

Appendix C
Memorandum: Bel-Red Corridor
Environmental Opportunities and Constraints

Herrera Environmental Consultants, Inc.

Memorandum

To Kevin McDonald
cc Diane Hennessey
From Kittie Ford, Herrera Environmental Consultants
Date January 27, 2006
Subject Bel-Red Corridor Environmental Opportunities and Constraints

The City of Bellevue has amassed substantial information on the general health and biological characteristics of its aquatic resources. City staff requested that Herrera compile the City's information, as well as information from other sources, in a format that would help decision-makers and the public to better understand the current quality of its natural resources and the opportunities for further improving the quality of those resources. Herrera focused on the natural resources in the Bel-Red Corridor study area, as well as areas immediately adjacent to the study area, that could affect the potential for restoration of natural resource functions through redevelopment. The attached materials address the form and function of streams and their associated vegetated corridors in the Bel-Red Corridor study area.

The City's GIS information on stream characteristics, and utilization of those streams by fish, forms the basis of the attached materials. Data was obtained from the City of Bellevue GIS and Utilities Department (Kit Paulsen). The parameters used were based on the Urban Stream Baseline Evaluation Method (USBEM) that Adolfson (2003) used in their *Bellevue Critical Areas Update Streams Inventory*. The USBEM was developed to assess habitat conditions of freshwater areas as part of the King, Pierce, and Snohomish County urban issues study for the region's response to listing of chinook and bull trout under the Endangered Species Act. The USBEM classifies streams to indicate: streams that are highly suitable to support salmonid species of concern; streams that provide potential suitable habitat, and streams that are unlikely to provide habitat due to geomorphic constraints, high levels of alteration, and/or natural barriers.

In a previous study of streams conducted by the City, each stream in the study area was divided into stream segments. Herrera compiled available information by stream segment, using city data and information gathered by others. Each stream segment and each stream was then rated for its suitability for fish and for rehabilitation. Rating criteria for the overall health of each stream segment are based on previous work conducted by the City in support of the ongoing critical areas update and the USBEM stream classifications. Rating criteria for good, moderate, and poor conditions were applied to a range of ecological parameters indicative of stream health and habitat suitability for fish.

The results of the data compilation, stream characterization, and rating are depicted in the attached tables and figures.

Following is a brief overview of each of the ecological factors considered in this analysis.

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Fish Use - Current distribution of anadromous salmonids in streams in the study area is an important indicator of stream suitability for fish. Salmonid use in piped streams indicates stream sections that would highly benefit from restoration of open channel habitat, since fish already exist. Confirmed chinook use in the study area and downstream indicates where fish species exist that are protected by the Endangered Species Act, and prioritizes the rating of those streams.

Physical Stream Corridor Conditions - Channel modifications uses percent of stream in culverts to indicate where streams have been most modified through manmade structures. Riparian constraints indicates the amount of impervious surface within 50 feet of stream and its influence on the stream. Watershed alterations/riparian breaks identifies the extent of areas without vegetation on either side of the stream and is an indicator of fragmentation of the riparian corridor.

Riparian Condition - Riparian vegetation within 50 feet of the stream is an indicator of more favorable riparian conditions for fish habitat and wildlife.

Fish Habitat Conditions – Conditions for fish spawning is indicated by a stream gradient of 4% or less. The most favorable spawning habitat occurs in these areas. The USBEM habitat suitability indicator was obtained from previous analysis completed by Adolfson (2003) and indicates which portions of the stream are have the highest suitability for anadromous fish.

Fish Access – The fish blockages (manmade and other) parameter indicates the amount of effort that is needed to rehabilitate streams for fish use. This parameter prioritizes streams that have no or only one blockage as those that would be more easily rehabilitated. Fish blockage also can occur when the stream gradient is greater than 12%, which is considered a physical natural barrier to fish passage. Streams with a gradient less than 12% are easier to rehabilitate because no gradient changes would be needed.

Water Quality - This indicator is an important component in stream health, but insufficient data for all streams in the study area was available to use it. The stream health index or I-IBI is based on the number and types of microorganisms in the stream that provide food for fish and other organisms, indicating the stream health. The 303(d) listing of streams indicates chemical or turbidity problems within a stream. There is some chemical water sample data for three of the six streams, but this data needs to be available for all the streams in the corridor before it is useful for decision-making. This parameter may be used in the future.

Upstream and Downstream Fish Use – Stream with current salmonid distribution in the upstream and downstream stream basins outside the study area have higher priority for restoration than streams without upstream or downstream anadromous salmonid use. Goff and Valley creeks are the only streams with upstream habitat. All streams have some anadromous fish use downstream of the study area.

Upstream and Downstream Health - Subbasin conditions were indicated by the watershed alteration/riparian breaks parameter to indicate conditions of the upstream and downstream watershed and riparian conditions. This parameter prioritizes those streams that have good up and downstream conditions.

Opportunities and Constraint of Potential Stream Rehabilitation

Several factors (described above) were used to determine “good”, “moderate”, or “poor” ratings for ecological conditions in streams and riparian areas in the Bel-Red Corridor study area. These ratings can be used to prioritize the potential fish habitat and riparian rehabilitation opportunities of the streams. The focus of the potential rehabilitation opportunities in this analysis is on improving streams for anadromous fish use and ecological health of streams.

Streams with the least number of constraints are those with the highest potential opportunities for rehabilitation. Constraints include fish blockages, impervious surfaces (parking lots, gravel drives, paved open space, etc.) adjacent to streams, buildings adjacent to streams, piped streams, poor substrate and instream fish habitat, and water quality. Constraints that are easiest to remediate include removal of fish blockages; planting vegetation in riparian corridors; removing impervious surface and replacing it with pervious surfaces or vegetation; and restoring sections of piped streams. Potential opportunities in the Bel-Red Corridor streams will focus on those constraints that are easiest to remove.

Potential opportunities for rehabilitation of Bel-Red Corridor streams are provided in order of highest to lowest levels of opportunities. The stream with the highest opportunity for rehabilitation and the least constraints is Valley Creek. This stream is used by all salmonids including chinook. This stream has no fish blockages and good potential spawning habitat in two reaches of the stream. The stream is only piped in one reach and has about 60 percent vegetation along the entire study area. The streams with the second highest opportunities for rehabilitation are Goff and Sears Creek. These streams are used by all anadromous salmonids except Goff Creek does not currently have chinook use. Goff and Sears have fish blockages at 3 and 2 culverts, respectively. The streams are piped along two reaches and the riparian areas have about 20 percent less percent vegetation and are more fragmented than Valley Creek. The West Tributary and the Unnamed tributary to Kelsey Creek have the third highest opportunity for rehabilitation. These streams are currently not used by anadromous salmonids, but are used by resident cutthroat trout and other fish. They have longer piped and more piped sections than the other streams discussed above. The Unnamed tributary has lower percent vegetation along its corridor than Valley, Goff and Sears Creeks. The West Tributary has relatively high levels of percent vegetation (70 percent) along the riparian corridor, but some of is adjacent to piped stream. Sturtevant Creek would take the largest effort to rehabilitate and is in the poorest condition of all the streams in the study area. Only cutthroat trout and other fish use the portion of Sturtevant Creek that is in the study area, and the stream has two fish blockages. Most of the stream is piped and percent vegetation in the riparian area is lower than the other streams. All streams have constraints that need to be removed, but those with the least number offer the best potential opportunities within an ecological context.

Stream Buffers

Bellevue is in the process of updating its Critical Areas Ordinance but has not made a final approval of the new regulations. Therefore, we will provide the existing and proposed buffers for the streams in the Bel-Red Corridor study area. Table 1 provides a listing of the buffer requirements for streams in Bellevue.

Table 1. Proposed and existing buffers for streams.

Stream Rating Washington State	Buffer under the proposed regulatory update (feet)	Buffer under existing Bellevue Code (feet)
Type S	100	50
Type F	100	50-10
Type N	50	50-25
Type O	25	10-0

Note: In addition to the buffers, a 10-20 foot setback will apply.

The types and buffer requirements for streams in the Bel-Red corridor are provided in Table 2. All streams in the Bel-Red corridor require a maximum buffer of 50 feet under the existing regulations. Under the new proposed regulations, Sturtevant, Goff, Valley and Sears Creek would have a larger buffer of 100 feet under the proposed regulations however, the new regulations are not yet approved.

Table 2. Proposed and existing buffers for streams in the Bel-Red Corridor project study area.

Stream Name	Stream Rating Washington State	Buffer under the proposed regulatory update (feet)	Buffer under existing Bellevue Code (feet)
Sturtevant	Type F	100	50-10
Unnamed tributary to Kelsey Creek	Type N	50	50-25
West Tributary	Type N	50	50-25
Goff	Type F	100	50-10
Valley	Type F	100	50-10
Sears	Type F	100	50-10

**Factors to determine suitability of stream habitat for fish and rehabilitation
Bel Red Corridor Project**

Ecological Factor	Parameter	Criteria	Ratings ^d		
			Good	Moderate	Poor
Fish use	Current Salmonid distribution	% total reach used by anadromous salmonids	>60% salmonids	>20-60% salmonids	<20% salmonids
	Salmonid use in piped streams (for total stream only)	% of culverted stream used by salmonids	<6%	6-30%	>30%
	Confirmed chinook use in study area and downstream	Chinook use in study area and downstream=2; use downstream only = 1, No use downstream=0	2	1	0
Physical stream corridor conditions	Channel modifications	% of stream in culverts	<10%	10-20%	>20%
	Riparian constraints	% TIA within 50 feet of stream (%buildings, ROW, Parking lots)	<10%	10-40%	>40%
	Watershed alterations/riparian breaks ^c	Rating of watershed alteration and riparian breaks (areas within 50 feet of stream where both sides are impervious)	Low (3)	Moderate (2)	High (1)
Riparian condition	Riparian vegetation	% vegetated within 50 feet of stream	>70%	40-70	<40%
Fish habitat conditions	Spawning potential	% of stream with gradient of 4% or less	>80%	40-80%	<40%
	USBEM Habitat suitability ^c	Rating of suitability based on Channel Type and stream alteration	Highly suitable with fish present (1)	Secondary habitat use with fish present or potentially present (2)	Negligible Habitat use with fish unlikely to be present (3)
Fish Access	Fish blockage (manmade and other)	Number of blockages (for entire stream in study area)	0	1-2	>=3
	Fish blockage due to gradient	% of stream with gradient of 12% or less	>75%	40-75%	<40%
Water Quality	Stream health index ^a	B-IBI ratings	>20	15-20	<15
	Water quality parameter ^b	% of stream with chemical contamination that would affect stream and habitat health			
	Water quality ^e	303(d) water quality limited list	No listed reaches	1 listed reach	>1 listed reach
Upstream and downstream fish use	Current Salmonid distribution	% total reach used by anadromous salmonid	>60% salmonids	>20-60% salmonids	<20% salmonids and 2 salmonid species or less (no use = score of 0)
Upstream and downstream health	Subbasin conditions ^b	Watershed alteration/riparian breaks	Low (3)	Moderate (2)	High (1)

^a Insufficient data for all streams for this parameter (only available for West Tributary, Goff Creek, and Sears Creek)

^b Need to compile and collect water quality data for this parameter

^c Parameters that were used from City of Bellevue segment data table, all other data is from the GIS department.

SUMMARY RATINGS by PARAMETER

Stream ID	Fish use			Physical stream corridor conditions		
	% used by anadromous salmon	chinook use in study area and downstream	% of culverted stream used by salmonids	% of stream in culverts	% TIA within 50 feet of stream	Watershed alteration/ Riparian Breaks
	Sturtevant	0	1	2	2	1
Unnamed tributary to Kelsey Creek	0	2	3	1	1	1
West Tributary	0	2	3	1.5	1.5	1
Goff	0.75	2	1.5	1.5	1	2
Valley	3	3	2	2	2	1
Sears	1	2	3	1	2	1

Summary rating using median of each parameter by category and all factors

SUMMARY RATINGS by PARAMETER: Good=3, Moderate=2, Poor=1

Stream ID	Fish use	Physical stream corridor conditions	Fish access	Fish habitat conditions	Riparian Condition	Summary of all parameters (median)
Sturtevant	1	1	2.5	2.5	2	1
Unnamed tributary to Kelsey Creek	2	1	2.75	2.25	2	1.5
West Tributary	2	1.5	2.75	1.5	1.5	1.5
Goff	1.5	1.5	2.75	1.5	2	2
Valley	3	2	3	2.5	1	3
Sears	2	1	2.5	1.5	2	2

Note: summary of all parameters includes upstream and downstream parameters

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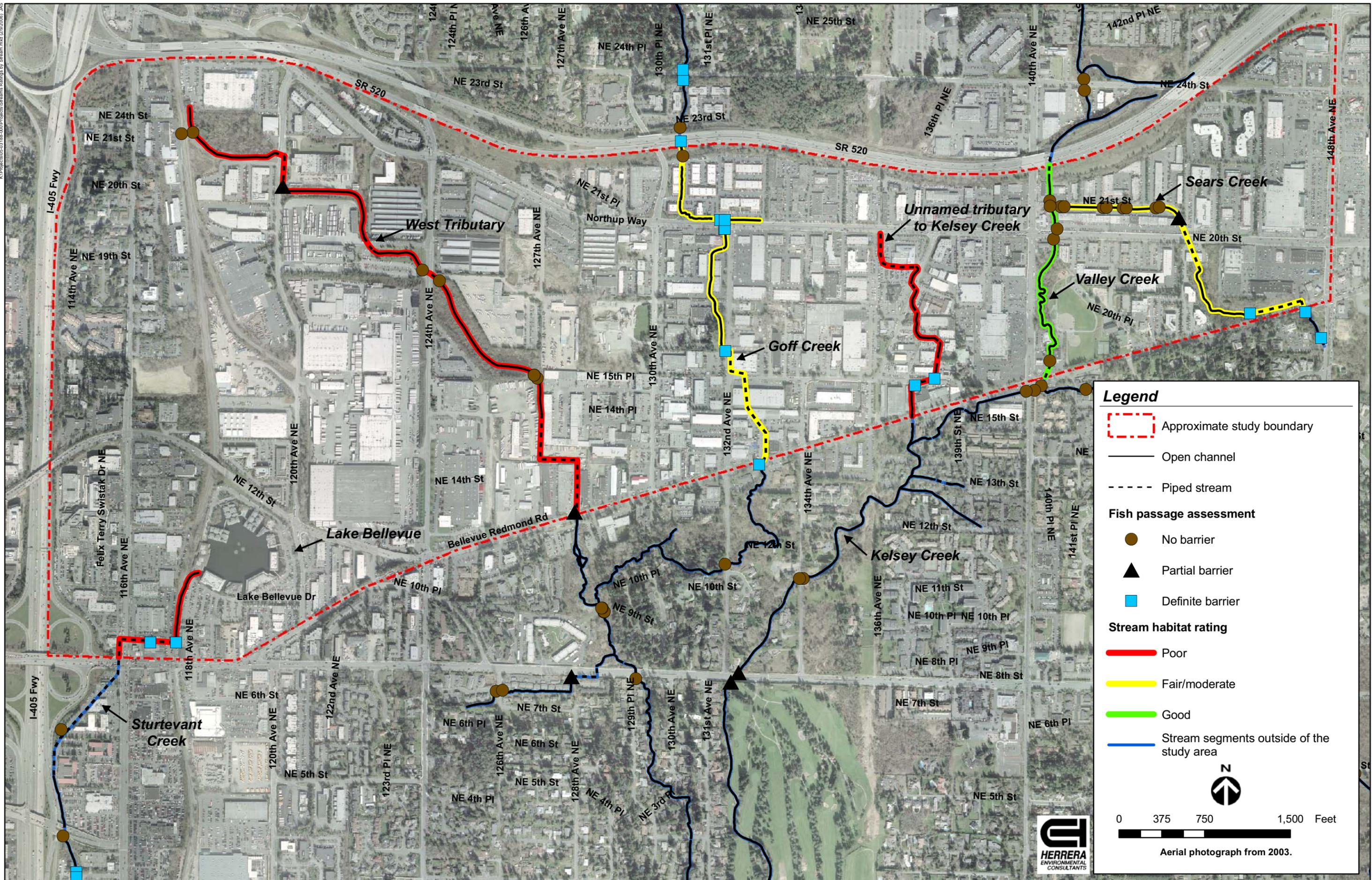


Figure 1. Stream habitat ratings by entire stream, piped stream and fish barriers within the Bellevue-Redmond Road study corridor

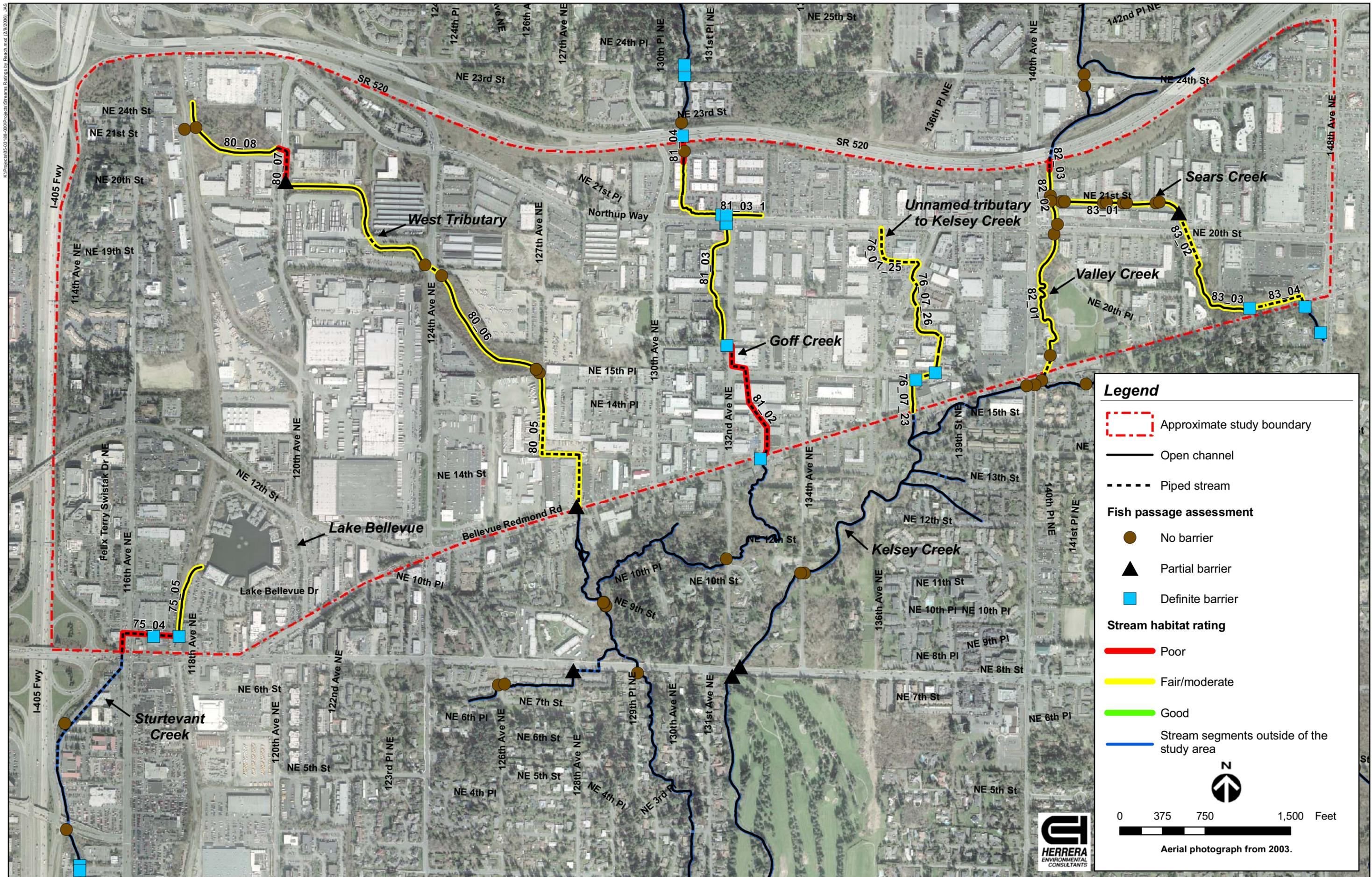


Figure 2. Stream habitat ratings by stream reach, piped stream and fish barriers within the Bellevue-Redmond Road study corridor.