FINAL DRAFT

KING COUNTY DEPARTMENT OF NATURAL RESOURCES
YEAR 2000 CSO PLAN UPDATE PROJECT
SEDIMENT MANAGEMENT PLAN

Sediment Site Prioritization

Task 1100
Technical Memorandum

BROWN AND CALDWELL
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January 1999

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EXECUTIVE SUMMARY

This technical memorandum presents prioritization criteria for consideration. Sediment site prioritization models that have been used in similar regional programs have been reviewed and evaluated. These programs include the State of Washington Sediment Management Standards (SMS), the Elliott Bay/Duwamish Restoration Program (EBDRP), and Bellingham Bay Demonstration Pilot Project.

The Washington State Department of Ecology's (Ecology's) SMS model incorporates the general ecological and human health risk reduction objectives of sediment cleanup. These objectives were transformed by Ecology into a set of detailed scoring guidelines, which in turn were incorporated into a spreadsheet-based scoring model designated as the Sediment Ranking System (SEDRANK).

The EBDRP developed a structured project identification and screening process for the prioritization of sediment remediation projects, similar in some respects to the SEDRANK criteria, but relying to a greater degree on various site-specific "statements" that could be evaluated qualitatively. The statement-based criteria included:

- Contaminated sediment present (high toxicity).
- Control of combined sewer overflows, storm drains, industrial input and recontamination from adjacent sediment.
- Potential for addressing injury to target species/fish.
- Potential to incorporate extra habitat improvement or proximity to other habitat projects or sediment remediation sites.
- Potential for human health risk.
- Potential for public education.
- Coordination with other projects.

Pilot Project sediment prioritization was performed using a consistent application of the baywide goals that reflected the collective interests and desired outcomes of the Pilot actions. The Pilot goals were applied to a range of project elements (i.e., source control and sediment cleanup, sediment disposal, habitat restoration, and aquatic land use) and were designed to represent key regulatory and policy issues and concerns. These statements are listed in logical goal groupings as follows:

- Goal 1 - Human Health and Safety
- Goal 2 - Ecological Health

- Goal 3 - Protect and Restore Ecosystems
- Goal 4 - Social and Cultural Uses
- Goal 5 - Resource Management
- Goal 6 - Faster, Better, Cheaper
- Goal 7 - Economic Vitality

Based largely on the successful Bellingham Pilot model, a recommended prioritization model is presented. This model consists of the SEDRANK scoring model modified in a manner similar to the Bellingham Pilot model to include relevance to local conditions in King County. The information contained within this document will be used to develop preliminary (programmatic) cleanup priorities at seven identified King County CSO sediment cleanup sites

INTRODUCTION

King County recently contracted with Brown & Caldwell and it's subconsultants (Herrera Environmental Consultants and Anchor Environmental) to develop a Sediment Management Plan (SMP) for King County's Combined Sewer Overflow (CSO) Program. One of the initial tasks (Task 1100) of this effort is to develop a list of criteria for use in prioritizing sediment remediation sites, along with a decision-making process for the SMP. Relevant criteria may include public health and environmental impacts, cost/benefit, cost effectiveness, opportunities for coincident benefits, potential for source trading, and "window of opportunity" issues. The decision-making process addresses the types of decisions that need to be made, responsible party for making decisions, and issues to be considered in decision-making. This technical memorandum presents prioritization criteria for consideration, to support development of preliminary (programmatic) cleanup priorities at seven identified King County CSO sediment cleanup sites.

SEDRANK – ECOLOGY'S SITE RANKING METHOD (1990)

As set forth in the SMS regulation, Ecology has developed a methodology to identify and prioritize agency resources to implement the SMS. The general ecological and human health risk reduction objectives of sediment cleanup, as defined by the SMS, were transformed by Ecology into a set of detailed scoring guidelines, which in turn were incorporated into a spreadsheet-based scoring model denoted the Sediment Ranking System (SEDRANK), January, 1990. The SEDRANK model integrates available information on toxicity potential, extent, natural recovery potential, habitat attributes, fisheries utilization, and other factors to derive a total score for each prospective sediment cleanup site. Use of the SEDRANK model has been incorporated into the SMS regulation (Chapter 173-204-540 WAC).

SEDRANK INPUT PARAMETERS

Inputs to the SEDRANK model include the following:

- Maximum concentration of individual contaminants;
- Area of contaminated sediments;
- Historical versus ongoing sources;
- Net sedimentation rate;
- Water depth of contaminated sediments;
- Habitat complexity;
- Proximity to special marine habitats and wildlife refuges;
- Proximity to tribal and other commercial fisheries; and
- Proximity to recreational fisheries and public access.

Each of these factors is discussed individually in the sections below.

Maximum Concentration of Individual Contaminants

The SEDRANK model uses as input the maximum concentration of individual analytes detected at a site, and then compares the maximum values with ecological and human health benchmarks derived from relevant toxicity criteria. The degree of exceedance of the Sediment Quality Standard (SQS) chemical criteria is used in the SEDRANK model as a measure of relative ecological risk. The concentration data are also used in a screening-level human health risk assessment.

Area of Contaminated Sediments

The SEDRANK model differentiated the areal extent of sediment contamination into high, medium, and low categories, with the cutoffs for such ranking occurring at intervals of 400 and 200 acres, respectively. Typically, most SMS sites fall within the "low" category of less than 200 acres.

Historical Versus Ongoing Sources

For the purpose of natural recovery estimates, the SEDRANK model differentiates between sites affected by ongoing inputs versus sites affected solely by historical releases. Best professional judgement is commonly used in this determination.

Net Sedimentation Rates

In addition to source control (and chemical-specific degradation rates coded into the model), the other parameter that determines natural sediment recovery in the SEDRANK model is the net sedimentation rate, which is a measure of the long-term burial rate of contaminated sediments beneath cleaner, more recent sediment materials. Net sedimentation rate estimates are typically based on ^{210}Pb and ^{137}Cs core profiles, and/or net changes in the mudline elevation over time, as determined from a comparison of channel condition surveys.

Water Depth Of Contaminated Sediments

In consideration of the well documented preference for many fish and shellfish species to utilize shallow water habitats over deeper zones, the SEDRANK model assigns a higher score to those sediment sites that are located within relatively shallow water.

Habitat Complexity

In developing the ecological risk score, the SEDRANK model utilizes information on site relief or the areal extent of habitat enhancing materials such as eelgrass, shell hash, or other similar enhancements within the contamination area.

Proximity To Special Marine Habitats, Wildlife Refuges, and Fisheries

The final set of parameters used in the SEDRANK model refers to the location of the sediment site relative to important ecological and human health exposure areas, including special marine habitats, tribal fisheries, and public access points.

SEDRANK SCORING

Using the input data described above, the SEDRANK model calculates an overall ecological and human health score. However, to date Ecology has only published the results of the ecological scoring, though the SEDRANK algorithm includes both elements.

Both the ecological and human health scores are based on Ecology's professional judgement, transformed into a set of detailed scoring algorithms that are integrated into the following equation:

Overall Score = Waste Characteristics Score x (Site Score + Affected Resources Score)

where:

> **Waste Characteristics Score** = Area Score x Overall Chemical Toxicity Score/3
>
> (using different chemical-specific toxicity scores for ecological and human health);
>
> **Site Score** = Natural Recovery Factor x Habitat Quality Score; and
>
> **Affected Resources Score** = Habitat Score + Sanctuary Score (ecological) or
>
> (5/8) x Commercial Fisheries Score + Recreational Fisheries Score (human health)

Ecology periodically applies the SEDRANK model to prioritize its resources from among the total list of Contaminated Sediment Sites it has identified. The most recent Ecology publication of the SEDRANK results was released in May, 1996. Based on these data, the seven sediment sites currently identified for consideration in the King County SMP were ranked as follows (ecological score only; out of a possible 100 points):

- Hanford Street CSO (EB8) - 42;
- Lander Street CSO (EB7) - 13;
- Duwamish Pump Sta./Diagonal CSO (DR31) - 12;
- Brandon Street CSO (DR32) - 10;
- King Street CSO (EB27) - 10;
- Denny Way CSO (EB26) - 6; and

- Chelan Avenue CSO (EB13) – Not Scored [within general Superfund site boundary]

(based on the relatively low exceedance of SQS criteria reported by Ecology within the vicinity of the Chelan Avenue CSO, the site would likely have a relatively low ecological score if ranked using the SEDQUAL algorithm).

ELLIOTT BAY/DUWAMISH RESTORATION PROGRAM (1994)

The Elliott Bay/Duwamish Restoration Program (EBDRP), consisting of a panel of cooperating governments, is responsible for implementing the requirements of a 1991 Consent Decree addressing alleged natural resource damages within the Elliott Bay/Duwamish area resulting from CSO and storm drain discharges. One of the initial tasks of the EBDRP Panel (Panel) was the development of a process to identify and evaluate potential sites for sediment remediation and habitat development projects. As presented in the June 1994 "Concept Document", the identification of sediment remediation project opportunities was carried out through a structured project identification and screening process for 24 sites in Elliott Bay and the lower Duwamish River. This process involved the following:

- Evaluation criteria that reflect the goals of the EBDRP;
- Weighting factors and scoring guidelines for each criterion;
- Prioritization between the various criteria;
- Identification of potential projects; and
- Evaluation of identified projects against the developed criteria.

The criteria selected by the Panel for the prioritization of sediment remediation projects were similar in some respects to the SEDRANK criteria outlined above, but relied to a greater degree on various site-specific "statements" that could be evaluated qualitatively. The Panel's statement-based criteria are described below, along with their associated weighting (each criterion was assigned a numerical weight of 1 to 5, with 5 meaning "highest priority and 1 meaning "lowest priority"):

- **Contaminated sediment present (high toxicity)** – Sites with sediment contamination potentially related to resource injury AND greater than the SMS Cleanup Screening Level (CSL). Weighted score = 5;
- **Control of combined sewer overflows, storm drains, industrial input and recontamination from adjacent sediment is adequate** – Sites adjacent to sources for which significant source control actions have been implemented or will be implemented by the time the remediation project is initiated, and for which minimal input of toxic contaminants is expected. Weighted score = 5;
- **Potential for addressing injury to target species/fish** – Sites with living estuarine resources having measurable injuries. Weighted score = 3;

- **Potential to incorporate extra habitat improvement, or proximity to other habitat projects or sediment remediation sites** – Sites adjacent to other areas that have received or have the potential of receiving sediment remediation or habitat restoration. Weighted score = 3;

- **Potential for human health risk** – Sites that have higher potential risks to public health. Weighted score = 3;

- **Potential for public education** – Sites in areas with existing, or high potential for, extensive public use and visibility. Weighted score = 3; and

- Coordination with other projects (for example, confined disposal or maintenance dredging) – Sites involved in projects that obtain major advantages by coordinating with other projects. Weighted score = 3.

Additional criteria originally established but not included in the ranking were as follows:

- Proximity to City or King County CSO or storm drain;

- Site ownership (Type of ownership was not anticipated to influence a project's feasibility or ease of implementation);

- Cost-effectiveness (Cost-effectiveness could not be determined for projects at the early stage of the process); and

- Opportunity (This criterion could not be determined at the early stage in the process. However, this criterion was used with several other factors in the final stage of project selection; see below).

The weighted criteria outlined above were used to score potential sediment remediation projects identified by the Panel. Each project was assigned a score depending on how well that project met the criterion as follows:

- Project received a high score of 3 if the match to a specific criterion was very good;

- Project received a medium score of 2 if the match was medium; and

- Project received a low score of 1 if the match was poor.

The overall priority of the various projects was determined by multiplying the weighting of each criterion by the score assigned to each project for how well the project met the criterion. The resulting numbers for the criteria were added together for each project to determine an overall score. Based on these scores, the projects were divided into a high, medium and low priority group with approximately the same number of projects in each group:

In order to complete the selection process, the Sediment Remediation Technical Working Group of the Panel evaluated potential sites in the order they were ranked and considered other factors that either supported or argued against proceeding with each project. These factors included:

- Potential for recontamination from other sources;
- Source control schedule;
- Potential for the project to be implemented by different sponsors;
- Opportunity for partial funding by another party; and
- Availability of capping material and/or disposal sites.

Following final project selection, the Panel proceeded with more specific planning and implementation. The Panel is currently in the process of developing and implementing detailed cleanup plans at several sites within the Elliott Bay/Duwamish area.

BELLINGHAM BAY PILOT PROJECT (1998)

Based on recent Puget Sound experiences, cleanup of contaminated sediments has proven to be a difficult task, complicated by high costs, limited disposal site options, concerns about environmental liability, source control issues, habitat alterations, and complex regulatory and land owner constraints. To address the need for sediment cleanup and overcome some of the existing roadblocks to expedited actions, in May 1994 a group of five federal and state agencies in Washington state formed the Cooperative Sediment Management Program (CSMP) and signed an intergovernmental agreement. The agencies that signed the CSMP Intergovernmental Agreement included:

- Washington State Department of Ecology (Ecology);
- Washington State Department of Natural Resources (DNR);
- U.S. Environmental Protection Agency, Region 10 (EPA);
- U.S. Army Corps of Engineers (Corps); and
- Puget Sound Water Quality Action Team.

The cooperating agencies, later including the Washington State Departments of Transportation (WSDOT) and Fish and Wildlife (WDFW) decided to focus on a pilot demonstration project in a selected embayment with the goal of overcoming roadblocks to expedited cleanup actions at that location. The agencies proposed to help fund a Demonstration Pilot Project (Pilot) to develop sediment cleanup and disposal, habitat restoration, and source control priorities in an urban embayment of Puget Sound by creating a partnership with local governments and businesses. The key goals of the Pilot were to control sources of contamination, expedite cleanup of high priority sediment sites, test various incentives for cleanup, and create new and flexible methods for achieving cleanup. The sponsoring agencies set aside a grant available to local governments under the Model Toxics Control Act (MTCA) to help fund the Pilot.

In June 1996, Bellingham Bay was selected as the location for the Pilot. Bellingham Bay was selected in part due to the responsiveness of a local group that had already initiated collaborative efforts. The local group included:

- Port of Bellingham (Port);
- City of Bellingham (City);
- Whatcom County Health Department; and
- Georgia-Pacific, West, Inc. (G-P).

In September 1996, the Bellingham Bay Work Group (BBWG) was established to initiate the Pilot. The BBWG "Pilot Team" included the sponsoring and cooperating state and federal agencies, the four local proponents, the U.S. Fish & Wildlife Service, and representatives of the Lummi Nation and Nooksack Tribe. The Pilot Team developed environmental, process, partnering, and policy objectives specific to the Pilot, which were intended to ensure achievement of the following overall mission statement:

> *"To use a new cooperative approach to expedite source control, sediment cleanup and associated habitat restoration in Bellingham Bay."*

The Pilot has four fundamental project elements, including:

- Sediment cleanup and source control;
- Sediment disposal;
- Habitat restoration; and
- Aquatic land use.

The Pilot was designed to expand opportunities for achieving multiple goals in Bellingham Bay, through comprehensive strategic environmental planning and well-integrated projects that would encompass the four elements listed above. A Comprehensive Strategy is currently being developed by the Pilot Team that integrates sediment cleanup and source control with the other project elements. The Comprehensive Strategy will include near-term project alternatives that are priority action items from each of the elements, integrated together into near-term actions. A generalized flow chart depicting this process is presented in Figure 1.

The Pilot's sediment cleanup and source control evaluation and prioritization was performed in several sequential steps as follows:

- Initial review of sediment and water quality contamination areas throughout Bellingham Bay, resulting in the identification of 12 sediment sites of potential concern;
- Development and description of the overall goals and corresponding evaluation criteria used by the Pilot Team to assess each potential sediment cleanup and source control site; and
- Assumptions, rationale, and results of applying these goals and evaluation criteria to the inventory of identified sediment cleanup and source control sites, resulting in the relative ranking of the 12 prospective cleanup sites.

A flow chart depicting the process used by the Pilot Team to identify and rank sediment cleanup and source control sites is presented in Figure 2.

BELLINGHAM BAY WORK GROUP GOALS AND EVALUATION CRITERIA

The evaluation and prioritization of the 12 prospective sediment cleanup and source control sites, identified based on a preliminary hazard assessment as described in SMS regulations, was performed using a consistent application of the Pilot goals. The development of baywide goals and evaluation criteria for this application is discussed below.

Development of Bellingham Bay Work Group Goals

Beginning in August 1997, the Pilot Team started a process of developing and refining baywide goals that reflected the collective interests and desired outcomes of the Pilot actions. The Pilot goals were initially developed as simple statements (the bullet items listed below under "goal descriptors") of desired outcomes that can be applied to all of the project elements (i.e., source control and sediment cleanup, sediment disposal, habitat restoration, and aquatic land use). The statements were also designed to represent key regulatory and policy issues and concerns of individual Pilot members (see below). These statements were then consolidated, reviewed, and refined into logical goal groupings as follows:

Goal 1 - Human Health and Safety

Goal Descriptors:

- Protect human health.
- Human safety.
- Protect drinking water supplies.
- Reduce contaminant sources.
- Control point and non-point sources.
- Minimize chemical releases and maintain integrity.
- Cleanup contaminated sediments posing human health risks.
- Protect water quality.

Goal 2 - Ecological Health

Goal Descriptors:

- Enhance or maintain aquatic organism health.
- Reduce contaminant sources.
- Control point and non-point sources.
- Minimize chemical releases and maintain integrity.
- Cleanup contaminated sediments posing ecological risks.
- Protect water quality.

Goal 3 - Protect and Restore Ecosystems

Goal Descriptors:

- Environmental protection/minimize environmental harm.
- Maintain physical integrity of habitats, including shoreline erosion/accretion.
- Habitat improvement.
- Avoid/minimize loss of in-water habitats and compensatory mitigation.
- Protect/restore aquatic life and aquatic resources.
- Maintain/enhance ecosystem diversity, productivity, stability, and biological function.
- Restore threatened and endangered fish and wildlife species.

Goal 4 - Social and Cultural Uses

Goal Descriptors:

- Protect spiritual use and location.
- Protect/enhance ceremonial and subsistence resource use.
- Ensure compatibility with community goals and property uses.
- Enhance recreation, aesthetic values, public use and access.

Goal 5 - Resource Management

Goal Descriptors:

- Utilize renewable resources.
- Use dredged material beneficially.
- Protect and develop water supplies.
- Conserve resources.

Goal 6 - Faster, Better, Cheaper

Goal Descriptors:

- Technical feasibility.
- Implementability.
- Timely completion.
- Cost effectiveness.
- Integrate multiple land-use and environmental objectives and actions.
- Efficient use of existing built-environment.

Goal 7 - Economic Vitality

Goal Descriptors:

- Encourage water dependent commerce.
- Allow only water dependent discharges.
- Maintain/enhance navigation.
- Tribal access to and use of treaty resources.
- Minimize treaty fishing losses.
- Develop marine transportation facilities.
- Maintain/enhance commercial property use and redevelopment.
- Enhance economic vitality.

As part of this goal development process, the Pilot Team assessed the relative priority of each of the goals. On a baywide basis (i.e., with all four project elements combined), the first three goals (Human Health and Safety, Ecological Health, and Protect/Restore Ecosystems) ranked higher than the remaining four goals.

Subsequent to the development of the agreed-upon Pilot goals, they were transformed into evaluation criteria scoring guidelines that were used to evaluate and rank prospective sediment cleanup and source control sites. Goals were transformed into evaluation criteria by developing generalized narrative descriptions of each goal that defined or discussed the goal in the context of sediment cleanup and source control. In developing the scoring criteria, an attempt was made to incorporate key regulatory and policy issues expressed by individual Pilot Team members. These key issues included (in no particular order):

- Model Toxics Control Act (MTCA) and SMS regulations for cleanup remedy selection.
- State Environmental Policy Act (SEPA) guidelines and policies.
- Local Shoreline Management Program (SMP) requirements.
- Port Development and Navigation Improvement/Maintenance Plans.
- Clean Water Act Regulations (esp. Section 404[b][1]).
- Washington State Department of Natural Resources Land Management Laws, Public Trust Doctrine, and related policies.
- Endangered Species Act (ESA) Section 7/10 Requirements.

The general relationship of the Pilot's goals to these key regulatory and policy issues is depicted on Table 1.

The seven goals were also evaluated to determine if there were priority goals among them with respect to sediment cleanup and source control (not on a bay-wide basis). The Pilot Team determined that the first four goals represented the primary elements of sediment cleanup and source control, and the remaining three goals were secondary. The relative importance of the first four goals was utilized in the scoring of sediment cleanup and source control sites.

RANKING OF PROSPECTIVE CLEANUP SITES

The guidelines for scoring developed by the Pilot for the sediment site and source control prioritization were found to be conceptually similar to guidelines previously developed by Ecology for SEDRANK (see Section 2.0). Because the SEDRANK model reasonably reflected a range of the Pilot's goals, particularly the primary Goals 1 through 4, and to provide consistency with SMS policies and guidelines, the Pilot Team decided to used the SEDRANK model to prioritize sediment cleanup and source control sites. In this case, minor modifications to the SEDRANK model were made to optimize its application in Bellingham Bay (see below).

SEDRANK Scoring Guidelines and Assumptions – Primary Goals 1 through 4

As discussed in Section 2.0, the SEDRANK model integrates available information on toxicity potential, extent, natural recovery potential, habitat attributes, fisheries utilization, and other factors to derive a total score for each prospective sediment cleanup site, consistent with evaluation criteria for Pilot Goals 1 through 4. Most of the SEDRANK input parameters were incorporated into the Bellingham Bay ranking model, though several of the parameters were modified as follows to improve resolution (i.e., relative site comparison) of the scoring:

- Maximum concentration of individual contaminants.
- Area of contaminated sediments.
- Water depth of contaminated sediments.

The Pilot's modifications to these parameters were consistent with those presented in Section 5.1. All other components of the ranking model for Goals 1 through 4 were unchanged from the original SEDRANK model.

Scoring Guidelines and Assumptions – Secondary Goals 5 through 7

Although the primary evaluation criteria for sediment cleanup and source control sites were represented by Goals 1 through 4, as reflected in the SEDRANK model, the remaining three Pilot goals were nevertheless relevant to the overall scoring and the development of the Pilot's Comprehensive Strategy. Accordingly, the last three Pilot goals were utilized to develop balancing criteria, and were applied to identify priority

sites in cases where scores for the first four goals were equivalent (i.e., tiebreaker criteria).

The results of the initial sediment site scoring ranked sites into the following categories:

- Highest Priority Sites (3 total).
- Medium/High Priority Sites (2 total).
- Medium Priority Sites (2 total).
- Medium/Low Priority Sites (2 total).
- Lowest Priority Sites (3 total).

As discussed above, a Comprehensive Strategy is currently being developed by the Pilot Team that integrates sediment cleanup and source control with the other project elements. The Comprehensive Strategy will include near-term project alternatives that are priority action items from each of the elements, integrated together into near-term actions. The 5 to 7 highest priority sediment cleanup sites are likely to be included in the near-term action for Bellingham Bay. Cleanup and restoration plans for these sites will be evaluated in more detail in a forthcoming EIS (Figures 1 and 2).

RECOMMENDED KING COUNTY SMP SITE PRIORITIZATION

Our preliminary recommendation is to use the Sediment Site and Source Control prioritization model recently developed by the Bellingham Bay Pilot Project, with minor modifications, to prioritize sediment cleanup sites for the SMP. That is, the SEDRANK scoring model, modified as discussed below, would be used as the primary basis to rank the various sites. Secondary goals as determined by the Bellingham Pilot (Resource Management; Faster, Better, Cheaper; and Economic Vitality) would be used as balancing criteria. For the seven identified sites, the ranking could be performed using existing data.

Application and adaptation of the Bellingham Pilot's prioritization model for sediment remediation sites in this case is supported by the following:

- The objectives of the Bellingham Pilot *(e.g., to use a cooperative approach to expedite sediment cleanup)* are similar to the goals of King County's SMP. Indeed, the Pilot envisioned that its efforts could be used to aid similar sediment cleanup efforts elsewhere in Puget Sound.

- The Bellingham Pilot is utilizing a decision-making process (including EIS components) that is similar in many respects to the expected process for King County's SMP, and which also addresses the importance of recent regional regulatory and policy developments including ESA.

- The Bellingham Pilot's sediment site and source control prioritization criteria address many of the key issues identified previously by King County for the SMP, including considerations of public health and environmental impacts, cost/benefit, cost effectiveness, opportunities for coincident benefits, potential for source trading, "window of opportunity" issues, and other relevant criteria.

- The goals and criteria developed by the Bellingham Pilot for sediment site and source control prioritization reflect the collective interests of key federal, tribal, state, local, and responsible party interests that are very similar in composition to stakeholders of the King County SMP project area.

- The Bellingham Pilot effort is successfully accomplishing its objectives.

- The methodology, outlined below, proposed for use in the King County SMP will not require new method development efforts, and so can be applied efficiently to identify sediment cleanup priorities in this area.

SEDRANK SCORING GUIDELINES AND ASSUMPTIONS – PRIMARY CRITERIA

The SEDRANK model will be used to integrate available information on toxicity potential, extent, source control, natural recovery potential, habitat attributes, fisheries utilization, and other factors to derive a total score for each sediment site. Most of the SEDRANK input parameters will be incorporated into the SMP ranking model, though several of the parameters will be modified as follows to improve resolution (i.e., relative site comparison) of the scoring as described in more detail below.

SEDRANK Model Modifications

The SMP ranking model will include the following specific modifications to improve its application for this project:

Maximum Concentration Of Individual Contaminants

The SEDRANK model uses as input the maximum concentration of individual analytes detected at a site, and then compares the maximum values with ecological and human health benchmarks derived from relevant toxicity criteria. However, other elements of the SMS program, including cleanup site identification, utilize the somewhat different concept of a "station cluster", which is defined as a group of geographically and chemically similar stations that together define the highest average chemical concentrations or biological effects. The station cluster concept addresses to some extent the characteristic variability of environmental measurements, and also is being considered for use in the SMS to define sediment "hotspots". For these reasons, a "station cluster hotspot", defined as a group of three contiguous sampling locations with the highest average chemical concentrations or biological effects, will be used to define the concentration term input to the SEDRANK model.

Area Of Contaminated Sediments

The SEDRANK model differentiates the areal extent of sediment contamination into high, medium, and low categories, with the cutoffs for such ranking occurring at intervals of 400 and 200 acres, respectively. However, because all prospective sediment cleanup sites in the SMP area would fall within the "low" category of less than 200 acres, the scale for this analysis will be adjusted to represent the logarithmic range of areas observed in the study area. The adjusted area scale will be as follows:

Area in acres	Score
<1	1
1 to 5	1.5
5 to 25	2
25 to 100	2.5
>100	3

Source Control

The SEDRANK model currently relies on best professional judgement (by Ecology staff) to determine whether contaminant sources to a given site have been sufficiently controlled to prevent future recontamination. However, because the seven SMP sites are all located in the immediate vicinity of CSO and storm drain outfalls, this determination may be difficult without the aid of additional analysis. Since the determination of source control has proven to be a critical component of overall site remediation plans at other sites in the area (e.g., Norfolk storm drain site), a more quantitative and defensible approach is desirable in this case.

For the purposes of the SMP site prioritization, the potential for recontamination at each of the 7 sites will be assessed using a combination of near-field (PLUMES) and far-field (WQA) screening-level model runs. The near-field modeling will determine the (approximate) probability distribution that sediment recontamination above SQS and/or CSL criteria could occur within a distance of approximately 20 to 50 feet from the CSO outfall, based on a statistical analysis of PLUMES output. The far-field modeling will assess the potential for recontamination approximately 100 to 400 feet from the CSO outfall (within the closest WQA model grid), incorporating other regional sources including storm drain discharges and local sediment resuspension. The near-field and far-field model output will be combined (using best professional judgement) and used to determine an overall 10-year sediment recovery factor (ratio of Year 0 to Year 10 surface sediment concentrations near the CSO) for input into the SEDRANK model.

The screening-level recontamination modeling process outlined above can also be used to help evaluate site-specific and regional source control and sediment remediation strategies including source “trading” concepts. That is, the benefits (in terms of reduced site-specific or aggregate SEDRANK scores) of further CSO, storm drain, and/or other source controls could be evaluated using the PLUMES and WQA models, and used in a broader analysis to assess the cost-effectiveness of alternative source control and sediment remediation strategies. This approach could also be used to identify those sites that would benefit the most from further source controls, potentially facilitating source trading and wasteload allocation approaches. These concepts will be evaluated in more detail as the SMP is developed.

Water Depth Of Contaminated Sediments

In consideration of the well documented preference for many fish and shellfish species to utilize shallow water habitats preferentially over deeper zones, the SEDRANK model assigns a higher score to those sediment sites that are located within relatively shallow water. However, given that the original SEDRANK model includes a category for very deep water (>50 ft) that is not represented by the 7 SMP sites, the scale for this analysis will be adjusted to represent the range of depths observed in the study area. Accordingly, the adjusted depth scale will be as follows:

Typical Water Depth Range in feet MLLW	Score
Deeper than -30’	1
-30’ to -15’	2
-15’ to 0	3
Above 0 (Intertidal)	4

All other components of the ranking model will be unchanged from the original SEDRANK model.

Scoring Guidelines and Assumptions – Secondary Criteria

Although the primary evaluation criteria for sediment cleanup and source control sites will be represented by SEDRANK, other criteria including cost-effectiveness and cooperation with other responsible parties, are also relevant to the overall scoring. Accordingly, criteria including resource management; faster, better, cheaper; and economic vitality will initially be used as balancing criteria in the preliminary scoring. Consistent with the Bellingham Pilot model, qualitative scores for these criteria will be applied to identify potential priority sites for cleanup. However, subsequent iterations of the scoring model applied to these sites will likely place greater emphasis on criteria such as implemetability, cost, and the potential for cooperative cleanup projects. These concepts will be developed in more detail with King County as the SMP is drafted.

The results of the sediment site scoring will rank sites into the following categories:

- Highest priority sites.
- Medium/high priority sites.
- Medium priority sites.

- Medium/low priority sites.
- Lowest priority sites.

As discussed above, the results of the scoring and supplemental source control modeling may also be used to identify those sites that would benefit the most from further source controls, potentially facilitating source trading and wasteload allocation approaches. These concepts will be evaluated in more detail as the SMP is developed.

Overview of Pilot Process

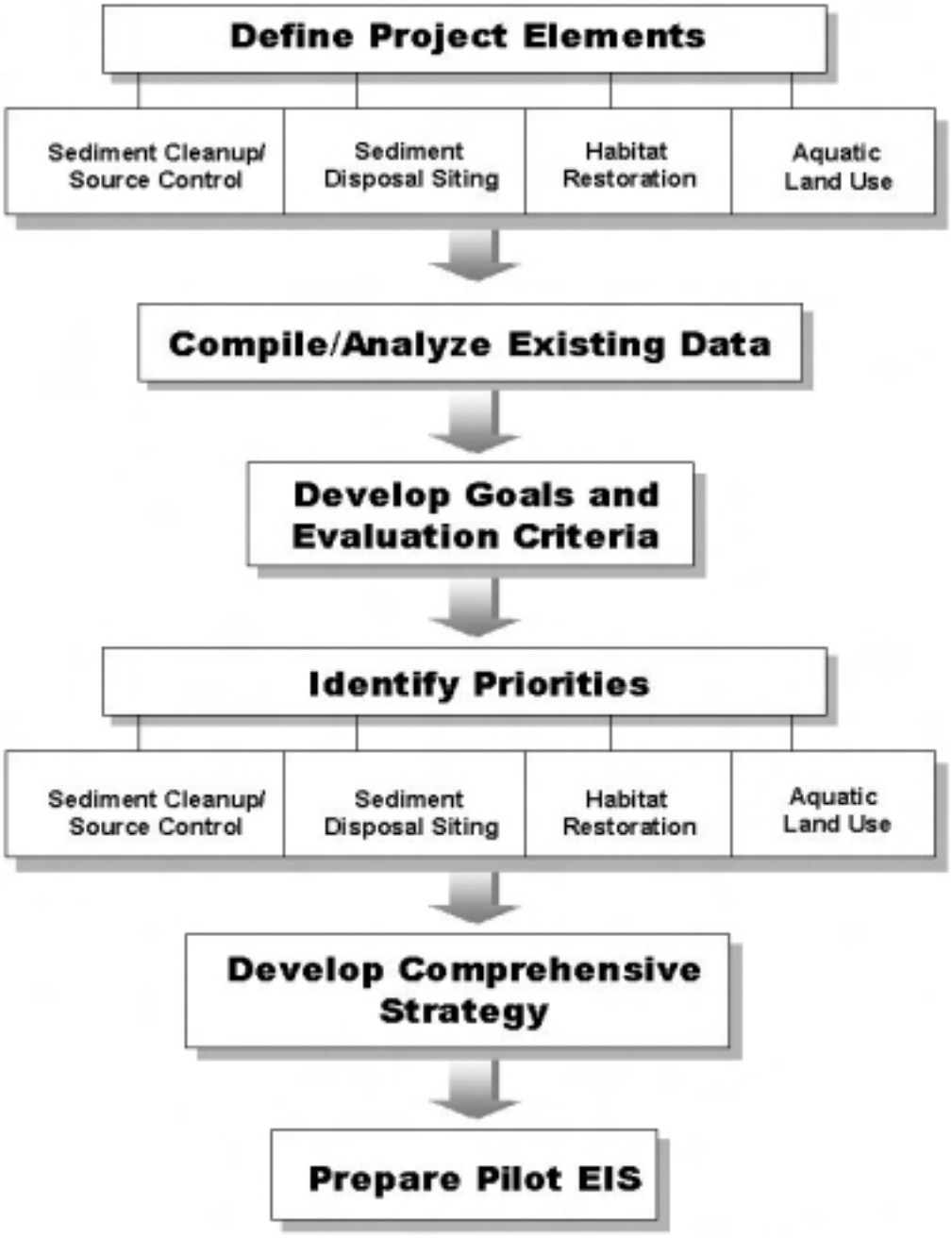

Figure 1

Table 1. Relationship of Bellingham Bay Demonstration Pilot Project Work Group Goals to MTCA, SEPA, SMP, CWA, State Lands, and ESA Evaluation Criteria

Bellingham Bay Pilot Project Work Group Goals	MTCA/SMS Evaluation Criteria (similar to Superfund)	Project SEPA/SMP Evaluation Criteria	404(b)(1) Evaluation Criteria	DNR Land Mgmt. Laws and Public Trust Doctrine	Endangered Species Act (ESA) Section 7/10
1. Human Health and Safety`	a. Overall Protection of Human Health (risk assessment) b. Compliance With Applicable Human Health Based Standards and Laws c. Use Permanent Solutions to the Maximum Extent Practicable	i. Geology, Soils, Water, Sediment, and Environmental Health	A. Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem	I. Environmental Protection	
2. Ecological Health	a. Overall Protection of the Environment (biological effects indicators) b. Compliance With Applicable Human Health Based Standards and Laws c. Use Permanent Solutions to the Maximum Extent Practicable	i. Geology, Soils, Water, Sediment, and Environmental Health	A. Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem	I. Environmental Protection	1. Effects on individuals and populations and their habitat 2. Cumulative effects on species and habitat
3. Protect/Restore Ecosystems	f. Implementability	ii. Fish, Wildlife, and Utilization	B. Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (e.g., Tribal treaty concerns, cultural values, land uses, recreation)	I. Environmental Protection II. Enhancement of Renewable Resources	1. Effects on individuals and populations and their habitat 2. Cumulative effects on species and habitat 3. Conservation measures. 4. Certainty of implementation. 5. Mitigation and adaptive management
4. Social and Cultural Uses	e. Public Acceptance f. Implementability	ii. Fish, Wildlife, and Utilization iii. Land and Shoreline Uses (SMP) iv. Transportation (Long-term) v. Air, Noise, Aesthetics, and Light vi. Cultural Resources	D. Potential Impacts on Human Use Characteristics (e.g., Tribal treaty concerns, cultural values, land uses, recreation)	III. Direct Public Use and Access	
5. Resource Management		ii. Fish, Wildlife, and Utilization vi. Public Services, Utilities, and Energy		II. Enhancement of Renewable Resources	
6. Faster, Better, Cheaper	d. Restoration Time Frame f. Implementability g. Cleanup Cost	iv. Transportation (Construction-Related)	E. Cost and Availability		
7. Economic Vitality			F. Navigation G. Fiscal Impact	IV. Enhancement of Water-Dependent/Harbor Uses V. Generate Revenue	

Flow Chart of Sediment Cleanup/Source Control Site Identification and Screening Process, Bellingham Bay

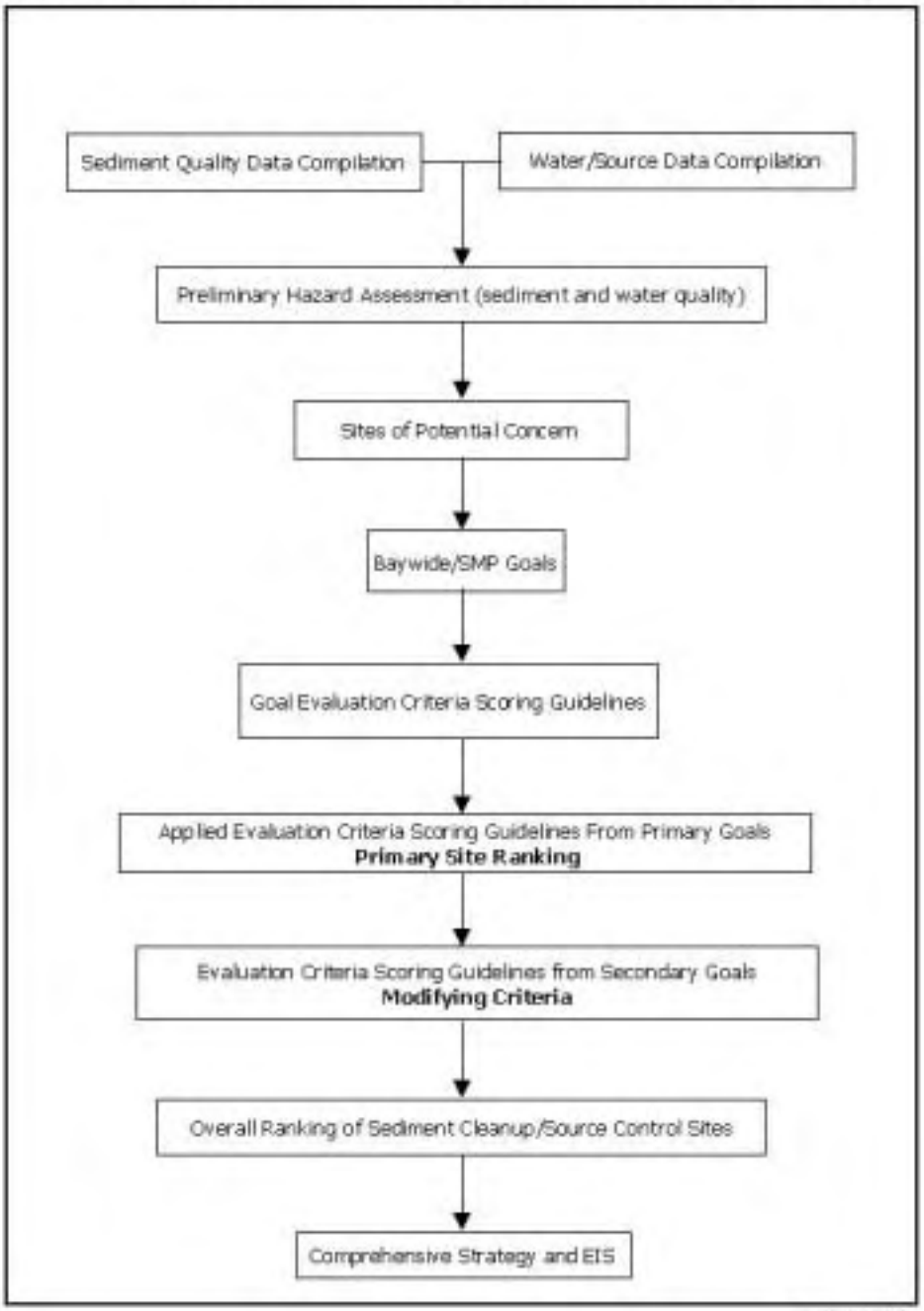

Figure 2