deposited, forming a dense, erosion-resistant, low permeability unit which probably underlies the island. This unit is called the Transitional beds (Qtb) because it was deposited in a transitional time between phases of glaciation. As an abbreviation Q is used to denote the Quaternary Period and tb is used to denote Transitional beds. This unit is present on the west and southeast shorelines of the island (Plate 2).

As the glaciers advanced from the north during the Vashon glaciation, sand and gravel were deposited over the Transitional beds. This unit is called advance outwash (Qva or Quaternary Vashon advance outwash). Although this unit was overridden by the glaciers and can stand vertically, it is susceptible to erosion and created many of the

[1] There are 54 numbered subbasins, some of which have multiple designations (i.e., 39a, 39b, etc.), for a total of 85.

erosion problems on the island. Furthermore, since it overlays the low permeability Transitional beds, advance outwash tends to collect groundwater and be subject to slope movement. Many of the slides on the island lie at the base of the advance outwash.

The material laid down directly under the glacier is till (Qvt). This unit forms a rolling cap which covers the top ¾ of the island and consists of a dense mixture of silt, sand and gravel. Because of its content and density is relatively resistant to erosion and sliding.

As the glaciers retreated, deposits of sand and gravel (Qvr) were laid down. This surface unit is present on the east shoreline and parts of the commercial district and is susceptible to erosion. Other mapped units include alluvium (Qyal) and modified soil/fill (m). These two units cover small areas.
Plate 2 shows the geology, landslide areas, watercourses, and major roads on Mercer Island.

Section 3

PHASE 1 PROBLEM IDENTIFICATION AND RESULTS

Section 3
PHASE 1 PROBLEM IDENTIFICATION AND RESULTS

This section contains a description of the methodologies used in the problem identification for Phase 1 as well as the approach to watercourse monitoring. This section also contains a summary of the problems identification results.

3.1 General Methodology

Drainage system and ravine erosion problem identification was conducted at a high-level for the Phase 1 analysis and was based on a combination of interviewing City staff, review of previous documents, LiDAR review and assessment, and limited field reconnaissance. The problem identification was considered high level because it did not include detailed hydrologic or hydraulic modeling or extensive field investigations. The objective of the planning-level problem identification was to determine the areas with high potential for drainage and erosion problems. Doing so provided multiple benefits. First, this information was later used to focus a more detailed evaluation of problem areas in Phase 2 to those problems that are more severe. Second, the information was used to estimate order of magnitude costs for capital improvements. Third, the information was used to evaluate policy decisions on where to focus the funding of the City's stormwater program, such as whether the City should correct all know erosion problems or focus on the most severe.

This work focused on ravine erosion problems along watercourses as well as drainage system (i.e., system of pipes and ditches) problems. Investigations to identify wetland, water quality, or fish habitat/passage problems were not included in this work.

3.2 Interviews with City Staff

Interviews were conducted with current and former City maintenance staff (Jerry Judd and Jerry Meier) at two meetings. The interviews were conducted to collect unpublished information and to compile information regarding current and past erosion and drainage system problems. The following paragraph provides a general description of the information gathered. Specific information about individual problems is included in Table 3-3 for erosion problems and Table 3-4 for drainage system problems.

There are many types of surface water problems that were generally found within the City. While there do not appear to be any major recurrent flooding problems that result in significant property damage, there are pipe system problems that result in localized minor flooding problems. These include both private and public substandard drainage systems that were installed long ago and which are either undersized, subject to root intrusion, may not be well maintained, or generally are in poor condition. In many cases private drainage systems are not well-maintained, and this can cause problems for the private systems as well as for the upstream public systems. In some cases, the private property owner may not be aware that problems exist within the private system. Some areas lack a formal drainage system, and in other areas, trashracks and culverts become clogged with debris, leaves and sediment. Furthermore, as a result of undersized drainage system components, the velocities in culverts or watercourses may be high and cause erosion. Steep channels throughout the City are susceptible to erosion and downcutting. Headcutting and sloughing also occur within the channels. Channel and streambank erosion occur where velocities are high. Bank failure and sediment deposition were also identified as problems throughout the City.

Following large storm events, City maintenance staff routinely discover new problems that need to be addressed.

3.3 Data Review

The City provided available drainage and utility documents for review. Several documents were provided that date back to the mid 1970s when comprehensive stormwater planning first began at the City. In more recent years, the City has conducted separate subbasin plans. These subbasin plans provided the most detailed account of drainage problems and were the focus of the data review. They included:

- Drainage Basin Evaluation - Basin 21 (Channel Stabilization Downstream of West Mercer Way), Harding Lawson Associates for City of Mercer Island, July 1998, Technical Memorandum.
- Drainage Basin Evaluation - Basin 26 (West Basin), CH2M Hill for City of Mercer Island, December 3, 2003, Technical Memorandum.
- Basin 29 Watercourse Stabilization and Rehabilitation - Preliminary Engineering Report. City of Mercer Island. February 2000. CH2M Hill. Draft Report.
- Basin 29 High Flow Bypass Pipeline and Stream Restoration, Final Design Report. CH2M Hill for City of Mercer Island. June 2001.
- Basin #32B - Drainage Basin Study, The McAndrews Group, Ltd., for the City of Mercer Island, November 2000.
- Basin #42 - Drainage Basin Study, The McAndrews Group, Ltd., for the City of Mercer Island, December 2000.
- Drainage Basin Evaluation - Basin 45b (East Basin), CH2M Hill for City of Mercer Island, December 9, 2003, Technical Memorandum.

3.4 LiDAR and GIS Ravine Analysis

3.4.1 Background and Data Sources

The City has benefited in this Ravine Analysis from the availability of a good quality LiDAR (Light Detection and Ranging) dataset obtained from King County and the Puget Sound Regional Council. The LiDAR was used to generate several derivative layers that support the analysis, including hydrographic flow direction, hill-shading, slope gradients and slope curvature. The analysis was also facilitated by several key GIS layers provided by the City's GIS coordinator which showed:

1. the City's stormwater conveyance system (originally an AutoCAD file);
2. impervious surfaces;
3. watercourses;
4. culverts and pipes;
5. historic landslides (where known); and
6. building footprints.

3.4.2 Analysis Objective

The objective of this analysis was to predict the susceptibility to erosion of any particular section of stream channel and to quantify that susceptibility as "high", "moderate", or "low". In order to do this, team geologists developed a predictive formula that considers a number of critical physical factors that contribute to the erosion process in the ravines. This was done by dividing each factor into categories and assigning a weight (or score) for each category. For example, the category of "Landslide in vicinity" was assigned a "yes" category with a weight of 5 and a "no" category with a weight of 0. The relative weights between categories were assigned by professional judgment of team geologists and from some sensitivity analysis. An additional factor was included that took into account known erosion problems area based on City staff input. These factors were then quantified to determine an overall susceptibility ranking.

3.4.3 Susceptibility Factors

The areas of potential erosion problems, as well as their severity, were identified using LiDAR and GIS information without performing significant field reconnaissance of the Island.

The key factors deemed to most influence the degree and susceptibility to erosion, and their relative importance (weighting) are tabulated below:

Table 3-1
Susceptibility Factor Weighting

Factor	Description	Categories	Weighting
Permeability	The City provided a layer showing areas of impermeability. No erosion takes place in these areas.	Yes No	1 0
Known areas of erosion	Areas known by the City to suffer from erosion.	Yes No	5 0
Geology	Main geological units from Dept. of Natural Recourses.	Till Outwash Transitional beds	2 10 5
Landslide in vicinity	Areas of landslide with a 50' zone. Contributes a weight of 5 if intersected by a stream.	Yes No	5 0
Degree of slope (stream gradient)	Gradient of the stream as determined by calculation from LiDAR data.	<15 15-30 30-40 >40	0 2 5 7
Degree of curvature	Rate of change of the gradient (slope of the slope).	+1 +2	2 5
Outfalls	If onto outwash units, 5; transitional beds, 3. No consideration for condition of outfall.	If yes Outwash Transitional Beds	5 3
Knickpoints	Identified as short, sharp gradients in the stream of greater than 100%.	Yes No	35 0

3.4.4 Detailed Methodology

The methodology applied to derive the measure of a stream channel's susceptibility to erosion comprised a sequence of steps using multiple GIS data layers, some of which already existed, and some of which were derived through this analysis. Those sequential steps are summarized below:

1. The Puget Sound Regional Council's LiDAR raw elevation data set was interpolated to a 3-foot-square grid covering the entirety of Mercer Island to create a digital terrain model (DTM). According to the PSLC statement accompanying the data, the mapping has vertical accuracy on the order of one foot. Locally (i.e., within isolated areas within the data), the data may be of poorer quality. In areas of dense vegetation, LiDAR ground data points may be further apart than the 3-foot-square grid resolution used for this study, and consequently the surface interpolated between the points may be more uneven

than represented by the surface model. Despite these caveats, the data remains a very good source of elevation data for a study of this kind.

2. A combination of two data sets was required to create a master layer that showed the watercourses which are subject to erosion, and that was used to tabulate the various erosion factors. First, the island's hydrography was derived from the DTM derived in the step described above. This layer was then compared with a second layer, the City's stormwater conveyance system layer. The hydrography was modified appropriately where stormwater is piped or conveyed by other than watercourses. The resulting layer is the master layer used to evaluate erosion susceptibility factors.

3. Landslide data were compiled as a combination of documented historic landslide events provided by the City and areas of subject to landslides, as interpreted by a geologist from the DTM.

4. Slopes (channel and land gradients) were derived from the DTM.

5. Curvature was derived from the DTM.

6. The outfall layer was created to represent the downstream end of road culverts for the ravine watercourses. Only those culverts relevant to the ravine watercourses were represented.

7. By definition, a knickpoint is an interruption or break in slope; especially an abrupt change in the longitudinal profile of a watercourse. For the knickpoint layer in this study, a threshold of 200 percent over a minimum horizontal distance of about 12 feet was initially used to try to define those places along a creek bed where it is likely subject to more aggressive erosion. However, at this threshold, no areas were identified. As a second attempt, at a threshold of 100 percent over a minimum horizontal distance of about 12 feet was used. The resulting analysis showed numerous areas along a creek bed where it is likely subject to more aggressive erosion. These inflection points were derived from the slope layer. Visual observation of the DTM and review of the gradients suggests that additional knickpoints exist along some streams but, because they did not meet the 100 percent steepness threshold over this length, they were not identified in the analysis. This assertion is supported by observation of the slope model and the failure of the stream to reduce its gradient profile to the local norm. The explanations for this can be that: (a) the stream has encountered a particularly resistant layer and cannot easily cut back further, or; (b) it has encountered a unit tends to stand tall until undercut and then collapses (like the till). This latter type represents an active erosion point of potential concern. Knickpoints were given a stand-alone weighting of the maximum (35) to ensure they were included as "high" erosion areas, even if other factors did not put them in that category. Some refinement in the slope/distance threshold may improve the knickpoint identification.

8. The final analysis with these combined data sets involved superimposing each of the layers shown on Table 3-1 above and attributing creeks with their numerical values (weightings). This involved summing the weighted values

for each factor along the line of each watercourse to arrive at the numerical totals along the line of the watercourse (which are symbolized on Plate 3). The values are cumulative so that the higher the value, the more susceptible to erosion is that section of the watercourse. The impervious surface GIS layer was used to negate all values where erosion is deemed unlikely. The result is that the numerical classification applies only to drainages on pervious surfaces.

9. Results are classified into the categories “high”, “moderate”, and “low” based approximately on standard deviations from the mean:

	Category	Score
>X+2s	High	> 30
X+1s – X+2s	Moderate	18 – 29
>X+1s	Low	< 18

Those creek sections included in the “High” category are identified on the map as separate clusters which are grouped based on proximity. They are labeled on the map using a numbering convention that uses the basin number as a prefix, followed by a period separator, followed by sequentially numbered suffix to designate separate groupings. Numbering begins at the downstream end of the mainstem and progresses upstream, then following with any tributaries, again progressing sequentially from the downstream end. In some cases, the cluster may include some sections of “Moderate” susceptibility, for example, if a short section of “Moderate” susceptibility lies between two “High” susceptibility clusters.

It should be noted that geology has a large influence on the streambed susceptibility to erosion. The spatial resolution of the Department of Natural Resource’s digital geology map is at a small, regional scale. Based on our field reconnaissance, the accuracy and resolution of the geology can be improved by re-interpreting the location of geological contacts relative to the topography. This refinement would likely result in additional watercourse sections being classified as “high”.

3.5 Watercourse Condition Monitoring

3.5.1 Baseline Field Monitoring

During Phase 1, the City identified three specific erosion problem sites for periodic monitoring. The sites are located in subbasins 26, 29, and 32b. Two members of the project team, a geomorphologist from GeoEngineers and a hydraulic engineer from R. W. Beck, visited the three sites on November 16, 2004, to evaluate the erosion problems. A monitoring plan was then developed for each site. Each monitoring plan was developed to meet the following objectives:

1. Define the problem explicitly.
2. Recommend appropriate tasks and measurements to document the progress or change of the problem.

3. Choose a method that allows City staff to perform the future monitoring without additional training.
4. Comparison of baseline and future monitoring results is intended to provide evidence as to whether or not the problem is worsening.

The monitoring plans for each site are presented in separate memoranda in Appendix C-1. Each memorandum includes a discussion of the following information:

1. Description of the specific erosion problem being monitored.
2. Site location and access.
3. A description of the measurement locations and other specifics regarding the measurements.
4. The locations of fixed nails and pins.
5. Guidelines for interpreting future monitoring observations and measurements.
6. Photographs of each site including close-ups of important features.
7. Two sketch maps for the site: a plan view and an oblique view map showing locations of baseline measurements and photo reference numbers.

Subsequently, as part of the Phase 2 effort, the sites were revisited in January and October 2006 and features were remeasured. The monitoring measurements and results for each site are presented in Appendix C-2. The second and third sets of results are presented in tabular form that can be added to for future measurements.

During the course of the Phase 2 field investigations, several new locations were also identified that should be considered for future monitoring sites. These sites are listed on Table 3-2 and were generally selected because the erosion problems tended to be more severe and/or it appeared the area was more actively eroding. Table 3-2 also provides a recommended priority of these sites based on these same considerations.

Table 3-2
Recommended New Monitoring Sites

Problem No.	Suggested Priority for Implementation of Monitoring based on Field Investigations
45b.3	1
49b.4	2
29.2	3
52.1	4
51a.1	5
4.2	6
46.3	7
42.1	8
42.1a	9
42.3	10
42.2	11
46a.4	12
42.4	13
27a.3	14
46.2	15
49b.2	16
4.1	17

Sites Already Being Monitored

Problem No.
26.1
29.1
32.5

3.5.2 LiDAR Monitoring

The 2002 LiDAR Digital Elevation Model (DEM) provides good baseline topography over the whole of the island and, in particular the ravines. Future comparison of a LiDAR DEM map against the 2002 baseline DEM could provide an effective means for detecting changes in the ravine slopes, and watercourses. Using two separate LiDAR images, GIS routines can be developed that compare and identify locations where changes of a certain specified vertical distance (e.g., one foot) have occurred. This could provide helpful data in evaluation erosion activity.

While future LiDAR monitoring can be very efficient because it is an in-office digital exercise as opposed to field work, some caution should be exercised. While the field work performed in Phase 2 of this study found general concurrence with the Phase 1 LiDAR analysis, there were also deviations where field observations showed erosion either more or less severe and/or the extent of problem locations was varied. New geologic mapping will be available in 2006 that will increase the reliability of future LiDAR analysis. In summary, the City should weigh the cost of future LiDAR analysis with what could be accomplished in field observations.

3.6 Watercourse Erosion Problems

The LiDAR and GIS ravine analysis identified potential erosion problems within basins. As described earlier in this section, the problems are defined primarily by assigning various weighting values to features/characteristics in GIS data layers such as geology, slope gradient, topographic curvature (inclination), known landslides, culverts, and drainage outfalls.

The watercourse erosion problems identified in this analysis are shown on Plate 3 and listed on Table 3-3. Each problem is assigned a unique number which starts with the subbasin number and then is followed by a problem number. Problems are numbered sequentially within each subbasin. The table shows the tabulation of the susceptibility factors, as well as problem type and length. The erosion problems identified by the analysis are grouped into five categories which are listed on Table 3-3: 1) streambed knickpoints, 2) outfall erosion, 3) landsliding exacerbated by streambank erosion, 4) landsliding driven by external factors (unstable slopes, road cuts, ground water seeps in granular slope soils), and 5) streambed and bank erosion. Descriptions of these erosion categories are:

- A **streambed knickpoint** is a vertical step with a plunge pool scoured in the streambed. As water cascades over the lip of the knickpoint, the plunge pool, and the face of the step erode further, causing upstream retreat of the face. Knickpoints typically form in channels underlain by erosion-sensitive soils, such as advance outwash. However, they can form in virtually any soil type including those more resistant to erosion such as till and transitional beds. Unless mitigated, the upstream propagation of the knickpoint will result in systemic lowering of the channel floor.
- The **outfall erosion** category refers primarily to road culverts, although the category can also pertain to stormwater pipe outfalls. Erosion at outfalls typically occurs in two scenarios: 1) confined flows exiting the culvert at high velocities, and 2) improperly designed or constructed culverts and pipes. For both scenarios, outfall erosion typically includes formation of a plunge pool immediately downstream of the outlet, severe bank erosion and possibly channel widening. Where bank erosion is severe, destabilization of the ravine can occur, resulting in small to moderate landslides depending on the extent of the bank erosion. The outfall erosion category does not include non-culvert storm outfalls. Review of the available Mercer Island drainage system

mapping indicates that few stormwater pipe systems outfall onto ravine slope soils above the ravine watercourse. In actuality, there are likely several drainage systems, particularly smaller ones such as individual house roof leaders that discharge to the upper portion of a ravine that can be a source of erosion.

- **Landslides** identified on Mercer Island fall into two major types: 1) relatively small, shallow failures caused by localized stream bank erosion, and 2) large failures caused by regional conditions. Type 1 landslides are caused, and/or exacerbated by streambank erosion, which effectively removes toe support of lower ravine slope soils. These failures contribute sediment to the stream, which is typically deposited downstream of the landslide. Depending on downstream channel conditions, the deposited sediment may cause aggradation of the streambed. Aggradation typically results in decreased channel flow area, which in turn can cause increased frequency of flooding. In addition to flooding, channel floor aggradation can cause moderate to severe stream bank erosion and channel widening. Type 1 landslides are included as candidates for CIP projects (see Section 4).

  Type 2 landslides are driven by regional scale conditions such as unstable soils, ground water seepage, and mechanical disturbances that destabilize ravine slopes (e.g., road cuts and improper discharge of stormwater runoff). These features are typically large, and can involve entire sections of a ravine. The movement of Type 2 landslides into a stream channel typically results in the diversion of the channel around the slide and severe erosion along the opposite bank. Similar to the Type 1 slides, eroded sediment is subject to downstream transport and deposition. Type 2 landslides are not included in the CIP project development at this time.

- **Streambed and bank erosion** within most streams on the island is caused by a combination of factors including geology and soil type, channel gradient, and increased peak flows resulting from urbanization and previous stormwater control practices. The erosion is most notable in drainages dominated by glacial outwash soils. However, erosion-resistant transitional beds are also subject to erosion, particularly in densely developed basins. Streambed erosion identified in the analysis typically reflects potential channel downcutting.

High and moderate erosion potential problems are shown on Plates 3 and 4. High erosion potential areas include several types of erosion problems: channel headcutting, outfall erosion, landsliding exacerbated by streambank erosion, and landslides. A representative example of a high erosion potential problem area is that provided at the monitoring site in subbasin 26, where an approximately 6-foot-high knickpoint is migrating upstream. As the knickpoint moves upstream, it leaves behind a wider, deeply incised channel. Moderate erosion potential areas typically consist of streambank and channel incision erosion. Moderate erosion potential areas include stream sections with outwash soils and channel gradients from 1 to 3 percent.

3.7 Drainage System Problems

Table 3-4 lists the drainage system problems (or drainage systems of concern/substandard) identified by current and former City staff. These problems are also shown on Plate 4. Drainage problems are numbered sequentially within each basin. Each problem is assigned a unique number which is preceded by a “D”, followed by the subbasin number, and then a problem number. The “D” is used to distinguish drainage problems from erosion problems. This plate also includes the watercourse erosion problems as described in Section 3.6.

Some of the problems listed on this table and shown on the figure are twenty-five (25) “hot spots” which were identified by City staff as areas that require attention during storm events in order to prevent flooding. These are listed as a general problem on Table 3-4. An example, of a “hot spot” would be a drainage system inlet where the inlet (or inlet grates) has been more historically susceptible to becoming clogged with leaves and/or other debris if left unattended during a major storm.

Table 3-3
Phase 1 - High Erosion Potential Areas

Basin #	Problem No.	Total Value[1]	Susceptivity Value[2]	Geology[3]	Nickpoint	Convexity	Stream Gradient	Known Slide[4]	Outfall	Known Problem[5]	Problem Classification Type	Supplemental Information, if available (City input/prior documents)	Approximate Length (ft)[6]
4	4.1	30	30	Qva			> 40%	yes		Erosion Downcutting	streambed and back erosion/channel confined by large	Upstream of erosion problem, there is hardpan. A small sediment pond exists at the downstream end of this water course, before it crosses under I-90.	12
4	4.2	49	14	Qvt	yes		30 - 40%	yes			streambed and back erosion/channel confined by large landslide		42
6	6.1	52	17	Qvt	yes		> 40%	no		Erosion Downcutting	knick point and incision	Follows is a general discussion of Basin #6. Two branches join prior to crossing under I-90. Around 1996-1997 City installed instream channel armoring/sandbags/check dams in the longer easterly branch. The shorter western branch where problem 6.1 is located was piped. Construction involved highline type operations. The watercourses join at a sediment pond. WSDOT had previously maintained the sed pond excavating out 1-2 truck loads/yr. City now does it and took out 60 yrds in 2003. The system has been improved but the improvements needs to be inspected.	52
6	6.2	39	4	Qvt	yes		0 - 15%	no			knick point		47
10	10.1	39	4	Qvt	yes		0 - 15%	no			knick point		65
10	10.2	47	12	Qvt	yes	21.1 - 37.5	15 - 30%	no			knick point and incision		27
10	10.3	39	4	Qvt	yes		0 - 15%	no			knick point		85
23	23.1	53	20	Qtb	yes		> 40%	no	yes		knick point at outfall	Problem previously solved by armoring in 2004	14
26	26.1	52	17	Qvt	yes		> 40%	no		Erosion Downcutting	knick point		11
27a	27a.1	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	streambed and back erosion	City staff reported erosion along water course. Main problem appears to be downcutting.	3
27a	27a.2	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	streambed and back erosion	City staff reported erosion along water course. Main problem appears to be downcutting.	12
27a	27a.3	50	15	Qtb	yes		> 40%	no			knick point	City staff reported erosion along water course. Main problem appears to be downcutting. This is the main problem reach in this basin. A general comment about basin 27 is that there has been exposed sewer along certain reaches. Historically, City has had to repair some damaged sewers along watercourse.	13
27a	27a.4	30	30	Qva		21.1 - 37.5	> 40%	no	yes		Outfall Erosion	Although identified by LiDAR/GIS analysis, this is not considered a problem because system is piped to the pond in this area.	2
27a	27a.5	47	12	Qvt	yes		> 40%	no			knick point	Although identified by LiDAR/GIS analysis, this is not considered a problem because system is piped with a low flow creek.	32
29	29.1[7]	30	30	Qva			> 40%	no	yes	Erosion Downcutting	Outfall Erosion/streambed and back erosion	The stream channel in Basin 29 watercourse has been downcut, causing bank failures in several locations. This has contributed to increasing sediment deposition within the stream and at the outlet to Lake Washington. The ravine slopes have undergone slides and active slope movement causing problems to the homeowners at the top of the ravine. CH2M has done a preliminary design report for a high flow bypass. City wants to construct in 2007. The distance measured by the LiDAR/GIS analysis for this basin for severe erosion is likely under estimated.	40
29	29.2[7]	57	22	Qva	yes	4.7-21	> 40%	no			knickpoint/streambed and back erosion	See note above.	50
38	38.1	30	30	Qva		21.1 - 37.5	> 40%	yes		Substandard System	streambed and back erosion	Although identified by LiDAR/GIS analysis, this is not considered a problem because system has been piped.	11
38	38.2	30	30	Qva		21.1 - 37.5	> 40%	yes			streambed and back erosion	Although identified by LiDAR/GIS analysis, this is not considered a problem because system has been piped.	5
38	38.3[7]	47-60	25	Qva	yes		> 40%	yes			knick point and incision	Although identified by LiDAR/GIS analysis, this is not considered a problem because system has been piped.	67
39a	39a.1[7]	30-35	30	Qva			> 40%	yes	yes		Outfall erosion and streambed and back erosion		7

Table 3-3
Phase 1 - High Erosion Potential Areas

Basin #	Problem No.	Total Value[1]	Susceptivity Value[2]	Geology[3]	Nickpoint	Convexity	Stream Gradient	Known Slide[4]	Outfall	Known Problem[5]	Problem Classification Type	Supplemental Information, if available (City input/prior documents)	Approximate Length (ft)[6]
42	42.1	30	25	Qvr		21.1 - 37.5	15 - 30%	yes		Erosion Downcutting	Toe erosion, landsliding and streambed and back erosion	Erosion of ravines. City performed instream bank stabilization, check dams, and gabions on different sections, as well as planting on banks. and constructed sediment vault. Improvements have helped but monitoring recommended.	5
42	42.2[7]	30-65	30	Qva		21.1 - 37.5	> 40%	yes		Hot Spots/Erosion Downcut	streambed and back erosion/channel confined by large landslide	same as above	110
42	42.3[7]	30-35	30	Qva			> 40%	yes		Erosion Downcutting	streambed and back erosion	same as above	67
42	42.4	57	22	Qvt	yes		> 40%	yes		Erosion Downcutting	knick point	same as above	12
42	42.5[7]	55	20	Qvr	yes		> 40%	no			knick point	same as above	46
42	42.6	60	25	Qva	yes		> 40%	yes			knick point	same as above	33
42	42.7[7]	30	30	Qva		21.1 - 37.5	> 40%	yes			streambed and back erosion	same as above	16
42	42.8[7]	30	30	Qva		21.1 - 37.5	> 40%	yes			streambed and back erosion	same as above	19
42	42.9[7]	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	streambed and back erosion	same as above	16
42	42.10	47	12	Qvt	yes		> 40%	no			knick point	same as above	17
44b	44b.1	30	30	Qva		21.1 - 37.5	> 40%	no	yes		Outfall Erosion		1
44b	44b.2	30	30	Qva		21.1 - 37.5	> 40%	no	yes		Outfall Erosion	City staff considered this problem to be solved	0
45b	45b.1[7]	30-60	25	Qva	yes		> 40%	no		Erosion Downcutting	knick point/streambed and back erosion	Considered minor erosion by City staff. Near East Mercer Way and Private Road, Minor channel downcutting was observed and a slow slide was observed on the southern embankment. During discussions with City staff, this section of channel was considered ok.	17
45b	45b.2	47	12	Qvt	yes		> 40%	no			knick point		41
46a	46a.1	39	4	Qvt	yes		0 to 40%	no			knick point/streambed and back erosion		87
46b	46b.1	52	17	Qvt	yes	21.1 - 37.5	> 40%	no			knick point and incision		61
47	47.1	47	12	Qvt	yes		> 40%	no			knick point		21
48	48.1[7]	47	12	Qvt	yes		> 40%	no		Problem Solved	knick point and incision		25
49b	49b.1	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	streambed and back erosion		12
49b	49b.2	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	streambed and back erosion		3
50b	50b.1	30	30	Qva		21.1 - 37.5	> 40%	no	yes		Outfall Erosion		4
50b	50b.2	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	streambed and back erosion	The LiDAR GIS analysis identified a less than 1 ft section of severe erosion. This location is in a long reach of moderate erosion (i.e, very dominated by moderate erosion) and therefore not considered a severe problem.	1
50b	50b.3[7]	55-67	20	Qva	yes		> 40%	no			knick point		83
50c	50c.1[7]	30	30	Qva			> 40%	no	yes	Erosion Downcutting	Outfall Erosion/streambed and back erosion	Some erosion problems below East Mercer Way in this watercourse	5

Table 3-3
Phase 1 - High Erosion Potential Areas

Basin #	Problem No.	Total Value[1]	Susceptivity Value[2]	Geology[3]	Nickpoint	Convexity	Stream Gradient	Known Slide[4]	Outfall	Known Problem[5]	Problem Classification Type	Supplemental Information, if available (City input/prior documents)	Approximate Length (ft)[6]
50c	50c.2	30	30	Qva			> 40%	yes		Erosion Downcutting	streambed and back erosion	Some erosion problems below East Mercer Way in this watercourse	6
50c	50c.3	30	30	Qva		21.1 - 37.5	> 40%	yes			streambed and back erosion	Some erosion problems below East Mercer Way in this watercourse	1
51a	51a.1[7]	30-35	30	Qva			> 40%	no	yes	Erosion Downcutting	Outfall erosion and streambed and back erosion	Some erosion problems below East Mercer Way in this watercourse	36

Explanation:

[2]**Suscept val:** Susceptibility value that represents the modeled value for erosion potential susceptibility that includes factors of geology, erodibility, convexity, slope %, and presence of landslides.

[1]**Total Value**: Total value that equals the Susceptibility value plus a knick point factor (35 points).

[3]**Geology:**

Qva: Quaternary age Vashon Advance Outwash
Qvt : Quaternary age Vashon Till
Qvr: Quaternary age Vashon Recessional Outwash
Qtb: Quaternary age Transitional Beds

[4]**Known Slide:** Within 50 feet of known slide area.

[5]**Known Problem:** Known problem areas identified by the City of Mercer Island staff.

[6]**Length:** The linear channel distance (feet) subject to high erosion potential. Note this is the length calculated in the GIS model and should be considered very approximate.

[7]Problem reflects a summary or accumulation of multiple problems in close proximity. See Appendix B for complete data for each problem reach.

Table 3-4
Phase 1 - Drainage System Problem Areas

Basin	Problem No.	Subbasin No./ Problem No.	Problem Type/Description	Approximate Length (ft)	Private/ Public
6	D6.1	6-2	Pipe system is surcharged. City previously installed locking Lid on system to contain flows. Further investigations would be necessary to determine if this is a problem.	400	
6	D6.90	6-3	Several blocks west of 84th Avenue SE that include private informal systems that are flate and likely substandard. Some ponding in road occurs.	600	
6	D6.91	7	Several blocks west of 84th Avenue SE that include private informal systems that are flate and likely substandard. Some ponding in road occurs.	600	
9	D9.1	9-1	Pipe system flows full causing periodic ponding in flat intersection. This hasn't been considered a significant flooding problem because ponding quickly recedes.	400	
9	D9.2(2.54)	9-2	Private system suspected as being substandard and in poor condition.	250	private
12	D12b.1	12-1	Substandard system. This block along Roanoke Way needs new drainage system.	500	
13	D13c.1	13-1	Private system suspected as being substandard and in poor condition.	400	private
15	D15.1	15-1	Private system suspected as being substandard and in poor condition. Has been subject to some	350	private
15	D15.2	15-4	Private system suspected as being substandard and in poor condition.	250	private
15	D15.3	15-2	Private system suspected as being substandard and in poor condition.	250	private
16	D16.1	15-3	Private system suspected as being substandard and in poor condition. Recommend replacement. Have not been able to TV system due to bad system.	350	private
16	D16.2	16-1	Private system suspected as being substandard and in poor condition.	250	private
18	D18c.1	18	First Hill Neighborhood. Some blocks (e.g., 70th and 71st) do not have formal drainage system. General area problem (e.g., plugged driveway culverts) that cause nuisance flooding of driveways, but no major flooding.	950	
18	D18c.2	18	First Hill Neighborhood. Some blocks (e.g., 70th and 71st) do not have formal drainage system. General area problem (e.g., plugged driveway culverts) that cause nuisance flooding of driveways, but no major flooding.	1,900	
19	D19a.1	19-1	Culvert crossing W Mercer Way is suspected of poor condition and should be inspected.	70	
20	D20.1	20-1	Private system suspected as being substandard and in poor condition. Also noted as very steep.	400	private
20	D20.2	20-1	Private system suspected as being substandard and in poor condition. Also noted as very steep.	300	private
21	D21.1	21-1	Private system suspected as being substandard and in poor condition.	250	private
21	D21.2	21-2	Private system suspected as being substandard and in poor condition. Recommend inspection.	150	
22	D22.1	23-2	Flat informal system subject to nuisance ponding. Currently planned overaly project will solve this problem	1,300	
23	D23.1	24-2	deep 18-inch crossing of Forest Ave SE (80th Ave SE near Merrimount Dr SE) is in bad condition and in need of inspection and possible replacement. Have not been able to TV system.	50	
25	D25b.1	25-1	Some sloughing alongside Forest Avenue SE (between SE 48th Street and SE 49th Street) fills ditch. Also debris plugging of nearby cross culvert has been a problem. Recommend inspection of cross culvert and downstream system to lake.	500	
25	D25b.2	25-2	Some debris plugging of West Mercer Way cross culvert. Also condition of cross culvert is old and deep. Inspection is recommended.	150	
28	D28b.1	27-2	1960 system installed in slide area. Any failure would have high risk of damage and inspection is recommended. Some root problems have occurred. There is also some concern that if bypass malfunctions all flows would return to channel and cause flooding. Inspection is recommended.	1,200	
29	D29.1	29-2	Older concrete system between 80th and 81st is suspect of poor conditions with root intrusion due to a lot of planting.	1,800	
31	D31c.1	31-1	Private system suspected as being substandard and in poor condition.	450	private
31	D31c.2	31-2	Private system suspected as being substandard and in poor condition.	800	private
32	D32a.1	32-1	Private system suspected as being substandard and in poor condition. System was TV'd and lower portion was found in bad condition.	1,000	private
32	D32b.1	32-2	Private system suspected as being substandard and in poor condition with root problems.	400	private

Table 3-4
Phase 1 - Drainage System Problem Areas

Basin	Problem No.	Subbasin No./ Problem No.	Problem Type/Description	Approximate Length (ft)	Private/ Public
33	D33a.1	33-1	Several West Mercer Way culvert crossings are old and in poor condition and need replacement. One option being considered is to route flow to south in new system in West Mercer Way to Lakeview Ln and then to lake. Several slide in area have occurred and repaired by the City. The pipe systems downstream from these culvert crossings were also noted as poor condition.	2,000	
35	D35.1	35-1	Old system constructed along steep bank. A past blowout occurred due to root intrusion resulting in flooding of home. System investigation is recommended. If failure occurs, damage risk is high.	1,000	
36	D36.1	36-1	Culvert/driveway crossing not functioning properly. Some settlement has occurred. May be private drainage problem.	40	
37	D37.1	37-1	Drainage system suspected of poor condition (not constant slope). Recommend inspection.	200	
37	D37.2	37-2	Drainage system suspected of poor condition (not constant slope). Recommend inspection.	350	
37	D37.3	37-3	Drainage system suspected of poor condition. Recommend inspection.	300	
38	D38.1	38-1	System near Terrywood Ln is constructed in steep sandy bank. Pipe is partially buried. City TV'd part of system and it was considered marginal. This system is a concern because if failure occurs there is high potential for damages. Downstream portion in park is considered ok.	700	
40	D40.a1	40-2	Informal drainage system in poor condition. A roadway/drainage improvement CIP planned for 2005 will solve this problem	300	
40	D40b.1	40-1	Culvert crossing suspected of poor condition. Recommend inspection.	50	
46	D46a.1	46-3	Culverts under East Mercer Way are suspected of poor condition and should be investigated. This site is also designated as a "Hot Spot".	60	
46	D46a.2	46-3	Culverts under East Mercer Way are suspected of poor condition and should be investigated.	150	
47	D47.1	47-1	Culvert under East Mercer Way are suspected of poor condition and should be investigated.	200	
49	D49b.1	49-2	Existing pipe system is suspected of being undersized and should be investigated.	150	
49	D49b.2	49-1	East Mercer Way culvert crossing is in substandard condition (old clay and cracked, imploding) and needs replacement	60	
50	D50c.1	50-4	18" cross culvert (at 4449 East Mercer Way) is failing and needs to be replaced.	60	
51	D51a.1	51-1	Private conveyance system at downstream end of watercourse is suspected of being undersized.	250	
53	D53.1	53-1	4" stormdrain is undersized. This may be a private system.	250	
		General	many systems installed a long time ago and are private are subject to root intrusion. These locations are often unknown until a problem occurs. Many of these system are also private. Private systems often lack maintenance and in some cases, even the system owners don't know the location of the system.		
		General	many public system are routed to private system which are not maintained. This can lead to problems both with private systems an the upstream public system.		
		General	City has identified approximately 25 "hot spots" that crews are sent to during significant storms. These are often associated with frequent plugging from leaves/debris/sediment and the crews work to keep the system functioning.		

Section 4

PHASE 1 PRELIMINARY CAPITAL PROJECTS IDENTIFICATION

Section 4
PHASE 1 PRELIMINARY CAPITAL PROJECTS IDENTIFICATION

4.1 General Approach

This section describes the identification of preliminary Capital Improvements Projects based on the identified problems in Section 3. As a part of the Phase 1 work, the CIPs are organized by groups represented by broad categories of improvements. As only a few of the problem areas were visited in the field as part of this phase, the type, extent, and cost of solutions are considered order-of-magnitude level. Planning level cost estimates were developed for each of the categories. As previously discussed, this information was later useful during Phase 2 to evaluate policy decisions on where to focus funding of the City's stormwater program and to provide a starting point from which problems should be investigated in more detail. In Section 5, Phase 2 builds on Phase 1 work and provides individual CIP descriptions and project costs for selected projects.

4.2 CIP Project Categories

The solution categories developed generally take into account the type of problem, potential severity, and appropriate groupings of problems. Groupings of problems to be addressed by a CIP were chosen to reflect the proximity of the problems as well as how the City could implement a project with consideration of severity. For example, if a severe erosion problem area is located immediately upstream or downstream of a short, moderate erosion problem area, it was assumed that the moderate problem area would be included in the solution. In these situations, the problem area is dominated by the severe erosion problem area. One reason to consider it this way is that once access to the site is obtained, it makes sense to solve both problem areas. However, if there was a small section of severe erosion adjacent to a lengthy section of moderate erosion (i.e., the watercourse system was dominated by moderate versus severe problems), solving these problems was defined as two separate CIPs (one project for the severe erosion area and the other project for the moderate erosion area). This is due in part to the possibility that the City may only be able afford to correct severe problems and it is desirable to keep track of the dominant conditions separately.

Four broad CIP Project categories include:

1. Drainage system investigations (e.g., TV). City staff reported many systems as systems of concern and/or substandard. More specific information about each system is necessary to determine the action necessary to ensure proper system performance. For example, some pipe systems may simply require

maintenance, some may require repair or replacement in the near term (e.g. 6-years), and some may be in better condition and not need replacement or need replacement in a longer term (6-years to 20-years). It is assumed that all pipe systems that were identified as a system of concern by the City will require some level of investigation to evaluate pipe conditions and therefore, will be TV'd and investigated. The data collected can be used to prioritize the drainage system replacements in the future.

2. Drainage system replacement. Drainage system replacement includes complete replacement of a drainage conveyance system identified by City staff as a system of concern. It is assumed that all systems identified by the City as problems or systems of concern will likely need to be replaced within the next 20 years even though it is likely many of these will not need replacement within the next 6 years.
3. High potential erosion. This includes correcting erosion problems that were dominated by areas with high erosion potential. The type of solution to correct the different types of erosion problems is discussed below.
4. Moderate potential erosion. This includes correcting erosion problems that were dominated by areas with moderate erosion potential. The type of solution to correct the different types of erosion problems is discussed below.

4.3 Phase 1 Cost Estimates

Generalized cost estimates were developed for the above categories during the Phase 1 effort. Phase 1 cost estimates are considered planning level and are not site-specific. Cost estimates were based on the Consultant's experiences with similar type projects and include a 40 percent construction contingency and 45 percent for planning, permitting, design, administration, and construction administration. For some CIP categories, different cost estimates were developed to more closely represent costs that would be commensurate with the type of solution. The breakdown is as follows:

1. Drainage system investigations. A cost of $4 per lineal foot (LF) of system was used. Cost includes pipe TV'ing and field investigations. A minimum cost of $800 was used for very short systems.
2. Drainage system replacement. Costs were based on LF of system. Cost estimates were developed for three categories. Simple, Complex and/or Larger Diameter systems, and ravine culvert replacement. Costs for simple systems ($400/LF) were based on pipe replacement of up to 18-inch-diameter pipes. Cost for complex systems was based on a ratio of 1.5 to the simple systems and $600/LF was used. This latter category would be used for systems known to be complex, deep, or larger in diameter. The ravine culvert category would be typically for culvert replacements for crossings of East or West Mercer Road. These are deep, large, may require headwalls, may be required to provide fish passage, and possibly other additional features than a pipe system replacement. A cost of $1800/LF was used.

3. Erosion. Several categories were used as follows:
   a) Correcting a Knickpoint with Difficult Access. A cost of $80,000 per each was used. Difficult access means that construction would be done by highline, large mobile crane, or hard labor (for small projects). Helicopter work would probably not be feasible in most areas.
   b) Correcting a Knickpoint with Vehicle Access. A cost of $30,000 per each was used. Vehicle access would allow normal construction equipment to be used with minimal road building.
   c) Instream Stabilization with Difficult Access. Construction methods include those described under Knickpoints. Most erosion restoration work on Mercer Island falls within this category. The cost per LF was estimated to be $1,800.
   d) Instream Stabilization with Vehicle Access. This occurs where vehicular access is likely to be feasible based on the slope and proximity to a street or driveway. The cost per LF was estimated to be $1400.
   e) High Flow Bypass. This option would be used very selectively for the most severe erosion problems that are difficult to access, construction feasibility problems, or where instream solutions would not work (like general landslide hazard area). The cost per LF was estimated to be $800.

      The Washington State Habitat Manager at the Washington Department of Fish and Wildlife (WDFW) was contacted to discuss acceptable solutions for erosion problems. The Habitat Manager indicated a preference that watercourse erosion problems be addressed by instream stabilization measures including such features as rock check dams, log check dams, boulders, rootwads, banks stabilization with plantings and bioengineering techniques. When asked about the use of high flow bypasses as an alternatives to instream stabilization, particularly in areas of severely restricted access, the habitat manager said that while they can be considered, there is some concern over the long-term sustainability with this approach, citing problems that other jurisdictions have encountered (e.g., City of Bellevue). Two situations where high flow bypasses would be considered more favorably were:

      - Where upstream urban storm runoff can be diverted at its sources (e.g., at the end of a piped drainage system outfall prior to entering a natural watercourse) and can be routed to Lake Washington without returning high flows to the watercourse.
      - For bypasses that involve diversion away from a natural watercourse or back into a watercourse, it is preferable to include stream enhancement of the affected watercourse along with any high flow bypass solutions in order to ensure that the channel

capacity is maintained and to protect the stream in the event that the bypass fails.

f) Pipe Outfall Erosion. This was estimated to be $16,000 per site. The cost was based on providing fish passage although it is recognized that few fish reside in the watercourses.

4.4 Phase 1 CIP Project Summary

Tables 4-1 and 4-2 summarize the CIP projects identified in the Phase 1 analysis for erosion problems and drainage system (piped) problems respectively. Again, the methodology used for the identification of erosion problems is approximate so this list of CIP erosion projects represents a list of “potential” erosion projects. In fact, during Phase 2, some of the identified problems were visited in the field and determined not to be a problem. Similarly, the drainage system problems identified by City staff are a good indication that the identified drainage system problems should be investigated. However, it is not certain that each system will need to be replaced. Therefore these drainage system CIPs should also be considered “potential” projects. Individual projects for both erosion and drainage system problems were later refined during Phase 2.

The total cost for completing all of the potential CIPs identified in Phase 1 is estimated to be approximately $42 million of which approximately 60 percent is for CIPs to solve moderate erosion problems. The total cost for completing all of the “High” category erosion problems is $4.6 million. The total cost for completing all of the “Moderate” erosion category problems is $24.4 million. The total cost for the drainage system CIPs is $12.6 million.

Table 4-1 includes some information on the proximity of house structures to erosion problems. This can be one factor in considering the risk of property damage due to continued erosion.

Table 4-2 also distinguishes which CIP solutions solve private drainage system problems. The indication of which systems are “private” is preliminary and should be reviewed by City staff. As previously noted, City staff report that new problems are often identified following a major storm event. Therefore, it is likely that within a 20-year planning horizon, additional problems and projects will be identified.

In general these planning level cost estimates reflect the projected cost to correct all “potential” drainage system and ravine erosion problems. As noted above, some of the projects evaluated further in Phase 2 were determined to be small enough as to not warrant a solution.

Table 4-1
Phase 1 - Watercourse Erosion Capital Projects Summary Table

Basin #	Project ID	Problem Type	Problems Solved	Dominate Severity Classification[1]	Solution Type	Construction Access (if applicable)[2]	Unit	Unit Cost	Quantity Severe	Quantity Moderate	Total Quantity	Cost[3]	Number of Houses In Area[4]	Comment
3	P3.1	Streambed and Bank erosion	3M	Moderate	Instream Stabilization		LF	$1,400		100	100	$140,000	NA	
4	P4.1	streambed and back erosion/channel confined by large landslide	4.1	Severe	Instream Stabilization	difficult	LF	$1,800	12	0	12	$21,600	0	
4	P4.2	streambed and back erosion/channel confined by large landslide	4.2	Severe	Instream Stabilization		LF	$1,400	42	0	42	$58,800	2	
4	P4.3	Streambed and Bank erosion	4M	Moderate	Instream Stabilization		LF	$1,400		690	690	$966,000	NA	
5	P5.1	Streambed and Bank erosion	5M	Moderate	Instream Stabilization		LF	$1,400		0	0	$0	NA	Drainage Section maps show as piped and therefore this is likely not a problem so no cost is included.
6	P6.1	Knickpoint and Streambed and bank erosion	6.1, 6.2	Severe	Instream Stabilization	difficult	LF	$1,800	100	0	100	$180,000	0	
6	P6.2	Streambed and Bank erosion	6M	Moderate	Instream Stabilization	difficult	LF	$1,800		360	360	$648,000	NA	As previously noted , two branches join prior to crossing under I-90. Around 1996-1997 City installed instream channel armoring/sandbags /check dams in the longer easterly branch. The shorter western branch was piped. The system has been improved but the improvements needs to be inspected.
7	P7.1	Streambed and Bank erosion	7M	Moderate	Instream Stabilization		LF	$1,400		40	40	$56,000	NA	City staff reported these channels as okay.
10	P10.1	Knickpoint and Streambed and bank erosion	10.1, 10.2, 10.3	Severe	Stabilize Knickpoint	difficult	EA	$80,000			1	$80,000	3	
10	P10.2	Stream and Bank Erosion	10M	Moderate	Instream Stabilization		LF	$1,400		30	30	$42,000	NA	Isolated headwater channels
11	P11.1	Stream and Bank Erosion	11M	Moderate	Instream Stabilization		LF	$1,400		100	100	$140,000	NA	The lowest reach of this basin was not identified a problem in the LiDAR/GIS analysis, but City staff indicated some erosion of banks north of SE 22nd St.
19a	P19a.1	Stream and Bank Erosion	19aM	Moderate	Instream Stabilization		LF	$1,400		50	50	$70,000	NA	City staff reported this watercourse as okay.
19b	P19b.1	Stream and Bank Erosion	19bM	Moderate	Instream Stabilization		LF	$1,400		50	50	$70,000	NA	City drainage system maps show areas as piped so may not be a problem.
21	P21.1	Stream and Bank Erosion	21M	Moderate	Instream Stabilization		LF	$1,400		260	260	$364,000	NA	City Staff reports some erosion.
22	P22.1	Stream and Bank Erosion	22M	Moderate	Instream Stabilization	difficult	LF	$1,800		450	450	$810,000	NA	City staff reported isolated erosion problems on the main tributary and downcutting on north branch. Possible culvert outfall erosion at Island Crest Way and SE 43rd Street
23	P23.1	Stream and Bank Erosion	23M	Moderate	Instream Stabilization	difficult	LF	$1,800		210	210	$378,000	NA	City staff reported this as steep with erosion problems and downcutting. Some check dams are already in place.
24	P24.1	Stream and Bank Erosion	24M	Moderate	Instream Stabilization		LF	$1,400		60	60	$84,000	NA	
25	P25.1	Stream and Bank Erosion	25M	Moderate	Instream Stabilization		LF	$1,400		120	120	$168,000	NA	
26	P26.1	Knickpoint	26.1	Severe	Stabilize Knickpoint	difficult	EA	$80,000			1	$80,000	0	
26	P26.2	Stream and Bank Erosion	26M	Moderate	Instream Stabilization		LF	$1,400		500	500	$700,000	NA	Downcutting and bank erosion between Island Crest Way and S 84th Street and downstream of SE 84th Street in slide area. Also outfall erosion is possible at Island Crest Way.
27a	P27a.1	streambed and back erosion	27a.1	Severe	Instream Stabilization	difficult	LF	$1,800	5	0	5	$15,000	6	Assume $15,000 minimum cost.
27a	P27a.2	Knickpoint and Streambed and bank erosion	27a.2, 27a.3	Severe	Instream Stabilization	difficult	LF	$1,800	25	40	65	$117,000	1	
27	P27.3	Stream and Bank Erosion	27M	Moderate	Instream Stabilization		LF	$1,400		1635	1635	$2,289,000	NA	City staff reported some additional reaches may be subject to erosion
29	P29.1	Outfall Erosion/streambed and back erosion	29.1	Severe	Instream Stabilization	difficult	LF	$1,800	1000	0	1000	$1,800,000	1	The LiDAR/GIS scoring system identified this reach as mostly moderate with some severe, based on site observations more of the reach appeared severe and the entire reach was reclassified as severe for the purpose of the CIP development.
29	P29.2	knickpoint/streambed and back erosion	29.2	Severe	HDPE Pipeline into Ravine		LF	$800	50	90	140	$112,000	0	Although more of the reach is classified as moderate, this entire reach was included in the severe category because the solution is relatively simple.
29	P29.3	Stream and Bank Erosion	29M	Moderate	Instream Stabilization	difficult	LF	$1,800		270	270	$486,000	NA	The moderate erosion is considered that portion upstream of West Mercer Way.
32	P32..1	Outfall Erosion	32M	Moderate	Instream Stabilization		LF	$1,400		0	0	$0	NA	All significant drainage at identified site is piped and this is not considered a problem and no cost are identified.

Table 4-1
Phase 1 - Watercourse Erosion Capital Projects Summary Table

Basin #	Project ID	Problem Type	Problems Solved	Dominate Severity Classification[1]	Solution Type	Construction Access (if applicable)[2]	Unit	Unit Cost	Quantity Severe	Quantity Moderate	Total Quantity	Cost[3]	Number of Houses In Area[4]	Comment
39a	P39a.1	Stream and Bank Erosion	39a.1	Severe	Outfall Restoration		EA	$16,000			1	$16,000	1	
39a	P39a.2	Stream and Bank Erosion	39aM	Moderate	Instream Stabilization		LF	$1,400		750	750	$1,050,000	NA	
39b	P39b.1	Stream and Bank Erosion	39bM	Moderate	Instream Stabilization	difficult	LF	$1,800		30	30	$54,000	NA	Watercourse fed by groundwater. Slide area to south.
40b	P40b.2	Stream and Bank Erosion	40bM	Moderate	Instream Stabilization		LF	$1,400		80	80	$112,000	NA	City did not report any problem in these reaches
40a	P40a.1	Stream and Bank Erosion	40aM	Moderate	Instream Stabilization		LF	$1,400		40	40	$56,000	NA	Very minor watercourse so may not be a problem
41	P41.1	Stream and Bank Erosion	41M	Moderate	Instream Stabilization		LF	$1,400		130	130	$182,000	NA	Problem located within 250 feet downstream of East Mercer Way. Other drainages are piped so adjustment in length was made.
42	P42.1	Toe erosion, landsliding and streambed and back erosion	42.1	Severe	Instream Stabilization	difficult	LF	$1,800	5	15	20	$36,000	0	
42	P42.2	streambed and back erosion/channel confined by large landslide	42.2	Severe	Instream Stabilization	difficult	LF	$1,800	110	190	300	$540,000	1	There are several severe locations interspersed with moderate erosion and it is suggested to include the moderate length and assume this CIP addresses a severe problem
42	P42.3	streambed and back erosion	42.3	Severe	Instream Stabilization	difficult	LF	$1,800	67	110	177	$318,600	0	There are several severe locations interspersed with moderate erosion and it is suggested to include the moderate length and assume this CIP addresses a severe problem
42	P42.4	knick point	42.4	Severe	Stabilize Knickpoint	difficult	EA	$80,000			1	$80,000	0	
42	P42.5	knick point, outfall erosion, and streambed and bank erosion	42.5	Severe	HDPE Pipeline Surface Pipeline into Ravine		LF	$800	46	114	160	$128,000	0	Although more of the reach is classified as moderate, this entire reach was included in the severe category because the solution is relatively simple.
42	P42.6	knick point	42.6	Severe	Stabilize Knickpoint/Instream Stabilization		EA	$1,400	35	0	35	$49,000	0	
42	P42.7	streambed and back erosion	42.7	Severe	Instream Stabilization		LF	$1,400	15	105	120	$168,000	1	Although more of the reach is classified as moderate, this entire reach was included in the severe category because the solution is relatively simple.
42	P42.8	streambed and back erosion	42.8	Severe	Instream Stabilization	difficult	LF	$1,800	19	0	19	$34,200	0	
42	P42.9	streambed and back erosion	42.9	Severe	Instream Stabilization	difficult	LF	$1,800	17	20	37	$66,600	0	
42	P42.10	knick point	42.10	Severe	HDPE Pipeline Surface Pipeline into Ravine	difficult	LF	$800	250	0	250	$200,000	1	Drainage System consists of half-round pipe and quarry spalls. CIP is assumed but it may not be needed.
42	P42.11	Stream and Bank Erosion	42M	Moderate	Instream Stabilization	difficult	LF	$1,800		2525	2525	$4,545,000	NA	Significant erosion in ravine subject to landslides.
43b	P43.1	Stream and Bank Erosion	43bM	Moderate	Instream Stabilization		LF	$1,400		110	110	$154,000	NA	Staff reported no problems but that stream corridor always wet.
44b	P44b.1	Outfall Erosion	44b.1	Severe	Outfall Restoration		EA	$16,000			1	$16,000	3	
44b	P44b.2	Stream and Bank Erosion	44bM	Moderate	Instream Stabilization		LF	$1,400		390	390	$546,000	NA	City staff reported no deposition problems downstream on south watercourse.
44a	P44a.3	Stream and Bank Erosion	44aM	Moderate	Instream Stabilization	difficult	LF	$1,800		120	120	$216,000	NA	flow in upper 2/3 of basin intercepted by East Mercer Way Pipe System, caring flow to basin 44b.
45b	P45b.1	knick point/streambed and back erosion	45b.1	Severe	Instream Stabilization	difficult	LF	$1,800	17	0	17	$30,600	0	Small length of erosion reach. City staff reported no problems in this reach.
45b	P45b.2	knick point	45b.2	Severe	Stabilize Knickpoint	difficult	EA	$80,000			1	$80,000	4	Street drainage probably flows into ravine
45b	P45b.3	Stream and Bank Erosion	45bM	Moderate	Instream Stabilization	difficult	LF	$1,800		730	730	$1,314,000	NA	Southern watercourse was considered minor erosion by City staff. Near East Mercer Way and Private Road, Minor channel downcutting was observed and a slow slide was observed on the southern embankment. During discussions with City staff, this section of channel was considered ok. For, northern watercourse, downcutting is occurring for 450 feet upstream of East Mercer Way exposing a sanitary sewer. Hillslopes show instability. Downstream of East Mercer Way, channel downcutting occurring and slow slide observed on south embankment. City staff reported that there were no problems. Pond at mouth requires approximately 8 cy of material to be removed each year.
45a	P45a.1	Stream and Bank Erosion	45aM	Moderate	Instream Stabilization	difficult	LF	$1,800		50	50	$90,000	NA	

Table 4-1
Phase 1 - Watercourse Erosion Capital Projects Summary Table

Basin #	Project ID	Problem Type	Problems Solved	Dominate Severity Classification[1]	Solution Type	Construction Access (if applicable)[2]	Unit	Unit Cost	Quantity Severe	Quantity Moderate	Total Quantity	Cost[3]	Number of Houses In Area[4]	Comment
46a	P46a.1	knick point/streambed and back erosion	46a.1	Severe	Stabilize Knickpoint	difficult	EA	$80,000			1	$80,000	0	
46a	P46a.2	streambed and back erosion	46aM	Moderate	Instream Stabilization	difficult	LF	$1,800		1260	1260	$2,268,000	NA	large unstable slope is feeding large quantities of sediment to creek. Downcuttng in tributaries also a source. Check dams in middle of basin trap sediment but they may be nearly full. Deposition at mouth is a problem.
46b	P46b.1	knick point/streambed and back erosion	46b.1	Severe	Stabilize Knickpoint	difficult	EA	$80,000			1	$80,000	3	
46b	P46b.2	streambed and back erosion	46bM	Moderate	Instream Stabilization	difficult	LF	$1,800		100	100	$180,000	NA	City staff did not report problems
47	P47.1	streambed and back erosion	47M	Moderate	Instream Stabilization	difficult	LF	$1,800		550	550	$990,000	NA	City staff did not report problems
48	P48.1	streambed and back erosion	48M	Moderate	Instream Stabilization	difficult	LF	$1,800		130	130	$234,000	NA	City staff reported most problems fixed with culvert replacement and installation of check dams.
49b	P49b.1	streambed and back erosion	49b.1	Severe	Instream Stabilization	difficult	LF	$1,800	12	0	12	$21,600	12	
49b	P49b.2	streambed and back erosion	49b.2	Severe	Instream Stabilization	difficult	LF	$1,800	3	0	3	$15,000	4	Assume $15,000 minimum cost.
49b	P49b.3	streambed and back erosion	49bM	Moderate	Instream Stabilization	difficult	LF	$1,800		830	830	$1,494,000	NA	City staff reported erosion problems in upper basin particularly pipe outfall from 91st Ave SE
49c	P49c.1	Streambed and Bank erosion	49cM	Moderate	Instream Stabilization			$1,400		100	100	$140,000	NA	probably small watercourse
50a	P50a.1	Streambed and Bank erosion	50aM	Moderate	Instream Stabilization	difficult	LF	$1,800		10	10	$18,000	NA	probably small watercourse
50b	P50b.1	Outfall Erosion	50b.1	Severe	Outfall Restoration		EA	$16,000			1	$16,000	0	
50b	P50b.3	knickpoint/streambed and back erosion	50b3	Severe	Stabilize Knickpoint & Outfall Restoration		EA	$30,000			1	$30,000	2	May be a result of Pipe outfall. An optional solution is 100 LF of HDPE surface Pipeline
50b	P50b.4	Streambed and Bank erosion	50bM	Moderate	Instream Stabilization	difficult	LF	$1,800		440	440	$792,000	NA	City staff reported some erosion problems upstream of East Mercer Way
50c	P50c.1	Outfall Erosion/streambed and back erosion	50c.1	Severe	Outfall Restoration		EA	$16,000			3	$48,000	1	
50c	P50c.2	streambed and back erosion	50c.2	Severe	Instream Stabilization		LF	$1,400	6	10	16	$22,400	5	
50c	P50c.3	streambed and back erosion	50c.3	Severe	Instream Stabilization		LF	$1,400	1	10	11	$15,400	5	
50c	P50c.4	Streambed and Bank erosion	50cM	Moderate	Instream Stabilization	difficult	LF	$1,800		800	800	$1,440,000	NA	City staff reported some erosion problems downstream of East Mercer Way
51a	P51.1	Outfall erosion and streambed and back erosion	51a.1	Severe	Outfall Restoration		EA	$16,000			1	$16,000	0	
51a	P51a.1	Streambed and Bank erosion	51aM	Moderate	Instream Stabilization	difficult	LF	$1,800		400	400	$720,000	NA	City staff reported some erosion problems downstream of East Mercer Way
52	P52.2	Streambed and Bank erosion	52M	Moderate	Instream Stabilization	difficult	LF	$1,800		210	210	$378,000	NA	Small watercourse
Totals										Totals (Severe)		$4,571,800		
										Totals (Moderate)		$24,384,000		
										Totals		$28,955,800		

[1] his severity class, although can include multiple classes

[2] Difficulty of access identified based on review of mapping only. If not designated as difficult, assumes access does not present major challenges

[3] Cost includes 40% construction contingency and 45% for administration, engineering, and permitting

[4] Indicates number of houses within 100 feet of problem grouping. Not estimated for moderate problems.

Table 4-2
Phase 1 - Drainage System Capital Projects Summary Table

Basin #	Project ID (same as Problem ID)	Problem Type/Description	Approximate Length (ft)	Assumed Solution Type	Unit	Unit Cost	CIP Cost	Unit Cost for Field Inspection	Cost For Field Inspection	Private
6	D6.1	Pipe system is surcharged. City previously installed locking Lid on system to contain flows. Further investigations would be necessary to determine if this is a problem. Cost only included for field investigation	400	NA	LF		NA	$4	$1,600	
6	D6.90	Several blocks west of 84th Avenue SE that include private informal systems that are flate and likely substandard. Some ponding in road occurs.	600	Simple	LF	$400	$240,000	$4	$2,400	
6	D6.91	Several blocks west of 84th Avenue SE that include private informal systems that are flate and likely substandard. Some ponding in road occurs.	600	Simple	LF	$400	$240,000	$4	$2,400	
9	D9.1	Pipe system flows full causing periodic ponding in flat intersection. This hasn't been considered a significant flooding problem because ponding quickly recedes.	400	Simple	LF	$400	$160,000	$4	$1,600	
9	D9.2(2.54)	Private system suspected as being substandard and in poor condition.	250	Simple	LF	$400	$100,000	$4	$1,000	private
12b	D12b.1	Substandard system. This block along Roanoke Way needs new drainage system.	500	Simple	LF	$400	$200,000	$4	$2,000	
13c	D13c.1	Private system suspected as being substandard and in poor condition.	400	Complex	LF	$600	$240,000	$4	$1,600	private
15	D15.1	Private system suspected as being substandard and in poor condition. Has been subject to some flooding.	350	Complex	LF	$600	$210,000	$4	$1,400	private
15	D15.2	Private system suspected as being substandard and in poor condition.	250	Simple	LF	$400	$100,000	$4	$1,000	private
15	D15.3	Private system suspected as being substandard and in poor condition.	250	Simple	LF	$400	$100,000	$4	$1,000	private
16	D16.1	Private system suspected as being substandard and in poor condition. Recommend replacement. Have not been able to TV system due to bad system.	350	Complex	LF	$600	$210,000	$4	$1,400	private
16	D16.2	Private system suspected as being substandard and in poor condition.	250	Simple	LF	$400	$100,000	$4	$1,000	private
18c	D18c.1	First Hill Neighborhood. Some blocks (e.g., 70th and 71st) do not have formal drainage system. General area problem (e.g., plugged driveway culverts) that cause nuisance flooding of driveways, but no major flooding.	950	Simple	LF	$400	$380,000	$4	$3,800	
18c	D18c.2	First Hill Neighborhood. Some blocks (e.g., 70th and 71st) do not have formal drainage system. General area problem (e.g., plugged driveway culverts) that cause nuisance flooding of driveways, but no major flooding.	1900	Simple	LF	$400	$760,000	$4	$7,600	
19a	D19a.1	Culvert crossing W Mercer Way is suspected of poor condition and should be inspected.	70	Culvert	LF	$1,800	$126,000	$4	$800	
20	D20.1	Private system suspected as being substandard and in poor condition. Also noted as very steep.	400	Complex	LF	$600	$240,000	$4	$1,600	private
20	D20.2	Private system suspected as being substandard and in poor condition. Also noted as very steep.	300	Complex	LF	$600	$180,000	$4	$1,200	private
21	D21.1	Private system suspected as being substandard and in poor condition.	250	Complex	LF	$600	$150,000	$4	$1,000	private
21	D21.2	Private system suspected as being substandard and in poor condition. Recommend inspection.	150	Simple	LF	$400	$60,000	$4	$800	
22	D22.1	Flat informal system subject to nuisance ponding. Currently planned overaly project will solve this problem	1300	Simple	LF	$400	$520,000	$4	$5,200	
23	D23.1	deep 18-inch crossing of Forest Ave SE (80th Ave SE near Merrimount Dr SE) is in bad condition and in need of inspection and possible replacement. Have not been able to TV system.	50	Culvert	LF	$1,800	$90,000	$4	$800	

Table 4-2
Phase 1 - Drainage System Capital Projects Summary Table

Basin #	Project ID (same as Problem ID)	Problem Type/Description	Approximate Length (ft)	Assumed Solution Type	Unit	Unit Cost	CIP Cost	Unit Cost for Field Inspection	Cost For Field Inspection	Private
25b	D25b.1	Some sloughing alongside Forest Avenue SE (between SE 48th Street and SE 49th Street) fills ditch. Also debris plugging of nearby cross culvert has been a problem. Recommend inspection of cross culvert and downstream system to lake.	500	Complex	LF	$600	$300,000	$4	$2,000	
25b	D25b.2	Some debris plugging of West Mercer Way cross culvert. Also condition of cross culvert is old and deep. Inspection is recommended.	150	Culvert	LF	$1,800	$270,000	$4	$800	
28b	D28b.1	1960 system installed in slide area. Any failure would have high risk of damage and inspection is recommended. Some root problems have occurred. There is also some concern that if bypass malfunctions all flows would return to channel and cause flooding. Inspection is recommended.	1200	Complex	LF	$600	$720,000	$4	$4,800	
29	D29.1	Older concrete system between 80th and 81st is suspect of poor conditions with root intrusion due to a lot of planting.	1800	Simple	LF	$400	$720,000	$4	$7,200	
31c	D31c.1	Private system suspected as being substandard and in poor condition.	450	Complex	LF	$600	$270,000	$4	$1,800	private
31c	D31c.2	Private system suspected as being substandard and in poor condition.	800	Simple	LF	$400	$320,000	$4	$3,200	private
32a	D32a.1	Private system suspected as being substandard and in poor condition. System was TV'd and lower portion was found in bad condition.	1000	Simple	LF	$400	$400,000	$4	$4,000	private
32b	D32b.1	Private system suspected as being substandard and in poor condition with root problems.	400	Simple	LF	$400	$160,000	$4	$1,600	private
33a	D33a.1	Several West Mercer Way culvert crossings are old and in poor condition and need replacement. One option being considered is to route flow to south in new system in West Mercer Way to Lakeview Ln and then to lake. Several slide in area have occurred and repaired by the City. The pipe systems downstream from these culvert crossings were also noted as poor condition.	2000	Complex	LF	$600	$1,200,000	$4	$8,000	
35	D35.1	Old system constructed along steep bank. A past blowout occurred due to root intrusion resulting in flooding of home. System investigation is recommended. If failure occurs, damage risk is high.	1000	Complex	LF	$600	$600,000	$4	$4,000	
36	D36.1	Culvert/driveway crossing not functioning properly. Some settlement has occurred. May be private drainage problem.	40	Simple	LF	$400	$16,000	$4	$800	
37	D37.1	Drainage system suspected of poor condition (not constant slope). Recommend inspection.	200	Simple	LF	$400	$80,000	$4	$800	
37	D37.2	Drainage system suspected of poor condition (not constant slope). Recommend inspection.	350	Complex	LF	$600	$210,000	$4	$1,400	
37	D37.3	Drainage system suspected of poor condition. Recommend inspection.	300	Complex	LF	$600	$180,000	$4	$1,200	
38	D38.1	System near Terrywood Ln is constructed in steep sandy bank. Pipe is partially buried. City TV'd part of system and it was considered marginal. This system is a concern because if failure occurs there is high potential for damages. Downsteam portion in park is considered ok.	700	Complex	LF	$600	$420,000	$4	$2,800	
40a	D40.a1	Informal drainage system in poor condition. A roadway/drainage improvement CIP planned for 2005 will solve this problem	300	Culvert	LF	$1,800	$540,000	$4	$1,200	
40b	D40b.1	Culvert crossing suspected of poor condition. Recommend inspection.	50	Simple	LF	$400	$20,000	$4	$800	
46a	D46a.1	Culverts under East Mercer Way are suspected of poor condition and should be investigated. This site is also designated as a "Hot Spot".	60	Culvert	LF	$1,800	$108,000	$4	$800	
46a	D46a.2	Culverts under East Mercer Way are suspected of poor condition and should be investigated.	150	Culvert	LF	$1,800	$270,000	$4	$800	

Table 4-2
Phase 1 - Drainage System Capital Projects Summary Table

Basin #	Project ID (same as Problem ID)	Problem Type/Description	Approximate Length (ft)	Assumed Solution Type	Unit	Unit Cost	CIP Cost	Unit Cost for Field Inspection	Cost For Field Inspection	Private
47	D47.1	Culvert under East Mercer Way are suspected of poor condition and should be investigated.	200	Culvert	LF	$1,800	$360,000	$4	$800	
49b	D49b.1	Existing pipe system is suspected of being undersized and should be investigated.	150	Culvert	LF	$1,800	$270,000	$4	$800	
49b	D49b.2	East Mercer Way culvert crossing is in substandard condition (old clay and cracked, imploding) and needs replacement	60	Culvert	LF	$1,800	$108,000	$4	$800	
50c	D50c.1	18" cross culvert (at 4449 East Mercer Way) is failing and needs to be replaced.	60	Culvert	LF	$1,800	$108,000	$4	$800	
51a	D51a.1	Private conveyance system at downstream end of watercourse is suspected of being undersized.	250	Culvert	LF	$1,800	$450,000	$4	$1,000	Private
53	D53.1	4" stormdrain is undersized. This may be a private system.	250	Complex	LF	$600	$150,000	$4	$1,000	
	Totals						$12,656,000		$94,400	
		Totals (Private Only)					$3,230,000		$23,800	
		Totals (Public)					$9,426,000		$70,600	

Notes: Use $800 minimum for TV/field inspection

Section 5

PHASE 2 CAPITAL PROJECTS IDENTIFICATION

Section 5
PHASE 2 CAPITAL PROJECTS IDENTIFICATION

5.1 General Approach

One of the main objectives of the Phase 2 effort was to carry the Phase 1 problem identification work forward and develop specific capital improvement projects (CIPs). There was insufficient budget available to investigate all of the Phase 1 projects in more detail, therefore the scope of the effort needed to be limited. For erosion-type problems, field investigations and problem solutions were conducted on those erosion problems categorized in Phase 1 as “high”. For drainage system problems, additional investigations (most often including TV’ing of pipe sections) were conducted on the systems of higher concern as determined by City staff. For these problems, solutions and conceptual cost estimates were developed.

5.2 Field Investigations for Erosion Problems

Field reviews were performed for the problems identified as “high” erosion potential areas during the Phase 1 effort shown on Table 3-3. City staff also identified a few additional erosion problems along other watercourses which were also investigated in Phase 2. These watercourses generally included Phase 1 erosion problems that were identified as “moderate” problems. However, the City staff had concerns about these systems because of either prior observations or prior citizen complaints. In general, the field reconnaissance included:

- Observing the nature, extent (problem limits) and severity of the problem.
- Observing site constraints, and other issues to identify the type of solution that will be appropriate for the problem area.
- Collecting other data about the problems areas considering information that is also used for prioritizing problems.

The site visits were conducted by a senior engineer with over 20 years of experience solving erosion problems. Site visits were made to approximately 17 ravines and about 50 problems were evaluated. Through the field reconnaissance, some new problems within these ravines were identified and considered severe enough to warrant a CIP. At the same time, some of the Phase 1 erosion problems were found to be small enough as to not warrant a solution. Eighteen of the 50 Phase 1 “high” erosion problems were eliminated.

The field investigations for erosion problems are summarized on Table 5-1 based on the detailed field investigation forms which are included in Appendix E. At each site, several parameters were evaluated, as shown on the table and field forms. These parameters include:

- Site Conditions
  1. Geology
  2. Approximate flow on the day of the investigation (estimated by "eye")
  3. Approximate channel gradient
  4. Approximate tributary area
  5. Bank vegetation type and quality
  6. Condition of aquatic habitat
  7. Proximity to drainage outfalls
  8. Location and apparent rate of erosion (i.e., bed, left or right bank, headcut)
- Risks
  1. Public versus private
  2. Whether unsafe conditions exist
  3. Bank and upper slope stability
  4. Landslide potential
  5. Sediment source
  6. Risk to habitat
  7. Risk to health and safety, property, home, other structures, private road or driveway, infrastructure, public road
  8. Proximity to homes at risk
- Solutions
  1. Construction access difficulties
  2. Potential reduction in O&M costs
  3. Restoration of construction access
  4. Conceptual solution
  5. Whether or not the site is a potential monitoring location

5.3 General Description of Solutions for Erosion Problems

Based on the field observations about the nature of erosion problems, there were eight general types of solutions that were identified as needed to solve erosion problems. These types of general solutions are briefly discussed below. In addition, the cost estimates (described later in this section and included in Appendix G) were developed for each CIP project. These detailed cost estimates provide additional detail about needed features for each project. Table 5-5 summarizes all of the proposed CIP projects and their respective costs.

In general these solutions should be considered preliminary for the purpose of estimating capital costs and defining priorities. As further investigations and design work proceeds on individual projects, refinements to the projects should be expected.

5.3.1 Outfall Protection

The outfall protection solution consists of a riprap pad and was considered when erosion occurs at a culvert or pipe outfall or other discharge point. Although angular quarry rock is normally used, rounded river rock could be used to create a more natural appearance. Rock pads do not provide fish passage.

5.3.2 Storm Drain Extension

This solution was proposed where it was practical and necessary to extend a pipeline but where the aquatic habitat was poor or non-existent. An example is where a storm drain discharges halfway down a steep slope toward a ravine.

5.3.3 Bypass Pipe

A bypass pipe solution would typically consist of a butt-fused HDPE pipeline (forming a single continuous length) with a manhole and buried concrete anchor block at the upstream end. These were proposed in reaches with severe erosion where pipes outlet onto steep channels having no fish habitat. An example of this is a pipe outlet at the top of a steep bank that slopes to a ravine watercourse.

5.3.4 Check Dams

Check dams were considered as a solution to channel erosion problems where the aquatic habitat is poor or fair, where the channel has a maximum gradient of about 10 percent, and where the banks are relatively stable. Rock check dams were assumed for cost estimating although log check dams could also be installed. In many cases, check dams were proposed to replace existing sand bag and geotextile dams that had been previously installed as a temporary solution.

5.3.5 Boulder Cascades

Boulder cascades were considered as a solution to channel erosion problems where the aquatic habitat is poor or fair, and the channel gradient is greater than 10 percent. These reaches are too steep to effectively use check dams. The intent of boulder cascades is to use large rounded rock to simulate a steep headwater stream.

5.3.6 Channel Stabilization

Channel stabilization was considered as a solution to channel erosion problems where check dams alone could not solve the problems, and where habitat potential was limited. Most often channel stabilization is selected over check dams in areas having bank instability. For the purpose of this study, channel stabilization was assumed to include less habitat improvement work and would be appropriate where potential aquatic habitat is limited. It would be less costly per linear foot than stream restoration.

5.3.7 Stream Restoration

As stated above, the stream restoration solution is similar to the channel stabilization solution. Stream restoration was assumed to require more habitat work and would have dual goals of reducing erosion and improving habitat. Stream restoration would be slightly more costly per linear foot than channel stabilization due to more planting and stream structures.

5.3.8 Hand-Constructed Stream Restoration

Hand-constructed stream restoration is similar to the stream restoration solution and was only considered in reaches where access with conventional and compact equipment is not practical, would cause excessive damage, or where the work was limited in magnitude. The work is limited to materials that can be carried manually or with very small machines. The cost of this solution is relatively high.

5.4 Permitting for Erosion Problems

Table 5-2 summarizes the permits that may be required for each of the erosion CIP solutions. The table also identifies special studies that could be necessary, and notes permits that require long lead times. Depending on the amount of work to be done inside of a wetland boundary, or below the ordinary high water mark, a Corps of Engineers (COE) nationwide permit may be required. This permit requirement would trigger the need for an Endangered Species Act (ESA) review, which requires the preparation of a Biological Assessment (BA). The COE permit could also trigger a Department of Ecology 401 Water Quality Certification review.

An ESA review and the requirement of a BA may also be triggered if the project is constructed using federal funding. A Hydraulic Permit Approval (HPA) from the Washington State Department of Fish and Wildlife will be required for projects that disturb any stream (defined as waters of the state) within its ordinary high water line. A SEPA checklist will be required for all projects. Additionally, local permits, such as a clearing/grading or right of way (ROW) use permits, may be required for projects.

5.5 Drainage Problems and CIP Projects

City maintenance crews conducted conveyance system inspections and "TV" investigations to assess the condition of selected segments of the City's drainage system. The investigated systems were selected by City staff and include many of the systems identified as problem areas during Phase 1, as well as a few additional systems not identified during Phase 1, but considered as systems of concern. Because of budget/resource limitations, not all of the systems identified in Phase 1 could be investigated. A summary of the areas that were investigated/TV'd is included in Table 5-3. The summary table was assembled following a meeting between R.W. Beck and City staff to review the information collected during the TV'ing. This table is also included in Appendix F, along with the summary forms that were filled out during the work. The table includes a summary of the observations by the TV consultant and City staff, and then one of three conclusions for each system. The three possible conclusions for each system investigated are:

- Not a problem – The system appears to be fully functioning with no or minimal maintenance needs.
- Not a major problem, but additional investigation and/or maintenance are required - For these systems, maintenance is needed (for example, if significant root intrusion is interfering with the flow area) and/or additional investigation is required to determine if the system is functioning. Additional investigations area often required for systems needing maintenance because the TV camera could not completely evaluate the pipe segment because it could not get past some obstacle, such as a root.
- Problem and CIP identified – These included systems problems that went beyond routine maintenance needs and required a capital improvement. Examples are severely damaged pipe, or where pipe joints have become severely separated.

There are many areas within the City where additional investigation and/or maintenance is required and these areas are listed on Table 5-4. The list was compiled from the TV inspections identified in Table 5-3 and from those systems identified in Phase 1 as systems of concern that were not investigated as part of Phase 2 because of limited resources. One of the most important recommendations for future studies is to investigate the condition of all culvert crossings of East and West Mercer Way not investigated as part of this study. These culverts represent critical components of the drainage system because failure of these culverts can affect the City's main arterials.

Through this process, six CIPs were identified to address drainage system problems. These six problems, their proposed solutions, and their estimated costs are summarized on Table 5-5.

The CIP solutions for the drainage system problems primarily include culvert or pipe replacement. Most of the pipe/culvert replacements can be done using traditional open cut/shoring techniques. In one case, pipe bursting methods are recommended for a pipe replacement across East Mercer Way due to high traffic volumes and depths of embankment.

5.6 Capital Improvement Projects for Erosion and Drainage Problems

Preliminary CIP projects were developed for the erosion problems visited as described in this section, and for the drainage problems identified with input from City staff. In addition to the data collected in the field, prior basin plan information was incorporated as appropriate for the erosion problems. A “Project Summary” was developed for each CIP and these are included in Appendix G. The “Project Summary” includes the following information:

- Basin number, project number and title
- Problem description and a representative photo (if available)
- CIP project description
- Related projects, if any
- Planning level cost estimate
- Simple plan view graphic showing location and extent of CIP

There are 25 erosion CIP Project Summaries and six drainage CIP Project Summaries. Some erosion CIPs address more than one problem identified in the Phase 1 analysis (for example, where there are two or more problems located close together along the same watercourse and one proposed project can fix both problems). In some cases, it is noted on the Project Summary if another CIP project should be completed prior to another.

The planning level cost estimates are for the total cost of the project. The estimates include consideration for special access requirements, erosion and sediment control, traffic control, mobilization, 30 percent contingency, and state sales tax. The cost estimates also include the following indirect costs: surveying and design, permitting, construction engineering and administration, and easement/land acquisition administration. For all easement acquisition, it is assumed that the only cost is administrative and that there is no cost to acquire the easement. Table 5-5 summarizes all of the proposed CIP projects and their respective costs.

The total cost for completing all of the CIPs is estimated to be approximately $6.4 million. The total cost for completing all of the erosion CIPs is $5.2 million and the total cost for completing all of the drainage CIPs is $1.2 million.

Note that the cost for these watercourse erosion projects are only for solving problems identified in Phase 1 as “high”. Additional future analysis of the problems identified in Phase 1 as “moderate” will result in additional projects. There were 40 locations where potential erosion problems in the “moderate” category were identified.

Table 5-1
Summary of Phase 2 Field Investigations for Erosion Problems

Basin No.	Problem No.	Date of site visit	Description of Problem [1]	Estimated Stream Gradient [2]	Approximate Size of Tributary Area [3]	Aquatic Habitat	Rate of Erosion	Located on Public or Private Property?	Landslide	Risk to Health and Safety	Risk to Residence	Risk of Property Damage [4]	Comments/City Input
4	4.1	9/24/05	Head cut is moving upstream creating a 30-foot long incised channel into till that is up to 7 feet deep	>10%	< 30 acres	Fair	Moderate	Private	None mapped or observed.	None	None	Bed erosion	A small sediment pond exists at the downstream end of this water course, before it crosses under I-90.
4	4.2	9/24/05	Downstream of storm drain outlet, flow is scouring and undercutting toe of large slide. Two other storm drain outlets contribute flow.	5-10%	< 30 acres	Good	Rapid	Private	Mapped and observed	None	None	Erosion and slide trigger. Long term risk to Gallager Hill Road.	
6	6.1	9/24/05	Downstream of surface storm drain outlet, flow is scouring and undercutting toe of small slide within an undeveloped ravine.	5-10%	30 to 80 acres	Fair	Moderate	Public	Observed	None	None	Deposition downstream and in lake.	Two branches join prior to crossing under I-90. Around 1996-1997 City installed instream channel armoring/sandbags/check dams in the longer easterly branch. Most of the shorter western branch where problem 6.1 is located was piped. The watercourses join at a sediment pond. WSDOT had previously maintained the sediment pond excavating 10-20 cy/yr. City now does it and removed 60 yds in 2003.
6	6.2	9/24/05	No significant erosion problem										
10	10.1	9/28/06	No significant erosion problem. Headwater area										
10	10.2	9/28/25	No significant erosion problem. Headwater area										
10	10.3	9/28/05	No significant erosion problem. Headwater area										
10	10.4	9/24/05	Large subbasin from business district outlets in open channel lined with riprap. Rock may be undersized	>10%	>80 acres	Poor	Stable	Private	None mapped or observed.	None	Low	Bank erosion	Reported to City staff by property owner
26	26.1	1/5/06	Nine-foot high head cut in glacial till in undeveloped ravine	>10%	>80 acres	Good	Moderate	Private	None mapped or observed.	Minor falling hazard	None	Bed and bank erosion	Design is already being developed as part of separate project. Subbasin plan was developed in 2003. This is a current monitoring site.
27a	27a.1	9/28/05	30 LF of streambed and bank erosion with head cut	>10%	30 to 80 acres	Poor	High	Private	Observed	None	None	Bank erosion	
27	27a.2	9/28/05	No significant erosion problem										
27a	27a.3	9/28/05	110 LF of deeply incised channel in glacial till with three head cuts in undeveloped ravine	2 to 5%	< 30 acres	Good	Moderate	Private	None mapped or observed.	Minor falling hazard	None	Bank erosion	
27	27a.4	9/28/05	No significant erosion problem										
27	27a.5	9/28/05	No significant erosion problem. System piped										
27a	27a.6	9/28/05	4-foot high timber dam is failing	2 to 5%	30 to 80 acres	Good	Rapid	Private	None mapped or observed.	None. Sanitary sewer main downstream not exposed.	None	Rapid incision and sediment pulse following dam failure	Has been observed in 2006 by city engineer and maintenance staff
29	29.1	1/5/06	Drop at culvert outlet at West Mercer Way and severe bank erosion along 600 feet of stream. Slope instability being created.	5-10%	>80 acres	Good	Rapid	Private	Mapped and observed	None	Low risk to 2 residences	Bank erosion and slope failure	The stream channel is down cutting, causing bank failures in several locations. This has contributed to increasing sediment deposition within the stream and at the outlet to Lake Washington. The ravine side slopes have undergone slides and active slope movement causing problems to the homeowners at the top of the ravine. A stream restoration design is being developed and construction is planned for 2007. This is a current monitoring site.
29	29.2	12/14/05	Very steep channel has created a head cut and incised into the east bank of the main stem of the creek. The small, narrow channel is up to 12 feet deep.	>10%	< 30 acres	Poor	Rapid	Private and public	None mapped or observed.	None	None	Bank erosion and slope failure	
32b	32b.1	10/20/06	Below the outlet of a 48 inch diameter, half round CMP conveyance pipe, the channel is scoured and drops 3 to 5 vertical feet over 15 to 20 linear feet. Water is also flowing along the underside of the half round pipe. Banks are steep, unvegetated, composed of very dense silt and retreating. Channel bottom lacks any substrate and consists of smooth, very dense silt.	>10%	>80 acres	Poor	Moderate	Private	None mapped or observed.	None	None	Bed and Bank Erosion.	
32b	32b.2	10/20/06	Approximate 5 to 7 foot deep headcut through very dense silt. Below headcut channel is deeply incised with vertical, unvegetated banks. Channel bottom has little loose substrate and consists of very dense silt.	>10%	>80 acres	Poor	Moderate	Private	None mapped or observed.	None	None	Bed and Bank Erosion. Headcut retreat	
37b	37b.1	3/3/06	Outfall erosion and erosion from street runoff is threatening driveway	>10%	< 30 acres	Poor	Moderate	Private and public	Mapped	Low	Low. Home is pile supported	Bank erosion and slope failure	Design underway by property owner's engineer.
39a	39a.1	9/28/05	40 LF of minor streambed erosion	>10%	< 30	Fair	Moderate	Private	Mapped	None	None	Bank erosion	
42	42.1	3/3/06	Bank protection and check dams of sandbag and geotextile were installed for temporary protection of this reach. The dams are up to 4 feet high and are beginning to fail. Some bank erosion is also occurring. There is a large amount of fine grained sand behind the dams and in the channel. South bank appears to be slide material.	2 to 5%	>80 acres	Fair	Moderate	Private	Observed on south bank but not mapped	None	None	Bank erosion and sandbag dam failure causing deposition downstream.	Much of the riparian area would be considered wetlands.

Table 5-1

Summary of Phase 2 Field Investigations for Erosion Problems

Basin No.	Problem No.	Date of site visit	Description of Problem [1]	Estimated Stream Gradient [2]	Approximate Size of Tributary Area [3]	Aquatic Habitat	Rate of Erosion	Located on Public or Private Property?	Landslide	Risk to Health and Safety	Risk to Residence	Risk of Property Damage [4]	Comments/City Input
42	42.1A	3/3/06	Two sandbag and geotextile check dams and sandbag and geotextile bank protection were temporarily installed for protection of this reach. These are beginning to fail. Some bank erosion is also occurring on the south bank.	5-10%	>80 acres	Good	Moderate	Private	Observed on downstream end of south bank but not mapped	None	None	Bank erosion and sandbag dam failure causing significant deposition downstream.	
42	42.2	3/3/06	About 100 feet of the south bank of this 300-foot reach s experiencing erosion and needs bank protection and restoration. Two large rock check dams need repairs.	5-10%	>80 acres	Fair	Moderate	Public	South bank mapped and observed as a landslide	None	None	Bank erosion and slope destabilization	
42	42.3	3/3/06	South bank is a landslide area and consists of soft, wet material that is subject to loss by flowing water and by spring sapping. About 90 feet of this 270-foot reach has problematic erosion.	5-10%	30-80 acres	Fair	Moderate	Public	South bank mapped and observed as a landslide	None	None	Bank erosion and slope destabilization	
42	42.4	3/3/06	Bank sloughing and spring sapping exists along about one-third of the south bank of this 400-foot reach. Previous restoration work done but additional work is needed. On the north bank the creek runs adjacent to sanitary sewer manhole and is armored with quarry spalls which may be too small in size for adequate protection.	5-10%	30-80 acres	Good	Moderate	Public	South bank mapped and observed as a landslide	Sanitary sewer manhole adjacent to creek	None	Bank erosion and slope destabilization	
42	42.5	3/3/06	No significant erosion or collection area.										
42	42.6	3/3/06	Erosion and head cutting of soft bed and banks in small steep water course with undeveloped drainage area.	>10%	< 30 acres	None	Moderate	Public open space	Mapped	None	None	Bed and bank erosion	
42	42.7	3/3/06	No significant erosion problem										
42	42.8	3/3/06	Erosion or soil movement in very small channel with limited drainage area, 40 percent gradient and erodible soil which is mapped as slide material. Soil loss is caused by spring sapping and flowing water.	>10%	< 30 acres	None	Rapid	Public open space	Mapped and observed	None	None	Bed and bank erosion	
42	42.8A	3/3/06	About 30 feet of the south bank is experiencing erosion and spring sapping. North bank composed of large rock to protect sanitary sewer main and no erosion is evident. Total reach length is about 140 feet. Large rock check dams are also okay.	2 to 5%	>80 acres	Fair	Slow	Public open space	Mapped	None	None	Bank erosion and slope destabilization	
42	42.9	3/3/06	There are two erosion problems at this site;1) a 5-foot drop from the 18-inch CMP culvert under a private driveway which is undergoing moderate erosion and 2) 30 feet of channel down cutting located 100 feet downstream of the culvert. The soft, wet east bank has wetland characteristics. Site is located in undeveloped ravine. Work may need to be done primarily by hand due to site conditions.	5-10%	< 30 acres	Fair	Slow	Private and public	Not Mapped or observed	None	None	Bed and bank erosion	
42	42.10	3/3/06	Existing public drainage system consists of a manhole with a sound CMP outlet pipe on top of the ravine about 50 feet long, about 30 feet of half round CMP, an above ground transition from the half-round pipe to a 24-inch corrugated polyethylene pipe and 80 feet of corrugated polyethylene pipe which lies on the ground in the bottom of the small ravine. Only one of the corrugated polyethylene pipe joints is capable of handling thrust. There is leakage from the pipe and seepage from the hill slope. The seepage has contributed to slope instability particularly on the south bank.	>10%	< 30 acres	None	Moderate	Private	Observed	None	None	Unraveling slope	
44b	44b.1	12/14/05	No erosion. Lined channel built by property owner										
44b	44b.2	12/14/05	No significant erosion problem. Quarry spalls in place										
45b	45b.1	12/8/05	Existing quarry spall check dams effective but need some bank protection	2 to 5%	30 to 80 acres	Fair	Slow	Private	Mapped on south bank	Bank Erosion potentially affecting East Mercer Way	None	Bank Erosion potentially affecting East Mercer Way	City crews knew of no problems, but 8 cy of sediment is removed annually.
45b	45b.2	12/8/05	No significant erosion problem										
45b	45b.3	9/12/05	Stream down cutting has exposed 120 feet of sewer and generated considerable sediment, which is a maintenance problem downstream. South bank subject to sliding.	>10%	< 30 acres	Fair	Rapid	Private and public	Observed on right bank	Exposed sewer is leaking into creek	None	Bank erosion and slope failure	Predesign investigation underway as part of the Parkwood Project.

Table 5-1
Summary of Phase 2 Field Investigations for Erosion Problems

Basin No.	Problem No.	Date of site visit	Description of Problem[1]	Estimated Stream Gradient[2]	Approximate Size of Tributary Area[3]	Aquatic Habitat	Rate of Erosion	Located on Public or Private Property?	Landslide	Risk to Health and Safety	Risk to Residence	Risk of Property Damage[4]	Comments/City Input
45b	45b.4	9/12/05 12/8/05	Drop at culvert outlet of 12-inch CMP culvert under private drive is eroding partially protected steep slope. Erosion also occurring downstream of the outlet.	>10%	< 30 acres	None	Moderate	Private	None mapped or observed.	None	None	Bank Erosion	
46a	46a.1	12/8/05	No significant erosion or collection area										
46a	46a.3	11/8/04 3/3/06	Large scale slope movement into creek is pinching channel along 250-foot reach. Creek erosion of toe and fill south of street may be contributing to slope movement. This is a large source of sediment. The slope and much of the contributing area is mapped as a slide.	2 to 5%	< 30 acres	Fair	Rapid	Public open space	Large scale slide mapped and observed	None	None	Bank erosion, deposition downstream and slope movement which may ultimately affect 53rd Palace	City crews report deposition at mouth is a problem.
46a	46a.4	3/3/06	Downstream of pipe outlet, channel is down cutting along 100 feet of soft fill and slide material. This tributary stream is located south of 53rd Place on city open space.	3 to 5%	< 30 acres	Good	Moderate	Public open space	Large scale slide mapped and observed	None	None	Bank erosion and deposition downstream	City crews report deposition at mouth is a problem.
46b	46b.1	12/8/05	No significant erosion or collection area. Slide										
49b	49b.1	12/8/05	Pipe system outlet from East Mercer Way and SE 47th Street discharges onto East Mercer Way embankment eroding a deep channel and 2 foot drop at outlet. Pipe outlet is also partially crushed.	>10%	< 30 acres	None	Rapid	Public	Mapped	Bank Erosion potentially affecting East Mercer Way	None	Bank Erosion potential affecting East Mercer Way	
49b	49b.2	12/8/05	Moderate bank erosion and head cutting along portions of 250 feet of channel.	>10%	< 30 acres	Poor	Slow	Private	None mapped at site but observed upstream.	None	None. Nearby house on pin piles	Bank Erosion	
49b	49b.4	12/14/05	Large scale, severe erosion at an existing 12-inch storm drainage outlet which drops six feet into a steep channel in sandy soil. Channel incision is about 100 feet long and the depth varies from 5 to 20 feet.	>10%	< 30 acres	Poor	Rapid	Unopened street right of way	Mapped	None	long term risk to one residence	Bank erosion	City staff reported erosion at outlet.
50b	50b.1	12/8/05	No significant erosion problem. Quarry spalls in place										
50b	50b.3	12/8/05	No significant erosion or collection area										
50c	50c.1	12/14/05	No significant erosion problem. Quarry spalls in place but suggest adding 2 additional CY										
50c	50c.2	12/18/05	Problem eliminated by installation of pipe system for home										
50c	50c.3	12/18/05	Problem eliminated by installation of pipe system along private drive										
51a	51a.1	12/14/05	50 feet of south bank erosion and outlet erosion at 18-inch culvert may threaten embankment of East Mercer Way. Considerable sand in channel from upstream	>10%	< 30 acres	Fair	Slow	Private	None mapped but south slopes are steep	Bank Erosion and upper slope failure potentially affecting East Mercer Way	None	Bank Erosion and upper slope failure potentially affecting East Mercer Way	City staff reported some erosion problems downstream of East Mercer Way.
52	52.1	12/14/05	Rapid bed erosion, bank erosion and head cuts in a small channel with a bottom width of 2 feet and a depth of 3 to 7 feet on downstream side of East Mercer Way. Bed and banks consist of erodible sandy material and fill. May have been accelerated by addition of collection area to the 18-inch pipe under East Mercer Way.	5-10%	< 30 acres	Poor	Rapid	Private	None mapped or observed.	None	Clogged system can cause flooding around residence	Bank erosion and deposition downstream. Deposition downstream causes flooding.	Resident reported problem to City.

Notes:
1. Refer to Appendix E for detailed field observations.
2. Stream gradient categories (field estimated): 0-1% 2-5% 5-10% >10%
3. Tributary area categories are estimated:
<30 acres = average flow of <0.1 cfs (no significant habitat value) and small peak flows
30-80 acres = average flow of 0.1 to 0.3 (some habitat) and moderate peak flows
>80 acres = average flow of > 0.3 cfs (has significant habitat) and high peak flows
4. Risk of property damage describes what is being eroded and if erosion could affect any roads/structures.

Table 5-2
Summary of Potential Permits

Permit / Approval	Lead Agency	Trigger	Design Detail Required	Processing Time	Appeal	Comments
FEDERAL – CORPS OF ENGINEERS (COE)						
Nationwide Permit under the Clean Water Act Section 404	COE – local district	Discharge of dredged or fill material into waters of the United States. Currently, there are 42 nationwide permits that may be used in Washington State for various types of activities. The specific NWP will be determined after an alternative is chosen.	As contained w/in JARPA application.	± 60 days	No internal appeal process.	Requires CZM (explained below), 401 WQ Certification (explained below), and 30 day public notice.
FEDERAL – U.S. FISH & WILDLIFE SERVICE (USFWS) & NATIONAL MARINE FISHERIES SERVICE (NMFS)						
Endangered Species Act Review	USFWS & NMFS	Federal Nexus** and listed species. Application for a federal permit when a plant or animal species may be affected that is suspected to be, or actually is of threatened or endangered status.	Requires specific construction detail for Biological Assessment.	Varies	Court	** A Federal nexus exists where projects require work in federally controlled properties, work requiring federally issued permits (i.e. COE Section 10 and 404), and/or projects that will use federal funding.
STATE – WASHINGTON STATE DEPT. OF FISH & WILDLIFE (WDFW)						
Hydraulic Project Approval (HPA)	WDFW	Work that uses, diverts, obstructs, or changes the natural flow or bed of state waters. Activities include: bridges, piers, & docks; pile driving; channel change/realignment; pipeline crossing; culvert installation; dredging; gravel removal; pond construction; placement of outfall structures; log, log jam, or debris removal; installation/maintenance of (w/equipment) water diversions.	• General Project Plans • 100% plans for work within the OHWM • 100% plans for the proper protection of fish • 3 copies of completed JARPA	• Max. 45 days after application and State Environmental Policy Act (SEPA) compliance are complete • Max. 15 days for expedited HPA • Immediately for emergency HPA	Informal and formal appeal processes avail. – must be filed w/in 30 days of HPA issuance / denial	
Priority Habitats and Species (PHS) Consideration	WDFW	A search of the WDFW PHS database is required to determine the presence of state and federally listed species including those that are designated as endangered, threatened, sensitive, candidate, and monitor.	• Project description • Vicinity map	Data is usually sent within 30 days and is accurate up to 6 months.	N/A	A search of the database has been completed for the project vicinity.
STATE – WASHINGTON STATE DEPT. OF ECOLOGY (ECOLOGY)						
Water Quality Certification Section 401 of the Clean Water Act	Ecology	Applying for a federal permit or license to conduct any activity that might result in a discharge of dredge or fill material into water or non-isolated wetlands or excavation in water or non-isolated wetlands.	As contained in JARPA application.	• Concurrent with Section 404. • Usually takes 30 days but can take up to 180 days.	Appealable to Pollution Control Hearings Board w/in 30 days of Ecology decision.	Issued after Section 404 permit.

Table 5-2
Summary of Potential Permits

Permit / Approval	Lead Agency	Trigger	Design Detail Required	Processing Time	Appeal	Comments
LOCAL						
Land Use Approval – Shoreline Master Program	Local government	Development w/in 200 ft. of water body covered by the SMP and associated wetlands.	Varies by jurisdiction.	Varies by jurisdiction.	Lengthy appeal to State Shoreline Hearings Board	Currently no projects are proposed within 200 feet of the shoreline.
Construction Permits • Grading/ Clearing • Right of Way (ROW) Use	Local government	Construction activities.	Varies by jurisdiction.	Varies by jurisdiction.	No.	Permits can be sequenced.
MISC. PERMITS						
SEPA Checklist	SEPA lead agency	Any proposal that requires a state or local agency decision to license, fund, or undertake a project, or the proposed adoption of a policy, plan, or program can trigger environmental review under SEPA. (See WAC 197-11-704 for a complete definition of agency action.) SEPA requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. The checklist provides information to help the agency identify impacts and decide whether an EIS is required.	• Typically at least 30% design. • Depends on SEPA lead agency. SEPA environmental review usually starts with the applicant completing an environmental checklist that is submitted to the SEPA lead agency. The standard checklist form is in WAC 197-11-960.	Depends on the lead agency. • Environmental Checklist – 3 to 6 months • EIS – 9 to 18 months	Depends on the lead agency.	
SPECIAL STUDES						
Wetland Determination Report	COE – local district, Ecology, local government	Work in proximity to wetlands.	N/A	N/A	N/A	
Biological Assessment	COE – local district, USFWS, NMFS Ecology, local government	Federal nexus.	60% design	180 days	N/A	
Conceptual Mitigation Plan	COE – local district, Ecology, local government	Unavoidable impacts to critical areas	30% design	60 days	N/A	

Table 5-2
Summary of Potential Permits

PERMIT / APPROVAL	LEAD AGENCY	TRIGGER	DESIGN DETAIL REQUIRED	PROCESSING TIME	APPEAL	COMMENTS
Final Mitigation Plan	COE – local district, Ecology, local government	Unavoidable impacts to critical areas	60% design	30 days	N/A	

Table 5-3

Summary Results of Phase 2 Drainage System Investigations [1]

Location	Phase 1 Problem No. (If Applicable) [2]	TV Site ID	City Map Section	Summary of Observation [3]	Conclusion Based on City Observations
60th Ave SE & SE 20th St	D13c.1	1 thru 4	A1	Part of pipe is oval-shaped from squashing; heavy debris at downstream end of pipe system.	Not a problem.
2227 80th Ave SE	D9.3 (new)	2 thru 4	A3	Upstream pipe is partially collapsed and needs replacement (site #2) at the crossing of 80th Ave SE near house #2227; some parts of the system could not be accessed; several joint offsets of 3 to 6 inches or more were identified; root intrusion and debris (rocks) present.	Problem - CIP Identified, more investigation required.
7638 SE 22nd St	none	5	A3	Light offsets.	Not a problem.
78th Ave SE and SE 22nd St	D9.1 (#10)	6 thru 10; 12 thru 14	A3	Light to medium joint offsets; could not access all of the system.	Not a major problem, but additional investigation may be required.
80th Ave SE and SE 22nd St	D9.1	11	A3	Medium offset at one joint.	Not a problem.
2218 80th Ave SE	D9.2	15	A3	Medium debris and offsets; light longitudinal cracking; light root intrusion and debris; break in one connection.	Not a problem.
80th Ave SE and SE 20th St	none	16 and 17	A3	Section of pipe is broken and sagging and needs to be replaced (site #17); medium offsets and separation observed.	Not a problem.[4]
2000 82nd Ave SE	none	18 and 19	A3	Some light to medium cracking and broken joints.	Not a problem.
63rd Ave SE and SE 27th St	D15.4 (new)	1 and 2	B1	Medium to heavy offsets; could not access all of the system.	Not a major problem, but additional investigation may be required. Possible CIP.[5]
2432 63rd Ave SE	D15.4 (new)	3	B1	Heavy offset; could not complete run.	Not a major problem, but additional investigation may be required. Possible CIP.[5]
2440 63rd Ave SE	D15.4 (new)	4	B1	Medium to heavy joint offsets and separation; this area needs a spot repair, especially the first 12 feet of pipe; could not access all of the system - may want to use the push camera. CB 28B is not on the storm drainage map but is downstream of CB 29.	Problem - CIP Identified, more investigation required. [5]
2420 63rd Ave SE	D15.4 (new)	5	B1	Heavy offset and separations; light to heavy root intrusion; could not complete run; needs replacement.	Problem - CIP Identified, more investigation required. [5]
61st Ave SE and SE 28th St	none	6 and 7	B1	Medium offsets and root intrusions; dissimilar pipe connections; broken pipe sections; some cracking.	Not a problem.
3049 71st Ave SE	D18c.2	1 and 2	B2	No problems observed.	Not a problem in the 500 feet TV'd.
70th Ave SE and SE 29th St	D18c.1	3 thru 13	B2	System along 70th Ave SE from SE 29th St to SE 32nd St; light to heavy offsets; not all of reach could be completed; medium cracking, medium to heavy separation; recommend monitoring areas of heavy offset (site #9); much of the reach was observed to have no problems; some broken sections that should be replaced also observed - within a 700 foot section there are two substandard sections, one is 125 feet long and one is 50 feet long; site #5 needs grouting at a heavily offset joint; this is a 12-inch shallow system.	Problem - CIP Identified, more investigation and maintenance is required.
8452 N Mercer Way	D6.1	1 and 2	B4	Shovel stuck within pipe at site #2; light root problem and slight oval-shape due to squashing also observed. It is also noted that a locking lid was installed recently to prevent flooding, and so far no flooding has been observed.	Not a major problem, but maintenance is required, and continued monitoring of the area where the locking lid was installed.
77th Ave SE and SE 37th St	none	1 thru 3	C3	No problems observed.	Not a problem.
76th Ave SE and SE 37th St	D10.1 (site 5) (new)	4 and 5	C3	76th Ave SE north of SE 37th St and near house #7602. Medium to heavy offset and separation; pipe is sagging in sections; pipe joint separation with void space in the bottom; need to apply grout in one void at invert of separated joint (site #5). This is a 12-inch pipe system.	Not a major problem, but maintenance and additional investigation is required.
76th Place SE and SE 36th St	none	6 and 7	C3	Light root intrusion and medium joint offset.	Not a problem.
76th Place SE and SE 34th St	D10.2 (site 8) (new)	8 and 9	C3	Medium to heavy offset and medium cracking; requires spot repair at site #8 where part of the pipe is broken and offset by 1 inch.	Not a major problem, but maintenance is required.
77th St SE and SE 37th St/Pl	none	10 through 12	C3	Medium to heavy offset, some pipe sagging; the observed heavy offset may actually be due to the pipe dropping over a bank - the top of the pipe looks well-grouted.	Not a problem.
3835 83rd Ave SE	D21.3 (sites 13, 14, 15) (new)	13 and 14	C3	Heavy offset (over 4"), this pipe needs replacement at site #13; the pipe is broken in one section and plugged with debris at site #14; could not complete the investigation to the end of the run.	Not a major problem, but maintenance is required and additional investigation may be required. [6]

Table 5-3

Summary Results of Phase 2 Drainage System Investigations (1)

Location	Phase 1 Problem No. (If Applicable) (2)	TV Site ID	City Map Section	Summary of Observation (3)	Conclusion Based on City Observations
3843 83rd Ave SE	D21.3 (sites 13, 14, 15) (new)	15 and 16	C3	Light offset; section of pipe is broken and full of dirt at site #16; could not complete investigation.	Not a major problem, but maintenance is required and additional investigation may be required. (6)
4845 Forest Ave SE	D25b.1	1 thru 5	F3	Could not complete entire investigation of this run; light to heavy root intrusion; medium offset observed; light to heavy offset and separation.	Not a major problem, but additional investigation may be required.
5225 E Mercer Way	D46a.2	1	F5	Light root intrusion.	Not a problem.
E Mercer Highlands and E Mercer Way (North of 4905)	D47.1	2	F5	Culverts under East Mercer Way are suspected of poor condition; investigation revealed cracked 18-inch clay pipe, longitudinal cracks, oblong pipe has started to flatten out; cross culvert under major arterial; the pipe is collapsed at the end; embankment is shallow on west side but there are two large trees at the inlet end of the culvert; the culvert is much deeper on the east side; could not complete investigation. High priority to replace.	Problem - CIP Identified, more investigation required.
6160 94th Ave SE	none	1	G5	Heavy separated joint.	Not a problem.
7515 SE 71st St	D31c.2	1	H2	Light root intrusion; could not complete investigation; medium separation at a couple of joints.	Not a major problem in the north branch TV'd, but additional investigation may be required.
80th Ave SE and SE 70th St	D29.1	1	H3	Heavy root intrusion blocking camera access to complete investigation; light debris accumulation; roots should be removed.	Not a major problem, but additional investigation and maintenance is required. (6)
80th Ave SE and SE 67th St	D29.1	2 and 3	H3	Light to heavy root intrusion; could not complete investigation; one large root at site #2 needs to be removed; roots at site #3 near backyard of 6537 81St Ave SE need to be removed.	Not a major problem, but additional investigation and maintenance is required. (6)
80th Ave SE and SE 65th St	D29.1	4	H3	Heavy root intrusion blocking camera access to complete investigation at site #4, roots should be removed; investigation could not be completed.	Not a major problem, but additional investigation and maintenance is required. (6)
80th Ave SE and SE 65th St	D29.2	5	H3	Medium to heavy cracking along the 24-inch pipe at site #5 which runs between two houses (on private property); the outlet section of the pipe at the watercourse is collapsed; this pipe needs replacement; the joints look okay.	Problem - CIP identified, but additional investigation is required.
7623 W Mercer Way	D32a.2	1	I2	Flow restriction due to pipe downsizing limited camera access; also pipe material changes from CMP to concrete with bad connection; monitor in the future; may want to try the push camera.	Not a major problem, but more investigation required.
7800 W Mercer Way	D33a.1	2	I2	Pipe replaced in Feb 2006 due to heavy offsets and broken/collapsed sections.	No problems observed now on the other East Mercer Way culverts, but additional investigation is required to make sure any problems that arise are addressed readily.
7405 78th Ave SE	none	1	I3	Light cracking and some debris.	Not a problem.
7408 Mercer Terrace Dr	none	2	I3	Light cracking, heavy root intrusion, heavy offsets, broken pipe section, could not complete investigation.	Not a major problem, but additional investigation may be required.
8410 W Mercer Way	none	1 and 2	J3	Medium root intrusion; could not complete investigation because end of pipe was submerged; one section of pipe was broken.	Not a major problem, but additional investigation may be required.
84th Ave SE and SE 83rd St	D35.1	3	J3	Medium to heavy root intrusion should be removed this summer; could not complete investigation.	Not a major problem, but additional investigation and maintenance is required.
8259 W Mercer Way	D35.1	4 thru 11	J3	No problems observed in most of the reach; one section could not be completely investigated because of steep slope; medium root intrusion at one end.	Not a major problem, but additional investigation may be required.

Notes:

(1) The results are presented in the order of the City storm drainage system "City Map Section" beginning with Section A1.

(2) If identified as (new), this system was not identified in the Phase 1 effort.

(3) See detailed Site ID results in Appendix F.

(4) Based on City input.

(5) The problems in this reach are combined into one CIP project where it will be necessary to evaluate the whole reach to determine the extent of the replacement required.

(6) Adjacent problem areas in these locations are combined into one problem.

Table 5-4
Summary of Areas Requiring Additional Investigation and/or Maintenance

No.	Basin	Problem No.	TV Site Designation (if applicable)	Problem Type/Description [1]	Approximate Length (ft)	Additional Comments
1	6	D6.1	B4, site 2	This pipe system experienced surcharging in the past, but the City previously installed a locking lid on system to contain flows and subsequently, no flooding has been observed. This is a 30-inch system. Shovel stuck within pipe at site #2; light root problem and slight oval-shape due to squashing also observed.	400	Maintenance staff to remove the shovel and continue to monitor for surcharging, in addition to continuing to perform routine TV'ing.
2	6	D6.90		Several blocks west of 84th Avenue SE that include private informal systems that are flat and likely substandard. Some ponding in road occurs.	600	
3	6	D6.91		Several blocks west of 84th Avenue SE that include private informal systems that are flat and likely substandard. Some ponding in road occurs.	600	
4	9	D9.1	A3, sites 10 and 11	Pipe system flows full causing periodic ponding in flat intersection. This hasn't been considered a significant flooding problem because ponding quickly recedes.	400	Not a major problem (site #10) based on TV'ing, but additional investigation may be required. (Site #11 was determined not a problem by TV'ing.)
5	9	D9.3 (new)	A3, site 2	Upstream pipe is partially collapsed and needs replacement (site #2) at the crossing of 80th Ave SE near house #2227; some parts of the system could not be accessed; several joint offsets of 3 to 6 inches or more were identified; root intrusion and debris (rocks) present.	40	A CIP is identified here (replace with12-inch-diameter concrete pipe), but additional investigation is also required in the this system.
6	10	D10.1 (new)	C3, site 5	Crossing of SE 37th Place and near house #7602. Medium to heavy offset and separation; pipe is sagging in sections; pipe joint separation with void space in the bottom; need to apply grout in one void at invert of separated joint (site #5). This is a 12-inch pipe system.	85	Not a major problem, but additional investigation may be required, in addition to possibly having maintenance grout the offset at site #5.
7	12	D12b.1		Substandard system. This block along Roanoke Way may need new drainage system.	500	
8	15	D15.1		Private system suspected as being substandard and in poor condition. Has been subject to some flooding.	350	
9	15	D15.2		Private system suspected as being substandard and in poor condition.	250	
10	15	D15.3		Private system suspected as being substandard and in poor condition.	250	
11	15	D15.4 (new)	B1, sites 1 through 5	There are medium to heavy offset joints and separation along the pipe system on east side of 63rd Ave SE from SE 24th St to SE 27th St. Several are severe along a 300 foot section. There are light roots coming through the pipe in multiple locations. This needs a follow up TV inspection. Shallow system along the shoulder is difficult to maintain.	650	A CIP has been identified here (replace with 12-inch concrete). However, for the CIP development, it was assumed that the entire reach will be replaced, but it could be that only the center section needs replacement; more investigation should be conducted to determine the extent of repair.
12	16	D16.1		Private system suspected as being substandard and in poor condition. Have not been able to TV system due to bad system.	350	
13	16	D16.2		Private system suspected as being substandard and in poor condition.	250	
14	18	D18c.1	B2, sites 3 through 13	System along 70th Ave SE from SE 29th St to SE 32nd St; light to heavy offsets; not all of reach could be completed; medium cracking, medium to heavy separation; recommend monitoring areas of heavy offset (site #9); much of the reach was observed to have no problems; some broken sections that should be replaced also observed - within a 700 foot section there are two substandard sections, one is 125 feet long and one is 50 feet long; site #5 needs grouting at a heavily offset joint; this is a 12-inch shallow system.	175	A CIP has been defined for this area (replace bad sections with12-inch culvert), but maintenance staff may grout heavily offset joint at site #5 and continue to monitor. Additional investigation may be required.
15	18	D18c.2	B2, sites 1 and 2	First Hill Neighborhood. Some blocks (e.g., 70th and 71st) do not have formal drainage system. General area problem (e.g., plugged driveway culverts) that cause nuisance flooding of driveways, but no major flooding.	1,900	The section of pipe for 500 feet north of SE 32nd St was TV'd and no problems were identified. The rest of the system requires investigation.
16	19	D19a.1		Culvert crossing W Mercer Way is suspected of poor condition and should be inspected.	70	
17	20	D20.1		Private system suspected as being substandard and in poor condition. Also noted as very steep.	400	

Table 5-4
Summary of Areas Requiring Additional Investigation and/or Maintenance

No.	Basin	Problem No.	TV Site Designation (if applicable)	Problem Type/Description [1]	Approximate Length (ft)	Additional Comments
18	20	D20.2		Private system suspected as being substandard and in poor condition. Also noted as very steep.	300	
19	21	D21.1		Private system suspected as being substandard and in poor condition.	250	
20	21	D21.2		Private system suspected as being substandard and in poor condition.	150	
21	7 and 21	D21.3 (new)	C3, sites 13,14,15	83rd Ave SE from house #8225 to #3880. This section of pipe includes several heavy joint offsets (some as much as 4") which need to be replaced at site #13; light roots growing into the pipe; some sections of the system are in good shape; area between CB 201 and CB 202 (site #14) is broken and there is dirt blocking the pipe; section of pipe is broken and full of dirt at site #16; could not complete the investigation at the end of the run.		Maintenance staff can fix the areas where the pipe is broken and debris and rock are blocking the pipe (from CB 199 to CB 198, between CB 199 and CB 200 and between CB 201 and CB 202), and also fix the large offset. Additional investigation and monitoring is recommended.
22	22	D22.1		Flat informal system subject to nuisance ponding. Currently planned overlay project will solve this problem.	1,300	
23	23	D23.1		deep 18-inch crossing of Forest Ave SE (80th Ave SE near Merrimount Dr SE) is in bad condition and in need of inspection and possible replacement. Have not been able to TV system.	50	
24	25	D25b.1	F3, sites 1 through 5	Some sloughing alongside Forest Avenue SE (between SE 48th Street and SE 49th Street) fills ditch. Also debris plugging of nearby cross culvert has been a problem. Recommend inspection of cross culvert and downstream system to lake.	500	Not a major problem based on TV'ing, but more investigation may be required.
25	25	D25b.2		Some debris plugging of West Mercer Way cross culvert. Also condition of cross culvert is old and deep. Inspection is recommended.	150	
26	28	D28b.1		1960 system installed in slide area. Any failure would have high risk of damage and inspection is recommended. Some root problems have occurred. There is also some concern that if bypass malfunctions all flows would return to channel and cause flooding.	1,200	
27	29	D29.1	H3, sites 1 through 4	Older concrete system between 80th Ave SE and 81st Ave SE from SE 65th Street to south of SE 70th St is 18-inch and/or 24-inch. The system has heavy root intrusion which blocks camera access so investigation could not be fully completed; roots are medium to large, but water can still flow through.	1,800	Maintenance can cut the roots and remove. Additional system investigation also required.
28		D29.2	H3, site 5	Medium to heavy cracking along the 24-inch pipe at site #5 which runs between two houses (on private property); the outlet section of the pipe at the watercourse is collapsed; this pipe needs replacement; the joints look okay.	100	A CIP has been identified here (replace 24-inch pipe from where the cracking starts to the outlet). Further investigation should be conducted to determine how much of the section needs to be replaced. The worst is the north end of the 100' length.
29	31	D31c.1		Private system suspected as being substandard and in poor condition.	450	
30	31	D31c.2	H2, site 1	Private system suspected as being substandard and in poor condition.	800	The north branch was TV'd and determined to not be a problem, but more investigation of this reach is required.
31	32	D32a.1		Private system suspected as being substandard and in poor condition. System was previously TV'd by the CIty and lower portion was found in bad condition.	1,000	
32	32	D32a.2	I2, site 1	West Mercer Way - pipe material changes from CMP to concrete to CMP with poor connections across WMW. The pipe size increases as move downstream. Could not access from upstream end because of flow restrictor. Need more investigation from the upstream side and need to monitor. The crossing is not that deep. Monitor in the future and may want to try push camera.	8 out of 60	A CIP was identified (replace 8 feet of 12-inch CMP culvert at the end). Further investigation is also required for the rest of the system.
33	32	D32b.1		Private system suspected as being substandard and in poor condition with root problems.	400	
34	32	none	I3, site 2	Light cracking, heavy root intrusion, heavy offsets, broken pipe section, could not complete investigation.		

Table 5-4
Summary of Areas Requiring Additional Investigation and/or Maintenance

No.	Basin	Problem No.	TV Site Designation (if applicable)	Problem Type/Description (1)	Approximate Length (ft)	Additional Comments
35	33	D33a.1	I2, site 2 is the location of the replaced culvert	Several West Mercer Way culvert crossings are old and in poor condition and need replacement. Several slides in area have occurred and repaired by the City. The pipe systems downstream from these culvert crossings were also noted as poor condition. The culvert at 7800 W Mercer was recently replaced (it's the furthest south). There is another culvert there that needs to be replaced. 40 feet of sewer main was also replaced.	2,000	No problems were observed with this TV investigation, but this area should be monitored for future problems.
36	35	D35.1	J3, site 3 (also sites 4 through 11)	Old system constructed along steep bank at 84th Ave SE and SE 83rd St. A past blowout occurred due to root intrusion resulting in flooding of home. If failure occurs, damage risk is high. There is a root along the invert of the pipe at 59 feet from CB 89 and then again at 78 feet; the pipe is nearly half full with debris and sediment. Approximately 50 feet of 18-inch pipe show root intrusion and debris to be removed.	190	Maintenance crew to address the issues of removing roots and other debris. This is the most urgent of the maintenance problems because it's on a hillside, near a heavily used trail. More investigation could also be conducted throughout the reach in additional to what was TV'd this time.
37	35	none	J3, sites 1 and 2	Medium root intrusion; could not complete investigation because end of pipe was submerged; one section of pipe was broken.		
38	36	D36.1		Culvert/driveway crossing not functioning properly. Some settlement has occurred. May be private drainage problem.	40	
39	37	D37.1		Drainage system suspected of poor condition (not constant slope). Recommend inspection.	200	
40	37	D37.2		Drainage system suspected of poor condition (not constant slope). Recommend inspection.	350	
41	37	D37.3		Drainage system suspected of poor condition. Recommend inspection.	300	
42	38	D38.1		System near Terrywood Ln is constructed in steep sandy bank. Pipe is partially buried. City previously TV'd part of system and it was considered marginal. This system is a concern because if failure occurs there is high potential for damages. Downstream portion in park is considered okay.	700	
43	40	D40.a1		Informal drainage system in poor condition. A planned roadway/drainage improvement CIP will solve this problem.	300	
44	40	D40b.1		Culvert crossing suspected of poor condition. Recommend inspection.	50	
45	46	D46a.1		Culverts under East Mercer Way are suspected of poor condition and should be investigated. This site is also designated as a "Hot Spot".	60	
46	47	D47.1	F5, site 2	Culvert under East Mercer Way investigation revealed cracked 18-inch clay pipe, longitudinal cracks, oblong pipe has started to flatten out; cross culvert under major arterial; the pipe is collapsed at the end; embankment is shallow on west side but there are two large trees at the inlet end of the culvert; the culvert is much deeper on the east side; could not complete investigation.	200	A CIP was identified at this location. More investigation may also be required.
47	49	D49b.1		Existing pipe system is suspected of being undersized and should be investigated.	150	
48	49	D49b.2		East Mercer Way culvert crossing is in substandard condition (old clay and cracked, imploding) and needs replacement	60	
49	50	D50c.1		18" cross culvert (at 4449 East Mercer Way) is failing and may need to be replaced.	60	
50	51	D51a.1		Private conveyance system at downstream end of watercourse is suspected of being undersized.	250	
51	53	D53.1		4" storm drain is undersized. This may be a private system.	250	
52	Varies	General		All culverts along East and West Mercer Way that were not inspected as part of this study should be inspected frequently and regularly.	Varies	

Notes:
(1) Sources of information are the TV inspection reports for those systems TV'd and interviews with City staff.

Table 5-5
CIP Summary

Problem/ Project No.	Problem	Proposed Project Solution	Estimated Costs
EROSION PROJECTS			
4.1	Head cut is moving upstream creating a 30-foot long incised channel into till that is up to 7 feet deep	Channel stabilization along about 40 feet of creek.	$45,000
4.2	Downstream of storm drain outlet, flow is scouring and undercutting toe of large slide. Two other storm drain outlets contribute flow.	Install manholes, anchor blocks and 12-inch-diameter butt-fused HDPE pipes along 100 feet of water course and 40 feet at two side drainage systems to stop erosion of slide toe. (1)	$198,000
6.1	Downstream of surface storm drain outlet, flow is scouring and undercutting toe of small slide within an undeveloped ravine.	Extend 18-inch-diameter surface CPEP previously installed by city crews 75 feet past slide.	$87,000
10.4	Large subbasin from business district outlets in open channel lined with riprap. Rock may be undersized	Place 5 cy of large riprap at outlet of 60-inch-diameter pipe.	$13,000
26.1	High streamflows in the subbasin have caused channel down-cutting in the reach between Island Crest Way and West Mercer Way. The channel erosion is largely confined to an approximate 600- to 700-foot reach immediately west of Island Crest Way, including a significant headcut (up to nine feet in height) that has the potential to travel upstream during high flows.	This project is already being designed and is at the 30-percent design stage. The project includes stream channel restoration for approximately 660 feet of channel length. The project will stabilize the stream channel through the application of bioengineering techniques including placement of woody debris, log weirs, coir fabric, natural streambed rock material, and riparian planting.	$1,061,000
27a.1	30 LF of streambed and bank erosion with head cut	Install 30 feet of channel stabilization creating a rounded rock channel.	$34,000
27a.3	110 LF of deeply incised channel in glacial till with three head cuts in undeveloped ravine	Stream restoration and lay back the top of the banks in undeveloped ravine.	$120,000
27a.6	4-foot high timber dam is failing	Construct 40 feet of boulder cascade.	$54,000
29.1	Drop at culvert outlet at West Mercer Way and severe bank erosion and down cutting along approximately 600 feet of stream below West Mercer Way. Slope instability is being created such that slides have occurred along much of the Reach. In addition, there is also some less severe downcutting in the channel at some locations downstream of this 600 foot section before it enters a culvert crossing at 77th Ave SE	This project is already being designed and is at the 90-percent design stage. The project includes a combination of stream highflow bypass and channel regrading and restoration for the upper approximately 530 feet of channel. The highflow bypass includes a 24-inch diameter HDPE pipeline buried below the restored channel bottom. The highflow bypass will carry high stream flows to reduce ongoing channel erosion. Channel restoration includes raising the grade of the stream, installation of rock revetments, placement of larger woody debris, and plantings. In addition, the project includes minor channel armoring using log deflectors and rock placement at select locations downstream of the highflow bypass.	$959,000
29.2	Very steep channel has created a head cut and incised into the east bank of the main stem of the creek. The small, narrow channel is up to 12 feet deep.	Butt-fused HDPE bypass pipe from West Mercer Way down the steep bank to the ravine bottom, a distance of 140 feet. New manhole and anchor near the street. All flow will be conveyed in the pipe.	$115,000
32b.1	Below the outlet of a 48 inch diameter, half round CMP conveyance pipe, the channel is scoured and drops 3 to 5 vertical feet over 15 to 20 linear feet. Channel is also scouring horizontally below culvert outlet. Water is also flowing along the underside of the half round pipe. Banks are steep, unvegetated, composed of very dense silt and retreating. Channel bottom lacks any substrate and consists of smooth, very dense silt	Construct approximately 30 linear feet of boulder cascade for outfall protection below half round pipe outlet.	$38,000
32b.2	Approximately 5 to 7 foot deep headcut through very dense silt. Below headcut channel is highly incised with vertical, unvegetated banks. Channel bottom has little loose substrate, and consists of very dense silt.	Construct approximately 50 linear feet of boulder cascade, regrade upper banks and replace invasive plants with native vegetation.	$55,000
37b.1	Outfall erosion and erosion from street runoff is threatening driveway	Solution being designed by homeowner's engineer.	$64,000
39a.1	40 LF of minor streambed erosion	Install channel stabilization along the reach. These would be located on private property, so easements will be required. Temporary access could be accomplished from the private drive.	$28,000
42.1	Bank protection and check dams of sandbag and geotextile were installed for temporary protection of this reach. The dams are up to 4 feet high and are beginning to fail. Some bank erosion is also occurring. There is a large amount of fine grained sand behind the dams and in the channel. South bank appears to be slide material.	Replace about 12 sandbag check dams with rock check dams or rock vortex weirs. Check dams are less expensive but rock vortex weirs may be needed to provide fish passage. Also install logs/large woody debris for bank protection.	$200,000
42.1A	Two sandbag and geotextile check dams and sandbag and geotextile bank protection were temporarily installed for protection of this reach. These are beginning to fail. Some bank erosion is also occurring on the south bank.	Replace sandbag check dams with rock check dams or rock vortex weirs. Check dams are less expensive but rock vortex weirs may be needed to provide fish passage. Also provide bank protection and stream restoration along about 60 feet of bank. Stream restoration would include logs/large woody debris, boulders, bank regrading and planting.	$122,000

Table 5-5
CIP Summary

Problem/ Project No.	Problem	Proposed Project Solution	Estimated Costs
42.2	About 100 feet of the south bank of this 300-foot reach s experiencing erosion and needs bank protection and restoration. Two large rock check dams need repairs.	100 feet of stream restoration/bank protection and repairs to two rock check dams.	$116,000
42.3	South bank is a landslide area and consists of soft, wet material that is subject to loss by flowing water and by spring sapping. About 90 feet of this 270-foot reach has problematic erosion.	Stream restoration to increase bank stability along about 90 feet of the south bank. Work will include placement of boulders and logs as well as planting of water-loving, shade-tolerant plants such as salmonberry. Planting may be as individuals or as wattles.	$91,000
42.4	Bank sloughing and spring sapping exists along about one-third of the south bank of this 400-foot reach. Previous restoration work done but additional work is needed. On the north bank the creek runs adjacent to sanitary sewer manhole and is armored with quarry spalls which may be too small in size for adequate protection.	Stream restoration to increase bank stability along about 130 feet of the south bank. Work will include placement of boulders and logs as well as planting of water-loving, shade-tolerant plants such as salmonberry. Planting may be as individuals or as wattles. Also place riprap on creekside of sanitary sewer manhole.	$136,000
42.6	Erosion and head cutting of soft bed and banks in small steep water course with undeveloped drainage area.	60 of channel stabilization.	$65,000
42.8	Erosion or soil movement in very small channel with limited drainage area, 40 percent gradient and erodible soil which is mapped as slide material. Soil loss is caused by spring sapping and flowing water.	Install wattles of willows or shade-tolerant plants such as Pacific ninebark perpendicular to the channel. Each wattle dam should be 4 to 8 feet wide. Space wattles 6 feet apart. All work would be manual.	$28,000
42.8A	About 30 feet of the south bank is experiencing erosion and spring sapping. North bank composed of large rock to protect sanitary sewer main and no erosion is evident. Total reach length is about 140 feet. Large rock check dams are also okay.	Stream restoration to increase bank stability along about 30 feet of the south bank. Work will include placement of boulders and logs as well as planting of water-loving, shade-tolerant plants such as salmonberry. Planting may be as individuals or as wattles.	$45,000
42.9	There are two erosion problems at this site;1) a 5-foot drop from the 18-inch-diameter CMP culvert under a private driveway which is undergoing moderate erosion and 2) 30 feet of channel down cutting located 100 feet downstream of the culvert. The soft, wet east bank has wetland characteristics. Site is located in undeveloped ravine. Work may need to be done primarily by hand due to site conditions.	Install culvert outlet protection and 30 feet of stream restoration.	$79,000
42.10	Existing public drainage system consists of a manhole with a sound CMP outlet pipe on top of the ravine about 50 feet long, about 30 feet of half round CMP, an above ground transition from the half-round pipe to a 24-inch-diameter corrugated polyethylene pipe (CPEP) and 80 feet of corrugated polyethylene pipe which lies on the ground in the bottom of the small ravine. Only one of the CPEP joints is capable of handling thrust. There is leakage from the pipe and seepage from the hill slope. The seepage has contributed to slope instability particularly on the south bank.	Install manhole at the downstream end of the sound, buried CMP. Remove half round pipe and replace with 24-inch-diameter corrugated polyethylene pipe (CPEP) extend from the new manhole to the existing 24-inch-diameter CPEP. Cover CPEP with 150 cy of well draining material to stabilize this pipe as well as the slopes. It may be possible to deliver fill with chute or blower truck.	$70,000
45b.1	Existing quarry spall check dams effective but need some bank protection	Partial stream restoration along 300 feet of channel involving repairs and additions to existing check dams as well as habitat friendly bank protection.	$179,000
45b.3	Stream down cutting has exposed 120 feet of sewer and generated considerable sediment, which is a maintenance problem downstream. South bank subject to sliding.	Stream restoration along 450 feet of channel is needed along with reconstruction of 120 feet of sanitary sewer. Erosion problem upstream previously solved by installation of piping in the water course.	$444,000
45b.4	Drop at culvert outlet of 12-inch-diameter CMP culvert under private drive is eroding partially protected steep slope. Erosion also occurring downstream of the outlet.	Replace culvert with manhole, concrete anchor and 120 feet of butt-fused HDPE pipe to ravine bottom.	$77,000
46a.3	Large scale slope movement into creek is pinching channel along 250-foot reach. Creek erosion of toe and fill south of street may be contributing to slope movement. This is a large source of sediment. The slope and much of the contributing area is mapped as a slide.	Install 250 feet of 12-inch-diameter CPEP along channel. Environmental and permitting concerns may be significant. Additional investigation should be done to determine if another alternative, rock lining and removal of fill at the top of the slope along the road, would stabilize the slope.	$109,000
46a.4	Downstream of pipe outlet, channel is down cutting along 100 feet of soft fill and slide material. This tributary stream is located south of 53rd Place on city open space.	Stream restoration along 100 feet to stabilize soft bed and banks.	$99,000
49b.1	Pipe system outlet from East Mercer Way and SE 47th Street discharges onto East Mercer Way embankment eroding a deep channel and 2 foot drop at outlet. Pipe outlet is also partially crushed.	Replace 50 feet of outlet ditch and line with riprap.	$12,000

Table 5-5
CIP Summary

Problem/ Project No.	Problem	Proposed Project Solution	Estimated Costs
49b.2	Moderate bank erosion and head cutting along portions of 250 feet of channel.	Partial stream restoration along 250 feet of channel.	$150,000
49b.4	Large scale, severe erosion at an existing 12-inch-diameter storm drainage outlet which drops six feet into a steep channel in sandy soil. Channel incision is about 100 feet long and the depth varies from 5 to 20 feet.	Install 12-inch-diameter HDPE pipeline with manhole energy dissipator at the downstream end. May be desirable to fill the erosion scar. (2)	$195,000
51a.1	50 feet of south bank erosion and outlet erosion at 18-inch-diameter culvert may threaten embankment of East Mercer Way. Considerable sand in channel from upstream	Install outlet protection and 50 feet of check dams to contain flow. Fill along toe of slope for stabilization.	$45,000
52.1	Rapid bed erosion, bank erosion and head cuts in a small channel with a bottom width of 2 feet and a depth of 3 to 7 feet on downstream side of East Mercer Way. Bed and banks consist of erodible sandy material and fill. May have been accelerated by addition of collection area to the 18-inch-diameter pipe under East Mercer Way.	Installation of channel stabilization measure of 150 feet of this small water course.	$105,000
		SUBTOTAL EROSION PROJECTS:	**$5,238,000**

DRAINAGE SYSTEM PROJECTS

Problem/ Project No.	Problem	Proposed Project Solution	Estimated Costs
D9.3	Upstream pipe is partially collapsed and needs replacement (site #2) at the crossing of 80th Ave SE near house #2227; some parts of the system could not be accessed; several joint offsets of 3 to 6 inches or more were identified; root intrusion and debris (rocks) present.	Replace approximately 40 feet of 12-inch-diameter concrete pipe.	$44,000
D15.4	There are medium to heavy offset joints and separation along the pipe system on east side of 63rd Ave SE from SE 24th St to SE 27th St. Several are severe along a 300 foot section. There are light roots coming through the pipe in multiple locations. This needs a follow up TV inspection. Shallow system along the shoulder is difficult to maintain.	Replace approximately 650 feet of 12-inch-diameter concrete pipe.	$585,000
D18c.1	System along 70th Ave SE from SE 29th St to SE 32nd St; light to heavy offsets; not all of reach could be completed; medium cracking, medium to heavy separation; recommend monitoring areas of heavy offset (site #9); much of the reach was observed to have no problems; some broken sections that should be replaced also observed - within a 700 foot section there are two substandard sections, one is 125 feet long and one is 50 feet long; site #5 needs grouting at a heavily offset joint; this is a 12-inch shallow system.	Replace approximately 175 feet of 12-inch-diameter concrete pipe.	$176,000
D29.2	Medium to heavy cracking along the 24-inch pipe at site #5 which runs between two houses (on private property); the outlet section of the pipe at the watercourse is collapsed; this pipe needs replacement; the joints look okay.	Replace approximately 100 feet of 24-inch-diameter pipe from where the cracking starts to the outlet (further investigation may show that the entire length does not need to be replaced).	$92,000
D32a.2	West Mercer Way - pipe material changes from CMP to concrete to CMP with poor connections across WMW. The pipe size increases as move downstream. Could not access from upstream end because of flow restrictor. Need more investigation from the upstream side and need to monitor. The crossing is not that deep. Monitor in the future and may want to try push camera.	Replace approximately 8 feet of 12-inch-diameter concrete pipe in the lower section of the 60-foot-long reach. Additional investigations are necessary to determine if any other sections of the reach need to be replaced.	$25,000
D47.1	Culvert under East Mercer Way investigation revealed cracked 18-inch clay pipe, longitudinal cracks, oblong pipe has started to flatten out; cross culvert under major arterial; the pipe is collapsed at the end; embankment is shallow on west side but there are two large trees at the inlet end of the culvert; the culvert is much deeper on the east side; could not complete investigation.	Replace approximately 200 feet of 18-inch-diameter concrete pipe using pipe bursting methods.	$243,000
		SUBTOTAL DRAINAGE SYSTEM PROJECTS:	**$1,165,000**
		TOTAL CIP PROJECTS:	**$6,403,000**

NOTES:

(1) This is the preferred solution approach based on the field investigation. It is recommended that additional investigation be conducted to consider additional alternatives described in the Project Summary. Consultation with WDFW is also recommended prior to selection of the preferred alternative for construction.

(2) The cost estimate for this project is based on this solution. However, other alternatives are presented in the Project Summary. It is recommended that the City consult with WDFW prior to selection of the preferred alternative for construction.

N

0 1,000 2,000 4,000 Feet

Legend

	Water Basin Boundaries		**Streams**
	Erosion Projects		**Major Roads**
	Drainage Projects		

Figure 5-1
CIP Project Locations

Comprehensive Basin Review
City of Mercer Island

R.W. BECK

R:\Seattle\004541 City of Mercer Island\11-00996-10000 Comprehensive Basin Review & Watercourse Monitoring\11-00996-10001 Phase 2\GIS Mapping And Figures, 06/07/06

Section 6

STORMWATER PROGRAM POLICIES

Section 6
STORMWATER PROGRAM POLICIES

6.1 Overview of Stormwater Program Policies

In order to formalize some of the more important stormwater program policies for the City, issues associated with these policies were reviewed and input was solicited from the City's Utility Board. Formalized policies will help define what is included in the CIP as well as manage day-to-day operation of the program. The goals of this process also included having stormwater policies that support the delivery of consistent services that the community desires and can afford and that support compliance with regulatory requirements.

The key policy issues that were identified with City staff and evaluated include:

- CIP prioritization
- Erosion, easements, and regulatory compliance
- Fee-in-lieu of detention
- Maintenance easements for stormwater facilities on private property
- Filling of roadside ditches

This work did not include comparing the City's existing stormwater program with what is necessary to be in compliance with the pending regulatory requirements, such as NPDES Phase II, because the regulations are not yet fully defined.

6.2 Recommended Policy Changes

For the selected policy issues, this Section describes the City's current practices and provides discussion and recommendations toward defining and documenting these policies, based on the study conducted with R.W. Beck, City staff, and the City's Utility Board.

6.2.1 CIP Prioritization

The City currently constructs surface water capital projects on a pay-as-you-go basis as funds are available through the Storm and Surface Water Utility and attempts to construct the highest priority projects first. Projects are generally categorized into one of three types: large projects, spot improvement projects, and neighborhood projects. Large projects are typically $150,000 to $500,000 and are associated with watercourse restoration. Spot improvement projects are typically $50,000 to $150,000 and are associated with watercourse restoration. Neighborhood projects are typically within the City right-of-way and are associated with catch basin and/or pipe installation/replacement.

Many factors can affect the order in which projects are constructed. For example, a less expensive project may be built before a more expensive project because of the limited funds available. In addition, the City attempts to balance its capital expenditures across the City's geographic areas, so that if the two most severe problems are near each other, the City may construct just one of them while building other projects in other areas.

The project team, City staff, and the City's Utility Board discussed options for prioritization and it was recommended that the City formalize a prioritization process. With a documented process in place, it is possible to more clearly describe the merits of a particular project, and to explain and document to ratepayers and elected officials why one project gets built before another. Also, having this documented process will help to ensure that priorities are established in a consistent manner from year to year.

Working with City staff and the City's Utility Board, the project team developed two components of a prioritization program. The first element is a prioritization process flow chart that helps decide whether or not the City should implement a project. For example, some problems that are entirely on private property where no public drainage contributes to the problem should not be addressed using public funds. This process diagram can be used to screen out projects such as this. The process diagram is shown on Figure 6-1. The process is also designed to consider the timing of permits needed for a project and the ability to obtain private easements where needed. The second element of the prioritization program is a prioritization model (or spreadsheet). A prioritization model was developed that ranks projects according to several scored criteria such as magnitude of the problem and cost effectiveness, as well as several other criteria. The detailed prioritization model and results is presented in Section 7.

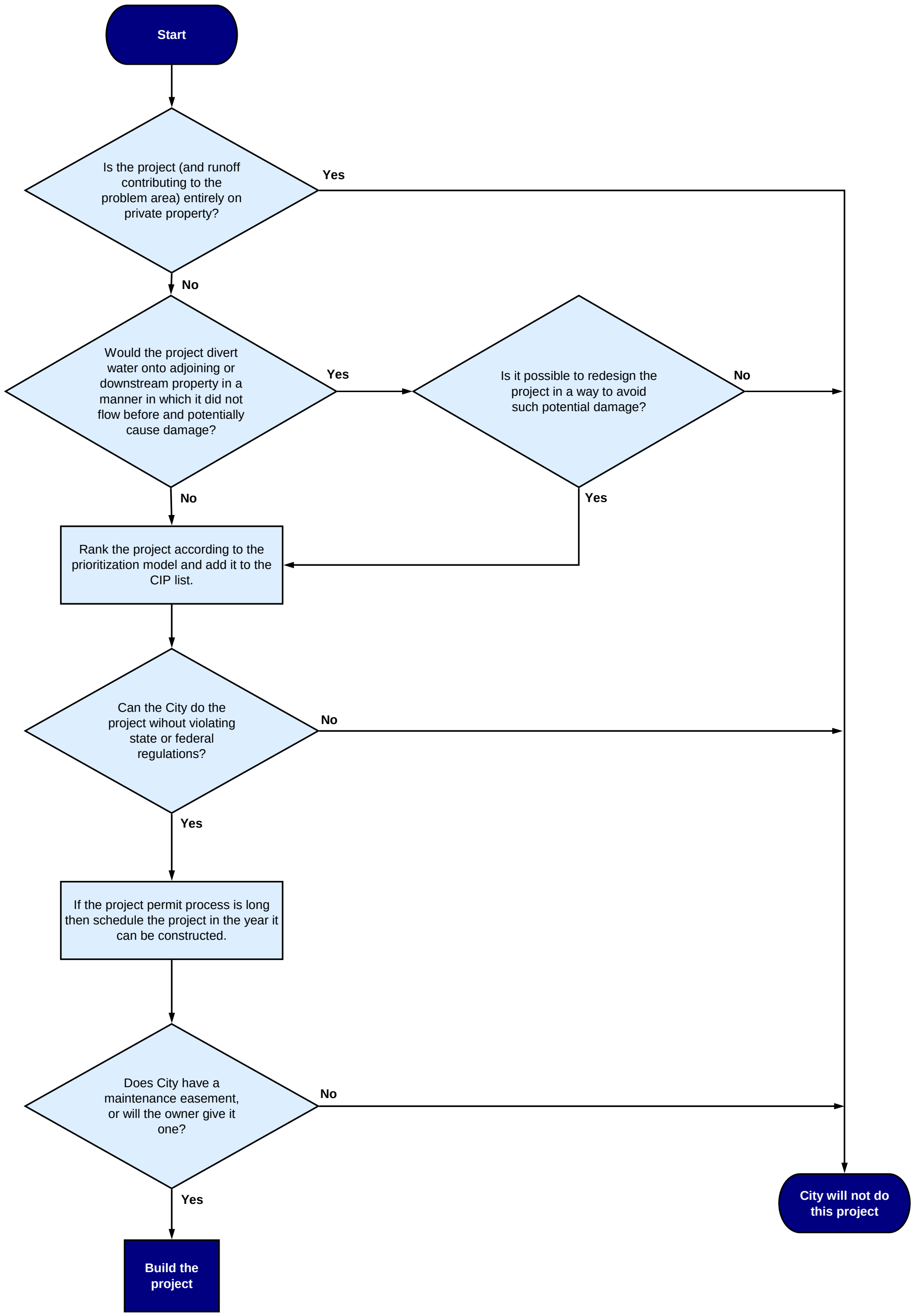


Figure 6-1
CIP Prioritization Process

6.2.2 Erosion, Easements, and Regulatory Compliance

There area a number of legal type issues the City is faced with when dealing with erosion problems which are most often on private property within ravines. Legal issues were discussed with the City staff, the City legal staff, and the City's Utility Board. The following paragraphs describe the main conclusions of these discussions:

- When implementing stormwater and erosion projects, any legal risks need to be reviewed on a case-by-case basis by the City.
- Where new development is adjacent to watercourses, proactively seeking easements during development review to allow future access to streams for CIP projects does not require the City to take over responsibility for correcting future problems in perpetuity because of the availability of the easement. The rights associated with the ownership of an easement do not extend to complete assumption of liability. The City is not responsible for drainage systems (pipes, ravines, watercourses) on private property that convey drainage from uphill City streets and private properties. There can be exceptions to this on a case-by-case basis.
- Any state or federal regulations implicated by a particular project must be given careful scrutiny and necessary permits must be obtained in order to avoid any regulatory compliance problems.
- The City should review the legal risks of potential CIP projects on a case-by-case basis and ensure that the project complies with any applicable state or federal regulations.

6.2.3 Fee-in-Lieu of Detention

Mercer Island City Code (section 15.11.030.A) currently allows private property owners to pay a fee-in-lieu of detention "when authorized by the City Engineer." The code states that the City Engineer will disallow a fee-in-lieu proposal "if, in the opinion of the City Engineer, undetained runoff from the development may materially adversely exacerbate an existing problem." However, the City previously had no written policy that explains how the City Engineer makes this decision.

The City Engineer currently considers many factors such as the location of the development within the subbasin, the magnitude of development, downstream drainage system conditions, the expected increase in stormwater runoff, etc. This practice has worked well, but it was concluded that these factors need to be documented as a part of this effort.

Based on the recommendations of the study with City staff and the City's Utility Board, the City developed the following set of review criteria to help guide decision-making on application of the fee-in-lieu of detention:

- The existence of known drainage system problems downstream of the project site, especially in a ravine/watercourse and whether they are worsening.

- The timing of future capital improvements planned in the ravine/watercourse and the benefit of applying fee-in-lieu monies toward the CIP compared to on-site detention.
- The history of landslides or instability in or along the downstream ravine/watercourse.
- The relative longitudinal slope, soil conditions, and peak flows in the ravine/watercourse. This is used as an indicator of potential erosion as well as how “flashy” the stormwater response is due to level of imperviousness in the subbasin. This is not quantified, but based rather on general observations and any historical knowledge.
- History of litigation regarding flooding or erosion in the subbasin.
- The extent to which the development increases peak flows into the system. Developments that either do not increase peak flows or where good downstream conditions exist are favorable candidates for fee-in-lieu of detention.
- Subbasin size, the project location within the subbasin, and the overall level of development in the basin. Detention in the lowest segments of the subbasin typically does not provide the same benefit as in the upper portions.

When the fee-in-lieu is determined to be an acceptable alternative to providing detention, the property owner’s civil engineer will still need to perform an analysis of the downstream system for one quarter mile to confirm that there are no capacity problems. If a problem is identified, the property owner will either need to correct the problem in addition to paying the fee-in-lieu or forego the fee and provide stormwater detention on the project site.

6.2.4 Maintenance Easements

The surface water system that falls within the jurisdiction of the Storm and Surface Water Utility includes the entire system within the city, both public and private. The system consists of naturally existing ravine watercourses and constructed pipes, culverts and channels. The “City or public drainage system” means those elements of the storm and surface water system within the City that are located on property owned by the City or within the public right-of-way, or are located on property on which the City has an easement. Some portions of the surface water system flow over private property for which there is not an easement. This type of system is referred to as a “private system.”

There are many of these private systems within the City. For private systems (where the City does not have an easement), the City is not responsible for the system operation nor does it have any rights to perform maintenance, improvements, or access the property. It is recognized that these private systems sometimes convey upstream runoff that includes public areas (such as roads). A malfunction of the system (such as plugging or pipe failure) could not only cause damage to the private property itself, but upstream or downstream properties. Therefore, in some cases where public drainage flows through private property, there may be some public benefit for the City to obtain maintenance easements to ensure that the system is reliable.

Following are some situations where obtaining a drainage easement may be desirable:

- The City would like to construct a capital project that results in public benefit, such as a watercourse stabilization project.
- The City would like to obtain an easement for future maintenance and/or replacement of a currently private system that conveys public drainage and it is in the public's interest to ensure that adequate maintenance is performed.
- When the City is reviewing a development proposal for a property with a private system that conveys public runoff and it is in the best public interest to obtain an easement.

It is not necessary to obtain drainage easements for all private systems. Therefore, the City should consider these situations on a case-by-case basis.

Based on the input from the City staff and the City's Utility Board, it is recommended that before the City performs maintenance or rehabilitation of systems on private property, the City obtain a maintenance easement from the property owner. This will allow the City to access the site and maintain the system. If an easement is not provided, the City should not work on the system. This requirement for an easement is also reflected in the CIP prioritization process shown on Figure 6-1.

It is also recommended that the City consider obtaining easements at the time a private property starts the permit process for development or redevelopment.

Note that these two recommendations do not include emergency projects, such as where a drainage problem caused by a recent storm poses an immediate danger. If there is an emergency, the City may need to access private property.

The following should be considered for obtaining an easement in accordance with either of the recommendations above:

- Obtaining an easement for a drainage system by the utility would provide a public benefit.
- Necessary and appropriate property rights are offered by the property owner at no monetary cost. Restoring property after completion of project improvements such as landscaping may be considered.
- That the system/facility substantially meets current engineering standards, as determined by the utility, or is brought up to current engineering standards by the owner or the City as part of a capital project.
- That there is access for utility maintenance.
- That the utility has adequate resources to maintain the facility.

6.2.5 Filling of Roadside Ditches

Many of the City's streets have roadside ditches and no pedestrian paths or shoulders. Private property owners often request that the City replace roadside ditches with piped systems. In considering these requests, the City must look at a number of factors, including:

- The desire of private property owners to have more parking or landscaping in front of their property.
- The safety of cyclists and pedestrians on narrow roadways.
- Water quality treatment provided by vegetated ditches.
- Water quantity control by allowing some infiltration (groundwater recharge) compared to piped systems.

On arterials that do not have much shoulder space, such as East Mercer Way, the City has piped ditches to provide additional space for bicycles and pedestrians. On residential streets with low traffic volumes, the water quality of runoff is likely better than arterials and other high traffic volume streets. Because the water quality on these streets is better, the water quality benefit of grassy ditches may be less compared to high traffic volume streets.

When the City has approved the filling of neighborhood ditches, it historically has also provided assistance. Property owners pay the cost of materials (pipe and backfill), and the City contributes the labor needed to install the materials and fill the ditch.

Based on input from the City's Utility Board, the City developed a set of criteria shown on Table 6-1 in order to help guide decision-making on preserving ditches. The decision to fill an existing ditch will be based on the type of street, whether it has a shoulder, and the water quality/quantity benefits provided. In addition, consideration of the water quality/quantity benefits should consider the basin conditions (e.g., whether there are erosion, flooding, or water quality problems and its location in the basin). Generally, on arterial streets with shoulders, existing ditches should be retained for their water quality/quantity benefits. For arterials without sufficient shoulders, safety is likely a higher priority than the water quality/quantity benefit of ditches. It is recognized that this table is simplified and the City may take other factors not listed here into consideration when determining whether to allow filling of a ditch. Note that no category is included for commercial areas because most of these areas do not have ditches.

Table 6-1. Ditch Filling Policy by Street Type

Type of Street	Roadside Ditch Filling Policy
Arterial[1] with shoulder	Generally not allowed in order to maintain the water quality/quantity benefits. In some locations, the safety of bicyclists and pedestrians may outweigh water quality/quantity benefits.
Arterial[1] w/o shoulder	Generally allowed.
Residential Street	Generally allowed unless in a basin that is subject to downstream water quality/quantity problems where continued filling of ditches in the basin will worsen current conditions.

[1]Arterial roads as defined in the Comprehensive Land Use Plan

In addition, in situations where ditch filling is allowed and it is requested by a property owner, the City will provide the labor and the property owner will purchase the materials. All costs associated with filling ditches when part of a development or redevelopment shall be solely the responsibility of the property owner.

Section 7

CIP PRIORITIZATION

Section 7
CIP PRIORITIZATION

7.1 Approach

As discussed in Section 6, the project team, City staff, and City's Utility Board worked together to develop a prioritization process or method. The process includes using evaluation criteria, weighing the relative importance of each evaluation criterion, and assessing the identified projects with respect to how well they meet each of the evaluation criteria. The result is a simple spreadsheet model that includes weighted criteria, scoring of the CIPs as to how well they meet the criteria and an overall ranking or prioritization. The scoring of individual projects was developed with City input to provide a prioritized ranking. The spreadsheet is further described in this section.

7.2 Criteria and Evaluation

The criteria that were evaluated for each CIP include the following:

- Magnitude of the problem (To help define the magnitude of problems, this criterion was further subdivided into separate criteria for risk to health and safety, risk to property, rate of degradation/project urgency, and the flows or size of the drainage area)
- Impact to water quality and stream habitat
- Cost effectiveness
- Special opportunity
- Reduction in maintenance and operation costs
- Neighborhood advocacy/complaints
- Permitting effort
- Overall project cost

Each of these criteria are defined and assigned a weighting factor on Table 7-1. The weighting factors range from 1 to 5 and were determined during meetings with City staff and the City's Utility Board. For each criterion, the projects were evaluated in terms of severity level. The definitions for each severity level are also defined on Table 7-1. The severity for each criteria is evaluated on a scale of 0 (none) to 3 (high). For each CIP project, all criteria are evaluated and scored according to severity. The total severity score for each project is the sum of the severity score times the weighting factor for each criterion.

Scoring for both erosion and drainage system CIPs was developed with input from the City. The prioritization results are presented in Table 7-1 for erosion problems and in Table 7-2 for drainage system problems. The projects with the highest scores reflect the highest priority projects and the projects are arranged from left to right. The spreadsheet model is set up to automatically update the ranking when the scoring is modified. In this way, the City can update the prioritization as more information about problems becomes available. A digital copy of the prioritization models is included in Appendix D for the City's future use.

7.3 Summary of Program Recommendations

The following paragraphs present a summary of the recommendations developed during the course of this study. These recommendations reflect City input as well as input received during City's Utility Board meetings.

1. Use the prioritization method developed to rank and implement projects.
2. Continue and expand erosion problem monitoring to provide additional data that can be input into the prioritization model and help the City make decisions on CIP implementation.
3. Continue to investigate drainage systems as summarized on Table 5-4 to identify and fix drainage system problems. Special emphasis should be placed on inspection and monitoring of the East Mercer Way and West Mercer Way culverts because these are critical structures.
4. The City should apply the formalized policies as presented in Section 6.
5. Continue investigation of erosion problems categorized as "medium" in Phase 1 and shown on Plate 3 and Table 4-1. Due to limited resources, only the "high" category problems were investigated as part of this study, but as additional resources become available, the City should continue investigations.

Table 7-1
Erosion CIP Prioritization

Criterion	Definition	Weighting Factor	Severity: 0 (No)	Severity: 1 (Low)	Severity: 2 (Medium)	Severity: 3 (High)
Magnitude of the Problem						
Risk to Health and Safety	What is the risk for public health and safety?	5.0	None	Low, problem is likely limited to property (land) damage (public or private) and no public health hazard	failure has a potential to be a public safety hazard to residential structure or road (public or private) or public health hazard.	failure can clearly result in public safety hazard to residential structure or road or a public health hazard.
Risk to Property	What is the risk for property damage?	3.0		no structures or roads, risk is only to land erosion or flooding of one or more yards	1 to 2 ancillary structures, underground utility or private road is at risk	one or more neighborhood residential dwelling or public road is at risk
Rate of Degradation/Project Urgency	Is the situation getting worse quickly? How imminent is significant damage/failure?	2.0		Situation has and is expected to approximately remain the same and damage will not occur in the near future .	Situation is slowly getting worse and damage could occur soon	Situation is rapidly getting worse and there is significant damage or risk if not completed (e.g., rusted culvert likely to fail soon)
Flows and/or Size of Drainage Area	How large is the tributary drainage area?	1.0		<30 acres	30 to 80 acres	> 80 acres
Impact to Water Quality and Stream Habitat[2]	To what degree does the project help improve water quality and stream habitat?	2.0		Benefit to water quality/habitat will be low for repairing small local watercourse erosion problems that have a low rate of degradation.	Benefit to water quality/habitat will be medium for repairing small local watercourse erosion problems that have a high rate of degradation; or for repairing large scale erosion problems that have a low rate of degradation.	Benefit to water quality/habitat will be high for repairing large scale watercourse erosion problems that have a high rate of degradation.
Cost Effectiveness	How does the project avoided cost[1] compare to the project cost?	2.0	Doesn't Apply (can't quantify the avoided cost)	Low. "Avoided cost " is less than expected "project cost" (if avoided cost can be computed)	Medium. "Avoided cost" is approximately the same as expected "project cost" (if avoided cost can be computed)	High. "Avoided cost" is higher than expected "project cost" (if avoided cost can be computed)
Special Opportunity	Would the opportunity to do this project go away (either because of other development, or unique funding source)?	2.0	No			Yes
Reduction in Maintenance and Operation Costs	How much would the improvements reduce the City's current M&O costs?	1.0	Increase in Maintenance Cost	Small reduction in M&O costs (< $1,000/yr)	Moderate reduction in M&O costs ($1,000 to $4,000/yr)	Significant reduction in M&O costs ($>4,000/yr)
Neighborhood Advocacy/Complaints	Has the City received complaints about the problem?	1.0	0 property owner complaints received	1 or 2 property owner complaints received	3 or 4 property owner complaints received	5 or more property owner complaints received
Permitting Effort	How large is the permitting effort (HPA, watercourse variance, etc.)?	1.0		High	Medium	Low
Overall Project Cost	How does the project cost compare to that of other similarly ranked projects?	1.0		High. Cost is high relative to other similarly ranked projects	Medium. Cost is comparable to other similarly ranked projects	Low. Cost is low relative to other similarly ranked projects

Rank	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Criterion	Project 29.1	Project 45b.3	Project 26.1	Project 49b.4	Project 27a.6	Project 37b.1	Project 29.2	Project 52.1	Project 45b.1	Project 4.2	Project 49b.1	Project 42.1	Project 46a.3	Project 51a.1	Project 10.4	Project 42.10	Project 42.1a
Risk to Health and Safety	3	3	1	2	2	2	2	2	2	2	2	1	2	2	1	1	1
Risk to Property	3	2	1	2	2	3	3	2	3	2	2	2	1	3	3	2	1
Rate of Degradation/Project Urgency	3	2	3	3	3	3	3	3	2	2	2	2	2	2	1	2	2
Flows and/or Size of Drainage Area	3	1	3	1	2	1	1	1	2	1	1	3	1	1	3	1	3
Impact to Water Quality and Stream Habitat	3	3	3	3	3	2	2	2	2	3	2	3	3	2	1	2	2
Cost Effectiveness	3	3	3	3	3	3	3	2	2	3	3	3	3	2	2	3	2
Special Opportunity	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reduction in Maintenance and Operation Costs	2	3	2	2	1	1	1	2	1	1	1	2	2	1	2	1	2
Neighborhood Advocacy/Complaints	3	1	2	1	0	1	0	2	0	0	0	1	0	0	1	1	0
Permitting Effort	2	2	2	2	2	2	1	1	3	3	3	2	3	1	2	2	2
Overall Project Cost	1	2	2	3	2	1	2	3	2	2	3	2	1	1	2	1	3
Project Total Score (severity x weighting factor)	**53**	**52**	**43**	**43**	**41**	**41**	**40**	**39**	**39**	**39**	**38**	**37**	**36**	**35**	**32**	**31**	**30**
Project Cost (Rounded to nearest $1000)	**$959**	**$444**	**$1,061**	**$195**	**$54**	**$64**	**$115**	**$105**	**$179**	**$198**	**$12**	**$200**	**$109**	**$45**	**$13**	**$70**	**$122**

Rank	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Criterion	Project 45b.4	Project 42.8a	Project 27a.1	Project 32b.1	Project 32b.2	Project 42.2	Project 42.8	Project 42.3	Project 42.6	Project 42.9	Project 46a.4	Project 42.4	Project 6.1	Project 27a.3	Project 49b.2	Project 39a.1	Project 4.1
Risk to Health and Safety	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Risk to Property	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Rate of Degradation/Project Urgency	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	1	2
Flows and/or Size of Drainage Area	1	3	2	3	3	2	1	2	1	1	1	2	1	1	1	1	1
Impact to Water Quality and Stream Habitat	1	2	2	1	1	2	2	2	1	2	2	2	2	2	1	1	1
Cost Effectiveness	1	2	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1
Special Opportunity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reduction in Maintenance and Operation Costs	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Neighborhood Advocacy/Complaints	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Permitting Effort	2	2	3	2	2	2	2	2	3	2	2	2	2	1	2	2	1
Overall Project Cost	2	3	3	3	2	2	2	1	3	1	1	2	1	2	2	1	2
Project Total Score (severity x weighting factor)	**30**	**29**	**29**	**29**	**28**	**27**	**26**	**26**	**26**	**25**	**25**	**25**	**23**	**23**	**22**	**19**	**16**
Project Cost (Rounded to nearest $1000)	**$77**	**$45**	**$34**	**$38**	**$55**	**$116**	**$28**	**$91**	**$65**	**$79**	**$99**	**$136**	**$87**	**$120**	**$150**	**$28**	**$45**

Notes:
1. Avoided costs are costs associated with any impacts that could result if the project is not implemented.
2. Most projects in Mercer Island that will have a water quality/habitat benefit associated with them are the water course projects since they will reduce the amount of sediment

Table 7-2

Drainage System CIP Prioritization

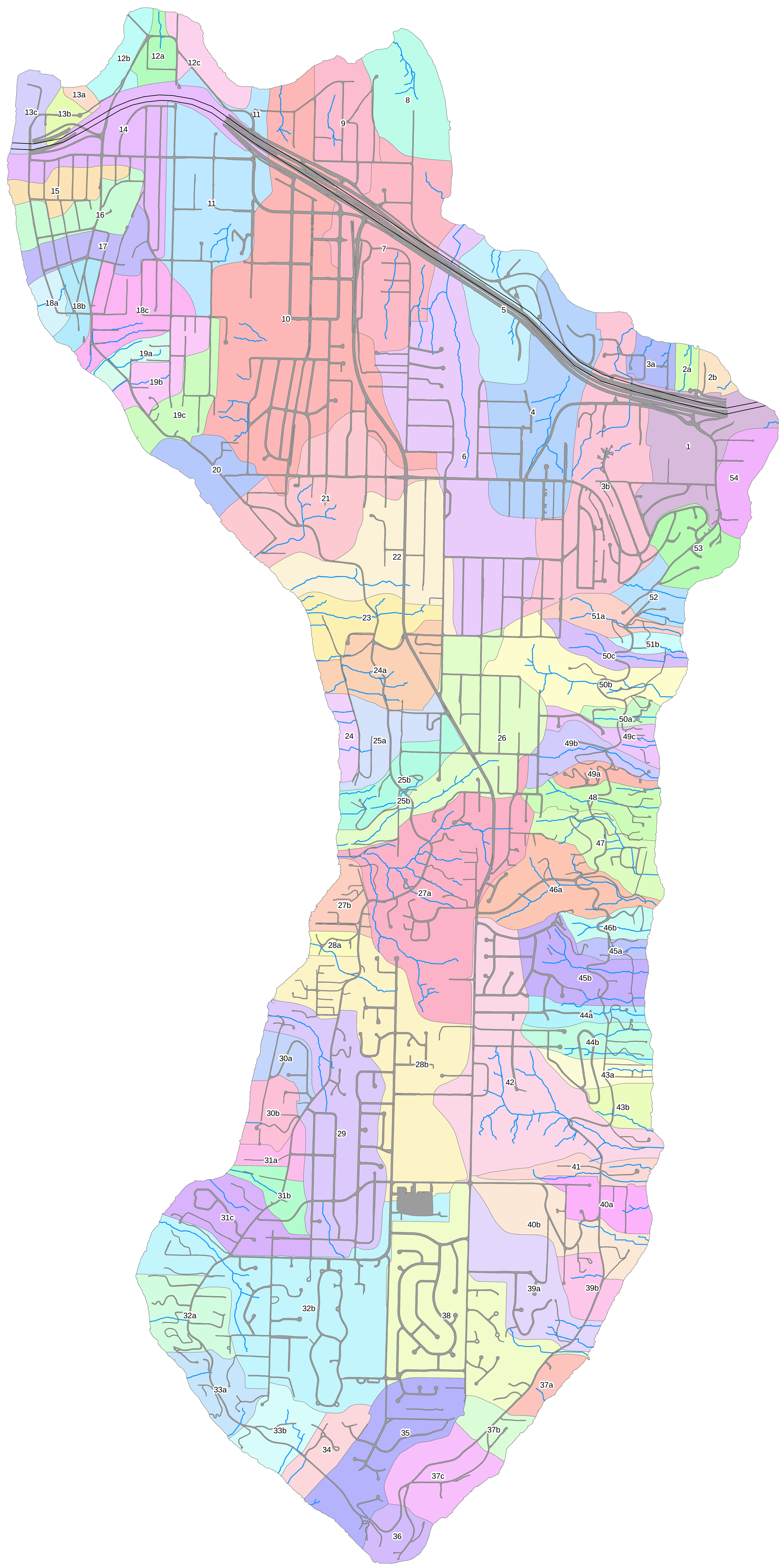
Criterion	Definition	Weighting Factor	Severity				Rank					
							1	2	3	4	5	6
			0 (No)	1 (Low)	2 (Medium)	3 (High)	Project 47.1	Project 29.2	Project 32a.2	Project 15.4	Project 9.3	Project 18c.1
Magnitude of the problem												
Risk to health and safety	What is the risk for public health and safety?	5.0	None	Low, problem is likely limited to property (land) damage (public or private) and no public health hazard	failure has a potential to be a public safety hazard to residential structure or road (public or private) or public health hazard.	failure can clearly result in public safety hazard to residential structure or road or a public health hazard.	3	2	2	1	0	0
Risk to property	What is the risk for property damage?	3.0		no structures or roads, risk is only to land erosion or flooding of one or more yards	1 to 2 ancillary structures, underground utility or private road is at risk	one or more neighborhood residential dwelling or public road is at risk	3	2	3	1	1	1
Rate of Degradation/Project Urgency	Is the situation getting worse quickly? How imminent is significant damage/failure?	2.0		Situation has and is expected to approximately remain the same and damage will not occur in the near future .	Situation is slowly getting worse and damage could occur soon	Situation is rapidly getting worse and there is significant damage or risk if not completed (e.g., rusted culvert likely to fail soon)	2	3	1	2	2	2
Flows and/or Size of Drainage Area	How large is the tributary drainage area?	1.0		<30 acres	30 to 80 acres	> 80 acres	1	2	1	1	1	1
Impact to Water Quality and Stream Habitat	To what degree does the project help improve water quality and stream habitat?	2.0		Benefit to water quality/habitat will be low for repairing small local watercourse erosion problems that have a low rate of degradation.	Benefit to water quality/habitat will be medium for repairing small local watercourse erosion problems that have a high rate of degradation; or for repairing large scale erosion problems that have a low rate of degradation.	Benefit to water quality/habitat will be high for repairing large scale watercourse erosion problems that have a high rate of degradation.	0	0	0	0	0	0
Cost Effectiveness	How does the project avoided cost[1] compare to the project cost?	2.0	Doesn't Apply (can't quantify the avoided cost)	Low. "Avoided cost " is less than expected "project cost" (if avoided cost can be computed)	Medium. "Avoided cost" is approximately the same as expected "project cost" (if avoided cost can be computed)	High. "Avoided cost" is higher than expected "project cost" (if avoided cost can be computed)	3	2	2	1	1	1
Special Opportunity	Would the opportunity to do this project go away (either because of other development, or unique funding source)?	2.0	No			Yes	0	0	0	0	0	0
Reduction in Maintenance and Operation Costs	How much would the improvements reduce the City's current M&O costs?	1.0	Increase in Maintenance Cost	Small reduction in M&O costs (< $1,000/yr)	Moderate reduction in M&O costs ($1,000 to $4,000/yr)	Significant reduction in M&O costs ($>4,000/yr)	0	0	0	0	0	0
Neighborhood Advocacy/Complaints	Has the City received complaints about the problem?	1.0	0 property owner complaints received	1 or 2 property owner complaints received	3 or 4 property owner complaints received	5 or more property owner complaints received	0	0	0	0	0	0
Permitting Effort	How large is the permitting effort (HPA, watercourse variance, etc.)?	1.0		High	Medium	Low	3	3	3	3	3	3
Overall Project Cost	How does the project cost compare to that of other similarly ranked projects?	1.0		High. Cost is high relative to other similarly ranked projects	Medium. Cost is comparable to other similarly ranked projects	Low. Cost is low relative to other similarly ranked projects	1	2	3	1	3	1
Project Total Score (severity x weighting factor)							39	33	32	19	16	14

Project Cost (Rounded to nearest $1,000)	$243	$92	$25	$585	$44	$176

Notes:

1. Avoided costs are costs associated with any impacts that could result if the project is not implemented.

LIST OF PLATES



Legend

Roads

Watercourses

Watershed Subbasins

Basin Number

1

11

14

1 inch equals 800 feet

0 1,000 2,000 4,000 6,000 8,000 10,000 Feet

1 0.5 0 1 Miles

p:\0\0817017\00\GIS\PLATE_1.MXD RGD 12/17/04

Notes:
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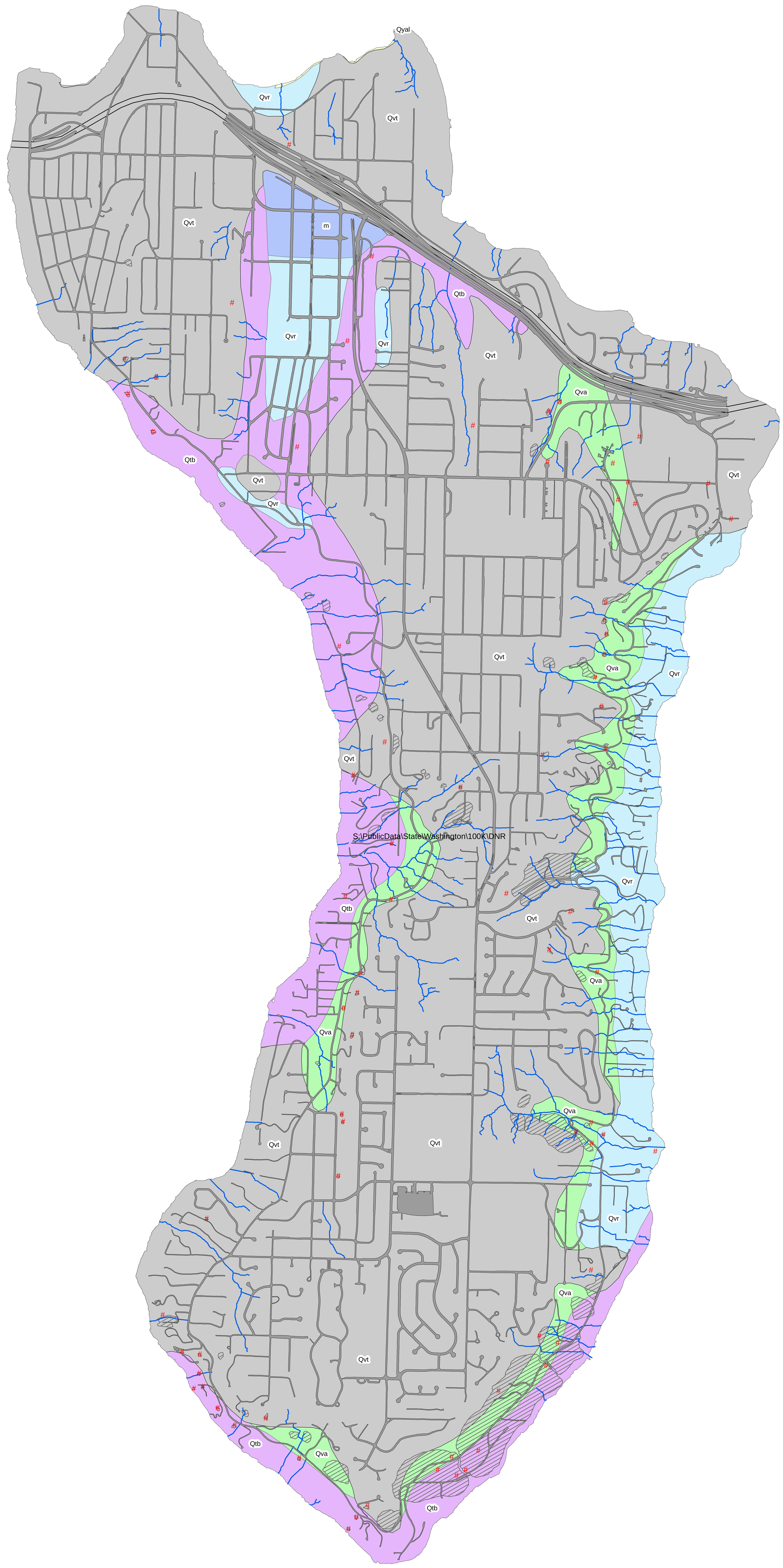
STUDY AREA

Mercer Island, WA

PLATE

1



Legend

- # Landslide Locations
- Landslide Areas
- Watercourses
- Roads
- Qtb
- Qva
- Qvr
- Qvt
- Qyal
- m

1 inch equals 800 feet

0 800 1,600 3,200 4,800 6,400 8,000 9,600 Feet

1 0.5 0 1 Miles

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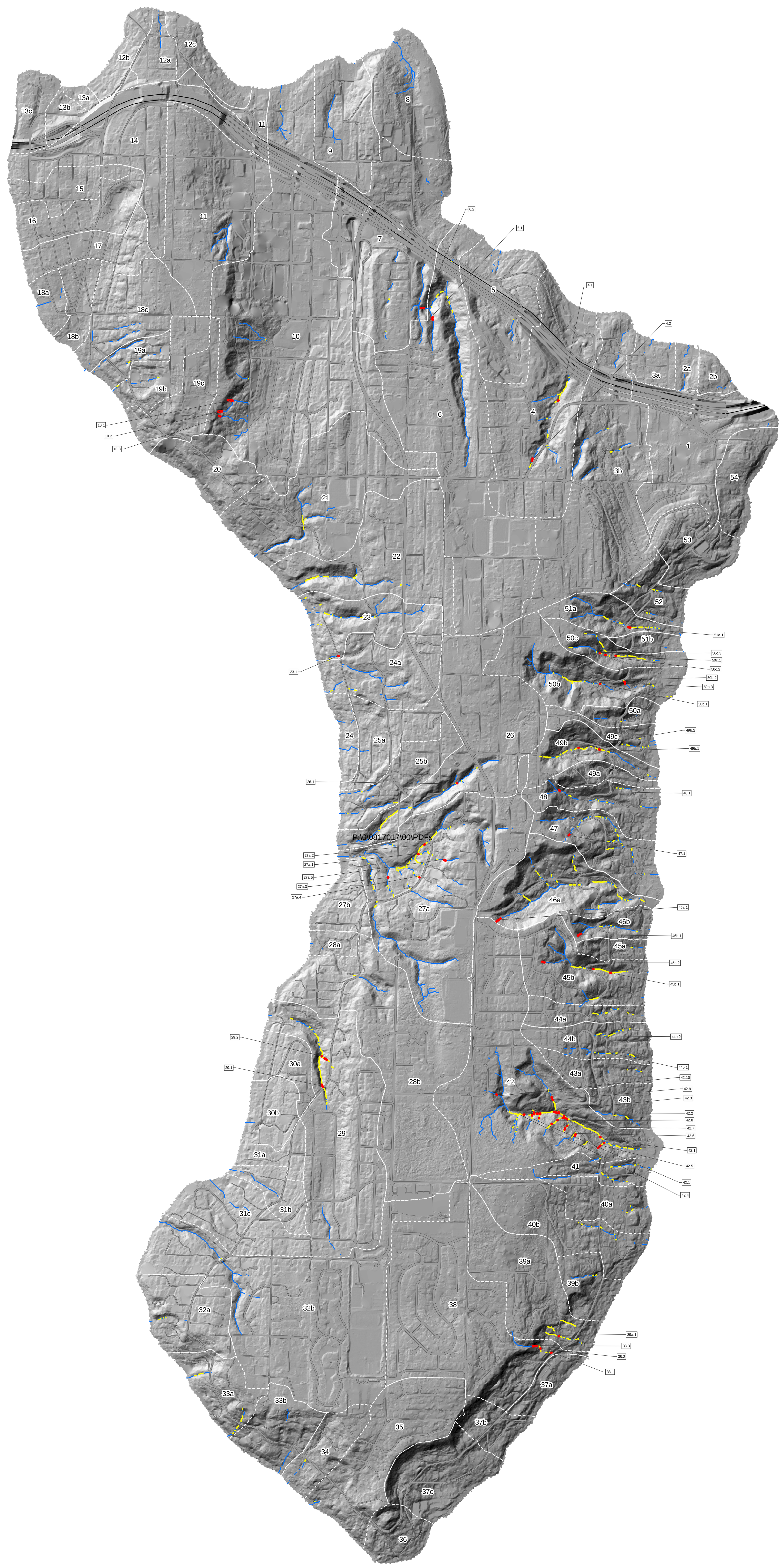
GEOLOGY AND LANDSLIDES

CITY OF MERCER ISLAND washington

PLATE

2



Legend

Roads

Watershed Subbasins

Erosion Susceptibility

Low

Moderate

High

1 inch equals 800 feet

0 800 1,600 3,200 4,800 6,400 8,000 9,600 Feet

1 0.5 0 1 Miles

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Notes:
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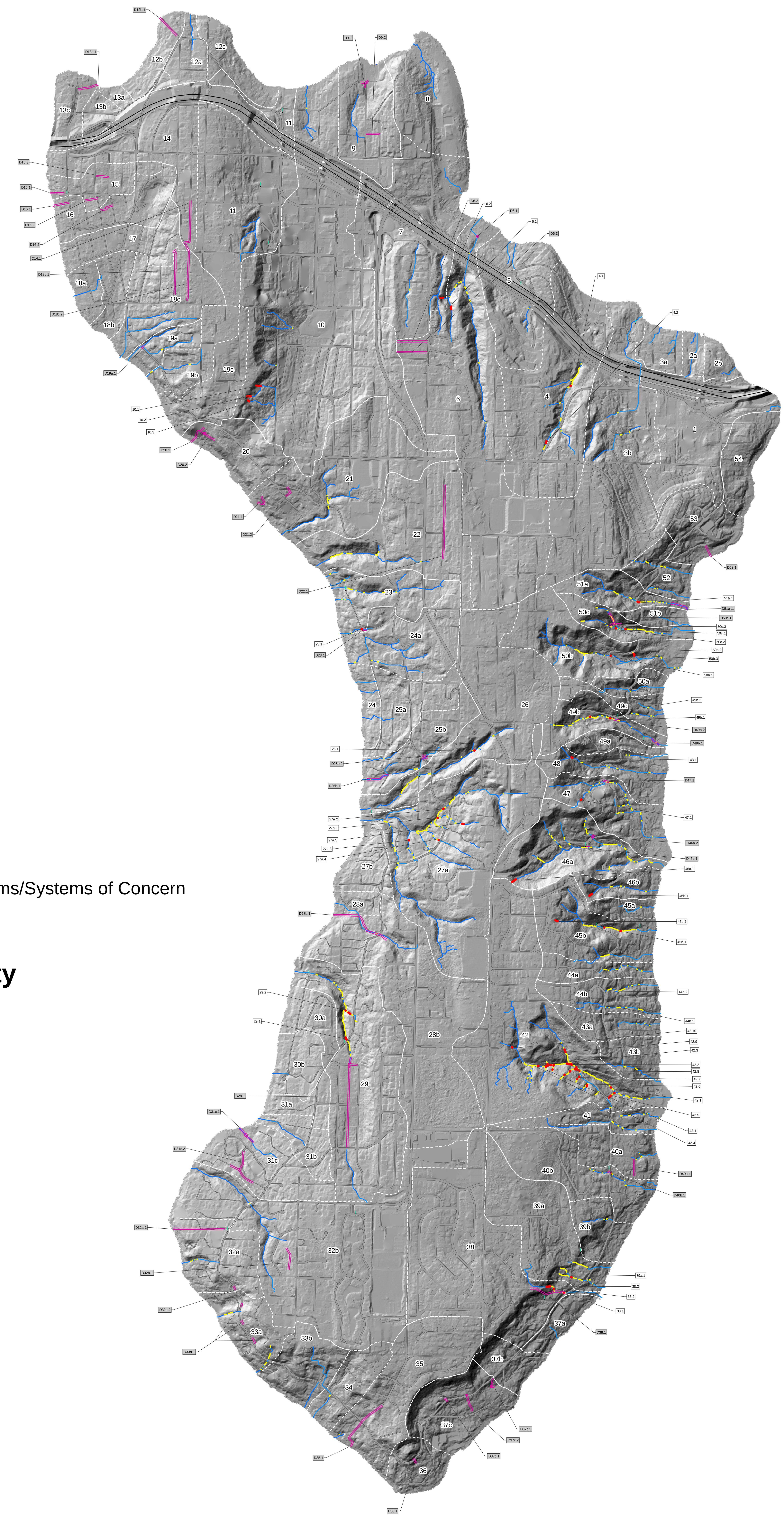
EROSION SUSCEPTIBILITY

CITY OF MERCER ISLAND
washington

PLATE
3



Legend

Roads

Watershed Subbasins

Problem Drainage Systems/Systems of Concern

Drainage Hot Spots

Erosion Susceptibility

Low

Moderate

High

1 inch equals 800 feet

0 800 1,600 3,200 4,800 6,400 8,000 9,600 Feet

1 0.5 0 1 Miles

Notes:
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EROSION & DRAINAGE PROBLEMS

CITY OF MERCER ISLAND
washington

PLATE

4

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COMPREHENSIVE BASIN REVIEW AND WATERCOURSE MONITORING

VOLUME 2 - APPENDICES

City of Mercer Island

in association with GeoEngineers, Inc.

December 2006

R·W·BECK

Appendix A

PHASE 1 COST ESTIMATES

Summary of Unit Cost

Solution Type	Access	Unit	Construction Cost	Construction Contingency (40%)	Subtotal	Engineering/ Admin/Permi tting (@45%)	Total	Rounded	Minimum (if applicabl e)	Comment
Stabilize Knickpoint	Difficult Access	Ea	$40,000	$16,000	$56,000	$25,200	$81,200	$80,000		
Stabilize Knickpoint	Non-Difficult Access	EA	$15,000	$6,000	$21,000	$9,450	$30,450	$30,000		
Outfall Stabilization		EA	$8,000	$3,200	$11,200	$5,040	$16,240	$16,000		
Instream Stabilization	Difficult Access	LF	$900	$360	$1,260	$567	$1,827	$1,800	$15,000	Based on two redmond projects
Instream Stabilization	Non-Difficult Access	LF	$700	$280	$980	$441	$1,421	$1,400	$15,000	Based on two redmond projects
High Flow Bypass		LF	$400	$160	$560	$252	$812	$800		Based on surface HDPE pipeline and new stream work
Field Inpsection		LF	$4						$800	$2 for tv plus 1/2 field crew of 2
Simple System Replacement		LF	$200	$80	$280	$126	$406	$400		Up to 18-inch pipe. Includes roadway restoration.
Complex System Replacement		LF	$300	$120	$420	$189	$609	$600		Greater than 18-inch pipe, tight conditions, deep.
Culvert Replacement		LF	$900	$360	$1,260	$567	$1,827	$1,800		Based on 8' cmp arch, 60' long, 12 deep

Appendix B

EROSION GIS ATTRIBUTE TABLES

HIGH EROSION POTENTIAL AREAS TABLE

Basin #	Label	Tot val	Suscept val	Geology	Nick pt	Convexity	Slope	Slide	Outfall	Known Problem	Length (ft)	Prob Type
4	4.1	30	30	Qva			> 40%	yes		Erosion Downcutting	12	Channel Incision/channel confined by large landslide
4	4.2	49	14	Qvt	yes		30 - 40%	yes			42	Channel Incision/channel confined by large landslide
6	6.1	52	17	Qvt	yes		> 40%	no		Erosion Downcutting	52	knick point and incision
6	6.2	39	4	Qvt	yes		0 - 15%	no			47	knick point
10	10.1	39	4	Qvt	yes		0 - 15%	no			65	knick point
10	10.2	47	12	Qvt	yes	21.1 - 37.5	15 - 30%	no			27	knick point and incision
10	10.3	39	4	Qvt	yes		0 - 15%	no			85	knick point
26	26.1	52	17	Qvt	yes		> 40%	no		Erosion Downcutting	11	knick point
23	23.1	53	20	Qtb	yes		> 40%	no	yes		14	knick point at outfall
27a	27a.1	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	3	Channel Incision
27a	27a.2	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	12	Channel Incision
27a	27a.3	50	15	Qtb	yes		> 40%	no			13	knick point
27a	27a.4	30	30	Qva		21.1 - 37.5	> 40%	no	yes		2	Outfall Erosion
27a	27a.5	47	12	Qvt	yes		> 40%	no			32	knick point
29	29.1	30	30	Qva			> 40%	no	yes	Erosion Downcutting	32	Outfall Erosion
29	29.1	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	4	Channel Incision
29	29.2	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	3	Channel Incision
29	29.2	57	22	Qva	yes	4.7-21	> 40%	no			46	knickpoint
38	38.1	30	30	Qva		21.1 - 37.5	> 40%	yes		Substandard System	11	Channel Incision
38	38.2	30	30	Qva		21.1 - 37.5	> 40%	yes			5	Channel Incision
38	38.3	60	25	Qva	yes		> 40%	yes			4	knick point and incision
38	38.3	42	7	Qvt	yes		15 - 30%	no			5	knick point and incision
38	38.3	44	9	Qvt	yes		30 - 40%	no			2	knick point and incision
38	38.3	47	12	Qvt	yes		> 40%	no			5	knick point and incision
38	38.3	47	12	Qvt	yes		> 40%	no			15	knick point and incision
38	38.3	47	12	Qvt	yes		> 40%	no			14	knick point and incision
38	38.3	49	14	Qvt	yes		30 - 40%	yes			4	knick point and incision
38	38.3	49	14	Qvt	yes	21.1 - 37.5	30 - 40%	no			3	knick point and incision
38	38.3	52	17	Qvt	yes	21.1 - 37.5	> 40%	no			2	knick point and incision
38	38.3	49	14	Qvt	yes	4.7-21	> 40%	no			1	knick point and incision
38	38.3	49	14	Qvt	yes	4.7-21	> 40%	no			4	knick point and incision
38	38.3	44	9	Qvt	yes	4.7-21	15 - 30%	no			2	knick point and incision
38	38.3	46	11	Qvt	yes	4.7-21	30 - 40%	no			2	knick point and incision
38	38.3	49	14	Qvt	yes	4.7-21	> 40%	no			4	knick point and incision
39a	39a.1	30	30	Qva			> 40%	yes	yes		5	Outfall Erosion
39a	39a.1	30	30	Qva		21.1 - 37.5	> 40%	yes			0	Channel Incision
39a	39a.1	35	35	Qva		21.1 - 37.5	> 40%	yes	yes		2	Outfall erosion and channel Incision
42	42.1	30	25	Qvr		21.1 - 37.5	15 - 30%	yes		Erosion Downcutting	5	Toe erosion, landsliding and channel Incision
42	42.2	30	30	Qva		21.1 - 37.5	> 40%	yes		Hot Spots	3	Channel Incision/channel confined by large landslide
42	42.2	30	30	Qva		21.1 - 37.5	> 40%	yes		Hot Spots	2	Channel Incision
42	42.2	30	30	Qva		21.1 - 37.5	> 40%	yes			10	Channel Incision
42	42.2	30	30	Qva		21.1 - 37.5	> 40%	yes		Hot Spots	13	Channel Incision
42	42.2	30	30	Qva			> 40%	yes		Erosion Downcutting	7	Channel Incision
42	42.2	30	30	Qva		21.1 - 37.5	> 40%	yes			3	Channel Incision
42	42.2	30	30	Qva			> 40%	yes		Erosion Downcutting	13	Channel Incision
42	42.2	65	30	Qva	yes		> 40%	yes		Erosion Downcutting	26	knick point
42	42.2	35	35	Qva		21.1 - 37.5	> 40%	yes		Erosion Downcutting	13	Channel Incision
42	42.2	32	32	Qva		4.7-21	> 40%	yes		Erosion Downcutting	2	Channel Incision
42	42.2	32	32	Qva		4.7-21	> 40%	yes		Erosion Downcutting	0	Channel Incision
42	42.2	30	30	Qva			> 40%	yes		Erosion Downcutting	4	Channel Incision
42	42.2	32	32	Qva		21.1 - 37.5	30 - 40%	yes		Erosion Downcutting	0	Channel Incision
42	42.2	32	32	Qva		21.1 - 37.5	30 - 40%	yes		Erosion Downcutting	2	Channel Incision
42	42.2	35	35	Qva		21.1 - 37.5	> 40%	yes		Erosion Downcutting	1	Channel Incision
42	42.2	35	35	Qva		21.1 - 37.5	> 40%	yes		Erosion Downcutting	10	Channel Incision
42	42.3	30	30	Qva			> 40%	yes		Erosion Downcutting	3	Channel Incision
42	42.3	35	35	Qva		21.1 - 37.5	> 40%	yes		Erosion Downcutting	3	Channel Incision
42	42.3	32	32	Qva		4.7-21	> 40%	yes		Erosion Downcutting	3	Channel Incision
42	42.3	32	32	Qva		4.7-21	> 40%	yes		Erosion Downcutting	3	Channel Incision
42	42.3	32	32	Qva		21.1 - 37.5	30 - 40%	yes		Erosion Downcutting	1	Channel Incision
42	42.3	30	30	Qva		21.1 - 37.5	15 - 30%	yes		Erosion Downcutting	7	Channel Incision
42	42.3	30	30	Qva			> 40%	yes		Erosion Downcutting	20	Channel Incision
42	42.3	30	30	Qva			> 40%	yes		Erosion Downcutting	10	Channel Incision
42	42.3	30	30	Qva			> 40%	yes		Erosion Downcutting	0	Channel Incision
42	42.3	32	32	Qva		4.7-21	> 40%	yes		Erosion Downcutting	2	Channel Incision
42	42.3	32	32	Qva		4.7-21	> 40%	yes		Erosion Downcutting	1	Channel Incision
42	42.3	35	35	Qva		21.1 - 37.5	> 40%	yes		Erosion Downcutting	3	Channel Incision
42	42.3	30	30	Qva		21.1 - 37.5	> 40%	yes			7	Channel Incision
42	42.3	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	4	Channel Incision
42	42.4	57	22	Qvt	yes		> 40%	yes		Erosion Downcutting	12	knick point
42	42.5	55	20	Qvr	yes		> 40%	no			28	knick point
42	42.5	30	30	Qvr		21.1 - 37.5	> 40%	no	yes		12	Outfall Erosion
42	42.5	30	30	Qvr		21.1 - 37.5	> 40%	no		Erosion Downcutting	6	Channel Incision
42	42.6	60	25	Qva	yes		> 40%	yes			33	knick point
42	42.7	30	30	Qva		21.1 - 37.5	> 40%	yes			7	Channel Incision
42	42.7	30	30	Qva		21.1 - 37.5	> 40%	yes			3	Channel Incision

HIGH EROSION POTENTIAL AREAS TABLE

Basin #	Label	Tot val	Suscept val	Geology	Nick pt	Convexity	Slope	Slide	Outfall	Known Problem	Length (ft)	Prob Type
42	42.7	30	30	Qva		21.1 - 37.5	> 40%	yes			2	Channel Incision
42	42.8	30	30	Qva		21.1 - 37.5	> 40%	yes			13	Channel Incision
42	42.8	30	30	Qva		21.1 - 37.5	> 40%	yes			6	Channel Incision
42	42.9	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	4	Channel Incision
42	42.9	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	3	Channel Incision
42	42.9	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	10	Channel Incision
42	42.10	47	12	Qvt	yes		> 40%	yes			17	knick point
44b	44b.1	30	30	Qva		21.1 - 37.5	> 40%	no	yes		1	Outfall Erosion
44b	44b.2	30	30	Qva		21.1 - 37.5	> 40%	no	yes	Problem Solved	0	Outfall Erosion
45b	45b.1	60	25	Qva	yes		> 40%	no		Erosion Downcutting	13	knick point
45b	45b.1	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	3	Channel Incision
45b	45b.1	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	1	Channel Incision
45b	45b.2	47	12	Qvt	yes		> 40%	no			41	knick point
46a	46a.1	39	4	Qvt	yes		0 - 15%	no			87	knick point
46b	46b.1	52	17	Qvt	yes	21.1 - 37.5	> 40%	no			61	knick point and incision
47	47.1	47	12	Qvt	yes		> 40%	no			21	knick point
48	48.1	47	12	Qvt	yes		> 40%	no		Problem Solved	23	knick point and incision
48	48.1	47	12	Qvt	yes		> 40%	no		Problem Solved	2	knick point
49b	49b.1	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	12	Channel Incision
49b	49b.2	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	3	Channel Incision
50b	50b.1	30	30	Qva		21.1 - 37.5	> 40%	no	yes		4	Outfall Erosion
50b	50b.2	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	0	Channel Incision
50b	50b.3	55	20	Qva	yes		> 40%	no			12	knick point
50b	50b.3	57	22	Qva	yes	4.7-21	> 40%	no			3	knick point
50b	50b.3	57	22	Qva	yes	4.7-21	> 40%	no			3	knick point
50b	50b.3	60	25	Qva	yes	21.1 - 37.5	> 40%	no			3	knick point
50b	50b.3	55	20	Qva	yes		> 40%	no			20	knick point
50c	50c.1	30	30	Qva			> 40%	no	yes	Erosion Downcutting	4	Outfall Erosion
50c	50c.1	30	30	Qva		21.1 - 37.5	> 40%	no		Erosion Downcutting	1	Channel Incision
50c	50c.2	30	30	Qva			> 40%	yes		Erosion Downcutting	6	Channel Incision
50c	50c.3	30	30	Qva		21.1 - 37.5	> 40%	yes			1	Channel Incision
51a	51a.1	30	30	Qva			> 40%	no	yes	Erosion Downcutting	28	Outfall erosion and channel Incision
51a	51a.1	32	32	Qva		21.1 - 37.5	30 - 40%	no	yes	Erosion Downcutting	2	channel Incision
51a	51a.1	35	35	Qva		21.1 - 37.5	> 40%	no	yes	Erosion Downcutting	0	channel Incision
51a	51a.1	32	32	Qva		4.7-21	> 40%	no	yes	Erosion Downcutting	6	channel Incision

Explanation:

Suscept val: Susceptibility value that represents the modeled value for erosion potential susceptibility that includes factors of geology, erodibility, convexity, slope %, and presence of landslides

Tot val: Total value that equals the Susceptibility value plus a knick point factor (35 points).

Geology:

Qva: Quaternary age Vashon Advance Outwash

Qvt : Quaternary age Vashon Till

Qvr: Quaternary age Vashon Recessional Outwash

Qtb: Quaternary age Transitional Beds

Known Problem: Known problem areas identified by the City of Mercer Island staff.

Length: The linear channel distance (feet) subject to high erosion potential.

BUILDINGS 100 FT FROM GROUPINGS

BasinNum	Group Label	House Count
4	4.1	0
4	4.2	2
6	6.1	0
6	6.2	0
10	10.1	1
10	10.2	1
10	10.3	1
23	23.1	2
29	29.1	1
38	38.1	2
38	38.2	3
38	38.3	3
42	42.1	0
42	42.10	1
42	42.2	0
42	42.2	1
42	42.2	0
42	42.2	0
42	42.2	0
42	42.2	0
42	42.3	0
42	42.3	0
42	42.3	0
42	42.3	0
42	42.3	0
42	42.3	0
42	42.3	0
42	42.4	0
42	42.4	0
42	42.4	0
42	42.5	0
42	42.6	0
42	42.6	0
42	42.6	0
42	42.7	1
42	42.8	0
42	42.9	0
47	47.1	5
48	48.1	1
27a	27a.1	2
27a	27a.1	2
27a	27a.1	2
27a	27a.2	1
27a	27a.3	0
27a	27a.4	2
27a	27a.5	1
39a	39a.1	1
44b	44b.1	3
44b	44b.2	3

45b	45b.1	0
45b	45b.2	4
46b	46b.1	3
49b	49b.1	2
49b	49b.1	2
49b	49b.1	2
49b	49b.1	2
49b	49b.1	2
49b	49b.1	2
49b	49b.2	4
50b	50b.1	0
50b	50b.2	0
50b	50b.2	0
50b	50b.2	0
50b	50b.3	2
50c	50c.1	1
50c	50c.2	5
50c	50c.3	5
51a	51a.1	0
51a	51a.1	0
51a	51a.1	0
51a	51a.1	0
51a	51a.1	0
51a	51a.1	0

Explanation:
House Count: number of houses within a 100 ft radius of high erosion potential group

Appendix C

WATERCOURSE MONITORING DATA

R·W·BECK

Appendix C-1

Phase 1 Monitoring Results

R·W·BECK

GEOENGINEERS

MEMORANDUM

8410 154th Avenue NE, Redmond, WA 98052, TELEPHONE: (425) 861-6000, FAX: (425) 861-6050 www.geoengineers.com

TO:	City of Mercer Island
FROM:	Mary Ann Reinhart
DATE:	December 15, 2004
FILE:	0817-017-00
SUBJECT:	Monitoring Prescription for Basin 26 Site

This memorandum provides a summary of information related to the Basin 26 monitoring site. The location of the site is southwest of the intersection of SE 47th street and Island Crest Way in Mercer Island. The site is accessed traversing downslope from the southwest corner of the church parking lot area located southwest of the intersection.

The site includes an abrupt knick point or "headcut" within a channel that is apparently eroding upstream, as shown in the attached Sketch Map Site Plan, Figure 1. Our reconnaissance on November 18, 2004 was conducted to provide baseline measurements to the knick point from labeled points on site for comparison with future measurements to be obtained by the City of Mercer Island Staff. The purpose of future measurements is to assess whether the knick point is migrating upstream (headward) or if the channel is scouring at the base (toe?) of the knick point over time.

The monitoring site includes two fixed points labeled Nail 1 and Nail 2, as shown on the Sketch Map Figure 1. The fixed points are marked by orange painted nails on two hardwood trees. Nail 1 is located on a dying broken top-tree that is close to the axis of the channel. The numeral of each point is painted onto the trunk of each tree.

We have identified specific features of the knick point, as shown in Figure 2. Figures 1 and 2 also show the locations of site photographs 32 through 37. The photographs show the key features of the knick point observed at the time of the monitoring site setup. Monitoring points HC1 through HC5 are designated to monitor the height and length from the top of the bank to the toe of the slope, as shown in Figure 2. We also identified an area of undercutting that ranges from a depth of 0.3 to 0.4 foot and a height of approximately 0.6 to 0.8 foot, as shown in Figure 2. Lastly, we identified an area of localized scour, as shown in Figure 2.

The following instructions provide guidelines for measuring and interpreting the data from future measurements at Basin 26. Instructions are provided looking from the top of the knick point downslope toward the feature.

Measurements:

- From Nail 1 on the right bank side of the channel, measure to HC1, HC2, HC3, HC5 and the point (*) on the ground adjacent to the holly tree on the right bank side of the knick point (see Figure 1 for comparison).

- From Nail 2 on the right bank side of the channel, measure HC1, HC2, HC3, HC5 and the point (*) on the ground adjacent to the holly tree on the right bank side of the knick point (see Figure 1 for comparison).

- From the top of slope at HC1, measure the distance to the toe of the slope (see Figure 2). The features were marked with orange paint.

- From the top of slope at HC2, measure the distance to the toe of the slope (see Figure 2). The features were marked with orange paint.

- From the top of slope at HC3, measure the distance to the toe of the slope (see Figure 2). The features were marked with orange paint.

- From the top of slope at HC4, measure the distance to the toe of the slope (see Figure 2). The features were marked with orange paint.

- From the top of slope at HC5, measure the distance to the toe of the slope (see Figure 2). The features were marked with orange paint.

- Measure the depth and height of the undercut and scour features (see Figure 2).

Interpretation:

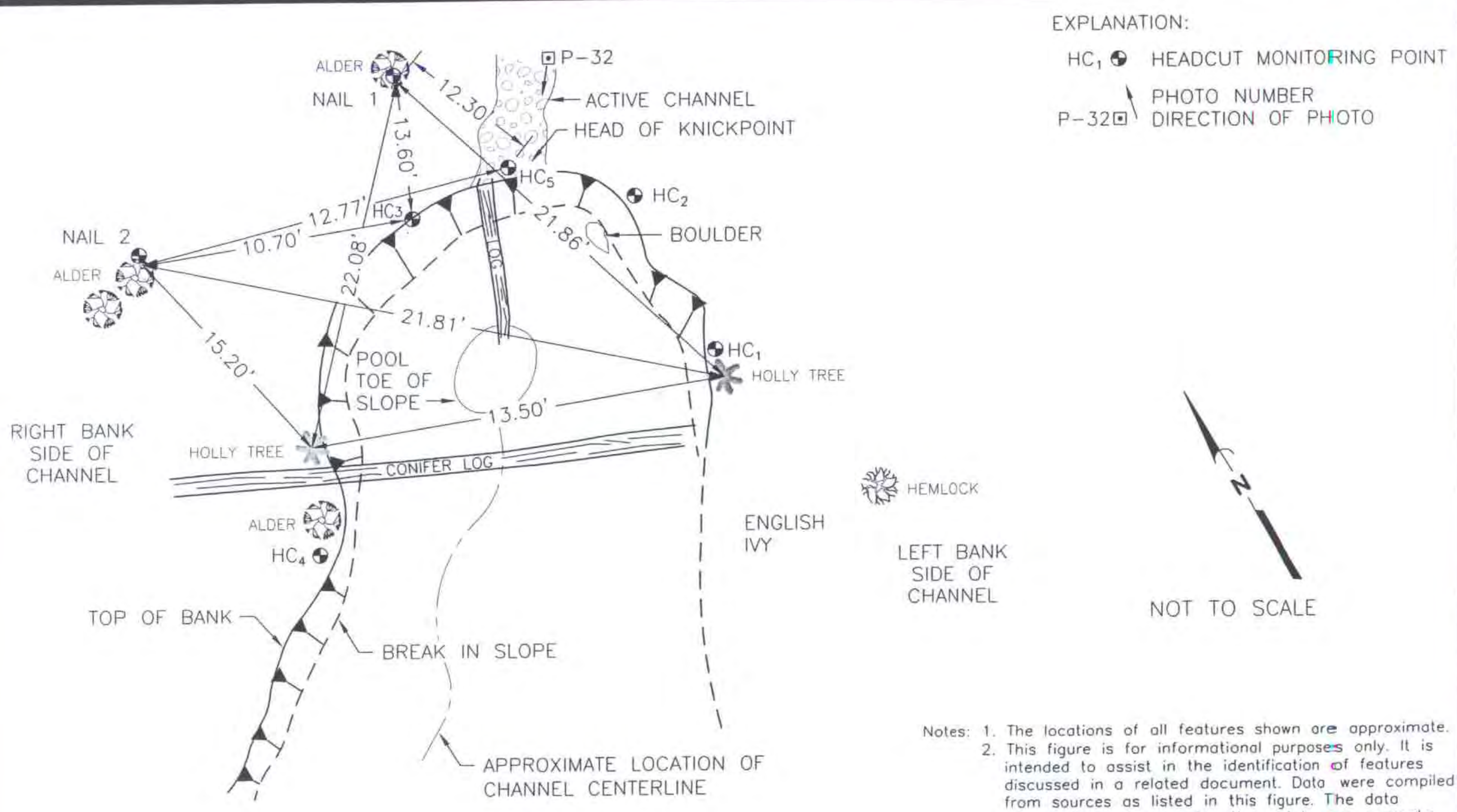
- Future measurements from Nail 1 and Nail 2 on the right bank side of the channel to HC1, HC2, HC3, HC5 and the point (*) on the ground adjacent to the holly tree on the right bank side of the knick point compared to the baseline data will reflect any change in geometry of the knick point. For example, a decrease in the distance from Nail 1 to HC5 would indicate recession. An increase in the distance from Nail 2 to HC5 would also indicate recession.

- For the height of the points HC1 through HC5, if the future height of the knick point is greater than the baseline data, then base scour has occurred.

- An increase in the depth of undercutting compared to the baseline data indicate an increased potential for upstream migration of the knick point.

- For the last two items above, if both base scour and undercutting are increasing, then the potential for upstream migration of the knick point (headcut) has increased.

REDM\P:\0817017\00\CAD\081701700C.DWG ETB:SYF 12/01/04



Notes:
1. The locations of all features shown are approximate.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Drawing produced from sketch provided by GeoEngineer's staff, November 2004.

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SKETCH MAP
BASIN 26, PLAN VIEW

FIGURE 1

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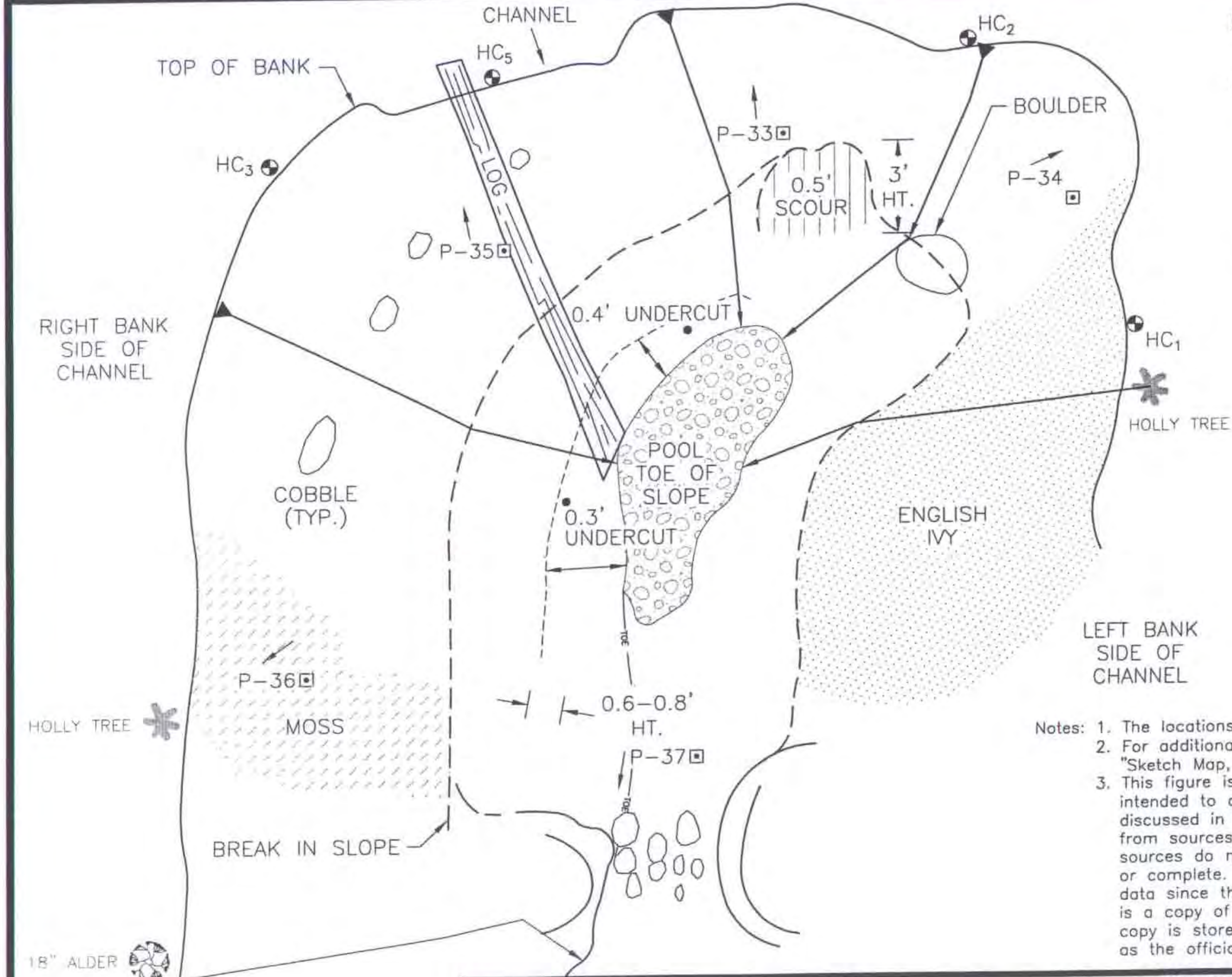

EXPLANATION:

P-34	PHOTO NUMBER DIRECTION OF PHOTO
⊕	HEADCUT MONITORING POINT
HC	HEADCUT MEASUREMENT (FT.) FROM TOP OF SLOPE TO TOE OF SLOPE
HC_1	13.9' VEGETATED (IVY)
HC_2	12.0'
HC_3	10.2'
HC_4	13.1'
HC_5	8.7'

N

NOT TO SCALE

Notes:
1. The locations of all features shown are approximate.
2. For additional details, refer to drawing entitled "Sketch Map, Basin 26, Site Plan," Figure 1.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Drawing produced from sketch provided by GeoEngineer's staff, November 2004.

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SKETCH MAP
BASIN 26, OBLIQUE VIEW INTO KNICKPOINT

FIGURE 2

View to the southwest downslope toward the knick point

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Photograph 32

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Mercer Island, Washington – Nov. 18, 2004

Photograph 33

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Mercer Island, Washington – Nov. 18, 2004

Photograph 34

PO\00\finals\0081701700-photos.ppt ETB: 11/18/04

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Mercer Island, Washington – Nov. 18, 2004

Photograph 35

PO\00\finals\0081701700-photos.ppt ETB: 11/18/04

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Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 36

GeoEngineers

MEMORANDUM

8410 154th Avenue NE, Redmond, WA 98052, TELEPHONE: (425) 861-6000, FAX: (425) 861-6050 www.geoengineers.com

TO:	City of Mercer Island
FROM:	Mary Ann Reinhart
DATE:	December 15, 2004
FILE:	0817-017-00
SUBJECT:	Monitoring Prescription for Basin 29 Site

This memorandum provides a summary of information related to the Basin 29 monitoring site. The location of the site is approximately 350 feet downstream from the culvert downslope of West Mercer Way. The site is accessed by parking along the West Mercer Way shoulder northwest of the intersection with 79th Avenue SE and traversing the embankment north to the channel.

The monitoring site includes an area where the right bank is failing into the channel, as shown on the Sketch Map Figure 1. Left and Right bank designations are made looking downstream. Our reconnaissance on November 18, 2004 was conducted to provide baseline measurements of the bank failure from a labeled point on site for comparison with future measurements to be obtained by the City of Mercer Island Staff. The purpose of future measurements is to assess whether the bank failure is migrating upstream (head ward) or if the channel is undercutting at the toe of the bank failure over time.

The monitoring site includes a fixed point labeled Nail, as shown on the Sketch Map Figure 1. The fixed point is marked by an orange painted nail driven into a fallen log on the left bank side of the channel.

We identified specific features of the bank failure, as shown in Figure 2. Figure 2 also shows the locations of site photographs 10 through 20. The photographs show the key features of the bank failure observed at the time of the monitoring site setup. We identified several monitoring points, labeled 1 through 7, to measure the distance from the fixed Nail point, as shown in Figure 1. The points 1 through 7 represent the break-in-slope contact between loose (disturbed) sediment and in-situ (undisturbed) bank material. We also identified an area of undercutting that ranges from a depth of 0.4 to 0.5 foot and a height of approximately 0.6 to 0.8 foot, as shown in Figure 2.

The following instructions provide guidelines for measuring and interpreting the data from future measurements at Basin 29.

Measurements:

- From the Nail measure across the channel to points 1 through 7.
- Observe new areas of damaged sand bag (DSB).
- Measure the depth into the slope and height of the undercut features.

Interpretation:

- The measurements from Nail to points 1 through 7 compared to the baseline data will reflect the change in geometry of the bank failure. For example, an increase in the distance from the Nail to points 1 through 7 would indicate that the bank is receding (eroding).
- If the sand bags undergo further deformation compared to the baseline, then erosion is occurring.
- An increase in the depth of undercutting compared to the baseline data would indicate an increased potential for additional failure.

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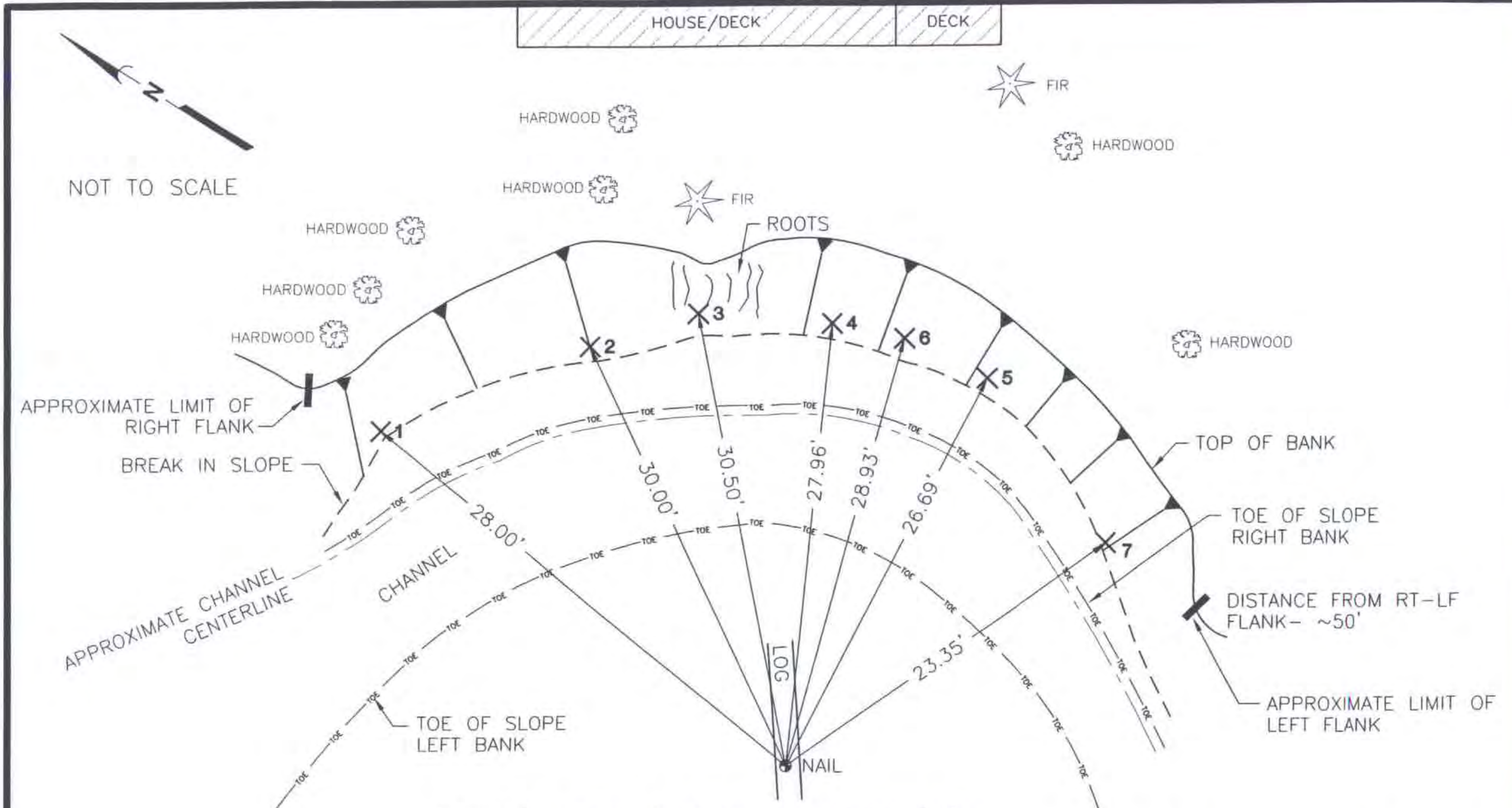

Notes: 1. The locations of all features shown are approximate.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Drawing produced from sketch provided by GeoEngineer's staff, November 2004.

EXPLANATION:

X1 PAINTED MONITOR POINT AT LOOSE SEDIMENT/MAIN SCARP CONTACT

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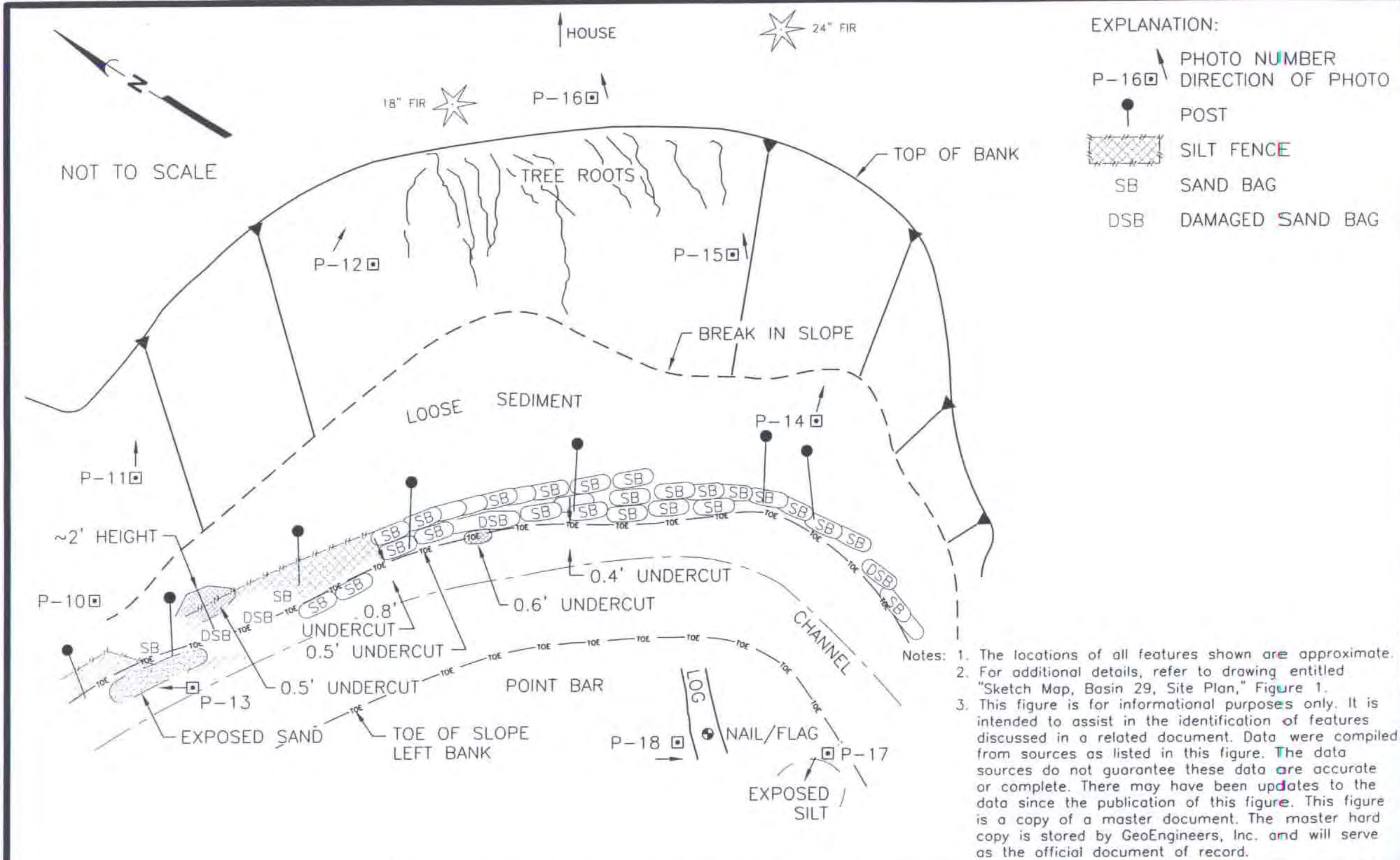
SKETCH MAP
BASIN 29, PLAN VIEW

FIGURE 1

REDM\P:\0817017\00\CAD\081701700B.DWG ETB:SYF 12/01/04



Notes:
1. The locations of all features shown are approximate.
2. For additional details, refer to drawing entitled "Sketch Map, Basin 29, Site Plan," Figure 1.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Drawing produced from sketch provided by GeoEngineer's staff, November 2004.

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SKETCH MAP
BASIN 29, OBLIQUE VIEW INTO BANK

FIGURE 2

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Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 10

GeoEngineers
Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 11

View to the northeast including the former lighthouse location

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GeoEngineers
Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 12

GeoEngineers
Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 13

GeoEngineers
Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 14

PO\00\finals\0081701700-photos.ppt ETB: 11/18/04

GeoEngineers
Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 15

GeoEngineers
Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 16

GEOENGINEERS
Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 17

GeoEngineers
Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 18

GEOENGINEERS
Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 19

GEOENGINEERS
Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 20

GeoEngineers

MEMORANDUM

8410 154th Avenue NE, Redmond, WA 98052, Telephone: (425) 861-6000, Fax: (425) 861-6050 www.geoengineers.com

To:	City of Mercer Island
From:	Mary Ann Reinhart
Date:	December 15, 2004
File:	0817-017-00
Subject:	Monitoring Prescription for Basin 32a site

This memorandum provides a summary of information related to the Basin 32a monitoring site. The location of the site is approximately 200 feet downslope from the Henkle residence located along the north side of Holly Hill Drive in Mercer Island, Washington. Holly Hill Drive is a side street off the west side of West Mercer Island Drive. The site is accessed by parking along Holly Hill Drive near the second residence on the right (north) side of the road and traversing the embankment to the channel. The site includes an area of channel incision, as shown in the Sketch Map site plan, Figure 1.

Our reconnaissance on November 24, 2004 was conducted to provide baseline measurements of the channel from labeled points on site for comparison with future measurements to be obtained by the City of Mercer Island Staff. The purpose of future measurements is to assess whether the channel is undergoing bank erosion, incision, or both, over time.

The monitoring site includes two fixed points, labeled Nail 1 and Nail 2, as shown on the Sketch Map Figure 1. Left and Right bank designations are made looking downstream. The left bank fixed point Nail 1 is marked by orange painted nails on a cedar tree. The right bank fixed point Nail 2 is marked by a orange painted nail on a hardwood tree. Also, the numeral of each point is painted onto the trunk of the tree.

We have also identified specific channel features included in the Monitoring Profile, Figure 2. Figure 1 shows the locations of site photographs 53 through 62. The photographs show the key channel features of the channel observed at the time of the monitoring site setup and the contact between the overlying sand and the fine-grained transitional bed deposits (Qtb) as shown on Figure 2. We also measured the approximate channel gradient both upstream and downstream of the A-A' section and area of incision that ranges from a depth of 0.8 to about one foot, as shown in Figure 1.

The following instructions provide guidelines for measuring and interpreting the data from future measurements from the Basin 32a monitoring site.

Measurements:

- Resurvey the elevation of and relative distance between points 1 to 12 including Nail 1 to Nail 2 (see Figure 2). We used an assume elevation for surveying.
- Measure the approximate channel gradient. The gradient was approximately 15% as measured immediately up and downstream of section A-A' on November 24, 2004.

Interpretation:

- The measurements from Nail 1 to points 4 through 10 compared to the baseline data will reflect the change in geometry of the channel. For example, a decrease in the distance from the Nail 1 to the top of the left bank (point 4) would indicate that the left bank is eroding. An increase in the distance from Nail 1 to the top of the right bank (point would indicate that the right bank is eroding.

- A decrease in elevation at the middle of the channel (approximate thalweg) would indicate that the channel is undergoing incision or down cutting (i.e. increased channel depth).

- A change in channel gradient would likely provide supporting information regarding erosion or incision. For example, a decrease in gradient would indicate an increased potential for bank erosion or that bank erosion is occurring. By contrast, an increase in gradient would indicate an increased potential for incision or that incision is occurring.

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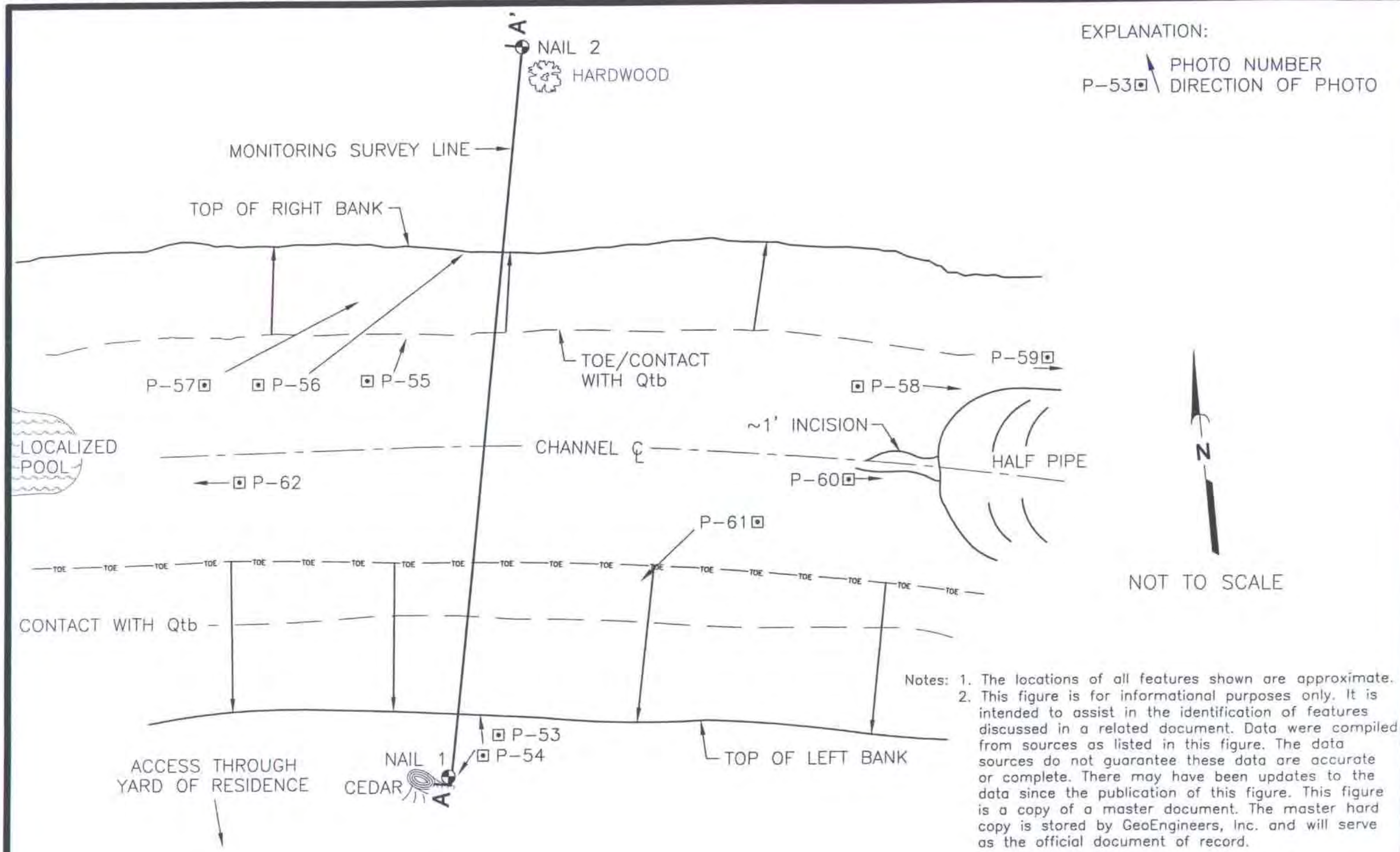


Notes:
1. The locations of all features shown are approximate.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

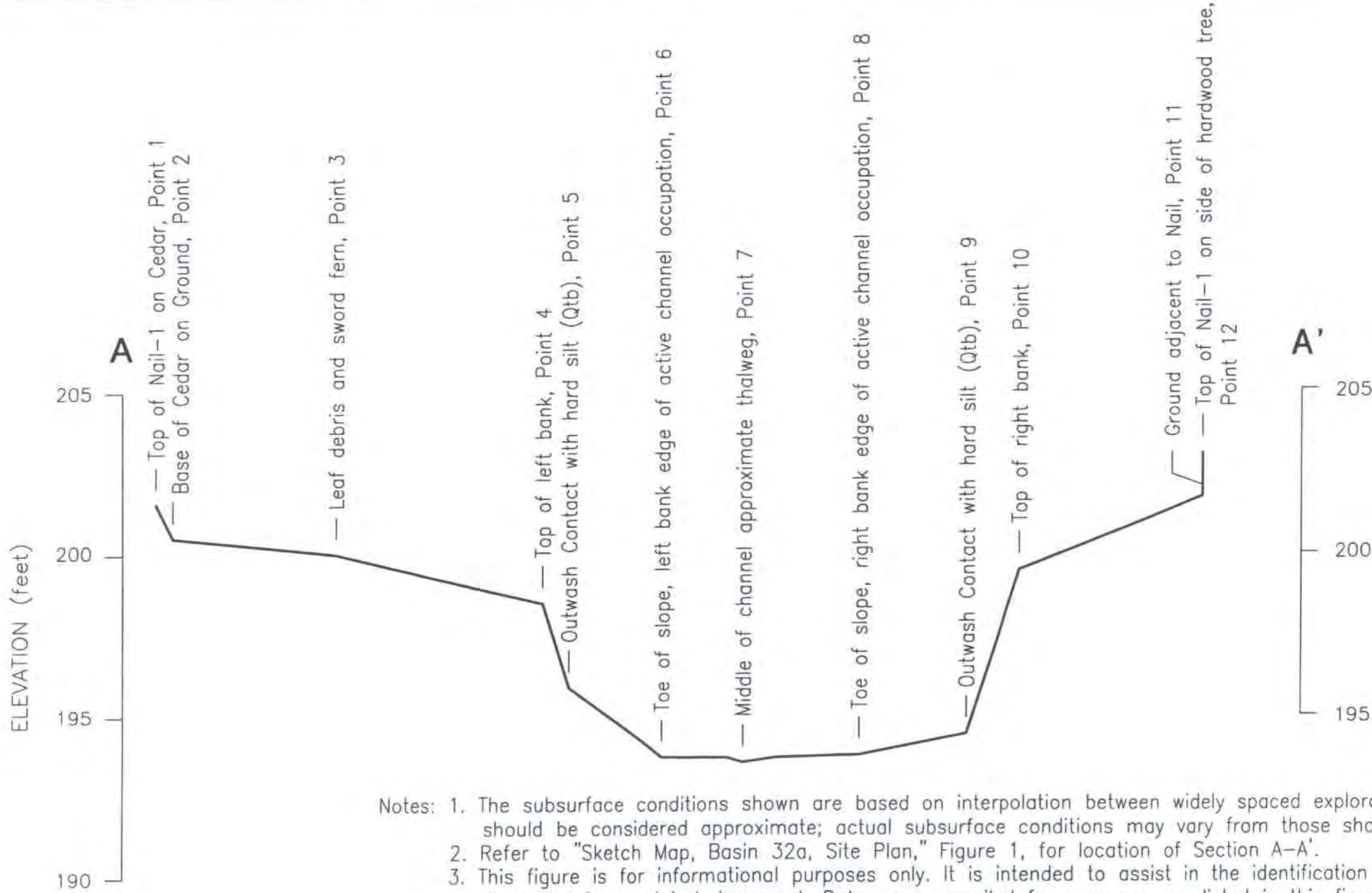
Reference: Drawing produced from sketch provided by GeoEngineer's staff, November 2004.

GeoEngineers

SKETCH MAP
BASIN 32a, SITE PLAN

FIGURE 1

REDM\P:\0817017\00\CAD\081701700F.DWG ETB:SYF 12/14/04



Notes:
1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. Refer to "Sketch Map, Basin 32a, Site Plan," Figure 1, for location of Section A–A'.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

HORIZONTAL AND VERTICAL SCALE: 1"=5'

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BASIN 32a MONITORING PROFILE

FIGURE 2

GEOENGINEERS
Earth Science + Technology

Mercer Island, Washington – Nov. 24, 2004

Photograph 53

GeoEngineers
Earth Science + Technology

Mercer Island, Washington – Nov. 24, 2004

Photograph 54

GEOENGINEERS
Earth Science + Technology

Mercer Island, Washington – Nov. 24, 2004

Photograph 55

GEOENGINEERS
Earth Science + Technology

Mercer Island, Washington – Nov. 24, 2004

Photograph 56

GEOENGINEERS
Earth Science + Technology

Mercer Island, Washington – Nov. 24, 2004

Photograph 57

GeoEngineers
Earth Science + Technology

Mercer Island, Washington – Nov. 24, 2004

Photograph 58

GEOENGINEERS
Earth Science + Technology

Mercer Island, Washington – Nov. 24, 2004

Photograph 59

PO\00\finals\0081701700-photos.ppt ETB: 11/24/04

GEOENGINEERS
Earth Science + Technology

Mercer Island, Washington – Nov. 18, 2004

Photograph 60

GeoEngineers
Earth Science + Technology

Mercer Island, Washington – Nov. 24, 2004

Photograph 61

GEOENGINEERS
Earth Science + Technology

Mercer Island, Washington – Nov. 24, 2004

Photograph 62

Appendix C-2

Phase 2 Monitoring Results

Water Course Monitoring Data
subbasin 26

measurement:		1	2	3
by:		GeoEngineers	Beck/City	Beck
date:		11/18/2004	1/5/2006	10/20/2006
Conditions:			very fast water and rainy.	Dry
distance (see Figure 1 in 12/15/04 Monitoring report)				
from point	to point	taped distance (ft)	taped distance (ft)	taped distance (ft)
nail 1	HC5	12.3	11.6	10.4
nail 2	HC5	12.8	13.7	13.3
nail 1	HC3	13.6	not measured	13.5
nail 2	HC3	10.70	9.1?	10.7
height (see Figure 2 in 12/15/04 Monitoring report)				
from point	to	distance (ft)	distance (ft)	distance (ft)
HC1	toe slope	13.9	14	12.8
HC3	toe slope	10.2	not measured	8
HC5	toe slope	8.7	8.5	8.6
	Conclusion		Headcut has retreated about 1' since Nov 2004 but stream invert about the same.	Headcut has retreated nearly another foot since Jan 2006. Pool has filled in with sand and gravel. Side banks unchanged since 2004

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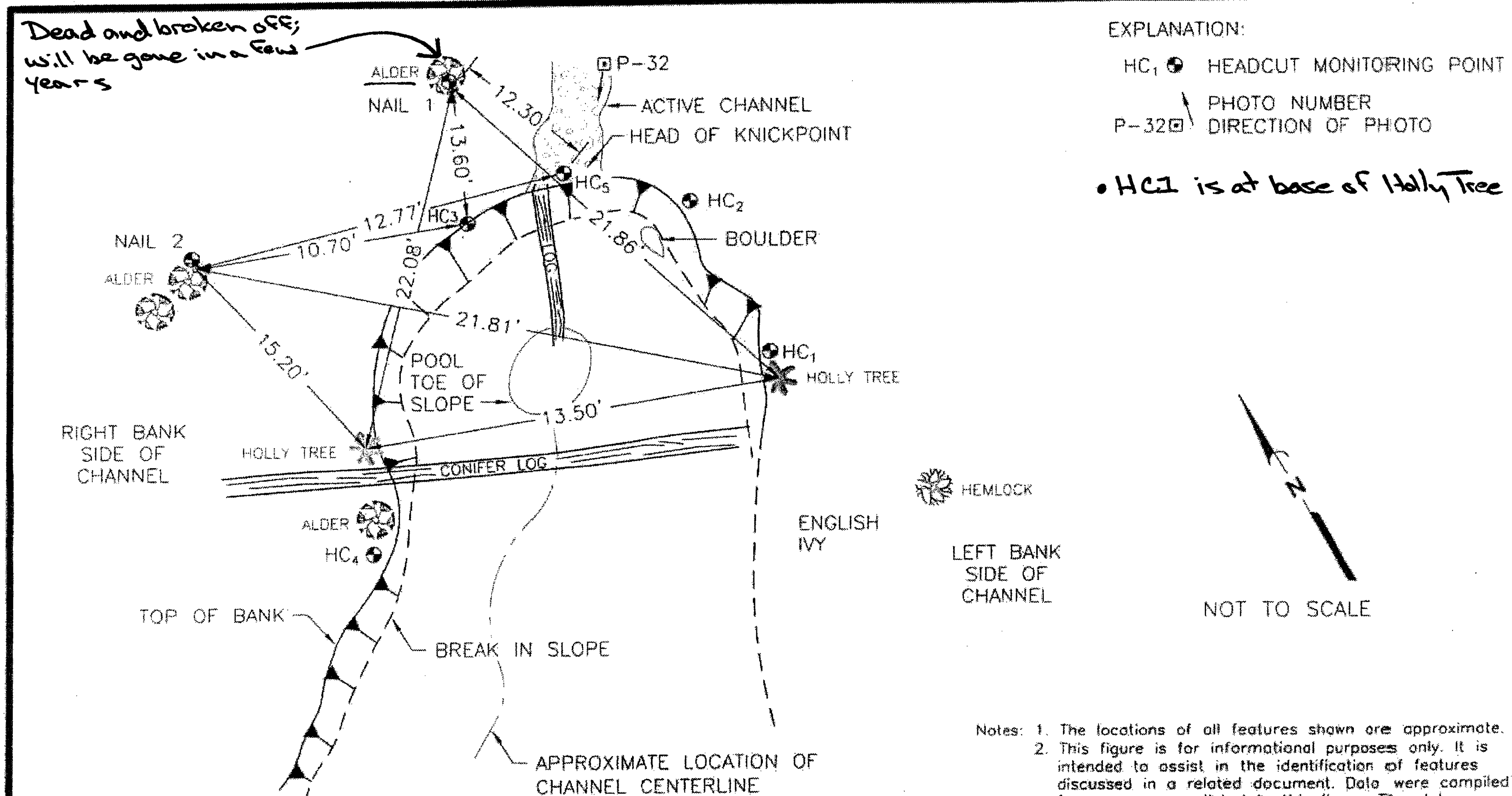


Notes: 1. The locations of all features shown are approximate.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Revised 11/30/06

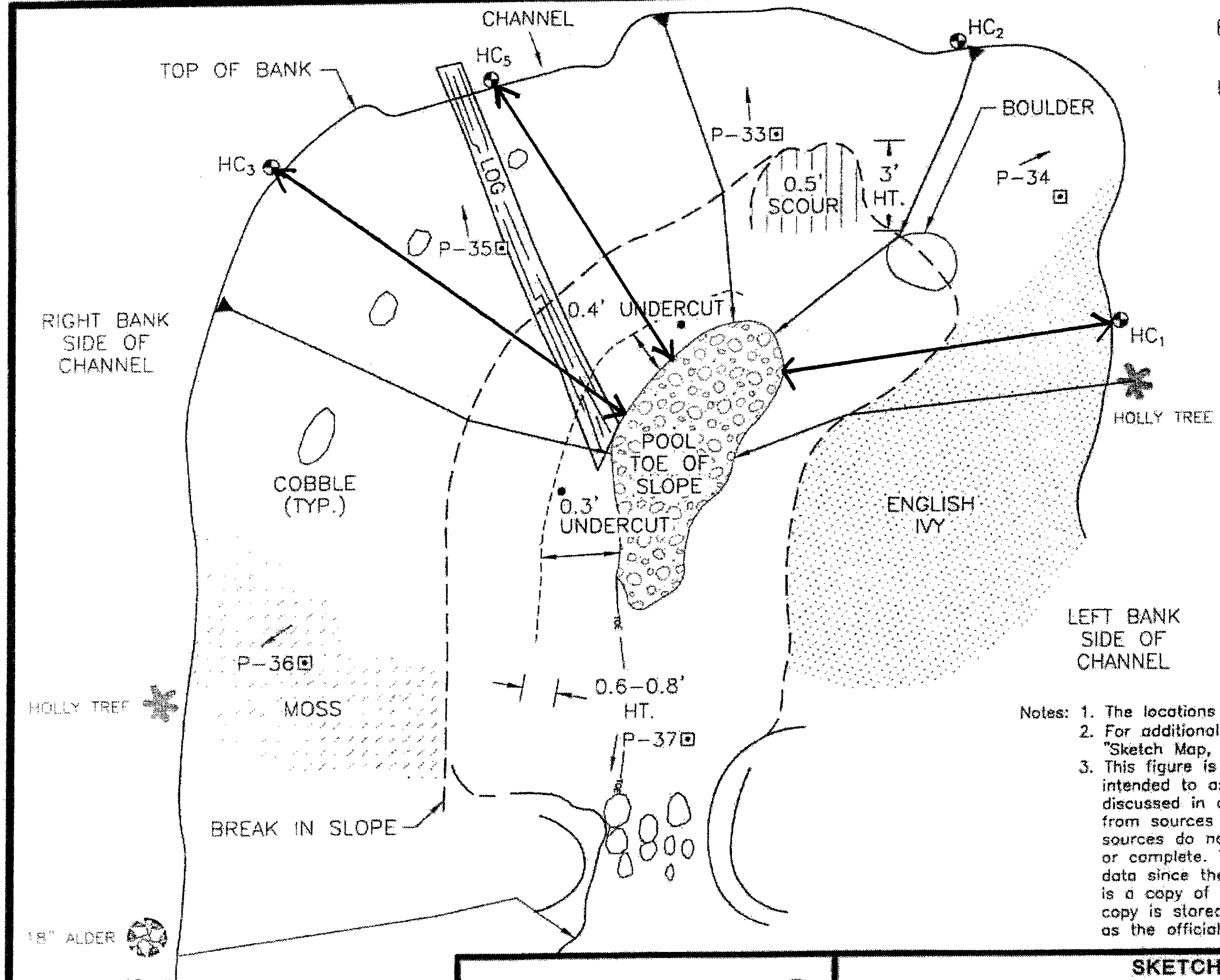
Reference: Drawing produced from sketch provided by GeoEngineer's staff, November 2004.

GEOENGINEERS

SKETCH MAP
BASIN 26, PLAN VIEW

FIGURE 1

REDM\P:\0817017\00\CAD\081701700D.DWG ETB:SYF 12/14/04



EXPLANATION:

P-34 — PHOTO NUMBER, DIRECTION OF PHOTO

HEADCUT MONITORING POINT

HC — HEADCUT MEASUREMENT (FT.) FROM TOP OF SLOPE TO TOE OF SLOPE

HC_1	13.9' VEGETATED (IVY)
HC_2	12.0'
HC_3	10.2'
HC_4	13.1'
HC_5	8.7'

Notes:
1. The locations of all features shown are approximate.
2. For additional details, refer to drawing entitled "Sketch Map, Basin 26, Site Plan," Figure 1.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Drawing produced from sketch provided by GeoEngineer's staff, November 2004.

GEOENGINEERS

SKETCH MAP
BASIN 26, OBLIQUE VIEW INTO KNICKPOINT

FIGURE 2

Water Course Monitoring Data

Cross section in subbasin 32b

measurement:	1			2			3		
by:	GeoEngineers			Beck/City			Beck		
date:	11/24/2004			1/5/2006			10/20/2006		
Conditions:				very fast water and rainy.			Dry		
Streambed Material	Smooth dense silt			Smooth dense silt			Smooth dense silt		
Instrument:	optical level			laser level			transit		
quality of measurement	very good			poor			fair		
	station	Elevation		station	Elevation		station	Elevation	
	0	201.55	Nail #1	0	201.55	Nail #1	0	201.55	Nail #1
	0.5	200.51		7	199.8		7	199.9	
	5.4	200.00		11.5	198.6		11	198.6	
	11.8	198.49		15	194.2		14.2	194.29	
	12.6	195.88		18	193.90		15.5	193.74	
	14.9	194.2		24	194.8		18	193.76	
	15.5	193.71		27	200.15		21	193.87	
	17.5	193.7		31.9	202.9	Nail #2	24.8	194.87	
	18	193.55					26.7	199.84	
	19	193.7					32	203.09	Nail #2
	21.5	193.77							
	24.8	194.42							
	26.4	199.49							
	32	201.72							
	32	203.02	Nail #2						
	Conclusion			No change since November 2004			No change since November 2004		

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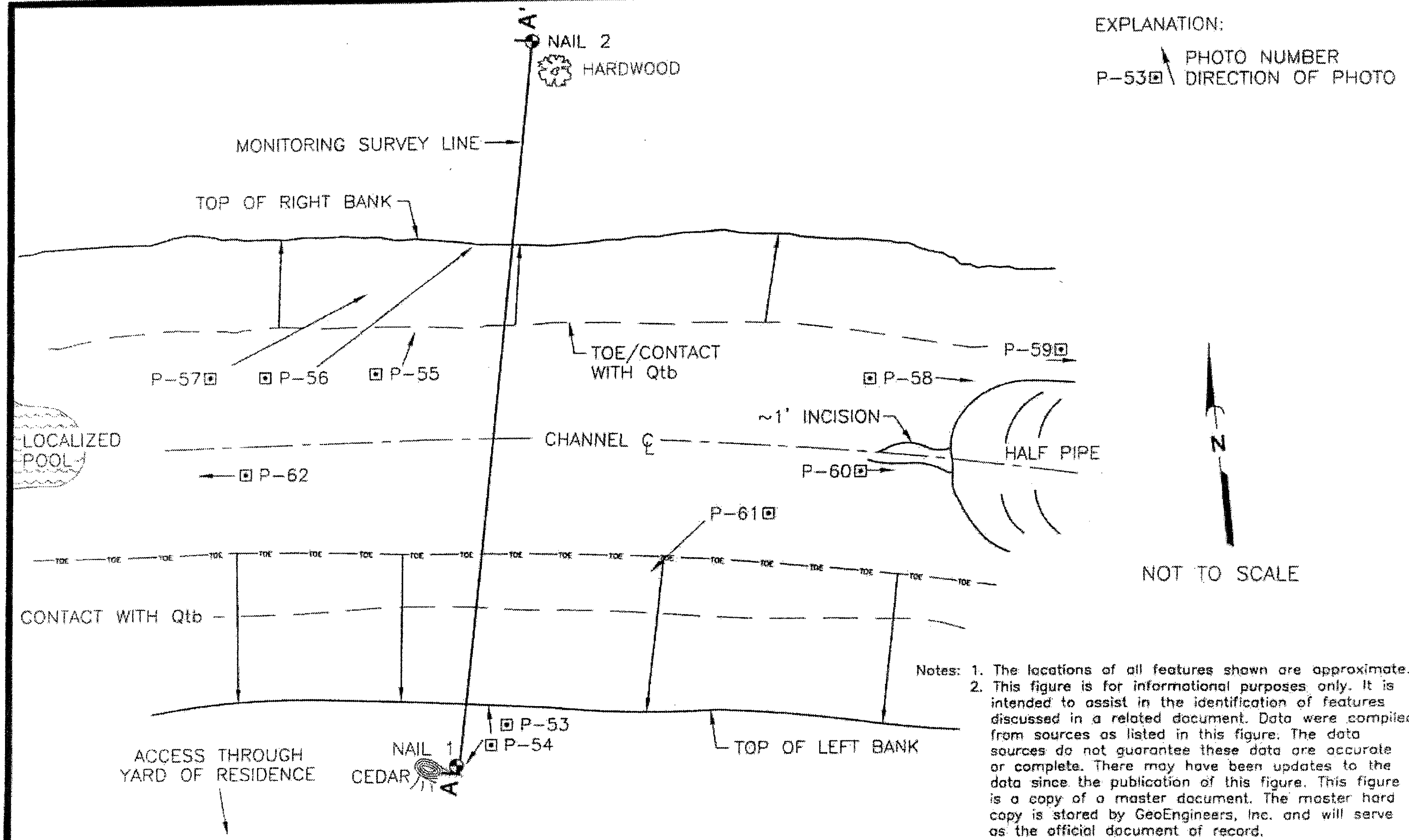

Notes:
1. The locations of all features shown are approximate.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Drawing produced from sketch provided by GeoEngineer's staff, November 2004.

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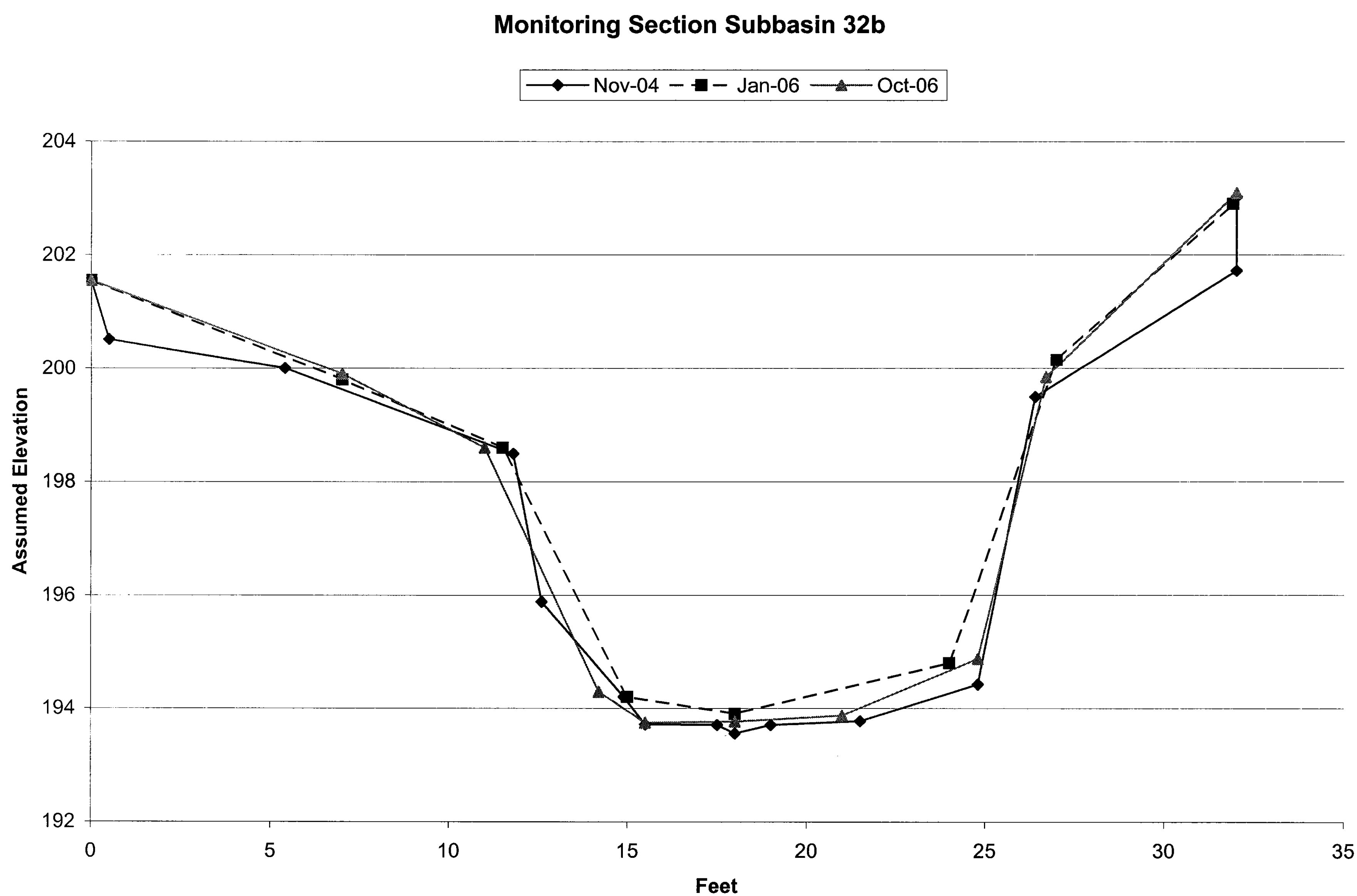
SKETCH MAP
BASIN 32~~a~~b, SITE PLAN

FIGURE 1


Monitoring Section Subbasin 32b
Nov-04
Jan-06
Oct-06
204
202
200
198
196
194
192
Assumed Elevation
0
5
10
15
20
25
30
35
Feet

Water Course Monitoring Data

subbasin 29

measurement:	1	2	3
by:	GeoEngineers	Beck/City	Beck
date:	11/18/2004	1/5/2006	10/20/2006
Conditions:		very fast water and rainy.	Dry
Radial distance (see Figure 1 in 12/15/04 Monitoring report)			
point	distance (ft)	distance (ft)	distance (ft)
1	28	28	28
2	30	30	30.4
3	30.50	30	30
4	27.96	26.6	27
5	28.93	not measured	26.60
6	26.69	26.9	27.1
7	23.35	not measured	23.00
Undercutting (see Figure 2 in 12/15/04 Monitoring report but letters not shown. Post F also added to drawing)			
steel fence post No. (downstream to upstream)	distance (ft)	distance (ft)	distance (ft)
A	0	0	0.1
B	0.5	0.4	0.7
C	0.8	0.75	0.5
D	0.5	0.5	post is gone
E	0.4	0	0.4
F	0	0	0.2
G	0	0.5	0.25
H	0	0	0.1
Conclusion		No significant change since Nov 2004	No significant change since Jan 2004. No significant sand bag losses. For posts A-G: creek thalweg below sand bags. For posts G-H: creek thalweg at sand bags

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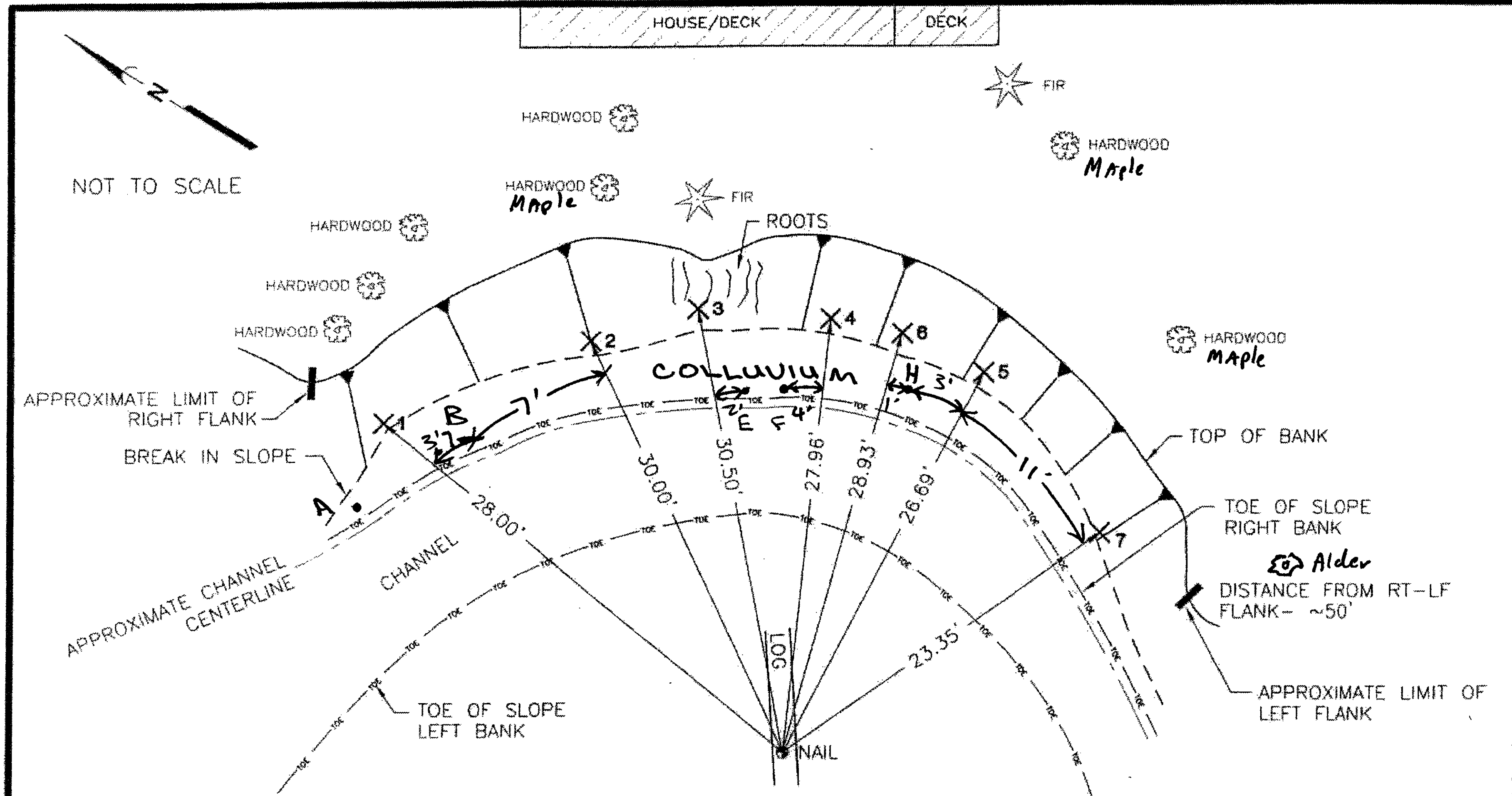


Notes: 1. The locations of all features shown are approximate.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Drawing produced from sketch provided by GeoEngineer's staff, November 2004.

Revised 11/30/06 to locate

EXPLANATION: Numbered points

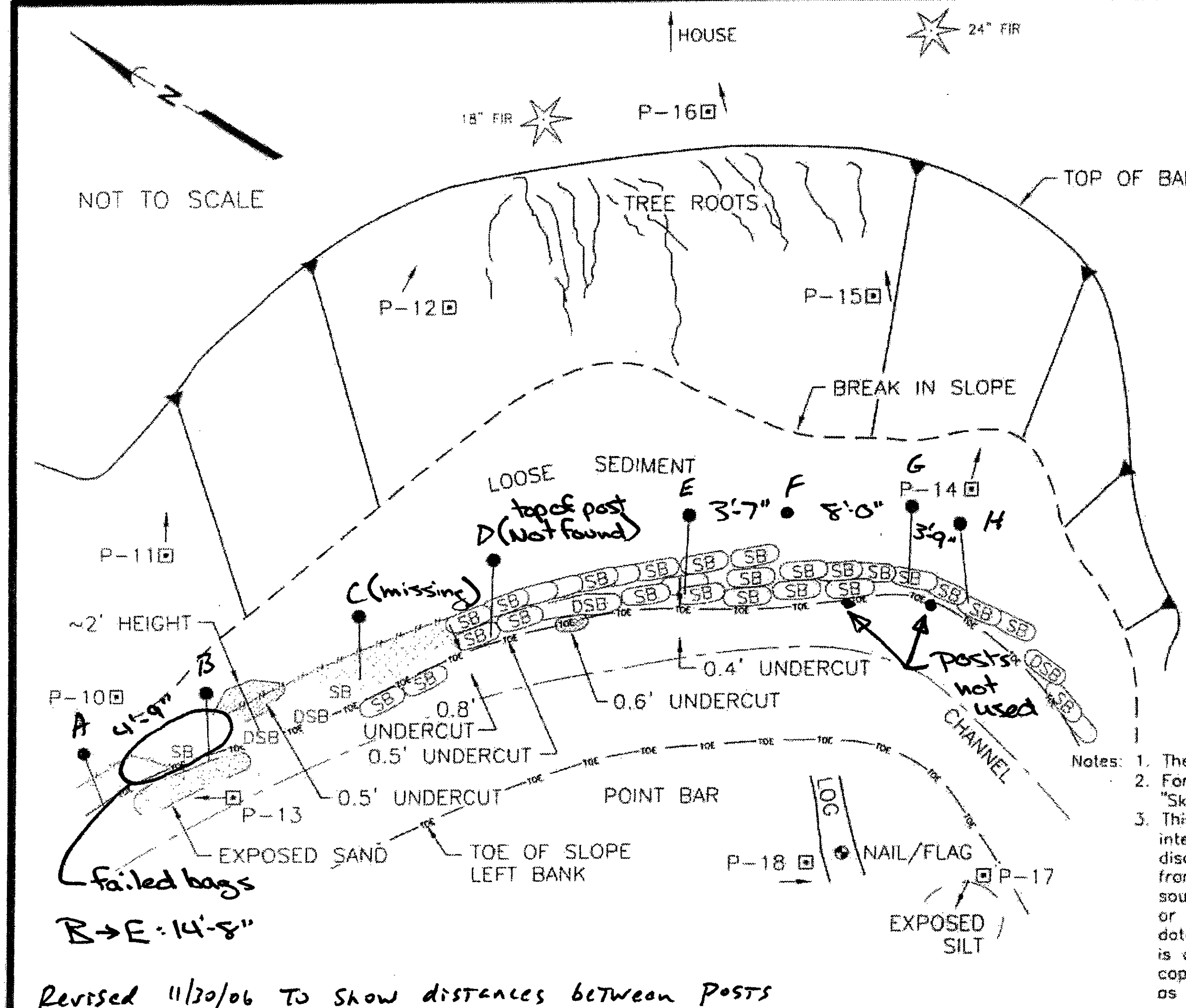
X1 PAINTED MONITOR POINT AT LOOSE SEDIMENT/MAIN SCARP CONTACT

GEOENGINEERS

SKETCH MAP
BASIN 29, PLAN VIEW

FIGURE 1

REDM\P:\0817017\00\CAD\081701700B.DWG ETB:SYF 12/01/04



EXPLANATION:

P-16 PHOTO NUMBER DIRECTION OF PHOTO

POST - Steel

SILT FENCE

SB SAND BAG

DSB DAMAGED SAND BAG

Notes:
1. The locations of all features shown are approximate.
2. For additional details, refer to drawing entitled "Sketch Map, Basin 29, Site Plan," Figure 1.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Revised 11/30/06 To show distances between posts

revised 1/26/06

Reference: Drawing produced from sketch provided by GeoEngineer's staff, November 2004.

GEOENGINEERS

SKETCH MAP
BASIN 29, OBLIQUE VIEW INTO BANK

FIGURE 2

Appendix D

DIGITAL APPENDIX

R·W·BECK

Appendix E

FIELD INVESTIGATION FORMS FOR EROSION PROBLEMS

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 4 **Problem No.** 4.1 **By:** J. Bjork 9/24/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: 50-100 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10%>10% varies

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: 125 ft. up/downstream 12 " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes:	**Horiz (ft)**	**Vert (ft)**	**Address**	**Apparent Hazard**
No risk ✓				Low Med High
				Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
	✓	Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
	✓	Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
	✓	Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 300 LF

Concept:

Outfall protection		LF
Bypass Pipe		LF
Check dams		LF
Channel restoration	30	LF
Stream restoration		LF

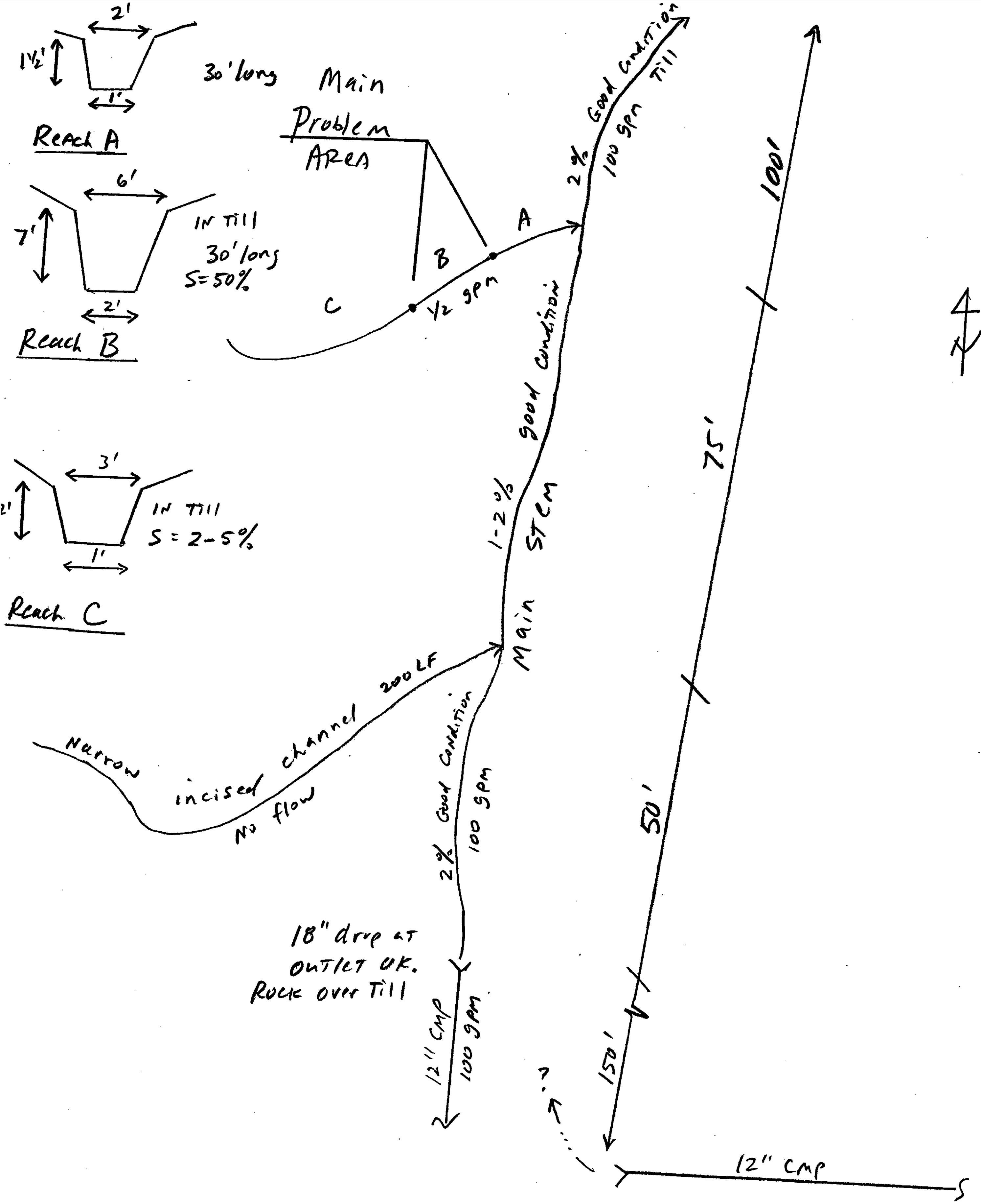
Other

Section maps incorrect

photos are reach B

Area < 30 acres

Potential Monitoring Site: Yes No


2'
1½'
1'
Reach A
30' long
Main Problem AREA
6'
7'
2'
IN Till
30' long
S=50%
Reach B
3'
2'
1'
IN Till
S = 2-5%
Reach C
A
B
C
½ gpm
2%
Good condition
100 gpm
Till
Good condition
good condition
1-2%
Main STEM
Narrow incised channel 200 LF
No flow
Good condition
100 gpm
2%
18" drop AT OUTLET OK.
Rock over Till
12" CMP
100 gpm
100'
75'
50'
150'
12" CMP

Problem 4.1

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 4 **Problem No.** 42 **By:** J. Bjork 9/24/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide & Fill

Flow Today: 10 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: ___ ft. up/downstream See sketch " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓	✓	
Upper Slope Stability		✓	✓	
Landslide		✓		
Sediment source		✓	✓	
Habitat destruction				
Threatens home				
Threatens other structure				
Threatens private road/driveway			✓ long term	
Threatens infrastructure				
Threatens public road				

Risk to Homes:

	Horiz (ft)	Vert (ft)	Address	Apparent Hazard
No risk_____	100'		3908 90th Ave SE	Low Med High
				Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
✓		Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
✓		Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 50 LF

Concept:

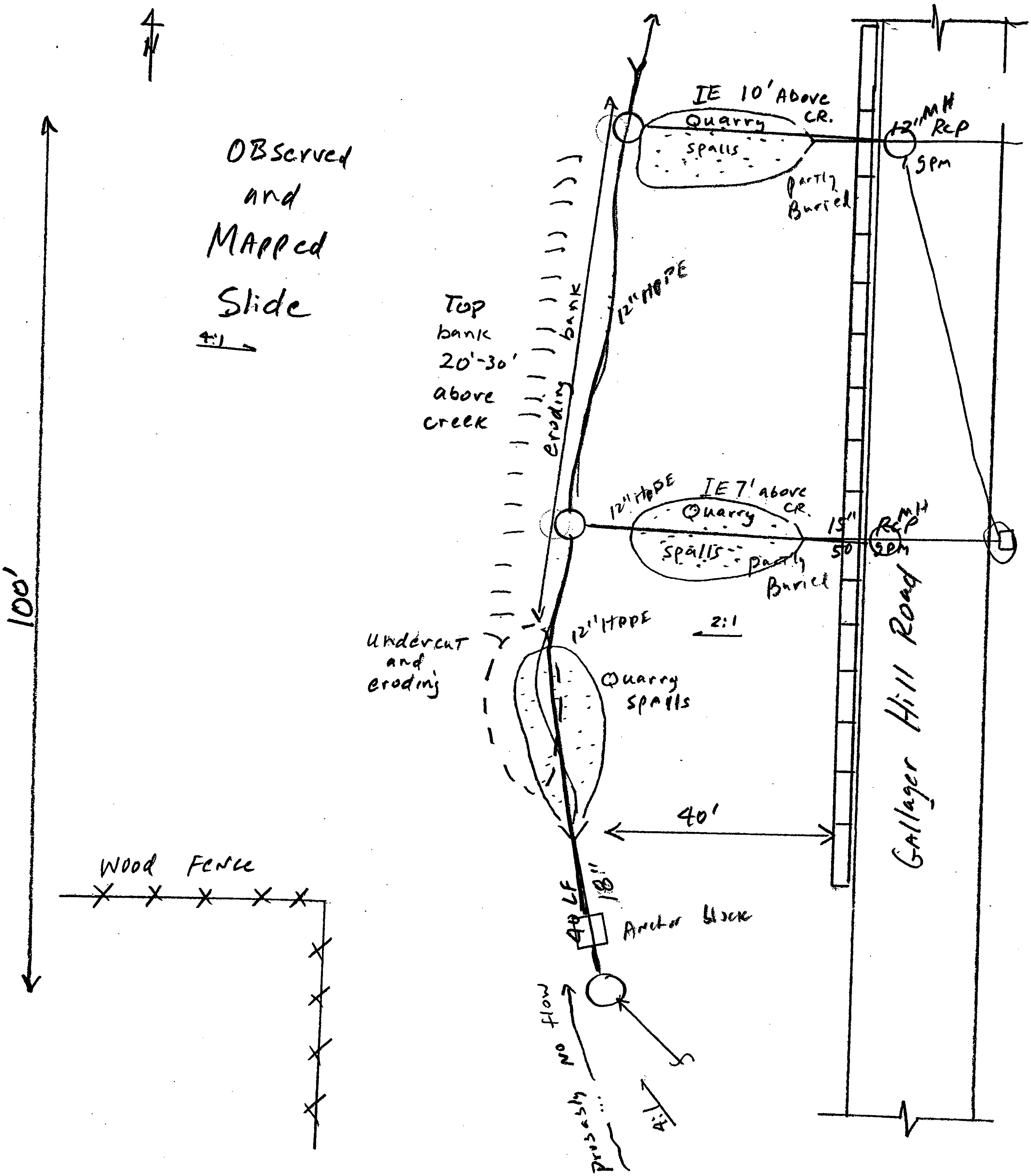
	Outfall protection		LF
Option 1	Bypass Pipe	200	LF
	Check dams		LF
Option 2	Channel restoration	200	LF
	Stream restoration		LF

Other

Presence of slide suggests butt fused HDPE pipe system for 3 outlets, 4 MH needed.

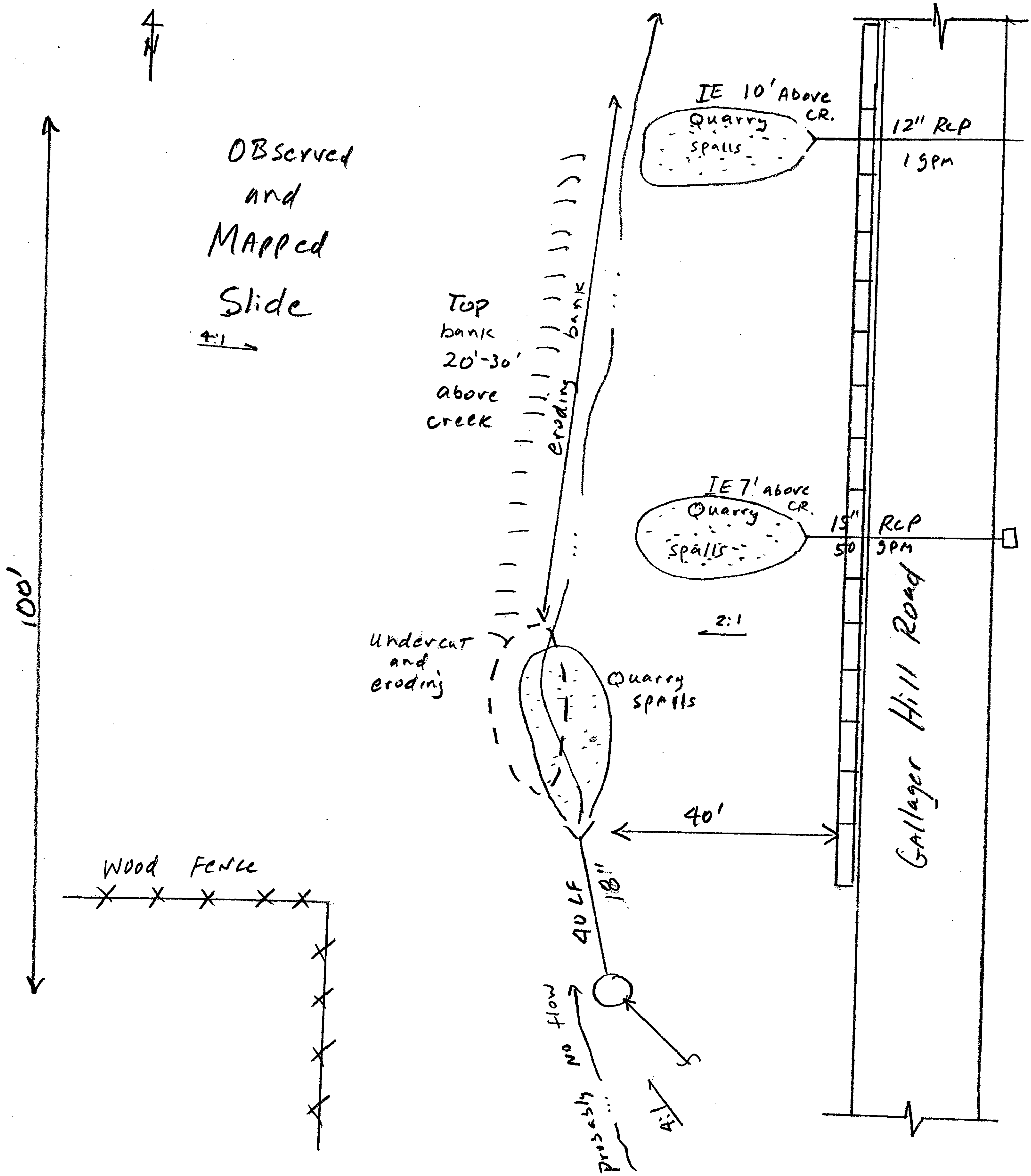
Potential Monitoring Site: Yes No

Ad < 30 Acres



Solution

Problem 4.2


N
OBserved and MApped Slide
4:1
100'
IE 10' Above CR.
Quarry spalls
12" RCP
1 gpm
Top bank 20'-30' above creek
eroding bank
IE 7' above CR.
Quarry spalls
15" RCP
50 gpm
2:1
Undercut and eroding
Quarry spalls
40'
Gallager Hill Road
Wood Fence
40 LF 18"
No flow
Probably ...
4:1

Problem 4.2

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 6 **Problem No.** 6.2 **By:** J. Bjork 9/28/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: 0 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor None
Proximity to Drainage Outfalls: ___ ft. up/downstream None " CMP RCP PVC CPEP No sign of flowing water
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source				
Habitat destruction				
Threatens home				
Threatens other structure				
Threatens private road/driveway				
Threatens infrastructure				
Threatens public road				

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard
No risk_____ Low Med High
Low Med High

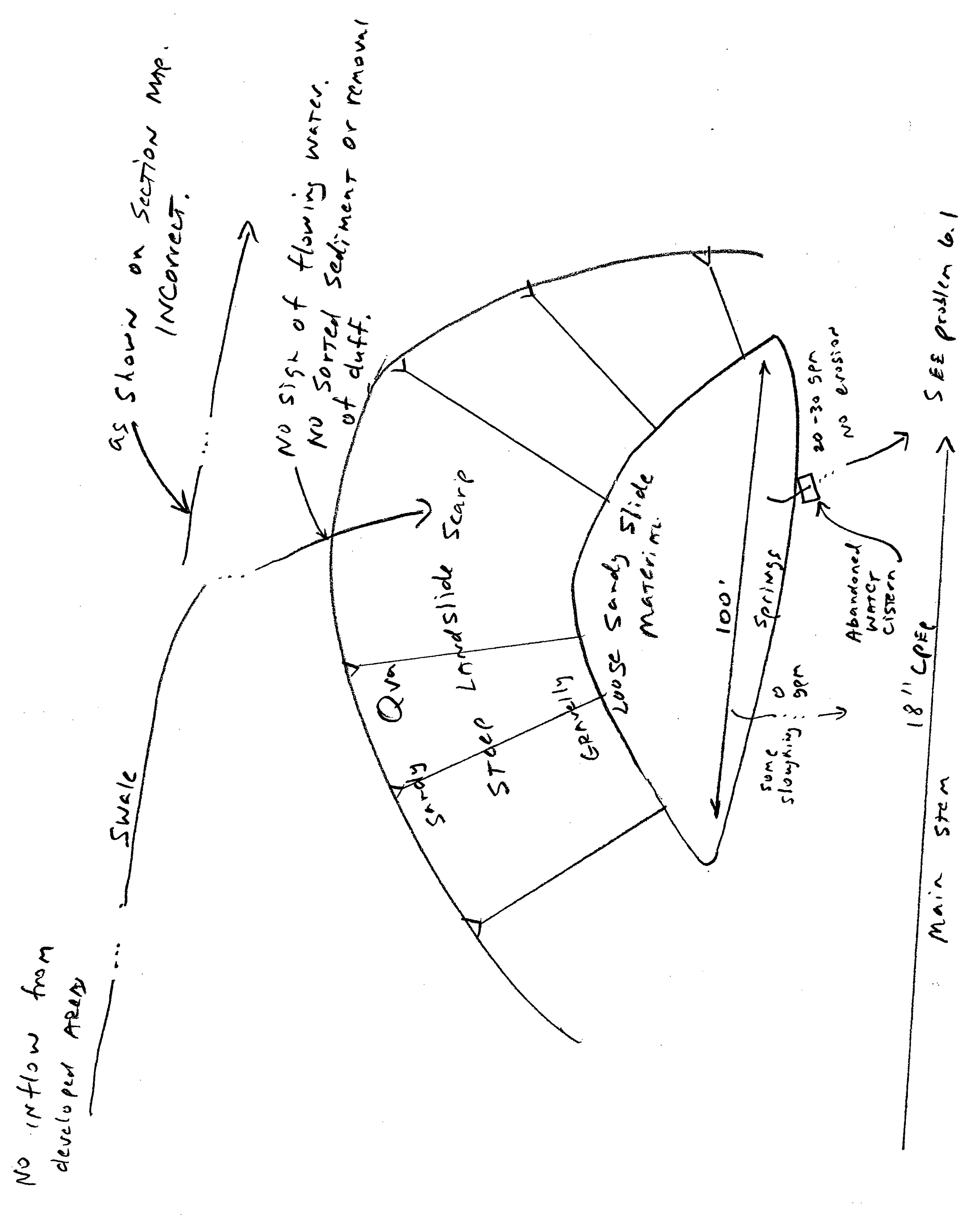
Solutions

Construction Access: yes	No	
		Conventional Equipment to site
		Conventional Equipment down ravine
		Conventional Equipment to top of ravine
		Crane (less than 200')
		Cable Way (straight line)
		Small equipment
		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped ________LF
Concept:
Outfall protection ________LF
Bypass Pipe ________LF
Check dams ________LF
Channel restoration ________LF
Stream restoration ________LF
Other NOT A Surface Water erosion Problem
Disturbance Caused by bikes. No runoff or sign of flowing water. Problem Location is at scarp of old slide. Springs in Lower area. Subbasin boundaries need to be adjusted.

Potential Monitoring Site: Yes No

AD < 30 Acres


NO inflow from developed AREA
Swale
as shown on SECTION MAP. INCorrect.
NO sign of flowing water. NO sorted sediment or removal of duff.
Qva
Sandy
STeep Landslide Scarp
GRAvelly
Loose Sandy Slide Material
100'
Springs
0 gpm
some sloughing
20-30 gpm
No erosion
Abandoned water cistern
18'' CPEP
Main stem
SEE Problem 6.1

Problem 6.2

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 10 **Problem No.** 10.1 **By:** J. Bjork 9 / 28 /05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: ____gpm ____cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% ≥10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor None
Proximity to Drainage Outfalls: ___ ft. up/downstream Roof Leaders " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut None
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes:	Horiz (ft)	Vert (ft)	Address	Apparent Hazard
No risk ✓	Near	7411		Low Med High
				Low Med High

Solutions

Construction Access:

yes	No	
NA		Conventional Equipment to site
		Conventional Equipment down ravine
		Conventional Equipment to top of ravine
		Crane (less than 200')
		Cable Way (straight line)
		Small equipment
		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 0 LF
Concept:
Outfall protection NA LF
Bypass Pipe ____ LF
Check dams ____ LF
Channel restoration ____ LF
Stream restoration ____ LF
Other ____

Topographic Swale Observed but little flowing water. No sediment sorting or collection area - not a problem.

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 10 **Problem No.** 10.2 **By:** J. Bjork 9 /28/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: Dry gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10% 30%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor None

Proximity to Drainage Outfalls: ___ ft. up/downstream None " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut None

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk ✓ Near 3620 Low Med High

Low Med High

Solutions

Construction Access:	yes	No	
			Conventional Equipment to site
			Conventional Equipment down ravine
			Conventional Equipment to top of ravine
			Crane (less than 200')
			Cable Way (straight line)
			Small equipment
			Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 0 LF

Concept:

Outfall protection ______ LF

Bypass Pipe ______ LF

Check dams ______ LF

Channel restoration ______ LF

Stream restoration ______ LF

Other

Topographic swale but no evidence of flowing water. Small collection area and none from street. Not a problem

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 10 **Problem No.** 10.3 **By:** J. Bjork 7 / 28 /05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: None gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10%>10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor None

Proximity to Drainage Outfalls: ___ ft. up/downstream 6'' " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: **Horiz (ft)** **Vert (ft)** **Address** **Apparent Hazard**

No risk ✓ ______ Low Med High

______ Low Med High

Solutions

	yes	No	
Construction Access:	NA		Conventional Equipment to site
			Conventional Equipment down ravine
			Conventional Equipment to top of ravine
			Crane (less than 200')
			Cable Way (straight line)
			Small equipment
			Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 0 LF

Concept:
- Outfall protection ______ LF
- Bypass Pipe ______ LF
- Check dams ______ LF
- Channel restoration ______ LF
- Stream restoration ______ LF
- Other ______

Very limited collection area. Section map system correct. No sorting on bed material down stream. Not a problem.

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 10 **Problem No.** 10.4 **By:** J. Bjork 9 /24 /05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide Large Loose Rip Rap

Flow Today: 30 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%

Bank Vegetation type: Native Invasive Landscaped NONE

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: ___ ft. up/downstream 36" D.S. & 60" U.S. " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut NONE

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard

No risk_____ 2235 77TH Avenue SE Low Med High

Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
	✓	Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
	✓	Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 120 LF

Concept:

Outfall protection ______ LF

Bypass Pipe ______ LF

Check dams ______ LF

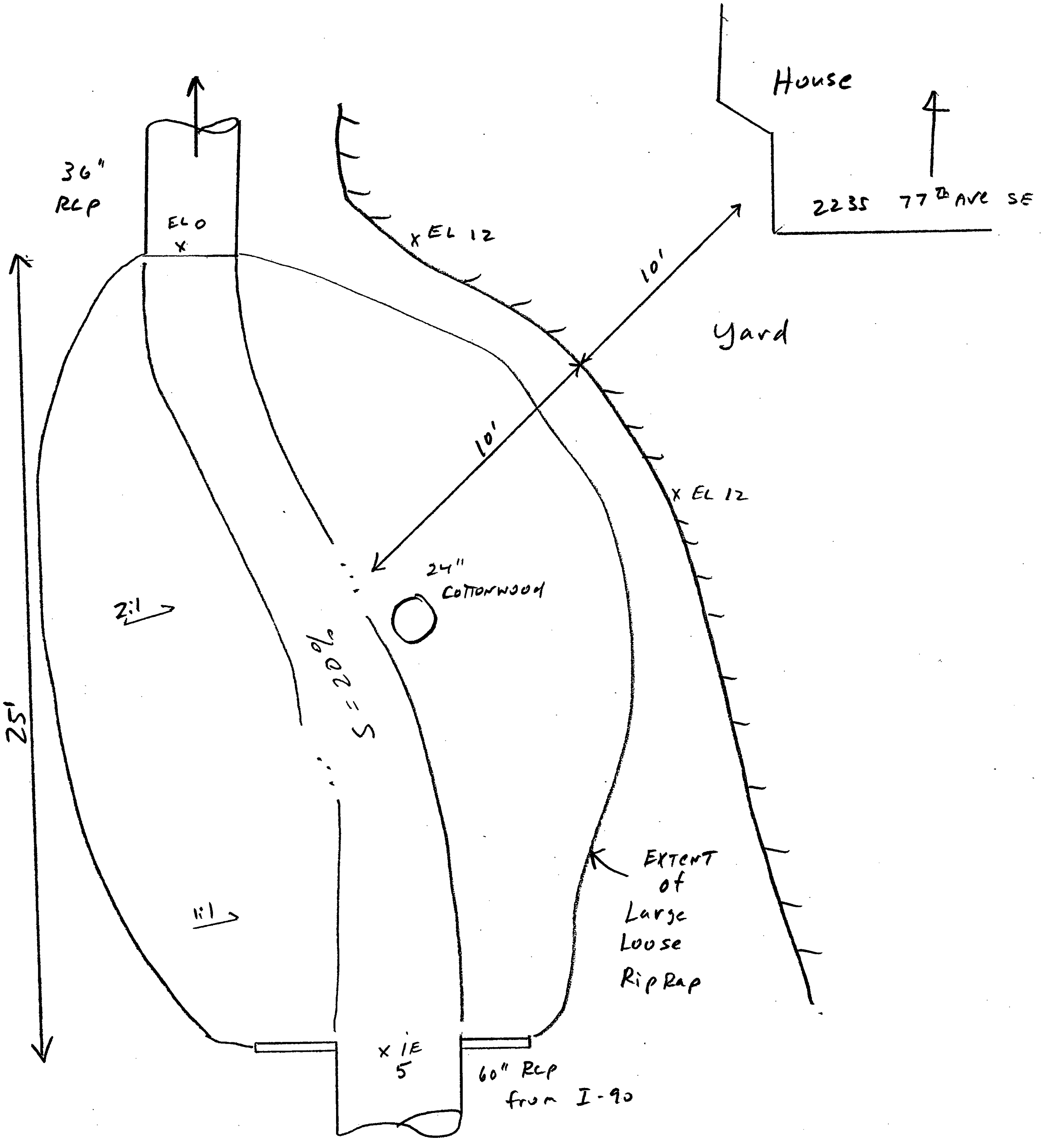
Channel restoration ______ LF

Stream restoration ______ LF

Other add 18"-24" Ø Rock at 60" outlet (5 cy) or Shotcrete

No erosion evident but rock lining not very good. Risk depends on expected flow. Additional analysis warranted.

Potential Monitoring Site: Yes No



Elevation estimated by Eye.
No datum.

Problem 10.4

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 26 **Problem No.** 26.1 **By:** J. Bjork 1/5/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: ___ gpm 2 cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: ___ ft. up/downstream none " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability	✓			
Landslide	✓			
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**
No risk ✓
Low Med High
Low Med High

Solutions

Construction Access:	yes	No	
	✓		Conventional Equipment to site
		✓	Conventional Equipment down ravine
		✓	Conventional Equipment to top of ravine
		✓	Crane (less than 200')
	✓		Cable Way (straight line)
	✓		Small equipment
	✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 250 LF
Concept:
Outfall protection ___ LF
Bypass Pipe ___ LF
Check dams ___ LF
Channel restoration ___ LF
Stream restoration 90 LF
Other

9' vertical Headcut. Design being developed.

Ad = 30-80 Acres

Potential Monitoring Site: Yes No Already is monitoring site.

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 27a Problem No. 27a.1 By: J. Bjork 9 / 28 /05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill undetermined slide

Flow Today: 10 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: 150 ft. up/downstream 15 " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut

Apparent rate of Erosion: stable Slow change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide		✓		
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes:	**Horiz (ft)**	**Vert (ft)**	**Address**	**Apparent Hazard**
No risk ✓	100'	30'	5609 W. Mercer Way	Low Med High
				Low Med High

Solutions

Construction Access:	yes	No	
	✓		Conventional Equipment to site
	✓		Conventional Equipment down ravine
		✓	Conventional Equipment to top of ravine
		✓	Crane (less than 200')
	✓		Cable Way (straight line)
	✓		Small equipment
	✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 150 LF

Concept:

Outfall protection		LF
Bypass Pipe		LF
Check dams		LF
Channel restoration	30	LF
Stream restoration		LF

Small Scale but rapid erosion in soft Material

AD = 30-80 Acres

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 279 **Problem No.** 279.2 **By:** J. Bjork 9/28/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: ____gpm ____cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: AT ft. up/downstream 15 " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut None
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**
No risk ✓ Low Med High
Low Med High

Solutions

Construction Access:	yes	No	
	NA		Conventional Equipment to site
			Conventional Equipment down ravine
			Conventional Equipment to top of ravine
			Crane (less than 200')
			Cable Way (straight line)
			Small equipment
			Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 0 LF
Concept:
Outfall protection None LF
Bypass Pipe ____ LF
Check dams ____ LF
Channel restoration ____ LF
Stream restoration ____ LF
Other ____

No erosion at West Mercer Way culvert outlet. Also no erosion upstream of W.M.W. New house at 5055 WMW does not affect main stem

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 27a **Problem No.** 27a3 **By:** J. Bjork 9 / 28 /05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: 20 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10%>10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: ___ ft. up/downstream None " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcuts 5' at us end; 4' at DS end.
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability	✓			
Landslide	✓			
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes:	**Horiz (ft)**	**Vert (ft)**	**Address**	**Apparent Hazard**
No risk ✓				Low Med High
				Low Med High

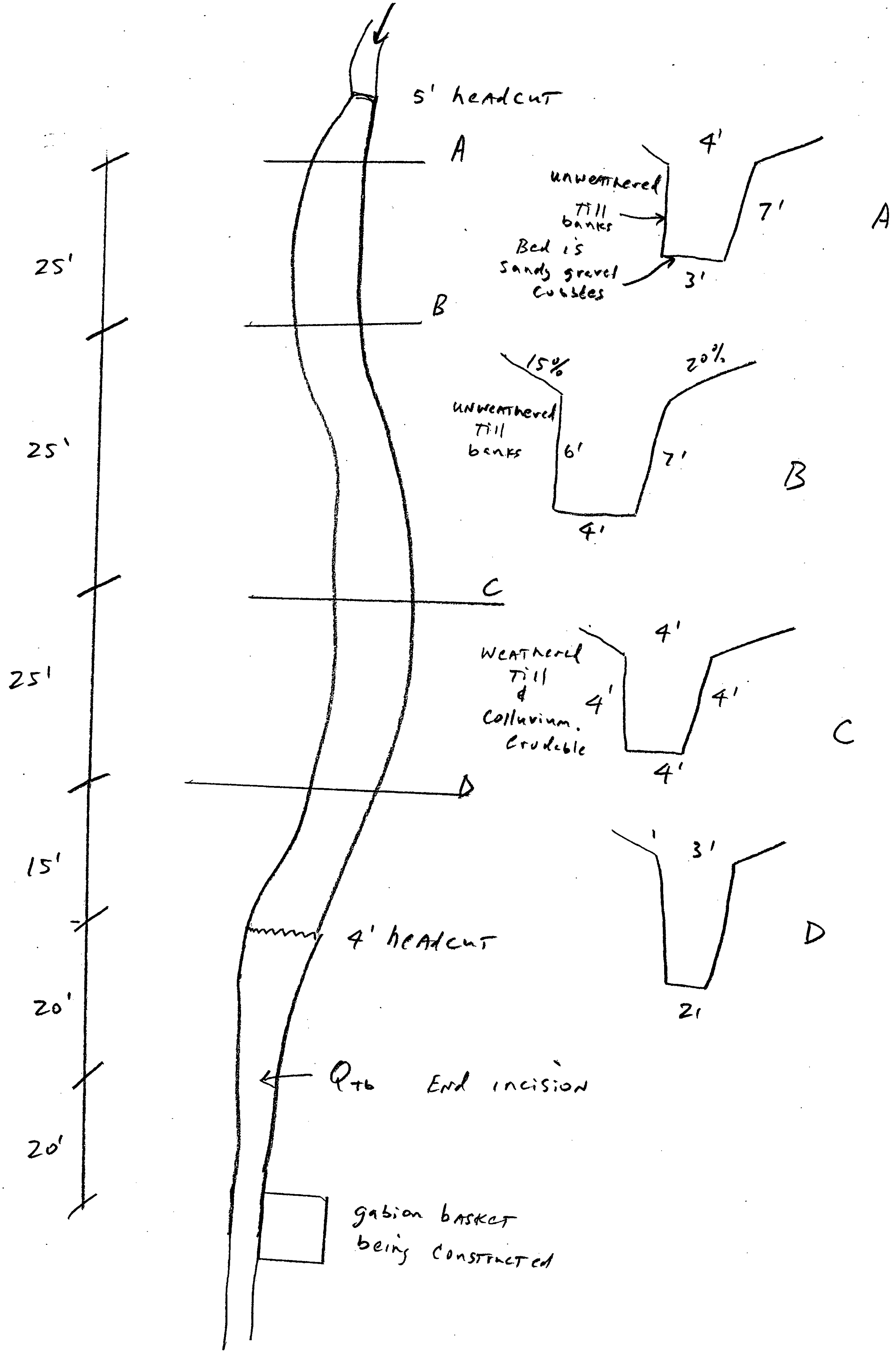
Solutions

Construction Access:	yes	No	
	✓		Conventional Equipment to site
		✓	Conventional Equipment down ravine
	✓		Conventional Equipment to top of ravine
		✓	Crane (less than 200')
	✓		Cable Way (straight line)
	✓		Small equipment
		✓	Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 150 LF
Concept:
Outfall protection ____ LF
Bypass Pipe ____ LF
Check dams ____ LF
Channel restoration ____ LF
Stream restoration 110 LF
Other ____

deeply incised channel
Ao < 30 acres

Potential Monitoring Site: Yes No


5' headcut
A
B
C
D
25'
25'
25'
15'
20'
20'
4'
unweathered Till banks
Bed is sandy gravel cobbles
7'
3'
A
15%
20%
unweathered Till banks
6'
7'
4'
B
4'
Weathered Till & Colluvium. Erodable
4'
4'
4'
C
3'
2'
D
4' headcut
Qtb
End incision
gabion basket being constructed

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 27 a **Problem No.** 27a.4 **By:** J. Bjork 9 /28 /05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: 0 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10%>10% NA
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor None
Proximity to Drainage Outfalls: ___ ft. up/downstream 12 " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard

No risk ✓ ______ Low Med High

______ Low Med High

Solutions

	yes	No	
Construction Access:	NA		Conventional Equipment to site
			Conventional Equipment down ravine
			Conventional Equipment to top of ravine
			Crane (less than 200')
			Cable Way (straight line)
			Small equipment
			Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 0 LF
Concept:
- Outfall protection 0 LF
- Bypass Pipe ___ LF
- Check dams ___ LF
- Channel restoration ___ LF
- Stream restoration ___ LF
- Other ___

Long time property owner at 5201 WM Way stated there has been no problem for 30 years since road rebuilt & culvert extended

Potential Monitoring Site: Yes No NO problem

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 279 **Problem No.** 279.5 **By:** J. Bjork 9 / 28/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: ____gpm ____cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: ___ ft. up/downstream ______" CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: **Horiz (ft)** **Vert (ft)** **Address** **Apparent Hazard**

No risk ✓

Low Med High

Low Med High

Solutions

Construction Access:	yes	No	
	NA		Conventional Equipment to site
			Conventional Equipment down ravine
			Conventional Equipment to top of ravine
			Crane (less than 200')
			Cable Way (straight line)
			Small equipment
			Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 0 LF
Concept:

Outfall protection 0 LF
Bypass Pipe ____ LF
Check dams ____ LF
Channel restoration ____ LF
Stream restoration ____ LF
Other

Section map correctly shows that this water course is piped. No erosion problem

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 27a **Problem No.** 27a.6 **By:** J. Bjork 9 / 28 /05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: ____gpm ____cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: ___ ft. up/downstream none " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut Crib dam failing
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability	✓			
Landslide	✓			
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure			✓	8" Sewer main crosses downstream
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard

No risk ✓

Low Med High

Low Med High

Solutions

Construction Access:	yes	No	
	✓		Conventional Equipment to site
		✓	Conventional Equipment down ravine
		✓	Conventional Equipment to top of ravine
		✓	Crane (less than 200')
		✓	Cable Way (straight line)
	✓		Small equipment
		✓	Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 250 LF
Concept:
- Outfall protection ____ LF
- Bypass Pipe ____ LF
- Check dams ____ LF
- Channel restoration ____ LF
- Stream restoration ____ LF
- Other 40 LF boulder cascade

4' high timber crib dam is failing. Failure imminent. Would create 20-50 cy of sediment. Sanitary sewer downstream not exposed.

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 29 **Problem No.** 29.1 **By:** J. Bjork 1/5/06

Site Conditions

Geology: Qtb Qva Qvt -10 Qvr Colluvium fill Undetermined slide
Flow Today: ____gpm 5 cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: ~~Native~~ Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: AT ft. up/downstream 27 " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide		✓		
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure Deck		✓		
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard

No risk____

Horiz (ft)	Vert (ft)	Address	Apparent Hazard
		6165 West Mercer Way	Low Med High
		6205 West Mercer Way	Low Med High

Solutions

Construction Access:

yes	No	
	✓	Conventional Equipment to site
✓		Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
	✓	Crane (less than 200')
	✓	Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 100 LF
Concept:
Outfall protection ____ LF
Bypass Pipe ____ LF
Check dams ____ LF
Channel restoration ____ LF
Stream restoration 600 LF
Other

drop at culvert outlet and severe erosion of banks. Design being developed. High flow bypass opposed by WDFW.

Potential Monitoring Site: Yes No Already is monitoring site.

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 29 **Problem No.** 29.2 **By:** J. Bjork 12 / 14 /05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: 80 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: 15 ft. up/downstream 12 " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut 2

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓	✓	
Landslide		✓	✓	
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road			✓	

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard

No risk ✓ ________________ Low Med High

________________ Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
	✓	Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
✓		Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

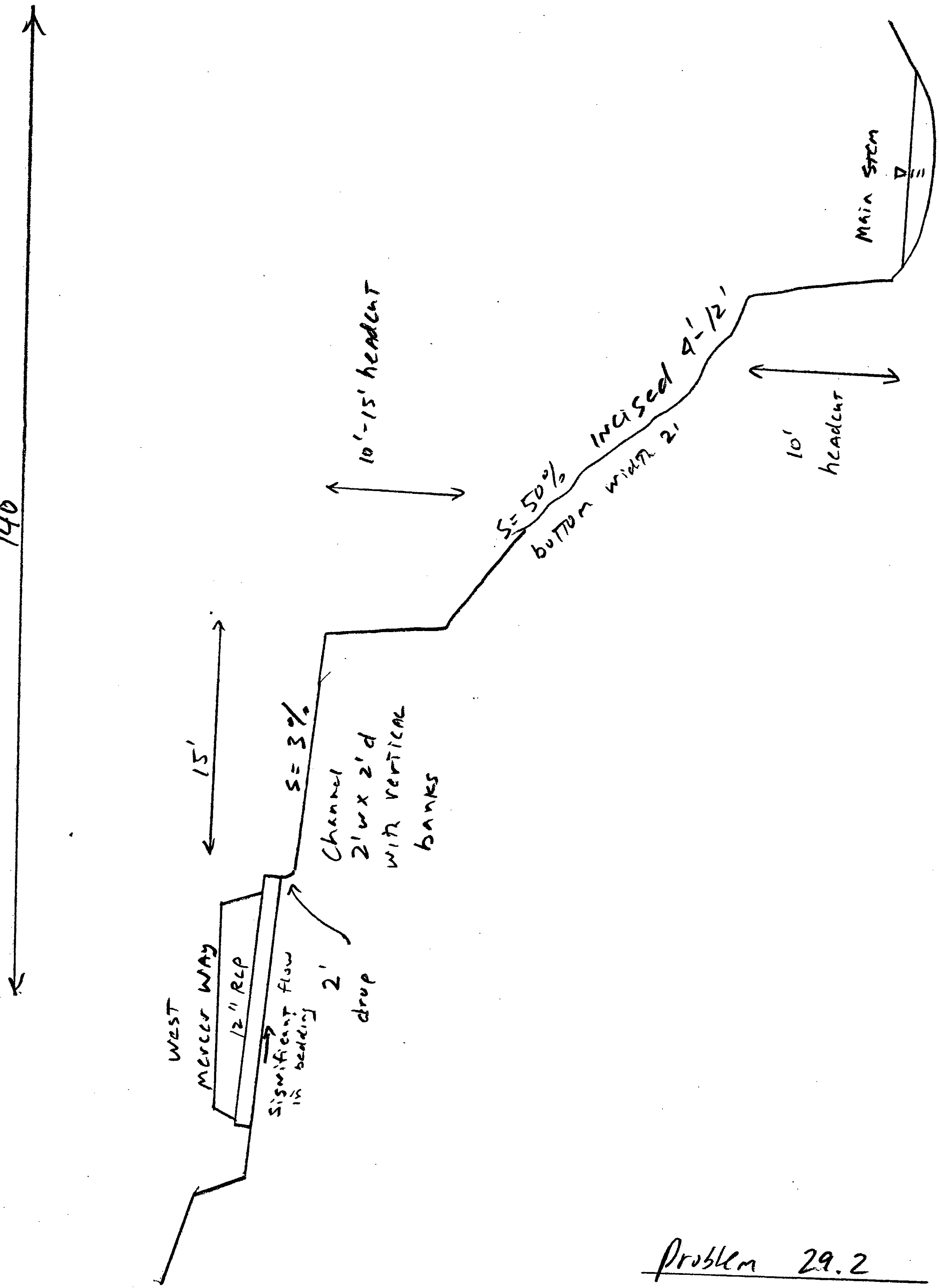
Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 25 LF

Concept:

- Outfall protection ______ LF
- Bypass Pipe HDPE 140 LF
- Check dams ______ LF
- Channel restoration ______ LF
- Stream restoration ______ LF
- Other ______

Potential Monitoring Site: Yes No



140'
West
Mercer Way
12" RCP
significant flow in bedding
2' drop
15'
S = 3%
Channel 2'w x 2'd with vertical banks
10'-15' headcut
S = 50%
incised 4'-12'
bottom width 2'
10' headcut
Main Stem

Problem 29.2

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 32b **Problem No.** 32B-2 **By:** J. Bjork 10/20/06

Site Conditions

Geology: Qtb (lower) Qva Qvt (upper) Qvr Colluvium fill Undetermined slide

Flow Today: 5 gpm ___ cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: 340 ft. up/downstream 28" CMP RCP PVC CPEP HDPE

Erosion of: bed left bank right bank headcut

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability	✓			
Landslide	✓			
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk ✓

Low Med High

Low Med High

Solutions

Construction Access:

yes	No	
	✓	Conventional Equipment to site
	✓	Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
✓		Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment via access road parallel to north side of ravine (Meadow Lane)
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 50-75 LF north bank

Concept:

Outfall protection ______ LF

Bypass Pipe ______ LF

Check dams ______ LF

Channel restoration ______ LF

Stream restoration ______ LF

Other Boulder cascade - 30-50 LF

Approximate 5' deep headcut in very dense silt. Channel is highly incised with unvegetated, vertical banks

* See attached sketch of proposed project

Potential Monitoring Site: Yes No

RWB
SD 31

R·W·BECK	Project 326.2	PROJECT
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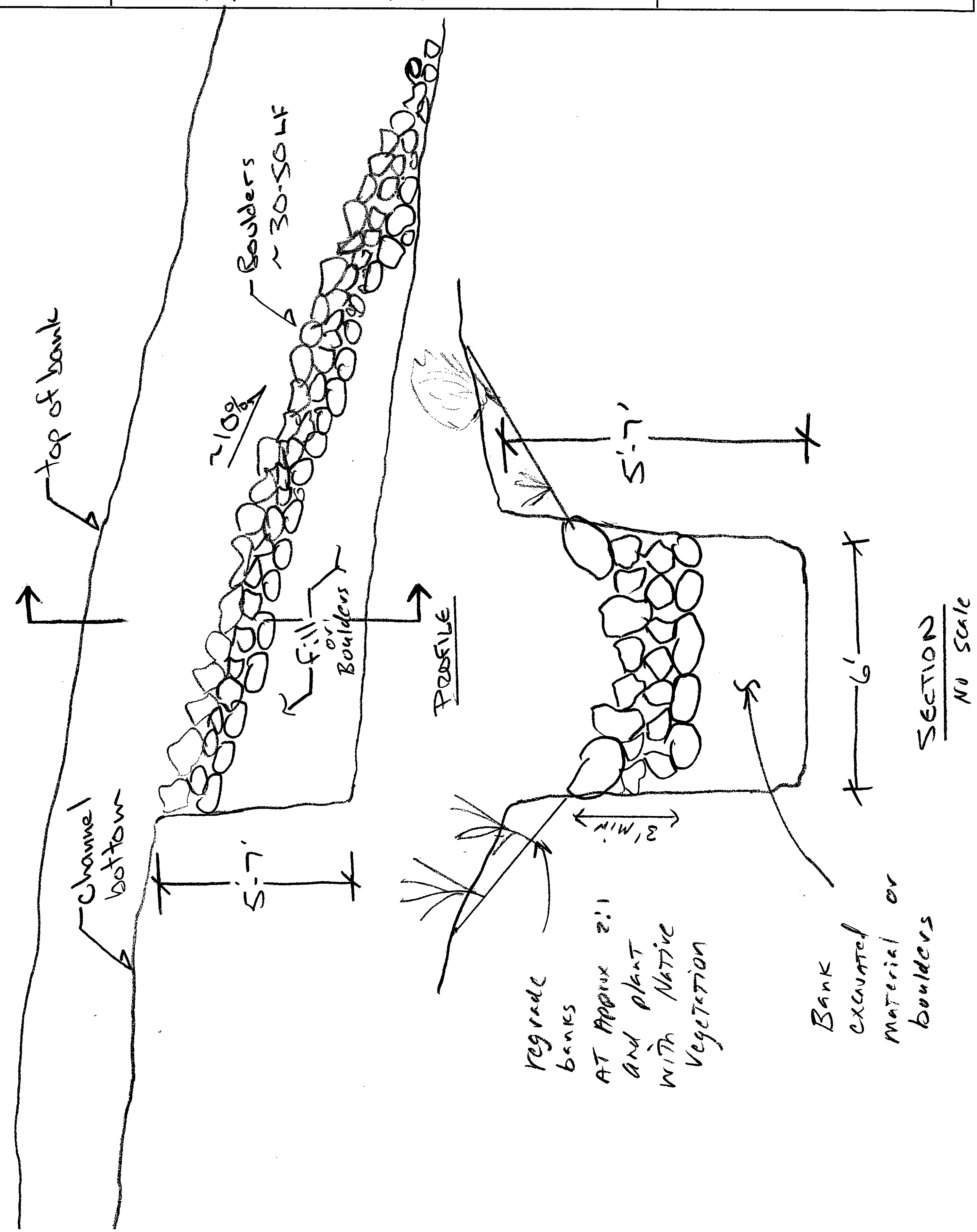

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 32B **Problem No** 32B1 **By:** J. Bjork 10/20/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: 5 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: 275 ft. up/downstream 28 " CMP RCP PVC CPEP HDPE
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability	✓			
Landslide	✓			
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**
No risk ✓
Low Med High
Low Med High

Solutions

Construction Access:

yes	No	
	✓	Conventional Equipment to site
	✓	Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
	✓	Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment via access road parallel to north side of ravine (Meadow Lane)
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped ~50 LF-north bank
Concept:
Outfall protection 30 LF
Bypass Pipe ___ LF
Check dams ___ LF
Channel restoration ___ LF
Stream restoration ___ LF
Other 30 LF of boulder cascade.

Problem located at downstream end of 48" half-round CMP. Channel drops ~3 feet over 30 LF. Banks are very dense silt but retreating.
* See attached sketch of proposed project

Potential Monitoring Site: Yes No

RWB
SD 31

R·W·BECK

Project 32b.1

COMP. B.S. CHK. JCB REV.
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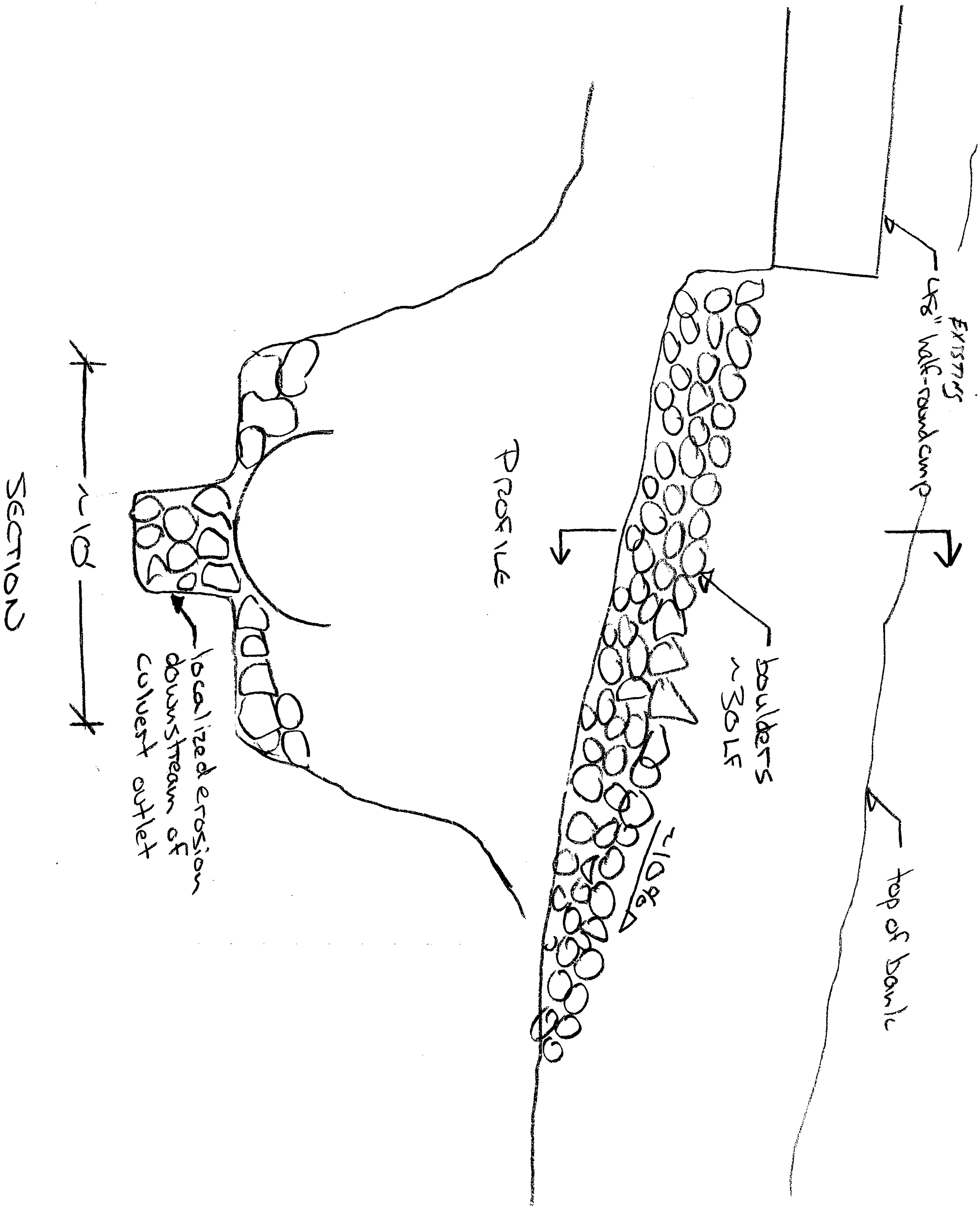

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 37b **Problem No.** 37b.1 **By:** J. Bjork 3/3/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide Mapped

Flow Today: 50 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: At ft. up/downstream 12-18 " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut 8' drop at outlet

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓	✓	
Upper Slope Stability		✓	✓	
Landslide		?		
Sediment source		✓		
Habitat destruction		✓		
Threatens home		✓		
Threatens other structure		✓		
Threatens private road/driveway	✓			
Threatens infrastructure				
Threatens public road			✓	
			✓	

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard

No risk_____ 8020 East Mercer Way Low Med High House pile-supported.

Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
✓		Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
✓		Crane (less than 200')
	✓	Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 100 LF

Concept:

Outfall protection 10 LF (City planner suggests 20'x3')

Bypass Pipe ___ LF

Check dams ___ LF

Channel restoration ___ LF

Stream restoration ___ LF

Other Type 2 drop CB & new outlet (optional)

Erosion is occurring at outfall. Separate issue is erosion caused by street runoff. Outfall has scoured hole 8'W x 5'd x 10'L. Upstream side East Mercer Way OK. Property owner Laura Pilkington is having Julian Liu, geotechnical engineer, prepare design.

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 39a **Problem No.** 39a1 **By:** J. Bjork 9 / 28 /05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill undetermined slide
Flow Today: 10 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% ≥10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: At ft. up/downstream 12 " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability	✓			
Landslide	✓			
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**
No risk ✓ Low Med High
Low Med High

Solutions

	yes	No	
Construction Access:	✓		Conventional Equipment to site
		✓	Conventional Equipment down ravine
		✓	Conventional Equipment to top of ravine
		✓	Crane (less than 200')
		✓	Cable Way (straight line)
		✓	Small equipment
		✓	Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 30 LF
Concept: Outfall protection ______ LF
Bypass Pipe ______ LF
Check dams ______ LF
Channel restoration ______ LF
Stream restoration ______ LF
Other Boulder Cascade 40 LF

Drainage Area < 30 Acres

Potential Monitoring Site: Yes No

RWB
SD 31

R·W·BECK	COMP. dcB CHK. REV.	PROJECT
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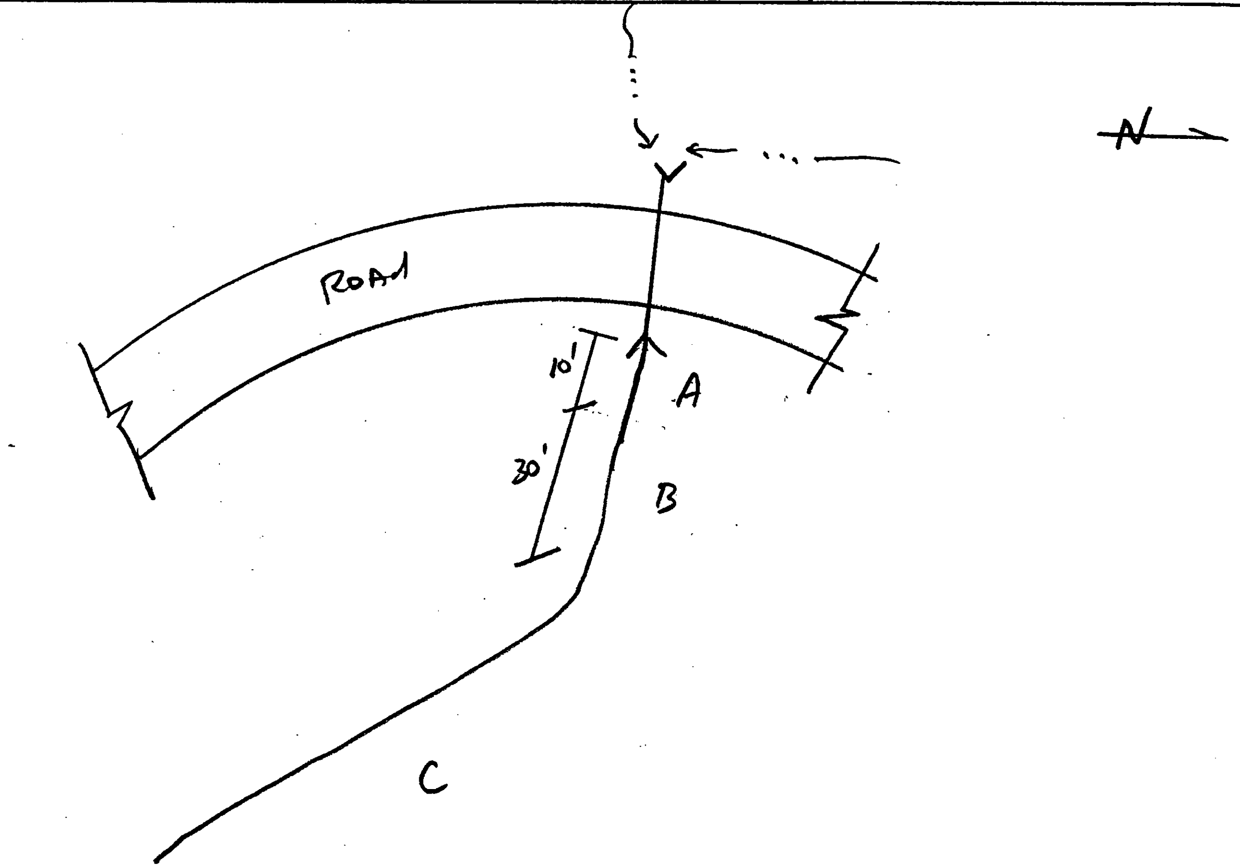

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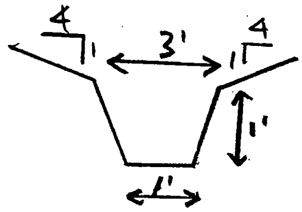
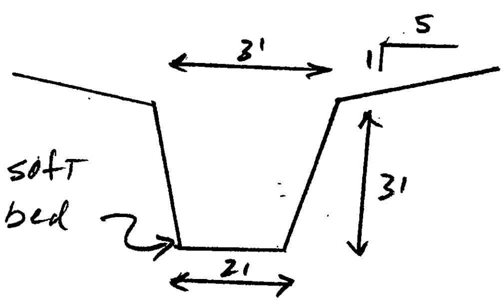


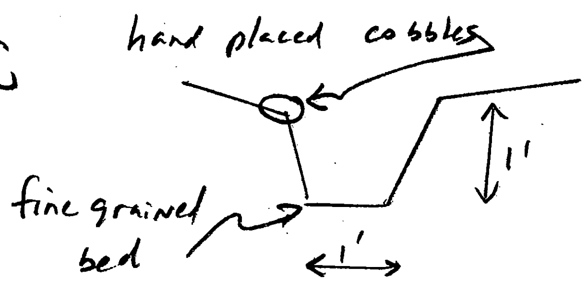
S= 10%

B



S = 20 - 30 %

C



Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 42 **Problem No.** 42.1 **By:** J. Bjork 3/3/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: 100-200 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: ___ ft. up/downstream None " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide	✓			
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard
No risk ✓
Low Med High
Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
✓		Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
	✓	Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
	✓	Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 200 LF
Concept:
Outfall protection ___ LF
Bypass Pipe ___ LF
Check dams 12 EA ~~LF~~
Channel restoration ___ LF
Stream restoration ___ LF
Other

Sand bag & geotexile check dams and silt fences have done a good job of stopping downcutting. There is some bank failure. The check dams are beginning to fail. Replace check dams because of large quantity of stored sand. Bed contains large quantity of sand

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 42 **Problem No.** 42.1A **By:** J. Bjork 3/3/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: ____ gpm 1/2 cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: ____ ft. up/downstream none " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability	✓			
Landslide	✓			
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			(
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk ✓

Low Med High

Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
	✓	Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
	✓	Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 200 LF

Concept:

Outfall protection		LF
Bypass Pipe		LF
Check dams	2 EA	LF
Channel restoration		LF
Stream restoration	60	LF

Other

Sand bag bank protection and check dam is failing. Right bank has some areas of erosion. Areas are intermittant. Sand bag check dam 3' high

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 42 **Problem No.** 42.2 **By:** J. Bjork 3 / 03 /06

Site Conditions

Geology: Qtb <u>Qva</u> Qvt Qvr Colluvium fill Undetermined <u>slide</u>
Flow Today: ____gpm ½ cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10%>10%
Bank Vegetation type: <u>Native</u> Invasive Landscaped
Bank Vegetation quality: Excellent <u>Good</u> Fair Poor
Aquatic Habitat: Excellent Good <u>Fair</u> Poor
Proximity to Drainage Outfalls: ___ ft. up/downstream None " CMP RCP PVC CPEP
Erosion of: bed left bank <u>right bank</u> headcut
Apparent rate of Erosion: stable Slow change <u>Moderate change</u> Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability			✓	
Upper Slope Stability			✓	
Landslide			✓	
Sediment source			✓	
Habitat destruction			✓	
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓	SS on right bank protected by rock		
Threatens public road	✓			

Risk to Homes:	**Horiz (ft)**	**Vert (ft)**	**Address**	**Apparent Hazard**
No risk ✓				Low Med High
				Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site along path
	✓	Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
✓		Crane (less than 200')
	✓	Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small <u>Moderate</u> Significant
Restoration of construction access: <u>Native</u> Landscaped 40 LF
Concept:
Outfall protection ____ LF
Bypass Pipe ____ LF
Check dams 3 ~~LF~~ EA repair
Channel restoration ____ LF
Stream restoration 100 LF
Other

Two big check dams ok. Stream restoration of south bank about 1/3 of total length.

Potential Monitoring Site: <u>Yes</u> No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 42 **Problem No.** 42.3 **By:** J. Bjork 3/3/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: ____ gpm 1/2 cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: ___ ft. up/downstream none " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide		✓		
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓ ss is ok			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk ✓ ____ Low Med High

____ Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site along path
	✓	Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
	✓	Crane (less than 200')
	✓	Cable Way (straight line)
✓		Small equipment in creek
✓		Chute/skid for boulders

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 100 LF

Concept:

- Outfall protection ____ LF
- Bypass Pipe ____ LF
- Check dams ____ LF
- Channel restoration ____ LF
- Stream restoration 90 LF
- Other ____

South bank very wet and erodable, small slope failures and spring sapping visible on south bank. Could restore with elwood and boulders.

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 42 **Problem No.** 424 **By:** J. Bjork 3/3/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: ____ gpm 1/2 cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: ___ ft. up/downstream none " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide		✓		
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure				
Threatens public road	✓		✓ Sewer main	

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk ✓

Low Med High

Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site along path
✓		Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
	✓	Crane (less than 200')
	✓	Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped

Concept:

Outfall protection ____ LF 100 LF
Bypass Pipe ____ LF
Check dams ____ LF
Channel restoration ____ LF
Stream restoration 130 LF
Other

highly erosive banks. Bank sloughing and Spring sapping visible on South bank. Previous restoration work done but additional work needed. Creek runs along SS MH which is partially protected by quarry spalls. Larger material may be needed.

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 42 **Problem No.** 42.5 **By:** J. Bjork 3/ 3 / 06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide Mapped

Flow Today: 0 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10%>10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor None

Proximity to Drainage Outfalls: ___ ft. up/downstream None " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut None

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk ✓

Low Med High

Low Med High

Solutions

Construction Access:

yes	No	
NA		Conventional Equipment to site
		Conventional Equipment down ravine
		Conventional Equipment to top of ravine
		Crane (less than 200')
		Cable Way (straight line)
		Small equipment
		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped NA LF

Concept:

Outfall protection	0	LF
Bypass Pipe		LF
Check dams		LF
Channel restoration		LF
Stream restoration		LF
Other		

This a steep slope but NO Surface water except direct precipitation. NO pipe outfalls. E.M.way has asphalt Lip on outside (downhill) edge so street runoff does NOT flow to slope.

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 42 **Problem No.** 42.6 **By:** J. Bjork 3/3/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide Soft Tan Silt
Flow Today: 10 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10% 20%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: At ft. up/downstream 12 " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private		Public	Creates Unsafe Condition
Bank Stability		✓	May		
Upper Slope Stability		✓	be		
Landslide		✓	City		
Sediment source		✓	property		
Habitat destruction	✓				
Threatens home	✓				
Threatens other structure	✓				
Threatens private road/driveway	✓				
Threatens infrastructure	✓				
Threatens public road	✓				

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard
No risk ✓
Low Med High
Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
✓		Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
✓		Crane (less than 200')
	✓	Cable Way (straight line)
✓		Small equipment
	✓	Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 10 LF
Concept:

Outfall protection		LF
Bypass Pipe		LF
Check dams		LF
Channel restoration	60	LF
Stream restoration		LF

Other

Steep Eroding channel in soft material

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 42 **Problem No.** 427 **By:** J. Bjork 3/3/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide — very soft silt

Flow Today: 0 gpm ___ cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor none

Proximity to Drainage Outfalls: ___ ft. up/downstream none " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut none

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability				
Upper Slope Stability				
Landslide				
Sediment source				
Habitat destruction				
Threatens home				
Threatens other structure				
Threatens private road/driveway				
Threatens infrastructure				
Threatens public road				

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard

No risk ✓ from erosion — 6520 East Mercer Way — Low Med High — from landslide

Low Med High

Solutions

Construction Access:

yes	No	
NA		Conventional Equipment to site
		Conventional Equipment down ravine
		Conventional Equipment to top of ravine
		Crane (less than 200')
		Cable Way (straight line)
		Small equipment
		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 0 LF

Concept:

Outfall protection 0 LF

Bypass Pipe ___ LF

Check dams ___ LF

Channel restoration ___ LF

Stream restoration ___ LF

Other

Little evidence of flowing water. Small collection area is undeveloped. NOT an erosion problem

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 42 **Problem No.** 428 **By:** J. Bjork 3/3/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined <u>slide</u>

Flow Today: .01 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10% 40%

Bank Vegetation type: <u>Native</u> Invasive Landscaped

Bank Vegetation quality: Excellent <u>Good</u> Fair Poor

Aquatic Habitat: Excellent Good Fair <u>Poor</u>

Proximity to Drainage Outfalls: ___ ft. up/downstream none " CMP RCP PVC CPEP

Erosion of: <u>bed</u> <u>left bank</u> <u>right bank</u> <u>headcut</u>

Apparent rate of Erosion: stable Slow change Moderate change <u>Rapid change</u>

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability			✓	
Upper Slope Stability			✓	
Landslide			✓	
Sediment source			✓	
Habitat destruction			✓	
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			✓
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk ✓

Low Med High

Low Med High

Solutions

Construction Access:

yes	No	
	✓	Conventional Equipment to site
	✓	Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
	✓	Crane (less than 200')
	✓	Cable Way (straight line)
✓		Small equipment
	✓	Chute/skid

Potential Reduction in O&M costs None <u>Small</u> Moderate Significant

Restoration of construction access: Native Landscaped ______LF

Concept:
- Outfall protection ______LF
- Bypass Pipe ______LF
- Check dams ______LF
- Channel restoration ______LF
- Stream restoration ______LF
- Other 150 LF willow wattles or a shade tolerate plant

All small collection area is underdeveloped. Highly erosive soil and bed. No material bed sorting or natural armoring. Failure may be related more to spring sapping than surface erosion.

Potential Monitoring Site: Yes <u>No</u>

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 42 **Problem No.** 42.8A **By:** J. Bjork 3/3/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: ____ gpm 1/2 cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: AT ft. up/downstream 4'W x 3'H " CMP RCP PVC CPEP box
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability			✓	
Upper Slope Stability			✓	
Landslide			✓	
Sediment source			✓	
Habitat destruction			✓	
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓ SS	OK		
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**
No risk ✓
Low Med High
Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site from path
	✓	Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
✓		Crane (less than 200')
	✓	Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 50 LF
Concept:
Outfall protection ____ LF
Bypass Pipe ____ LF
Check dams ____ LF
Channel restoration ____ LF
Stream restoration 30 LF right bank only
Other

Left bank is composed of Large rock To protect sewer main. No erosion is evidence, Large rock check dams also ok. Right bank has some spring sapping and bank failures

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 42 **Problem No.** 42.9 **By:** J. Bjork 3/3/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: 50 gpm ___ cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: ___ ft. up/downstream 18 " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide		✓		
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**
No risk ✓
Low Med High
Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
✓		Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
	✓	Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
	✓	Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 10' LF wetlands
Concept:
Outfall protection 10 LF
Bypass Pipe ___ LF
Check dams ___ LF
Channel restoration ___ LF
Stream restoration 30 LF
Other

There are 2 problems at this site: 1) a 5' drop at culvert outlet for private road which has moderate erosion, 2) channel downcutting under tree at mapped site for 30 feet. Left bank is moist and loose and would be considered at wetland

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 42 **Problem No.** 42.10 **By:** J. Bjork 3 / 3 / 06

Site Conditions

Geology: Qtb Qva Qvt ? Qvr Colluvium fill Undetermined slide
Flow Today: 50 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor NONE
Proximity to Drainage Outfalls: ___ ft. up/downstream along 12" " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide		✓		
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**
No risk ✓ Low Med High
Low Med High

Solutions

Construction Access:

yes	No	
	✓	Conventional Equipment to site
✓		Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
	✓	Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped ___LF
Concept:
Outfall protection ___ LF
Bypass Pipe 30 LF and $\frac{10'+5'}{2} \times 5'd \times 80'LF = 100$ cy Fill
Check dams ___ LF
Channel restoration ___ LF
Stream restoration ___ LF
Other

The existing system of CMP 1/2 round CMP and surface CPEP is working with moderate leakage. The surface CPEP has only 1 joint suitable for thrust. This system works but should be ultimately replaced or covered

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 44b **Problem No.** 44b.1 **By:** J. Bjork 12 / 14 /05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: 0 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: ___ ft. up/downstream 12 " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk ✓ ______ Low Med High
______ Low Med High

Solutions

Construction Access: yes	No	
NA		Conventional Equipment to site
		Conventional Equipment down ravine
		Conventional Equipment to top of ravine
		Crane (less than 200')
		Cable Way (straight line)
		Small equipment
		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 0 LF
Concept:
Outfall protection ______ LF
Bypass Pipe NA LF
Check dams ______ LF
Channel restoration ______ LF
Stream restoration ______ LF
Other ______

NOT A problem. Property owner Horn INSTAlled rock Lined landscaped Channel. OK on WEST side East Mercer Way.

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 44 b **Problem No.** 2 **By:** J. Bjork 12 / 14 /05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: 0 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10%>10% 30% AT OUTLET THEN TO 5%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: AT ft. up/downstream 12 " CMP RCP PVC CPEP DI

Erosion of: bed left bank right bank headcut NONE

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard

No risk ✓

Low Med High

Low Med High

Solutions

Construction Access:	yes	No	
	NA		Conventional Equipment to site
			Conventional Equipment down ravine
			Conventional Equipment to top of ravine
			Crane (less than 200')
			Cable Way (straight line)
			Small equipment
			Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 0 LF

Concept:

- Outfall protection 0 LF
- Bypass Pipe ___ LF
- Check dams ___ LF
- Channel restoration ___ LF
- Stream restoration ___ LF
- Other

Quarry Spalls placed AT OUTLET. Reasonably Protected. No flume AT end of 12" DI as shown on Section map

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 45b **Problem No.** 45b1 **By:** J. Bjork 12 / 8 /05

Site Conditions

Geology: Qtb <u>Qva</u> Qvt Qvr <u>Colluvium</u> fill Undetermined slide

Flow Today: 20-40 gpm ___cfs **Approx. Channel Gradient** 0-1% <u>2-5%</u> 5-10%>10%

Bank Vegetation type: <u>Native</u> <u>Invasive</u> Landscaped

Bank Vegetation quality: Excellent <u>Good</u> Fair Poor

Aquatic Habitat: Excellent Good <u>Fair</u> <u>Poor</u>

Proximity to Drainage Outfalls: 100 ft. up/downstream 24 " <u>CMP</u> RCP PVC CPEP

Erosion of: bed left bank right bank headcut

Apparent rate of Erosion: stable <u>Slow change</u> Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓	✓	
Upper Slope Stability		✓	✓	
Landslide		✓ Mapped	✓	
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure			Low risk	
Threatens public road			Low risk	

Risk to Homes:

	Horiz (ft)	Vert (ft)	Address	Apparent Hazard
No risk_____			5616 East Mercer Way	<u>Low</u> Med High
				Low Med High

Solutions

Construction Access:

yes	No	
	✓	Conventional Equipment to site
✓		Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
✓		Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small <u>Moderate</u> Significant

Restoration of construction access: <u>Native</u> Landscaped ________LF

Concept:
- Outfall protection ________ LF
- Bypass Pipe ________ LF
- Check dams 300 LF Add to existing dams
- Channel restoration ________ LF
- Stream restoration ________ LF
- Other ________

Existing quarry spall check dams have significantly reduced erosion. Dams are filled and some bank erosion. Moderate problem

Potential Monitoring Site: Yes <u>No</u>

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 45b **Problem No.** 45b2 **By:** J. Bjork 12/ 8 / 05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: None gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% ≥10% 20%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor None

Proximity to Drainage Outfalls: ___ ft. up/downstream None " CMP RCP PVC CPEP perhaps roof leaders

Erosion of: bed left bank right bank headcut NA

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: **Horiz (ft)** **Vert (ft)** **Address** **Apparent Hazard**

No risk ✓ ______ Low Med High

______ Low Med High

Solutions

	yes	No	
Construction Access:	NA		Conventional Equipment to site
			Conventional Equipment down ravine
			Conventional Equipment to top of ravine
			Crane (less than 200')
			Cable Way (straight line)
			Small equipment
			Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 0 LF

Concept:
- Outfall protection 0 LF
- Bypass Pipe ______ LF
- Check dams ______ LF
- Channel restoration ______ LF
- Stream restoration ______ LF
- Other ______

NO evidence of flowing water. Limited collection area and no pipe outlets except roof drains. No concentration of storm water. Not an erosion problem

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 45b **Problem No.** 45b.3 **By:** J. Bjork / /

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: ____gpm ____cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: ___ ft. up/downstream 12 " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide		✓		
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure		✓	side sewer leaking and exposed.	✓
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**
No risk ✓ Low Med High
Low Med High

Solutions

Construction Access:	yes	No	
		✓	Conventional Equipment to site
	✓		Conventional Equipment down ravine
		✓	Conventional Equipment to top of ravine
		✓	Crane (less than 200')
		✓	Cable Way (straight line)
	✓		Small equipment
		✓	Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 600 LF
Concept:
Outfall protection ____ LF
Bypass Pipe ____ LF
Check dams ____ LF
Channel restoration ____ LF
Stream restoration 450 LF
Other Side Sewer repair

This is Parkwood Project

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 45b **Problem No.** 45b4 New **By:** J. Bjork 12/8/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: Dry gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10% 50%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: at ft. up/downstream 12 " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide		Low		
Sediment source		✓		
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway		✓		
Threatens infrastructure		✓	✓ Sewer	
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk ✓ ______ Low Med High
______ Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
	✓	Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
✓		Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped ______LF
Concept:
Outfall protection 50 - 100 LF
Bypass Pipe or 100 LF if significant flow
Check dams ______ LF
Channel restoration ______ LF
Stream restoration ______ LF
Other

Outfall of private culvert on steep erodible slope has been partially repaired with Quarry spalls

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 46a **Problem No.** 46a.1 **By:** J. Bjork 12/8/05

Site Conditions

Geology: Qtb Qva Qvt Qvr <u>Colluvium</u> fill Undetermined slide

Flow Today: dry gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10% 30%

Bank Vegetation type: <u>Native</u> Invasive Landscaped

Bank Vegetation quality: Excellent <u>Good</u> Fair Poor

Aquatic Habitat: Excellent Good Fair Poor NONE

Proximity to Drainage Outfalls: ___ ft. up/downstream NONE " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut NONE

Apparent rate of Erosion: <u>stable</u> Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability		✓		
Landslide		✓		
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: **Horiz (ft)** **Vert (ft)** **Address** **Apparent Hazard**

No risk ✓ Low Med High

Low Med High

Solutions

Construction Access:

yes	No	
NA		Conventional Equipment to site
		Conventional Equipment down ravine
		Conventional Equipment to top of ravine
		Crane (less than 200')
		Cable Way (straight line)
		Small equipment
		Chute/skid

Potential Reduction in O&M costs <u>None</u> Small Moderate Significant

Restoration of construction access: Native Landscaped 0 LF

Concept:

Outfall protection	0	LF
Bypass Pipe		LF
Check dams		LF
Channel restoration		LF
Stream restoration		LF

Other

No evidence of surface water flow. Limited contributing area including 1-2 homes and ravine area. Risk here is from slides or mass wasting not erosion. Property downhill being developed. NOT an erosion problem

Potential Monitoring Site: Yes <u>No</u>

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 46a **Problem No.** 46a3 **By:** J. Bjork 11/8/04 and 3/3/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide silty sand
Flow Today: ____ gpm 1 cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: ___ ft. up/downstream None " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓ city		
Landslide mapped		✓	property?	
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**
No risk ✓ Low Med High
Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
	✓	Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
	✓	Crane (less than 200')
	✓	Cable Way (straight line)
✓		Small equipment
	✓	Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 200 LF
Concept:
Outfall protection ____ LF
Bypass Pipe 250 LF optional
Check dams ____ LF
Channel restoration ____ LF
Stream restoration 250 LF
Other

This is reach of Major Slope instability. Slide from north pinching Creek in some portions. Considerable sand in stream. Fill adjacent to roadway be driving slope movement. Selection of Solution Will require further investigation and monitoring of movement

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 46a **Problem No.** 46a.4 **By:** J. Bjork 3/3/06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium <u>fill</u> Undetermined <u>slide</u>
Flow Today: 10-20 gpm ____cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% <u>>10%</u>
Bank Vegetation type: <u>Native</u> <u>Invasive</u> Landscaped
Bank Vegetation quality: Excellent <u>Good</u> Fair Poor
Aquatic Habitat: Excellent Good <u>Fair</u> Poor
Proximity to Drainage Outfalls: AT ft. up/<u>downstream</u> 24 " CMP RCP PVC CPEP
Erosion of: <u>bed</u> left bank right bank <u>headcut</u>
Apparent rate of Erosion: stable Slow change <u>Moderate change</u> Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide		✓ City		
Sediment source		✓ property?		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes:

	Horiz (ft)	Vert (ft)	Address	Apparent Hazard
No risk ✓				Low Med High
				Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
	✓	Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
✓		Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None <u>Small</u> Moderate Significant
Restoration of construction access: <u>Native</u> Landscaped 50 LF
Concept:
Outfall protection ____ LF
Bypass Pipe ____ LF
Check dams ____ LF
Channel restoration ____ LF
Stream restoration 100 LF
Other ____

downcutting in Tributary

Potential Monitoring Site: <u>Yes</u> No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 46B **Problem No.**46b.1 **By:** J. Bjork 12/8/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: dry gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10% 50-75%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor NONE
Proximity to Drainage Outfalls: ___ ft. up/downstream NONE " CMP RCP PVC CPEP 1 or 2 roof leaders
Erosion of: bed left bank right bank headcut NONE
Apparent rate of Erosion: stable Slow change Moderate change Rapid change UNKNOWN

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability		✓		
Landslide NOT MAPPED		✓		
Sediment source		✓		
Habitat destruction	✓			
Threatens home		✓		
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk_____ 9166 54B Low Med High ?

Low Med High

Solutions

Construction Access:

yes	No	
NA		Conventional Equipment to site
		Conventional Equipment down ravine
		Conventional Equipment to top of ravine
		Crane (less than 200')
		Cable Way (straight line)
		Small equipment
		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped NA LF
Concept:
Outfall protection NA LF
Bypass Pipe ____ LF
Check dams ____ LF
Channel restoration ____ LF
Stream restoration ____ LF
Other

Landslide occurred here a few years ago. Site near top of slope so surface water runoff small. Runoff from 1 or 2 roof leaders & 100' x 100' area. This is a landslide not an erosional problem

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 49b **Problem No.** 49b1 **By:** J. Bjork 12/8/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: 20-40 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10% 30%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor NONE

Proximity to Drainage Outfalls: AT ft. up/downstream 24" CMP RCP PVC CPEP 2' drop

Erosion of: bed left bank right bank headcut

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability			✓	
Upper Slope Stability			✓	
Landslide Mapped			✓	
Sediment source			✓	
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road			Low	

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk ✓ Low Med High

Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
	✓	Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
	✓	Crane (less than 200')
	✓	Cable Way (straight line)
	✓	Small equipment
	✓	Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped ____LF

Concept:

- Outfall protection ____ LF
- Bypass Pipe 24" 50 LF From CB
- Check dams ____ LF
- Channel restoration ____ LF
- Stream restoration ____ LF
- Other

OPTIONAL - Line remaining 30 LF of ditch

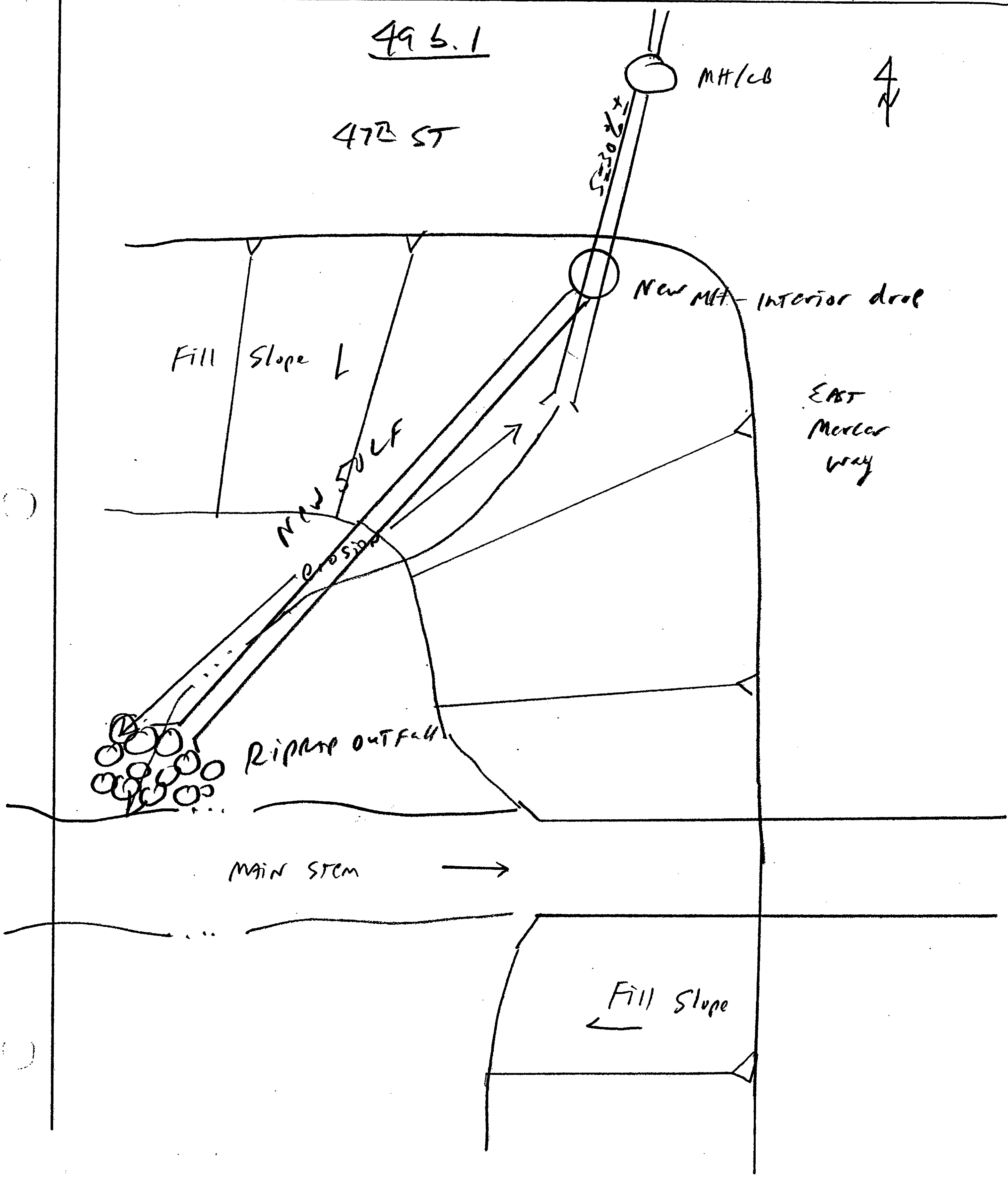
Recommend replacing pipe because IT IS damaged

Potential Monitoring Site: Yes No

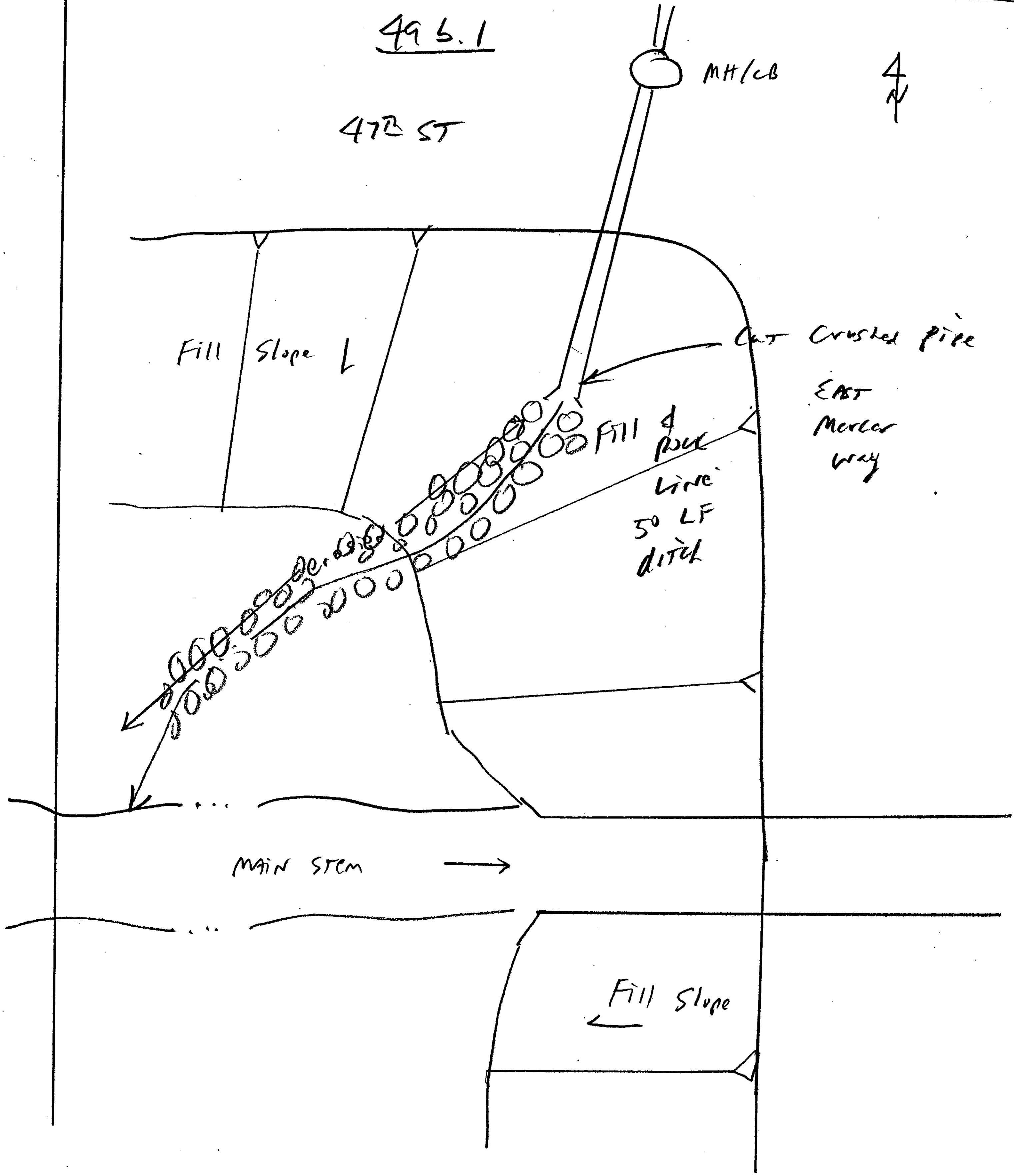
RWB
SD 31

R·W·BECK	Solution 1			PROJECT
				FILE NO.
	COMP. JCB	CHK.	REV.	PAGE ____ OF ____ PA
	DATE 5/24/06	DATE	DATE	

49 b.1

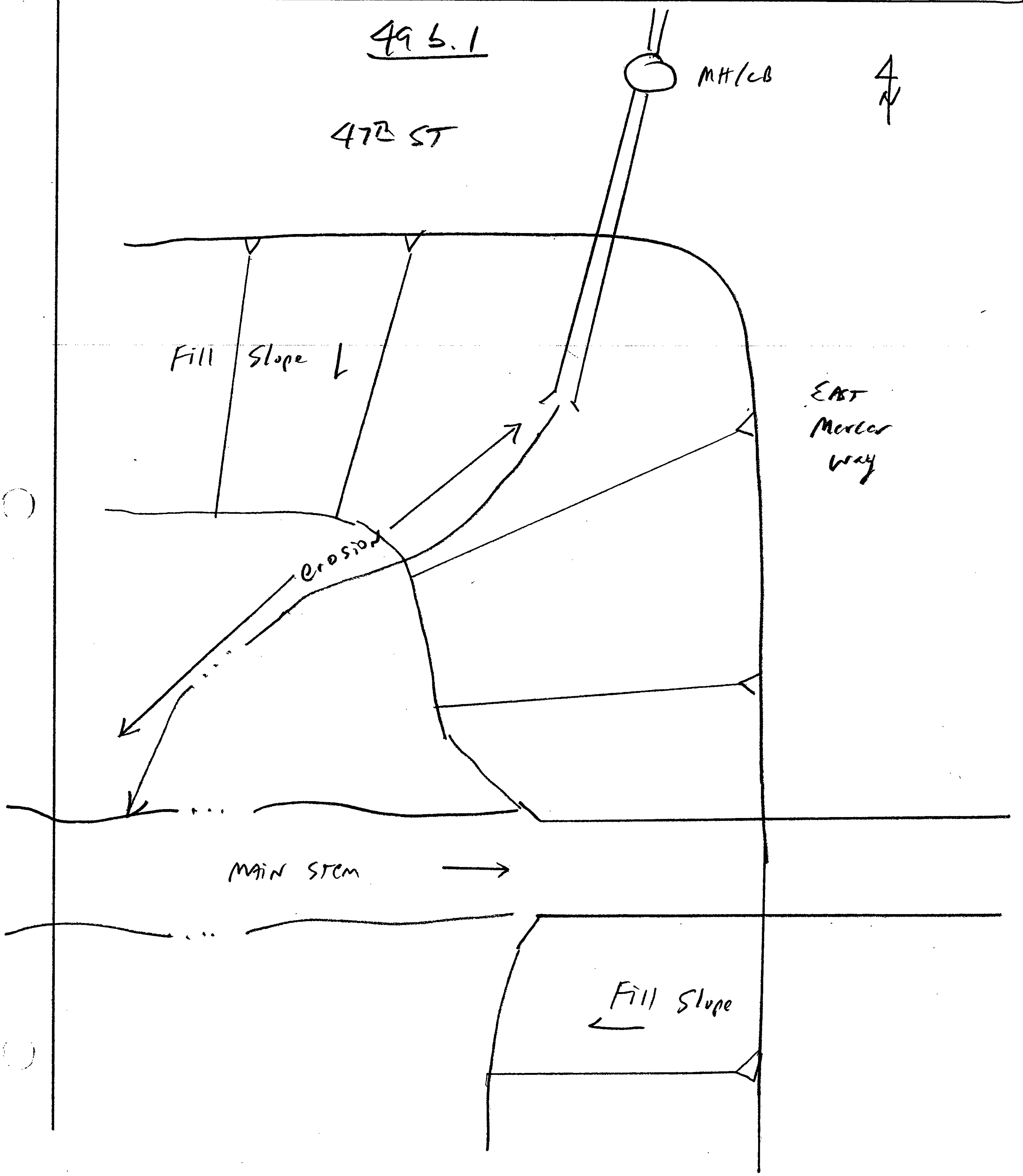


R·W·BECK	Solution 2	PROJECT
	COMP. JCB CHK. REV.	FILE NO.
	DATE 5/24/06 DATE DATE	PAGE OF PAGES



RWB
SD 31

R·W·BECK		PROJECT
	COMP. JCB CHK. REV.	FILE NO.
	DATE 5/24/06 DATE DATE	PAGE OF PA



Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 49b **Problem No.** 49b.2 **By:** J. Bjork 12/8/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: 10-20 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: ___ ft. up/downstream NONE " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide	✓			
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk ✓ 9445 47th ST. Pin pile Supported Low Med High

Low Med High

Solutions

	yes	No	
Construction Access:	✓		Conventional Equipment to site
	✓		Conventional Equipment down ravine
		✓	Conventional Equipment to top of ravine
		✓	Crane (less than 200')
		✓	Cable Way (straight line)
	✓		Small equipment
		✓	Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 150 LF

Concept:

Outfall protection ___ LF

Bypass Pipe ___ LF

Check dams ___ LF

Channel restoration ___ LF

Stream restoration 250 LF

Other

TOO STeep For check Dams

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 49 6 **Problem No.** 496.4 **By:** J. Bjork 12/14/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: 0 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10%>10% 30% Then 10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: AT ft. up/downstream 12 " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut Pipe outlet 6' drop

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓		
Landslide		✓		
Sediment source		✓		
Habitat destruction		✓		
Threatens home		✓		
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes:	Horiz (ft)	Vert (ft)	Address	Apparent Hazard
No risk_____	100'	30'	4680 91st Avenue SE	Low Med High
				Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
	✓	Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
	✓	Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 220 LF

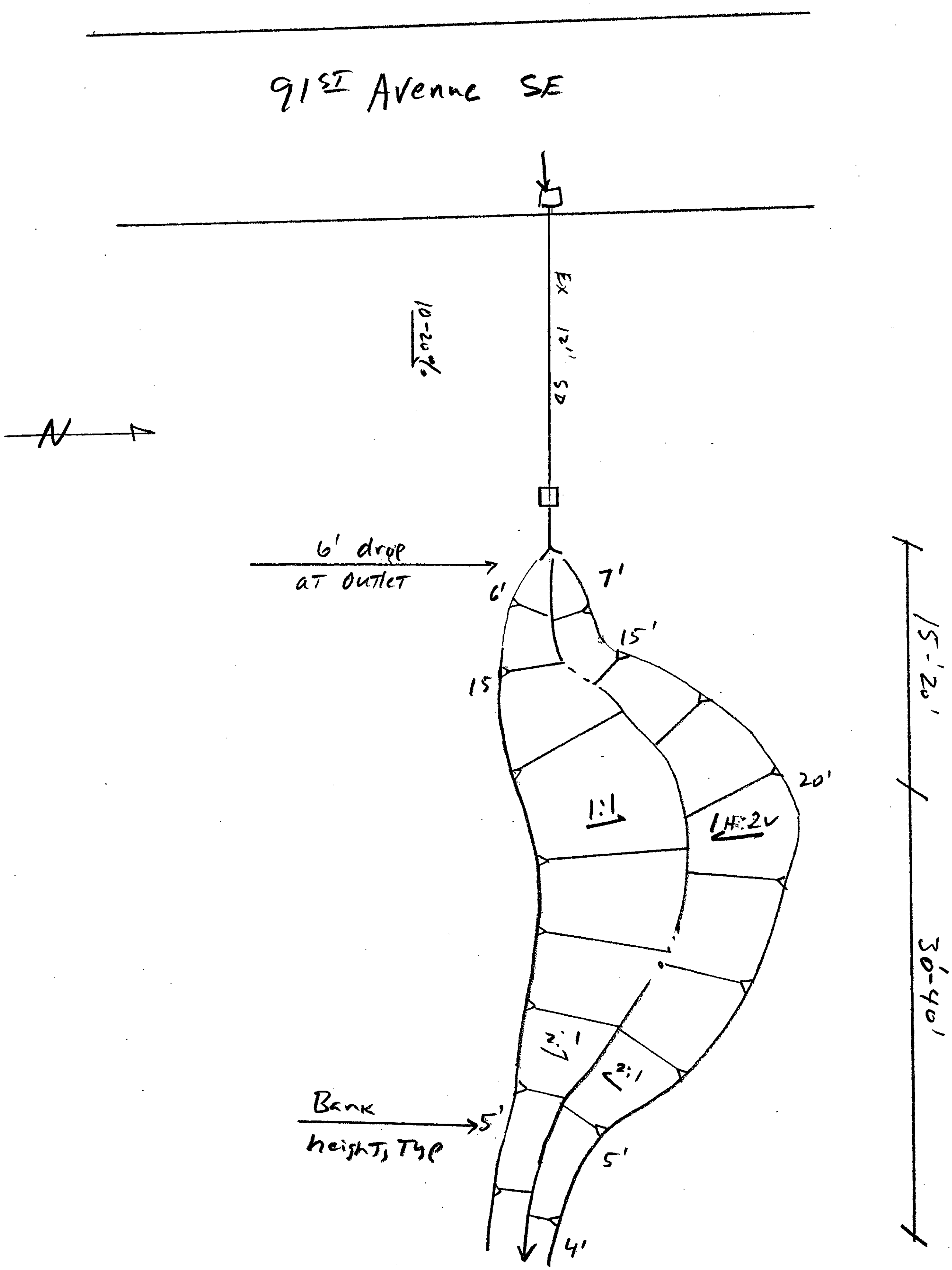
Concept:

Outfall protection	✓	LF
Bypass Pipe	75-100	LF
Check dams		LF
Channel restoration	/	LF
Stream restoration		LF

Other

Large scale erosion problem at pipe outlet. Install gabion basket energy dissapator at outlet. Mapped as water course on section maps; Alternative solution would be to do channel stabilization

Potential Monitoring Site: Yes No



Problem 496.4

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 50b **Problem No.** 50b1 **By:** J. Bjork 12/8/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: 50 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10% 30 Then 2-
Bank Vegetation type: Native, Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: AT ft. up/downstream 24" CMP RCP PVC CPEP steel
Erosion of: bed left bank right bank headcut none
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability	✓			
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**
No risk ✓ Low Med High
Low Med High

Solutions

	yes	No	
Construction Access:	✓		Conventional Equipment to site
			Conventional Equipment down ravine
			Conventional Equipment to top of ravine
			Crane (less than 200')
			Cable Way (straight line)
			Small equipment
			Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped ______LF
Concept:
Outfall protection ______ LF
Bypass Pipe ______ LF
Check dams ______ LF
Channel restoration ______ LF
Stream restoration ______ LF
Other

Channel downstream of outlet drops across Quarry spalls at a gradient of about 30%. Then flattens out in typical M.I. channel at 2-3%. Erosion control although more quarry spalls would be helpful. Channel down 600' looks ok.

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 50b **Problem No.** 506.3 **By:** J. Bjork 12 / 8 / 06

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: dry gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10% 40-50%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor None
Proximity to Drainage Outfalls: ___ ft. up/downstream None " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	✓			
Upper Slope Stability – NOT erosion Related		✓	✓	
Landslide	✓			
Sediment source	✓			
Habitat destruction	✓			
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard

No risk ✓

Low Med High

Low Med High

Solutions

Construction Access:

yes	No	
N/A		Conventional Equipment to site
		Conventional Equipment down ravine
		Conventional Equipment to top of ravine
		Crane (less than 200')
		Cable Way (straight line)
		Small equipment
		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped NA LF
Concept:

Outfall protection	0	LF
Bypass Pipe		LF
Check dams		LF
Channel restoration		LF
Stream restoration		LF
Other		

No contributing area; only direct prep. on slope. Road slopes to inside of hill (north) and is collected in new drainage system. Drainage system flows west. Existing risk of instability is related to steepness of slope and probable road fill.

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 50C **Problem No.** 50C1 **By:** J. Bjork 12/14/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: 5-10 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10%>10%
Bank Vegetation type: Native Invasive Landscaped 10% for 50' Then 3%
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: AT ft. up/downstream 12" + 12" " CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability			Low	
Upper Slope Stability	✓			
Landslide	✓			
Sediment source			Low	
Habitat destruction			Low	
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	✓			

Risk to Homes: **Horiz (ft)** **Vert (ft)** **Address** **Apparent Hazard**
No risk ✓
Low Med High
Low Med High

Solutions

Construction Access:	yes	No	
	✓		Conventional Equipment to site
			Conventional Equipment down ravine
	✓		Conventional Equipment to top of ravine
	✓		Crane (less than 200')
	✓		Cable Way (straight line)
	✓		Small equipment
	✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 0 LF
Concept: Outfall protection 0 LF
Bypass Pipe ___ LF
Check dams ___ LF
Channel restoration ___ LF
Stream restoration ___ LF
Other

Quarry spalls placed for most of outlet area. About 2 cy more needed.

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 50C **Problem No.** 50C.2 **By:** J. Bjork 12/18/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide
Flow Today: 0 gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%
Bank Vegetation type: Native Invasive Landscaped
Bank Vegetation quality: Excellent Good Fair Poor
Aquatic Habitat: Excellent Good Fair Poor
Proximity to Drainage Outfalls: ___ ft. up/downstream ______" CMP RCP PVC CPEP
Erosion of: bed left bank right bank headcut
Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability				
Upper Slope Stability				
Landslide				
Sediment source				
Habitat destruction	NA			
Threatens home				
Threatens other structure				
Threatens private road/driveway				
Threatens infrastructure				
Threatens public road				

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk_____ NA Low Med High

Low Med High

Solutions

Construction Access:

yes	No	
NA		Conventional Equipment to site
		Conventional Equipment down ravine
		Conventional Equipment to top of ravine
		Crane (less than 200')
		Cable Way (straight line)
		Small equipment
		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped ______LF
Concept:

Outfall protection NA LF
Bypass Pipe ______LF
Check dams ______LF
Channel restoration ______LF
Stream restoration ______LF
Other

Problem eliminated by installation of pipe system and Home at 4415 East Mercer Way

Potential Monitoring Site: Yes No

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 50C **Problem No.** 50C.3 **By:** J. Bjork 12/18/05

Site Conditions

Geology: Qtb <u>Qva</u> Qvt Qvr Colluvium fill Undetermined slide
Flow Today: ____gpm ___cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10%>10%
Bank Vegetation type: <u>Native</u> <u>Invasive</u> Landscaped
Bank Vegetation quality: Excellent <u>Good</u> Fair Poor
Aquatic Habitat: Excellent Good Fair <u>Poor</u>
Proximity to Drainage Outfalls: ___ ft. up/downstream None " CMP RCP PVC CPEP
Erosion of: bed left bank right bank <u>headcut</u> discontinous
Apparent rate of Erosion: stable <u>Slow change</u> Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability	NA			
Upper Slope Stability				
Landslide				
Sediment source				
Habitat destruction				
Threatens home				
Threatens other structure				
Threatens private road/driveway				
Threatens infrastructure				
Threatens public road				

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**
No risk_____ Low Med High
Low Med High

Solutions

	yes	No	
Construction Access:	NA		Conventional Equipment to site
			Conventional Equipment down ravine
			Conventional Equipment to top of ravine
			Crane (less than 200')
			Cable Way (straight line)
			Small equipment
			Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant
Restoration of construction access: Native Landscaped 6 LF
Concept:
Outfall protection N/A LF
Bypass Pipe ____ LF
Check dams ____ LF
Channel restoration ____ LF
Stream restoration ____ LF
Other ____

Erosion problem eliminated by installation of pipe system along long driveway. Both Tributaries of watercourse are wet inspire of Sandy soil, Slide reported in area. Flowing water has created multiple irregular small channels. This is a problem area but not for erosion.

Potential Monitoring Site: Yes <u>No</u>

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 51a **Problem No.** 51a.1 **By:** J. Bjork 12/14/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: ____ gpm 1/2 cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: AT ft. up/downstream 18 " CMP RCP PVC CPEP DI

Erosion of: bed left bank right bank headcut

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓		
Upper Slope Stability		✓	✓	
Landslide		✓		
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road			✓	

Risk to Homes: Horiz (ft) Vert (ft) Address Apparent Hazard

No risk ✓

Low Med High

Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
✓		Conventional Equipment down ravine
	✓	Conventional Equipment to top of ravine
✓		Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

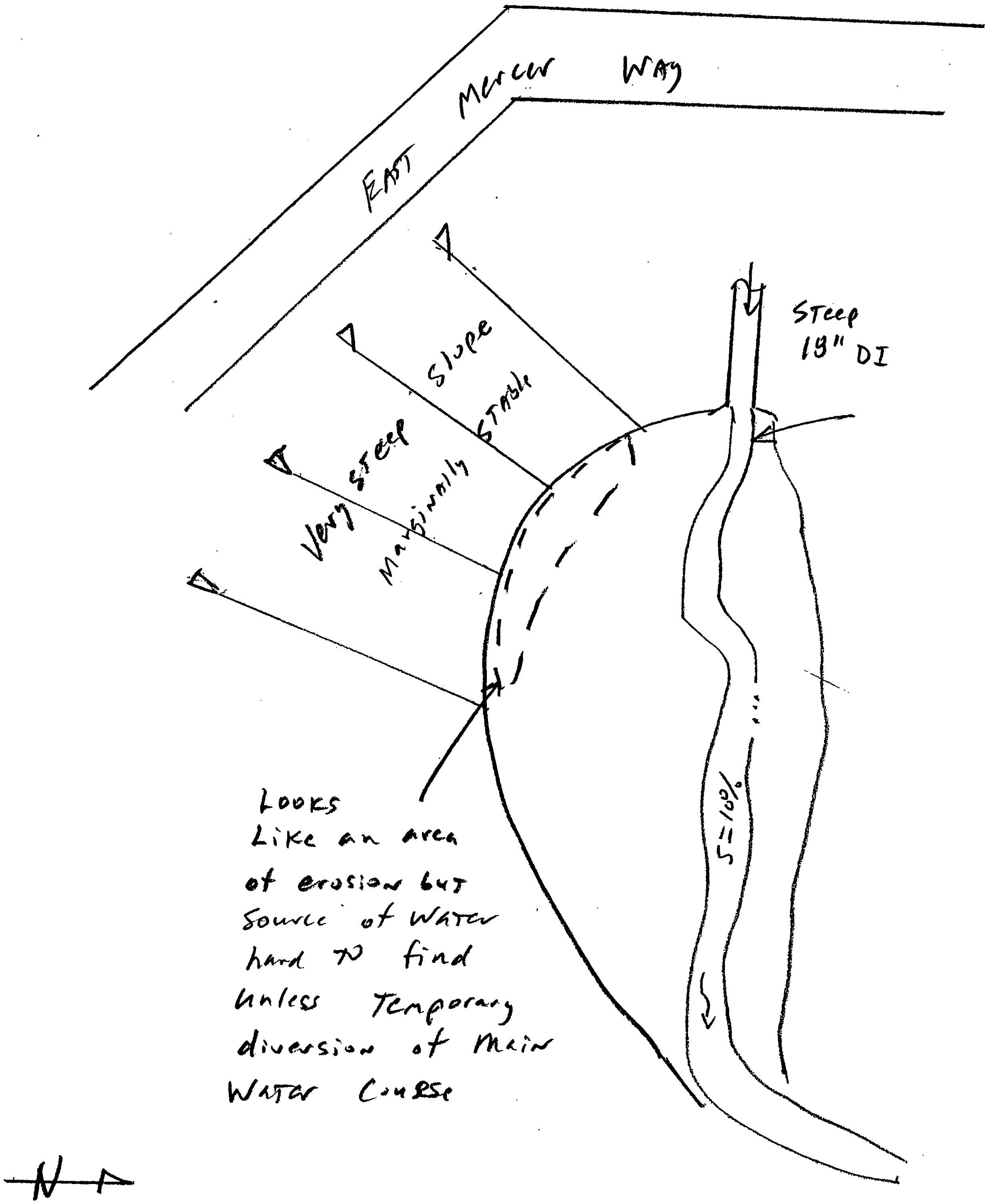
Restoration of construction access: Native Landscaped 150 LF

Concept:

Outfall protection	10	LF
Bypass Pipe		LF
Check dams	50	LF
Channel restoration		LF
Stream restoration		LF
Other		

Minor erosion at outfall of 1-2'. Steep erodable channel with erosion on south bank which is steep and marginally stable. Downstream of site is 150 LF of low intensity erosion. Considerable sand in channel. Upstream slide mapped channel for 100' upstream of E.M.W. is okay.

Potential Monitoring Site: Yes No



Problem 51C,1

JCB

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 52 **Problem No.** 52.1 **By:** J. Bjork 12/14/05

Site Conditions

Geology: Qtb Qva Qvt Qvr Colluvium fill Undetermined slide

Flow Today: .01 gpm ____cfs **Approx. Channel Gradient** 0-1% 2-5% 5-10% >10%

Bank Vegetation type: Native Invasive Landscaped

Bank Vegetation quality: Excellent Good Fair Poor

Aquatic Habitat: Excellent Good Fair Poor

Proximity to Drainage Outfalls: AT ft. up/downstream 18 " CMP RCP PVC CPEP

Erosion of: bed left bank right bank headcut

Apparent rate of Erosion: stable Slow change Moderate change Rapid change

Risks (Check Applicable)

	None	Private	Public	Creates Unsafe Condition
Bank Stability		✓	✓	
Upper Slope Stability	✓			
Landslide	✓			
Sediment source		✓		
Habitat destruction		✓		
Threatens home	✓			
Threatens other structure	✓			
Threatens private road/driveway	✓			
Threatens infrastructure	✓			
Threatens public road	Long	Term		

Risk to Homes: Horiz (ft) Vert (ft) Address **Apparent Hazard**

No risk ✓

Low Med High

Low Med High

Solutions

Construction Access:

yes	No	
✓		Conventional Equipment to site
✓		Conventional Equipment down ravine
✓		Conventional Equipment to top of ravine
		Crane (less than 200')
✓		Cable Way (straight line)
✓		Small equipment
✓		Chute/skid

Potential Reduction in O&M costs None Small Moderate Significant

Restoration of construction access: Native Landscaped 50 LF

Concept:

Outfall protection ____ LF

Bypass Pipe ____ LF

Check dams 150 LF OPTIONAL

Channel restoration 150 LF

Stream restoration ____ LF

Other

Looks Like New drainage area added TO OUTLET. Rapid bed and bank erosion of Channel (2' bottom width, 4' TOP width, 3'-7' deep). Only 0.75' of head over 12" RCP downstream so minor inlet clogging would cause overtopping toward #4314 E.M.W. Steep ground slope

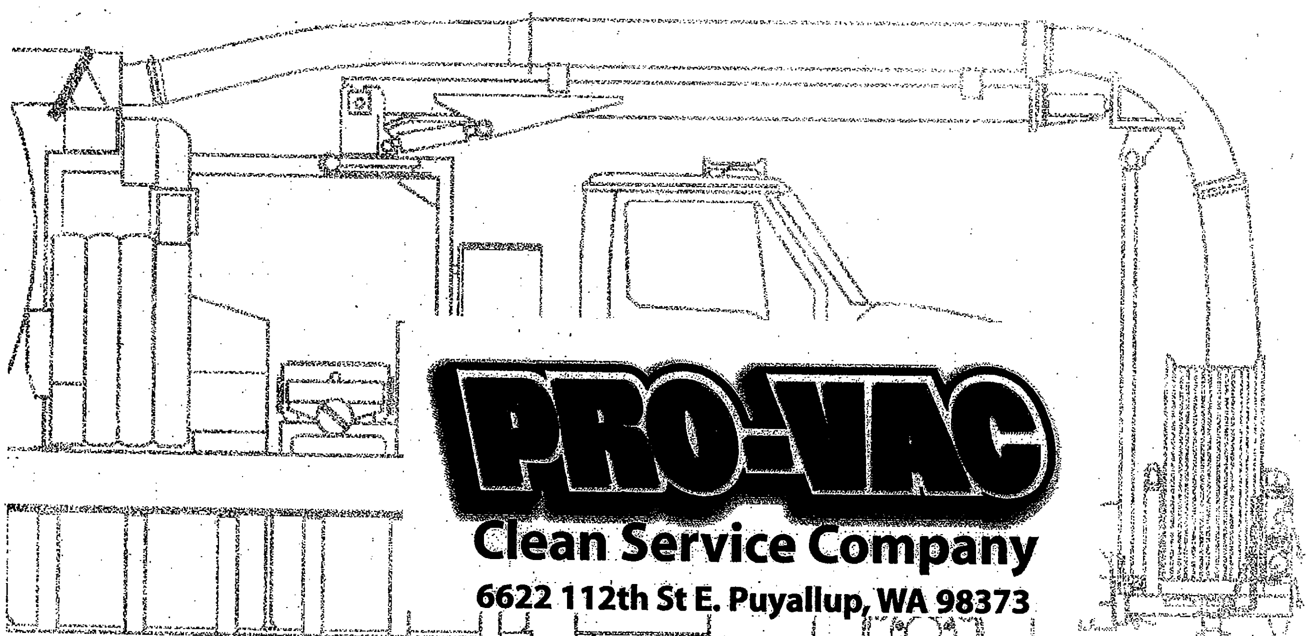
Potential Monitoring Site: Yes No

Appendix F

TV INVESTIGATIONS (BY CITY)

MERCER ISLAND

STORM»



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MERCER ISLAND TURN-IN 01-09-06
STORM
MAP SHEET A1---SITES 1-4
MAP SHEET A3---SITES 1-19
MAP SHEET B1---SITES 1-7
MAP SHEET B2---SITES 1-13
MAP SHEET B4---SITES 1-2
MAP SHEET C3---SITES 1-16
MAP SHEET F3---SITES 1-5
MAP SHEET F5---SITES 1-2
MAP SHEET H2---SITES 1
MAP SHEET H3---SITES 1-5
MAP SHEET I2---SITES 1-2
MAP SHEET I3---SITES 1-2
MAP SHEETJ3---SITES 3-11

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cell 206-423-2445

CUES

Site Data for Project: Mercer Island-SD-A1

Site IDs 3	City	Street 6	Date	Time
1	Mercer Island	60TH AV S & SE 22TH ST	09/12/2005	11:24:15 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
4	OPEN PIPE	.	6.0	+131.9

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-D	Gravel Shoulder	Jerry Hyatt

Comment 3

WITH THE FLOW-STORM DRAINAGE-MAP SHEET [redacted]

Observation Data 4

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					43.96		02:05:45
2	32.2		Service Conn.	Service top					119.75		
	32.2		Service Conn.	Protruding 6"+					148.93		
	131.9		Other	Open Pipe					320.59		

QUES

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Site Data for Project: Mercer Island-SD-A1

Site ID	City	Street	Date	Time
2	Mercer Island	60TH AV S & SE 22TH ST	09/12/2005	01:53:54 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
2	OPEN PIPE	.	6.0	+110.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
4 CMP	12	10	Away-U	Gravel Shoulder	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET A1

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					21.20		02:10:59
2	100.0		Other	CMP TO CIP					216.55		
	110.0		Pipe Problem	Ovaled		10%			280.60		
	110.0		Other	end/inspection					304.45		

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CUES

Site Data for Project: Mercer Island-SD-A1

Site ID	City	Street	Date	Time
3	Mercer Island	60TH AV S & SE 22TH ST	09/12/2005	02:16:23 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
2	1	.	6.0	+38.1

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	12	10	Away-D	Gravel Shoulder	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET A1

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					9.15		02:16:36
2	38.1		Other	Downstream CB					79.95		

2/1/7

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Site Data for Project: Mercer Island-SD-A1

Site ID	City	Street	Date	Time
4	Mercer Island	60TH AV S & SE 22TH ST	09/12/2005	02:27:05 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
1	OPEN PIPE	.	6.0	+51.9

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	10	Away-D	Gravel Shoulder	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE MAP SHEET A1

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					26.87		02:18:18
2	51.9		Pipe Problem	debris		HEAVY			152.49		

2/16

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Site Data for Project: Mercer Island-SD-A3

Site ID	City	Street	Date	Time
1	Mercer Island	2222 80TH AV SE	09/07/2005	12:22:54 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
CB 33	CB 35		6.0	35.1

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-U	Yard	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					71.70		01:37:29
2	8.0		Root Problem	begin roots		MEDIUM			118.59		
	22.4		Pipe Problem	debris		MEDIUM			349.06		
4	35.1		Service Conn.	LEFT					490.60		
5	35.1		Root Problem	Heavy					657.72		
6	35.1		Other	CAN'T COMPLETE					669.25		

2/16
B
line need jetting!
then re TV. was redone
1/08

CUES

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Site Data for Project: Mercer Island-SD-A3

Site ID	City	Street	Date	Time
2	Mercer Island	2227 80TH AV SE	09/07/2005	01:02:41 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
37	36	.	6.0	20.6

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					30.84		01:49:39
2	10.6		Other	PIPE CURVES LT					61.13		
	11.7		Other	OLD REPAIR	02/04				141.24		
	11.7		Pipe Problem	Longit Crack		MEDIUM			295.43		
5	14.3		Pipe Problem	[redacted]		[redacted]			345.41		
6	14.4		[redacted]	[redacted]	[redacted]				415.60		
7	14.8		[redacted]	[redacted]		MEDIUM			459.96		
8	19.2		Pipe Problem	possible sag					574.73		
9	20.6		Other	CAN'T COMPLETE					826.84		

replaced

PARTIAL COLLAPSE

~~SD-AB2~~

SD A32

2/23

BEHIND 87 crosswalk (PARTIAL COLLAPSE)

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CUES

Site Data for Project: Mercer Island-SD-A3

Site ID	City	Street	Date	Time
3	Mercer Island	2227 80TH AV SE	09/07/2005	01:21:14 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
37	OPEN PIPE	.	6.0	+45.2

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					17.15		02:01:47
2	29.7		Root Problem	begin roots		LIGHT			76.08		
	44.5		[redacted]	[redacted] 3"-6"		HEAVY			148.76		
	44.5		Joint Problem	SOIL VISIBLE					165.38		
5	45.2		Other	CAN'T COMPLETE					235.09		

3/27

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Site Data for Project: Mercer Island-SD-A3-2

Site ID	City	Street	Date	Time
4	MERCER ISLAND	2227 80TH AV SE	01/08/2006	02:06:34 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
1	U/S		7.0	7.5

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Gravel Shoulder	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	[illegible]		~~Joint Problem~~	~~OFFSET~~		LARGE					
	[illegible]		~~Joint Problem~~	~~OFFSET~~		~~LARGE~~					
	7.5		Pipe Problem	FULL OF ROCKS							

Pipe is full of debre & offset. 2/28

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Site Data for Project: Mercer Island-SD-A3-2

Site ID	City	Street	Date	Time
5	MERCER ISLAND	7638 SE 22ND ST	01/08/2006	02:19:47 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
2	7		7.0	95.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Gravel Shoulder	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	14.3		Other	PIPE CURVES LT							
[illegible]	72.0		Other	Repair Coupler							
[illegible]	72.0		Joint Problem	OFFSET		LIGHT					
5	75.1		Other	Repair Coupler							
6	75.1		Joint Problem	OFFSET		LIGHT					
7	95.7		Other	Upstream CB							

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Site Data for Project: Mercer Island-SD-A3

Site ID	City	Street	Date	Time
6	Mercer Island	78TH AV SE & SE 22ND ST	09/20/2005	01:58:52 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
11	12	.	6.0	+69.8

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-U	Gravel Shoulder	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					19.04		00:09:11
2	2.0		Other	PIPE CURVES LT					35.15		
	4.0		Joint Problem	GROUT		MEDIUM			187.38		
	69.8		Other	Upstream CB					399.16		

2/20

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CUES

Site Data for Project: Mercer Island-SD-A3

Site ID	City	Street	Date	Time
7	Mercer Island	78TH AV SE & SE 22ND ST	09/20/2005	02:26:34 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
11	21	.	6.0	+146.6

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-D	Gravel Shoulder	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							00:16:09
2	146.6		Other	Downstream CB					301.50		

2/20

CUES

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Site Data for Project: Mercer Island-SD-A3-2

Site ID	City	Street	Date	Time
8	MERCER ISLAND	78TH AV SE & SE 22ND ST	01/08/2006	02:27:17 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
20	21		0	125.5

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Gravel Shoulder	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	8.8		Joint Problem	OFFSET		~~LIGHT~~					
	~~[illegible]~~		~~Joint Problem~~	~~OFFSET~~		MEDIUM					
	~~35.4~~		~~Joint Problem~~	~~OFFSET~~		~~MEDIUM~~					
5	109.5		Joint Problem	OFFSET		LIGHT					
6	125.5		Other	Upstream CB							

Joints Good

OK

2/28

CUES

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Site Data for Project: Mercer Island-SD-A3-2

Site ID	City	Street	Date	Time
9	MERCER ISLAND	78TH AV SE & SE 22ND ST	01/08/2006	02:35:32 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
20	19	.	0	113

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Gravel Shoulder	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	113.0		Other	Downstream CB							

2/28

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CUES

Site Data for Project: Mercer Island-SD-A3-2

Site ID	City	Street	Date	Time
10	MERCER ISLAND	78TH AV SE & SE 22ND ST	//	02:41:31 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
18	19	.	0	123.2

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Gravel Shoulder	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	8.0		Other	PIPE CURVES LT							
	80.7		Service Conn.	right							
4	122.2		Joint Problem	OFFSET		MEDIUM					
5	123.2		Other	CAN'T COMPLETE							

Good
2/23

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Site Data for Project: Mercer Island-SD-A3-2

Site ID	City	Street	Date	Time
11	MERCER ISLAND	80TH AV SE & SE 22ND ST	01/08/2006	02:50:42 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
18	22		0	83.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Gravel Shoulder	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	7.4		Joint Problem	OFFSET		MEDIUM					
3	15.7		Service Conn.	right							
4	15.7		Service Conn.	protruding4-6"							
5	46.5		Service Conn.	right							
6	83.7		Other	Upstream CB							

2/23

CUES

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Site Data for Project: Mercer Island-SD-A3

Site ID	City	Street	Date	Time
12	Mercer Island	78TH AV SE & SE 22ND ST	09/22/2005	10:07:16 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
14	15	.	6.0	+61.1

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-U	Gravel Shoulder	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					46.78		00:41:08
2	61.1		Other	Upstream CB					139.67		

2/23

CUES

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Site Data for Project: Mercer Island-SD-A3

Site ID	City	Street	Date	Time
13	Mercer Island	78TH AV SE & SE 22ND ST	09/22/2005	11:49:47 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
14	13		6.0	+45.1

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-D	Gravel Shoulder	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					10.60		00:43:42
2	11.8		Joint Problem	Offset		LIGHT			49.17		
	18.1		Joint Problem	Offset		MEDIUM			82.82		
	45.1		Other	Downstream CB					136.21		

2/23

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CUES

Site Data for Project: Mercer Island-SD-A3

Site ID	City	Street	Date	Time
14	Mercer Island	78TH AV SE & SE 22ND ST	09/22/2005	02:34:12 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
13 added	13		6.0	+103.3

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-U	Gravel Shoulder	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	6.0		Other	Downstream CB					16.50		00:46:13
2	103.3		Other	Upstream CB					187.21		

2/23

CUES

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Site Data for Project: Mercer Island-SD-A3-2

Site ID	City	Street	Date	Time
15	MERCER ISLAND	2218 80TH AV SE	01/08/2006	03:09:14 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
35	33	.	0	254.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Gravel Shoulder	Jerry Hyatt

Comment
with THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	6.7		Pipe Problem	debris		MEDIUM					
3	18.5		Joint Problem	OFFSET		MEDIUM					
4	26.4		Service Conn.	left							
5	88.1		Service Conn.	top			Hammer tap.				
6	88.2		Pipe Problem	Longit Crack		LIGHT					
7	88.9		Pipe Problem	Longit Crack	12	LIGHT					
8	88.9		Service Conn.	left							
9	88.9		Service Conn.	protruding1-3"							
10	89.6		Other	PIPE CURVES LT							
11	100.4		Other	PIPE CURVES RT							
12	101.3		Other	PIPE CURVES RT							
13	101.3		Root Problem	begin roots		LIGHT					
14	130.8		Other	PIPE CURVES LT							
15	145.9		Other	PIPE CURVES LT							
16	154.6		Service Conn.	left							
17	154.6		Service Conn.	protruding1-3"							
18	157.3		Joint Problem	OFFSET		MEDIUM					
19	162.5		Service Conn.	right							
20	162.5		Pipe Problem	Longit Crack		LIGHT					

2/23

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CUES

Site Data for Project: Mercer Island-SD-A3-2

Site ID	City	Street	Date	Time
15	MERCER ISLAND	2218 80TH AV SE	01/08/2006	03:09:14 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
35	33	.	0	254.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Gravel Shoulder	Jerry Hyatt

Comment

with THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
21	178.2		Service Conn.	right							
22	178.2		Service Conn.	Break in Conn.		MEDIUM	soil visible no grout				
3	199.7		Pipe Problem	debris		LIGHT	big rock that looks like a brick.				
24	220.0		Service Conn.	left							
25	230.0		Service Conn.	right							
26	254.7		Other	Downstream CB							

2/23
Same reach as #1 sheet A3

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Site Data for Project: Mercer Island-SD-A3

Site ID	City	Street	Date	Time
16	Mercer Island	SE 20TH ST & 80TH AV SE	11/14/2005	11:24:51 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
26	OPEN PIPE		6.0	+95.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-U	Gravel Shoulder	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					42.86		00:32:29
2	67.0		Joint Problem	GROUT		MEDIUM			215.82		
[illegible]	67.0		Other	OLD REPAIR					239.52		
4	95.0		Other	Open Pipe					320.38		

2/23

CUES

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-A3

Site ID	City	Street	Date	Time
17	Mercer Island	SE 20TH ST & 80TH AV SE	11/14/2005	11:37:26 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
~~26~~ 25?	24		6.0	+140.1

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-D	Gravel Shoulder	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					41.63		00:38:17
2	23.6		Joint Problem	Separated		MEDIUM			177.38		
	23.6		Joint Problem	SOIL VISIBLE					189.89		
	23.6		Joint Problem	Offset		MEDIUM			207.58		
5	75.6		Pipe Problem	possible sag					343.04		
6	76.9		Service Conn.	service right					370.98		
7	86.6		Pipe Problem	1/4 pipe 44-0					452.89		
8	103.9		Pipe Problem	end sag					513.14		
9	[redacted]								708.92		
10	140.1		Other	Downstream CB					859.64		

not good
top is sagging
into pipe 6-1'
strip of conc. ADC
2/23

CUES

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-A3

Site ID	City	Street	Date	Time
18	Mercer Island	2000 82ND AVE SE	11/14/2005	01:11:41 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
2000	1925	.	6.0	+87.6

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-D	Shoulder	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					46.36		00:53:08
2	20.7		Joint Problem	Broken		MEDIUM			138.28		
	72.1		Pipe Problem	Circular Crack		LIGHT			307.96		
	73.7		Service Conn.	Service tap	All related to service install				398.79		
5	73.7		Pipe Problem	Circular Crack		MEDIUM			452.36		
6	73.8		Pipe Problem	SOIL INFIL					604.50		
7	87.6		Other	Downstream CB	wooden top				884.62		

2/21

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-A3

Site ID	City	Street	Date	Time
19	Mercer Island	2000 82ND AVE SE	11/14/2005	01:36:13 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
2000	31	.	6.0	+52.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CONC	12	3	Away-U	Shoulder	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE MAP SHEET A3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					23.47		01:08:03
2	6.1		Joint Problem	Broken		LIGHT			96.23		
	12.0		Joint Problem	Broken		MEDIUM			191.67		
	52.0		Other	Upstream CB					314.89		

2/23

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B1

Site ID	City	Street	Date	Time
1	Mercer Island	SE 27TH ST & 63RD AV SE	09/23/2005	09:34:32 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
31	32	.	6.0	+61.2

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Gravel Shoulder	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET B1

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					24.82		00:49:23
2	54.8		Joint Problem	Offset		MEDIUM			117.85		
	61.0		Service Conn.	service left					205.74		
	~~61.0~~		~~Service Conn.~~	~~Protruding 3-5~~					~~221.67~~		
5	61.2		Other	CAN'T COMPLETE					283.32		

slides pipe around service broken, & not properly grouted

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

CUES

Site Data for Project: Mercer Island-SD-B1

Site ID	City	Street	Date	Time
2	Mercer Island	SE 27TH ST & 63RD AV SE	09/23/2005	09:56:28 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
31	30	.	6.0	+40.5

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Gravel Shoulder	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET B1

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					18.69		00:54:24
2	4.0		Joint Problem	Offset		MEDIUM			64.71		
[redacted]											
	40.5		Other	CAN'T COMPLETE					203.01		

looks like it's 1 joint short of the c/b

2/28

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

CUES

Site Data for Project: Mercer Island-SD-B1

Site ID	City	Street	Date	Time
3	Mercer Island	2432 63RD AV SE	09/23/2005	10:15:46 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
~~28B~~ 29	28A		6.0	+6.6

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Gravel Shoulder	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET B1

Observation Data

Obs ID	Ft.	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					114.99		00:58:10
2	6.3		Joint Problem	Offset		HEAVY			145.42		
	6.3		Pipe Problem	pipe curves RT					170.71		
	6.6		Other	CAN'T COMPLETE					264.37		

NOT SURE WHY. SLIGHT SAG BUT PIPE LOOKED OK LOOKING AHEAD PIPE CURVE MAY HAVE BEEN PROB. FOR CAMERA

w/28 ~~that ft,~~ this hole section is trashed from 28-29

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B1

Site ID	City	Street	Date	Time
4	Mercer Island	2440 63RD AV SE	09/23/2005	10:37:43 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
28B	29	.	6.0	+11.6

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Gravel Shoulder	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET B1

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					72.71		01:02:54
2	6.7		Joint Problem	Separated		HEAVY			102.95		
	8.4		Joint Problem	Broken		MEDIUM			173.03		
	8.4		Joint Problem	Offset		MEDIUM			200.81		
5	11.1		Joint Problem	Offset		HEAVY			241.96		
6	11.1		Joint Problem	Separated		HEAVY			257.18		
7	11.6		Other	CAN'T COMPLETE					307.39		

Needs
spot
repair

2/28 whole section is trashed
we might want to run a
smaller push camera through

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B1

Site ID	City	Street	Date	Time
5	Mercer Island	2420 63RD AV SE	09/23/2005	10:58:45 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
OPEN PIPE	29	.	5.0	+6.4

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Gravel Shoulder	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET B1

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	OPEN DITCH					37.54		01:08:29
2	3.0		Joint Problem	Separated		HEAVY			64.50		
	3.0		Root Problem	begin roots		LIGHT			98.81		
	6.4		Joint Problem	Separated		HEAVY			171.74		
5	6.4		Joint Problem	Offset		HEAVY	Bad!		186.18		
6	6.4		Joint Problem	SOIL VISIBLE					195.37		
7	6.4		Other	CAN'T COMPLETE					234.28		

Oh my God!
every section as far as
you can see is separated
2/28

CUES

PRO-VAC
6622 112th ST E
Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-B1-2

Site ID	City	Street	Date	Time
6	MERCER ISLAND	SE 28TH ST & 61ST AV SE	01/08/2006	03:38:21 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
2801	2808		0	32

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Gravel Shoulder	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET B1

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	7.0		Joint Problem	OFFSET		MEDIUM					
3	9.3		Other	CONC TO VCP							
4	9.3		Joint Problem	broken		LARGE	soil visible				
5	9.3		Joint Problem	soil visible							
6	14.4		Other	VCP TO CONC							
7	18.7		Joint Problem	OFFSET		MEDIUM					
8	28.3		Other	CONC TO VCP							
9	30.7		Service Conn.	right							
10	30.7		Service Conn.	protruding4-6"							
11	32.0		Pipe Problem	Broken		MEDIUM					
12	32.0		Other	CAN'T COMPLETE							

OK

N20

PRO-VAC
6622 112th ST E
Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-B1-2

Site ID	City	Street	Date	Time
7	MERCER ISLAND	SE 28TH ST & 61ST AV SE	01/08/2006	03:55:23 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
2808	2801		0	88.1

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Gravel Shoulder	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET B1

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	11.9		Root Problem	begin roots		MEDIUM					
3	47.5		Pipe Problem	Longit Crack		LIGHT					
4	50.1		Pipe Problem	end crack							
5	55.7		Root Problem	end roots							
6	88.1		Other	Buried CB							

2/20

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
1	MERCER ISLAND	3049 71ST AV SE	09/23/2005	11:23:29 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
HS# 3049	HS# 2935	.	6.0	+282.8

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					53.71		01:12:27
2	282.8		Other	Upstream CB					535.56		

2/28

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
2	MERCER ISLAND	3049 71ST AV SE	09/23/2005	11:52:08 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
HS# 3049	HS# 3073	.	6.0	+156.2

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					25.75		01:21:44
2	156.2		Other	Downstream CB					301.89		

32' service left
pipe broken w/a half
hazard repair
7/209

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
3	MERCER ISLAND	SE 29TH ST & 70TH AV SE	09/23/2005	12:14:06 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
184	OPEN PIPE	.	6.0	+47.3

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					22.18		01:26:56
2	19.7		Joint Problem	Offset		MEDIUM			60.46		
	47.3		Joint Problem	Offset		HEAVY			129.64		
	47.3		Other	CAN'T COMPLETE					151.10		

1 joint from the outlet

2/28

CUES

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
4	MERCER ISLAND	SE 29TH ST & 70TH AV SE	09/23/2005	12:19:24 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
184	185	.	6.0	+96.4

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					11.23		01:29:32
2	4.0		Pipe Problem	Longit Crack		LIGHT			60.16		
	5.0		Service Conn.	service left					81.11		
	38.0		[redacted]	Offset		MEDIUM			160.08		
5	38.0		Other	OLD REPAIR					182.58		
6	41.3		[redacted]	Separated partialy	repaird	HEAVY			221.94		
7	41.3		[redacted]	SOIL VISIBLE					228.02		
8	62.8		[redacted]	Offset		LIGHT			293.42		
9	73.1		[redacted]	Circular Crack		MEDIUM			344.28		
10	96.4		Other	Downstream CB					481.85		

2 sections fractured

2/28

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
5	MERCER ISLAND	SE 29TH ST & 70TH AV SE	09/23/2005	12:53:48 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
186A	186		6.0	+7.3

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					61.19		01:37:50
2	5.9		Joint Problem	Offset		HEAVY			106.37		
	7.3		Other	12X 8 Reducer					324.15		
	7.3		Other	CAN'T COMPLETE					341.50		

GAP UCBOS
GROUTING

2/28

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
6	MERCER ISLAND	SE 29TH ST & 70TH AV SE	09/23/2005	01:02:36 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
186A	187		6.0	+30.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					16.85		01:43:40
2	6.0		Joint Problem	Offset		MEDIUM			47.52		
	30.7		Other	Downstream CB					121.82		

7/2/00

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
7	MERCER ISLAND	SE 29TH ST & 70TH AV SE	09/23/2005	01:14:58 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
187	187A	.	0	+36.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					23.27		01:45:51
2	11.5		Service Conn.	service left					47.69		
	36.0		Other	Downstream CB					111.16		

2/28

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

CUES

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
8	MERCER ISLAND	SE 29TH ST & 70TH AV SE	09/23/2005	01:19:28 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
187A	188	.	0	+137.3

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					7.97		01:47:51
2	60.2		Joint Problem	Offset		MEDIUM			112.87		
	60.2		Other	OLD REPAIR					123.29		
	137.3		Other	Downstream CB					315.38		

2/28

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
9	MERCER ISLAND	SE 29TH ST & 70TH AV SE	09/23/2005	01:26:39 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
188	189		0	127.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					47.58		01:53:16
2	38.4		Joint Problem	Offset		MEDIUM			115.05		
	38.4		Joint Problem	Separated		MEDIUM			124.06		
	39.6		Joint Problem	Broken		MEDIUM			211.52		
5	79.9		Joint Problem	Offset		LIGHT			320.44		
6	89.2		Pipe Problem	Longit Crack		LIGHT			389.02		
7	92.2		Joint Problem	Offset		MEDIUM			430.57		
8	110.4		Joint Problem	Offset		HEAVY	MONITOR	TUES	533.72		
9	120.8		Pipe Problem	end crack					643.18		
10	127.0		Other	Downstream CB							

3 sticks of pipe bad from 189 north

2/2/08

CUES

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
10	MERCER ISLAND	SE 29TH ST & 70TH AV SE	09/23/2005	01:40:37 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
189	HS#3056	.	2.5	+55.9

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					42.38		02:06:00
2	8.9		Joint Problem	Broken		LIGHT			86.43		
	32.3		Service Conn.	service left					167.82		
	32.3		Other	OLD REPAIR					227.53		
5	55.9		Other	Downstream CB					311.49		

2/28 no tape

CUES

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
11	MERCER ISLAND	SE 29TH ST & 70TH AV SE	09/23/2005	01:50:00 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
HS#3056	190		0	+65.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					12.46		02:11:27
2	65.7		Other	Downstream CB					1278.54		

Same as 12?

2/28

CUES

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
12	MERCER ISLAND	SE 29TH ST & 70TH AV SE	09/23/2005	02:24:29 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
HS#3056	190	.	2.0	+50.6

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	2.0		Other	Upstream CB	not so bad				52.21		02:33:12
2	32.2		Joint Problem	Offset		HEAVY			122.05		
	50.6		Other	Downstream CB					204.67		

2/28

Same as 11?

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Puyallup, WA 98373
253-435-4328
cell 206-423-2445

CUES

Site Data for Project: Mercer Island-SD-B2

Site ID	City	Street	Date	Time
13	MERCER ISLAND	SE 29TH ST & 70TH AV SE	09/23/2005	02:30:11 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
190	190A	.	0	+30.2

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
DIP	12	18	Away-D	Paved Asphalt	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET B2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					65.89		02:36:44
2	30.2		Other	Downstream CB					130.77		

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Office#253-435-4328

Site Data for Project: Mercer Island-SD-B4-2

Site ID	City	Street	Date	Time
1	MERCER ISLAND	8452 N MERCER WY	01/09/2006	07:03:11 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
10	11		0	174.2

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	30	20	Away-U	Yard	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET B4

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	174.2		Other	Upstream CB							

1/20

CUES

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Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-B4-2

Site ID	City	Street	Date	Time
2	MERCER ISLAND	8452 N MERCER WY	01/09/2006	07:09:02 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
10	9	.	0	99.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	30	20	Away-D	Yard	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET B4

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	16.2		Other	OLD REPAIR							
3	49.9		Pipe Problem	Ovaled		10%					
	59.0		Root Problem	Light							
5	99.0		Pipe Problem	Shovel in Pipe							
6	99.0		Other	CAN'T COMPLETE							

this is where PSE pushed a gas main through.

2/28

NEED to RESTORE THIS!

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

CUES

Site Data for Project: Mercer Island-SD-C3

Site ID	City	Street	Date	Time
1	MERCER ISLAND	SE 37TH ST & 77TH AV SE	09/30/2005	01:24:30 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
43	17	.	6.0	+287.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0.		Other	Downstream CB					37.60		03:13:04
2	287.0		Other	Upstream CB					497.55		

2/2/08

CUES

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6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-C3

Site ID	City	Street	Date	Time
2	MERCER ISLAND	SE 37TH ST & 77TH AV SE	10/06/2005	01:26:25 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
46	38	.	6.0	+298.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	18	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					41.26		00:17:23
2	137.3		Service Conn.	service left					260.29		
	177.9		Service Conn.	service left					354.35		
	254.1		Service Conn.	service right					490.00		
5	259.7		Service Conn.	service left					524.22		
6	281.7		Service Conn.	service left					582.45		
7	293.2		Service Conn.	service left					621.57		
8	294.0		Service Conn.	service left					680.42		
9	298.7		Other	Downstream CB					714.33		

3# R

1/28

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6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-C3

Site ID	City	Street	Date	Time
3	MERCER ISLAND	SE 37TH ST & 77TH AV SE	10/06/2005	01:47:45 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
46	42	.	7.0	+122.9

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					20.61		00:33:45
2	77.7		Service Conn.	service left					138.06		
	122.9		Other	Upstream CB					258.68		

x1280 JB

CUES

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Office#253-435-4328

Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
4	MERCER ISLAND	SE 37TH ST & 76TH AV SE	01/08/2006	04:17:34 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
17	87	.	0	91.4

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	52.5		Pipe Problem	Possible Sag							
3	55.6		Joint Problem	Separated		MEDIUM					
4	59.2		Joint Problem	OFFSET		MEDIUM					
5	60.2		Pipe Problem	End Sag							
6	91.4		Other	Upstream CB							

Grade changes
alot in this area pipe looks
realy good
2/20

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CUES

Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
5	MERCER ISLAND	SE 37TH ST & 76TH AV SE	01/08/2006	04:34:16 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
17	18		0	85.9

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	54.1		Pipe Problem	Possible Sag							
3	80,1		Joint Problem	OFFSET		HEAVY					
	82.6		Pipe Problem	End Sag							
5	85.9		Other	Upstream CB							

NEEDS GROUT IN VOID IN AREA OF SEPARATED JOINT

second joint from manhole #18

2/20

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CUES

Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
6	MERCER ISLAND	SE 36TH ST & 76TH PL SE	01/08/2006	04:38:39 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
31	33	.	0	212

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	6.1		Root Problem	begin roots		LIGHT					
3	6.1		Joint Problem	Infiltration		LIGHT					
4	8.0		Root Problem	Medium							
5	25.5		Root Problem	end roots							
6	64.8		Joint Problem	OFFSET		MEDIUM					
7	64.8		Joint Problem	soil visible							
8	83.5		Root Problem	Light							
9	170.4		Joint Problem	OFFSET		MEDIUM					
10	212.0		Other	Upstream CB							

2/28 nn looks o.k.

CUES

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Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
7	MERCER ISLAND	SE 36TH ST & 76TH PL SE	01/08/2006	04:47:32 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
30	28		0	71.3

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	65.8		Joint Problem	OFFSET		MEDIUM					
3	71.3		Other	Upstream CB							

2/28

CUES

PRO-VAC
6622 112th ST E
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Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
8	MERCER ISLAND	SE 34TH ST & 76TH PL SE	01/08/2006	04:50:32 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
28	27	.	0	177.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	76.4		Joint Problem	OFFSET		MEDIUM					
3	109.7		Joint Problem	OFFSET		HEAVY					
4	139.4		Pipe Problem	Circular Crack		MEDIUM	(NEED SPOT REPAIR)				
5	176.2		Joint Problem	OFFSET		MEDIUM					
6	177.7		Other	Downstream CB							

going down a hill!

Gasket showing bottom of pipe bad. 1" VERTICAL OFFSET

top of pipe broken

2/2006

CUES

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Office#253-435-4328

Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
9	MERCER ISLAND	SE 34TH ST & 76TH PL SE	01/08/2006	04:57:18 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
27	26		0	64.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	64.7		Other	Downstream CB							

2/2/06

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Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
10	MERCER ISLAND	SE 34TH ST & 76TH PL SE	01/08/2006	04:59:55 PM

or 77th Ave SE and SE 37th Pl

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
44 24?	45 25?	.	0	146.1

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	146.1		Other	Upstream CB							

2/2 96

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CUES

Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
11	MERCER ISLAND	SE 37TH ST & 77TH ST SE	01/08/2006	05:02:10 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
44	43	.	0	72.8

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	72.8		Other	Downstream CB							

2/2/08

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Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
12	MERCER ISLAND	SE 37TH ST & 77TH ST SE	01/08/2006	05:05:10 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
43	42			42.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	19.5		Pipe Problem	Possible Sag							
	19.5		Joint Problem	OFFSET		MEDIUM					
	26.1		Joint Problem	OFFSET		MEDIUM					
5	26.1		Pipe Problem	1/2 Pipe							
6	32.3		Joint Problem	OFFSET		HEAVY					
7	32.3		Pipe Problem	End Sag							
8	32.3		Other	Grade Change							
9	42.0		Other	Downstream CB							

looks like the pipe is droping over a bank, the top of the pipe is well grouted

2/208

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Office#253-435-4328

Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
13	MERCER ISLAND	3835 83RD AV SE	01/08/2006	05:14:30 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
199	200	.	0	7.6

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Toward-U	Paved Asphalt	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	[redacted]										
	7.6		Joint Problem	soil visible							
	7.6		Other	CAN'T COMPLETE							

realy bad
@7.6" pipe looks good
past this point
2/28

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Office#253-435-4328

Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
14	MERCER ISLAND	3835 83RD AV SE	01/08/2006	05:18:49 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
199	198	.	0	86.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	25.2		Other	PIPE CURVES LT							
	~~86.7~~		~~Pipe Problem~~	~~Broken~~		~~HEAVY~~	BROKEN TOP, PIPE PLUGGED W/ DEBRIS				
	86.7		Other	CAN'T COMPLETE							

Pipe is completely pluged w/ a big rock or something

CUES

PRO-VAC
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Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
15	MERCER ISLAND	3843 83RD AV SE	01/08/2006	05:23:34 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
201	200	.	0	80.8

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	80.8		Other	Upstream CB							

N 2 8

CUES

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Site Data for Project: Mercer Island-SD-C3-2

Site ID	City	Street	Date	Time
16	MERCER ISLAND	3843 83RD AV SE	01/08/2006	05:26:37 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
201	202	.	0	79.9

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3'	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET C3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	40.6		Root Problem	Light							
	43.4		Joint Problem	OFFSET		LIGHT					
	79.9		Pipe Problem	Broken		HEAVY					
5	79.9		Pipe Problem	FULL OF DIRT							
6	79.9		Other	CAN'T COMPLETE							

Pipe ends & looks like it should cont. through to 40th according to the map.

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Site Data for Project: Mercer Island-SD-F3-2

Site ID	City	Street	Date	Time
1	MERCER ISLAND	4845 FOREST AV SE	01/08/2006	06:05:23 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
4	OPEN PIPE		0	33.4

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	24	10	Away-U	Yard	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET F3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	28.6		Service Conn.	left							
	33.4		Pipe Problem	PIPE DOWNSIZES							
	33.4		Other	CAN'T COMPLETE							

2/2/06

PRO-VAC
6622 112th ST E
Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-F3-2

Site ID	City	Street	Date	Time
2	MERCER ISLAND	4845 FOREST AV SE	01/08/2006	06:10:57 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
4	3		0	100.1

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	18	10	Away-D	Yard	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET F3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	10.5		Other	CMP TO CONC							
	19.0		Service Conn.	top							
	31.2		Service Conn.	left							
5	31.2		Service Conn.	Min Deposits		HEAVY					
6	41.4		Service Conn.	left							
7	41.4		Service Conn.	protruding4-6"							
8	68.9		Service Conn.	left							
9	70.4		Other	perforated	10						
10	100.1		Other	Downstream CB							

Looks more like roots

2/20

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Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-F3-2

Site ID	City	Street	Date	Time
3	MERCER ISLAND	4845 FOREST AV SE	01/08/2006	06:21:44 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
3	2	.	0	31.8

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	18	10	Away-D	Yard	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET F3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	7.8		Service Conn.	top							
	13.2		Service Conn.	top							
	31.8		Other	Downstream CB							

Disc would not work

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Office#253-435-4328

Site Data for Project: Mercer Island-SD-F3-2

Site ID	City	Street	Date	Time
4	MERCER ISLAND	4845 FOREST AV SE	01/08/2006	06:26:18 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
2	1		0	55.5

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	18	4	Away-D	Yard	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET F3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	31.8		Service Conn.	right							
	36.7		Joint Problem	OFFSET		MEDIUM					
	55.5		Other	Open Pipe							

Could not view
2/28
Disc damaged

CUES

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Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-F3-2

Site ID	City	Street	Date	Time
5	MERCER ISLAND	4845 FOREST AV SE	01/08/2006	06:32:00 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
W C	4		0	195.6

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	18	18	Away-D	Yard	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET F3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Open Pipe							
2	14.5		Other	CMP TO CONC							
[illegible]	17.5		Joint Problem	Mineral Deposi		MEDIUM					
[illegible]	25.8		Joint Problem	Infiltration		MEDIUM					
5	39.7		Joint Problem	Separated		LIGHT					
6	63.8		Joint Problem	OFFSET		LIGHT					
7	64.4		Other	PIPE CURVES LT							
8	75.9		Joint Problem	Separated		HEAVY					
9	75.9		Joint Problem	soil visible							
10	75.9		Joint Problem	void		MEDIUM					
11	78.6		Joint Problem	OFFSET		LARGE					
12	99.6		Joint Problem	Separated		LARGE					
13	99.6		Joint Problem	soil visible							
14	102.8		Joint Problem	OFFSET		MEDIUM					
15	117.9		Root Problem	begin roots		LIGHT					
16	123.8		Joint Problem	Separated		HEAVY					
17	123.8		Joint Problem	soil visible							
18	163.5		Joint Problem	Separated		LARGE					
19	163.5		Joint Problem	soil visible							
[illegible]	163.5		Joint Problem	void		LARGE					

c/p damaged

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Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-F3-2

Site ID	City	Street	Date	Time
5	MERCER ISLAND	4845 FOREST AV SE	01/08/2006	06:32:00 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
W C	4	.	0	195.6

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	18	18	Away-D	Yard	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET F3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
21	195.6		Other	CONC TO CMP							
22	195.6		Other	SIZE CHANGE							
[illegible]	195.6		Other	CAN'T COMPLETE							

c/p damaged

CUES

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Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-F5-2

Site ID	City	Street	Date	Time
1	MERCER ISLAND	5225 E MERCER WY	01/08/2006	06:58:44 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
22	OPEN PIPE	.	0	46.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET F5

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	34.1		Other	Grade Change							
3	39.5		Root Problem	begin roots		LIGHT					
	46.7		Other	Open Pipe							

2\2 80

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Office#253-435-4328

CUES

Site Data for Project: Mercer Island-SD-F5-2

N. of 4905 EMW

Site ID	City	Street	Date	Time
2	MERCER ISLAND	E MERCER HIGHLANDS & EMW	01/08/2006	07:04:06 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
OPEN PIPE	OPEN PIPE		0	74.1

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
VCP	18	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET F5

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Open Pipe							
2	9.3		Pipe Problem	Longit Crack	12	MEDIUM					
	9.3		Pipe Problem	Longit Crack	03	MEDIUM	OBLONG				
	9.3		Pipe Problem	Longit Crack	06	MEDIUM					
5	9.3		Pipe Problem	Longit Crack	09	MEDIUM					
6	64.0		Pipe Problem	Collapsed		20%					
7	74.1		Pipe Problem	Broken		HEAVY					
8	74.1		Pipe Problem	Collapsed		30%					
9	74.1		Other	CAN'T COMPLETE							

~~Good condition for~~ ~~Slip lining~~

almost every stick of pipe is cracked @74' need to replace might be able to slip line across the road

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-G5

Site ID	City	Street	Date	Time
1	MERCER ISLAND	6160 94TH AV SE	10/06/2005	11:57:52 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
66	67		6.0	+195.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-D	Difficult Access	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET G5

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					41.53		00:00:00
2	147.9		Other	OLD REPAIR					445.73		
[illegible]	154.1		Other	PIPE CURVES LT					476.13		
[illegible]	192.2		Joint Problem	Separated		HEAVY			618.35		
5	195.0		Other	Downstream CB					754.89		

CUES

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Office#253-435-4328

Site Data for Project: Mercer Island-SD-H2-2

Site ID	City	Street	Date	Time
1	MERCER ISLAND	7515 SE 71ST ST	01/08/2006	07:15:28 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
10	10A	.	0	38.9

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Yard	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET H2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	10.0		Other	PERF PIPE							
	12.2		Root Problem	Light							
	15.5		Joint Problem	Separated		MEDIUM					
5	15.5		Root Problem	end roots							
6	15.5		Other	END PERF PIPE							
7	28.7		Other	PIPE CURVES RT							
8	28.7		Other	PERF PIPE							
11	31.3		Joint Problem	soil visible							
9	31.4		Other	END PERF PIPE							
10	31.4		Joint Problem	Separated		MEDIUM					
12	38.9		Other	PIPE CURVES RT							
13	38.9		Other	CAN'T COMPLETE							

2/28

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6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-H3

Site ID	City	Street	Date	Time
1	MERCER ISLAND	80TH AV SE & SE 70TH ST	09/30/2005	10:15:50 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
115	110	.	7.0	+98.2

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	24	4	Away-D	Private Yard	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET H3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					35.69		02:21:00
2	8.3		[redacted]	Mineral Deposi		✓LIGHT			681.59		
	96.5		[redacted]lem	Heavy					883.57		
	98.2		Other	CAN'T COMPLETE					1035.66		

BIG ROOT ENTERS PIPE FROM THIS JOINT. CAMERA CAN'T GET THROUGH TO THIS POINT. PIPE LOOKS OK OVERALL THOUGH.

roots bad

~ 1200

NEEDS ROOT CUTTING

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-H3

Site ID	City	Street	Date	Time
2	MERCER ISLAND	80TH AV SE & SE 67TH ST	09/30/2005	11:18:13 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
62	110		7.0	+61.1

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	24	4	Away-U	Private Yard	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET H3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					30.34		02:29:52
2	34.7		Other	24" X 18"					168.08		
	40.7		Root Problem	begin roots		LIGHT			233.95		
	59.2		Root Problem	Medium					281.93		
5	61.1		Other	CAN'T COMPLETE					329.23		

1 SINGLE BIG ROOT

120

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-H3

Site ID	City	Street	Date	Time
3	MERCER ISLAND	80TH AV SE & SE 67TH ST	09/30/2005	11:38:24 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
62	59	.	7.0	+327.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	24	4	Away-D	Private Yard	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET H3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					30.25		02:35:29
2	139.2		Service Conn.	service right					355.32		
[illegible]	141.4		Service Conn.	service right					382.68		
[illegible]	254.4		Service Conn.	service right					629.98		
5	277.1		Root Problem	Light					716.53		
6	327.0		Other	Downstream CB					922.44		
7	327.0		Other	Roots in MH		HEAVY			967.54		

IN BACKYARD OF 6537 81st AVE SE

N2 80

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

Site Data for Project: Mercer Island-SD-H3

Site ID	City	Street	Date	Time
4	MERCER ISLAND	80TH AV SE & SE 65TH ST	09/30/2005	12:10:19 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
23	59	.	7.0	+102.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	24	4	Away-U	Private Yard	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET H3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					22.87		02:51:46
2	33.2		Service Conn.	service left					93.06		
	100.1		Root Problem	begin roots		HEAVY			216.75		
	102.0		Other	CAN'T COMPLETE					309.64		

ROOT MAT.

4/20

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Office#253-435-4328

Site Data for Project: Mercer Island-SD-H3-2

Site ID	City	Street	Date	Time
5	MERCER ISLAND	80TH AV SE & SE 65TH ST	01/08/2006	05:36:27 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
23	OPEN PIPE	.	0	153.3

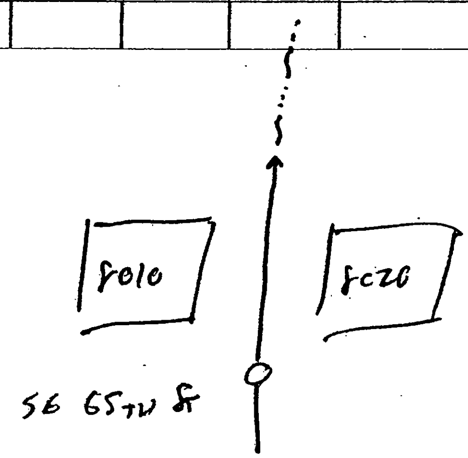
Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
VCP	24	4	Away-D	Yard	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET H3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	107.8		Pipe Problem	Longit Crack	12						
	117.4		Pipe Problem	Longit Crack	12	MEDIUM	CRACK WIDENS HERE				
	117.4		Pipe Problem	Longit Crack	03	MEDIUM					
5	117.4		Pipe Problem	Longit Crack	06	MEDIUM					
6	117.4		Pipe Problem	Longit Crack	09	MEDIUM					
7	130.2		Pipe Problem	Longit Cracks		HEAVY					
8	134.0		Pipe Problem	Collapsed		20%	LARGE CRACKS @ CROWN OF PIPE				
9	144.8		Pipe Problem	Collapsed		30%					
10	144.8		Pipe Problem	Broken		HEAVY					
11	153.3		Pipe Problem	Collapsed		100%					
12	153.3		Pipe Problem	Void		LARGE					
13	153.3		Pipe Problem	Soil Visible							
14	153.3		Other	CAN'T COMPLETE							

Bad news



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Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-I2-2

Site ID	City	Street	Date	Time
1	MERCER ISLAND	7623 W MERCER WAY	01/08/2006	07:30:58 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
46	47		0	8.2

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	12	3	Away-U	Paved Asphalt	Jerry Hyatt

Comment

AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET I2

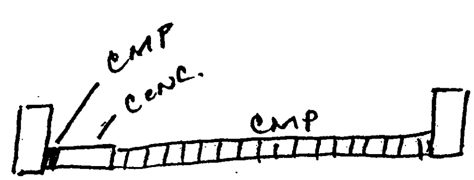
Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	8.2		Other	PIPE DOWNSIZES							
3	8.2		Other	CAN'T COMPLETE							

FLOW RESTRICTOR IN CB 47
PREVENTS TV ACCESS FROM
OTHER THAN CB 46

Replace

2/28



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Office#253-435-4328

Site Data for Project: Mercer Island-SD-I2-2

Site ID	City	Street	Date	Time
2	MERCER ISLAND	7800 W MERCER WAY	01/08/2006	07:36:22 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
62	67	.	0	48.4

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
VCP	12	3	Away-D	Paved Asphalt	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET I2

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	10.4		Joint Problem	Mineral Deposi		LIGHT					
	10.4		Joint Problem	Infiltration		LIGHT					
	14.3		Joint Problem	Mineral Deposi		LIGHT					
5	14.3		Joint Problem	Infiltration		LIGHT					
6	18.1		Joint Problem	Separated		HEAVY					
7	18.1		Joint Problem	soil visible							
8	22.2		Joint Problem	OFFSET		HEAVY					
9	22.2		Joint Problem	soil visible							
10	26.5		Joint Problem	OFFSET		HEAVY					
11	26.5		Joint Problem	soil visible							
12	30.4		Joint Problem	OFFSET		HEAVY					
13	30.4		Joint Problem	soil visible							
14	46.5		Joint Problem	OFFSET		HEAVY					
15	46.5		Joint Problem	soil visible							
16	48.4		Pipe Problem	Collapsed		100%					
17	48.4		Pipe Problem	Broken		HEAVY					
18	48.4		Pipe Problem	Soil Visible							
19	48.4		Pipe Problem	Void		LARGE					

Replace

PIPE REPLACED FEB. 2006 BY ROAD CONST. NW FOR MAINT DEPT. (JUDD)

PRO-VAC
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Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-I3-2

Site ID	City	Street	Date	Time
1	MERCER ISLAND	7405 78TH AV SE	01/08/2006	07:56:09 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
58	54		0	139.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	15	3	Away-D	Yard	Jerry Hyatt

Comment

WITH THE FLOW-STORM DRAINAGE-MAP SHEET ~~I~~ 3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	15.3		Joint Problem	Mineral Deposi		LIGHT					
	27.7		Joint Problem	Mineral Deposi		LIGHT					
	27.7		Joint Problem	Infiltration		LIGHT					
5	94.9		Pipe Problem	Longit Crack	12	LIGHT					
6	100.3		Pipe Problem	end crack							
7	139.7		Other	Downstream CB							

28

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6622 112th ST E
Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

CUES

Site Data for Project: Mercer Island-SD-I3-2

Site ID	City	Street	Date	Time
2	MERCER ISLAND	7408 MERCER TERRACE DR	01/08/2006	08:03:10 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
46	54	.	0	113.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	15	3	Away-U	Yard	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET I~~5~~ 3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	45.2		Pipe Problem	Circular Crack		LIGHT					
[illegible]	76.4		Service Conn.	left							
[illegible]	76.4		Service Conn.	Roots		HEAVY					
5	99.5		Service Conn.	right							
6	99.5		Service Conn.	protruding6"+							
7	101.5		Other	Grade Change							
8	107.6		Joint Problem	broken		MEDIUM					
9	110.0		Joint Problem	OFFSET		HEAVY					
10	113.0		Joint Problem	OFFSET		HEAVY					
11	113.0		Other	CAN'T COMPLETE							

2/20

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

CUES

Site Data for Project: Mercer Island-SD-J3

Site ID	City	Street	Date	Time
1	MERCER ISLAND	8410 W MERCER WY	10/27/2005	11:43:53 AM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
107	106	.	6.0	+81.2

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP-PERF PIPE	12	10	Away-D	Paved Asphalt	Jerry Hyatt

Comment
WITH THE FLOW-MAP SHEET J3-STORM DRAINAGE

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB					34.37		
2	29.7		Other	PIPE CURVES RT					119.81		
	49.6		Other	PIPE CURVES RT					194.17		
	69.4		Root Problem	begin roots		MEDIUM			303.99		
5	80.0		Pipe Problem	under water					376.60		
6	81.2		Other	CAN'T COMPLETE					420.70		

repaired pipe 11-8-05 12' section.

Same as 2

Pro-Vac/Gary's Tele-Scan
6622 112th ST E
Puyallup, WA 98373
253-435-4328
cell 206-423-2445

CUES

Site Data for Project: Mercer Island-SD-J3

Site ID	City	Street	Date	Time
2	MERCER ISLAND	8410 W MERCER WY	10/27/2005	12:13:47 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
106	107		6.0	

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP-PERF PIPE	12	10	Away-U	Paved Asphalt	Jerry Hyatt

Comment

AGAINST THE FLOW-MAP SHEET J3-STORM DRAINAGE

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB					63.99		
2	30.1		Pipe Problem	DOWNSIZES					850.56		
	30.1		Pipe Problem	Broken		HEAVY			868.48		

same as 1

CUES

PRO-VAC
6622 112th ST E
Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-J3-2

Site ID	City	Street	Date	Time
3	MERCER ISLAND	84TH AV SE & SE 83RD ST	01/08/2006	08:27:06 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
89	88	.	0	113.9

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	18	3	Away-D	Wooded Hillside	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET J3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	58.6		Root Problem	begin roots		MEDIUM					
3	80.0		Root Problem	Heavy							
	113.9		Other	CAN'T COMPLETE							

1 MEDIUM ROOT. LONG AND BECOMES FIBROUS.

ROOT MAT ENTERS @ 80'
(BOTTOM 1/3 - 1/2 OF PIPE)

M 9/1

1/2 96

CUES

PRO-VAC
6622 112th ST E
Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-J3-2

Site ID	City	Street	Date	Time
4	MERCER ISLAND	8259 W MERCER WAY	01/08/2006	08:34:50 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
85	87A	.	0	59.8

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
Concrete	18	3	Away-U	Wooded Hillside	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET J3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	59.8		Other	Buried CB							

2/20

CUES

PRO-VAC
6622 112th ST E
Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-J3-2

Site ID	City	Street	Date	Time
5	MERCER ISLAND	8259 W MERCER WAY	01/08/2006	08:38:29 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
87A	87	.	0	156.8

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	18	20	Away-U	Wooded Hillside	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET J3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	156.8		Other	Upstream CB							

2/28

PRO-VAC
6622 112th ST E
Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

CUES

Site Data for Project: Mercer Island-SD-J3-2

Site ID	City	Street	Date	Time
6	MERCER ISLAND	8259 W MERCER WAY	01/08/2006	08:46:55 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
87	88	.	0	4.0

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	18	20	Away-U	Wooded Hillside	Jerry Hyatt

Comment
AGAINST THE FLOW-STORM DRAINAGE-MAP SHEET J3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Downstream CB							
2	4.0		Other	CAN'T COMPLETE							
3	4.0		Other	GRADE TO STEEP							

2128

PRO-VAC
6622 112th ST E
Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-J3-2

Site ID	City	Street	Date	Time
7	MERCER ISLAND	8259 W MERCER WAY	01/08/2006	08:50:50 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
85	84	.	0	62.4

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	18	20	Away-D	Wooded Hillside	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET J3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	62.4		Other	Downstream CB							

2/2/06

PRO-VAC
6622 112th ST E
Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

CUES

Site Data for Project: Mercer Island-SD-J3-2

Site ID	City	Street	Date	Time
8	MERCER ISLAND	8259 W MERCER WAY	01/08/2006	08:52:54 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
84	83		0	28.2

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	18	20	Away-D	Wooded Hillside	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET J3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	28.2		Other	Downstream CB							

2/2/00

PRO-VAC
6622 112th ST E
Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-J3-2

Site ID	City	Street	Date	Time
9	MERCER ISLAND	8259 W MERCER WAY	01/08/2006	08:54:43 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
83	82	.	0	48.7

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	18	20	Away-D	Wooded Hillside	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET J3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	48.7		Other	Downstream CB							

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Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-J3-2

Site ID	City	Street	Date	Time
10	MERCER ISLAND	8259 W MERCER WAY	01/08/2006	08:58:11 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
82	81	.	0	192.2

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	18	20	Away-D	Wooded Hillside	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET J3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	30.4		Other	PIPE CURVES RT							
3	39.2		Joint Problem	OFFSET		MEDIUM					
	68.8		Root Problem	begin roots		MEDIUM					
5	85.0		Other	PIPE CURVES LT							
6	149.6		Root Problem	end roots							
7	192.2		Other	Downstream CB							

50' ROOTS MEDIUM

PRO-VAC
6622 112th ST E
Puyallup, WA 98373
Cell#206-423-2445
Office#253-435-4328

Site Data for Project: Mercer Island-SD-J3-2

Site ID	City	Street	Date	Time
11	MERCER ISLAND	8259 W MERCER WAY	01/08/2006	09:11:19 PM

M.H. Start	M.H. Stop	M.H. Depth	Starting Dist	Final Dist
81	80		0	81.4

Type of Pipe	Pipe Size(in)	Sec. lgth	Direction	Surface Condition	Operator
CMP	18	20	Away-D	Wooded Hillside	Jerry Hyatt

Comment
WITH THE FLOW-STORM DRAINAGE-MAP SHEET J3

Observation Data

Obs ID	Ft	Lat Ft	Category	Category Details	ClockPos	Sevr Lv	Ph1 ID	Ph2 ID	VclipID	VidID	TapeCnt
1	0		Other	Upstream CB							
2	60.7		Other	PIPE CURVES RT							
3	81.4		Other	Downstream CB							

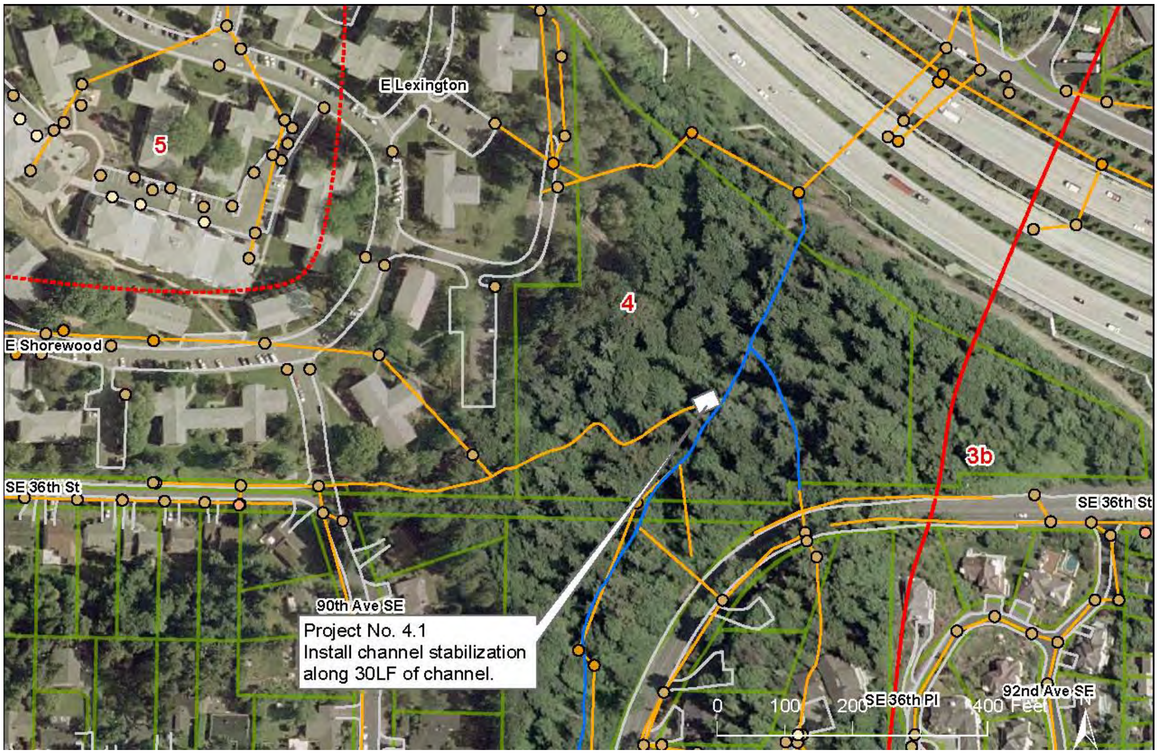
Appendix G

PROJECT SUMMARIES (BY SUBBASIN)

PROJECT SUMMARY SHEET

Basin No.:	4
Project No:	4.1
Project Title:	**40 Feet of Channel Stabilization Northwest of Gallager Hill Road**
Problem Description:	Headcut is moving upstream creating a 30-foot long incised channel into glacial till that is up to 7 feet deep. Contributing area is small. Located in undeveloped open space Northwest of Gallager Hill Road and SE 36th Street. See Appendix E for a field sketch of the problem area.
Project Description:	Channel stabilization along about 40 feet of creek.
Related Projects	None
Estimated Project Cost:	$45,000

Looking Upstream 9/24/2005



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 4.1 **CHECKED BY:** msg
BY: jcb **DATE:** 5/23/2006
CHANNEL STABILIZATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	30	LF	$ 10	$ 300
CUTTING LARGE TREES	1	EA	$ 1,000	$ 840
REMOVE/DISPOSE MISC DEBRIS	30	LF	$ 2	$ 60
EXCAVATION	30	CY	$ 50	$ 1,500
BOULDERS	12	TON	$ 100	$ 1,200
STREAMBED GRAVEL AND COBBLES	8	TON	$ 80	$ 640
LOGS	2	EA	$ 1,500	$ 2,250
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
ACCESS (10' WIDE)	200	LF	$ 10	$ 2,000
ACCESS RESTORATION	200	LF	$ 10	$ 2,000
RIPARIAN PLANTING AND SEEDING	30	LF	$ 30	$ 900
			Subtotal	$ 12,690
SPECIAL ACCESS/CONSTRUCTION	5%			$ 635
MISC	10%			$ 1,269
EROSION & SEDIMENTATION CONTROL	10%			$ 1,269
TRAFFIC CONTROL	5%			$ 635
			Subtotal	$ 16,497
MOBILIZATION	10%			$ 1,650
			Subtotal	$ 18,000
CONTINGENCY	30%			$ 5,400
			Subtotal	$ 23,400
STATE SALES TAX	8.80%			$ 2,059
	Total Estimated Construction Cost (Rounded)			$ 29,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 7,250
PERMITTING	10%			$ 2,900
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 5,800
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$ 500	$ 500
	Total Estimated Project Cost (Rounded)			**$ 45,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.: 4

Project No: 4.2

Project Title: **Bypass Pipes along west side of Gallager Hill Road**

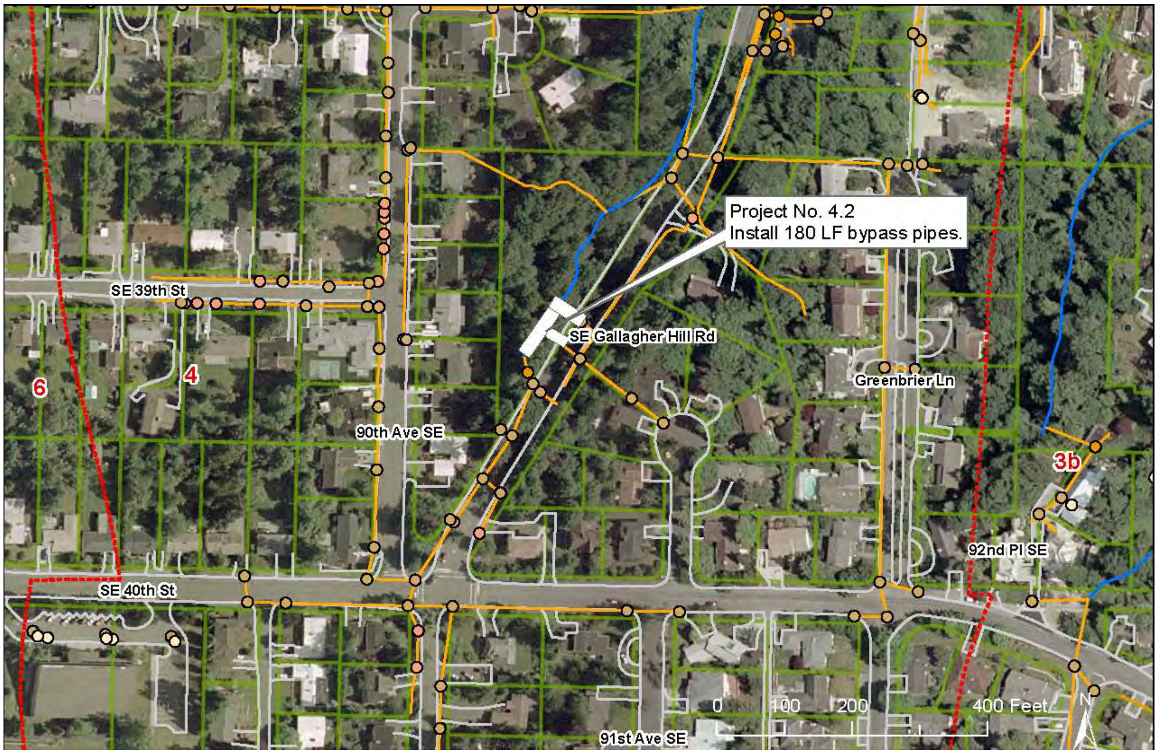
Problem Description: Downstream of storm drain outlet, flow is scouring and undercutting toe of large, mapped slide. This is long term risk to Gallager Hill Road as well. Two other storm drain outlets contribute flow. See Appendix E for a field sketch of the problem area.

Project Description: The preferred approach based upon the field reconnaissance includes installing manholes, anchor blocks, and 12-inch butt-fused HDPE pipes along 100 feet of water course and 40 feet at two side drainage systems to stop erosion of slide toe. Additional investigations are recommended for this problem with considerations of other alternatives and seeking input from WDFW. Two other options could be considered. The first is to re-route the drainage system in the road so that the majority of flow is directed to the downstream side drainage and then extend this pipe system to the channel at the toe of the slope. The system could be designed to allow low flows from the upper side drainage to continue to discharge down its side drainage. The second option is channel stabilization of the channel and only piping the side drainages down the steep slope. The cost estimate is based on the bypass pipes with 12-inch pipe.

Related Projects None

Estimated Project Cost: $198,000

Looking Downstream at Outlet 9/24/2005



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 4.2 **CHECKED BY:** msg
BY: jcb **DATE:** 5/23/2006
BYPASS PIPE

	BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	CONSTRUCTION COSTS				
	CLEARING AND GRUBBING	200	SY	$ 10	$ 2,000
	EXCAVATION	10	CY	$ 40	$ 400
	RIPRAP/BOULDERS/QUARRY SPALLS	5	CY	$ 120	$ 600
	PIPE ANCHORS	6	EA	$ 800	$ 4,800
	12" BUTT FUSED HDPE PIPE	200	LF	$ 75	$ 15,000
	ANCHOR BLOCK AND SPECIAL FITTINGS	1	EA	$ 5,000	$ 5,000
	MANHOLES/CB	4	EA	$ 3,500	$ 14,000
	UTILITY RELOCATIONS	1	EA	$ 8,000	$ 8,000
	TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
	ACCESS (10' WIDE)	75	LF	$ 10	$ 750
	RESTORATION OF ACCESS AND AREA	290	SY	$ 15	$ 4,354
				Subtotal	$ 55,904
	SPECIAL ACCESS/CONSTRUCTION	0%			$ -
	MISC	10%			$ 5,590
	EROSION & SEDIMENTATION CONTROL	10%			$ 5,590
	TRAFFIC CONTROL	10%			$ 5,590
				Subtotal	$ 72,675
	MOBILIZATION	10%			$ 7,268
				Subtotal	$ 80,000
	CONTINGENCY	30%			$ 24,000
				Subtotal	$ 104,000
	STATE SALES TAX	8.80%			$ 9,152
		Total Estimated Construction Cost (Rounded)			$ 128,000
	INDIRECT COSTS				
	SURVEYING AND DESIGN	25%			$ 32,000
	PERMITTING	10%			$ 12,800
	CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 25,600
	EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
		Total Estimated Project Cost (Rounded)			**$ 198,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	6
Project No:	6.1
Project Title:	**Extend Surface Pipe in Ravine east of 84th Avenue SE**
Problem Description:	30 feet downstream of surface storm drain outlet, flow is scouring and undercutting toe of small slide within an undeveloped ravine. This generates sandy sediment downstream. See Appendix E for a field sketch of the problem area.
Project Description:	Extend 18-inch surface CPEP previously installed by city crews 75 feet past slide.
Related Projects	None
Estimated Project Cost:	$87,000

Looking Upstream at 18” Corrugated PE Pipe Outlet 9/28/2005

Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 6.1 **CHECKED BY:** msg
BY: jcb **DATE:** 5/23/2006
BYPASS PIPE

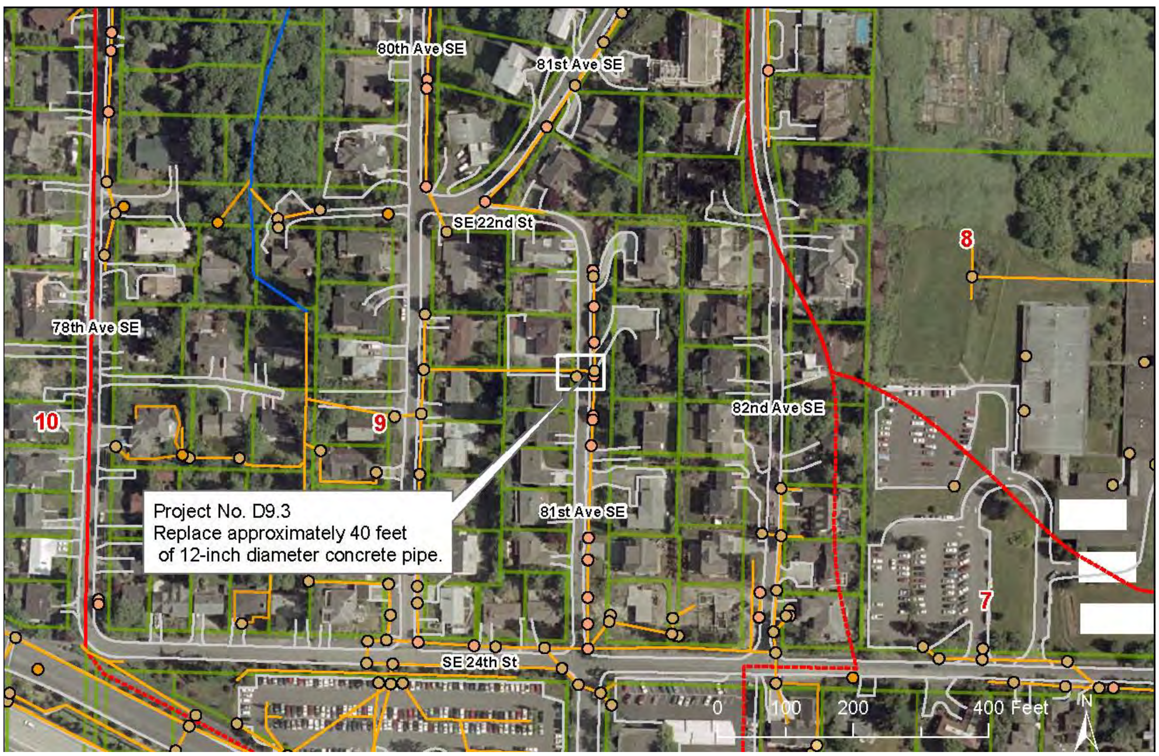
	BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	CONSTRUCTION COSTS				
	CLEARING AND GRUBBING	75	SY	$ 10	$ 750
	EXCAVATION	10	CY	$ 40	$ 400
	RIPRAP/BOULDERS/QUARRY SPALLS	5	CY	$ 120	$ 600
	PIPE ANCHORS	8	EA	$ 800	$ 6,400
	18" CPEP PIPE	75	LF	$ 75	$ 5,625
	COUPLINGS-THRUST RESISTANT	4	EA	$ 500	$ 2,000
	MANHOLES/CB	0	EA	$ 3,500	$ -
	UTILITY RELOCATIONS	0	EA	$ 8,000	$ -
	TEMPORARY BYPASS	1	LS	$ 3,000	$ 3,000
	ACCESS (10' WIDE)	350	LF	$ 10	$ 3,500
	RESTORATION OF ACCESS AND AREA	306	SY	$ 15	$ 4,583
				Subtotal	$ 26,858
	SPECIAL ACCESS/CONSTRUCTION	0%			$ -
	MISC	10%			$ 2,686
	EROSION & SEDIMENTATION CONTROL	10%			$ 2,686
	TRAFFIC CONTROL	0%			$ -
				Subtotal	$ 32,230
	MOBILIZATION	10%			$ 3,223
				Subtotal	$ 35,000
	CONTINGENCY	30%			$ 10,500
				Subtotal	$ 45,500
	STATE SALES TAX	8.80%			$ 4,004
		Total Estimated Construction Cost (Rounded)			$ 56,000
	INDIRECT COSTS				
	SURVEYING AND DESIGN	25%			$ 14,000
	PERMITTING	10%			$ 5,600
	CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 11,200
	EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$ 500	$ 500
		Total Estimated Project Cost (Rounded)			**$ 87,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	9
Project No:	D9.3
Project Title:	**80th Ave SE at house #2227**
Problem Description:	Pipe is partially collapsed, is offset in several locations, and has root intrusion and debris within the pipe.
Project Description:	Replace approximately 40 feet of 12-inch-diameter concrete pipe.
Related Projects	None
Estimated Project Cost:	$44,000

– No Photo Available – See Appendix F for detailed TV inspection.



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: D9.3 **CHECKED BY:** msg
BY: jlg **DATE:** 5/10/2006
STORM DRAINAGE PIPES

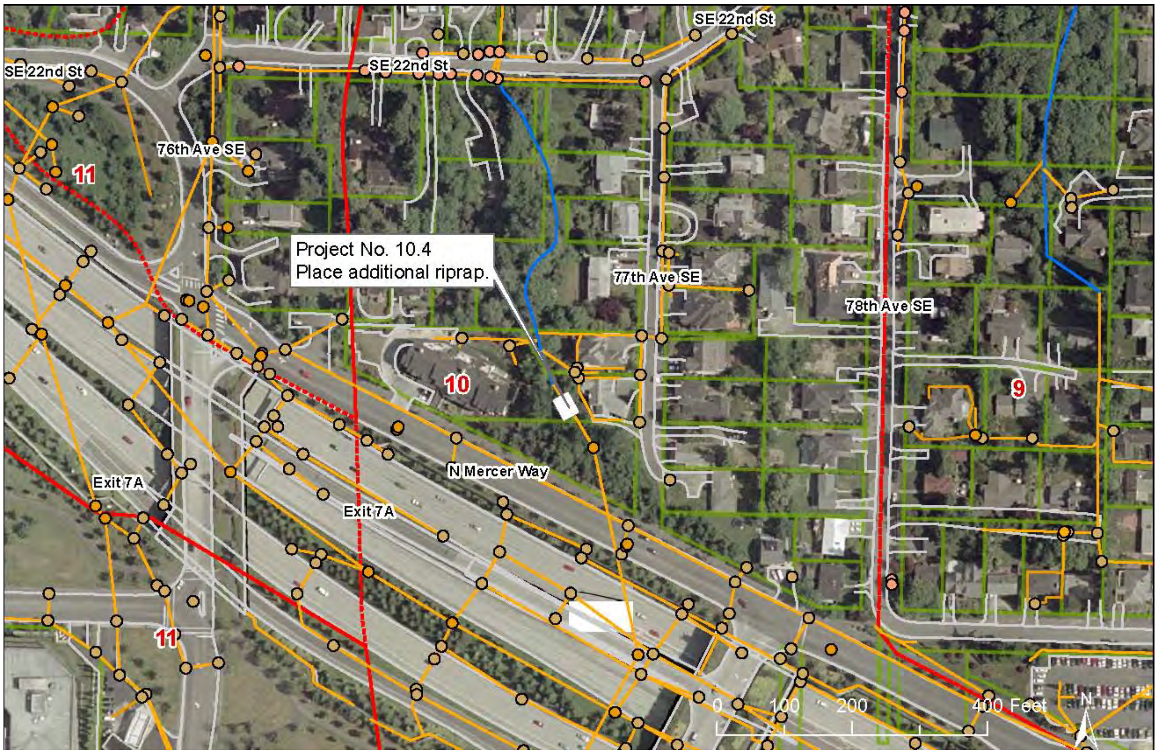
	BID ITEM	QUANTITY	UNIT	UNIT PRICE		AMOUNT	
	CONSTRUCTION COSTS						
	ACCESS (10' WIDE)	0	LF	$	10	$	-
	ACESS RESTORATION	0	SY	$	5	$	-
	CLEARING AND GRUBBING	10	SY	$	20	$	200
	SAWCUTTING	50	LF	$	8	$	400
	REMOVE PAVEMENT	19	SY	$	20	$	389
	REMOVE PIPE	40	LF	$	15	$	600
	REMOVE CATCH BASIN	2	EA	$	300	$	600
	12" CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL)	40	LF	$	175	$	7,000
	18" CONC PIPE	0	LF	$	190	$	-
	24" CONC PIPE	0	LF	$	210	$	-
	RELACE 18" CONC PIPE WITH PIPE BURSTING	0	LF	$	250	$	-
	PIPE BURSTING INSERTION/PULL PIT	0	EA	$	15,000	$	-
	CATCH BASIN TYPE 1	2	EA	$	1,400	$	2,800
	MANHOLES/CB	0	EA	$	3,500	$	-
	PAVEMENT RESTORATION	19	SY	$	20	$	389
	ROADSIDE/LANDSCAPE RESTORATION	1	LS	$	500	$	500
	RIPRAP/BOULDERS/QUARRY SPALLS	0	CY	$	40	$	-
	UTILITY RELOCATIONS	0	EA	$	8,000	$	-
	TEMPORARY BYPASS	1	LS	$	1,000	$	1,000
					Subtotal	$	13,878
	MISC	10%				$	1,388
	EROSION & SEDIMENTATION CONTROL	5%				$	694
	TRAFFIC CONTROL	5%				$	694
					Subtotal	$	16,653
	MOBILIZATION	10%				$	1,665
					Subtotal	$	18,000
	CONTINGENCY	30%				$	5,400
					Subtotal	$	23,400
	STATE SALES TAX	8.80%				$	2,059
		Total Estimated Construction Cost (Rounded)				$	29,000
	INDIRECT COSTS						
	SURVEYING AND DESIGN	25%				$	7,250
	PERMITTING	5%				$	1,450
	CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%				$	5,800
	EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$	500	$	-
		Total Estimated Project Cost (Rounded)				**$**	**44,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. Work did not include site visit to perform site specific cost estimate. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	10
Project No:	10.4
Project Title:	**Additional Riprap downstream of I-90 and west of 77th Avenue SE.**
Problem Description:	Large subbasin from business district outlets in open channel lined with riprap. Riprap thickness is thin and material may be undersized. See Appendix E for a field sketch of the problem area.
Project Description:	Place 5 cy of large riprap at outlet of 60-inch pipe
Related Projects	None
Estimated Project Cost:	$13,000

Looking Upstream at 60” Outlet 9/24/2005



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 10.4 | **CHECKED BY: msg**
BY: jcb | **DATE: 5/23/2006**
OUTLET PROTECTION

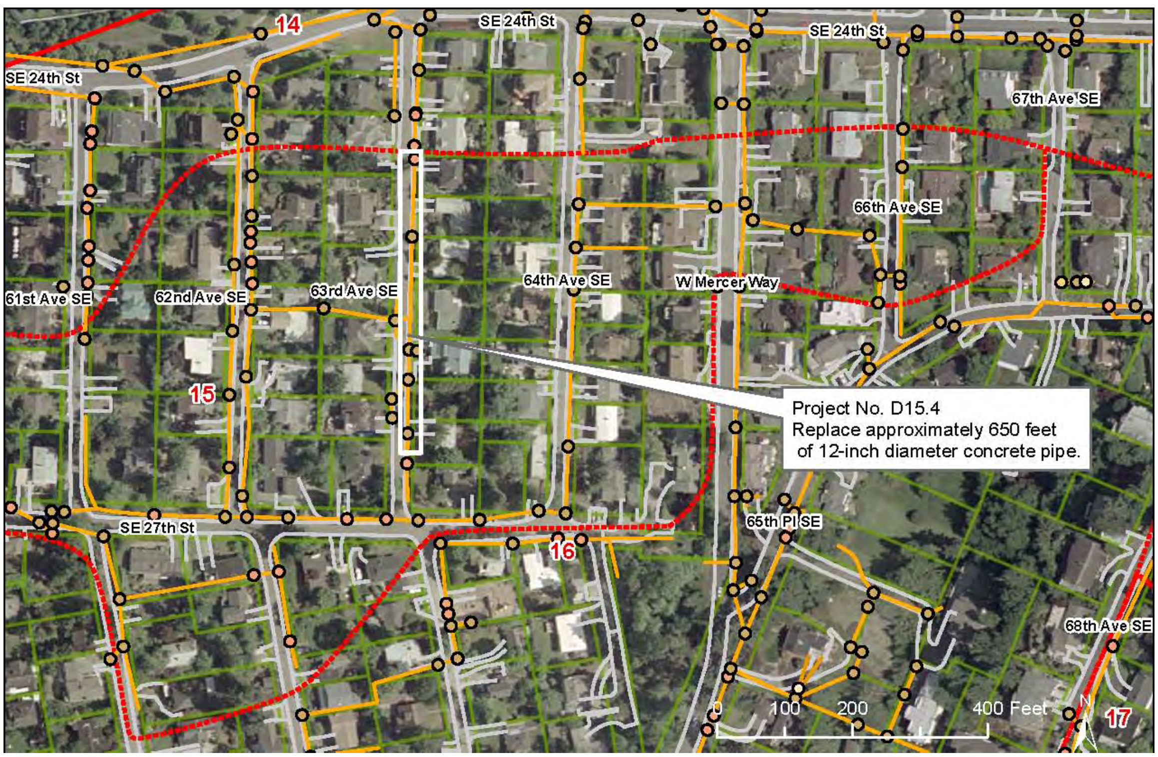
BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	0	SY	$ 10	$ -
EXCAVATION	10	CY	$ 40	$ 400
RIPRAP/BOULDERS	20	CY	$ 80	$ 1,600
GEOTEXTILE	0	SY	$ 1	$ -
UTILITY RELOCATIONS	0	EA	$ 8,000	$ -
TEMPORARY BYPASS	1	LS	$ -	$ -
ACCESS (10' WIDE)	70	LF	$ 10	$ 700
RESTORATION OF ACCESS AND AREA	97	SY	$ 10	$ 972
			Subtotal	$ 3,672
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 367
EROSION & SEDIMENTATION CONTROL	10%			$ 367
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 4,407
MOBILIZATION	10%			$ 441
			Subtotal	$ 5,000
CONTINGENCY	30%			$ 1,500
			Subtotal	$ 6,500
STATE SALES TAX	8.80%			$ 572
	Total Estimated Construction Cost (Rounded)			$ 8,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 2,000
PERMITTING	10%			$ 800
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 1,600
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$ 500	$ 500
	Total Estimated Project Cost (Rounded)			**$ 13,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	15
Project No:	D15.4
Project Title:	**63rd Ave SE from SE 24th St to SE 27th St**
Problem Description:	Severe pipe offsets along entire reach with the worst sections a 300-foot-long section of pipe.
Project Description:	Replace approximately 650 feet of 12-inch-diameter concrete pipe.
Related Projects	None
Estimated Project Cost:	$585,000

– No Photo Available – See Appendix F for detailed TV inspection.



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: D15.4 **CHECKED BY:** msg
BY: jlg **DATE:** 5/10/2006
STORM DRAINAGE PIPES

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
ACCESS (10' WIDE)		LF	$ 10	$ -
ACESS RESTORATION	0	SY	$ 5	$ -
CLEARING AND GRUBBING	50	SY	$ 20	$ 1,000
SAWCUTTING	1,300	LF	$ 8	$ 10,400
REMOVE PAVEMENT	512	SY	$ 20	$ 10,236
REMOVE PIPE	650	LF	$ 15	$ 9,750
REMOVE CATCH BASIN	6	EA	$ 300	$ 1,800
12" CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL)	650	LF	$ 175	$ 113,750
18" CONC PIPE		LF	$ 190	$ -
24" CONC PIPE		LF	$ 210	$ -
RELACE 18" CONC PIPE WITH PIPE BURSTING		LF	$ 250	$ -
PIPE BURSTING INSERTION/PULL PIT		EA	$ 15,000	$ -
CATCH BASIN TYPE 1	6	EA	$ 1,400	$ 8,400
MANHOLES/CB		EA	$ 3,500	$ -
PAVEMENT RESTORATION	512	SY	$ 20	$ 10,236
ROADSIDE/LANDSCAPE RESTORATION	1	LS	$ 1,000	$ 1,000
RIPRAP/BOULDERS/QUARRY SPALLS	0	CY	$ 40	$ -
UTILITY RELOCATIONS	1	EA	$ 8,000	$ 8,000
TEMPORARY BYPASS	1	LS	$ 3,000	$ 3,000
			Subtotal	$ 177,571
MISC	10%			$ 17,757
EROSION & SEDIMENTATION CONTROL	5%			$ 8,879
TRAFFIC CONTROL	10%			$ 17,757
			Subtotal	$ 221,964
MOBILIZATION	10%			$ 22,196
			Subtotal	$ 244,000
CONTINGENCY	30%			$ 73,200
			Subtotal	$ 317,200
STATE SALES TAX	8.80%			$ 27,914
	Total Estimated Construction Cost (Rounded)			$ 390,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 97,500
PERMITTING	5%			$ 19,500
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 78,000
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
	Total Estimated Project Cost (Rounded)			**$ 585,000**

Notes:

1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. Work did not include site visit to perform site specific cost estimate. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	18
Project No:	D18c.1
Project Title:	**Pipe system along 70th Ave SE from SE 29th St to SE 32nd St**
Problem Description:	Offsets and cracking along a 125-foot-long and a 50-foot-long section.
Project Description:	Replace approximately 175 feet of 12-inch-diameter concrete pipe.
Related Projects	None
Estimated Project Cost:	$176,000

– No Photo Available – See Appendix F for detailed TV inspection.

Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: D18c.1 **CHECKED BY:** msg
BY: jlg **DATE:** 5/10/2006

STORM DRAINAGE PIPES

	BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	CONSTRUCTION COSTS				
	ACCESS (10' WIDE)	0	LF	$ 10	$ -
	ACESS RESTORATION	0	SY	$ 5	$ -
	CLEARING AND GRUBBING	50	SY	$ 20	$ 1,000
	SAWCUTTING	350	LF	$ 8	$ 2,800
	REMOVE PAVEMENT	142	SY	$ 20	$ 2,847
	REMOVE PIPE	175	LF	$ 15	$ 2,625
	REMOVE CATCH BASIN	4	EA	$ 300	$ 1,200
	12" CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL)	175	LF	$ 175	$ 30,625
	18" CONC PIPE	0	LF	$ 190	$ -
	24" CONC PIPE	0	LF	$ 210	$ -
	RELACE 18" CONC PIPE WITH PIPE BURSTING	0	LF	$ 250	$ -
	PIPE BURSTING INSERTION/PULL PIT	0	EA	$ 15,000	$ -
	CATCH BASIN TYPE 1	4	EA	$ 1,400	$ 5,600
	MANHOLES/CB	0	EA	$ 3,500	$ -
	PAVEMENT RESTORATION	142	SY	$ 20	$ 2,847
	ROADSIDE/LANDSCAPE RESTORATION	1	LS	$ 2,500	$ 2,500
	RIPRAP/BOULDERS/QUARRY SPALLS	0	CY	$ 40	$ -
	UTILITY RELOCATIONS	0	EA	$ 8,000	$ -
	TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
				Subtotal	$ 53,043
	MISC	10%			$ 5,304
	EROSION & SEDIMENTATION CONTROL	5%			$ 2,652
	TRAFFIC CONTROL	10%			$ 5,304
				Subtotal	$ 66,304
	MOBILIZATION	10%			$ 6,630
				Subtotal	$ 73,000
	CONTINGENCY	30%			$ 21,900
				Subtotal	$ 94,900
	STATE SALES TAX	8.80%			$ 8,351
		Total Estimated Construction Cost (Rounded)			$ 117,000
	INDIRECT COSTS				
	SURVEYING AND DESIGN	25%			$ 29,250
	PERMITTING	5%			$ 5,850
	CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 23,400
	EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
		Total Estimated Project Cost (Rounded)			**$ 176,000**

Notes:

1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. Work did not include site visit to perform site specific cost estimate. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.: 26

Project No: 26.1

Project Title: **Stream Restoration Downstream of Island Crest Way in 4700 Block**

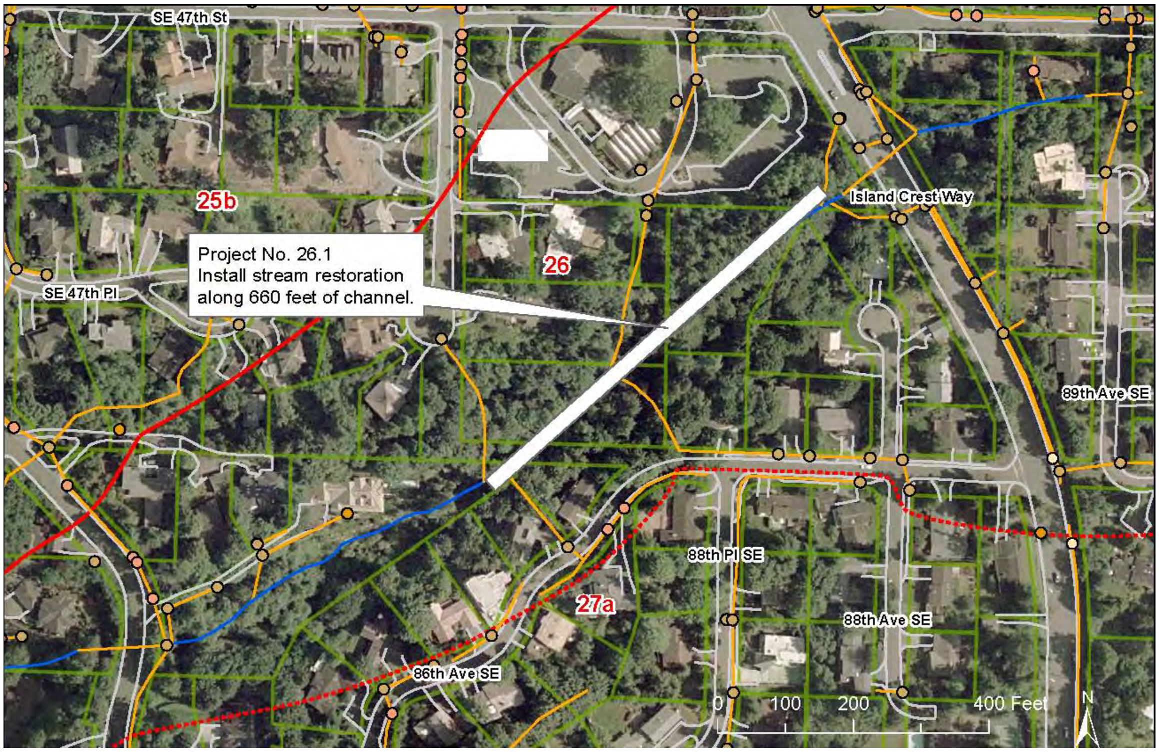
Problem Description: High streamflows in the subbasin have caused channel down-cutting in the reach between Island Crest Way and West Mercer Way. The channel erosion is largely confined to an approximate 600- to 700-foot reach immediately west of Island Crest Way, including a significant headcut (up to nine feet in height) that has the potential to travel upstream during high flows.

Project Description: This project is already being designed and is at the 30-percent design stage. The project includes stream channel restoration for approximately 660 feet of channel length. The project will stabilize the stream channel through the application of bioengineering techniques including placement of woody debris, log weirs, coir fabric, natural streambed rock material, and riparian planting.

Related Projects: None

Estimated Project Cost: $961,000 construction plus $100,000 engineering for a total of $1,061,000. (Note that this estimate was prepared by others as part of a 30-percent design. The estimate, attached, does not include the same permitting, design, and construction contingencies as other cost estimates developed for this Comprehensive Basin Review plan.)

Looking Upstream at Headcut 1/5/2006



Project Location Map

CITY OF MERCER ISLAND
UPPER BASIN 26 WATERCOURSE STABILIZATION PROJECT
CLASS 3 COST OPINION (30 PERCENT DESIGN SUBMITTAL)

DATE: 6/5/2006
PROJECT NO.: 344328.16.03
ESTIMATE BY: C. Moore
REVIEWED BY: J. Kapla

Item No.	Item Description	Plan Quantity	Unit	Unit Price (2007)	Extended Amount
	SECTION: 1 PREPARATION				
1	MOBILIZATION	1	LS	$ 67,045	$ 67,045
2	CONSTRUCTION SURVEYING	1	LS	$ 4,110	$ 4,110
3	PREPARE TESC PLAN FOR STAGING AREA	1	LS	$ 690	$ 690
4	TEMPORARY ACCESS ROAD AND RESTORATION	1	LS	$ 42,030	$ 42,030
5	CLEARING AND GRUBBING	1	LS	$ 11,680	$ 11,680
6	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	0	LS		$ -
7	TREE REMOVAL 12-36 IN. DIAM.	3	EA	$ 218	$ 654
8	TEMPORARY STREAM DIVERSION	1	LS	$ 37,170	$ 37,170
9	CLEARING LIMITS FLAGGING	1400	LF	$ 1.60	$ 2,240
10	HIGH VISIBILITY CONSTRUCTION FENCING	400	LF	$ 6.00	$ 2,400
	SECTION: 2 GRADING				
11	CHANNEL & EMBANKMENT EXCAVATION	820	CY	$ 57.00	$ 46,740
12	QUARRY SPALLS	510	TN	$ 82.00	$ 41,820
13	TILL	1100	TN	$ 45.00	$ 49,500
14	ENGINEERED ORDERED OVEREXCAVATION	100	CY	$ 85.00	$ 8,500
	SECTION: 5 STORM SEWER				
15	STORM SEWER PIPE 8" DIAM	10	LF	$ 27.00	$ 270
16	HDPE STORM SEWER PIPE 12" DIAM	100	LF	$ 43.00	$ 4,300
	SECTION: 17 EROSION CONTROL AND PLANTING				
17	SILT FENCE	500	LF	$ 10.00	$ 5,000
18	PLASTIC COVERING	100	SY	$ 2.70	$ 270
19	STREET CLEANING	156	HR	$ 105	$ 16,380
20	CONSTRUCTION GEOTEXTILE FOR SEPARATION	900	SY	$ 5.00	$ 4,500
21	COCONUT FIBER BLANKET	1100	SY	$ 2.50	$ 2,750
22	STABILIZED CONSTRUCTION ENTRANCE	60	SY	$ 67.00	$ 4,020
23	ROCK CHECK DAM	2	EA	$ 183	$ 366
24	TOPSOIL TYPE C	165	CY	$ 80.00	$ 13,200
25	PSIPE SALAL, 1 GAL	396	EA	$ 18.00	$ 7,128
26	PSIPE SWORD FERN, 1 GAL	396	EA	$ 18.00	$ 7,128
27	PSIPE OREGON GRAPE, 1 GAL	396	EA	$ 18.00	$ 7,128
28	PSIPE HAZELNUT, 1 GAL	108	EA	$ 18.00	$ 1,944
29	PSIPE SNOWBERRY, 1 GAL	108	EA	$ 18.00	$ 1,944
30	PSIPE VINE MAPLE, 1 GAL	108	EA	$ 18.00	$ 1,944
31	PSIPE WESTERN RED CEDAR, 2 GAL	30	EA	$ 32.00	$ 960
32	PSIPE WESTERN HEMLOCK, 2 GAL	30	EA	$ 32.00	$ 960
33	PSIPE BIG LEAF MAPLE, 2 GAL	21	EA	$ 32.00	$ 672
34	EROSION CONTROL SEED MIX	0	LS	$ -	$ -
35	EROSION/WATER POLLUTION CONTROL	1	FA	$ 2,000	$ 2,000
36	SEDIMENT TRAP	1	LS	$ 5,870	$ 5,870

CITY OF MERCER ISLAND
UPPER BASIN 26 WATERCOURSE STABILIZATION PROJECT
CLASS 3 COST OPINION (30 PERCENT DESIGN SUBMITTAL)

DATE: 6/5/2006
PROJECT NO.: 344328.16.03
ESTIMATE BY: C. Moore
REVIEWED BY: J. Kapla

Item No.	Item Description	Plan Quantity	Unit	Unit Price (2007)	Extended Amount
	SECTION: 18 TRAFFIC				
37	TRAFFIC CONTROL LABOR	176	HR	$ 43.00	$ 7,568
38	TEMPORARY TRAFFIC CONTROL DEVICES	1	LS	$ 975	$ 975
39	COMMERCIAL HMA	15	Ton	$ 160.00	$ 2,400
	SECTION: 19 OTHER ITEMS				
40	LOG WEIR	17	EA	$ 5,495	$ 93,415
41	ROOT WAD	8	EA	$ 1,260	$ 10,080
42	ROOT WAD DEFLECTOR	5	EA	$ 1,260	$ 6,300
43	LOG DEFLECTOR	5	EA	$ 1,220	$ 6,100
44	REMOVE AND RESET EXISTING LOG	10	EA	$ 980	$ 9,800
45	STREAM ROCK	2025	TN	$ 66.00	$ 133,650
46	SANDING MIX	510	TN	$ 43.00	$ 21,930
47	CHANNEL BOULDER	67	EA	$ 91.00	$ 6,097
48	STRUCTURAL BOULDER	20	EA	$ 91.00	$ 1,820
49	MISCELANEOUS PROPERTY RESTORATION	1	FA	$ 3,000	$ 3,000
	SUBTOTAL (ROUNDED)				$ 706,000
	CONTINGENCY			25%	$ 176,500
	SUBTOTAL (ROUNDED)				$ 883,000
	SALES TAX			8.8%	$ 77,704
	TOTAL CONSTRUCTION COSTS (ROUNDED)				**$ 961,000**

NOTE: The above cost opinion is in June 2007 dollars and does not include escalation, construction management, financing, O&M or hazardous material mitigation costs. This Class 3 cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, actual site productivity, competitive market conditions, final project scope, final project schedule and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 26.1 **CHECKED BY:** msg
BY: jcb **DATE:** 5/23/2006
STREAM RESTORATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	90	LF	$ 10	$ 900
REMOVE/DISPOSE MISC DEBRIS	90	LF	$ 2	$ 180
EXCAVATION	90	CY	$ 50	$ 4,500
BOULDERS	36	TON	$ 100	$ 3,600
STREAMBED GRAVEL MIX	20	TON	$ 80	$ 1,600
LOGS	9	EA	$ 1,400	$ 12,600
ROOTWADS	3	EA	$ 900	$ 2,430
REUSE ONSITE LOGS	1	EA	$ 500	$ 450
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
ACCESS (10' WIDE)	250	LF	$ 10	$ 2,500
ACCESS RESTORATION	250	LF	$ 10	$ 2,500
RIPARIAN PLANTING AND SEEDING	90	LF	$ 30	$ 2,700
			Subtotal	$ 34,960
SPECIAL ACCESS/CONSTRUCTION	5%			$ 1,748
MISC	10%			$ 3,496
EROSION & SEDIMENTATION CONTROL	10%			$ 3,496
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 43,700
MOBILIZATION	10%			$ 4,370
			Subtotal	$ 48,000
CONTINGENCY	30%			$ 14,400
			Subtotal	$ 62,400
STATE SALES TAX	8.80%			$ 5,491
	Total Estimated Construction Cost (Rounded)			$ 77,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 19,250
PERMITTING	10%			$ 7,700
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 15,400
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	2	PARCEL	$ 500	$ 1,000
	Total Estimated Project Cost (Rounded)			**$ 120,000**

Notes:
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2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.: 27a

Project No: 27a.1

Project Title: **Channel Stabilization near 56th and West Mercer Way**

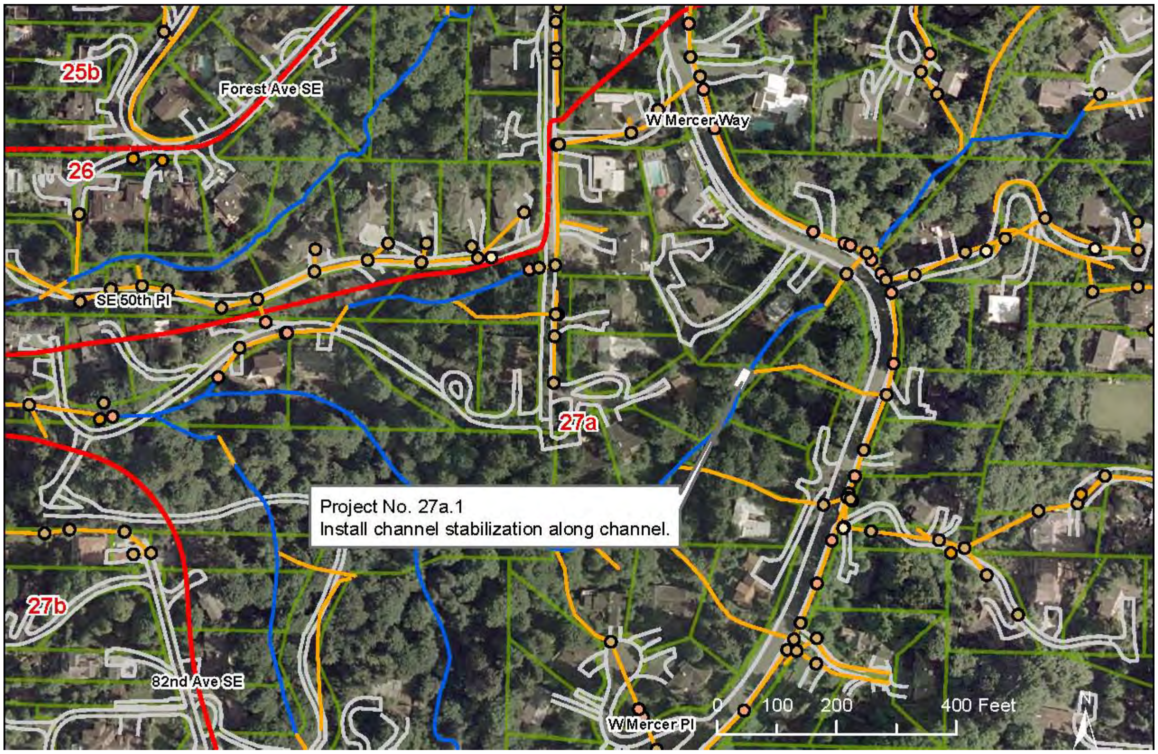
Problem Description: Streambed and bank erosion with headcut formed by 6-foot drop over 30 feet of channel in soft material. Area is subject to long-term erosion and slope failures. Located behind homes in shallow, undeveloped ravine.

Project Description: Install 30 feet of channel stabilization creating a rounded rock channel.

Related Projects None

Estimated Project Cost: $34,000

Looking Upstream 9/28/2006



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 27a.1 **CHECKED BY:** msg
BY: jcb **DATE:** 5/23/2006
CHANNEL STABILIZATION

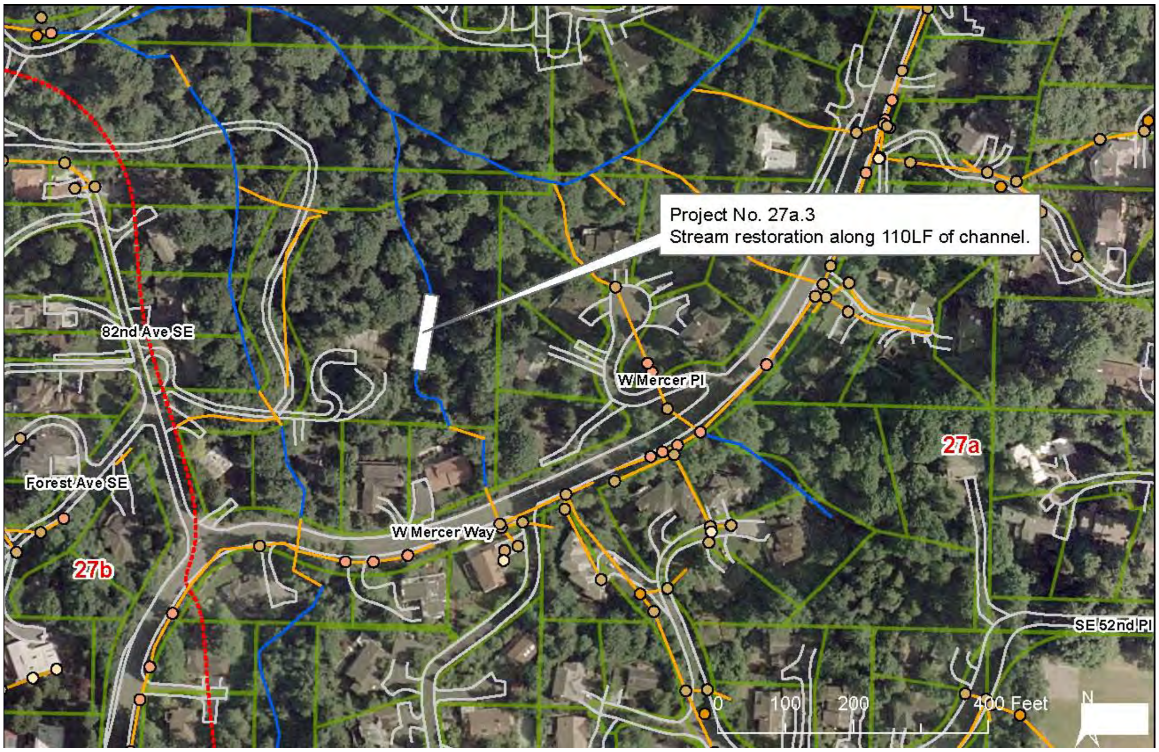
BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	30	LF	$ 10	$ 300
REMOVE/DISPOSE MISC DEBRIS	30	LF	$ 2	$ 60
EXCAVATION	15	CY	$ 40	$ 600
BOULDERS	12	TON	$ 100	$ 1,200
STREAMBED GRAVEL MIX	8	TON	$ 80	$ 600
LOGS	2	EA	$ 1,400	$ 2,100
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
ACCESS (10' WIDE)	150	LF	$ 10	$ 1,500
ACCESS RESTORATION	150	LF	$ 5	$ 750
RIPARIAN PLANTING AND SEEDING	30	LF	$ 30	$ 900
			Subtotal	$ 9,010
SPECIAL ACCESS/CONSTRUCTION	5%			$ 451
MISC	10%			$ 901
EROSION & SEDIMENTATION CONTROL	10%			$ 901
TRAFFIC CONTROL	5%			$ 451
			Subtotal	$ 11,713
MOBILIZATION	10%			$ 1,171
			Subtotal	$ 13,000
CONTINGENCY	30%			$ 3,900
			Subtotal	$ 16,900
STATE SALES TAX	8.80%			$ 1,487
	Total Estimated Construction Cost (Rounded)			$ 21,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 5,250
PERMITTING	10%			$ 2,100
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 4,200
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	2	PARCEL	$ 500	$ 1,000
	Total Estimated Project Cost (Rounded)			**$ 34,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	27a
Project No:	27a.3
Project Title:	**Stream restoration of incised channel east of 52nd Avenue SE and north of West Mercer Way.**
Problem Description:	Small channel is deeply incised for about 110 feet. The channel has a bottom width of 3 to 4 feet, a depth of 4 to 7 feet and near vertical banks in till. Headcuts of 4 and 5 feet high also occur. The rate of erosion over time is moderate. See Appendix E for a field sketch of the problem area.
Project Description:	Stream restoration and lay back the top of the banks in undeveloped ravine area.
Related Projects	None
Estimated Project Cost:	$120,000

Looking Downstream - 9/28/2006



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: **27a.3** **CHECKED BY:** **msg**
BY: **jcb** **DATE:** **5/23/2006**
STREAM RESTORATION

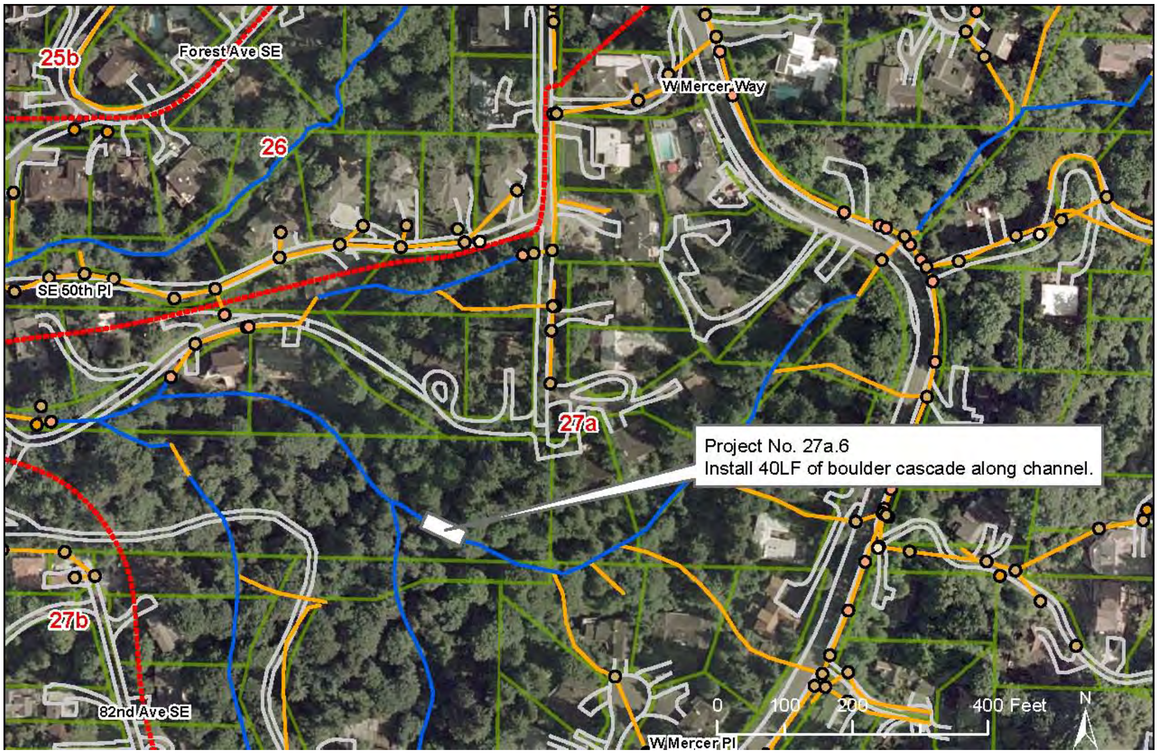
BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	110	LF	$ 10	$ 1,100
REMOVE/DISPOSE MISC DEBRIS	110	LF	$ 2	$ 220
EXCAVATION	50	CY	$ 50	$ 2,475
BOULDERS	44	TON	$ 100	$ 4,400
STREAMBED GRAVEL MIX	28	TON	$ 80	$ 2,200
LOGS	11	EA	$ 1,400	$ 15,400
ROOTWADS	3	EA	$ 900	$ 2,970
REUSE ONSITE LOGS	1	EA	$ 500	$ 550
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
ACCESS (10' WIDE)	150	LF	$ 10	$ 1,500
ACCESS RESTORATION	150	LF	$ 10	$ 1,500
RIPARIAN PLANTING AND SEEDING	110	LF	$ 30	$ 3,300
			Subtotal	$ 36,615
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 3,662
EROSION & SEDIMENTATION CONTROL	10%			$ 3,662
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 43,938
MOBILIZATION	10%			$ 4,394
			Subtotal	$ 48,000
CONTINGENCY	30%			$ 14,400
			Subtotal	$ 62,400
STATE SALES TAX	8.80%			$ 5,491
	Total Estimated Construction Cost (Rounded)			$ 77,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 19,250
PERMITTING	10%			$ 7,700
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 15,400
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	2	PARCEL	$ 500	$ 1,000
	Total Estimated Project Cost (Rounded)			**$ 120,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	27a
Project No:	27a.6
Project Title:	**Boulder Cascade to Replace Timber Dam in 5200 Block north of West Mercer Way**
Problem Description:	4-foot high dam of 6 by 6 timbers and geotextile is falling over and will release about 20 to 50 cy of stored sediment. Sanitary sewer lies downstream of dam.
Project Description:	Construct 40 feet of boulder cascade.
Related Projects	None
Estimated Project Cost:	$54,000

Looking Upstream at Failing Timber Dam 9/28/2006



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: **27a.6** **CHECKED BY:** **msg**
BY: **jcb** **DATE:** **5/23/2006**
CHANNEL STABILIZATION

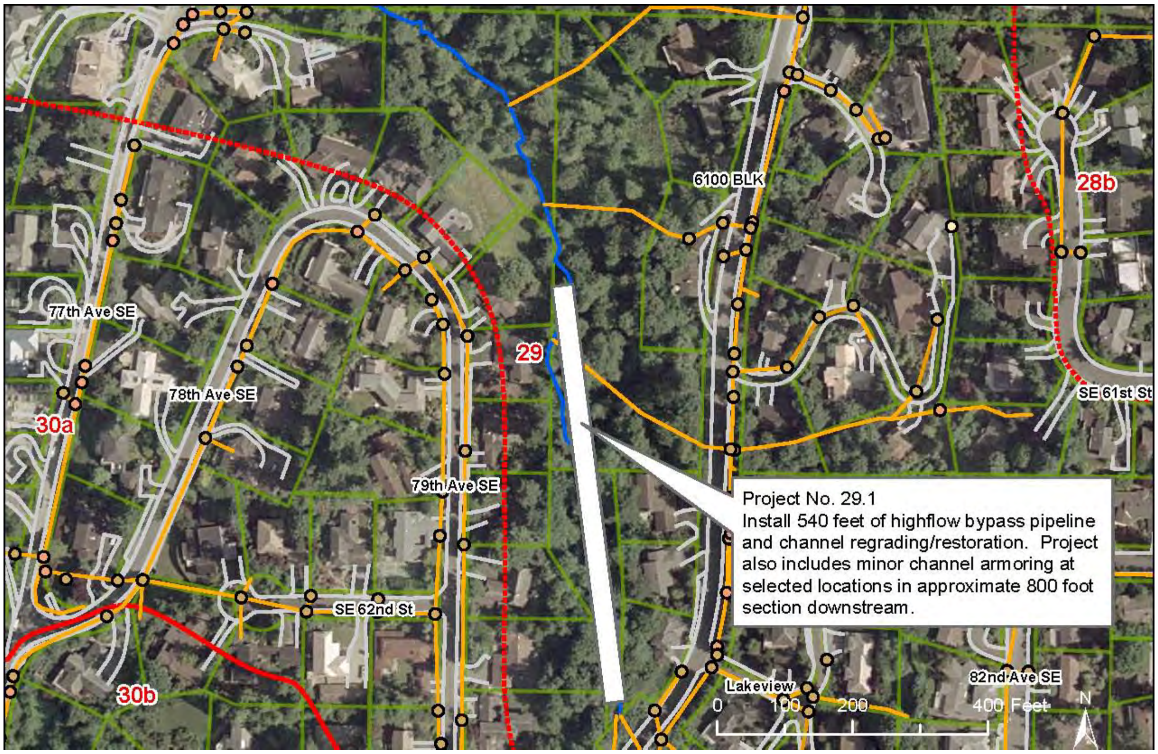
	BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	CONSTRUCTION COSTS				
	CLEARING AND GRUBBING	40	LF	$ 10	$ 400
	REMOVE/DISPOSE MISC DEBRIS	40	LF	$ 2	$ 80
	EXCAVATION	18	CY	$ 40	$ 720
	BOULDERS	16	TON	$ 100	$ 1,600
	STREAMBED GRAVEL MIX	10	TON	$ 80	$ 800
	LOGS	2	EA	$ 1,500	$ 3,000
	TEMPORARY BYPASS	1	LS	$ 3,000	$ 3,000
	ACCESS (10' WIDE)	250	LF	$ 10	$ 2,500
	ACCESS RESTORATION	250	LF	$ 10	$ 2,500
	RIPARIAN PLANTING AND SEEDING	40	LF	$ 30	$ 1,200
				Subtotal	$ 15,800
	SPECIAL ACCESS/CONSTRUCTION	0%			$ -
	MISC	10%			$ 1,580
	EROSION & SEDIMENTATION CONTROL	10%			$ 1,580
	TRAFFIC CONTROL	0%			$ -
				Subtotal	$ 18,960
	MOBILIZATION	10%			$ 1,896
				Subtotal	$ 21,000
	CONTINGENCY	30%			$ 6,300
				Subtotal	$ 27,300
	STATE SALES TAX	8.80%			$ 2,402
		Total Estimated Construction Cost (Rounded)			$ 34,000
	INDIRECT COSTS				
	SURVEYING AND DESIGN	25%			$ 8,500
	PERMITTING	10%			$ 3,400
	CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 6,800
	EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	3	PARCEL	$ 500	$ 1,500
		Total Estimated Project Cost (Rounded)			**$ 54,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	29
Project No:	29.1
Project Title:	**Stream Restoration downstream of West Mercer Way at 6200 block**
Problem Description:	Drop at culvert outlet at West Mercer Way and severe bank erosion and down cutting along approximately 600 feet of stream below West Mercer Way. Slope instability is being created such that slides have occurred along much of the Reach. In addition, there is also some less severe downcutting in the channel at some locations downstream of this 600 foot section before it enters a culvert crossing at 77th Ave SE.
Project Description:	This project is already being designed and is at the 90-percent design stage. The project includes a combination of stream highflow bypass and channel regrading and restoration for the upper approximately 530 feet of channel. The highflow bypass includes a 24-inch diameter HDPE pipeline buried below the restored channel bottom. The highflow bypass will carry high stream flows to reduce ongoing channel erosion. Channel restoration includes raising the grade of the stream, installation of rock revetments, placement of larger woody debris, and plantings. In addition, the project includes minor channel armoring using log deflectors and rock placement at select locations downstream of the highflow bypass.
Related Projects:	None
Estimated Project Cost:	$864,000 construction plus $95,000 engineering for a total of $959,000 (Note that this estimate was prepared by others as part of 90-percent design. The estimate, attached, does not include the same permitting, design, and construction contingencies as other cost estimates developed for this Comprehensive Basin Review plan.)

Looking Downstream at Sandbagged Bank 1/5/2006



Project Location Map

CITY OF MERCER ISLAND
BASIN 29 HIGH FLOW BYPASS PIPELINE AND STREAM RESTORATION
CLASS 3 COST OPINION (EQUIVALENT 30 PERCENT DESIGN LEVEL)

DATE: 6/8/2006
PROJECT NO.: 314888.08.01
ESTIMATE BY: C. Moore
REVIEWED BY: J. Kapla

Item No.	Item Description	Plan Quantity	Unit	Unit Price (2007)	Extended Amount
	SECTION: 1 PREPARATION				
1	MOBILIZATION	1	LS	$ 60,950	$ 60,950
2	CONSTRUCTION SURVEYING	1	LS	$ 4,110	$ 4,110
3	PREPARE TESC PLAN FOR STAGING AREA	1	LS	$ 690	$ 690
4	TEMPORARY ACCESS ROAD AND RESTORATION	1	LS	$ 43,380	$ 43,380
5	TEMPORARY STREAM DIVERSION	1	LS	$ 35,000	$ 35,000
6	CLEARING AND GRUBBING	1	LS	$ 11,680	$ 11,680
7	CLEARING LIMITS FLAGGING	1100	LF	$ 1.60	$ 1,760
	SECTION: 2 GRADING				
8	LIGHT LOOSE RIP RAP	255	TN	$ 94.00	$ 23,970
9	QUARRY SPALLS	500	TN	$ 82.00	$ 41,000
10	CHANNEL & EMBANKMENT EXCAVATION	655	CY	$ 48.00	$ 31,440
11	SHORING OR EXTRA EXCAVATION	1	LS	$ 4,410	$ 4,410
12	IMPORTED TILL	1750	CY	$ 62.00	$ 108,500
13	ENGINEERED ORDERED OVEREXCAVATION	100	CY	$ 85.00	$ 8,500
	SECTION: 5 STORM SEWER				
14	TEST STORM SEWER PIPE	530	LF	$ 6.10	$ 3,233
15	HDPE STORM SEWER PIPE 12" DIAM	50	LF	$ 47.00	$ 2,350
16	HDPE STORM SEWER PIPE 24" DIAM	490	LF	$ 105.00	$ 51,450
17	HDPE STORM SEWER PIPE 36" DIAM	40	LF	$ 154.00	$ 6,160
18	HDPE TRANSITION 36" TO 24" DIAM	1	LF	$ 2,340	$ 2,340
19	CULVERT INLET	2	EA	$ 5,870	$ 11,740
20	HIGH FLOW BYPASS STRUCTURE	1	LS	$ 33,320	$ 33,320
21	COLLECTOR STRUCTURE	1	EA	$ 7,600	$ 7,600
22	ENERGY DISSIPATOR	1	EA	$ 6,290	$ 6,290
	SECTION: 17 EROSION CONTROL AND PLANTING				
23	SILT FENCE	500	LF	$ 10.00	$ 5,000
24	SEDIMENT TRAP	1	LS	$ 5,870	$ 5,870
25	PLASTIC COVERING	100	SY	$ 2.70	$ 270
26	STREET CLEANING	156	HR	$ 105	$ 16,380
27	CONSTRUCTION GEOTEXTILE FOR EROSION CONTROL	40	SY	$ 5.00	$ 200
28	EROSION WATER/POLLUTION CONTROL	1	FA	$ 2,000	$ 2,000
29	TOPSOIL TYPE B	260	CY	$ 60.00	$ 15,600
30	PSIPE SALAL, 1 GAL	136	EA	$ 18.00	$ 2,448
31	PSIPE SWORD FERN, 1 GAL	379	EA	$ 18.00	$ 6,822
32	PSIPE KINNIKINNICK, 1 GAL	379	EA	$ 18.00	$ 6,822
33	PSIPE NOOTKA ROSE, 1 GAL	52	EA	$ 18.00	$ 936
34	PSIPE VINE MAPLE, 1 GAL	14	EA	$ 18.00	$ 252
35	PSIPE THIMBLEBERRY, 1 GAL	52	EA	$ 18.00	$ 936
36	PSIPE SALMONBERRY, 1 GAL	29	EA	$ 18.00	$ 522
37	PSIPE GOOSEBERRY, 1 GAL	24	EA	$ 18.00	$ 432

CITY OF MERCER ISLAND
BASIN 29 HIGH FLOW BYPASS PIPELINE AND STREAM RESTORATION
CLASS 3 COST OPINION (EQUIVALENT 30 PERCENT DESIGN LEVEL)

DATE: 6/8/2006
PROJECT NO.: 314888.08.01
ESTIMATE BY: C. Moore
REVIEWED BY: J. Kapla

Item No.	Item Description	Plan Quantity	Unit	Unit Price (2007)	Extended Amount
38	PSIPE WESTERN RED CEDAR, 2 GAL	4	EA	$ 32.00	$ 128
39	PSIPE WESTERN HEMLOCK, 2 GAL	6	EA	$ 32.00	$ 192
40	PSIPE BIG LEAF MAPLE, 2 GAL	6	EA	$ 32.00	$ 192
41	PSIPE HAZELNUT, 2 GAL	11	EA	$ 32.00	$ 352
	SECTION: 18 TRAFFIC				
42	TRAFFIC CONTROL LABOR	200	HR	$ 43.00	$ 8,600
43	TRAFFIC CONTROL SUPERVISOR	25	HR	$ 55.00	$ 1,375
44	TEMPORARY TRAFFIC CONTROL DEVICES	1	LS	$ 1,220	$ 1,220
	SECTION: 19 OTHER ITEMS				
45	ROADSIDE CLEANUP	1	LS	$ 3,450	$ 3,450
46	LOG DEFLECTOR	3	EA	$ 1,400	$ 4,200
47	ROOT WAD DEFLECTOR	3	EA	$ 1,450	$ 4,350
48	ROCK REVETMENT	190	TN	$ 103.00	$ 19,570
49	STREAM ROCK	380	TN	$ 66.00	$ 25,080
50	SANDING MIX	40	TN	$ 43.00	$ 1,720
	SUBTOTAL (ROUNDED)				$ 635,000
	CONTINGENCY			25%	$ 159,000
	SUBTOTAL (ROUNDED)				$ 794,000
	SALES TAX			8.8%	$ 69,872
	TOTAL CONSTRUCTION COSTS (ROUNDED)				**$ 864,000**

NOTE: The above cost opinion is in June 2007 dollars and does not include escalation, construction management, financing, O&M or hazardous material mitigation costs. This Class 3 cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, actual site productivity, competitive market conditions, final project scope, final project schedule and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

PROJECT SUMMARY SHEET

Basin No.:	29
Project No:	29.2
Project Title:	**140 LF butt-fused HDPE pipe on west side of West Mercer Way in 6100 block**
Problem Description:	Very steep channel has created a headcut and incised into the east bank of the main stem of the creek. The small, narrow channel is up to 12 feet deep and rapidly eroding. See Appendix E for a field sketch of the problem area.
Project Description:	Butt-fused HDPE bypass pipe from West Mercer Way down the steep bank to the ravine bottom, a distance of 140 feet. New manhole and anchor near the street. All flow will be conveyed in the pipe.
Related Projects	None
Estimated Project Cost:	$115,000

Looking at 10’ Incised channel 12/14/2005

Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 29.2 **CHECKED BY: msg**
BY: jcb **DATE: 5/23/2006**
BYPASS PIPE

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	140	SY	$ 20	$ 2,800
EXCAVATION	10	CY	$ 40	$ 400
RIPRAP/BOULDERS/QUARRY SPALLS	5	CY	$ 120	$ 600
PIPE ANCHORS	2	EA	$ 800	$ 1,493
12" BUTT FUSED HDPE PIPE	140	LF	$ 75	$ 10,500
ANCHOR BLOCK AND SPECIAL FITTINGS	1	EA	$ 5,000	$ 5,000
MANHOLES/CB	2	EA	$ 3,500	$ 7,000
UTILITY RELOCATIONS	0	EA	$ 8,000	$ -
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
ACCESS (10' WIDE)	25	LF	$ 10	$ 250
RESTORATION OF ACCESS AND AREA	186	SY	$ 15	$ 2,796
			Subtotal	$ 31,839
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 3,184
EROSION & SEDIMENTATION CONTROL	10%			$ 3,184
TRAFFIC CONTROL	10%			$ 3,184
			Subtotal	$ 41,391
MOBILIZATION	10%			$ 4,139
			Subtotal	$ 46,000
CONTINGENCY	30%			$ 13,800
			Subtotal	$ 59,800
STATE SALES TAX	8.80%			$ 5,262
	Total Estimated Construction Cost (Rounded)			$ 74,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 18,500
PERMITTING	10%			$ 7,400
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 14,800
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$ 500	$ 500
	Total Estimated Project Cost (Rounded)			**$ 115,000**

Notes:
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2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.: 29

Project No: D29.2

Project Title: **SE 65th St between 80th Ave SE and 81st Ave SE**

Problem Description: The outlet end of the pipe discharging to the watercourse is collapsed and there is cracking along the 24-inch-diameter pipe.

Project Description: Replace approximately 100 feet of 24-inch-diameter pipe from where the cracking starts to the outlet (further investigation may show that the entire length does not need to be replaced).

Related Projects None

Estimated Project Cost: $92,000

– No Photo Available – See Appendix F for detailed TV inspection.

Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: D29.2 **CHECKED BY:** msg
BY: jlg **DATE:** 5/10/2006
STORM DRAINAGE PIPES

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
ACCESS (10' WIDE)	200	LF	$ 10	$ 2,000
ACESS RESTORATION	122	SY	$ 5	$ 611
CLEARING AND GRUBBING	25	SY	$ 20	$ 500
SAWCUTTING	0	LF	$ 8	$ -
REMOVE PAVEMENT	0	SY	$ 20	$ -
REMOVE PIPE	100	LF	$ 15	$ 1,500
REMOVE CATCH BASIN	0	EA	$ 300	$ -
12" CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL)	0	LF	$ 175	$ -
18" CONC PIPE	0	LF	$ 190	$ -
24" CONC PIPE	100	LF	$ 210	$ 21,000
RELACE 18" CONC PIPE WITH PIPE BURSTING	0	LF	$ 250	$ -
PIPE BURSTING INSERTION/PULL PIT	0	EA	$ 15,000	$ -
CATCH BASIN TYPE 1	0	EA	$ 1,400	$ -
MANHOLES/CB	0	EA	$ 3,500	$ -
PAVEMENT RESTORATION	0	SY	$ 20	$ -
ROADSIDE/LANDSCAPE RESTORATION	1	LS	$ 2,000	$ 2,000
RIPRAP/BOULDERS/QUARRY SPALLS	5	CY	$ 40	$ 200
UTILITY RELOCATIONS	0	EA	$ 8,000	$ -
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
			Subtotal	$ 28,811
MISC	10%			$ 2,881
EROSION & SEDIMENTATION CONTROL	5%			$ 1,441
TRAFFIC CONTROL	5%			$ 1,441
			Subtotal	$ 34,573
MOBILIZATION	10%			$ 3,457
			Subtotal	$ 38,000
CONTINGENCY	30%			$ 11,400
			Subtotal	$ 49,400
STATE SALES TAX	8.80%			$ 4,347
	Total Estimated Construction Cost (Rounded)			$ 61,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 15,250
PERMITTING	5%			$ 3,050
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 12,200
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$ 500	$ 500
	Total Estimated Project Cost (Rounded)			**$ 92,000**

Notes:

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2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. Work did not include site visit to perform site specific cost estimate. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	32
Project No:	D32a.2
Project Title:	**West Mercer Way Near House #7625**
Problem Description:	Pipe material varies from CMP to concrete and many connections are poor.
Project Description:	Replace approximately 8 feet of 12-inch-diameter concrete pipe in the lower section of the 60-foot-long reach. Additional investigations are necessary to determine if any other sections of the reach need to be replaced.
Related Projects	None
Estimated Project Cost:	$25,000

– No Photo Available – See Appendix F for detailed TV inspection.

Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: D32a.2 **CHECKED BY:** msg
BY: jlg **DATE:** 5/10/2006
STORM DRAINAGE PIPES

	BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	CONSTRUCTION COSTS				
	ACCESS (10' WIDE)	0	LF	$ 10	$ -
	ACESS RESTORATION	0	SY	$ 5	$ -
	CLEARING AND GRUBBING	25	SY	$ 20	$ 500
	SAWCUTTING	80	LF	$ 8	$ 640
	REMOVE PAVEMENT	14	SY	$ 20	$ 284
	REMOVE PIPE	8	LF	$ 15	$ 120
	REMOVE CATCH BASIN	1	EA	$ 300	$ 300
	12" CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL)	8	LF	$ 175	$ 1,400
	18" CONC PIPE	0	LF	$ 190	$ -
	24" CONC PIPE	0	LF	$ 210	$ -
	RELACE 18" CONC PIPE WITH PIPE BURSTING	0	LF	$ 250	$ -
	PIPE BURSTING INSERTION/PULL PIT	0	EA	$ 15,000	$ -
	CATCH BASIN TYPE 1	1	EA	$ 1,400	$ 1,400
	MANHOLES/CB	0	EA	$ 3,500	$ -
	PAVEMENT RESTORATION	14	SY	$ 20	$ 284
	ROADSIDE/LANDSCAPE RESTORATION	1	LS	$ 2,000	$ 2,000
	RIPRAP/BOULDERS/QUARRY SPALLS	0	CY	$ 40	$ -
	UTILITY RELOCATIONS	0	EA	$ 8,000	$ -
	TEMPORARY BYPASS	1	LS	$ 500	$ 500
				Subtotal	$ 7,429
	MISC	10%			$ 743
	EROSION & SEDIMENTATION CONTROL	5%			$ 371
	TRAFFIC CONTROL	5%			$ 371
				Subtotal	$ 8,915
	MOBILIZATION	10%			$ 891
				Subtotal	$ 10,000
	CONTINGENCY	30%			$ 3,000
				Subtotal	$ 13,000
	STATE SALES TAX	8.80%			$ 1,144
		Total Estimated Construction Cost (Rounded)			$ 16,000
	INDIRECT COSTS				
	SURVEYING AND DESIGN	25%			$ 4,000
	PERMITTING	5%			$ 800
	CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 3,200
	EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$ 500	$ 500
		Total Estimated Project Cost (Rounded)			**$ 25,000**

Notes:

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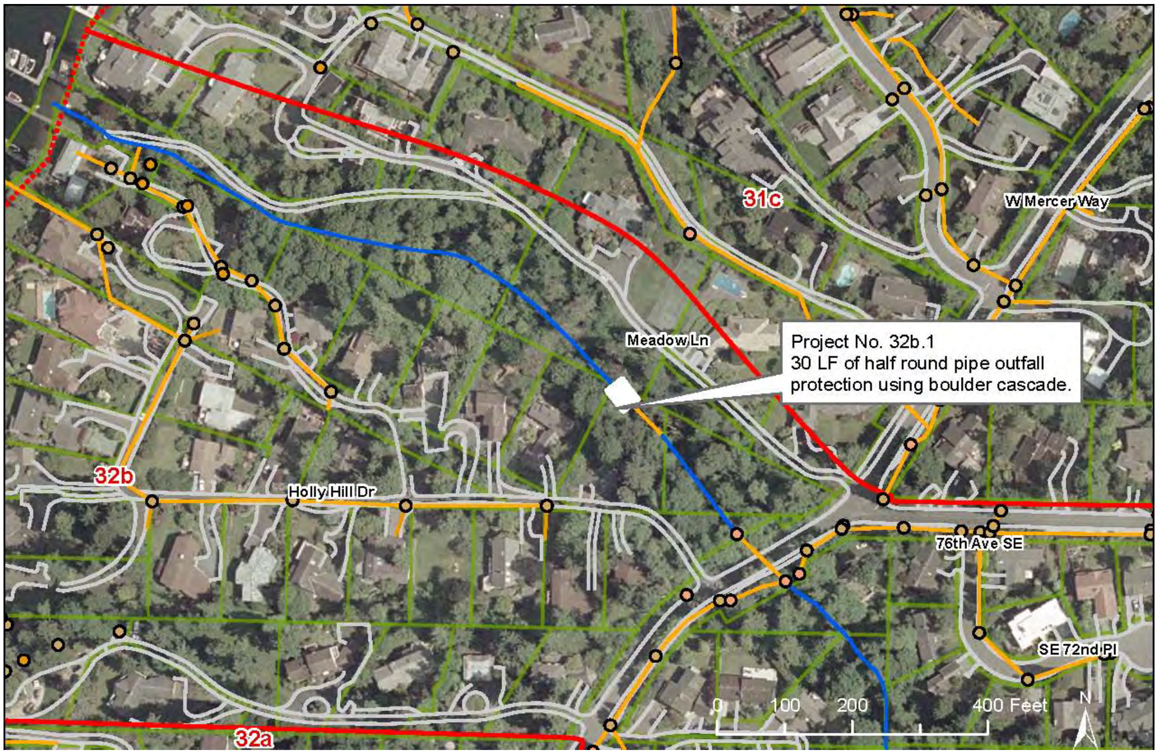
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	32
Project No:	32b.1
Project Title:	**30 LF of Boulder Cascade as outfall protection for half round pipe south of Meadow Lane, and west of West Mercer Way**
Problem Description:	Below the outlet of a 48 inch diameter, half round CMP conveyance pipe, the channel is scoured and drops 3 to 5 vertical feet over 15 to 20 linear feet. Channel is also scouring horizontally below culvert outlet. Water is also flowing along the underside of the half round pipe. Banks are steep, unvegetated, composed of very dense silt and retreating. Channel bottom lacks any substrate and consists of smooth, very dense silt.
Project Description:	Construct approximately 30 linear feet of boulder cascade for outfall protection below half round pipe outlet.
Related Projects	32b.2 (located downstream)
Estimated Project Cost:	$38,000

Looking Upstream 10/20/2006



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: **32b.1** **CHECKED BY:** **jcb**
BY: **sb** **DATE:** **11/30/2006**
OUTLET PROTECTION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	30	LF	$ 10	$ 300
REMOVE/DISPOSE MISC DEBRIS	30	LF	$ 2	$ 60
EXCAVATION	10	CY	$ 50	$ 500
BOULDERS	36	TON	$ 100	$ 3,600
STREAMBED GRAVEL MIX	5	TON	$ 80	$ 400
LOGS	2	EA	$ 1,400	$ 2,800
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
ACCESS (10' WIDE)	50	LF	$ 10	$ 500
ACCESS RESTORATION	50	LF	$ 10	$ 500
RIPARIAN PLANTING AND SEEDING	30	LF	$ 30	$ 900
			Subtotal	$ 10,560
SPECIAL ACCESS/CONSTRUCTION	5%			$ 528
MISC	10%			$ 1,056
EROSION & SEDIMENTATION CONTROL	10%			$ 1,056
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 13,200
MOBILIZATION	10%			$ 1,320
			Subtotal	$ 15,000
CONTINGENCY	30%			$ 4,500
			Subtotal	$ 19,500
STATE SALES TAX	8.80%			$ 1,716
	Total Estimated Construction Cost (Rounded)			$ 24,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 6,000
PERMITTING	10%			$ 2,400
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 4,800
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	2	PARCEL	$ 500	$ 1,000
	Total Estimated Project Cost (Rounded)			**$ 38,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
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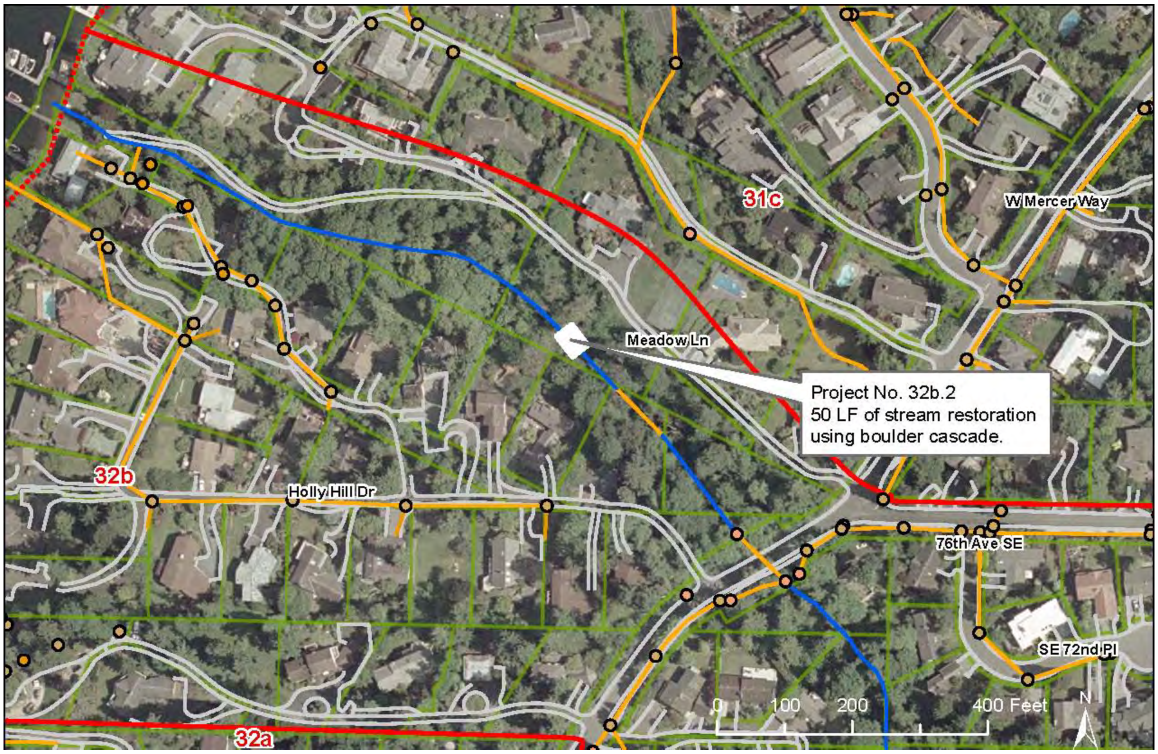
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	32
Project No:	32b.2
Project Title:	**Boulder cascade at headcut in incised stream channel south of Meadow Lane and west of West Mercer Way**
Problem Description:	Approximately 5 to 7 foot deep headcut through very dense silt. Below headcut channel is highly incised with vertical, unvegetated banks. Channel bottom has little loose substrate, and consists of very dense silt.
Project Description:	Construct approximately 50 linear feet of boulder cascade, regrade upper banks and replace invasive plants with native vegetation.
Related Projects	32b.1 (located upstream)
Estimated Project Cost:	$55,000

Looking Upstream 10/20/2006



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 32b.2 **CHECKED BY:** jcb
BY: bs **DATE:** 11/30/2006
STREAM RESTORATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	50	LF	$ 10	$ 500
REMOVE/DISPOSE MISC DEBRIS	50	LF	$ 2	$ 100
EXCAVATION	20	CY	$ 50	$ 1,000
BOULDERS	60	TON	$ 100	$ 6,000
STREAMBED GRAVEL MIX	5	TON	$ 80	$ 400
LOGS	3	EA	$ 1,400	$ 4,200
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
ACCESS (10' WIDE)	75	LF	$ 10	$ 750
ACCESS RESTORATION	75	LF	$ 10	$ 750
RIPARIAN PLANTING AND SEEDING	50	LF	$ 30	$ 1,500
			Subtotal	$ 16,200
SPECIAL ACCESS/CONSTRUCTION	5%			$ 810
MISC	10%			$ 1,620
EROSION & SEDIMENTATION CONTROL	10%			$ 1,620
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 20,250
MOBILIZATION	10%			$ 2,025
			Subtotal	$ 22,000
CONTINGENCY	30%			$ 6,600
			Subtotal	$ 28,600
STATE SALES TAX	8.80%			$ 2,517
	Total Estimated Construction Cost (Rounded)			$ 35,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 8,750
PERMITTING	10%			$ 3,500
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 7,000
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$ 500	$ 500
	Total Estimated Project Cost (Rounded)			**$ 55,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	37b
Project No:	37b.1
Project Title:	**Catch basin and pipe at 8020 Block of East Mercer Way**
Problem Description:	Outfall erosion from 8-foot high drop and erosion from street runoff is threatening driveway
Project Description:	Install a deep type 2 catch basin in street shoulder with an outlet pipe 8 feet lower at the level of the downstream channel. Catch basin would also allow collection of problematic street drainage. Temporary access could be accomplished from the private drive.
Related Projects	Solution being designed by homeowner's engineer
Estimated Project Cost:	$64,000

Flow from Pipe Outlet 3/3/2006

Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: **37b1** **CHECKED BY:** **msg**
BY: **jcb** **DATE:** **5/23/2006**
STORM DRAINAGE PIPES

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	20	SY	$ 20	$ 400
EXCAVATION	20	CY	$ 40	$ 800
RIPRAP/BOULDERS/QUARRY SPALLS	10	CY	$ 80	$ 800
PAVEMENT RESTORATION	1	LS	$ 2,000	$ 2,000
24" CPEP PIPE	20	LF	$ 60	$ 1,200
ANCHOR BLOCK AND SPECIAL FITTINGS	0	EA	$ 5,000	$ -
MANHOLES/CB	1	EA	$ 3,500	$ 3,500
UTILITY RELOCATIONS	1	EA	$ 8,000	$ 8,000
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
ACCESS (10' WIDE)	0	LF	$ 10	$ -
RESTORATION OF ACCESS AND AREA	24	SY	$ 15	$ 367
			Subtotal	$ 18,067
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 1,807
EROSION & SEDIMENTATION CONTROL	10%			$ 1,807
TRAFFIC CONTROL	10%			$ 1,807
			Subtotal	$ 23,487
MOBILIZATION	10%			$ 2,349
			Subtotal	$ 26,000
CONTINGENCY	30%			$ 7,800
			Subtotal	$ 33,800
STATE SALES TAX	8.80%			$ 2,974
	Total Estimated Construction Cost (Rounded)			$ 42,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 10,500
PERMITTING	5%			$ 2,100
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 8,400
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$ 500	$ 500
	Total Estimated Project Cost (Rounded)			**$ 64,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	39a
Project No:	39a.1
Project Title:	**Channel Stabilization Downstream of SE 76th Street**
Problem Description:	Downcutting of the channel along 40 feet of channel that is 6 inches to 2 feet deep and slopes 10 to 30%. The downcutting is not related to the culvert outlet. The contributing drainage area is small and there is no threat to any structures. The problem is relatively minor. The project site is located east of 7523 East Mercer Way. See Appendix E for a field sketch of the problem area.
Project Description:	Install channel stabilization along the reach. These would be located on private property, so easements will be required. Temporary access could be accomplished from the private drive.
Related Projects	None
Estimated Project Cost:	$28,000

Looking Upstream 9/28/2005

Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 39a.1 **CHECKED BY: msg**
BY: jcb **DATE: 5/23/2006**
CHANNEL STABILIZATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	40	LF	$ 10	$ 400
REMOVE/DISPOSE MISC DEBRIS	40	LF	$ 2	$ 80
EXCAVATION	18	CY	$ 40	$ 720
SIDE ROOF LEADER EXTENSION	0	EA	$ 500	$ 200
BOULDERS	16	TON	$ 100	$ 1,600
STREAMBED GRAVEL MIX	10	TON	$ 80	$ 800
LOGS	2	EA	$ 1,400	$ 2,800
TEMPORARY BYPASS	1	LS	$ -	$ -
ACCESS (10' WIDE)	10	LF	$ 10	$ 100
ACCESS RESTORATION	10	LF	$ 10	$ 100
RIPARIAN PLANTING AND SEEDING	40	LF	$ 30	$ 1,200
			Subtotal	$ 8,000
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 800
EROSION & SEDIMENTATION CONTROL	10%			$ 800
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 9,600
MOBILIZATION	10%			$ 960
			Subtotal	$ 11,000
CONTINGENCY	30%			$ 3,300
			Subtotal	$ 14,300
STATE SALES TAX	8.80%			$ 1,258
	Total Estimated Construction Cost (Rounded)			$ 18,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 4,500
PERMITTING	10%			$ 1,800
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 3,600
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$ 500	$ 500
	Total Estimated Project Cost (Rounded)			**$ 28,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	42
Project No:	42.1
Project Title:	Replace about 12 sandbag check dams with rock check dams or rock vortex weirs. Also install large woody debris for bank protection.
Problem Description:	Sandbag and geotextile check dams were installed at 20 to 100 feet spacing for temporary protection of this 600-foot reach. The dams are up to 4 feet high and are beginning to fail. Some bank erosion is also occurring. There is a large amount of fine grained sand behind the dams and in the channel. South bank appears to be slide material. Much of the riparian area would be considered wetlands. Not mapped by the Watershed Company as having potential fish use.
Project Description:	Replace about 12 sandbag check dams with rock check dams or rock vortex weirs. Check dams are less expensive but rock vortex weirs may be needed to provide fish passage. Also install logs/large woody debris for bank protection.
Related Projects	None
Estimated Project Cost:	$200,000

Looking Upstream at 3' High Sandbag and Geotextile Dam 9/28/2005

Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 42.1 **CHECKED BY: msg**
BY: jcb **DATE: 5/23/2006**
check dam

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	600	LF	$ 10	$ 6,000
REMOVE/DISPOSE MISC DEBRIS	600	LF	$ 2	$ 1,200
EXCAVATION	18	CY	$ 50	$ 900
RIPRAP/BOULDERS/QUARRY SPALLS	9	CY	$ 200	$ 1,800
BANK REGRADING	1	LS	$ 10,000	$ 10,000
LOGS	10	EA	$ 1,400	$ 14,000
TEMPORARY BYPASS	1	LS	$ 7,000	$ 7,000
ACCESS (10' WIDE)	650	LF	$ 10	$ 6,500
ACCESS RESTORATION	650	LF	$ 10	$ 6,500
RIPARIAN PLANTING AND SEEDING	200	LF	$ 20	$ 4,000
			Subtotal	$ 57,900
SPECIAL ACCESS/CONSTRUCTION	5%			$ 2,895
MISC	10%			$ 5,790
EROSION & SEDIMENTATION CONTROL	10%			$ 5,790
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 72,375
MOBILIZATION	10%			$ 7,238
			Subtotal	$ 80,000
CONTINGENCY	30%			$ 24,000
			Subtotal	$ 104,000
STATE SALES TAX	8.80%			$ 9,152
	Total Estimated Construction Cost (Rounded)			$ 128,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 32,000
PERMITTING	10%			$ 12,800
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 25,600
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	3	PARCEL	$ 500	$ 1,500
	Total Estimated Project Cost (Rounded)			**$ 200,000**

Notes:
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3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.: 42

Project No: 42.1A

Project Title: Replace 2 sandbag check dams with rock weirs and provide bank protection and stream restoration along about 60 feet of bank.

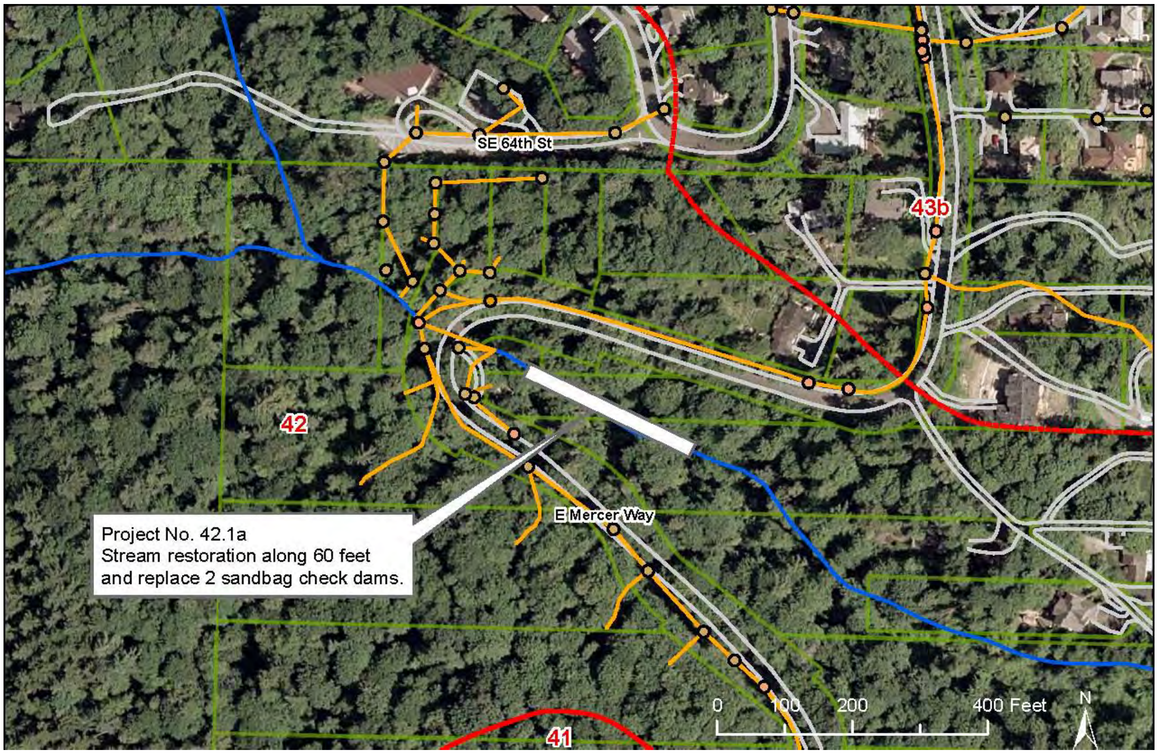
Problem Description: Two sandbag and geotextile check dams and sandbag and geotextile bank protection were temporarily installed for protection of this reach. These are beginning to fail. Some bank erosion is also occurring on the south bank. Not mapped by the Watershed Company as having potential fish use.

Project Description: Replace sandbag check dams with rock check dams or rock vortex weirs. Check dams are less expensive but rock vortex weirs may be needed to provide fish passage. Also provide bank protection and stream restoration along about 60 feet of bank. Stream restoration would include logs/large woody debris, boulders, bank regrading and planting.

Related Projects None

Estimated Project Cost: $122,000

Looking Upstream 3/3/2006



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: **42.1A** **CHECKED BY:** **msg**
BY: **jcb** **DATE:** **5/23/2006**
check dam

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	100	LF	$ 10	$ 1,000
REMOVE/DISPOSE MISC DEBRIS	100	LF	$ 2	$ 200
EXCAVATION	20	CY	$ 50	$ 1,000
BOULDERS	24	TON	$ 100	$ 2,400
STREAMBED GRAVEL MIX	15	TON	$ 90	$ 1,350
LOGS	6	EA	$ 1,400	$ 8,400
ROOTWADS	2	EA	$ 900	$ 1,620
BANK REGRADING	1	LS	$ 5,000	$ 5,000
TEMPORARY BYPASS	1	LS	$ 7,000	$ 7,000
ACCESS (10' WIDE)	300	LF	$ 10	$ 3,000
ACCESS RESTORATION	300	LF	$ 10	$ 3,000
RIPARIAN PLANTING AND SEEDING	100	LF	$ 20	$ 2,000
			Subtotal	$ 35,970
SPECIAL ACCESS/CONSTRUCTION	5%			$ 1,799
MISC	10%			$ 3,597
EROSION & SEDIMENTATION CONTROL	10%			$ 3,597
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 44,963
MOBILIZATION	10%			$ 4,496
			Subtotal	$ 49,000
CONTINGENCY	30%			$ 14,700
			Subtotal	$ 63,700
STATE SALES TAX	8.80%			$ 5,606
	Total Estimated Construction Cost (Rounded)			$ 78,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 19,500
PERMITTING	10%			$ 7,800
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 15,600
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	3	PARCEL	$ 500	$ 1,500
	Total Estimated Project Cost (Rounded)			**$ 122,000**

Notes:
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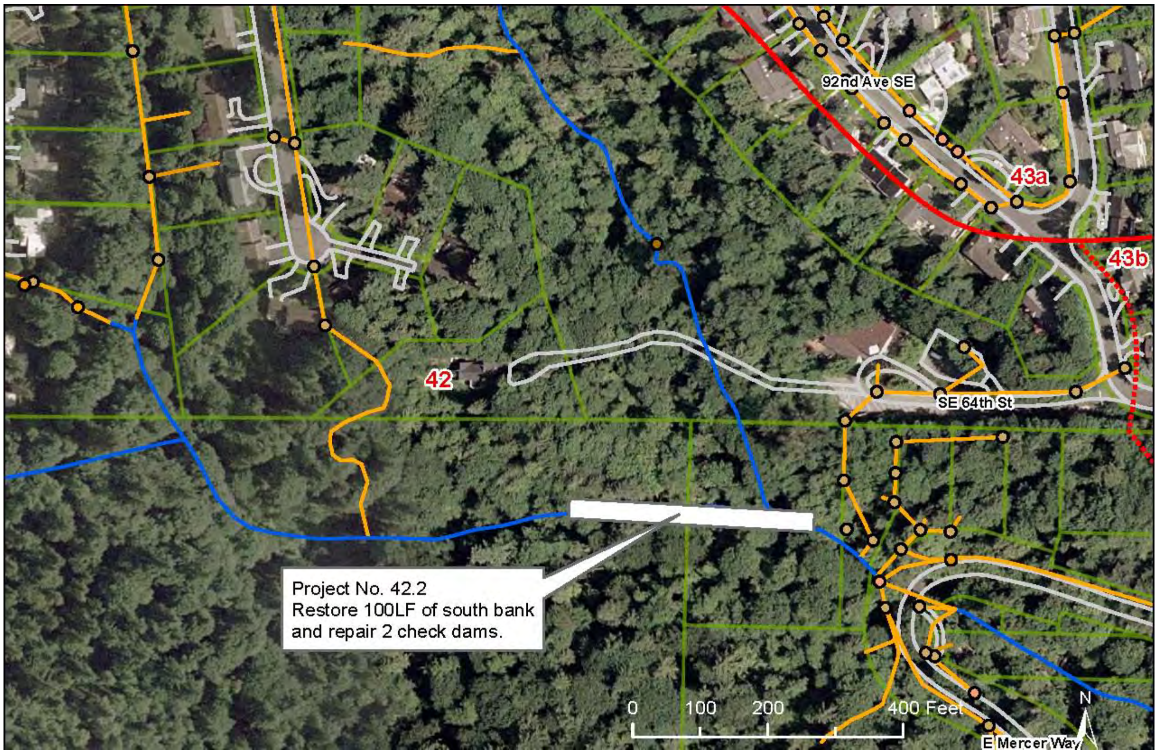
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	42
Project No:	42.2
Project Title:	100 feet of stream restoration/bank protection and repairs to two rock check dams.
Problem Description:	About 100 feet of the south bank of this 300-foot reach is experiencing erosion and needs bank protection and restoration. Two large rock check dams need repairs.
Project Description:	100 feet of stream restoration/bank protection and repairs to two rock check dams.
Related Projects	None
Estimated Project Cost:	$116,000

Looking Upstream 3/3/2006



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP				
PROJECT: 42.2		**CHECKED BY: msg**		
BY: jcb		**DATE: 5/23/2006**		
check dam				
BID ITEM	**QUANTITY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	100	LF	$ 10	$ 1,000
REMOVE/DISPOSE MISC DEBRIS	100	LF	$ 2	$ 200
EXCAVATION	5	CY	$ 50	$ 250
BOULDERS	50	TON	$ 100	$ 5,000
STREAMBED GRAVEL MIX	15	TON	$ 80	$ 1,200
LOGS	10	EA	$ 1,400	$ 14,000
ROOTWADS	3	EA	$ 900	$ 2,700
BANK REGRADING	1	LS	$ 1,000	$ 1,000
TEMPORARY BYPASS	1	LS	$ 7,000	$ 7,000
ACCESS (10' WIDE)	50	LF	$ 10	$ 500
ACCESS RESTORATION	50	LF	$ 10	$ 500
RIPARIAN PLANTING AND SEEDING	100	LF	$ 20	$ 2,000
			Subtotal	$ 35,350
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 3,535
EROSION & SEDIMENTATION CONTROL	10%			$ 3,535
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 42,420
MOBILIZATION	10%			$ 4,242
			Subtotal	$ 47,000
CONTINGENCY	30%			$ 14,100
			Subtotal	$ 61,100
STATE SALES TAX	8.80%			$ 5,377
	Total Estimated Construction Cost (Rounded)			$ 75,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 18,750
PERMITTING	10%			$ 7,500
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 15,000
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
	Total Estimated Project Cost (Rounded)			**$ 116,000**

Notes:
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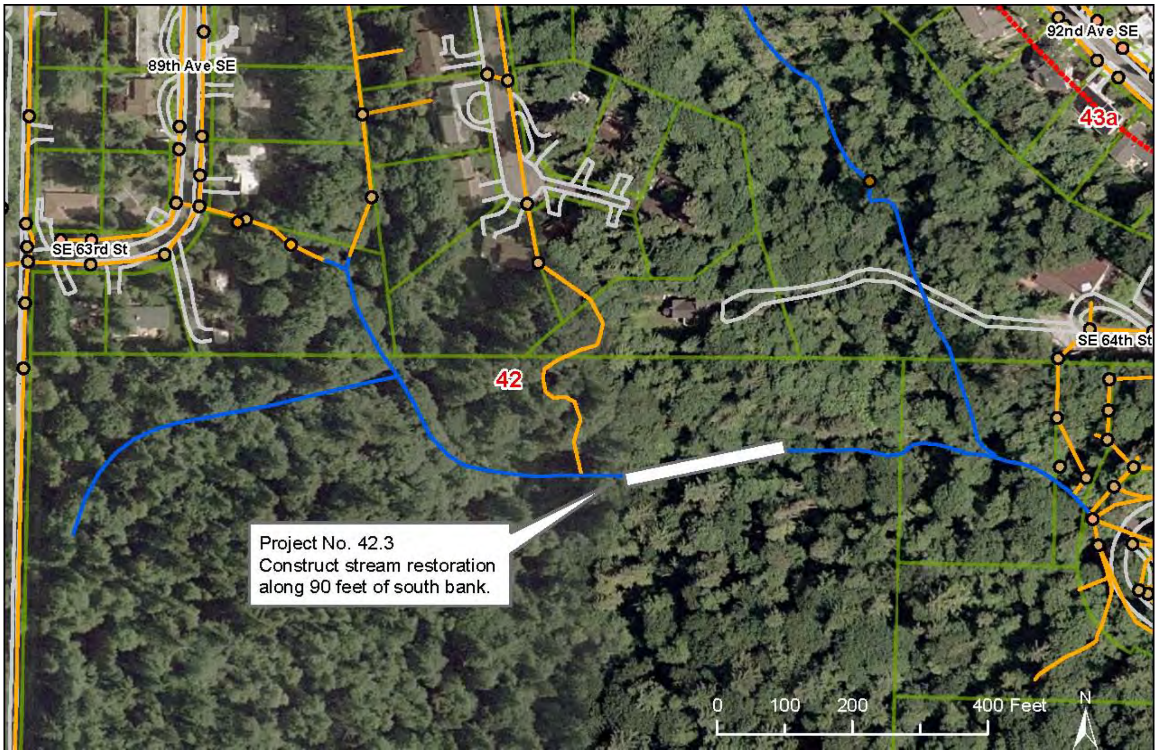
PROJECT SUMMARY SHEET

Basin No.:	42
Project No:	42.3
Project Title:	Stream restoration to increase bank stability along about 90 feet of the south bank
Problem Description:	South bank is a landslide area and consists of soft, wet material that is subject to loss by flowing water and by spring sapping. About 90 feet of this 270-foot reach has problematic erosion.
Project Description:	Stream restoration to increase bank stability along about 90 feet of the south bank. Work will include placement of boulders and logs as well as planting of water-loving, shade-tolerant plants such as salmonberry. Planting may be as individuals or as wattles.
Related Projects	None
Estimated Project Cost:	$91,000

Looking Upstream 3/3/2006



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: **42.3** | **CHECKED BY:** **msg**
BY: **jcb** | **DATE:** **5/23/2006**
STREAM RESTORATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	90	LF	$ 10	$ 900
REMOVE/DISPOSE MISC DEBRIS	90	LF	$ 2	$ 180
EXCAVATION	5	CY	$ 50	$ 250
BOULDERS	30	TON	$ 100	$ 3,000
STREAMBED GRAVEL MIX	20	TON	$ 80	$ 1,600
LOGS	9	EA	$ 1,400	$ 12,600
ROOTWADS	3	EA	$ 900	$ 2,430
REUSE ONSITE LOGS	1	EA	$ 500	$ 450
TEMPORARY BYPASS	1	LS	$ 3,000	$ 3,000
ACCESS (10' WIDE)	50	LF	$ 10	$ 500
ACCESS RESTORATION	50	LF	$ 10	$ 500
RIPARIAN PLANTING AND SEEDING	90	LF	$ 30	$ 2,700
			Subtotal	$ 28,110
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 2,811
EROSION & SEDIMENTATION CONTROL	10%			$ 2,811
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 33,732
MOBILIZATION	10%			$ 3,373
			Subtotal	$ 37,000
CONTINGENCY	30%			$ 11,100
			Subtotal	$ 48,100
STATE SALES TAX	8.80%			$ 4,233
	Total Estimated Construction Cost (Rounded)			$ 59,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 14,750
PERMITTING	10%			$ 5,900
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 11,800
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
	Total Estimated Project Cost (Rounded)			**$ 91,000**

Notes:

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3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	42
Project No:	42.4
Project Title:	**Stream restoration to increase bank stability along about 130 feet of the south bank. Also place riprap on creekside of sanitary sewer manhole.**
Problem Description:	Bank sloughing and spring sapping exists along about one-third of the south bank of this 400-foot reach. Previous restoration work done but additional work is needed. On the north bank the creek runs adjacent to sanitary sewer manhole and is armored with quarry spalls which may be too small in size for adequate protection.
Project Description:	Stream restoration to increase bank stability along about 130 feet of the south bank. Work will include placement of boulders and logs as well as planting of water-loving, shade-tolerant plants such as salmonberry. Planting may be as individuals or as wattles. Also place riprap on creekside of sanitary sewer manhole.
Related Projects	None
Estimated Project Cost:	$136,000

Looking Upstream 3/3/2006

Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 42.4 **CHECKED BY:** msg
BY: jcb **DATE:** 5/23/2006
STREAM RESTORATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	130	LF	$ 10	$ 1,300
REMOVE/DISPOSE MISC DEBRIS	130	LF	$ 2	$ 260
EXCAVATION	5	CY	$ 50	$ 250
BOULDERS	65	TON	$ 100	$ 6,500
STREAMBED GRAVEL MIX	30	TON	$ 80	$ 2,400
LOGS	13	EA	$ 1,400	$ 18,200
ROOTWADS	4	EA	$ 900	$ 3,510
REUSE ONSITE LOGS	1	EA	$ 500	$ 650
TEMPORARY BYPASS	1	LS	$ 3,000	$ 3,000
ACCESS (10' WIDE)	100	LF	$ 10	$ 1,000
ACCESS RESTORATION	100	LF	$ 10	$ 1,000
RIPARIAN PLANTING AND SEEDING	130	LF	$ 30	$ 3,900
			Subtotal	$ 41,970
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 4,197
EROSION & SEDIMENTATION CONTROL	10%			$ 4,197
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 50,364
MOBILIZATION	10%			$ 5,036
			Subtotal	$ 55,000
CONTINGENCY	30%			$ 16,500
			Subtotal	$ 71,500
STATE SALES TAX	8.80%			$ 6,292
	Total Estimated Construction Cost (Rounded)			$ 88,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 22,000
PERMITTING	10%			$ 8,800
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 17,600
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
	Total Estimated Project Cost (Rounded)			**$ 136,000**

Notes:
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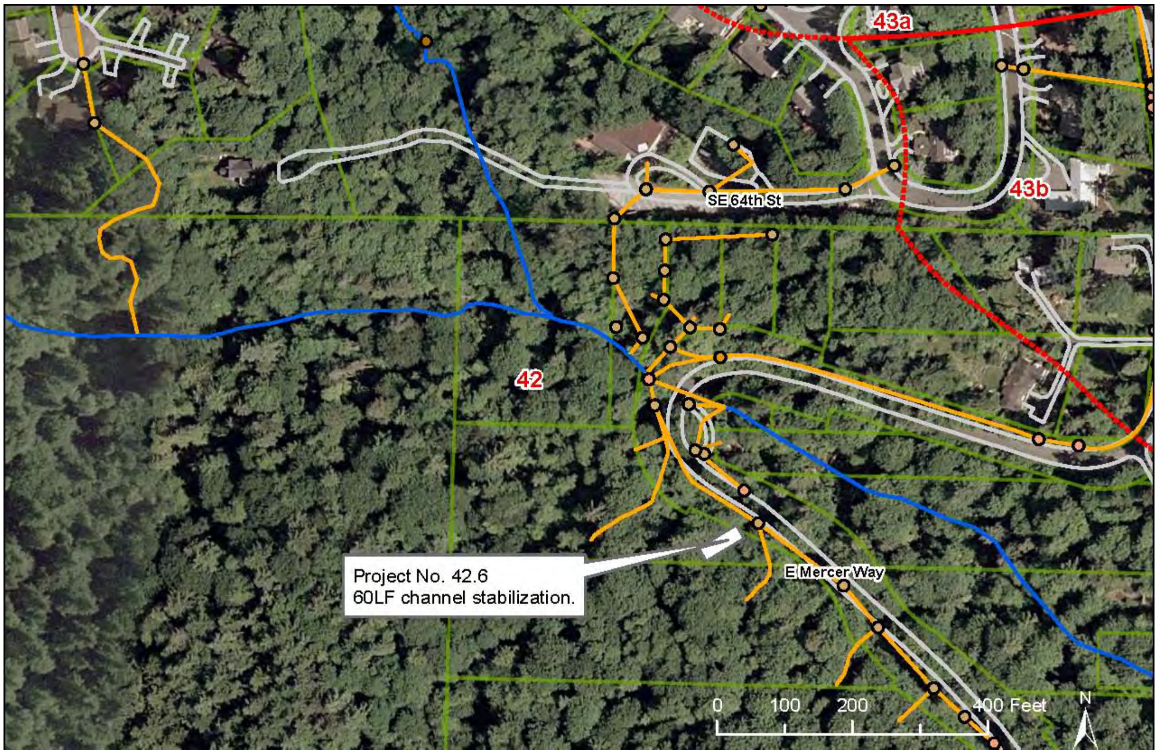
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	42
Project No:	42.6
Project Title:	**60 of channel stabilization**
Problem Description:	Erosion and headcutting of soft bed and banks in small steep water course with undeveloped drainage area. Site is off East Mercer Way.
Project Description:	60 of channel stabilization
Related Projects	None
Estimated Project Cost:	$65,000

Looking Upstream from East Mercer Way 3/3/2006



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: **42.6** **CHECKED BY:** **msg**
BY: **jcb** **DATE:** **5/23/2006**
CHANNEL STABILIZATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	100	LF	$ 10	$ 1,000
REMOVE/DISPOSE MISC DEBRIS	100	LF	$ 2	$ 200
EXCAVATION	50	CY	$ 50	$ 2,500
BOULDERS	35	TON	$ 100	$ 3,500
STREAMBED GRAVEL MIX	20	TON	$ 80	$ 1,600
LOGS	4	EA	$ 1,400	$ 5,600
TEMPORARY BYPASS	1	LS	$ -	$ -
ACCESS (10' WIDE)	50	LF	$ 10	$ 500
ACCESS RESTORATION	60	LF	$ 10	$ 600
RIPARIAN PLANTING AND SEEDING	100	LF	$ 30	$ 3,000
			Subtotal	$ 18,500
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 1,850
EROSION & SEDIMENTATION CONTROL	10%			$ 1,850
TRAFFIC CONTROL	10%			$ 1,850
			Subtotal	$ 24,050
MOBILIZATION	10%			$ 2,405
			Subtotal	$ 26,000
CONTINGENCY	30%			$ 7,800
			Subtotal	$ 33,800
STATE SALES TAX	8.80%			$ 2,974
	Total Estimated Construction Cost (Rounded)			$ 42,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 10,500
PERMITTING	10%			$ 4,200
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 8,400
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
	Total Estimated Project Cost (Rounded)			**$ 65,000**

Notes:
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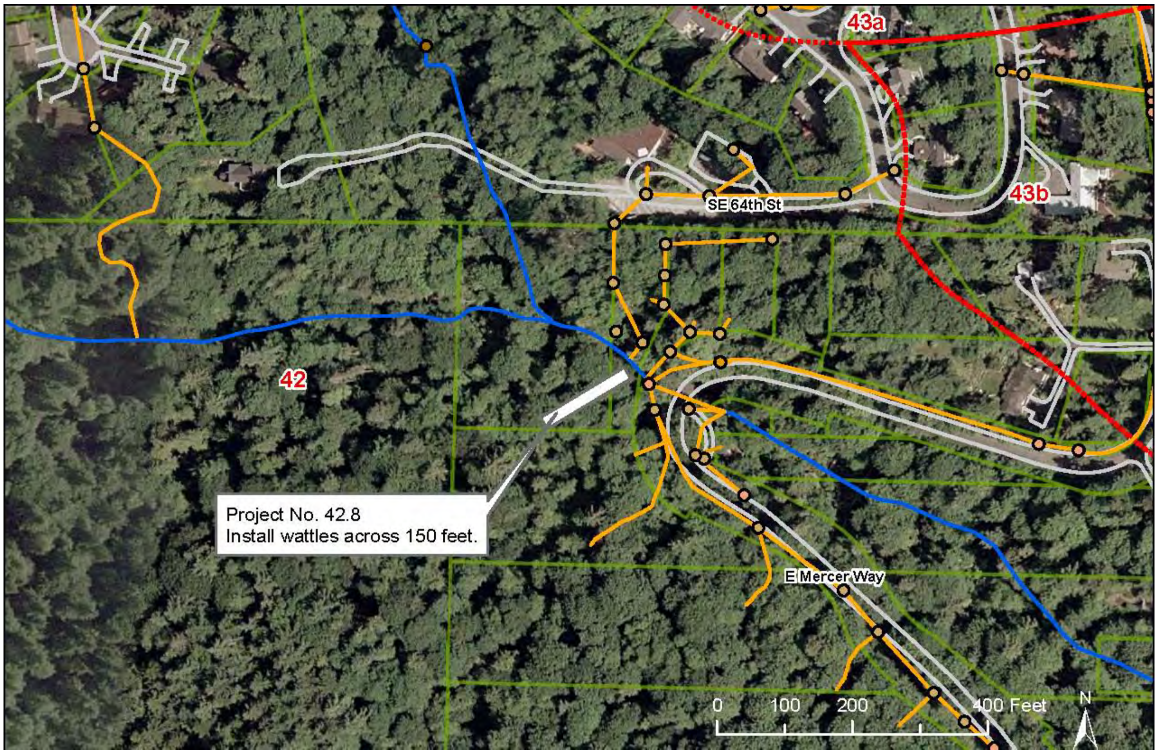
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	42
Project No:	42.8
Project Title:	**Install Wattles across 150 feet of channel west of East Mercer Way in 6500 block.**
Problem Description:	Erosion or soil movement in very small channel with limited drainage area, 40 percent gradient and erodible soil which is mapped as slide material. Significant seepage in channel and adjacent to channel suggests that spring sapping may also be contributing. Channel bed has little material sorting or armoring which also suggests spring sapping is more significant than flowing water.
Project Description:	Install wattles of willows or shade-tolerant plants such as Pacific ninebark perpendicular to the channel. Each wattle dam should be 4 to 8 feet wide. Space wattles 6 feet apart. All work would be manual.
Related Projects	None
Estimated Project Cost:	$28,000

Looking across ravine at water course poorly defined watercourse 3/3/06



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 42.8 | **CHECKED BY:** msg
BY: jcb | **DATE:** 5/23/2006
HAND LABOR STREAM RESTORATION

	BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	CONSTRUCTION COSTS				
	CLEARING AND GRUBBING	150	LF	$ 10	$ 1,500
	REMOVE/DISPOSE MISC DEBRIS	0	LF	$ 1	$ -
	HAND EXCAVATION	5	CY	$ 500	$ 2,500
	SMALL BOULDERS	0	TON	$ 250	$ -
	STREAMBED GRAVEL MIX	2	TON	$ 150	$ 300
	WATTLES	200	LF	$ 20	$ 4,000
	MANUFACTURED LOGS	0	EA	$ 5,000	$ -
	ROOTWADS	0	EA	$ 900	$ -
	REUSE ONSITE LOGS	0	EA	$ 1,000	$ -
	TEMPORARY BYPASS	0	LS	$ -	$ -
	ACCESS (10' WIDE)	0	LF	$ 10	$ -
	ACCESS RESTORATION	0	LF	$ 5	$ -
	RIPARIAN PLANTING AND SEEDING	0	LF	$ 25	$ -
				Subtotal	$ 8,300
	SPECIAL ACCESS/CONSTRUCTION	0%			$ -
	MISC	10%			$ 830
	EROSION & SEDIMENTATION CONTROL	10%			$ 830
	TRAFFIC CONTROL	0%			$ -
				Subtotal	$ 9,960
	MOBILIZATION	10%			$ 996
				Subtotal	$ 11,000
	CONTINGENCY	30%			$ 3,300
				Subtotal	$ 14,300
	STATE SALES TAX	8.80%			$ 1,258
		Total Estimated Construction Cost (Rounded)			$ 18,000
	INDIRECT COSTS				
	SURVEYING AND DESIGN	25%			$ 4,500
	PERMITTING	10%			$ 1,800
	CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 3,600
	EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
		Total Estimated Project Cost (Rounded)			**$ 28,000**

Notes:
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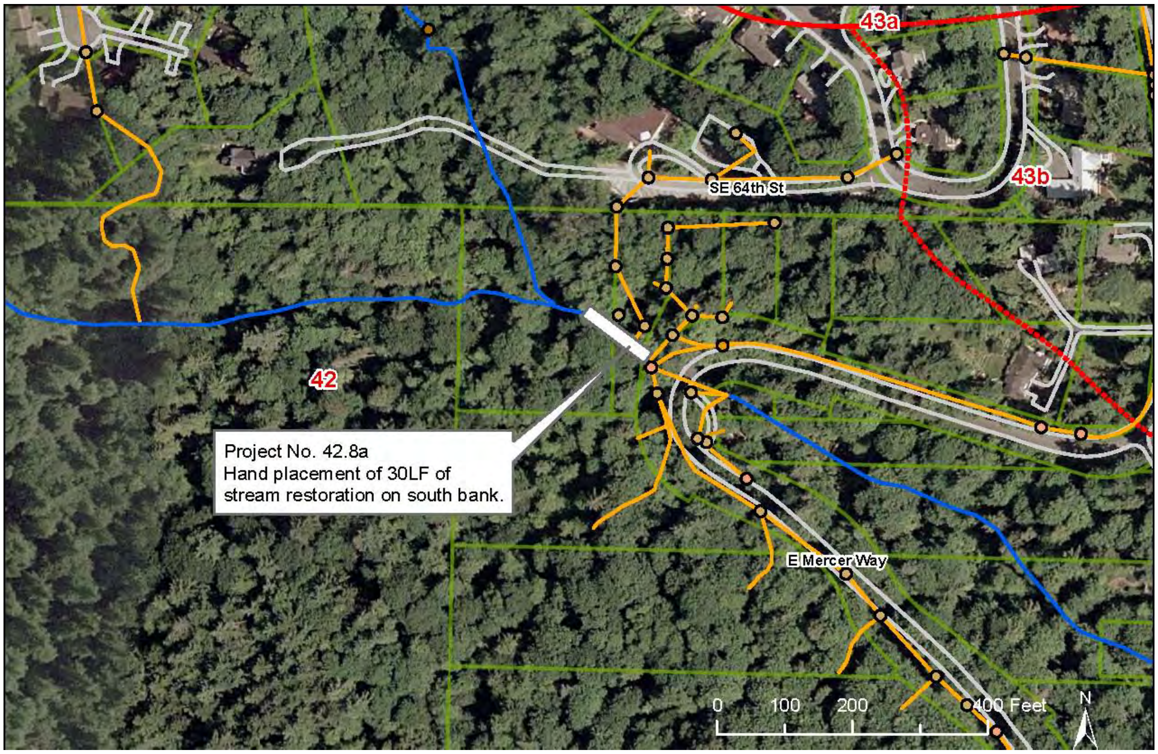
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	42
Project No:	42.8A
Project Title:	**Stream restoration to increase bank stability along about 30 feet of the south bank.**
Problem Description:	About 30 feet of the south bank is experiencing erosion and spring sapping. North bank composed of large rock to protect sanitary sewer main and no erosion is evident. Total reach length is about 140 feet. Large rock check dams are also okay.
Project Description:	Stream restoration to increase bank stability along about 30 feet of the south bank. Work will include placement of boulders and logs as well as planting of water-loving, shade-tolerant plants such as salmonberry. Planting may be as individuals or as wattles.
Related Projects	None
Estimated Project Cost:	$45,000

Looking Upstream. Rock Protection on left. 3/3/2006



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: **42.8A** **CHECKED BY:** **msg**
BY: **jcb** **DATE:** **5/23/2006**
HAND LABOR STREAM RESTORATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	30	LF	$ 10	$ 300
REMOVE/DISPOSE MISC DEBRIS	0	LF	$ 1	$ -
HAND EXCAVATION	5	CY	$ 150	$ 750
SMALL BOULDERS	1	TON	$ 250	$ 250
STREAMBED GRAVEL MIX	1	TON	$ 150	$ 90
WATTLES	90	LF	$ 20	$ 1,800
MANUFACTURED LOGS	2	EA	$ 5,000	$ 10,000
ROOTWADS	0	EA	$ 900	$ -
REUSE ONSITE LOGS	0	EA	$ 1,000	$ -
TEMPORARY BYPASS	0	LS	$ 1,000	$ -
ACCESS (10' WIDE)	0	LF	$ 10	$ -
ACCESS RESTORATION	0	LF	$ 5	$ -
RIPARIAN PLANTING AND SEEDING	30	LF	$ 25	$ 750
			Subtotal	$ 13,940
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 1,394
EROSION & SEDIMENTATION CONTROL	10%			$ 1,394
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 16,728
MOBILIZATION	10%			$ 1,673
			Subtotal	$ 18,000
CONTINGENCY	30%			$ 5,400
			Subtotal	$ 23,400
STATE SALES TAX	8.80%			$ 2,059
	Total Estimated Construction Cost (Rounded)			$ 29,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 7,250
PERMITTING	10%			$ 2,900
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 5,800
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
	Total Estimated Project Cost (Rounded)			**$ 45,000**

Notes:
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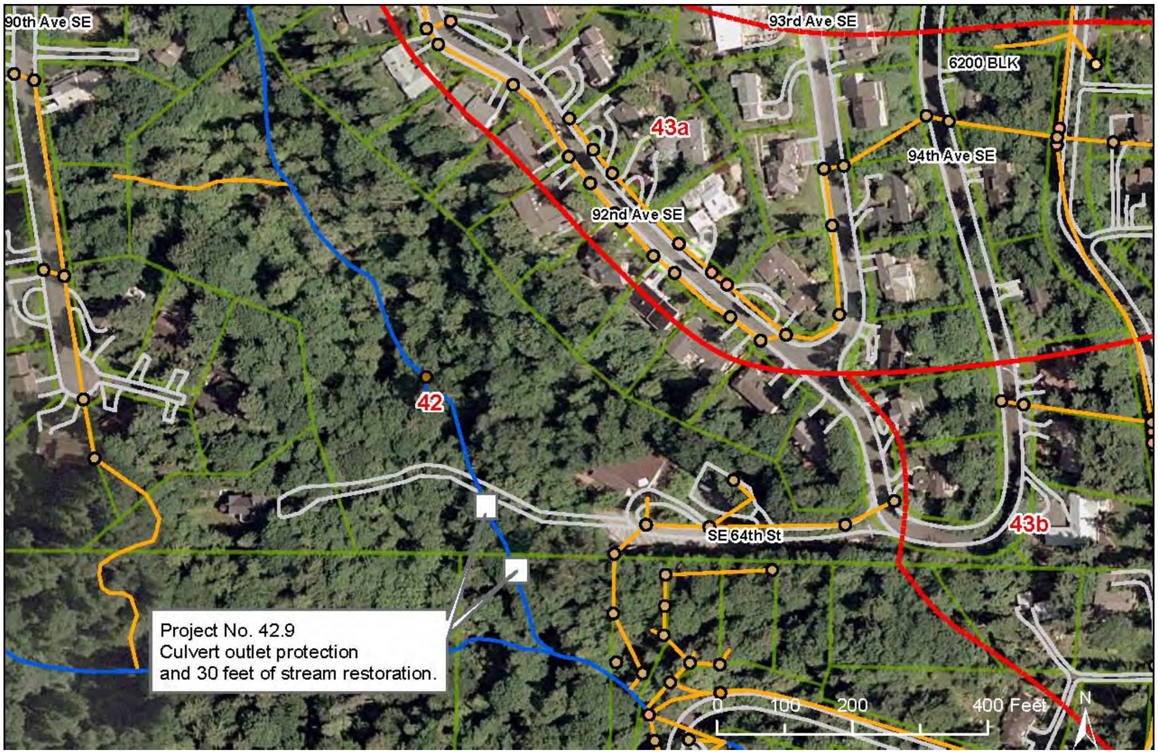
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	42
Project No:	42.9
Project Title:	**Culvert Outlet Protection and 30 feet of Stream Restoration west of 92nd Avenue SE.**
Problem Description:	There are two erosion problems at this site;1) a 5-foot drop from the 18-inch CMP culvert under a private driveway which is undergoing moderate erosion and 2) 30 feet of channel downcutting located 100 feet downstream of the culvert. The soft, wet east bank has wetland characteristics. Site is located in undeveloped ravine. Work may need to be done primarily by hand due to site conditions.
Project Description:	Install culvert outlet protection and 30 feet of stream restoration.
Related Projects	None
Estimated Project Cost:	$79,000

Looking Upstream at Culvert Outlet 3/3/2006



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: **42.9** **CHECKED BY:** **msg**
BY: **jcb** **DATE:** **5/23/2006**

HAND LABOR STREAM RESTORATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	1	LS	$ 1,000	$ 1,000
HAND EXCAVATION	10	CY	$ 150	$ 1,500
SMALL BOULDERS	1	TON	$ 300	$ 300
STREAMBED GRAVEL MIX	1	TON	$ 300	$ 300
MANUFACTURED LOGS	3	EA	$ 5,000	$ 15,000
ROOTWADS	0	EA	$ 900	$ -
EXCAVATION	5	CY	$ 20	$ 100
RIPRAP/BOULDERS	10	CY	$ 40	$ 400
GEOTEXTILE	15	SY	$ 1	$ 15
REUSE ONSITE LOGS	1	EA	$ 1,000	$ 1,000
TEMPORARY BYPASS	1	LS	$ 3,000	$ 3,000
ACCESS (10' WIDE)	0	LF	$ 10	$ -
ACCESS RESTORATION	0	LF	$ 10	$ -
RIPARIAN PLANTING AND SEEDING	20	LF	$ 30	$ 600
			Subtotal	$ 23,215
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 2,322
EROSION & SEDIMENTATION CONTROL	10%			$ 2,322
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 27,858
MOBILIZATION	10%			$ 2,786
			Subtotal	$ 31,000
CONTINGENCY	30%			$ 9,300
			Subtotal	$ 40,300
STATE SALES TAX	8.80%			$ 3,546
	Total Estimated Construction Cost (Rounded)			$ 50,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 12,500
PERMITTING	10%			$ 5,000
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 10,000
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	2	PARCEL	$ 500	$ 1,000
	Total Estimated Project Cost (Rounded)			**$ 79,000**

Notes:
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3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.: 42

Project No: 42.10

Project Title: **Remove half round pipe, install manhole and 30 feet of 24-inch pipe and fill.**

Problem Description: Existing public drainage system consists of a manhole with a sound CMP outlet pipe on top of the ravine about 50 feet long, about 30 feet of half round CMP, an above ground transition from the half-round pipe to a 24-inch corrugated polyethylene pipe and 80 feet of corrugated polyethylene pipe which lies on the ground in the bottom of the small ravine. The system conveys flow to the main water course. Only one of the corrugated polyethylene pipe joints is capable of handling thrust. There is considerable leakage from the pipe and seepage from the hillslope. The seepage has contributed to slope instability particularly on the south bank.

Project Description: Install manhole at the downstream end of the sound, buried CMP. Remove half round pipe and replace with 24-inch corrugated polyethylene pipe (CPEP) extending from the new manhole to the existing 24-inch CPEP. Cover CPEP with 150 cy of well draining material to stabilize this pipe as well as the slopes. It may be possible to deliver fill with chute or blower truck.

Related Projects None

Estimated Project Cost: $70,000

Looking Downstream at Surface CPEP 3/3/2006

Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 42.10 | **CHECKED BY: msg**
BY: jcb | **DATE: 5/23/2006**
STORM DRAINAGE PIPES

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	139	SY	$ 20	$ 2,778
EXCAVATION	0	CY	$ 40	$ -
FILL	150	CY	$ 40	$ 6,000
RIPRAP/BOULDERS/QUARRY SPALLS	10	CY	$ 80	$ 800
PAVEMENT RESTORATION	0	SY	$ 20	$ -
LANDSCAPE RESTORATION	139	SY	$ 20	$ 2,778
12" CPEP PIPE (TRENCHING,BEDDING,PIPE,BACKFILL)	0	LF	$ 40	$ -
18" CPEP PIPE	0	LF	$ 50	$ -
24" CPEP PIPE	30	LF	$ 70	$ 2,100
30" CPEP PIPE	0	LF	$ 85	$ -
MANHOLES/CB	1	EA	$ 3,500	$ 3,500
TEMPORARY BYPASS	1	LS	$ 3,000	$ 3,000
ACCESS (10' WIDE)	90	LF	$ 10	$ 900
RESTORATION OF ACCESS	55	SY	$ 15	$ 825
			Subtotal	$ 22,681
MISC	10%			$ 2,268
EROSION & SEDIMENTATION CONTROL	5%			$ 1,134
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 26,083
MOBILIZATION	10%			$ 2,608
			Subtotal	$ 29,000
CONTINGENCY	30%			$ 8,700
			Subtotal	$ 37,700
STATE SALES TAX	8.80%			$ 3,318
	Total Estimated Construction Cost (Rounded)			$ 46,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 11,500
PERMITTING	5%			$ 2,300
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 9,200
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	2	PARCEL	$ 500	$ 1,000
	Total Estimated Project Cost (Rounded)			**$ 70,000**

Notes:
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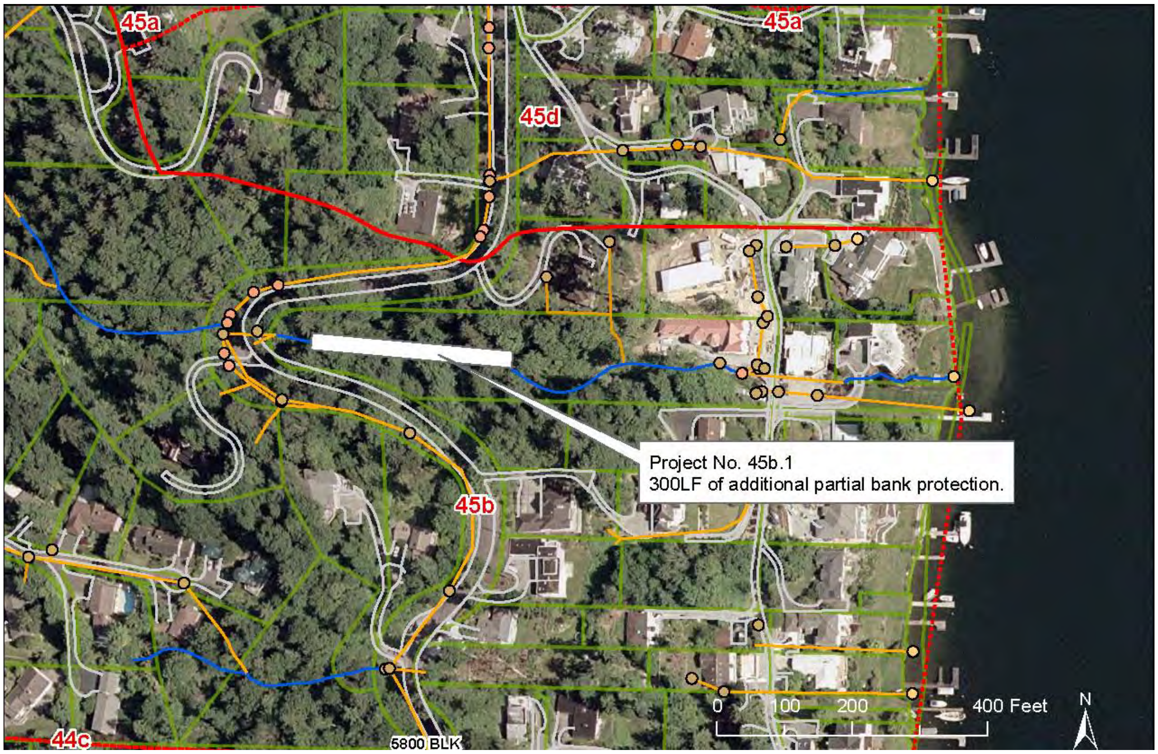
PROJECT SUMMARY SHEET

Basin No.:	45b
Project No:	45b.1
Project Title:	**Partial Stream Restoration along 300 feet near East Mercer Way in 5600 Block**
Problem Description:	Existing quarry spall check dams are relatively effective but some repairs and bank protection needed. Erosion creates downstream deposition and potential for failure of East Mercer Way.
Project Description:	Partial stream restoration along 300 feet of channel involving repairs and additions to existing check dams as well as habitat friendly bank protection.
Related Projects	None
Estimated Project Cost:	$179,000

Looking Upstream 12/8/2005



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 45b.1 **CHECKED BY:** msg
BY: jcb **DATE:** 5/23/2006
STREAM RESTORATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	300	LF	$ 10	$ 3,000
REMOVE/DISPOSE MISC DEBRIS	300	LF	$ 2	$ 600
EXCAVATION	50	CY	$ 50	$ 2,500
BOULDERS	60	TON	$ 100	$ 6,000
STREAMBED GRAVEL MIX	20	TON	$ 80	$ 1,600
LOGS	16	EA	$ 1,400	$ 22,400
ROOTWADS	4	EA	$ 900	$ 3,600
REUSE ONSITE LOGS	2	EA	$ 500	$ 1,000
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
ACCESS (10' WIDE)	100	LF	$ 10	$ 1,000
ACCESS RESTORATION	100	LF	$ 10	$ 1,000
RIPARIAN PLANTING AND SEEDING	300	LF	$ 30	$ 9,000
			Subtotal	$ 52,700
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 5,270
EROSION & SEDIMENTATION CONTROL	10%			$ 5,270
TRAFFIC CONTROL	5%			$ 2,635
			Subtotal	$ 65,875
MOBILIZATION	10%			$ 6,588
			Subtotal	$ 72,000
CONTINGENCY	30%			$ 21,600
			Subtotal	$ 93,600
STATE SALES TAX	8.80%			$ 8,237
	Total Estimated Construction Cost (Rounded)			$ 115,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 28,750
PERMITTING	10%			$ 11,500
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 23,000
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$ 500	$ 500
	Total Estimated Project Cost (Rounded)			**$ 179,000**

Notes:
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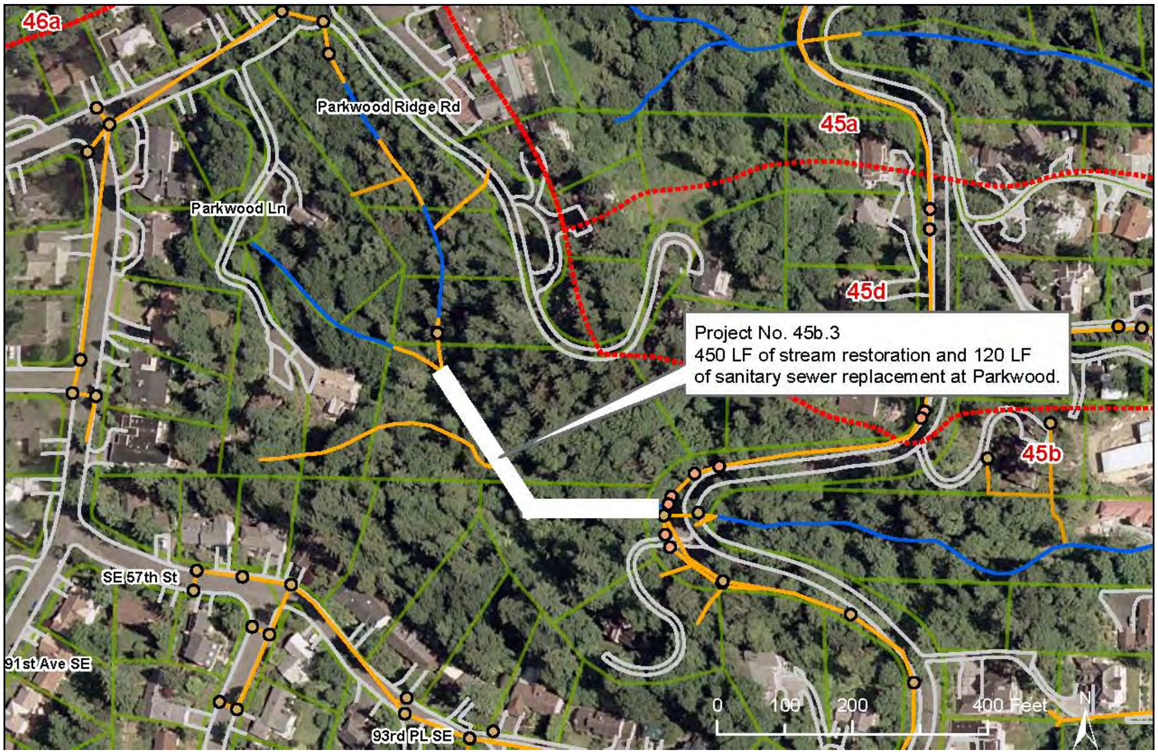
PROJECT SUMMARY SHEET

Basin No.:	45b
Project No:	45b.3
Project Title:	**450 feet of Stream Restoration and 120 feet of Sewer Replacement at Parkwood**
Problem Description:	Stream downcutting has exposed 120 feet of sewer and generated considerable sediment, which is a maintenance problem downstream. Sewer is leaking into water course.
Project Description:	Stream restoration along 450 feet of channel is needed along with reconstruction of 120 feet of sanitary sewer. Erosion problem upstream previously solved by installation of piping in the water course.
Related Projects	Predesign investigation underway for this site.
Estimated Project Cost:	$444,000

Looking Downstream at Exposed Sewer Pipe 9/12/2005



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 45b.3 **CHECKED BY:** msg
BY: jcb **DATE:** 5/23/2006
STREAM RESTORATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	1,200	SY	$ 4	$ 4,800
REMOVE/DISPOSE MISC DEBRIS	450	LF	$ 2	$ 900
EXCAVATION AND HAUL	100	CY	$ 40	$ 4,000
BOULDERS	180	TON	$ 100	$ 18,000
STREAMBED GRAVEL MIX	60	TON	$ 80	$ 4,800
SANDING MIX	25	TON	$ 80	$ 2,000
LOGS	30	EA	$ 1,400	$ 42,000
ROOTWADS	1	EA	$ 900	$ 900
REUSE ONSITE LOGS	2	EA	$ 500	$ 1,000
TEMPORARY BYPASS	1	LS	$ 5,000	$ 5,000
ACCESS RESTORATION	250	SY	$ 15	$ 3,750
RIPARIAN PLANTING AND SEEDING	750	SY	$ 25	$ 18,750
5' WIDE CRUSHED ROCK TRAIL	1,025	LF	$ 14	$ 14,350
TRAIL AREA PLANTING AND SEEDING	350	SY	$ 22.50	$ 7,875
6" SEWER REPLACEMENT (NO TEMP BYPASS)	150	LF	$ 75	$ 11,250
			Subtotal	$ 139,375
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 13,938
EROSION & SEDIMENTATION CONTROL	10%			$ 13,938
TRAFFIC CONTROL	1	LS		$ 5,000
			Subtotal	$ 172,250
MOBILIZATION	10%			$ 17,225
			Subtotal	$ 189,000
CONTINGENCY	30%			$ 56,700
			Subtotal	$ 245,700
STATE SALES TAX	8.80%			$ 21,622
	Total Estimated Construction Cost (Rounded)			$ 302,000
INDIRECT COSTS				
SURVEYING AND DESIGN	20%			$ 60,400
PERMITTING	7%			$ 21,140
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 60,400
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$ 500	$ 500
	Total Estimated Project Cost (Rounded)			**$ 444,000**

Notes:
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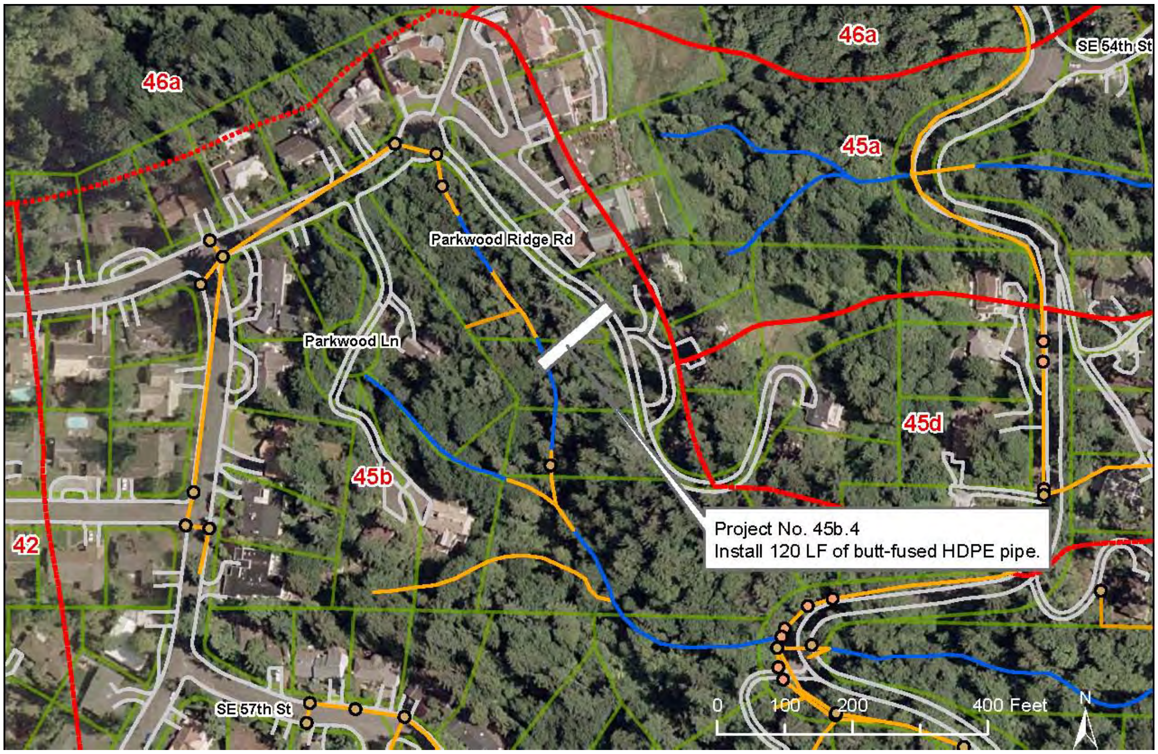
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	45b
Project No:	45b.4
Project Title:	**120 feet of butt-fused HDPE pipe to ravine bottom near Parkwood**
Problem Description:	Drop at culvert outlet of 12-inch CMP culvert under private road is eroding partially protected steep slope. Erosion also occurring downstream of the outlet. Rate of erosion is moderate.
Project Description:	Replace culvert with manhole, concrete anchor and 120 feet of butt-fused HDPE pipe to ravine bottom.
Related Projects	None
Estimated Project Cost:	$77,000

Culvert Outfall on Steep Slope 12/8/2005



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: **45b.4** **CHECKED BY:** **msg**
BY: **jcb** **DATE:** **5/23/2006**
BYPASS PIPE

	BID ITEM	QUANTITY	UNIT	UNIT PRICE		AMOUNT	
	CONSTRUCTION COSTS						
	CLEARING AND GRUBBING	120	SY	$	20	$	2,400
	EXCAVATION	10	CY	$	40	$	400
	RIPRAP/BOULDERS/QUARRY SPALLS	5	TON	$	100	$	500
	PIPE ANCHORS	2	EA	$	800	$	1,280
	12" BUTT FUSED HDPE PIPE	120	LF	$	75	$	9,000
	ANCHOR BLOCK AND SPECIAL FITTINGS	1	EA	$	5,000	$	5,000
	MANHOLES/CB	1	EA	$	3,500	$	3,500
	UTILITY RELOCATIONS	0	EA	$	8,000	$	-
	TEMPORARY BYPASS	0	LS	$	-	$	-
	ACCESS (10' WIDE)	0	LF	$	10	$	-
	RESTORATION OF ACCESS AND AREA	147	SY	$	15	$	2,200
					Subtotal	$	24,280
	SPECIAL ACCESS/CONSTRUCTION	0%				$	-
	MISC	10%				$	2,428
	EROSION & SEDIMENTATION CONTROL	10%				$	2,428
	TRAFFIC CONTROL	0%				$	-
					Subtotal	$	29,136
	MOBILIZATION	10%				$	2,914
					Subtotal	$	32,000
	CONTINGENCY	30%				$	9,600
					Subtotal	$	41,600
	STATE SALES TAX	8.80%				$	3,661
		Total Estimated Construction Cost (Rounded)				$	51,000
	INDIRECT COSTS						
	SURVEYING AND DESIGN	25%				$	12,750
	PERMITTING	5%				$	2,550
	CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%				$	10,200
	EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$	500	$	500
		Total Estimated Project Cost (Rounded)				**$**	**77,000**

Notes:
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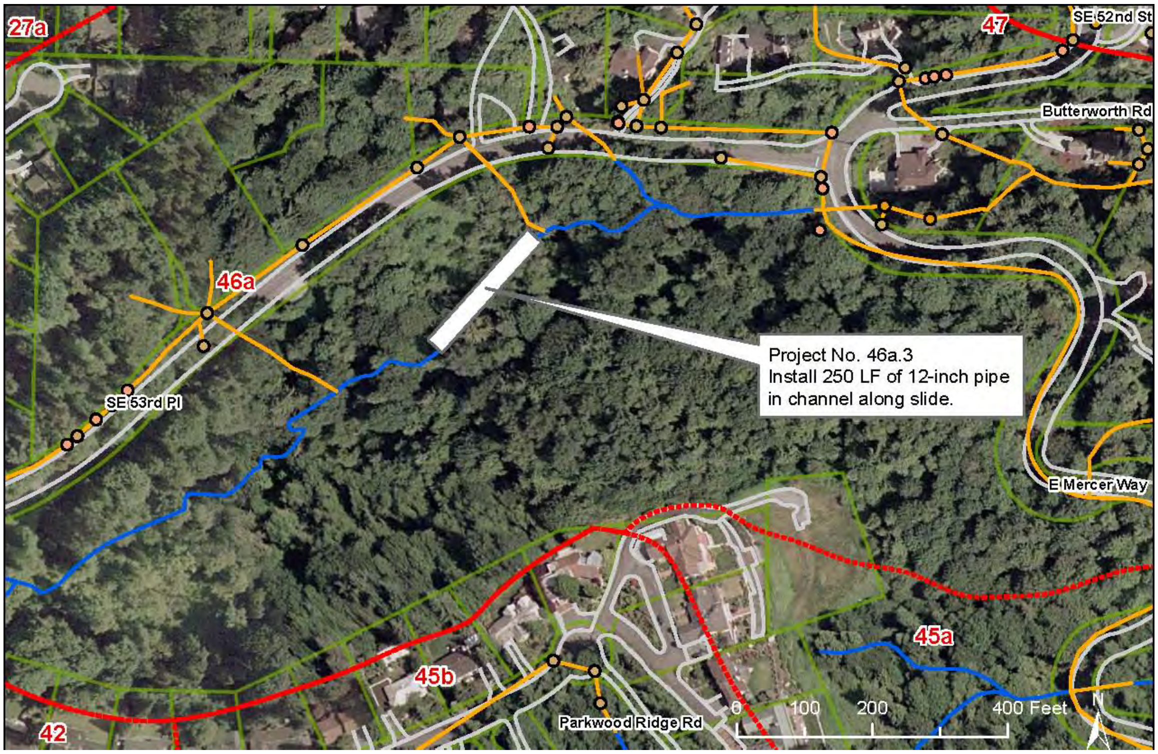
PROJECT SUMMARY SHEET

Basin No.:	46a
Project No:	46a.3
Project Title:	**Install 250 feet of 12-inch corrugated polyethylene pipe in channel to stop slope movement near SE 53rd Place.**
Problem Description:	Large scale slope movement into creek is pinching channel along 250-foot reach. Creek erosion of toe and fill south of street may be contributing to slope movement. This is a large source of sediment. The slope and much of the contributing area is mapped as a slide.
Project Description:	Install 250 feet of 12-inch CPEP along channel. Environmental and permitting concerns may be significant. Additional investigation should be done to determine if another alternative (rock lining and removal of fill at the top of the slope along the road) would stabilize the slope.
Related Projects	City will be making improvements to the drainage system in SE 53rd Place in 2006 with one objective to keep more runoff in the SE 53rd Place system and reduce runoff currently flowing to the cross culverts and watercourse.
Estimated Project Cost:	$109,000

No picture available.



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 46a.3 **CHECKED BY:** msg
BY: jcb **DATE:** 5/23/2006
STORM DRAIN PIPE

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	139	SY	$ 20	$ 2,778
EXCAVATION	200	CY	$ 40	$ 8,000
RIPRAP/BOULDERS/QUARRY SPALLS	10	CY	$ 80	$ 800
PAVEMENT RESTORATION	0	SY	$ 20	$ -
LANDSCAPE RESTORATION	250	SY	$ 20	$ 5,000
12" CPEP PIPE (TRENCHING,BEDDING,PIPE,BACKFILL)	250	LF	$ 40	$ 10,000
18" CPEP PIPE	0	LF	$ 50	$ -
24" CPEP PIPE	0	LF	$ 70	$ -
30" CPEP PIPE	0	LF	$ 85	$ -
MANHOLES/CB	0	EA	$ 3,500	$ -
TEMPORARY BYPASS	1	LS	$ 3,000	$ 3,000
ACCESS (10' WIDE)	180	LF	$ 10	$ 1,800
RESTORATION OF ACCESS	110	SY	$ 15	$ 1,650
			Subtotal	$ 33,028
MISC	10%			$ 3,303
EROSION & SEDIMENTATION CONTROL	5%			$ 1,651
TRAFFIC CONTROL	5%			$ 1,651
			Subtotal	$ 39,633
MOBILIZATION	10%			$ 3,963
			Subtotal	$ 44,000
CONTINGENCY	30%			$ 13,200
			Subtotal	$ 57,200
STATE SALES TAX	8.80%			$ 5,034
	Total Estimated Construction Cost (Rounded)			$ 70,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 17,500
PERMITTING	10%			$ 7,000
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 14,000
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
	Total Estimated Project Cost (Rounded)			**$ 109,000**

Notes:
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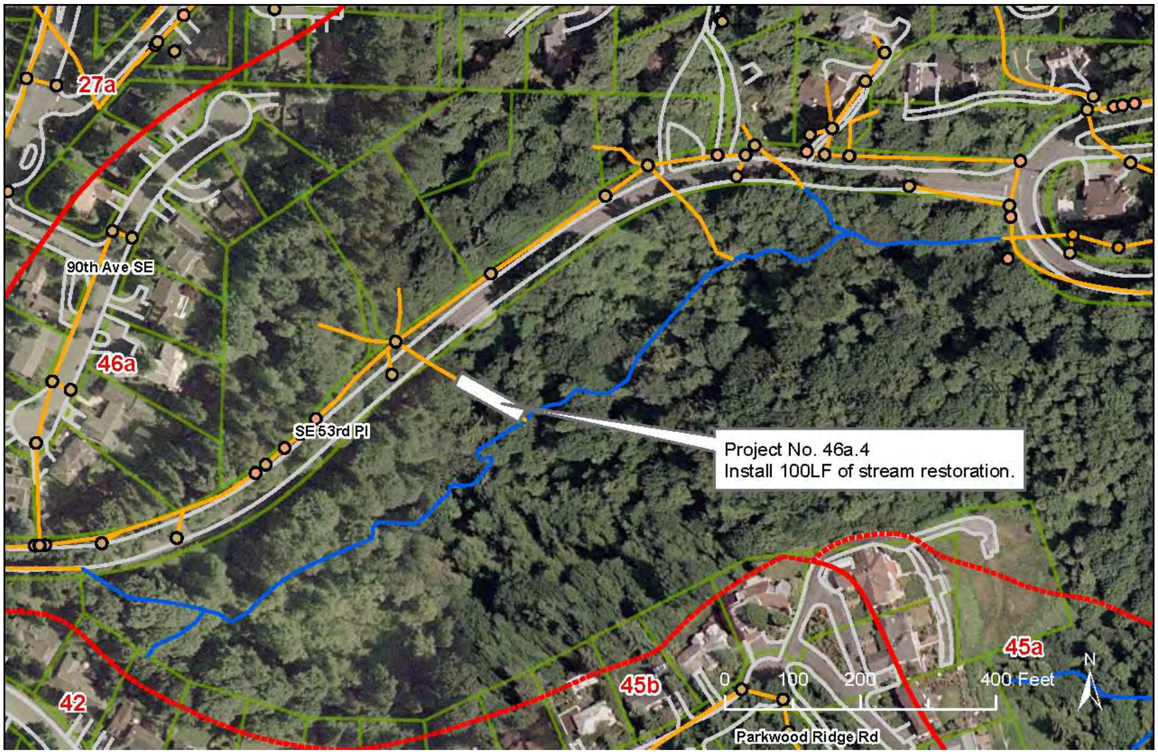
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	46a
Project No:	46a.4
Project Title:	**Stream restoration along 100 feet of channel near 53rd Place**
Problem Description:	Downstream of pipe outlet, channel is downcutting along 100 feet of soft fill and slide material. This tributary stream is located south of 53rd Place on city open space.
Project Description:	Stream restoration along 100 feet to stabilize soft bed and banks.
Related Projects	None
Estimated Project Cost:	$99,000

No picture on file.



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 46a.4 **CHECKED BY: msg**
BY: jcb **DATE: 5/23/2006**
STREAM RESTORATION

	BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	CONSTRUCTION COSTS				
	CLEARING AND GRUBBING	100	LF	$ 10	$ 1,000
	REMOVE/DISPOSE MISC DEBRIS	100	LF	$ 2	$ 200
	EXCAVATION	45	CY	$ 50	$ 2,250
	BOULDERS	40	TON	$ 100	$ 4,000
	STREAMBED GRAVEL MIX	25	TON	$ 80	$ 2,000
	LOGS	10	EA	$ 1,400	$ 14,000
	ROOTWADS	0	EA	$ 900	$ -
	REUSE ONSITE LOGS	1	EA	$ 500	$ 500
	TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
	ACCESS (10' WIDE)	50	LF	$ 10	$ 500
	ACCESS RESTORATION	50	LF	$ 10	$ 500
	RIPARIAN PLANTING AND SEEDING	100	LF	$ 30	$ 3,000
				Subtotal	$ 28,950
	SPECIAL ACCESS/CONSTRUCTION	0%			$ -
	MISC	10%			$ 2,895
	EROSION & SEDIMENTATION CONTROL	10%			$ 2,895
	TRAFFIC CONTROL	5%			$ 1,448
				Subtotal	$ 36,188
	MOBILIZATION	10%			$ 3,619
				Subtotal	$ 40,000
	CONTINGENCY	30%			$ 12,000
				Subtotal	$ 52,000
	STATE SALES TAX	8.80%			$ 4,576
		Total Estimated Construction Cost (Rounded)			$ 64,000
	INDIRECT COSTS				
	SURVEYING AND DESIGN	25%			$ 16,000
	PERMITTING	10%			$ 6,400
	CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 12,800
	EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
		Total Estimated Project Cost (Rounded)			**$ 99,000**

Notes:
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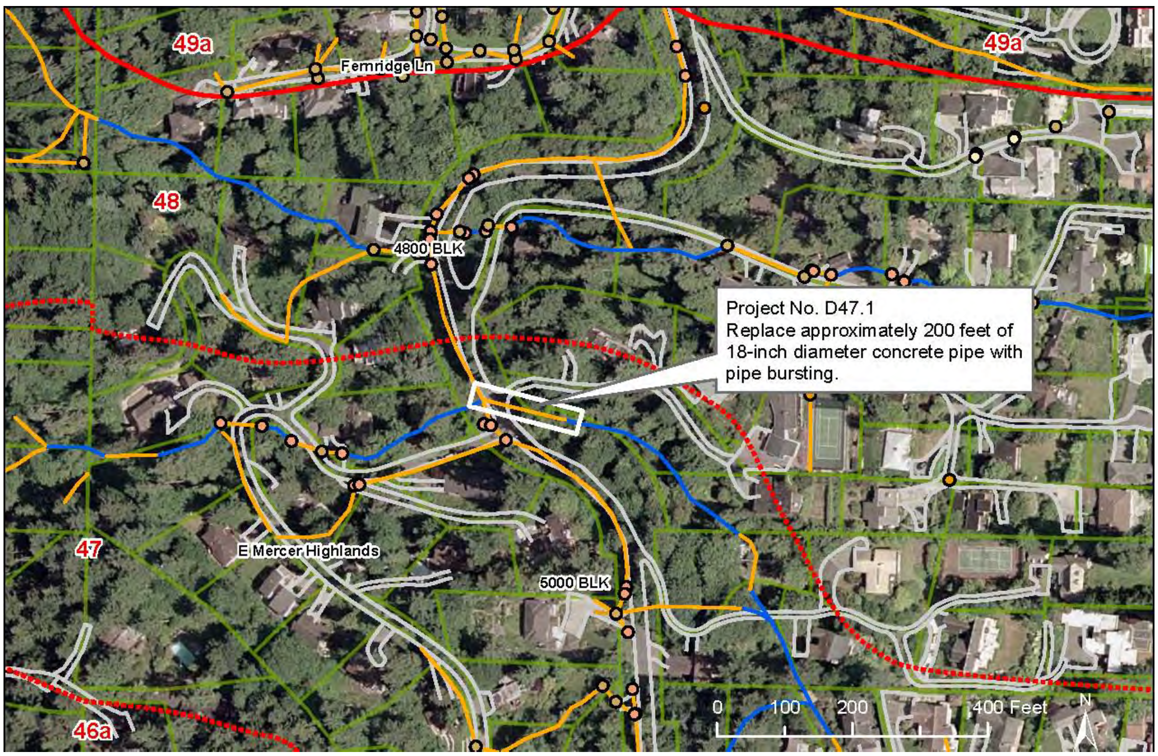
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	47
Project No:	D47.1
Project Title:	**Culvert Under East Mercer Way Near House #4905**
Problem Description:	18-inch-diameter culvert is broken (visible cracks and squashing).
Project Description:	Replace approximately 200 feet of 18-inch-diameter concrete pipe using pipe bursting methods.
Related Projects	None
Estimated Project Cost:	$243,000

– No Photo Available – See Appendix F for detailed TV inspection.



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: D47.1 **CHECKED BY:** msg
BY: jlg **DATE:** 5/10/2006
STORM DRAINAGE PIPES

BID ITEM	QUANTITY	UNIT	UNIT PRICE		AMOUNT	
CONSTRUCTION COSTS						
ACCESS (10' WIDE)	0	LF	$	10	$	-
ACESS RESTORATION	0	SY	$	5	$	-
CLEARING AND GRUBBING	100	SY	$	20	$	2,000
SAWCUTTING	0	LF	$	8	$	-
REMOVE PAVEMENT	0	SY	$	20	$	-
REMOVE PIPE	0	LF	$	15	$	-
REMOVE CATCH BASIN	0	EA	$	300	$	-
12" CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL)	0	LF	$	175	$	-
18" CONC PIPE	0	LF	$	190	$	-
24" CONC PIPE	0	LF	$	210	$	-
RELACE 18" CONC PIPE WITH PIPE BURSTING	200	LF	$	250	$	50,000
PIPE BURSTING INSERTION/PULL PIT	1	EA	$	15,000	$	15,000
CATCH BASIN TYPE 1	0	EA	$	1,400	$	-
MANHOLES/CB	0	EA	$	3,500	$	-
PAVEMENT RESTORATION	0	SY	$	20	$	-
ROADSIDE/LANDSCAPE RESTORATION	1	LS	$	1,000	$	1,000
RIPRAP/BOULDERS/QUARRY SPALLS	5	CY	$	40	$	200
UTILITY RELOCATIONS	0	EA	$	8,000	$	-
TEMPORARY BYPASS	1	LS	$	2,000	$	2,000
				Subtotal	$	70,200
MISC	10%				$	7,020
EROSION & SEDIMENTATION CONTROL	5%				$	3,510
TRAFFIC CONTROL	5%				$	3,510
				Subtotal	$	84,240
MOBILIZATION	20%				$	16,848
				Subtotal	$	101,000
CONTINGENCY	30%				$	30,300
				Subtotal	$	131,300
STATE SALES TAX	8.80%				$	11,554
	Total Estimated Construction Cost (Rounded)				$	162,000
INDIRECT COSTS						
SURVEYING AND DESIGN	25%				$	40,500
PERMITTING	5%				$	8,100
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%				$	32,400
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$	500	$	-
	Total Estimated Project Cost (Rounded)				**$**	**243,000**

Notes:

1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. Work did not include site visit to perform site specific cost estimate. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	49b
Project No:	49b.1
Project Title:	**Regrade 50 LF of ditch and line with Riprap**
Problem Description:	Pipe system outlet from East Mercer Way and SE 47th Street discharges onto East Mercer Way embankment eroding a deep channel and 2 foot drop at outlet. Pipe outlet is also partially crushed. See Appendix E for a field sketch of the problem area.
Project Description:	Regrade 50 LF of outlet ditch and line with riprap. (Quarry spalls would be too small.)
Related Projects	None
Estimated Project Cost:	$12,000

Erosion at Pipe Outlet (pipe crushed) 12/8/2005

Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 49b.1 **CHECKED BY:** msg
BY: jcb **DATE:** 5/24/2006
OUTLET PROTECTION/DITCH LINING

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	28	SY	$ 20	$ 556
REGRADING	1	LS	$ 1,500	$ 1,500
RIPRAP/BOULDERS	20	CY	$ 80	$ 1,600
PAVEMENT RESTORATION	0	SY	$ 20	$ -
LANDSCAPE RESTORATION	20	SY	$ 20	$ 400
GEOTEXTILE	20	SY	$ 1	$ 20
12" CPEP PIPE (TRENCHING,BEDDING,PIPE,BACKFILL)	0	LF	$ 40	$ -
18" CPEP PIPE	0	LF	$ 50	$ -
24" CPEP PIPE	0	LF	$ 70	$ -
MANHOLES/CB	0	EA	$ 3,500	$ -
UTILITY RELOCATIONS	0	EA	$ 8,000	$ -
TEMPORARY BYPASS	0	LS	$ -	$ -
ACCESS (10' WIDE)	0	LF	$ 10	$ -
RESTORATION OF ACCESS	0	SY	$ 5	$ -
			Subtotal	$ 4,076
MISC	10%			$ 408
EROSION & SEDIMENTATION CONTROL	5%			$ 204
TRAFFIC CONTROL	5%			$ 204
			Subtotal	$ 4,891
MOBILIZATION	10%			$ 489
			Subtotal	$ 5,000
CONTINGENCY	30%			$ 1,500
			Subtotal	$ 6,500
STATE SALES TAX	8.80%			$ 572
	Total Estimated Construction Cost (Rounded)			$ 8,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 2,000
PERMITTING	10%			$ 800
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 1,600
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
	Total Estimated Project Cost (Rounded)			**$ 12,000**

Notes:
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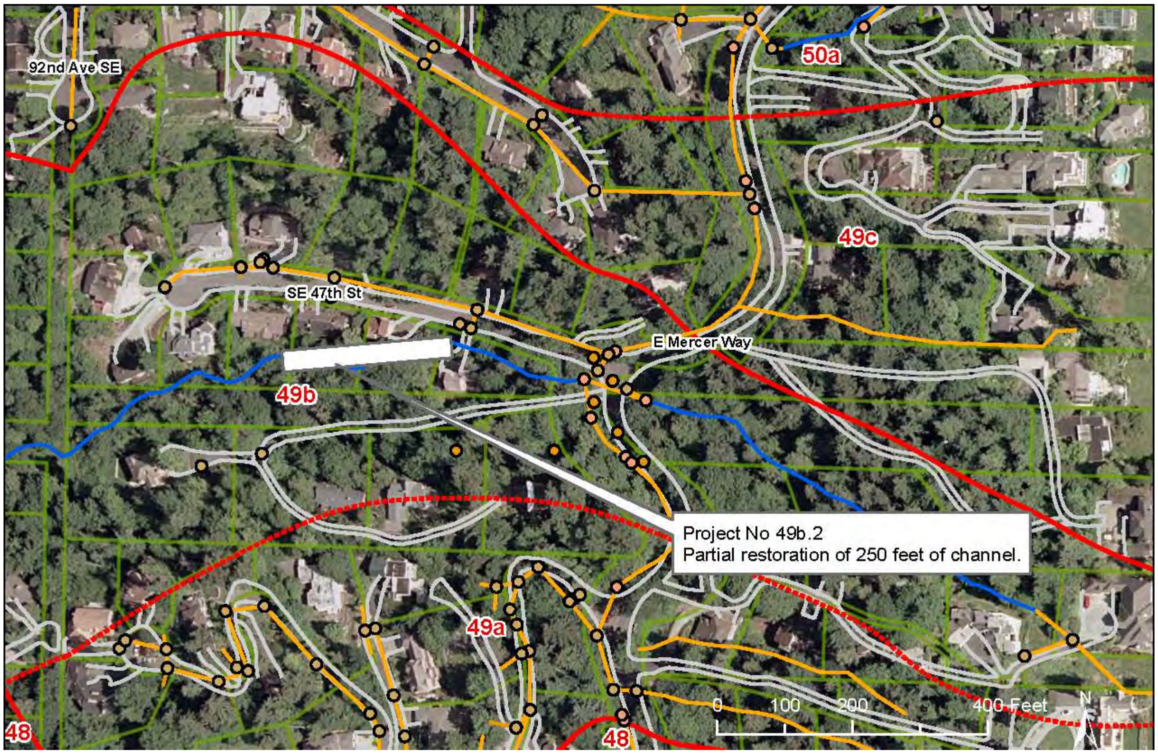
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	49b
Project No:	49b.2
Project Title:	**Partial stream restoration along 250 feet of channel near SE 47th Street.**
Problem Description:	Moderate bank erosion and headcutting along portions of 250 feet of channel.
Project Description:	Partial stream restoration along 250 feet of channel.
Related Projects	None
Estimated Project Cost:	$150,000

Looking Upstream 12/8/2005



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: **49b.2** | **CHECKED BY:** **msg**
BY: **jcb** | **DATE:** **5/24/2006**

STREAM RESTORATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	150	LF	$ 10	$ 1,500
REMOVE/DISPOSE MISC DEBRIS	150	LF	$ 2	$ 300
EXCAVATION	60	CY	$ 50	$ 3,000
BOULDERS	60	TON	$ 100	$ 6,000
STREAMBED GRAVEL MIX	38	TON	$ 80	$ 3,000
LOGS	15	EA	$ 1,400	$ 21,000
ROOTWADS	3	EA	$ 900	$ 2,700
REUSE ONSITE LOGS	2	EA	$ 500	$ 750
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
ACCESS (10' WIDE)	100	LF	$ 10	$ 1,000
ACCESS RESTORATION	100	LF	$ 10	$ 1,000
RIPARIAN PLANTING AND SEEDING	150	LF	$ 30	$ 4,500
			Subtotal	$ 45,750
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 4,575
EROSION & SEDIMENTATION CONTROL	10%			$ 4,575
TRAFFIC CONTROL	0%			$ -
			Subtotal	$ 54,900
MOBILIZATION	10%			$ 5,490
			Subtotal	$ 60,000
CONTINGENCY	30%			$ 18,000
			Subtotal	$ 78,000
STATE SALES TAX	8.80%			$ 6,864
	Total Estimated Construction Cost (Rounded)			$ 96,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 24,000
PERMITTING	10%			$ 9,600
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 19,200
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	2	PARCEL	$ 500	$ 1,000
	Total Estimated Project Cost (Rounded)			**$ 150,000**

Notes:
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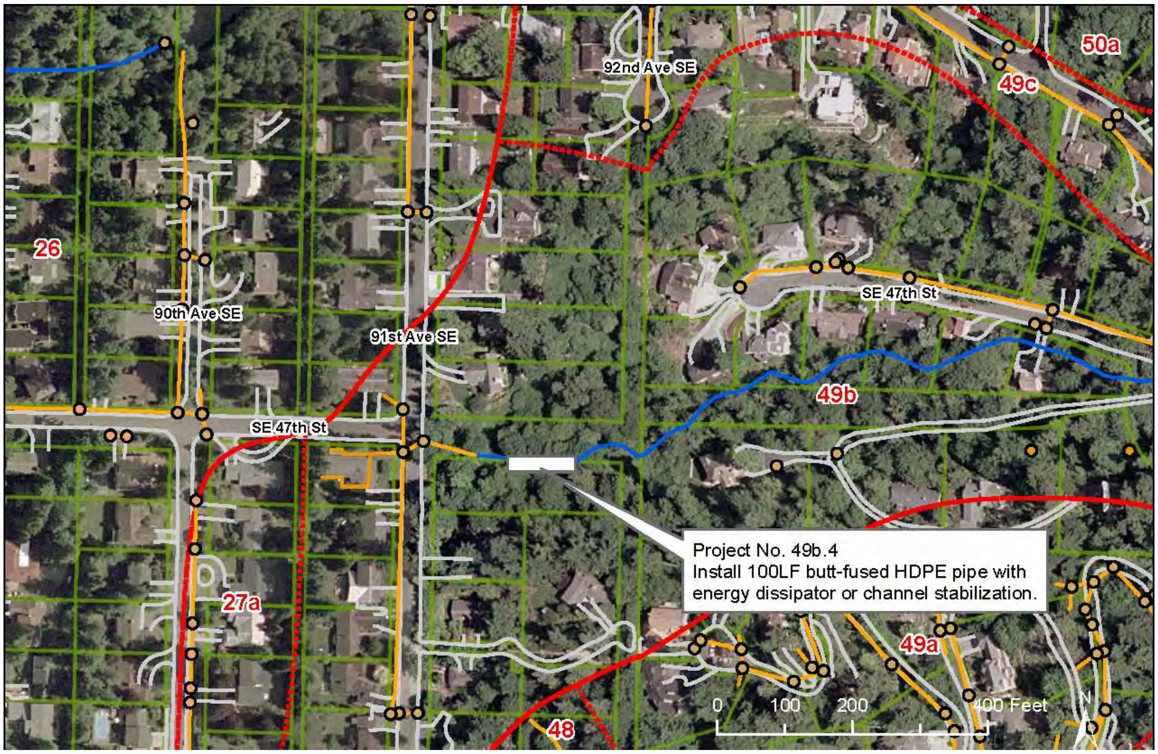
PROJECT SUMMARY SHEET

Basin No.:	49b
Project No:	49b.4
Project Title:	**Butt-fused HDPE pipeline on stream stabilization east of 91st Avenue SE in 4700 Block**
Problem Description:	Large scale, severe erosion of 1,000 CY at an existing 12-inch storm drainage outlet which drops six feet into a steep channel in sandy soil. Channel incision is about 100 feet long and the depth varies from 5 to 20 feet. See Appendix E for a field sketch of the problem area.
Project Description:	Two alternatives are considered for this problem. The first is to install 12-inch-diameter HDPE pipeline with manhole energy dissipator at the downstream end. Under this alternative it may be desirable to fill the erosion scar. The second alternative is stream stabilization along the 100 feet of channel. It is recommended the City get input from WDFW prior to selecting the preferred alternative. The cost estimate is based on the HDPE pipeline alternative.
Related Projects	None
Estimated Project Cost:	$195,000

Looking Upstream at Upper Half of Erosion Problem 12/14/2005



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 49b4 | **CHECKED BY:** msg
BY: jcb | **DATE:** 5/24/2006
BYPASS PIPE

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	100	SY	$ 20	$ 2,000
FILL	1,000	CY	$ 30	$ 30,000
RIPRAP/BOULDERS/QUARRY SPALLS	5	CY	$ 80	$ 400
PIPE ANCHORS	1	EA	$ 800	$ 1,067
12" BUTT FUSED HDPE PIPE	100	LF	$ 75	$ 7,500
ANCHOR BLOCK AND SPECIAL FITTINGS	1	EA	$ 5,000	$ 5,000
MANHOLES/CB	2	EA	$ 3,500	$ 7,000
12" CPEP PIPE (TRENCHING,BEDDING,PIPE,BACKFILL)	20	LF	$ 40	$ 800
UTILITY RELOCATIONS	0	EA	$ 8,000	$ -
TEMPORARY BYPASS	1	LS	$ -	$ -
ACCESS (10' WIDE)	170	LF	$ 10	$ 1,700
RESTORATION OF ACCESS AND AREA	226	SY	$ 15	$ 3,392
			Subtotal	$ 58,858
SPECIAL ACCESS/CONSTRUCTION	0%			$ -
MISC	10%			$ 5,886
EROSION & SEDIMENTATION CONTROL	10%			$ 5,886
TRAFFIC CONTROL	5%			$ 2,943
			Subtotal	$ 73,573
MOBILIZATION	10%			$ 7,357
			Subtotal	$ 81,000
CONTINGENCY	30%			$ 24,300
			Subtotal	$ 105,300
STATE SALES TAX	8.80%			$ 9,266
	Total Estimated Construction Cost (Rounded)			$ 130,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 32,500
PERMITTING	5%			$ 6,500
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 26,000
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	0	PARCEL	$ 500	$ -
	Total Estimated Project Cost (Rounded)			**$ 195,000**

Notes:

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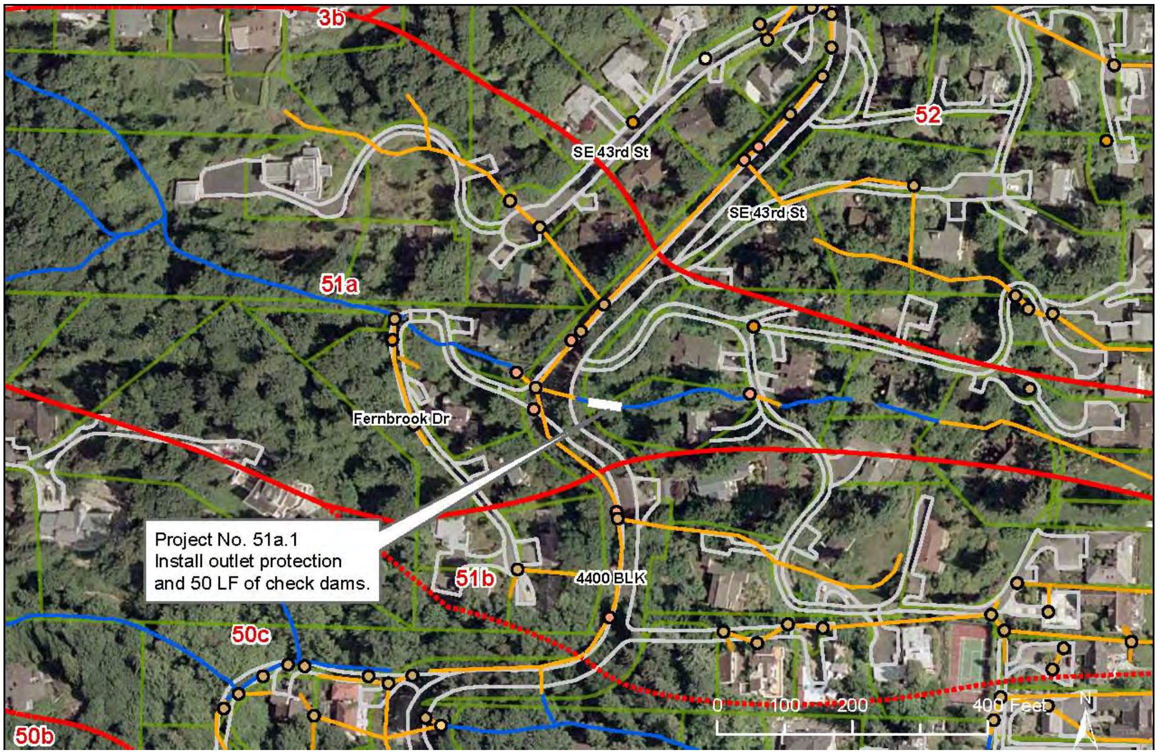
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	51a
Project No:	51a.1
Project Title:	**Install outlet protection and 50 feet of check dams near East Mercer Way in 4300 Block**
Problem Description:	50 feet of south bank erosion and outlet erosion at 18-inch culvert may threaten embankment of East Mercer Way. Considerable sand in channel from upstream. Also low intensity erosion for about 150 feet downstream of this site. See Appendix E for a field sketch of the problem area.
Project Description:	Install outlet protection and 50 feet of check dams to contain flow. Fill along toe of slope for stabilization.
Related Projects	None
Estimated Project Cost:	$45,000

Looking Upstream at Steep Channel and Outlet. Erosion of Bank on Left. 12/14/2005



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: 51a.1 **CHECKED BY:** msg
BY: jcb **DATE:** 5/24/2006
check dam

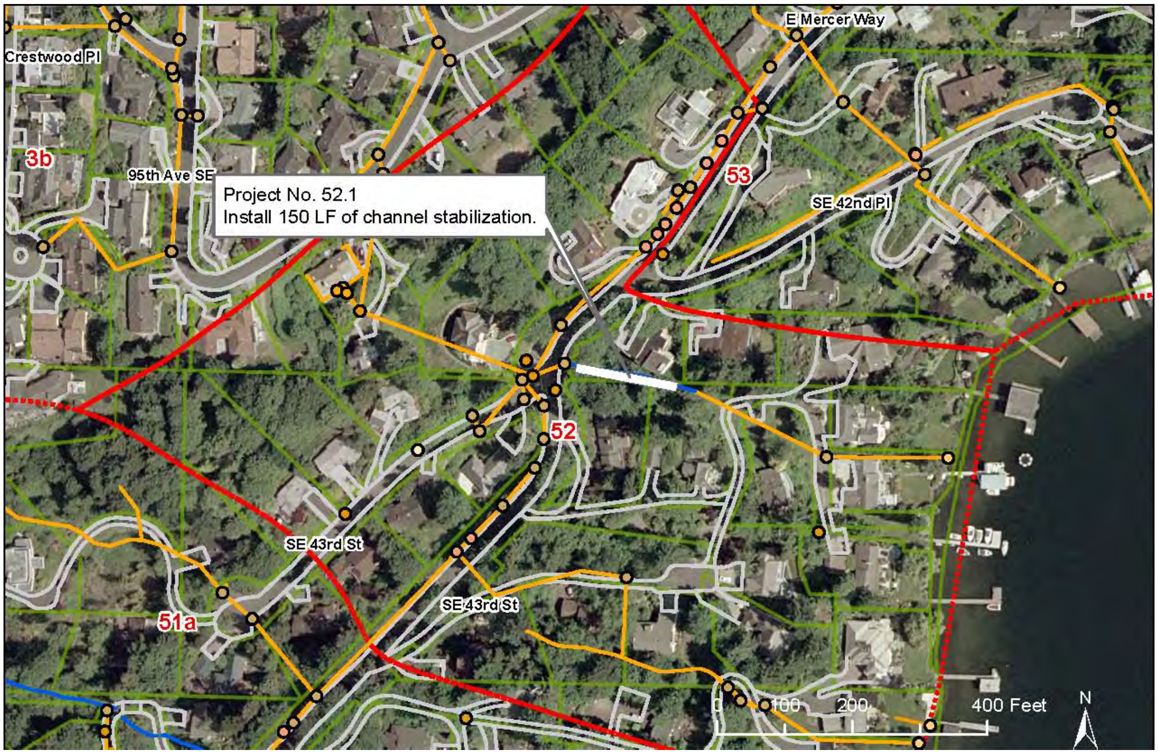
BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	50	LF	$ 20	$ 1,000
REMOVE/DISPOSE MISC DEBRIS	50	LF	$ 2	$ 100
EXCAVATION	5	CY	$ 50	$ 250
RIPRAP/BOULDERS/QUARRY SPALLS	20	CY	$ 100	$ 2,000
FILL	50	CY	$ 30	$ 1,500
LOGS	2	EA	$ 1,400	$ 2,800
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
ACCESS (10' WIDE)	150	LF	$ 10	$ 1,500
ACCESS RESTORATION	150	LF	$ 10	$ 1,500
RIPARIAN PLANTING AND SEEDING	50	LF	$ 30	$ 1,500
			Subtotal	$ 13,150
SPECIAL ACCESS/CONSTRUCTION	5%			$ -
MISC	10%			$ 1,315
EROSION & SEDIMENTATION CONTROL	10%			$ 1,315
TRAFFIC CONTROL	5%			$ 658
			Subtotal	$ 16,438
MOBILIZATION	10%			$ 1,644
			Subtotal	$ 18,000
CONTINGENCY	30%			$ 5,400
			Subtotal	$ 23,400
STATE SALES TAX	8.80%			$ 2,059
	Total Estimated Construction Cost (Rounded)			$ 29,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 7,250
PERMITTING	10%			$ 2,900
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 5,800
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	1	PARCEL	$ 500	$ 500
	Total Estimated Project Cost (Rounded)			**$ 45,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

Basin No.:	52
Project No:	52.1
Project Title:	**150 feet of Channel Stabilization on downstream side of East Mercer Way in 4300 Block**
Problem Description:	Rapid bed erosion, bank erosion and headcuts in a small channel with a bottom width of 2 feet and a depth of 3 to 7 feet on downstream side of East Mercer Way. Bed and banks consist of erodible sandy material and fill.
Project Description:	Installation of channel stabilization on 150 feet of this small water course.
Related Projects	None
Estimated Project Cost:	$105,000

Looking Upstream 12/14/2005



Project Location Map

PLANNING LEVEL CONSTRUCTION COST OPINION-MERCER ISLAND CIP

PROJECT: **52.1** **CHECKED BY:** **msg**
BY: **jcb** **DATE:** **5/24/2006**
CHANNEL STABILIZATION

BID ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
CONSTRUCTION COSTS				
CLEARING AND GRUBBING	150	LF	$ 10	$ 1,500
REMOVE/DISPOSE MISC DEBRIS	150	LF	$ 2	$ 300
EXCAVATION	68	CY	$ 40	$ 2,700
BOULDERS	60	TON	$ 100	$ 6,000
STREAMBED GRAVEL MIX	38	TON	$ 80	$ 3,000
LOGS	8	EA	$ 1,400	$ 10,500
TEMPORARY BYPASS	1	LS	$ 1,000	$ 1,000
ACCESS (10' WIDE)	50	LF	$ 10	$ 500
ACCESS RESTORATION	50	LF	$ 10	$ 500
RIPARIAN PLANTING AND SEEDING	150	LF	$ 30	$ 4,500
			Subtotal	$ 30,500
SPECIAL ACCESS/CONSTRUCTION	5%			$ 1,525
MISC	10%			$ 3,050
EROSION & SEDIMENTATION CONTROL	10%			$ 3,050
TRAFFIC CONTROL-approach from east	0%			$ -
			Subtotal	$ 38,125
MOBILIZATION	10%			$ 3,813
			Subtotal	$ 42,000
CONTINGENCY	30%			$ 12,600
			Subtotal	$ 54,600
STATE SALES TAX	8.80%			$ 4,805
	Total Estimated Construction Cost (Rounded)			$ 67,000
INDIRECT COSTS				
SURVEYING AND DESIGN	25%			$ 16,750
PERMITTING	10%			$ 6,700
CONSTRUCTION ENGINEERING AND ADMINISTRATION	20%			$ 13,400
EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3)	3	PARCEL	$ 500	$ 1,500
	Total Estimated Project Cost (Rounded)			**$ 105,000**

Notes:
1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

Appendix H

ADDITIONAL FIELD PHOTOGRAPHS

Problem No. 4.2

Problem No. 6.1

Problem No. 6.2

Problem No. 6.2

Problem No. 6.2

Problem No. 6.2

Problem No. 10.4

Problem No. 10.4

Problem No. 10.4

Problem No. 26.1

Problem No. 27a.1

Problem No. 27a.3

Problem No. 27a.3

Problem No. 27a.3

Problem No. 27a.3

Problem No. 27a.3

Problem No. 27a.6

Problem No. 29.1

Problem No. 29.2_60

Problem No. 29.2_60

Problem No. 29.2_60

Problem No. 32b.1

Problem No. 32b.1

Problem No. 37b.1

Problem No. 37b.1

Problem No. 39a.1

Problem No. 39a.1

Problem No. 42.1a

Problem No. 42.2

Problem No. 42.2

Problem No. 42.3

Problem No. 42.3

Problem No. 42.4

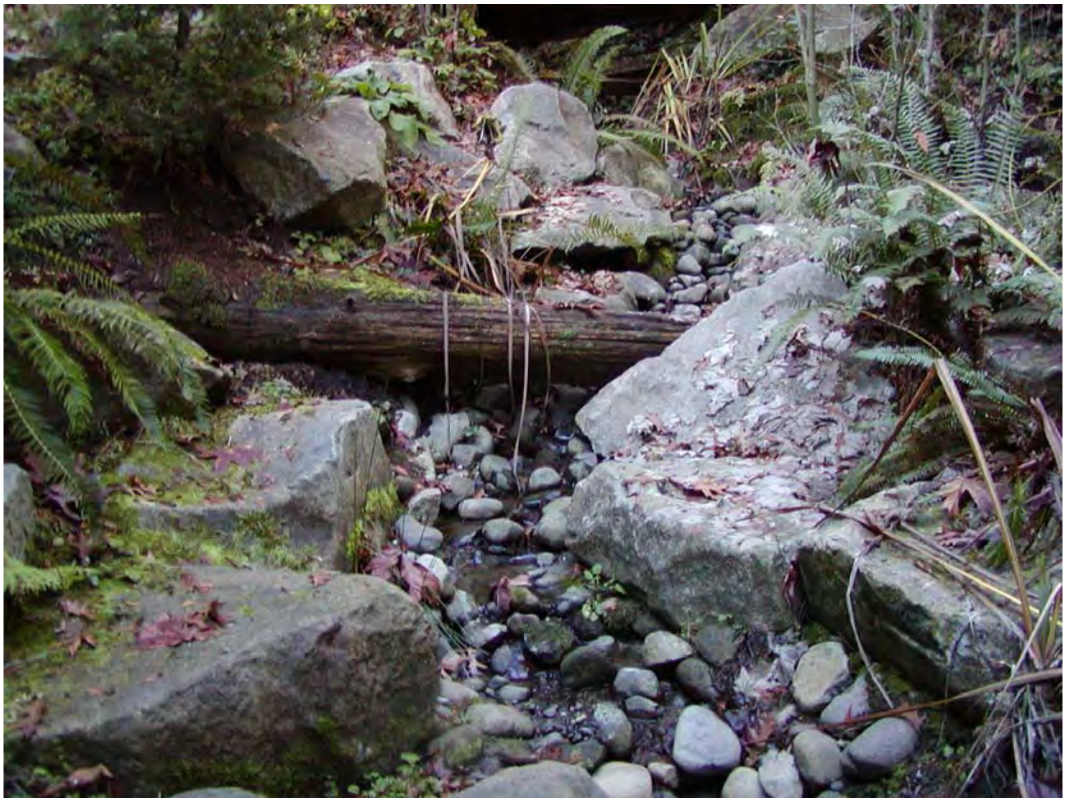
Problem No. 42.8a

Problem No. 42.8a

Problem No. 44b.1_60

Problem No. 44b.1_60

Problem No. 45b1



Problem No. 45b2

Problem No. 45b4

Problem No. 46.1

Problem No. 46.1

Problem No. 46.1

Problem No. 46.1

Problem No. 46.1

Problem No. 46.6

Problem No. 46.7

Problem No. 46.10

Problem No. 46.10

Problem No. 46a1

Problem No. 49b1

Problem No. 49b2

Problem No. 49b2

Problem No. 49b.4_60

Problem No. 49b.4_60

Problem No. 49b.4_60

Problem No. 50b1

Problem No. 50b3

Problem No. 50c.1_60

Problem No. 51a.1_60

Problem No. 51a.1_60

Problem No. 52.2_60