



Sediment Management Standards Responsiveness Summary

1993 Annual Review
1995 Triennial Review
1996 Annual Review

Draft Final

Also see Ecology Publication 97-001
Responsiveness Summary Appendices

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WASHINGTON STATE
DEPARTMENT OF
E C O L O G Y

Responsiveness Summary

Sediment Management Standards

1993 Annual Review

1995 Triennial Review

1996 Annual Review

**Draft Final
April 30, 1997**

**Draft Final
Responsiveness Summary
for Sediment Management Standards
1993 Annual Review, 1995 Triennial Review and
1996 Annual Review**

April 30, 1997

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List of Acronyms

Administrative Procedure Act	(APA)
American Society for Testing and Materials	(ASTM)
Annual Review Meeting	(ARM)
Apparent Effects Threshold	(AET)
Applicable or Relevant and Appropriate Requirement	(ARAR)
Best Management Practices	(BMPs)
Cleanup Screening Level	(CSL)
Comprehensive Environmental Response, Compensation and Liability Act	(CERCLA)
Department of Health	(DOH)
Environmental Protection Agency	(EPA)
Freshwater Sediment Quality Database	(FSEDQUAL)
Highest Apparent Effects Threshold value	(HAET)
High Molecular Weight Polynuclear Aromatic Hydrocarbons	(HPAH)
Lowest Apparent Effects Threshold value	(LAET)
Minimum Cleanup Level	(MCUL)
Model Toxics Control Act	(MTCA)
MTCA Policy Advisory Committee	(MTCA PAC)
National Pollutant Discharge Elimination System	(NPDES)
National Research Council	(NRC)
Puget Sound Dredged Disposal Analysis	(PSDDA)

List of Acronyms (cont.)

Puget Sound Estuary Program	(PSEP)
Quality Assurance/Quality Control	(QA/QC)
Science Advisory Board	(SAB)
Sediment Management Annual Review Meeting	(SMARM)
Sediment Management Standards	(SMS)
Sediment Quality Database	(SEDQUAL)
Sediment Ranking System	(SEDRANK)
Sediment Scientific Review Board	(SSRB)
Sediment Source Control Users Manual	(SCUM1)
Sediment Cleanup Standards User Manual	(SCUM2)
Sediment to Biota Accumulation Factors	(BSAF)
Sediment Impact Zone	(SIZ)
Sampling and Analysis Plan Appendix	(SAPA)
Second Lowest Apparent Effects Threshold value	(2LAET)
Summary of Criteria and Guidelines for Contaminated Freshwater Sediments	(FSEDCRIT)
Technical Information Memoranda	(TIM)
Total Organic Carbon	(TOC)
Washington Administrative Code	(WAC)
Washington Department of Ecology	(Ecology)
Water Quality Analysis Simulation Program	(WASP)

Executive Summary

Within the Sediment Management Standards (SMS), Chapter 173-204 Washington Administrative Code (WAC) adopted in March 1991, the Washington Department of Ecology (Ecology) identified an annual review process to be followed for public review and comment on the rule. In fulfillment of that process, this draft SMS Responsiveness Summary identifies public comments and recommendations on the SMS rule. Ecology received these comments and recommendations from the 1993 annual review, 1995 triennial review and 1996 annual review. Not all the comments received are specific to revision of the SMS rule; some comments pertain to technical and policy development and implementation of the rule. Ecology has reviewed and provided responses to each comment and has assembled recommended revisions to the SMS rule based on these comments. This draft final Responsiveness Summary will be provided to members of the SMS Implementation Committee and the interested public for review and comment. Ecology plans completion of a final Responsiveness Summary after review of the public comments and discussion of priority issues with the SMS Implementation Committee members planned for early 1997.

This draft final SMS Responsiveness Summary is compiled into seven related parts. Part I provides background information on the SMS rule and the annual and triennial review process. Part II provides a brief synopsis of Ecology's rule revision recommendations based on the public comments that were received. Part III identifies individual general comments (17) and provides Ecology's response to each. Part IV provides specific comments on key topic areas as follows and provides Ecology's response to each.

- Chemical Criteria (6)
- AETs (13)
- Bioassay/Benthic Community Structure (15)
- Human Health (8)
- Sediment Source Control (7)
- Sediment Cleanup (23)

Part V identifies Port of Seattle recommendations (33) for revision of the SMS rule and provides Ecology's response to each. Part VI is the list of references cited by Ecology in responding to the public comments and Part VII is appendices.

In Part II, Ecology identifies six recommendations for revision of the SMS rule, fifteen areas where additional discussion/evaluation is recommended, and twelve areas where Ecology recommends no further action be taken on the public comment/recommendation. These Part II recommendations are identified below

Ecology Recommended SMS Rule Revisions:

1. Adopt a larval reference sediment performance standard to be set at a seawater normalized effective mortality of 35 percent.
2. Adopt new language to identify contaminated sediment site listing and delisting as part of the sediment cleanup decision process.
3. Adopt new language to identify a minimum of three stations are needed to define a station cluster.
4. Adopt language to require 30 day public response times for both hazard assessment and public notice.
5. Adopt rule language to identify the sediment ranking system (SEDRANK) as the site ranking tool to be used by the department in the section, Considerations in ranking.
6. Adopt language to allow natural recovery for site delisting and include a definition of natural recovery.

Public Comments Needing More Discussion/ Evaluation Prior to Identifying Specific SMS Rule Revisions

1. Identify sediment chemical and/or biological criteria for other marine waters, e.g., Grays Harbor.
2. Identify a set period of time for submittal of sediment data collected to comply with SMS rule source control, dredging or cleanup programs.
3. Use the 1994 AET values for revision of the SMS rule in 1997.
4. Place greater emphasis on benthic community assessment data in determining whether sediments exceed regulatory limits.
5. "We urge Ecology to set sediment criteria using tests that examine sublethal effects and account for bioaccumulation."
6. Adopt bioassay procedures and interpretive endpoints for low salinity and freshwater sediments.
7. Do not include federal Superfund sites in future SMS rule Site List updates.
8. Ensure consistency and clarity between the SMS and Model Toxics Control Act (MTCA), Chapter 70.105D Cleanup rules.
9. Improve clarity between what is required of a SMS cleanup study plan and report.
10. Improve clarity to address independent and interim sediment cleanup actions.
11. Identify better definitions for the types of cleanup in the SMS rule.
12. Chemical concentration criteria are among the provisions of the SMS that need to be modified regularly to ensure that they continue to accurately reflect the latest scientific knowledge.

Public Comments Needing More Discussion/ Evaluation Prior to Identifying Specific SMS Rule Revisions (cont.)

13. Revise WAC 173-204-130(6) to clarify that Ecology will conduct an annual review of the SMS and, based upon its annual review, must make any necessary revisions to the rule on at least a triennial basis to ensure that the rule continues to accurately reflect the latest scientific knowledge.
14. Require Ecology to focus sediment cleanup actions at the worst sites, i.e., a revised regulatory trigger.
15. Revised the procedures in WAC 173-204-530(4) to identify cleanup sites. Sites will include only those adjacent sediment stations that exceed the SMS regulatory trigger " cleanup screening level (CSL).

Public Comments That Ecology Recommends Receive No Further Action

1. Provide a definition of "sediment" to differentiate between sediments and wastes that have been dumped in the aquatic environment.
2. Ecology should repropose Marine Finfish Rearing Facilities sediment criteria to be consistent with criteria for "Significant Legislative Rules" per ESHB 1010.
3. Reconceive sediment quality criteria as "screens" or "flags" instead of "pass-fail" evaluations. . . .
4. "Re. the 25% rule for hits in amphipod mortality.... Why not just consider any statistical difference from the negative control to be ecologically significant?"
5. Develop a methodology for applying site specific modifications to the SMS sediment criteria.
6. Do not continue to develop or adopt human health sediment criteria.
7. Eliminate sediment impact zones (SIZ) as incompatible with the goal of no impact on biological resources.
8. "Focus active cleanup efforts on hotspots to accelerate cleanup at the worst sites. Set new CSL at EIS "moderate adverse effects level."
9. Incorporate benefit analysis into the SMS rule, it must be a part of the process for "applying sediment standards as the basis for management...."
10. "Delete microtox test from the SMS rule."
11. Revise SMS rule so that sediment station clusters of potential concern are identified based upon the minimum cleanup levels (MCUL) criteria rather than the CSL criteria.
12. Revise the SMS rule so the department need only review and approve the cleanup study plan/report for department or other person initiated cleanups.

Part I. Introduction

A. Background

The SMS rule, Chapter 173-204 WAC, establishes a comprehensive framework for managing sediments in Washington State. The SMS rule was legally effective on April 27, 1991 and includes (1) scientific methods for identifying contaminated sediments and (2) policies and procedures for implementation of sediment source control and sediment cleanup.

When developing the SMS rule, Ecology recognized that our scientific understanding of sediment quality impacts was still evolving and that uncertainties existed with respect to how the rule would be implemented. Consequently, the SMS rule contains several general goals and statements of intent to consider application of new or additional scientific information (see section 130(1)). With respect to review procedures, the SMS rule specifies that Ecology will regularly review and, when appropriate, revise the rule based on new or additional scientific information and/or implementation experience (see section 130(6)). The SMS rule also provides guidance on the types of information and factors Ecology will consider when evaluating the need for rule revision.

B. Triennial Review

Triennial Review is the common term used for the SMS rule process that commits Ecology to work with the public to review the rule and identify needed changes. Triennial Review also includes modifying the rule language and completing adoption procedures for new standards every three years or as determined necessary by Ecology.

The SMS Triennial Review requirements are based in part on the federal Clean Water Act. To obtain Environmental Protection Agency (EPA), Region 10 approval of the SMS rule, Ecology agreed to adopt the rule consistent with section 303(c)(1) of the Clean Water Act, which reads in part:

(c)(1) The Governor of a State or the State water pollution control agency of such State shall from time to time (but at least once each three year period beginning with the date of enactment of the Federal Water Pollution Control Act Amendments of 1972) hold public hearings for the purpose of reviewing applicable water quality standards and, as appropriate, modifying and adopting standards. Results of such review shall be made available to the Administrator.

The SMS Triennial Review process is planned to be carried out in three main phases.

○ Comment Process/Issue Identification: The first phase of the Triennial Review process involves issue identification. During this phase, Ecology has sought public input several times. First, Ecology co-hosted the May 1995 Sediment Management Annual Review Meeting (SMARM), a two day meeting jointly coordinated with the Puget Sound Dredged Disposal Analysis (PSDDA) agencies. At this meeting, Ecology identified the purpose and time period for the SMS rule Triennial Review. Ecology also presented an overview of ongoing SMS rule program implementation and development activities, and specific papers on current SMS rule technical, policy and implementation issues. This process was repeated again at the May 1996 SMARM to obtain public annual review comments on the SMS rule.

As part of the 1995 SMS Triennial Review, Ecology also conducted two public hearings in May 1995 to accept public written and oral comment and recommendations on needed revisions to the SMS rule. Additionally, Ecology accepted written comments during an identified Triennial Review comment period in 1995.

This Draft Responsiveness Summary summarizes the 1995 Triennial Review comments and the 1993 and 1996 annual review comments received from the public. These comments are included with Ecology responses below.

○ Issue Evaluation/Resolution: The second phase of the Triennial Review process involves Ecology evaluation of identified issues contained in the comments received during the first phase. Based on this review, Ecology staff will draft initial responses, distribute the draft responses for public review and discussion, and prepare final responses. Beginning in May 1997 Ecology plans to use the SMS Implementation Committee as the key forum for discussion of specific issues of interest before completion of final responses.

○ Rulemaking/Guidance Development: The final phase of the Triennial Review process involves the development and adoption of rule amendments and/or guidance documents. Prior to formal proposal in the Washington State Register, Ecology will prepare and distribute the department's draft SMS rule language revisions to the SMS Implementation Committee and other interested parties. Ecology plans to use the SMS Implementation Committee for review of draft SMS rule language based on this draft final Responsiveness Summary prior to beginning formal rule adoption processes.

Ecology will comply with all applicable requirements in the Administrative Procedure Act (APA), Chapter 34.05 RCW, as amended, prior to formal adoption of any SMS rule changes. This will include separate, formal public hearings and a comment period to receive public oral and/or written comment on Ecology's proposed SMS rule language.

C. Format of the Draft Responsiveness Summary

This draft final Responsiveness Summary addresses comments on the SMS rule received during the 1993 and 1996 annual reviews and the 1995 Triennial Review. Comments were reviewed and divided into the issue areas identified in the Table of Contents above. Where multiple comments were received on a particular issue, Ecology combined the individual comments. If multiple comments on the same issue were received but each contained important differences or additional clarifying information, Ecology attempted to answer each individually.

This document is divided into five main parts.

Part I - Introduction: This part provides background information on Triennial Review and summarizes the purpose of the SMS rule review process. The Introduction also provides information on Ecology's intent and identified process to revise the SMS rule and what opportunities exist for public review, discussion and comment.

Part II - Department of Ecology Recommendations for Revision of the SMS, Chapter 173-204 WAC: This part summarizes Ecology's response on Triennial Review issues and is divided into three parts. The first part, Specific Recommendations identifies specific rule sections and issues for rule revision. The second part, General Recommendations Requiring Further Evaluation/Discussion identifies general topic areas or issues where Ecology believes further study and/or discussion is needed before drafting rule language. The third part, No Further Action, identifies public comments and recommendations that Ecology believes are best deferred at this time. For each recommendation, a reference back to a specific public comment(s) is identified. These parts of the draft final Responsiveness Summary will be used as appropriate by Ecology in phase three of the Triennial Review process, i.e., the rule development phase, as identified above in Triennial Review.

Part III - General Comments: This part summarizes comments on a number of general comments and Ecology responses to these comments. General comments are divided into three categories: (1) the rule development process, (2) implementation of the rule in coordination with other environmental programs or rules; and (3) general comments concerning different parts of the SMS rule. In the first group of general comments, Ecology identifies issues of policy that broadly apply to development and implementation of the SMS rule. In the second group, Ecology has assembled general comments directed at broad implementation issues. And in the third group, Ecology identifies general comments related to the individual main parts of the SMS rule, e.g., Part I, General Information, Part II, Definitions, etc.,.

Part IV - Specific Comments: This part contains issues and Ecology responses on the SMS rule associated with specific rule sections or subject areas. In some cases, Ecology has identified its decision on the need for a SMS rule revision by

highlighting text in **bold**. Specific comments were organized into one of the following subject areas:

○ **Chemical Criteria:** Comments which address the chemical criteria identified in Tables I, II or III of the SMS rule, the sediment quality standards, SIZ maximum standards, and the CSLs/MCULs respectively.

○ **Apparent Effects Threshold Method (AET):** Comments on issues associated with calculating and updating the AET method values which form the basis of most of the chemical criteria in Tables I, II and III in the SMS rule.

○ **Bioassay/Benthic Community Structure:** Comments on methodological issues associated with sampling, analyzing and interpreting sediment laboratory bioassay and field evaluations of benthic infaunal community structure.

○ **Human Health Criteria:** Comments on the policies and methodologies underlying Ecology's development of human health sediment quality criteria.

○ **Source Control:** Comments on Part IV of the SMS rule which contains sections 400 through 420.

○ **Cleanup:** Comments on Part V for the SMS rule which contains sections 500 through 590.

Part V - Port of Seattle Recommended Triennial Review Revisions to the SMS Rule, Chapter 173-204 WAC: This part describes the Port of Seattle recommendations for SMS rule revisions and Ecology's individual answers to each recommended language change.

Part VI - References: This part provides information on literature referred to in Ecology's responses to all comments.

Part VII - Appendices: This part includes copies of the written comments received during the SMS rule annual and triennial reviews, a copy of the current SMS rule, as amended and adopted in December 1995, a list of previous SMS rule development commitments made by Ecology in 1991, and other background information.

Part II. Department of Ecology Recommendations for Revision of the Sediment Management Standards, Chapter 173-204

Specific SMS Rule Revision Recommendations - Action Items

The following list of SMS rule revisions identify issues where Ecology has concluded that rule amendments are appropriate. Ecology will develop specific rule language and a schedule for proposed SMS rule revisions and first, provide review and comment opportunity to the SMS Implementation Committee before proceeding to the formal rulemaking process.

1. Re: WAC 173-204-310. Ecology will propose an SMS rule revision for the larval reference sediment performance standard to be set at a seawater normalized effective mortality of 35 percent. (See IV.C. Comment #12, Page 57)
2. Re: WAC 173-204-500. Ecology will propose rule language to include contaminated sediment site listing and delisting as part of the sediment cleanup decision process identified in subsection (1). (See V., Comment #14, WAC 173-204-500 Sediment cleanup decision process and policies, Page 105)
3. Re: WAC 173-204-510. Ecology will propose rule language that will clarify a minimum of three stations are needed to define a station cluster. (See IV.F. Comment #21, Page 95)
4. Re: WAC 173-204-530 and 580. Ecology will propose rule language that will require 30 day public response times for both hazard assessment and public notice. (See IV.F. Comment #22, Page 95)
5. Re: WAC 173-204-540. WAC 173-204-540(2) defines SEDRANK as the site ranking tool to be used by the department. Ecology will propose rule language to repeat this in the following section, Considerations in ranking, for emphasis. (See V., Comment 24, WAC 173-204-540 Ranking and list of sites, Page 109)
6. Re: WAC 173-204-540 and 200. Ecology will propose rule language in subsections 173-204-540(6)(a) and (b) to acknowledge natural recovery for site delisting as well as include a definition of natural recovery in 173-204-200. (See IV.F. Comment #17, Page 93; V., Comments # 26 and 27, Page 109)

Deferred SMS Rule Revision Recommendations - More Discussion/ Evaluation Needed

The following list of SMS rule revision recommendations identify comments or Ecology recommendations on related comments where Ecology considers additional department and public review and discussion is needed. The location of each specific comment is identified at the end of each of the recommendations below. Ecology's rationale for deferral is provided in the formal response to each comment. Ecology will provide this list to the SMS Implementation Committee for review, comment and future meeting discussions.

1. Ecology recommends revision of the SMS rule to identify chemical and/or biological criteria for other marine waters, e.g., Grays Harbor. Ecology will investigate the applicability of the current Puget Sound marine chemical and biological criteria and the recommendations from EPA, Region 10, contract work to identify and establish west coast marine sediment criteria. (See III.C., Part III, Comment 1, Page 24)
2. Ecology recommends revision of the SMS rule to include a set period of time for submittal of sediment data collected to comply with SMS rule source control, dredging or cleanup programs. (See III.C., Part VI, Comment 1, Page 27)
3. Ecology recommends evaluating the potential use of the 1994 AET values for revision of the SMS rule in 1997. This evaluation will focus on identification of one or more options for incorporation of the new AET values into the SMS rule chemical criteria and corresponding review of reliability analyses. (See IV. A. Comment #4, Page 32)
4. "Provide greater emphasis on benthic community assessment data in determining whether sediments exceed regulatory limits." (See IV.C. Comment #3, Page 47)
5. "We urge Ecology to set sediment criteria using tests that examine sublethal effects and account for bioaccumulation." (See IV.C. Comment #4, Page 52)
6. Adopt bioassay procedures and interpretive endpoints for low salinity and freshwater sediments. (See IV.C. Comment #7, Page 54)
7. Ecology recommends future review and Implementation Committee discussion of the appropriateness of not including federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) sites in future SMS rule Site List updates and whether the SMS rule should be amended accordingly. (See IV.F. Comment 1, Page 82)
8. Ecology is in agreement with many of the suggested rule changes and will develop draft SMS rule language for discussion with the SMS Implementation Committee on

the issue of consistency and clarity between the SMS and Chapter 70.105D MTCA Cleanup rules. The changes will make the SMS more consistent and comparable with MTCA. (See IV.F. Comment #2, Page 83)

9. Ecology recommends modification of WAC 173-204-560 to improve clarity between what is required of a cleanup study plan and report. The Port of Seattle has submitted draft rule language which the department believes should be the starting point for rule language development discussions. Ecology will recommend draft rule revisions for review by the SMS Implementation Committee. (See IV.F. Comment #5, Page 85)

10. Ecology agrees that more clarity is needed to address independent and interim sediment cleanup actions. We are presently working on development of related policies and will recommend additional discussion in the SMS Implementation Committee on the issue of interim cleanup actions, including the potential advantages/disadvantages of incorporating interim actions in the SMS rule. (See IV.F. Comment #7, Page 86)

11. Ecology recommends further consideration, discussion in the SMS Implementation Committee and development of revised rule language to better define types of cleanup in 173-204-550(3). Ecology plans development of policies to address and guide these types of cleanup. (See IV.F. Comment #8, Page 87)

12. "Inserted a phrase in WAC 173-204-130(3) to clarify that chemical concentration criteria are among the provisions of the Sediment Management Standards that need to be modified regularly to ensure that they continue to accurately reflect the latest scientific knowledge as established through ongoing validation and refinement." (See V., Comment #1, Section 130, Page 96)

13. "Revised WAC 173-204-130(6) to clarify that Ecology will conduct an annual review of the Sediment Management Standards and, based upon its annual review, make any necessary revisions to the rule on at least a triennial basis to ensure that the rule continues to accurately reflect the latest scientific knowledge." (See V., Comment #3, Section 130, Page 98)

14. "Added a policy in WAC 173-204-500(4) to require Ecology to focus sediment cleanup actions at the worst sites. Sites will include only those adjacent sediment stations that exceed the Sediment Management Standards regulatory trigger " (CSL). (See V., Comment #17, Section 500, Page 106)

15. Revised the procedures in WAC 173-204-530(4) to identify cleanup sites. Sites will include only those adjacent sediment stations that exceed the SMS regulatory trigger (CSL). (See V. Comment #23, Section 530, Page 108)

SMS Rule Revision Recommendations - No Further Action Recommended At This Time

The following list of public recommendations for SMS rule revision identify major issues or themes where Ecology disagrees with the rule recommendation made. This list will provide the scope and nature of these major recommendations which were received during three years of annual review comments. The location of each specific comment is identified at the end of each of the recommendations below. Ecology's rationale for deferral is provided in the formal response to each comment. Ecology will provide this list for review and comment by the SMS Implementation Committee.

1. "A definition of "sediment" is needed . . . to differentiate between sediments and wastes that have been dumped in the aquatic environment." (See III.C. Part II. Comment #1, Page 24)
2. Development of Marine Finfish Rearing Facilities, Sediment Criteria: "...Ecology should consider reproposing it after it has been compared to the adoption criteria for "Significant Legislative Rules" per ESHB 1010." (See III.C. Part IV. Comment #1, Page 25)
3. "Reconceive sediment quality criteria as "screens" or "flags" instead of "pass-fail" evaluations. . . . Accordingly under the Rule, sediments that exceed the sediment quality chemical criteria should not be presumed to have adverse effects." (See IV.A. Comment #3, Page 30)
4. "Re. the 25% rule for hits in amphipod mortality (pg. 17): 25% seems artificially high and perhaps under protective. How are AET values changed if this is dropped back to 20% or to "anything that is statistically different"? Why not just consider any statistical difference from the negative control to be ecologically significant? (See IV.B. Comment #3, Page 37)
5. "The department needs to develop a methodology for applying site specific modifications to their sediment criteria. There should be means of adjusting the criteria to reflect sensitivity of species at the site, site specific toxicity testing, and bioavailability. . . . EPA is considering such an approach for sediments. EPA also allows for site specific modifications to their surface water criteria." (See IV.C. Comment #5, Page 53)
6. Several commenters expressed concerns about Ecology's efforts to develop human health sediment criteria and recommended that the department "... not extend the SMS Rule at this time to include human health criteria." (See IV.D. Comment #1, Page 60)
7. ". . . We strongly urge the elimination of both mixing zones and sediment impact

zones as incompatible with the goal of no impact on biological resources. . . ." (See IV.E. Comment #2, Page 76)

8. "Focus active cleanup efforts on hotspots to accelerate cleanup at the worst sites. Set new CSL at EIS "moderate adverse effects level." (See IV.F. Comment #12, Page 89)

9. "The sediment management program recognizes that benefit analysis must be a part of the process for "applying sediment standards as the basis for management...." There is Ecology advisory committee consensus that in most cases, mechanical cleanup methods present more of a hazard to the environment than leaving the sediments alone. Many cases have verified that limited "hot spot" cleanups would achieve most of the program's goals with minimal damage to the environment, and also reduce demand on agency and business resources. The benefit analysis concept should be incorporated in WAC 173-204-100 (2)." (See IV.F. Comment #16, Page 92)

10. "Deleted microtox test from WAC 173-204-315(1)(b)(iii) and WAC 173-204-315(2)(e) as an approved chronic effect test because of the great potential for false positives associated with this test." (See V., Comment #8, Section 315, Page 101)

11. "Revised section to reflect that the sediment station clusters of potential concern are identified based upon the minimum cleanup levels criteria rather than the cleanup screening levels criteria." (See V., Comment #18, Section 510, Page 107)

12. "Revised WAC 173-204-560(1) to clarify that, although a cleanup study plan and report must be prepared by the person undertaking the cleanup, the department need only review and approve the cleanup study plan and report in the case of department or other person initiated cleanups." (See V., Comment #32, Section 560, Page 111)

Part III. General Rule Comments

III.A. General Comments Related To Policy Issues

Comment 1. "Conform the SMS as closely as possible to federal requirements. Where federal requirements do not exist, Ecology should seek formal written concurrence from federal agencies prior to rule/policy development. EPA should also be consulted during early implementation of the SMS to ensure consistent application."

Response: Ecology agrees that it is important to minimize inconsistencies between federal and state requirements. To-date, the EPA has not "adopted" federal regulations addressing sediment quality. However, Ecology continues to monitor and review several ongoing EPA criteria and sediment management program development efforts to determine their significance for Washington's sediment

management programs. For example, EPA has proposed interim standards for five contaminants of concern for public review and comment (EPA, 1994). Ecology has commented on EPA's Sediment Quality Criteria/Support Documents and separately, EPA's Contaminated Sediment Management Strategy (Ecology, 1994b) and National Sediment Contaminant Source Inventory (Ecology, 1994a).

It is also important to recognize that the initial development and adoption of the SMS rule was fully coordinated with the EPA Region 10, and the U.S. Army Corps of Engineers, Seattle District. Their comments are in the public record and appear in the SMS rule Responsiveness Summary (Ecology, 1990a). Additionally, EPA reviewed and approved the SMS rule in August 1991 as federally approved water quality standards for the State of Washington. Ecology has also asked EPA Region 10 to review and approve the December 1995 amended SMS rule.

Finally, Ecology is one of the four PSDDA agencies that collectively manage disposal of dredged material in Puget Sound. The PSDDA agencies include EPA Region 10 and the U.S. Army Corps of Engineers, Seattle District (Corps). Ecology routinely participates with the PSDDA agencies in conducting annual reviews of both the PSDDA and SMS sediment management programs. These reviews are presented to the public for comment in May of each year at the SMARM. Ecology routinely coordinates with the PSDDA agencies on recommended PSDDA and SMS program changes to minimize inconsistencies between federal and state sediment management program requirements. And, EPA and the Corps participate on the SMS Implementation Committee, a stakeholder group which reviews development and implementation of the SMS rule. EPA and the Corps actively comment on the SMS rule in both forums.

Comment 2. "The rule should also clarify how existing and future federal regulations relating to sediment criteria and/or cleanup requirements will relate to those adopted and implemented under this state rule. A mechanism for ensuring federal involvement and concurrence with state rulemaking and implementation is essential to the rule's success. This is also important in light of EPA's new policy of performing consultations under the Endangered Species Act when it approves state water quality rules."

Response: Because EPA has not yet proposed federal sediment regulations, it is somewhat difficult to predict their future impact on implementation of the SMS rule. However, as identified in comment #1 above, Ecology continues to monitor and comment on EPA's development of a national sediment management program.

It is important to note that the original SMS rule adopted in 1991 did address many federal coordination issues concerning dredging and sediment source control programs authorized under the federal Clean Water Act (see SMS sections 100(5), 120(2), 130(5), (11), 400(9), (13) and 410(7)).

Under federal Clean Water Act requirements, Ecology must submit any revisions of the SMS rule to EPA for review. This federal requirement will ensure EPA's full involvement with SMS rule development and implementation. In this regard, Ecology has also submitted the December 1995 revised SMS rule to EPA for review. Ecology understands that EPA's SMS rule review has proceeded slowly, but that their approval is likely.

Comment 3. "As a matter of public policy and consistent rule development, Ecology should codify all mandatory requirements. The application of discretionary, i.e., non-administrative rule based material as contained in Ecology's Permit Writers Manual, in Technical Information Memoranda (TIMs) and/or Focus Sheets should be limited to non-enforceable technical guidance."

Response: Ecology agrees that mandatory requirements are best codified in administrative rules. In this regard, Ecology continues to work on development of specific human health and freshwater sediment criteria and standards for adoption directly into the rule. However, the SMS rule is applicable to a wide variety of implementation scenarios via multiple state and federal authorities. To address this implementation complexity, Ecology has identified required implementation methods via referenced citations in the SMS rule, e.g., Puget Sound Protocols, section 200(21) and the PSDDA Management Plans, section 410(7). Ecology's use of referenced implementation manuals and procedures complies with the APA and fulfills use of the department's best professional judgment authority and ability to identify and implement best management practices (BMP) as identified under state and federal clean water laws.

Ecology believes the current SMS rule guidance and materials strike an appropriate balance between establishing clear and understandable rule language and providing meaningful implementation guidance to the regulated community, the public, and agency staff. This is consistent with the department's ongoing efforts to provide technical assistance to the regulated community and the public. It is also consistent with the APA (as amended by ESHB 1010) which encourages agencies to advise the public of its current opinions, approaches, and likely courses of action by publishing interpretive or policy statements when the adoption of rules is not feasible and practicable. The APA also states that a person may petition an agency requesting the conversion of such interpretative and policy statements into rules. To date, Ecology has not received any petitions requesting the conversion of specific guidance provisions into the SMS rule.

Comment 4. "The sediment source control standards user manual should not be used to circumvent Administrative Procedure Act (APA) requirements or to override the commitments made to committee members and the public by Ecology to promulgate freshwater sediment criteria through proper rulemaking procedures. Because of their variable nature, freshwater sediment criteria will be technically challenging to develop. There are numerous site specific considerations which would require

review in the development of such criteria for Washington State. Ecology should not circumvent this process by endorsing the use of criteria which have had no technical or scientific review by Ecology staff, committee members or the public."

Response: In 1991, Ecology made a commitment to develop and adopt freshwater sediment criteria following the APA requirements (see Appendix C). Since 1991, Ecology has completed several freshwater sediment criteria technical reports available to the public (see Appendix D). Inclusion of the Ecology report Summary of Criteria and Guidelines for Contaminated Freshwater Sediments (FSEDCRIT), September 1991 within the Sediment Source Control Standards User Manual was intended to provide Ecology permit managers with best scientific information and a range of alternatives for case-by-case source control decision making. In the introduction of the FSEDCRIT report, Ecology specifically identifies "This report and the accompanying data table are reference documents only. The publication of this information in no way implies that any numbers or methods contained herein are currently endorsed or recommended by the Department of Ecology." Indeed, the FSEDCRIT report identifies seven North American sources, e.g., Environment Canada, for freshwater sediment criteria/guidelines, which do not include Ecology. To-date, Ecology has not endorsed use of any specific freshwater sediment criteria and does not use the Sediment Source Control Users Manual (SCUM1) to circumvent legal procedures for rule adoption.

Ecology believes use of the SCUM1 is consistent with its state and federal clean water authority, i.e., use of all known available and reasonable methods of prevention, control and treatment and best professional judgment, respectively. Specifically, Ecology uses this and other guidance in the manual to evaluate a discharge for the potential for sediment contamination on a pollutant-specific and facility-specific basis and to develop case-by-case effluent limitations, as necessary. Ecology's case-by-case decisions are subject to public review as part of the National Pollutant Discharge Elimination System (NPDES) permit process and affected parties may also appeal those decisions to the state Pollution Control Hearings Board or superior court.

Comment 5. "Washington State must accept its continuing obligation to critically review the effectiveness of the SMS Rule and make any necessary modifications."

Response: Ecology agrees that it is important to routinely review the SMS rule for necessary modifications. To meet this intent, Ecology inserted annual and triennial review requirements into the SMS rule when first adopted. Additionally, Ecology has begun an agency-wide effort to regularly review all its administrative rules to assess which rules are still necessary or may be repealed, which need amendments and the degree of stakeholder interest in each rule. Ecology believes it has demonstrated its continued commitment to the review and evaluation of the SMS rule by conducting three years of annual review reflected within this responsiveness summary.

Ecology also recognizes that "actions speak louder than words." The department understands that some members of the public remain skeptical about whether the department actually intends to fulfill the commitments to critically evaluate the rule and make appropriate modifications. Consequently, Ecology views this responsiveness summary as an important step towards completing "action" on triennial review issues.

Ecology responses to these issues can be divided into four categories based on whether (1) the department believes that rule amendments/guidance materials are necessary to address technical and policy recommendations and (2) an evaluation of the department's resources is needed to address an issue:

- **Completed Actions:** Ecology completed 57 changes to the SMS rule which were adopted in December 1995. Some of the triennial review issues were completed at that time.
- **Action Items:** For many issues, Ecology has concluded that rule amendments are an appropriate response to the concerns raised by one or more commenters. Part II of this document is designed to provide concrete action items that Ecology will address through rulemaking and/or guidance.
- **Deferred Action Items:** There are a number of issues where Ecology agrees with the recommendation, but believes the benefits of the SMS revision do not outweigh the staff/resource commitments needed to develop a scientifically and legally defensible revision.
- **No Further Action:** There were some issues where Ecology has concluded that rule amendments are not necessary and no further action is recommended.

Ecology believes that making and fulfilling Triennial Review commitments must be tempered by staff and resource availability. The recommendations in Part II reflect this dependency and the reality that available resources and staff have been substantially reduced relative to the period of 1988 to 1991, when the SMS rule was first developed and adopted. Resource implications are particularly important in the development and evaluation of new or modified chemical and biological criteria which are heavily based on peer reviewed scientific studies. These scientific studies and coordinated peer review are often cost and time intensive, which may result in delayed changes to the SMS rule. Additionally, recent revisions of the APA have made rule adoption processes more complex (e.g., agencies need to develop cost/benefit studies to support regulatory endpoints proposed for adoption).

Ecology maintains its commitment to revise the SMS rule in a manner which focuses on the use of best available science, responsiveness to rule implementation experience

and reliance on multiple and diverse statutory authorities. This commitment will continue to be communicated and coordinated with key stakeholders represented on the SMS Implementation Committee.

Comment 6. "Incorporate Ecology proposed technical revisions to the SMS Rule." Complete adoption of SMS rule revisions proposed at the May 1995 Sediment Management Annual Review Meeting."

Response: Ecology has completed the proposed rule revisions identified at the 1995 SMARM. A list of the changes adopted into the December 1995 SMS rule are identified in Appendix B below.

Comment 7. "ESHB 1010 includes new rule adoption criteria for "Significant Legislative Rules" proposed by Ecology. ...We expect that prior to rulemaking Ecology will address those criteria and allow for adequate public comment."

Response: Ecology will comply with the APA, as amended for all future proposed revisions to the SMS rule. The APA was revised by the 1996 Legislature per ESHB 1010 to address additional requirements for adoption of administrative rules.

III.B. General Comments Related To Implementation Issues

Comment 1. "Prior to developing new rules Ecology should adequately staff, budget and implement existing regulations."

Response: Ecology agrees with the need for trained staff and adequate resources to effectively implement the SMS rule. Ecology continues to coordinate rule development and implementation with the SMS Implementation Committee. The committee is the principal forum where staff and budget implications to SMS rule development and implementation will be discussed.

Since 1991, Ecology has tried to maintain adequate staff and resources for both (1) technical work to ensure that sediment scientific methods identified in the SMS rule continue to reflect current scientific knowledge and (2) technical work associated with implementation of sediment programs. This will be particularly challenging during the 1997-1999 biennium because of the ongoing budget pressures faced by Ecology. For example, Ecology has identified that water quality permit fees needed to support sediment data management, permit support activities and development of implementation guidance are projected to not be fully funded in the 1997-1999 biennium.

Comment 2. "And finally, any new efforts to manage sediments must consider the ability of the state to adequately staff and implement the program. The regulated community, especially small businesses, will need technical assistance to ensure

compliance with discharge related and cleanup requirements."

Response: Consistent with legislative mandates in ESHB 1010 (now embodied in the APA), Ecology has emphasized technical assistance activities, especially for industrial and commercial permitted facilities. An example is Ecology's increased focus on pollution prevention, i.e., the review of permit facility chemical uses/disposal methods and identification of alternatives to avoid or reduce waste production and to focus on reuse/recycling.

Ecology's Sediment Management Unit provides source control technical review and direct assistance to both Ecology permit writers and permittees and their consultants. The Sediment Management Unit's focus is the potential for sediment contamination from a source discharge and its elimination/reduction through coordination between the department and the permittee. Similarly, Ecology's Toxics Cleanup Program sediment staff provide technical review assistance for a range of cleanup actions implemented by businesses, industry and local, state and federal agencies. Although these technical assistance activities are subject to Ecology's staff resource limitations, the Sediment Management Unit continues to look for additional opportunities to enable sediment source control and cleanup actions to move forward. For example, the Sediment Management Unit is considering several SMS rule revisions to allow increased flexibility for voluntary cleanup actions and to provide faster response to cleanup site delisting requests. The Sediment Management Unit is also coordinating with the Toxics Cleanup Program on the recommendations of the MTCA Policy Advisory Committee (PAC) for identification of appropriate SMS rule and guidance revisions.

Comment 3. "Our comment and related recommendation relate to the general issue of the application of total organic carbon (TOC) normalization to sediment data on nonionic organic constituents, which is incorporated in WAC 173-204-320(2) and 520(2) and is discussed in Appendix G of the Sediment Cleanup Standards Users Manual (Ecology 1991). Specifically, we are concerned about how Ecology might regulate the way TOC normalization of nonionic organic constituents is performed in the presence of organic matter such as coarse woody debris. . . . Nevertheless, we recommend that caution is exercised when methodologies or regulations are developed for determining the contribution of coarse wood debris to the TOC content of marine sediment. . . . In summary, we recommend that any further guidance related to the issue of TOC normalization and wood debris should acknowledge this potential bias and therefore not automatically preclude use of previously collected site specific TOC data that is greater than an arbitrarily determined amount."

Response: Ecology has not identified or adopted a specific methodology to address the appropriate TOC normalization of sediment chemical quality data when woodwaste or woody debris is present and may contribute to sediment TOC. The current Ecology guidance, contained in the Sediment Cleanup Users Manual, Appendix G (see Appendix E) identifies that in some cases it may be appropriate to

subtract the TOC contribution of woodwaste or to use the sediment dry weight normalized value for compliance determinations. In other cases, the presence of woodwaste may be interpreted under the other toxic, radioactive, biological or deleterious substances subsection of the SMS rule, e.g., section 320(5), as directly causing biological effects by smothering or by toxicity of its leachate. At this time, Ecology believes the above scenarios are best left to project-by-project determinations. Currently, Ecology is coordinating with the PSDDA agencies on the development of a SMARM paper concerning management of woodwaste for the May 7, 1997 SMARM.

III.C. General Comments Related to Parts of the SMS Rule

Part II -- Definitions

Comment 1. Re: WAC 173-204-200 Definitions. "A definition of "sediment" is needed . . . to differentiate between sediments and wastes that have been dumped in the aquatic environment." "How about something like, 'Naturally occurring deposits of mineral and organic matter, containing less than 50% material of anthropogenic origin (e.g., wood debris, bark, sandblast grit, slag.)'"

Response: Ecology does not agree that a definition of sediment is needed or possible. While Ecology understands that industrial/commercial wastes have often been discharged into receiving waters and settled to the sea floor, differentiation of sediments from "wastes" in the aquatic environment seems complex and somewhat duplicative of solid waste programs. Designating material as sediments or wastes based on the percent of anthropogenic material seems technically insupportable and ignores the underlying principle of the SMS rule to address the biological effects of in-place sediments, and whether source control and/or cleanup is needed. If the in-place sediments can be documented as solid waste, then appropriate solid waste and cleanup authorities exist to address removal of the solid wastes. If the in-place sediment causes unacceptable adverse biological effects, then the SMS rule can be used to designate the sediment and address necessary cleanup, regardless of the degree of waste present.

Part III -- Sediment Quality Standards

Comment 1. Re: WAC 173-204-320(1)(b), (c) Marine sediment quality standards. Goal and applicability. "We should consider extending the Puget Sound marine sediment standards to other marine areas of the state, based on the recent work that's been done by EPA. Also applies to WAC 173-2094-420(1)(b) and WAC 173-204-520(1)(b). Even if the chemical standards could not be extended, we should consider extending the biological standards."

Response: The narrative SMS rule sediment quality standard of "no adverse biological effects, no significant human health threat" has been adopted and is applicable to all state sediments. However, Ecology agrees that specific marine sediment chemical and biological criteria would provide needed regulatory clarity to sediment

management activities in non-Puget Sound areas. Ecology recommends additional SMS Implementation Committee discussion of this topic prior to beginning work to adopt sediment criteria for other marine areas of the state.

Ecology will develop a workplan to identify key technical and policy tasks and staff/resources necessary to determine applicable chemical and biological sediment criteria for other marine sediments in Washington State. Ecology's Sediment Management Unit will communicate and coordinate the workplan and schedule for these activities with the SMS Implementation Committee. Work tasks will include assembling available sediment quality data for these areas and coordinating with EPA Region 10, to review the results of their work to establish a United States west coast marine sediment database.

Comment 2. Re: WAC 173-204-320(5) Marine sediment quality standards. Marine sediment other toxic, radioactive, biological, or deleterious substances criteria. "In practice, I've been using the bioassay tests and biological criteria for other deleterious substances not represented in the chemical criteria. Would it be worth identifying in this section that the biological tests can be used for these contaminants? Also applies to WAC 173-204-420(5) and WAC 173-204-520(5)."

Response: Ecology has reviewed this issue and does not believe rule revisions are needed at this time. The existing Puget Sound marine biological effects criteria (section 320(3), 420(3) and 520(3)) are clearly applicable to all Puget Sound marine sediments and may be used to evaluate Puget Sound marine sediments which contain other toxic, radioactive, biological, or deleterious substances (section 320(5), 420(5) and 520(5)). The "other toxics" sediment quality criteria were adopted to provide an additional mechanism to address the impacts of unique discharges (e.g., net pens, log storage) on sediment quality which may affect beneficial resources or human health. These sediment quality impacts may not be adequately addressed by the SMS chemical or biological criteria. Indeed, the SMS rule benthic abundance test and criteria have and continue to be applied to net pen facilities, acknowledging that these facilities do not routinely violate the SMS chemical criteria or the SMS marine sediment bioassays.

Ecology believes the SMS marine sediment chemical and biological criteria would first be applied, and only when these criteria failed to substantiate a known environmental or human health problem, would other toxics be suspected. Ecology expects that application of the "other toxics" criteria would include sediment testing using alternative chemical, biological and/or human health evaluation test procedures. As these procedures are defined by implementation experience, Ecology will consider including them in the appropriate SMS rule sections.

Part IV -- Sediment Source Control

Comment 1. Development of Marine Finfish Rearing Facilities, Sediment Criteria:
"...Ecology should consider reproposing it after it has been compared to the adoption

Committee focused on legal authority and use of data prior to proposing any change to the SMS rule. **Pending this discussion, Ecology recommends a revision to the SMS rule to identify a set period of time for submittal of sediment data collected to comply with source control, dredging or cleanup program monitoring requirements.** The authority for requiring the data submittal timeline will be identified in the draft SMS rule revision.

Part IV. Specific Comments - Comments and Ecology Responses Arranged by Topic Area:

IV.A. Specific Comments - Chemical Criteria

Comment 1. "The chemical criteria for the marine sediment quality standards (Table 1 of WAC 173-204-320) do not include a number of fairly common industrial chemicals, such as those associated with pulp mill effluents (e.g., organotin compounds, tetrachlorophenol, trichlorophenol, polychlorinated dibenzodioxins, and polychlorinated dibenzofurans). These compounds should be evaluated and included in the chemical criteria."

Response: Ecology recognizes that the SMS rule sediment quality chemical criteria do not include all common industrial chemicals found in Puget Sound sediments. Between 1988 and 1991, Ecology evaluated many AET values for adoption into Table 1 of the SMS rule. A comprehensive list of AET values for Puget Sound marine sediments may be found in: Contaminated Sediments Criteria Report, Appendix B (Ecology, 1989a).

Prior to adoption of the SMS rule in 1991, Ecology's focus for identification of sediment chemical criteria was on the ability to predict adverse biological effects in Puget Sound marine sediments, not to address the diversity of possible sediment chemical contaminants. In part, this focus originated from the 1989 Puget Sound Water Quality Management Plan, element P-2 which mandated development of sediment criteria for identifying and designating sediments that have acute or chronic adverse effects on biological resources or pose a significant health risk humans

Between 1988 and 1991, Ecology evaluated sediment values developed by the AET method and the Equilibrium Partitioning method using reliability analyses of synoptic chemical and biological data in Ecology's sediment quality database (SEDQUAL). The reliability analyses compared predicted toxicity by one or more chemical values against known biological effects in SEDQUAL. These reliability analyses can be reviewed in: Application of Equilibrium Partitioning Sediment Quality Criteria to Puget Sound, Ecology, 1989b. Ecology chose to identify an SMS rule Table 1 criterion where biological effects predictions were improved by inclusion of that particular chemical value. These reliability evaluations indirectly addressed the presence of individual chemical contaminants in Puget Sound marine sediments

and the scientific limitation that most AET values are not direct cause and effect indicators. Ecology continues to use these reliability analysis procedures in the ongoing development of freshwater sediment chemical values and revised Puget Sound marine sediment AET values.

Additionally, when human health sediment criteria are proposed for adoption, Ecology may identify "new" chemical criteria not currently identified in the SMS rule, e.g., dioxin. Finally, the SMS rule also specifies that Ecology may use best professional judgment authority to make project-by-project decisions on appropriate chemical values to protect sediment quality, even if the values are not adopted into Table 1 of the SMS rule (see general comment A.4.).

Comment 2. "The standards for metals need to better address the issue of bioavailability. . . . This issue was also raised by the SAB. The issue of bioavailability may also have been a factor in those cases where DOE chose to exclude anomalous data in SEDQUAL from the derivation of the standards."

Response: Ecology agrees that bioavailability, especially for heavy metals, may be a key factor affecting the impact of a chemical on biological organisms. Bioavailability can be extremely complex and variable in dynamic receiving water and sediment scenarios. There continues to be large uncertainty in predictions of the bioavailability of heavy metals due to chemical-specific properties and site-specific physical and biological factors. The SMS rule currently enables the agency or project proponent to propose an alternate technical method to replace or enhance the application of a specific technical method (WAC 173-204-130(4)). This provision provides a mechanism to address site-specific concerns for bioavailability of a sediment contaminant. At this time, Ecology does not recommend any revision of the SMS rule to address the issue of metals bioavailability.

The current metals criteria in Table 1 of the SMS rule represent the 1988 lowest AET values (dry weight normalized) for the identified eight metals and only indirectly address bioavailability. That is to say, the AET method does not directly address the route, duration or other specifics of exposure, but instead associates a chemical value with the biological endpoint for the AET indicator. AET values incorporate to some unknown degree the availability of a contaminant through multiple exposure routes to the biological organism(s) of concern. Additionally, chemical data treatment methods to identify the 1988 AET values did address anomalously high chemical concentrations at nonimpacted stations due to various factors including sediment matrix effects, low bioavailability, localized tolerant species, etc., (Puget Sound Estuary Program (PSEP), 1988). (The AET method for identifying chemically anomalous sediment stations is currently being evaluated by Ecology and the PSDDA agencies to determine if improvements to the method may be made.) Ecology acknowledges that bioavailability (or the lack of) may have been one factor among others in the derivation of 1988 AET values for chromium, arsenic, antimony, lead and mercury.

Ecology continues to work on development of human health sediment criteria and the issue of bioavailability as expressed in bioaccumulation is a key study area. Ecology's work to-date has addressed the development of sediment to biota accumulation factors (BSAF) for metals and polar organic compounds (Ecology, 1995a) and nonpolar organics (Ecology, 1995b). Due to high levels of uncertainty concerning the bioaccumulation (bioavailability) of heavy metals, Ecology's BSAF values and human health criteria will predominately focus on nonpolar, organic contaminants. However, Ecology plans to continue BSAF and human health sediment criteria development efforts for mercury as a key heavy metal of concern.

Comment 3. "Reconceive sediment quality criteria as "screens" or "flags" instead of "pass-fail" evaluations: . . . Accordingly under the Rule, sediments that exceed the sediment quality chemical criteria should not be presumed to have adverse effects."

- "See EPA's Contaminated Sediment Management Strategy,... August 1994 ...(discussing the Scientific Advisory Board's rejection of pass/fail sediment quality criteria).
- "More flexible and focused responses are particularly needed in the Superfund context, where there is a tendency by EPA (and other agencies) to mechanistically apply Ecology's numerical sediment criteria...without regard to the array of factors beyond chemical concentrations that affect actual toxicity and environmental impact."
- "... should not be used as "pass-fail" water quality standards, cleanup triggers, or dredged-material disposal requirements."

Response: Ecology has reviewed this issue and does not agree that the SMS rule sediment quality criteria should be reconceived as "screens" or "flags." The department believes the current approach strikes an appropriate balance between regulatory certainty/predictability and site-specific flexibility. As such, the current approach facilitates cross-program consistency and serves to minimize lengthy project delays and increased transaction costs associated with case-by-case decision making. Ecology believes that using the SMS sediment quality criteria (i.e., chemistry and biological criteria) as flags would reduce regulatory clarity and increase confusion and delay in implementation of sediment source control, dredged material disposal and cleanup activities.

Ecology also believes that reconfiguring the chemical and biological criteria into "flags" would jeopardize several important sediment management objectives being addressed under the current approach:

- Specific sediment chemical criteria are preferred for development of discharge effluent limitations, evaluation of individual and multiple discharge impacts to in-place sediment quality and implementation of sediment source control programs;

- Specific sediment chemical criteria provide the needed ability to identify sediment cleanup sites and to evaluate cleanup alternatives based on considerations of cost, technical feasibility and net environmental impacts;
- Combined chemical and biological criteria provide needed regulatory certainty and cross-program consistency for source control, dredging and cleanup activities;
- Adoption of the sediment chemical criteria in a rule is needed to prevent unpredictable, unenforceable, inconsistent and possibly unreliable regulatory and management practices which can result from the use of values as "guidelines;" and
- Chemical criteria are included in the rule to streamline the sediment quality designation process and to minimize the economic impacts of testing requirements.

Ecology also believes the SMS rule currently implements the intent of the EPA Science Advisory Board (SAB) recommendation by including and using biological criteria to reduce the uncertainty of the SMS chemical criteria in the implementation of all sediment programs. In reaching this conclusion, it is important to understand the source and context of the EPA SAB recommendations. The referenced EPA SAB recommendations were made to the EPA concerning their intent to "adopt" national sediment quality criteria. Specifically, this EPA SAB comment is explained in An SAB Report: Review of Sediment Criteria Development Methodology for Non-Ionic Organics. Sediment Quality Subcommittee of the Ecological Processes and Effects Committee, 1992. This report identifies that the SAB recommended chemical criteria not be used alone as "pass/fail" criteria, but instead **be paired with biological tests/ criteria to address the technical uncertainty of the chemical criteria development method** (emphasis added). Specifically, the SAB was speaking to EPA's proposed use of chemical criteria developed using the equilibrium partitioning method.

Finally, the department is not convinced that reconfiguring the chemical and biological criteria as "flags" or "screens" will address the underlying concern that agencies may only consider the numeric chemical criteria when establishing requirements for state and federal contaminated sediment cleanup actions. Ecology believes that the rule needs to be considered in its entirety when establishing cleanup requirements. This position is reflected in section 130(11) of the SMS rule which states:

"(11) When the department identifies this chapter as an applicable, or relevant and appropriate requirement (ARAR) for a federal cleanup action under the CERCLA, the department shall identify the entire contents of this chapter as the appropriate state requirement."

Ecology continues to work through the Cooperative Sediment Management Program

to coordinate with the EPA Region 10 Superfund program to ensure that application of the SMS rule to federal cleanup actions meets the intent of section 130(11). However, Ecology has limited ability to constrain EPA's implementation of the federal Superfund program in Puget Sound.

Comment 4. "Recalculate chemical criteria based upon new information. ...Consistent with Ecology's commitment to regularly revise the rule to reflect the latest scientific knowledge... Ecology should systematically recalculate the chemical criteria."

- "Ecology should address and accept a fundamental policy issue, which is that recalculation of the criteria may well result in legitimate increases in the criteria for some chemicals. ...Ecology should, therefore, be wary of resisting this trend by using methodologies that are biased toward lowering the criteria."
- "Consideration should be given to why data is flagged for Quality Assurance/Quality Control (QA/QC). Often, it is for reasons that would not necessarily affect the validity of the sample, such as when there is high mortality in the reference samples, but low mortality in the project samples. ...Currently, Ecology appears to be filtering out about half of the data being evaluated for inclusion in the AET data set."
- "Another example of a biased methodology is the PSDDA agencies' proposed addition of another larval abnormality test (echinoderm) for calculating AETs for Puget Sound. ...The better and less biased methodology would be to pool the oyster and echinoderm data into one abnormality category."
- "We are enclosing a large data set from the Sediment Unit of the Harbor Island Superfund Site Although we are still finalizing the QA/QC work, our preliminary review of the data indicates that including the data in the recalculation process will improve the reliability of the AETs, and should, in several instances, result in higher AETs and higher chemical criteria."

Response: When the SMS rule was adopted, Ecology identified several commitments concerning development of sediment chemical criteria (see Appendix D). Although these commitments did not specifically address a "systematic recalculation of the AET values," Ecology has completed the 1994 AET technical development activities (Ecology 1996) and the SMS program is now focusing on evaluating the potential use of the 1994 AET values for revision of the SMS rule in 1997. This evaluation will focus on identification of one or more options for incorporation of the new AET values into the SMS rule chemical criteria and corresponding review of reliability analyses.

Ecology made multiple presentations on the 1994 AET development activities to PSDDA Annual Review Meetings (ARM) and the SMS Implementation Committee.

A principal part of these presentations has been the statement that this effort has focused on as consistent a use of the 1988 AET methodology, as possible. Ecology is confident that the rejection of data has strictly followed 1988 AET method, and that no intentional Ecology bias has been introduced into the 1994 AET development.

Ecology has previously stated at PSDDA ARM and SMS Implementation Committee meetings the acceptability of AET values increasing and being adopted into the SMS rule. Ecology acknowledges that in keeping with the AET methodology, generally AET values should only increase, i.e., become less stringent. While Ecology acknowledges this technical reality, the department has always stated that our selection of AET values for adoption into the SMS rule will be predicated on review of reliability analyses and modification of the rule criteria tables consistent with the legal mandates for the SMS rule. In some, but not all cases, Ecology agrees that criteria in the SMS rule will increase from the 1994 and future AET revisions. There are reasons for the SMS rule criteria to stay the same or decrease:

- Only two AET were revised in 1994 which may not affect the lowest or second AET values reflected by Table 1 and Tables 2 and 3, respectively;
- In a few cases, the revised AET went down due to AET methodology/rules on rejection of data; and
- Ecology may decide to use the lower of two larval AET.

Ecology calculated a separate echinoderm AET based on the department's judgment that adequate echinoderm data was available, the data represented recent sampling efforts and no good justification existed for combining newer echinoderm data with older data used to calculate the 1988 oyster AET value. Interestingly, Ecology's early 1994 AET revision efforts combined the oyster and echinoderm data into one AET, and Ecology received public comment at the sixth PSDDA ARM on May 6, 1994 recommending calculation of separate larval AETs. Ecology plans additional internal study and peer review and stakeholder discussion of the individual larval AETs before final decision making concerning the appropriate use of one or more larval AETs within the SMS rule.

At this time, Ecology plans to complete review of the 1994 marine AET values for revision of the SMS rule in 1997 before beginning any new marine sediment AET value development effort. Ecology looks forward to QA/QC review and entry of the Harbor Island data set, as well as many others from other marine sediment areas in Washington State for recalculation of AET values after 1997. Of course, Ecology's commitment to recalculating the SMS rule sediment chemical criteria in the future is contingent on available staff and resources to complete necessary work, e.g., data QA/QC review, data entry into SEDQUAL and AET analyses, etc.,.

Comment 5. Chemical Summing of LPAH, HPAH, Benzofluoranthenes and Total PCBs: "The proposed modification will ensure consistency between SMS and PSDDA

data sets. This modification will accurately address the use of non-detected data for regulatory purposes. We support the proposal."

Response: The SMS rule was revised and adopted in December 1995. The SMS rule was modified in sections 320 (2), 420 (2) and 520 (2) to address revised chemical summing procedures. For the above chemical groups, the SMS rule now requires:

- i) where chemical analyses identify an undetected value for every individual compound/isomer then the single highest detection limit shall represent the sum of the respective compounds/isomers; and
- ii) where chemical analyses detect one or more individual compounds/isomers, only the detected concentrations will be added to represent the group sum.

The SMS rule changes will bring consistency between the PSDDA and SMS programs concerning chemical summing and reporting of Low Molecular Weight Polynuclear Aromatic Hydrocarbons, High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAH), Total Benzofluoranthenes and Total PCBs. These changes will also reduce and likely eliminate the number of times regulators are triggered to suspect potential adverse biological impacts based on use of summed detection limits.

Additionally, these changes necessitated changing the SEDQUAL database source code for how these summed chemical AETs are calculated. Review of 1988 AET values for these summed chemicals identified that the 1988 Amphipod HPAH AET included a Total Benzofluoranthenes value that represented a sum of detected and undetected values (Betts, 1995). The 1988 Amphipod HPAH AET value was the second lowest AET value and therefore is reflected in the SMS rule in Tables 2 and 3 for the HPAH criteria. For this reason, future revisions of the AET values using the new chemical summing procedure may identify a change to the second lowest AET for HPAH.

Comment 6. Difficulty in Meeting SMS Rule Detection Limits/Use of Alternative Detection Limits: "In the past Ecology has used the proposed approach on a case-by-case basis to address problems with detection limits for the chlorinated organics (compounded in low TOC sediments) and subsequent comparison to the SMS chemical criteria. We support the proposal to broadly adopt this approach."

Response. In July 1996, Ecology revised recommended detection limits for the SMS program (see Appendix F).. These revised detection limits are expressed as dry weight values and reflect 1/3 of the 1988 dry weight lowest Apparent Effects Threshold (LAET) value for all SMS chemicals of concern except for:

- 1,2 Dichlorobenzene
- 1,2,4 Trichlorobenzene
- Hexachlorobenzene

- Hexachlorobutadiene
- N-nitrosodiphenylamine
- 2 Methylphenol
- 4 Methylphenol
- Benzyl alcohol

For these eight chemicals, Ecology will require that dry weight detection limits be at or below the 1988 dry weight LAET. Analytical laboratories must submit adequate explanation of the measures taken to reduce detection limits in compliance with these revised recommendations. Ecology will prepare a draft Technical Information Memorandum (TIM) identifying the recommended SMS detection limits and clarifying the procedures discussed above for use of alternate 1988 dry weight normalized sediment values for SMS compliance determinations.

This approach addresses the two major reasons for difficulty in meeting detection limits required by the SMS rule. These were described in the paper presentation, "Sediment Management Standards Detection Limits" at the 1995 SMARM. The paper identified alternative approaches using the 1988 dry weight LAET values for two common scenarios relative to compliance with recommended SMS detection limits.

Scenario 1. Low SMS criteria for the chlorinated hydrocarbon group: The SMS TOC normalized criteria for these and a few other chemicals are so low that TOC normalization with sediments containing normal TOC levels may still result in TOC normalized value for a test sediment above the SMS criteria.

Scenario 2. Unusually low TOC concentrations: Extremely low levels of TOC in a test sediment may artificially inflate the reported chemical concentrations over criteria levels for some nonionizable organic chemicals. Sediment sample analyses associated with TOC levels below 0.5% are often in this scenario.

For both scenarios, Ecology's Sediment Management Unit or regional sediment technical experts should be contacted when test sediment detection limits exceed Ecology's revised recommendations (see Appendix F) or test sediment TOC is expected or measured below 0.5% at a sampling site. In these cases, Ecology will determine whether the dry weight chemical results should not be TOC normalized and rather should be compared to the 1988 dry weight LAET to evaluate sediment toxicity on a site-specific basis.

IV.B. Specific Comments - Apparent Effects Threshold Method

Comment 1. "Why aren't "chemically anomalous" samples included in the AET, or at least included in tables so that the data can be evaluated by others?"

Response: The PSDDA agencies calculated 1994 AET values using methods consistent

with those used to derive the 1988 AETs which form the basis of current regulatory guidelines and criteria. The 1988 methods and resulting AETs were considered acceptable for regional regulatory use by the EPA SAB (EPA, 1989). The 1988 AETs were calculated after excluding certain anomalous samples from the sediment quality database. An anomalous sample was defined as one showing no significant biological effect (e.g., amphipod mortality or benthic abundance depression) but having a chemical concentration at least three times greater than the next highest "No Hit" sample (Appendix C, PSEP, 1988).

Chemically anomalous samples excluded from the 1994 AET calculations are listed in the draft report, Appendix B, notably Table B-7 (Ecology, 1996a). Chemically anomalous samples excluded from the 1988 AET calculations are listed in Table 6 of PSEP, 1988.

Ecology participated with the PSDDA agencies in organizing a PSDDA Regulatory Workgroup which in part provided the agencies with recommendations for improvement to the AET method, including options for exclusion of chemically anomalous samples. In early 1997, the Regulatory Workgroup provided a recommendation to Ecology and the PSDDA agencies for use of a statistical test, (i.e., Dixon's or Rosner's test) for outliers to exclude anomalous "No Hit" samples. Ecology plans further review of these recommendations and an evaluation/comparison of the proposed and existing AET method to identify chemically anomalous samples. This work will focus on changes to the 1994 AET values associated with use of the revised method and an assessment of changes to the sensitivity and efficiency of revised SMS chemical criteria based on incorporation of the existing and revised 1994 AET values, as appropriate.

Comment 2. "The bases for rejecting over 50% (452 out of 824) of the amphipod bioassay samples should be reconsidered? ...The stated "lack of a matching reference sample" seems an arbitrary and unnecessary reason for rejection of most of these data....How does including these data (at least those rejected for lack of grain-size reference data) affect the AETs?"

Response: Most of the available synoptic samples not included in 1994 AET calculations lacked a reference sample or the associated reference sample did not meet quality assurance guidelines or performance standards. Relatively few samples were excluded because they were found to be "statistically inconclusive" or considered "anomalous" as defined in PSEP, 1988. The number of samples excluded, and the reason why they were excluded, is summarized in the 1994 AET draft report, Appendix B, Tables B-2 through B-5 and B-7 (Ecology, 1996a). The PSDDA agencies initially tried to maximize the number of new synoptic samples included in preliminary recalculations of AETs. When reference samples were not collected or reference results were not available, test samples were compared to negative control sample results. This resulted in a much higher number of samples being classified as "Hit" samples. The resulting AET values were often unrealistically low and the

overall reliability of those values was also quite low (Gries et al., 1993). For these reasons, the agencies agreed to eliminate such comparisons and use only surveys for which reference data were available. Test sample results were excluded if the associated reference sample did not meet quality assurance guidelines or performance standards.

The PSDDA Regulatory Workgroup provided the PSDDA agencies with a recommendation for development of a reference sample default performance standard. In cases, where no reference sample was collected or the reference sample failed quality assurance guidelines, the Regulatory Workgroup recommended use of a default reference performance standard, matched or stratified to the test sample grain size, TOC etc.. Ecology plans to coordinate with the PSDDA agencies for further review of this recommendation. Ecology's focus will be on changes to the 1994 AET values associated with use of the revised method and an assessment of changes to the sensitivity and efficiency of revised SMS chemical criteria based on incorporation of the existing and revised 1994 AET values, as appropriate.

Comment 3. "Re. the 25% rule for hits in amphipod mortality (pg. 17): 25% seems artificially high and perhaps under protective. How are AET values changed if this is dropped back to 20% or to "anything that is statistically different"? Why not just consider any statistical difference from the negative control to be ecologically significant? What is the ecological basis for deciding that a hit has to be 20-25% greater than some value?"

Response: Ecology has reviewed this comment and decided to not revise the amphipod hit rule. In the development of the 1994 AETs, Ecology decided it was important to be consistent with the 1988 AET methods. Therefore, the 1994 AET calculations were based on the same definition of a significant adverse effect ("Hit") in 10-day amphipod mortality bioassay samples as was used in PSEP, 1988. Historically, the 25% (absolute) mortality level was based on two studies: earlier findings (Mearns et al., 1986) that demonstrated that 25 percent mortality could be consistently discriminated as a toxic response relative to control sediment, and review of amphipod reference performance and selection of 25 percent mean mortality (PSEP, 1988) as a guideline.

At this time, Ecology believes no change to the SMS rule is appropriate for revision of the Amphipod biological effects (hit) criteria. If the PSDDA or SMS program determines that new amphipod AETs should be based on a different definition of a significant adverse effect (e.g., anything that is statistically different from reference) or just statistically different from the negative control sample), then the resulting AET values would be expected to be more stringent and more sensitive predictors of adverse effects. However, the "real world" implications of more stringent amphipod AET values are not known."

Comment 4. "Were non-polar organic contaminant concentrations normalized to

measured TOC values for the sample from which the contaminant was measured?"

Response: Yes, in order to calculate a TOC-normalized AET value, each sample in SEDQUAL must have associated with it concentrations of chemicals of concern and of TOC. All of the TOC data which have been added to SEDQUAL since 1989 represent individual samples or subsamples, and did not result from averaging TOC values within a region or between stations.

Comment 5. "Studies are needed to ground truth the benthic abundance responses used in the AETs... One way to approach this is to examine the sensitivities of these species to toxicants, TOC, grain-size, ammonia, and other correlated factors, and relate those responses to field concentrations of these factors which have been associated with changes in benthic abundance."

Response: The scope of the 1994 AET re-evaluation does not include AETs based on benthic infaunal effects. When the current effort was begun, insufficient new benthic data were available to justify recalculating benthic AETs. Benthic experts had recommended that benthic AETs be recalculated based on use of additional endpoints, e.g., species richness, not just the abundance of major taxonomic groups as used by the SMS and PSDDA programs. To-date, there has been no technical or policy decision by the SMS or PSDDA programs on which additional benthic endpoints to use. Ecology and the PSDDA agencies recognize that historic benthic effects data may need to be re-evaluated using alternative endpoints and that biotic and abiotic conventional factors may adversely affect benthic organisms. Ecology will propose further discussion of artifact toxicity to benthic infauna by the PSDDA agencies and to evaluate current regional and national scientific literature and developments for their use, as appropriate within the SMS and PSDDA programs.

Comment 6. Freshwater Sediment AETs. "Why haven't community structure data been incorporated into the AETs?"

Response: The development of freshwater sediment AET values has not considered benthic community structure primarily due to the lack of synoptic benthic data for the historical freshwater sediment data collected in Washington State. Recently, the Lower Columbia River Bi-State Study has completed benthic analyses, but this data represents estuarine conditions as defined by the SMS rule and therefore has not been incorporated into the freshwater sediment quality database, FSEDQUAL. Ecology plans to collect and evaluate all freshwater benthic data from Washington and Oregon for potential use in development of freshwater AET values. Available data will be summarized in future Ecology reports and when enough samples have been collected and entered into FSEDQUAL (approximately 50), Ecology plans to calculate preliminary freshwater sediment benthic AET values.

Ecology has developed: A Review of Interpretation Methods for Freshwater Benthic Invertebrate Survey Data Used by Selected State and Federal Agencies, 1991. This

document identifies that multiple methods exist for interpretation of freshwater benthic community impacts. Ecology has not identified a preferred benthic interpretation method(s) pending review of future Washington State freshwater sediment benthic data.

Comment 7. AET Recalculations: "The continued use of the LAET and 2LAET is inconsistent with the EIS prepared during the development of the SMS rule. Further, the use of the 2LAET results in a overly conservative cleanup levels."

Response: Ecology disagrees; we prepared the SMS rule Environmental Impact Statement and believe it fully supports adoption of the LAET and second lowest Apparent Effects Threshold value (2LAET) as defined within the SMS rule. However, per the request of the Cleanup Workgroup, Ecology continues to discuss the utility and viability of the 2LAET in implementation of the sediment source control and cleanup programs in several regional sediment forums. While cleanup cost impacts will continue to be evaluated using the 2LAET, Ecology is concerned that adoption of an alternate regulatory endpoint would significantly confound coordination and implementation of sediment source control and cleanup programs with regional dredging programs. This would especially be true if all sediment programs did not use essentially the same regulatory biological effects level, termed "regulatory blight" by the SMS Implementation Committee. Ecology believes the impacts of alternate regulatory endpoints needs to be carefully considered by the PSDDA agencies and the regulated community prior to revision of these programs. Implementation of the demonstration bay pilot study by the Cooperative Sediment Management Program will help to evaluate alternate regulatory endpoints proposed by the public.

Comment 8. "Any rule changes must consider the following important synoptic data sets [which] include:

- 1: Pre-Design Field and Data Report, West Harbor Operable Unit, Wyckoff/Eagle Harbor Superfund Sites. January 30, 1995.
2. Supplemental Remedial Investigation Project, Harbor Island Sediment Operable Unit, Harbor Island Superfund Site. July, 1995.
3. Shannon Point Seafoods Phase II Sampling and Analysis Program. June, 1995."

"Additional data sets (discussed above) which support higher AETs (and MCULs/CSLs) for mercury are not currently included in the database used to recalculate AETs. The exclusion of these data sets may result in overly conservative cleanup levels and sites which are held to different standards."

Response: The current PSDDA agencies' AET recalculation effort began in 1992 with data acquisition, review and entry. In late 1992 Ecology and the PSDDA agencies decided on an overt data input cutoff date to allow recalculation of the AET and presentation of results at the 1993 ARM. The above data sets were not included

because they were either not available or quality assurance/control reviews and/or SEDQUAL data entry had not been completed in time. Future AET recalculations will include or address use of these and other sediment data sets. Ecology will explore collaborative efforts to accelerate incorporation of post-1994 sediment quality data into SEDQUAL for future AET recalculations.

Comment 9. "The AET re-calculation should address *Ampelisca abdita* and *Neanthes arenaceodentata*."

Response: At the time the 1994 AET recalculation effort began in late 1992, insufficient data was available to calculate AETs for these biological indicators. While there is likely adequate bioassay data for *Neanthes* to calculate an AET, Ecology believes there is still insufficient bioassay data to support development of an *Ampelisca* AET. We understand the Port of Seattle is currently developing a *Neanthes* AET. Ecology has been coordinating with the Port's consultant, EVS Consultants, in assembling available *Neanthes* data for AET development. Ecology also intends to provide review of the Port and EVS AET development work and to recommend any changes to the SMS rule based on availability of a final *Neanthes* AET.

Comment 10. "The 1994 Amphipod (*Rhepoxynius abronius*) AET for tributyltin is >180 ppb. The Harbor Island Sediment Operable Unit data set (discussed above) provides sufficient data to develop AETs for a number of biological tests. Consequently, the opportunity of the development of SMS and PSDDA chemical criteria for TBT should be evaluated."

Response: At this time, Ecology intends to complete the 1994 AET recalculation before conducting additional AET recalculation tasks primarily due to staff and resource limitations. Currently, we consider development of a TBT AET to be of lesser importance relative to the other sediment development and implementation tasks planned by Ecology.

Comment 11. Re-evaluating AETs: "I share concerns by many industry representatives at the SMARM meeting about the increasingly larger number of data points that are being deleted from the data sets as being anomalous. While the justifications seem reasonable, one cannot help but wonder if there is a fatal flaw in the approach. ...Rather than simply discarding these other sediment chemistry measurements as anomalous, perhaps the bioaccumulation endpoint could be used as a fourth tool in modifying the AET approach."

Response: Ecology agrees that bioaccumulation testing may serve as an additional method for identification of potential biological or human health threat from sediment contamination. Such testing has been required on a case-by-case basis. In addition, EPA is evaluating several approaches for assessing bioaccumulation potential. However, Ecology does not believe that current methodologies have

reached a point of development that would warrant SMS rule changes. Ecology and the PSDDA agencies continue to evaluate the methods, utility and costs of bioaccumulation tests as confirmational tools for sediment chemical evaluations and bioassay tests. Additionally, when sufficient bioaccumulation data have been generated, it may be possible to develop one or more bioaccumulation AET values.

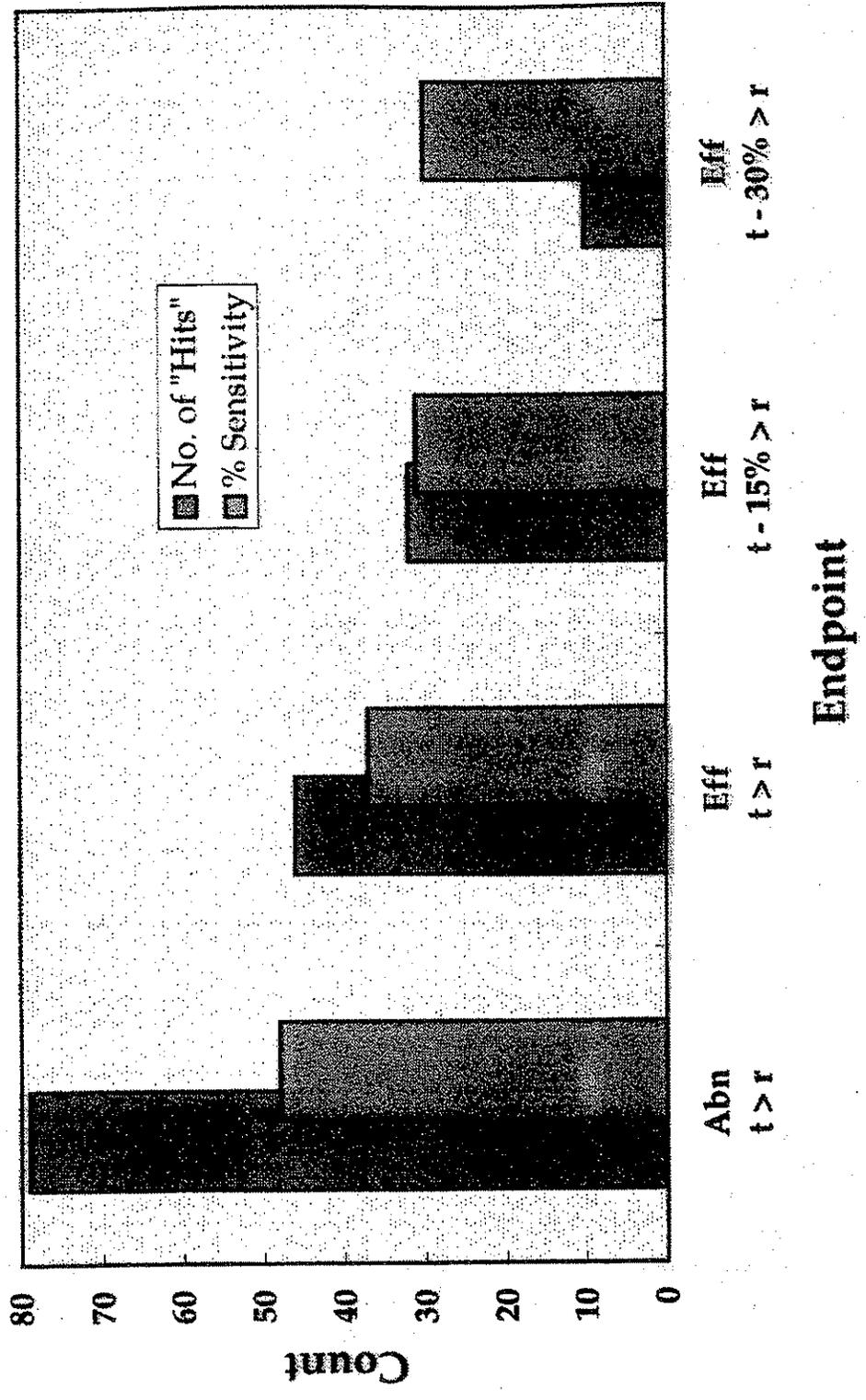
Comment 13. " The triennial review needs to evaluate the changes to the "no adverse effects levels" and the "minor adverse effects levels" that result from the change in the oyster larvae test protocols. . . . Oyster larvae results often set the sediment quality standard (the no effects level) or the minimum cleanup standard (the minor effects level). As additional data is collected but tests other than oyster larvae are used, the standards, set by the old protocol, will not be adjusted because people will be using other tests instead. The department therefore needs to conduct studies to evaluate the magnitude of this difference, and even to correct the standard, or delete the old oyster larvae data from the data base altogether and recompute the standards. The original protocol was changed to correct a fault, yet we are left with the legacy of the old protocol in our numerical standards."

Response: Ecology agrees that review and evaluation of the 1988 oyster AET is needed to decide if and how it should be used, and whether it should be updated. Ecology believes there is adequate new bivalve data (*C. gigas* or *M. galloprovincialis*) exist, compared to the 1986 and 1988 oyster AET data set, to justify calculation of a new "bivalve" AET value. Ecology agrees that the 1988 oyster AET, based only on the abnormality endpoint, is more sensitive than AETs based on a combined endpoint, i.e., effective mortality (mortality and abnormality). The results in Figure 1 show that the simpler endpoints, e.g., abnormality, predict more "hits" than effective mortality endpoints. This provides support to the contention that the 1986 oyster AET based only on abnormality may be too stringent a criteria, i.e., nonhit stations were called hits, thus lowering the oyster AET, and that use of a combined endpoint may be more appropriate. In Ecology's development of revised AET criteria (Ecology, 1996a), several echinoderm endpoints were examined for their predictive reliability.

If a revised bivalve AET can be calculated, a comparison of the historic oyster AET, revised bivalve AET, and the 1994 echinoderm AET (Ecology, 1996a) may be possible. Additionally, Ecology also plans to review sensitivity of the SMS larval bioassay species to assist in determination of the appropriate use of more than one larval AET. The PSDDA regulatory workgroup reinforced this message, recommending additional scientific study and discussions concerning the use of one or more larval AET endpoints. Of course, study of the larval AET is one of many AET issues Ecology must prioritize for completion with limited staff and contract resources. Ecology plans to coordinate with the other PSDDA agencies on the priority for this additional AET work.

Figure 1 - Echinoderm endpoints

Sensitivity of Echinoderm AETs



IV.C. Specific Comments - Bioassay / Benthic Community Structure

By far, the majority of comments received on the SMS rule bioassay and/or benthic infaunal abundance tests addressed the scientific or regulatory implementation uncertainties of the individual tests. The following comments were chosen by Ecology as reflective of the larger group of comments. Specific to many of these comments was the term, "artifact toxicity," meaning ecological effects measured in an individual SMS biological test, but attributable to natural factors, such as TOC, salinity, grain size, ammonia, sulfides, etc., or in the case of benthic infaunal community impacts, attributable to natural factors or anthropogenic impacts not related to chemical contamination of sediments, e.g., propeller wash from ships, dredging and filling, construction of piles, bridge pillars, etc.,.

The next most common type of comment concerned the use of and/or adoption of new or revised sediment bioassay or benthic community assessment methods into the SMS rule. Common to these comments and the artifact toxicity comments is the national and regional scientific development work on and regulatory use of method protocols, which serve as a guide for the proper way to culture test animals, setup and conduct the test, and collect and report test data. The SMS rule requires by direct reference, use of the PSEP Protocols which describe the use and limitations of the respective toxicity endpoints; the field collection and processing methods; and the laboratory analytical, QA/QC and data reporting procedures. In the past, the PSEP Protocols have been developed by Ecology, EPA Region 10 and the Puget Sound Action Team (Water Quality Authority) with the assistance of regional professionals and use and reference to the American Society for Testing and Materials (ASTM) guidance and other peer reviewed scientific literature.

Comment 1. "The standards may be overly stringent due to toxic effects that are artifacts from the bioassay methods. . . . EPA's Science Advisory Board, when commenting on the AET method, specifically raised the issue of possible toxic effects from disturbing the sediments¹. The concern is that the bioassay with disturbed sediments indicate a toxicity that may not actually exist in ambient conditions if the sediments are not disturbed. The numbers are driven by the bioassay. To override the numbers, one must go back and use the same type of bioassay (i.e., with disturbed sediments). The rule did not address this concern, even though the SAB had raised it."

The triennial review needs to examine the significance of this issue and perhaps different numbers, or different confirmatory biological test protocols are needed for disturbed and non-disturbed sediments. This could also mean that PSDDA criteria are overly stringent. If toxicity, as determined by bioassay, is a short term phenomenon, and not an ongoing one, then the standards are too stringent because the short term acute effects of smothering associated with dredged material disposal greatly overshadow this. . . . (Note that the Oyster Larvae protocol was recently

changed to allow some settling time before adding the larvae.)"

"In discussing uncertainties in the AET, the SAB specifically mentioned "bioassay conducted with homogenized sediments or with supernatants derived from agitated sediments as opposed to undisturbed sediments."

Response: Ecology has reviewed this issue and does not believe that SMS rule amendments are needed or can be made at this time. While we understand the theoretical basis for the comment concerning use of disturbed sediment bioassays, Ecology maintains that use of the PSEP Protocols bioassays continues to be appropriate because:

- The PSEP Protocols represent practical, affordable, and regional and nationally peer reviewed test procedures which address key uncertainties with the use of these bioassays;
- The bias introduced by use of disturbed sediment bioassays remains unquantified and instead the Protocols have been developed to "block" for interferences induced by the test procedure;
- Use of disturbed sediment bioassays may more accurately mimic ambient sediment conditions in Puget Sound urban bays where SMS source control and cleanup activities are focused; and
- The SMS rule provides the flexibility to project proponents to propose alternate technical methods (section 130(4)), e.g., bioassays, on a case-by-case basis.

The SMS rule requires use of the PSEP Protocols for conducting chemistry, bioassay and benthic analyses. The PSEP Protocols represent regionally peer reviewed recommendations for these procedures which incorporate regional and nationally peer reviewed literature and guidance, e.g., ASTM guides for conducting marine and estuarine bioassay. Both the PSEP Protocols and ASTM guides acknowledge that the recommended test procedures are not intended to exactly simulate the exposure of benthic organisms to contaminants under natural conditions, "...but rather to provide a conveniently rapid, standard toxicity test procedure yielding a reasonably sensitive indication of the toxicity of materials in marine and estuarine sediments" (ASTM, 1992).

The ASTM test procedures acknowledge that "...the sediment environment is composed of a myriad of microenvironments, redox gradients and other interacting physicochemical and biological processes. Many of these characteristics influence sediment toxicity and bioavailability to benthic and planktonic organisms, microbial degradation, and chemical sorption. Any disruption of this environment complicates interpretations of treatment effects, causative factors, and in situ comparisons" (ASTM, 1992)

Static, static renewal and flowthrough bioassay tests, admittedly may not accurately

replicate field conditions and therefore bias interpretation of results to a greater or lesser degree than actually found in situ. However, we are not aware of any studies that quantify the error rate induced by the type of bioassay used. Laboratory bioassay protocols routinely address and caution users on the potential for interferences and uncertainty in identified methods. ASTM identifies that in some cases, static bioassay tests may not be appropriate for evaluation of certain types of sediment contamination. For example, sediment contaminated by materials that are highly volatile or are rapidly biologically or chemically transformed may not be reliably evaluated by static test procedures due to immediate degradation/loss of toxicant(s). Notwithstanding, ASTM and the PSEP Protocols recommend that laboratory bioassay are applicable to sediments containing most chemicals, either individually or in formulations, commercial products, and known or unknown mixtures.

Ecology considers that most SMS source control and cleanup sediment bioassay testing is routinely done on nearshore, urban bay sediments. These sediments more closely reflect disturbed sediment conditions rather than static. Therefore, disturbed sediment bioassays would seem to more appropriately mimic ambient sediment conditions in urban bays than static bioassays. Bioassay testing under the SMS rule is normally being conducted to characterize surface sediments at a cleanup site or outfall discharge location. In nearshore areas, surface sediments are routinely disturbed by wind waves, wakes, prop wash, fishing activities, anchors, waterfront activities, and other natural and anthropogenic effects.

In addition, the logistics and expense of collecting undisturbed sediment samples for bioassay testing would be a hardship for regulated parties, since as many as 50 stations may be sampled during larger remedial investigations. During many investigations, large sample volumes are being split for multiple bioassay and chemical analyses for the purposes of evaluating the specific causes of toxicity and to differentiate sources and liable parties. These correlative evaluations are made more difficult if chemical and biological testing cannot be conducted on the same homogenate.

It is important then to reemphasize that laboratory bioassay tests are not intended to be exact simulations of field toxicity. Rather, laboratory bioassay are designed to be affordable, replicable and sensitive test procedures that primarily focus on sediment chemical contaminant toxicity. Regional and national bioassay test procedures acknowledge and are structured by design to "block" interferences by other factors (artifacts), e.g., grain size, salinity, that may induce toxicity. This is routinely done by use of negative and positive control sediment tests and through the use of reference sediment tests, which are intended to evaluate combined artifact toxicity of all other chemical, physical and biological features other than the presence of specific contaminants of concern.

For further discussion on bioassay artifact toxicity, please see the comment below.

Comment 2. "Recognize and institute procedures to minimize false positives resulting from interfering factors in bioassay."

- "...Some of the common potential interferences which can cause significant mortality in test organisms include ammonia, sulfide, grain size and salinity."
- "Second, a party sampling sediments under the SMS Rule should have the option of using procedures to minimize, track, and identify interferences leading to false positives."

Response: The SMS program and the PSDDA program have historically considered ammonia/sulfide effects on sediment bioassay. Together with the PSEP, both programs have worked to revise and improve the bioassay protocols to consider ammonia/sulfide effects. Currently, Ecology supports the PSEP Protocols and the PSDDA agencies recommendation that interstitial measurements of ammonia and sulfides be collected at the option of the project proponent. This recommendation is included in the 1995 PSEP Recommended Guidelines For Conducting Laboratory Bioassay On Puget Sound Sediments (PSEP Protocols) which identify interstitial ammonia and sulfide testing as optional for the amphipod, larval and juvenile polychaete bioassay.

Regionally, Ecology understands that interstitial sediment measurements may be used to assess the potential for conventional contaminants causing "false" toxicity in sediment laboratory bioassay. Ecology has introduced this subject for further discussion and a recommended course of action at routine coordination meetings between PSDDA and SMS program staff. Specifically, Ecology is recommending that staff focus on review of information and recommendations provided by the Port of Seattle and their contractor: Battelle, Marine Sciences Laboratory in the report: Reducing Uncertainty In The Interpretation of Sediment Toxicity Tests and Benthic Community Effects, August 1995. Ecology appreciates the supporting technical information provided by this commenter concerning procedures to minimize false positive results in laboratory bioassay. Additionally, Ecology has also recommended staff from both programs again review regional and national bioassay performance and protocol development efforts to specifically evaluate new developments and the status of latest scientific development concerning the effects of interstitial ammonia, sulfides and other factors on sediment bioassays.

At this time, Ecology believes that no specific change to the SMS rule is necessary or would be consistent with the current format of the SMS rule. The SMS rule has always referenced the PSEP Protocols as the minimum requirements for sampling, handling and analysis of sediments, see SMS rule sections 130(9), 200(21), 350(1) and 600(3). Additionally, the SMS rule does not limit any individual from proposing use of improved protocols on a case-by-case basis due to a concern to limit the potential for false positives in sediment bioassay. The ability to use alternate technical methods has already been used as provided for under the topic of "alternate technical

methods" referenced in section 130(4) of the SMS rule. Previous examples of alternate technical methods used include: adjusting bioassay interstitial salinity, use of alternative organisms due to grain size sensitivity, evaluating organism seasonal effects, and collection of additional bioassay data to interpret test results.

Clearly, the most appropriate regional forum currently available for full scientific consideration of this comment is by regional experts and bioassay laboratory professionals that assist the Puget Sound Action Team in review and update of the PSEP Protocols. These bioassay protocols were recently updated in 1995. While Ecology believes that the PSEP Protocols have routinely addressed interfering factors as part of recommended methods, we will provide this specific comment and supporting technical documentation directly to the Puget Sound Action Team with our recommendation that review of the PSEP Bioassay Protocols begin as soon as possible to fully consider these and other pertinent protocol comments to determine the appropriate improvements necessary to the Protocols.

Also, it should not be overlooked that certain types of discharges and handling practices may impact sediment quality with the same conventional substances that this comment identifies cause erroneous toxic results in sediment laboratory bioassay. In these situations, the SMS program staff must use their best professional judgment to review case-by-case technical information to determine whether, e.g., ammonia and sulfides should be considered contaminants of concern under the other toxics and deleterious substances section (320(5)) of the SMS rule. In these cases, additional sediment and bioassay information may be necessary to determine whether conventional parameters such as ammonia and sulfides are to be considered naturally occurring conventional parameters or contaminants of concern which cause laboratory toxicity.

Finally, via the PSEP Protocols there has been routine scientific acknowledgement of the need to identify interstitial "pore water" salinities to ensure sediment bioassay test animals are appropriate for the range of salinity found in test sediments. Interstitial pore water salinity monitoring requirements and limitations have been routinely identified in all versions of the PSEP Protocols since 1986. Additionally, the PSEP Protocols provide discussion on the sensitivity of bioassay organisms to pore water salinity and the importance of monitoring pore water salinity in the bioassay test procedures.

Comment 3. "Provide greater emphasis on benthic community assessment data in determining whether sediments exceed regulatory limits."

- "Detailed benthic studies indicating a healthy and diverse benthic population should be allowed, under appropriate circumstances, to override both the chemistry and the bioassay as third tier screen when considering large expensive active remediation projects."

- "We feel that the best approach to assessing the benthic effects is in the infaunal trophic index. The Ecology recommended choice of the Swartz diversity index does not provide the level of information necessary to make the required detailed assessment of the benthic community."
- "We support benthic studies in reference areas but we would like to see the reference areas expanded to include deeper stations to evaluate potential effects at sediment disposal sites."
- "There are several Metro data sets from the early to mid 1980s that should be added to the SEDQUAL benthic data set."
- "Interstitial water ammonia, salinity and, if possible, H₂S measurements should be made during benthic studies, as there is a good possibility that some benthic effects may be due to the known interstitial toxicity of these interfering factors."

Response: Currently the SMS rule uses laboratory bioassay and benthic evaluations as similar but independent scientific tools to evaluate (confirm) adverse biological effects predicted by sediment chemical contamination. The SMS rule approach designates sediment quality based on a preponderance of evidence similar to the Triad method, using chemistry, bioassay and benthic evaluations. Ecology believes there are several technical and policy uncertainties that preclude use of benthic community assessment data as a stand-alone third tier biological effects screen, in the near future. Ecology recommends additional discussion of this comment in the SMS IC and in other regional sediment forums, e.g., the SMARM.

The technical uncertainties related to use of benthic community assessment data are well documented concerning "...the variability introduced by naturally produced chemical, as well as biological and physical factors..."(Dewitt, et. al., 1995). Past recommendations from a 1993 Ecology and PSDDA agencies' national benthic experts' workshop also identified scientific uncertainties with use of benthic infaunal evaluations (Ecology, 1993a). Many of the experts identified a degree of uncertainty for SMS benthic hit predictions based on a concern for selection and use of an appropriate reference station for comparison to, and interpretation of the test station benthic infaunal community impacts. Similar to laboratory bioassays, benthic reference stations are used by the SMS rule to "block" for potential benthic impacts identified in the test sediment sample, which may be due to noncontaminant effects, e.g., grain size, organic carbon, water depth, etc.,. The SMS rule approach to counter the technical uncertainties of the benthic assessment method by the use of laboratory sediment bioassays is a basic feature of the Triad Approach and AET method. "Natural sediment features and biotic interactions can strongly influence the composition of benthic invertebrate communities, hence the need for sediment toxicity data to determine biological effects of contaminants, because toxicity tests should be independent of (or minimally influenced by) the natural factors that can structure marine benthos (Chapman, et. al., 1991).

There are also policy considerations pertinent to the suggestion that benthic evaluations should override bioassay tests. Acknowledging that the SMS rule implements the intent of federal and state clean water laws, i.e., to protect biological resources, changing the interpretive relationship between bioassay and benthic effects may not meet the intent of state and federal law. That is, water and sediment quality criteria have historically been established based on the use of laboratory bioassays, and using benthic evaluations to override bioassay tests may attract national level legal challenges to protect the legal precedent established by the Clean Water Act. It is also likely that EPA would not accept any SMS rule revision proposal to de-emphasize criteria based on laboratory bioassays without considerable delay for scientific and legal review. At the least, Ecology would have to coordinate a policy level review of the national strength of laboratory bioassays as used to implement state and federal clean water laws. An additional technical/policy consideration is that Ecology will have to decide which new benthic endpoints to include in the SMS rule and what interpretive endpoints to use for designation of "contaminated" sediment.

Interestingly, the ability of laboratory sediment bioassays versus use of benthic assessments to predict adverse biological effects from sediment contamination was evaluated by Ecology in the development of the 1994 Puget Sound AET values (Ecology, 1996a). Tom Gries, Ecology, developed and presented Figure 2, which identifies the reliability of the separate AET biological indicators, at the sixth PSDDA ARM, May 6, 1994. This figure shows the 1988 benthic AET values to be neither the best at predicting all toxicity (sensitivity) nor the most accurate (efficiency).

Regionally, it would seem appropriate that existing bioassay and benthic evaluation methods and development activities reach scientific consensus and conclusion before a fundamental change in sediment science application, i.e., a benthic override proposal is developed or considered for regulatory application. For example, artifact toxicity is a concern for both bioassay tests and benthic evaluations (Dewitt, et.al., 1995). Ecology supports review of the PSEP Protocols to consider recommendations for changes to bioassay and benthic assessment protocols on the issue of artifact toxicity using information provided by the Port of Seattle and their contractor: Battelle, Marine Sciences Laboratory.

Working for the PSDDA agencies, Ecology contracted two consultants to separately evaluate the use of alternative benthic infaunal assessment methods for sediment decisions using Puget Sound synoptic data sets. Two technical reports on their work are available to the public from Ecology: Evaluation and Recommendation of Revised SMS Benthic Infaunal Sediment Standards, Roy F. Weston, December 1995, and Development of Reference Value Ranges For Benthic Infauna Assessment Endpoints In Puget Sound, Striplin Environmental Associates, January 1996 (see Appendix D). At this time, Ecology has not recommended the Swartz diversity index or another benthic endpoint or reference performance standards. Ecology plans additional contract work in 1997/1998 to:

- Bring together the two independent consultants' recommendations to identify an agreed set of recommended benthic community endpoints and regulatory interpretation standards;
- Identify pollution tolerant and intolerant species that may be used to evaluate sediment quality; and
- Conduct a regional benthic experts' workshop to present and discuss the PSDDA benthic studies and recommendations.

Ecology may conduct a reliability analysis of the recommended new benthic endpoints before recommending any revision of the SMS rule. Based on public comment, revision of the SMS rule may include use of recommended benthic reference area performance standards and/or pollution tolerant/sensitive species.

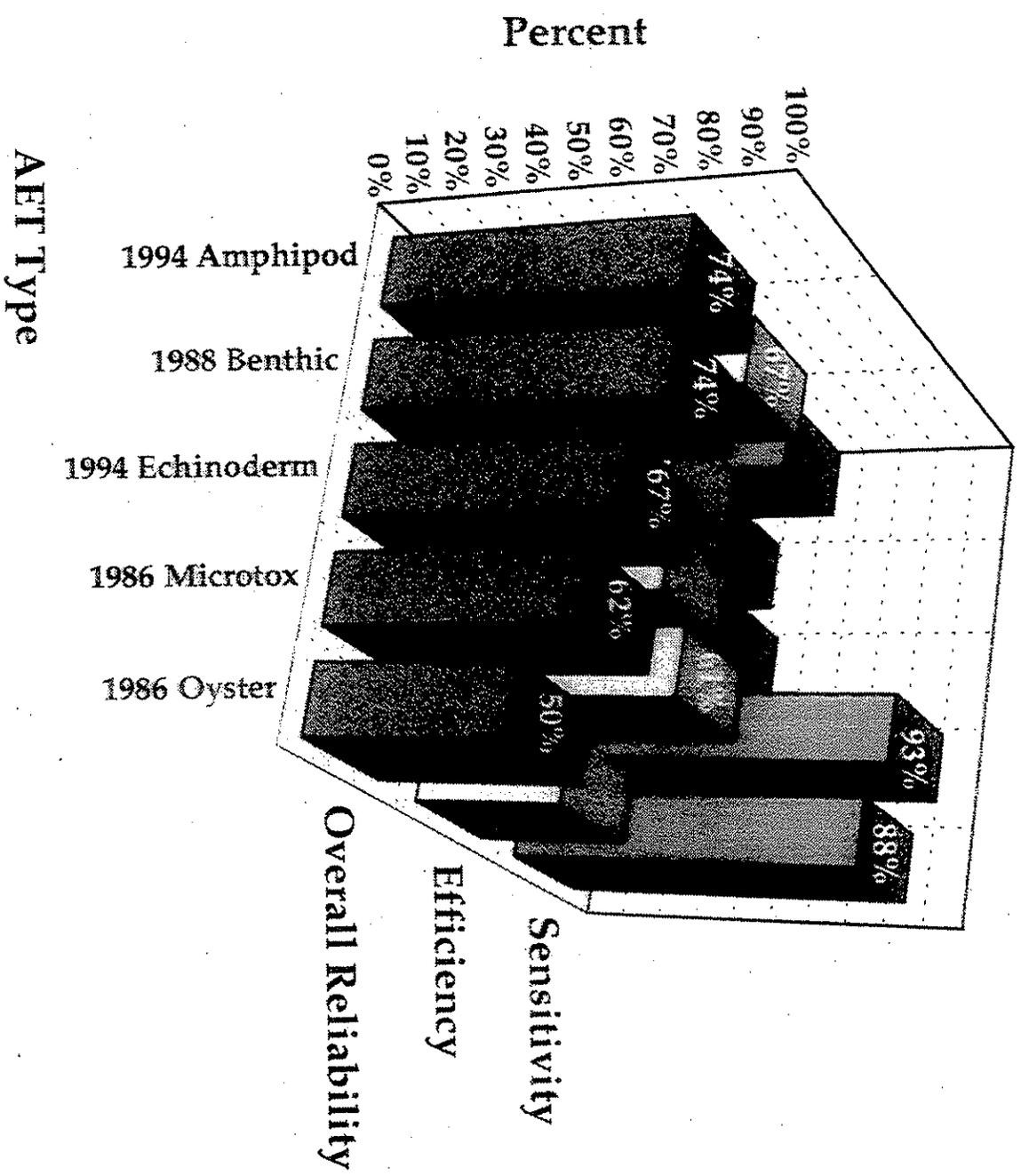
Development of Puget Sound benthic reference area performance standards under Ecology's contract focused on the shallower depth zone primarily due to lack of data to support statistical analyses needs for other depth categories. The shallow depth zone represented by depths <150 feet had an adequate number of stations to support statistical analyses, and this zone represents the predominant area for SMS rule sediment source control and cleanup activities. The development of benthic reference area performance standards for this specific depth was never intended to replace current PSDDA program disposal site "reference sediment" comparisons for deeper dredged sediment disposal areas.

Ecology's benthic contract efforts did include additional key Puget Sound benthic data sets, e.g., Metro's Toxicant Pretreatment Planning Study, Alki Outfall Study, Seahurst Baseline Studies, etc., (Ecology, 1996b). Ecology encourages public and peer review of the benthic contract reports (see Appendix D) for recommendations concerning future assessment and development needs.

Ecology's review of the 1987 PSEP Protocols, Recommended Protocol's For Sampling And Analyzing Subtidal Benthic Macroinvertebrate Assemblages In Puget Sound indicates no discussion of synoptic sediment chemical analysis for conventional parameters, e.g., ammonia to evaluate artifact toxicity. Ecology will introduce the above comment and supporting contract report to the PSDDA agencies for review and possible discussion at the 1997 SMARM. Ecology will also provide this specific comment and supporting technical documentation directly to the Puget Sound Action Team with our recommendation that review of the 1987 PSEP Bioassay Protocols begin immediately to fully consider these and other pertinent protocol comments to determine the appropriate improvements necessary to the Protocols.

Figure 2: Reliability of Dry Weight Puget Sound AETs

Reliability of Dry Weight Puget Sound AETs



Comment 4. "We are concerned that the current chemical and biological criteria used in the sediment quality standards may not be adequate to prevent sublethal effects on marine organisms, unacceptable levels of bioaccumulation, and adverse effects on human health. It is our understanding that the criteria were established on the basis of toxicity tests that look only for mortality and do not consider sublethal effects, such as impairment of growth, reproduction and immune systems. . . . The process of setting criteria must also fully consider the effects of bioaccumulation on the ecosystem. It is not sufficient to consider merely the effects of a pollutant on a single species used in bioassay. Effective tests must be used to predict bioaccumulation in predator species. The effects on predators must then be taken into account in setting criteria. We urge Ecology to set sediment criteria using tests that examine sublethal effects and account for bioaccumulation."

Response: The SMS program recognizes the importance of establishing sediment criteria based in part on chronic/sublethal biological evaluations to protect human health and sediment organisms. However, Ecology has no immediate plans for development of new or additional sublethal bioassays or their use in sediment criteria development. This is primarily due to the substantial number of higher priority, ongoing sediment development activities that currently exceed Ecology's resources. We continue to recognize our 1991 commitment to improve our ability to evaluate and address sublethal biological impacts and bioaccumulation of sediment contaminants. But at this time, Ecology recommends additional discussion of this comment by regional sediment forums and continued review by the PSDDA agencies for opportunities to make improvements in these areas.

Historically, both the 1991 and 1995 versions of the SMS rule have incorporated use of the benthic and Microtox[®] AET values which indirectly reflect sublethal responses, although to a varying and unknown degree.

In the future, Ecology and the PSDDA agencies have planned to complete development of a *Neanthes* AET, which will directly reflect a chronic/sublethal endpoint. Completion of this work is pending the recently completed review of the 1994 AET values by the PSDDA Regulatory Workgroup, and prioritization of multiple AET development tasks by Ecology and the PSDDA agencies.

At this time, Ecology understands that the Port of Seattle is currently sponsoring ongoing development of a *Neanthes* AET by EVS Consultants. This work will certainly speed up the timeframe for finalization of a *Neanthes* AET, but must and will be fully evaluated by Ecology and the PSDDA before it is proposed for use in regulatory programs, e.g., the SMS rule.

Finally, human health criteria when adopted into the SMS rule by Ecology will provide additional needed protection for human health and biological organisms from bioaccumulative effects. Ecology currently plans to adopt sediment human

health criteria in 1997.

Comment 5. "The department needs to develop a methodology for applying site specific modifications to their sediment criteria. There should be means of adjusting the criteria to reflect sensitivity of species at the site, site specific toxicity testing, and bioavailability. . . . EPA is considering such an approach for sediments. EPA also allows for site specific modifications to their surface water criteria."

Response: While it is true that Ecology has not identified procedures to adjust the SMS rule chemical and biological criteria for consideration of site-specific biological sensitivity and/or bioavailability, site specific modifications are not precluded by the SMS rule either. Section 130(4), Administrative policies, in the SMS rule provides for proposal of alternate technical methods to "replace or enhance the application of a specific technical method required under this chapter." Ecology believes this provision would allow for consideration of a proposal to use alternate biological indicators and bioaccumulation to modify the SMS rule sediment designation on a site specific basis.

The EPA Office of Science and Technology has released Guidelines for Deriving Site-Specific Sediment Quality Criteria for the Protection of Benthic Organisms, September 1993. This is one of the technical support documents for EPA's five proposed sediment quality criteria and could provide additional guidance to Ecology in development of specific procedures for the State of Washington. However, the document is primarily focused on revision of sediment criteria developed using the equilibrium partitioning method which may reduce its usefulness to Ecology.

On a theoretical basis, site-specific modifications to the SMS rule criteria may be justified because the rule criteria may be under or over protective based on considerations of 1) more or less sensitive species at the site than used to develop the SMS rule criteria or 2) sediment or chemical quality characteristics at the site that alter the bioavailability and thus the toxicity of sediment bound contaminants. Ecology's experience is that the second condition, bioavailability of sediment contaminants, e.g., tributyltin, impacts bioaccumulation much more often than the presence of more or less sensitive species. In most cases, the need for site-specific modifications to the existing SMS rule criteria occurs infrequently and the rule's biological tests and allowance for use of alternate technical methods provide the needed flexibility to address site-specific acute and chronic bioassay testing or bioavailability questions.

At this time, Ecology considers the technical development need identified by this comment to be low priority for investment of staff and resources and proposes to continue consideration of this comment in pertinent regional technical and policy sediment management forums and within ongoing activities in support of revisions to the SMS rule.

Comment 6. Amphipod Bioassay: "We support the proposed SMS rule change to expand the list of amphipod species to include *Ampelisca abdita* (not sensitive to fine grained sediments greater than 60 percent fines) and *Eohaustorius estuarius* (not sensitive to changes in salinity. We believe this issue will reduce "false positives" associated with salinity and grain size."

Response: Ecology amended the SMS rule in December 1995. This version of the rule included *Ampelisca abdita* and *Eohaustorius estuarius* to the definition of "Amphipod" and to the Amphipod tests provided for in the rule.

This decision was based on thorough regional scientific evaluation conducted in support of the 1995 revised PSEP Bioassay Protocols. The PSEP Bioassay Protocols include methods for the use of *A. abdita* to assess sediment effects in marine sediments having 60% or greater fines (i.e., silt and clay grain size particles), and the use of *E. estuarius* for low salinity sediments.

Comment 7. Re: WAC 173-204-330 and 340. Low salinity sediment quality standards. Freshwater sediment quality standards. "Even though we don't have chemical criteria, I would like to recognize EILS and PSDDA work, and start listing some biological tests for these sections. For example, both amphipod and Microtox[®] work in these situations. *Eohaustorius estuarius* could be used for estuarine and *Hyallela azteca* for freshwater. Because the endpoints that correspond to SQS and CSL are primarily policy-based, we could use the same endpoints we use for marine sediments. . . . Also applies to WAC 173-204-420(1)(C), (D) and WAC 173-204-520(1)(c),(d)."

Response: Ecology agrees that Sediment Management Unit and the Environmental Investigation and Laboratory Services Program work on development of freshwater sediment quality values have identified that the Microtox[®] and *Hyallela azteca* bioassays are standardized and valuable tools to assess freshwater sediment quality. And we agree that interpretation standards for SMS rule SQS and CSL/sediment impact zone maximum freshwater sediment endpoints could mimic the Puget Sound marine bioassays, based on a blend of technical and policy considerations. However, Ecology has made a previous commitment to convene a special freshwater sediment criteria stakeholders group prior to proposing any freshwater sediment criteria for SMS rule adoption. Currently, Ecology has no immediate plans for additional work on development or adoption of freshwater sediment criteria. This is primarily due to the substantial number of higher priority, ongoing sediment development activities that currently exceed Ecology's resources. Ecology recommends additional discussion with the SMS Implementation Committee on the priority of freshwater sediment criteria development tasks prior to proceeding with additional work.

Comment 8. "The utility of grain-size reference sites should be evaluated...One approach would be to compare the reference site data with the DeWitt et. al. grain-size effects model. If the model leads to the same conclusions as the reference site

approach, then significant savings could be achieved by using the model."

Response: The SMS and PSDDA programs are always interested in examining alternative approaches, when they effect a cost savings and still provide high quality data necessary for regulatory decision-making. As part of the regional development of bioassay and benthic reference area performance standards, Ecology will recommend the SMS and PSDDA programs examine and compare reference site data collected by the programs with the DeWitt et. al. grain-size effects model to evaluate its usefulness as an alternative or supplement to reference site data in decision-making.

Comment 9. Juvenile Polychaete Bioassay: "We support the proposal to change the bioassay protocol to reduce false positives by determining elevated ammonia and sulfides concentrations in test waters. However, this may increase the cost of testing. We are also concerned that insufficient data are now available to evaluate whether incorporating a growth rate as a bioassay endpoint will result in a change in the performance standard...."

Response: Ecology agrees with the PSDDA agencies that for the amphipod, larval and *Neanthes* bioassays that interstitial measurements of ammonia and sulfides be collected at the option of the project proponent. For the SMS program, a protocol for collecting interstitial water should be included in the sampling and analysis plan and must be approved by Ecology prior to initiating bioassay testing. However, the requirement to collect dissolved ammonia and sulfide measurements for these bioassays in a single replicate test (chemistry only) beaker at test initiation and test termination will remain in effect. Ecology and the PSDDA agencies understand that this will nominally increase the cost of an individual bioassay test approximately thirty dollars. The SMS program will continue to examine ammonia and sulfide effects on bioassay data, and will evaluate ongoing national guidance regarding this issue as it becomes available for potential future implementation."

Although Ecology revised the "Juvenile polychaete" test in the December 1995 version of the SMS rule, the interpretation endpoint in sections 320, 420 and 520 were not changed significantly. These endpoints were simply expressed as growth rate, i.e., normalizing the growth endpoint to a per day value. The biological effects criteria (interpretation standard) for this test was kept the same in these sections. However, the performance standards for the Juvenile polychaete control sediment was significantly changed to include a 0.72 mg/ind/day growth rate minimum. This change was made based on review of national studies and Puget Sound regional laboratory performance to ensure adequate test performance, i.e, reproductive success, and was not associated with change to a growth rate endpoint. The 1995 and 1996 SMARM minutes present a discussion of these changes (Littleton and Kendall, 1995, Kendall 1996). In 1996, the PSDDA program identified a QA/QC target of 0.72 mg/ind/day and a QA/QC failure of 0.38 mg/ind/day (SMARM minutes 1996).

Comment 10. *Neanthes* 20-Day Growth Bioassay "...As such, *Neanthes* tests which are initiated with worms smaller than 0.25 mg (dry weight) should not automatically be considered a failure, but should be judged on the overall quality and technical validity of the test using best professional judgment, similar to the approach used to evaluate QA/QC failure problems common in the amphipod test."

Response. The SMS and PSDDA programs reviewed four years of data regarding initial starting size of worms in the *Neanthes* test (Littleton and Kendall, 1995, Kendall 1996). The data review indicated increased variability in control and reference growth when initial worm sizes are less than 0.25 mg (dry weight). Worms larger than 0.25 mg (dry weight) exhibited similar growth rates to worms larger than 0.5 mg (dry weight). The PSEP Protocols for the *Neanthes* test recommend: "Worms should be 0.5 - 1.0 mg (dry weight) (i.e., 2-3 weeks post emergence) to ensure that they are in a rapid growth phase during the exposure period." Consistent with the PSDDA program, the SMS program reaffirms that the 0.5 mg (dry weight) initial growth weight as a guideline target and may consider tests initiated with worms smaller than 0.25 mg (dry weight) as a QA/QC failure. The determination of QA/QC failure will be made on a case-by-case basis and will require retesting of the sediments. Prior to requiring retesting of sediments, the SMS program staff will review supporting laboratory data, use of correct test conditions, and quality assurance/quality control procedures to determine whether test failure may have been attributable to initial polychaete weight.

The SMS program and PSDDA agencies will continue to evaluate the laboratory performance for the *N. arenaceodentata* toxicity test as results become available, and if the review process shows that modifications are warranted, the sediment programs will recommend revisions in guidance such as, the PSEP Protocols.

Comment 11. Larval Bioassay: "We support the proposal to change the larval bioassay protocol to reduce false positives in either test waters or due to the lack of viable test species. The addition of *Stronglyocentrotus droebachiensis* should allow for testing to be performed during certain time periods without viability issues. We are however concerned that insufficient data are now available to evaluate whether sensitivity of this species in comparison (sic) to other test organisms."

Response: Ecology shares the concern that definitive technical studies may not be available to identify strict comparability in sensitivity to contaminants between the six larval candidate species allowed under the SMS rule. However, the 1995 PSEP Protocols identify that the six allowable larval species may be considered interchangeable for the purpose of regulatory decision making. Finally, as additional regional or national data becomes available the SMS program will evaluate if *Stronglyocentrotus droebachiensis* is more sensitive to certain physical or chemical sediment conditions than the other two echinoderm species.

Comment 12. Larval Bioassay: "We support the following bioassay protocol and SMS rule changes:

- Seawater Control Performance;
- Reference Performance;
- Test Performance;
- Laboratory Procedures;
- Non-Treatment Factors; and
- Bioassay Test Species.

Because these issues are the result of the PSDDA/SMS [PSEP] bioassay protocol workshop and are generally supported by the "scientific" community, we believe that these modifications are positive."

Response. The SMS rule was revised and adopted in December 1995. This version of the rule included the addition of *Strongylocentrotus droebachiensis* to the Larval tests and decreased the acceptable combined mortality and abnormality from 50% to 30% for the larval negative seawater control performance standard. These changes are based on the work of Fox and Littleton (1994) and PSEP(1995). Additionally, to ensure high quality results for use in regulatory decision making, Ecology concurs with the PSDDA program in requiring monitoring and reporting of overlying water quality data, including ammonia and sulfide assessments, in a single replicate test (chemistry only) beaker at test initiation and test termination.

Ecology did not include a larval reference standard or modify the larval test biological criteria in the SMS rule when it was revised in December 1995. This was because Ecology planned to conduct further SEDQUAL database analyses to verify that similar PSDDA program changes made in 1994 were appropriate for the SMS rule larval standards. Ecology's analysis recommending use of the PSDDA larval reference standards was distributed at the 1996 SMARM in a draft technical information memorandum (Sparks-McConkey, 1996). At the 1996 SMARM, Ecology also distributed a draft TIM which identified that Ecology recommended case-by-case use of the 1994 PSDDA larval bioassay quality assurance guidelines for implementation of the SMS rule (Michelsen, 1996).

Based on these 1996 SMARM draft SMS technical information memoranda and supporting documentation, Ecology will prepare a proposed SMS rule revision for the larval reference sediment performance standard to be set at a seawater normalized effective mortality of 35 percent.

At this time Ecology is still evaluating the additional larval bioassay revisions made by the PSDDA program, (e.g., changes to the test sediment performance, an increase in the alpha level to 0.1, use of power analysis tests) for possible revision of the SMS rule larval bioassay criteria. **Ecology will identify final recommended changes to the SMS rule larval bioassay testing requirements criteria for discussion with the SMS**

Implementation Committee and presentation at a future SMARM for public review and comment prior to proposed changes to the SMS rule.

Comment 13. Bioassay Holding Times: "This is a significant and important change which will reduce sampling and analysis costs. We support the change because it will allow for determination of chemical concentrations (and need for biological testing) prior to biological testing."

Response: The SMS rule requires use and compliance with the PSEP Protocols. In 1995, the PSEP Bioassay Protocols were revised and currently allow on an interim basis up to 8 weeks holding time for test sediments before conducting bioassay. The Protocols identify that the 2-week holding time is considered the minimum holding time that can be routinely achieved by most studies conducted in Puget Sound, based partly on logistical considerations. The Protocols recommend that "...it is prudent to store sediments for as short a time as possible after field collection. If there are no other compelling reasons (such as the tiered testing schedule under PSDDA), a maximum holding time of 2 weeks is recommended for Puget Sound, based on the best professional judgment of regional investigators and on logistical constraints." This interim allowance of a maximum 8 week holding time will enable completion of SMS sediment chemical analyses and determinations of the need for bioassay studies before holding time is exhausted. However, project proponents must identify proposed holding times and rationale within facility or site-specific sediment sampling plans and allow for Ecology review and approval. Ecology will review these plans for consistency with PSEP Protocols recommendations.

Comment 14. Statistical Evaluation of Bioassay Results: "...Specifically, transformations should not be applied to the data unless there is clear evidence that the untransformed data do not meet the assumptions of the statistical test. Further, since the t-test is more robust than the hypothesis testing suggested in the [1996 SMARM] paper, use of the hypothesis testing for screening is inappropriate. Accepting the hypothesis testing as a screening tool may result in increased use of a nonparametric test and potentially greater likelihood of Type II errors."

Response. The SMS and PSDDA agencies agree that if the toxicity test results do not meet the assumptions of the student's t-test then transforming (e.g., using arcsine square root transformation, and etc.) the data will be performed to correct for the data's non-normality (i.e., variances are unequal).

Regarding the comment that hypothesis testing should not be used as a screening tool because it may increase the potential of Type II errors (calling a test sediment no different from the reference sample when in fact it is) is unsubstantiated. This is because the one-tailed Student's t-test is not as robust as the two-tailed method. Additionally, when sample size is small and deviates from a normal distribution, the one-tailed t-test is more vulnerable to increased Type I errors or reduced power (Zar, 1994).

Comment 15. Inconsistencies in Approach: "If there are significant differences in the results of larval testing from different species, it is not clear why the Department of Ecology is requiring bivalve bioassay at pulp and paper mills in Puget Sound"

Response. Whole effluent toxicity testing is a requirement of state and federal regulations to evaluate potential ecological impacts from discharges. Given specific conditions that must be met, all discharges are subject to requirements of Whole Effluent Toxicity (WET) testing. Ecology contracted the study, West Coast Marine Species Chronic Protocol Variability Study, February 1994, to address a number of issues concerning selection of appropriate species and protocols. We understand after reading this study that the larval protocols used are essentially the same as the sediment larval protocols, but without sediment. Additionally, both echinoderm and bivalve species, and other invertebrates, fish and plants are acceptable organisms for these WET tests. Interestingly, the above study found that the protocols used for bivalve and echinoderm tests yielded EC50 estimates with relatively low variability among laboratories (inter- and intralaboratory results). Lastly, the study concluded that several of the laboratories had more difficulty in conducting the echinoderm test than the bivalve test.

IV. D. Specific Comments - Human Health Criteria

General Response

Ecology began efforts to develop human health sediment quality criteria in 1989. During this triennial review, several commenters recommended that Ecology further delay rulemaking activities until scientific and implementation uncertainties have been resolved and issues associated with implementing current requirements have been addressed. Ecology has reviewed those comments and decided that it is still important to move forward on developing rule amendments and guidance for human health sediment quality criteria. However, Ecology has also found that the comments received during the triennial review process raise a number of important issues that will need to be resolved prior to finalizing rule amendments. In working through those and other key issues, Ecology will adhere to the following principles:

- **Scientific Foundation:** Ecology is committed to using current scientific information in its regulatory decisionmaking processes.
- **Level of Protection:** Ecology believes that the sediment quality standards must be designed to protect human health. However, Ecology also believes that in defining protective levels it is important to balance the need for prudence in the face of scientific uncertainty with the need to avoid the use of overly timid estimates as the basis for regulatory decisionmaking.
- **Costs and Implementation:** Ecology believes that the development of human health sediment quality criteria needs to take into account the practicality and real world implications of implementing such criteria.
- **Consistency:** Ecology will strive to maximize consistency with risk assessment/risk management policies and procedures being used by other regulatory programs.
- **Stakeholder Involvement:** Ecology believes that the development of scientifically sound, protective and workable sediment quality criteria will require full consideration of the values and opinions held by various stakeholder groups.

Response to Individual Comments

Comment 1: Several commenters expressed concerns about Ecology's efforts to develop human health sediment criteria and recommended that the Department "... not extend the SMS Rule at this time to include human health criteria." Specific concerns include implementation uncertainties, need for further scientific review, and the need to comply with the requirements in ESHB 1010.

Response: Ecology understands the concerns about the development of human health sediment quality criteria and has modified the rulemaking schedule to provide more time to address those concerns. However, there are several reasons why the department believes it is important to continue efforts to complete these rule amendments:

- Nature of the Problem: Studies in the 1980's reported elevated levels of hazardous substances in fish caught in areas with contaminated sediments. In several cases, local and state health agencies have issued health advisories warning the public to reduce or eliminate consumption of fish caught in such areas. Sediments were found to be a significant cause of elevated fish tissue levels.
- Consistency and Predictability: Current laws and rules require that sediment cleanup and source control activities protect human health and the environment. Decisions on how to protect human health from bioaccumulative chemicals of concern are currently being made on a case-by-case basis. Adoption of human health criteria will lead to more regulatory certainty, provide consistent decisionmaking procedures and minimize the inefficiencies associated with reinventing those procedures on a case-by-case basis. Ecology believes the increased regulatory certainty will provide an incentive for Potentially Liable Parties (PLPs) to undertake sediment cleanup actions and reduce future liabilities for second cleanup actions.
- PSWOA Plan Requirements: The Puget Sound Water Quality Authority Management Plans have required Ecology to develop human health sediment criteria as soon as the technical and scientific methods are available to establish such criteria. The workplan prepared by the Puget Sound Action Team contains a similar requirement (PSWQAT, 1996).
- Agency Commitment: In 1990, Ecology elected to defer adoption of human health sediment criteria pending the completion of technical development work. Completion of this rulemaking amendment was included in the list of commitments made by the Ecology Director in 1991 (Ecology 1991).

Although Ecology intends to continue efforts to develop rule amendments, the department has modified the rulemaking schedule to respond to concerns raised during the triennial review process. Specifically, Ecology intends to complete the following activities:

- Case Studies: Ecology is preparing a series of case studies to identify and evaluate the incremental impacts associated with human health sediment quality criteria and implementation concerns raised by commenters. The case studies will focus on sediment cleanup. These case studies will be distributed

and discussed with the SMS Implementation Committee.

- Scientific Review: Ecology and the Department of Health (DOH) requested and received review comments from the Sediment Scientific Review Board (SSRB) on the draft Tier I Report. If additional scientific peer review is needed, Ecology will consider reconvening the SSRB to assist in the development of final criteria values.
- Cost/Benefit Analysis and Compliance with ESHB 1010: Ecology intends to fully comply with the APA (as amended by ESHB 1010). This includes an evaluation of the costs and benefits associated with proposed rule amendments.

Ecology intends to work with members of the SMS Implementation Committee to ensure that all relevant issues and concerns are addressed during the rule development process.

Comment 2: "The development by the state of human health-based standards for sediments is the first in the country. The rule must ensure that the risk management approach proposed is consistent with other risk management approaches developed by the state. This is especially important for the human health-based water quality criteria being developed by Ecology in the next triennial review. The state's view of risk must be consistently applied in order to ensure a rational basis for regulation and enforcement. NWPPA [Northwest Pulp and Paper Association] continues to endorse the use of scientific boards to assist Ecology and other state agencies in this effort."

Response: Ecology agrees that human health sediment criteria must be based on sound scientific policies and procedures that are consistent with risk management approaches being used by other state and federal programs. Toward that end, Ecology has formed the Risk Assessment Forum to coordinate risk assessment activities among Ecology programs, worked closely with the DOH, and reviewed existing federal requirements.

In developing rule amendments and guidance, Ecology will strive to maximize consistency with risk assessment/risk management policies and procedures being used by other regulatory programs. However, it is important to recognize that federal and state programs employ a range of procedures that have been developed over the last 10-15 years (Commission on Risk Assessment and Risk Management, 1997). It may be possible to achieve consistency with another program while, at the same time, be using procedures that differ from a third program. Consequently, Ecology will consider several factors when attempting to reconcile differing requirements. These include:

- Current Scientific Information: Ecology is committed to using current scientific information in its regulatory decisionmaking processes and is concerned that rigid adherence to historical practices will create obstacles to the use of such information. This approach is consistent with approaches used by the EPA (EPA 1996) and recommendations by numerous public and private review committees (National Research Council (NRC), 1994; Business Roundtable, 1995; National Academy of Public Administration, 1995; Commission on Risk Assessment and Risk Management, 1996).
- Statutory Directives: Ecology will comply with the statutory directives and policies in the MTCA and the Water Pollution Control Act when developing human health sediment quality criteria. In addition, Ecology will ensure that the final sediment quality criteria comply with the requirements in the APA (as amended by the Regulatory Reform Act of 1995).
- Variations in Susceptibility and Scientific Uncertainty: There are substantial variations in exposure and responses to toxic substances among population groups and individuals. In addition, there are uncertainties regarding the health risks associated with hazardous chemicals. Given this variability and uncertainty, the choice of risk parameters (i.e. fish consumption rates, etc.) used to estimate health risks will significantly influence the degree of protectiveness associated with the resulting risk estimate. In developing human health sediment quality values, Ecology will consider potential variations in exposure/responses and the scientific uncertainty surrounding health risk estimates.
- Regulatory Costs/Implementation Considerations: Ecology believes that the development of human health sediment quality criteria need to take into account the practicality and real world implications of implementing such criteria.
- Approaches Used by Other Regulatory Agencies: Ecology will strive to maximize consistency with risk assessment/risk management policies and procedures being used by regulatory programs. In evaluating consistency with other risk assessment/risk management procedures, Ecology will consider the context in which those procedures are used and the problems they are designed to address.
- Environmental Equity: Ecology will take into account the potential for exposures to highly susceptible and/or highly exposed population sub-groups when making risk assessment and risk management decisions. This is consistent with Presidential Executive Order 12898 on Environmental Justice which requires that programs using federal funding to protect minority-group and low-income populations from disproportionately high exposures and

adverse human health and environmental effects. This approach is also embodied in recommendations from several expert scientific policy committees (NRC, 1994; Commission on Risk Assessment and Risk Management, 1996).

- Stakeholder Values and Opinions: Ecology believes that the development of scientifically sound, protective and workable sediment quality criteria will require full consideration of the values and opinions held by various stakeholder groups. The importance of stakeholder involvement in regulatory decisionmaking has been emphasized by several government review committees (President's Council on Sustainable Development, 1996; NRC, 1996; Commission on Risk Assessment and Risk Management, 1996; Business Roundtable, 1995; National Academy of Public Administration, 1995). Ecology intends to work with the SMS Implementation Committee to ensure that important issues and concerns are identified and addressed during the rule development process.

Ecology will work with the SMS Implementation Committee to determine if additional factors should be considered when establishing risk assessment/risk management approaches. In addition, Ecology intends to discuss the application of these decision-making factors for individual rulemaking issues.

Comment 3: "...One of our primary concerns regarding Ecology's development of a human health SMS rule is Ecology's apparent preference for a rule based on biota-sediment accumulation factors (BSAFs) for Puget Sound. ...Any BSAF-based approach introduces such a tremendous amount of variability into the standard-setting process as to call into question the validity of any standards that result. This is evidenced by the preliminary standards derived using a BSAF-based approach for the DOH Tier 1 Report, which would indicate that vast areas of Puget Sound are grossly contaminated, and that even completely unaffected areas such as the San Juan Islands have levels of certain contaminants that are many times higher than an acceptable level. This conclusion simply does not make sense...."

Response: When establishing chemical criteria it is necessary to establish the quantitative relationship between sediment concentrations and fish/shellfish tissue concentrations. Ecology believes that the BSAF approach represents a reasonable method for establishing this relationship provided the overall decisionmaking framework enables consideration of site-specific tissue data. In reaching this conclusion, Ecology has considered several factors:

- Consistent with Latest Scientific Methods: The BSAF approach is consistent with and represents latest scientific methods to identify the relationships between chemical concentrations in sediments and fish/shellfish tissue and the mechanisms by which chemicals are transferred between the two compartments.

- Consistent with Current Regulatory Approaches: The BSAF approach has been used to establish cleanup levels at ongoing state and federal Superfund sites (i.e. Commencement Bay, Cascade Pole, etc). It is also consistent with approaches being developed in other parts of the country (EPA Regions II, V, and IX).
- DOH Report/Recommendations: The DOH recommended that Ecology use the BSAF approach to establish Tier I human health sediment quality criteria (DOH 1995). DOH recommended that Ecology use a combination of methods including (1) grouping chemicals into four distinct chemical groups, (2) grouping chemicals by Kow and assigning a surrogate BSAF value for each chemical grouping and (3) chemical-specific BSAF values.

While Ecology believes the BSAF approach represents a reasonable method for quantifying the relationship between sediment and tissue levels, the comments received during the triennial review process raise several important issues which are discussed below. As noted in those responses, Ecology will continue to work with the SMS Implementation Committee and other stakeholders to ensure that relevant issues and concerns associated with the use of BSAFs are addressed during the rule development process.

Variability in BSAF Values: The first issue raised with respect to the use of BSAFs is the "tremendous amount" of variability in values. Variability is a very well-known fact of life in science and is not unique to the BSAF issue. Ecology has taken (and will continue to take) this variability into account when developing human health sediment quality values. Ecology believes that the variability in BSAF values is no greater than the variability found in other risk assessment parameters and, consequently, believes the amount of variability should not be the basis for rejecting the use of the BSAF approach. However, the department intends to work with the SMS Implementation Committee to evaluate alternative approaches for factoring variability into regulatory decisionmaking. In working through this issue, Ecology believes it will be important to focus on three key questions.

- (1) How much variability exists in current BSAF values? There are numerous factors which influence the relationship between chemical concentrations in fish/shellfish tissue and concentrations in the underlying sediments. Consequently, it is not surprising that a wide range of values have been reported in the scientific literature. Several recent evaluations provide some indications on the amount of variability associated with BSAF values. These include:
 - DOH Tier I Report: Data included in the DOH report indicate that for many chemicals there is less than an order of magnitude difference between the median and 90th percentile values. For example, PCBs

with K_{ow} s between 6.0 and 7.0 (which includes most Aroclors seen in the aquatic environment) range from a median of 1.5 to a 90th percentile of 12.1 (less than a 10-fold difference).

- PTI Review of BSAF Information: Ecology contracted with PTI Environmental Services to conduct an additional analysis of the data collected and analyzed by DOH. In this review, PTI used regression analysis techniques to calculate BSAFs for PCBs, dioxins/furans, PAHs and pesticides. Highly significant regressions of BSAF on K_{ow} were obtained for PCBs and dioxins in finfish, and for PAHs and PCBs in shellfish. The confidence limits of BSAFs for PCBs and dioxins showed very little variability between the 0.5 and 0.95 confidence limits for PCBs and dioxins. PTI concluded that the mean regression line is generally well defined for PCBs, dioxins and PAHs and that the mean BSAF can be predicted with greater confidence than an individual BSAF value.
- Tracey and Hansen (1996): In a recent article, Tracey and Hansen concluded that BSAFs do not significantly differ as a function of feeding type or habitat of benthic species. The authors confirmed that BSAFs are dependent on K_{ow} , and that if one limits the K_{ow} range under consideration, the BSAF variability is quite small. BSAFs calculated by Tracey and Hansen are in the same range as those calculated by DOH and PTI. Tracey and Hansen reported about an order of magnitude difference in BSAFs between the 50th percentile and 99th percentile for PAHs, PCBs and pesticides.

- (2) Does the variability in current BSAF values differ from the variability found in other areas of risk assessment? The NRC (NRC 1994) observed that variability is a well-known fact of life in science and provided several examples to illustrate that concept. In some cases, extensive variability exists. For example, the NRC summarized work by Hattis et al. (1986) and Finkel (1987) which indicates that there is considerable variability in human susceptibility to pollutants. These studies suggest that the logarithmic standard deviation of the susceptibility distribution lies between 0.9 and 2.7. With a standard deviation of 2.0, about 5% of the population might be 25 times more susceptible than the average person and 5% might be 25 times less susceptible (625 fold difference between the two ends of the population distribution) and about 1% might be at least 100 times more or less susceptible (@10,000 fold difference between people at the two ends of the population distribution). With other risk parameters (i.e. adult body weights), available data suggests there is a relatively small degree of variability (e.g. less than an order of magnitude between the upper (99th) and lower (1st) percentile values). [see EPA 1989 for additional examples on interindividual variability in exposure parameters] It appears that the variability associated with BSAF values is

similar to the variability in risk assessment parameters used by agencies to assess environmental problems and establish control requirements.

- (3) Is the use of an upper percentile BSAF value an appropriate public policy response to the variability/uncertainties associated with predicting the relationship between sediments and fish/shellfish tissue? The DOH reviewed available information on BSAF values and calculated means, medians, 75th percentile, and 90th percentile values by chemical class and Kow range. DOH recommended that Ecology use an upper percentile value (e.g., the 75th percentile value) to establish Tier I sediment quality values. Ecology believes there is a sound policy rationale for using this approach when selecting BSAF values (specifically) and establishing human health sediment quality values (more generally) which includes the following:

- Consistent with the Public Preferences: With respect to environmental problems, the public generally expresses the opinion it is "better to be safe than sorry" when addressing environmental problems. For example, in a recent survey (Graham et al. 1995), people were asked whether they agree with the statement "When scientists are unsure about how harmful pollution is, environmental regulations should be designed to err on the side of safety, even if that makes the regulations more expensive". Over three quarters of those surveyed strongly agreed (20%) or agreed (56%) with the statement.
- Consistent with Statutory Mandates Under State and Federal Law: A policy of preventive action in the face of scientific uncertainty is embedded in most state and federal environmental laws. For example, the MTCA defines hazardous substances to include "...any substance or category of substances.... determined by the director by rule to present a "threat" to human health or the environment "if" released into the environment..."[emphasis added]. Under the Water Pollution Control Act, "pollution" is defined to include "...discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state as will or "is likely" to create a nuisance or render such waters harmful, detrimental or injurious...." [emphasis added]. Such an approach is consistent with the preventive policies embodied in federal laws. The rationale underlying these policies was summarized by the D.C. Circuit Court of Appeals in its ruling in Ethyl Corp. v. EPA (541 F.2d 1 at 28) where it stated "...commonly, reasonable medical concerns and theory long precede certainty. Yet the statutes and common sense demand regulatory action to prevent harm, even if the regulator is less certain that harm is otherwise inevitable..."
- Consistency with Expert Committee Reviews/Recommendations: This

approach is included among the four common approaches for dealing with variability in regulatory decisionmaking identified by the NRC (1994).

- Consistency with Approaches Used by Other Environmental Agencies: EPA and other state environmental agencies generally use protective approaches when evaluating environmental and human health risks. For example, EPA recently proposed changes to their carcinogen assessment procedures to reflect the recommendations from the NRC (NRC, 1994). In the proposed guidelines, EPA elected to retain the use of default assumptions and stated "...these defaults remain public health conservative, but in some instances, they have been modified to reflect the evolution of scientific knowledge since 1986" (EPA, 1996).
- Consistent with Practices in Other Professions: Protectiveness in the face of scientific uncertainty is embedded in a number of other professional disciplines. For example, engineers typically employed several safety factors when designing bridges and highways. Doctors usually employ a conservative approach to treatment and diagnosis because the implications of waiting for verified science are often unacceptable for the patient.

Ecology recognizes that some commenters may view the choice of the 75th percentile value as overly conservative for development of a sediment quality criteria. Indeed, Ecology is aware that many experts have criticized regulatory agency procedures as being overly conservative and at variance with new theories or scientific data (Paustenbach, 1989; Business Roundtable, 1995; OMB, 1990). These experts have argued that over-reliance on "worst case" assumptions has driven out scientific rules of reason and that the use of multiple conservative values within environmental and human health assessments combine to produce highly conservative results. The end result, in their opinion, is that the use of such procedures results in approaches that seriously overstate actual problems and impose unnecessary regulatory costs. In the context of sediment management, several commenters have noted that highly conservative values serve as disincentives for sediment cleanup and may have the unintended consequence of providing less protection.

Recognizing these concerns, Ecology believes it is important to balance the need for prudence in the face of variability and scientific uncertainty with the need to avoid the use of overly timid estimates as the basis for regulatory decisionmaking. Consequently, Ecology has taken steps to ensure that (1) procedures and individual risk parameters are scientifically well-grounded (e.g. supported by current scientific studies) and (2) the risk assessment parameters used to establish human health sediment quality criteria represent

a reasonable balance between average and upperbound values.

Ecology believes this is an important regulatory question which will require additional review and discussion with the SMS Implementation Committee. To facilitate that discussion, Ecology intends to (1) utilize probabilistic analyses to provide a better context for various point estimates and (2) complete several case studies to highlight implementation issues and cost implications.

Relationship to Background or Reference Concentrations: A second concern raised with respect to the use of BSAFs was that sediment quality values based on this methodology resulted in large areas of Puget Sound being identified as "grossly contaminated". Ecology has reviewed this issue and believes that it is important to recognize that the potential for exceedances to be found in reference areas is not unique to human health sediment quality values. For example, Ecology and other regulatory agencies face this question when implementing air, water and waste regulations. Indeed, there are situations where the chemical concentrations at individual "background" or "reference" stations exceed the ecological standards for one or more chemicals. Consequently, the SMS rule currently contains several provisions which are designed to ensure that "common sense" is injected into the regulatory decisionmaking process when implementing such criteria values. First, the SMS rule currently includes provisions for using area-wide background values in place of applicable sediment quality standards in those situations where "...nonanthropogenically affected sediment quality is of a lower quality than the applicable sediment quality standards assigned for said sediments by this chapter..." (WAC 173-204-320(6), -420(6), and -520(6)) Second, the SMS rule requires the department to consider the spatial extent and distribution of contamination when making regulatory decisions. For example, the SMS rule specifies that designation of a cleanup site is based upon average exceedance of the CSL at three or more stations. Finally, the rule includes a two-tiered regulatory approach with regulatory action being triggered at levels above the sediment quality standards. With the exception of PCBs, the preliminary sediment quality values based on a risk level of 10^{-5} are higher than reported reference area concentrations. Ecology intends to work with the SMS Implementation Committee to determine whether additional provisions are needed to address this issue.

Role of BSAF-Based Sediment Quality Values in Decisionmaking Process: Ecology's draft framework for human health criteria includes a two-tiered decisionmaking process. The first tier is intended to allow for an initial evaluation to determine if sediment chemical concentrations pose a significant human health risk. BSAFs are used to calculate the Tier I sediment quality criteria. The second tier allows for additional site-specific analysis (including the development of site-specific BSAFs).

Comment 4: One commenter expressed concerns about the exposure assumptions necessary to establish sediment quality criteria that protect human health. "Consumption rates," "exposure routes (whole fish, fillets, etc.)," and "selection of

populations appropriate to protect" were among the listed factors.

Response: Exposure assessment is the "...determination of the intensity, frequency, and duration of actual or hypothetical exposures of humans to the agents in question..." Ecology efforts to establish sediment quality criteria are based on an exposure model which involves: (1) accumulation of chemicals in sediment; (2) transfer of chemical contaminants from the sediment to fish/shellfish tissue; and (3) consumption of fish/shellfish tissue by humans at varying rates. Comments on the approach and underlying assumptions associated with evaluating the transfer of chemical contaminants from sediments to fish tissue were discussed above (Comment #3). The rationale and current status of issues associated with estimating fish consumption rates is discussed in this section.

In general, Ecology believes that the exposure assessment methods embodied in the current approach have a sound scientific and policy basis. However, the department also recognizes that final decisions on these methods will need to reflect (1) additional analysis of available fish consumption studies by the Ecology Risk Assessment Forum and subsequent external review; (2) additional discussions with the SMS Implementation Committee on how to manage the uncertainties and variabilities inherent in risk estimates, and (3) evaluation of the economic implications associated with various approaches.

- Selection of Populations Appropriate to Protect: Available studies indicate that there are three main groups of fish consumers in Washington State: (1) general population; (2) recreational fishermen and women; and (3) subsistence fishing (e.g. Native American, Asian, Pacific Islanders, etc). Ecology believes that human health sediment quality values should be designed to protect all three population groups. This is based on consideration of several factors:
 - Statutory Directives: This fundamental policy choice is consistent with directives contained in state law. For example, the MICA states that "...[e]ach person has a fundamental and unalienable right to a healthful environment...". Ecology believes that the failure to take into account exposures to all three population groups would be inconsistent with that directive.
 - Environmental Equity: This approach is consistent with Executive Order 12898 on Environmental Justice which requires that federal programs protect minority-group and low-income populations from disproportionately high exposures and adverse human health and environmental effects. In addition, questions have been raised as to whether the failure to take into account fish consumption patterns for such groups would be consistent with EPA's regulations implementing Title VI of the Civil Rights Act of 1964. Specifically, the EPA

regulations specify that "...[a] recipient [of EPA financial assistance] shall not use criteria or methods of administering its program which will have the effect of subjecting individuals to discrimination..."

- Stevens Treaties: This approach is consistent with the Stevens Treaties which provide for the continued subsistence and commercial use of fisheries resources. For example, the Treaty of Medicine Creek states "...[t]he right of taking fish at all usual and accustomed grounds and stations, is further secured to said Indians, in common with all citizens of the territory..." These rights were recognized in the landmark decision in *United States v State of Washington* (Boldt Decision).
- Expert Committee Recommendations: Recent expert scientific policy committees have recommended that agencies consider exposures to susceptible subgroups when making regulatory decisions (NRC, 1994; Commission on Risk Assessment and Risk Management, 1996).
- Measures of Exposure: Available fish consumption surveys indicate there is considerable variability in the amount of fish consumed by the general population, shore anglers, and subsistence fishermen/women. Ecology has evaluated the distributions of consumption rates among these groups and has developed preliminary human health sediment quality criteria based on use of the arithmetic mean from Toy et al., 1996 (see below). This approach was selected based upon the following considerations:
 - Appropriate Degree of Protectiveness: In developing human health sediment quality values, Ecology has used Monte Carlo distributional analysis to develop criteria which fall near the 90th percentile of the probability distribution curve. Ecology's preliminary criteria are based on an average fish consumption rate in combination with other risk equation input parameters that are based on upper percentile values.
 - Consistency with Other Regulatory Agencies: It is EPA's policy that reasonably maximum exposure (RME) estimates should fall between the 90th and 95th percentile of a population of potentially exposed individuals (EPA 1992).
- Fish Consumption Rates: Ecology's Risk Assessment Forum has reviewed the fish consumption surveys conducted in Washington State during the last 20 years. [NOTE - The Ecology Risk Assessment Forum fish consumption paper is currently undergoing internal review]. For purposes of calculating preliminary human health sediment quality values, Ecology is using a fish ingestion rate of 42 grams/day which is based upon the average finfish consumption rate reported for the Tulalip and Squaxin Island Indian Tribes

(Toy et al., 1996).

- ❑ Use of Current Scientific Information: The Toy, et. al. (1996) study represents the most current scientific information available on fish consumption patterns among Native Americans in the Puget Sound area. The study appears to have been well designed and conducted and the results are directly applicable to the population group considered to have the highest fish consumption rates.
- ❑ Consistency with Other Available Studies: Fish consumption rates based on the Toy, et. al. (1996) study are consistent with estimates from other studies conducted in Washington and Oregon. For example, the Columbia River Inter-Tribal Fish Commission (CRITFC, 1994) surveyed fish consumption rates of four tribes (Nez Perce, Umatilla, Yakama, and Warm Springs) who fish along the Columbia River. Estimated mean and upper 95th percentile fish consumption rates are 63 and 170 grams/day, respectively. Finally, studies by Landolt et al. (1987 and 1985) and Pierce et al. (1981) result in estimated average concentrations of 60 and 39 grams/day, respectively.
- ❑ Environmental Equity: The use of the Toy et al. data is consistent with Executive Order 12898 and the Treaty of Medicine Creek (see above).
- ❑ Expert Committee Recommendations: The use of the Toy et al. data is consistent with recommendations by the NRC (1994) that agencies use local data to estimate exposures whenever such data are available.
- ❑ Regulatory Consistency: EPA guidance materials encourage states to use regional fish consumption data in place of national default values when establishing water quality standards (EPA, 1992) and performing risk assessments at Superfund sites (EPA, 1989). Use of the Toy, et. al. (1996), Landolt, et. al. (1985, 1987), CRITFC (1994), and Pierce, et. al. (1981) data sets is consistent with those policies.

In conclusion, Ecology has carefully considered available information and key policies associated with estimating exposure levels. Some of the technical information is still undergoing analysis and review. This brief summary highlights the rationale for several regulatory issues associated with using that information in regulatory decisionmaking. Ecology intends to discuss these and other related issues (i.e. level of protectiveness, dealing with scientific uncertainty) with the SMS Implementation Committee as part of the rule development process.

Comment 5: Several commenters recommended that Ecology base regulatory decisions on chemical concentrations in fish and shellfish tissue. For example:

"Current efforts to establish a human health criteria should abandon the bioaccumulation factor approach currently being pursued. We recommend that the muscle tissue toxic level test be considered as a practical alternative to bioaccumulation factors."

"Rather than establish a BSAF-based human health rule, Ecology should further pursue ways to use fish tissue data. A much simpler and more effective approach would be to define fish tissue levels that would serve as triggers for concern, and only move forward with site-specific inquiries on the need for sediment cleanup in those areas where fish tissue monitoring defines a valid concern for human health. Both the Sediment Scientific Review Board and the EPA's Science Advisory Board have endorsed the use of fish tissue data as an important component of human health criteria. Ecology should seriously consider these recommendations before proceeding further with adoption of SMS human health criteria."

"Where a significant human health concern exists, monitoring of "edible" fish tissue will provide the necessary information to develop an appropriate response"

Response: Ecology agrees that fish tissue analyses/monitoring results should be considered when establishing sediment cleanup and source control requirements. However, the department is still evaluating several approaches for incorporating such results into the decision-making process. Potential approaches include:

- Base Cleanup Site Listings on Fish Tissue Analyses: Ecology is evaluating an approach where the department would base cleanup site listings on fish tissue analyses.
- Use Fish Tissue Data to Override Sediment Chemistry Results: Ecology is evaluating an approach which involves using fish tissue data as a biological override (e.g., if sediment levels exceed Tier I human health sediment criteria but tissue levels are below "tissue criteria" then no regulatory action would be required).
- Use Fish Tissue Data to Calculate a Site-Specific BSAF: Ecology intends to incorporate a Tier II evaluation process into the SMS rule. This process would provide the flexibility for cleanup or source control proponents to collect and analyze fish tissue samples. The results would be used to calculate a BSAF value which would be used to establish site-specific sediment quality values.

Comment 6: "There (are) a number of inherent problems in using chemical analysis of fish tissues to identify contaminated sediment sites. The most fundamental problem is an accurate estimate of exposure duration. ...Representatives of the Department of Ecology and industry have been frustrated by the inability of fish tissue sampling to consistently detect the presence of dioxins in the Columbia River for example. ...Questions like these have led the Department of Ecology and the Department of Health to propose in their Tier 1 Report for the Development of Sediment Quality Criteria for the Protection of Human Health that caged fish or bivalves be used to develop site-specific biota-sediment accumulation factors. ...Unfortunately, although caging fish has been used in a variety of applications, there are many potential problems in caging fish at any site. One of the most important of these aspects is ensuring an adequate food supply and using species that are adaptable to caging. Bivalves do not have these disadvantages.... Using bivalves would also provide a link between human-health assessments and ecological assessment by utilizing species that were adaptable to both programs. There is also the additional link between consumption of bivalves and tissue residues measured in the field."

Response: Ecology supports limited use of caging studies and intends to allow the use of caged mussels (or other sedentary species) as a component of site-specific bioaccumulation assessment. However, Ecology believes that the use of such studies should generally be limited to relatively sedentary species (i.e. bivalves). In these situations, the benefits of caging studies (e.g. reduced variability, ability to design study to differentiate between water column and sediment exposures, more accurate exposure determinations, etc) appear to outweigh the limitations of such studies (i.e. handling/crowding stress, disrupted feeding habits, inadequate exposure times). Ecology currently uses caged mussels at cleanup sites to assess bioaccumulation potential.

Comment 7: "...Ecology should also consider the work of the MTCA Policy Committee to ensure that a consistent approach to human health risks is implemented across its cleanup programs...."

Response: Ecology agrees that the final recommendations of the MTCA PAC (MTCA PAC, 1996) are an important consideration in developing human health sediment quality criteria. Specifically, there are several issues and recommendations (i.e. site-specific risk assessment, remedy selection (including the use of institutional controls), cleanup action levels, and probabilistic risk assessment) that are relevant to this effort. Consequently, the Sediment Management Unit/Team intends to coordinate with the Toxics Cleanup Program and their efforts to address the MTCA PAC recommendations. Indeed, closer coordination was one of several reasons Ecology elected to delay the schedule for amending the SMS rule.

Comment 8: "...Ecology sediment management should provide direction to its

regional offices indicating that the June 1995 DOH Tier I Report is not a valid basis for making regulatory determinations in exercising best professional judgment (BPJ) in regulatory case-by-case decision making..."

Response: Ecology has carefully considered this comment and finds areas for agreement and disagreement. First, Ecology agrees the potential exists for misapplication of information in the Tier I report in making regulatory determinations for individual cleanup and/or source control actions. Of particular concern is the use of preliminary sediment quality values found in Table 6 of the report. At this time, we are not aware of any situations where the values in Table 6 of the report have been applied directly to a cleanup or source control decisions. Ecology's regional sediment cleanup staff are well aware of the limitations and the qualifiers on the use of the report in regulatory decisionmaking. Indeed, the memorandum used to distribute the Tier I report included the following qualifier:

"Please note: Ecology has not yet proposed human health sediment criteria; the criteria values listed in Appendix C should be viewed only as a point of reference."

Despite these earlier qualifiers, Ecology recognizes that concerns still exist among the regulated community. Ecology believes that it is important to reinforce the position that the scientific policy determinations underlying the draft numerical criteria in the Tier I report are still being evaluated and debated as part of the rulemaking process. Until the rulemaking process has been completed, these scientific policy determinations will need to be resolved on a case-by-case basis and guided by appropriate regulatory/statutory authority.

IV.E. Specific Comments - Sediment Source Control

Comment 1. "Existing monitoring techniques for compliance with sediment standards involves sampling of sediments near an outfall. This type of monitoring can show if standards are violated in the sediments but do not show whether a particular discharge is the sole cause or only one of the causes of the violation. Monitoring of sediments also cannot show the amount of sediment actually contributed by a particular source. To demonstrate this a method of sampling the actual particulates in the effluent must be developed. . . . Ecology must first develop reliable methods for sampling effluent particulates and establishing sediment effluent limits before it can properly determine compliance."

Response: Ecology agrees that effluent particulates are an important factor in assessing the effects of any discharge, but effluent particulates are just one of many factors to be considered. The SMS rule identifies particulates as a factor for Ecology to consider when assessing the potential of a discharge to violate the SQS; other factors include discharge contaminant concentrations, discharge flow, discharge

loading rate, and receiving environment characteristics (WAC 173-204-400(6)). It has been our experience that the balance between solids and contaminant loading is generally more important than each factor individually. The comprehensive approach to sediment source control, as identified in Part IV of SMS, includes both monitoring and modeling of discharges. Effluent particulates are considered during an early "screening evaluation" phase which identifies discharges that are subject to monitoring and modeling requirements. In the modeling of a discharge (using the Water Quality Analysis Simulation Program (WASP) model), effluent particulates are just one of the many factors that is required as a model input. If shown necessary by the modeling, sediment-based effluent limits can be derived from the modeling predictions of future impacts to sediment chemical quality. More discussion and both the screening evaluation and modeling can be found in the Sediment Source Control Standards User Manual. An order form is available by calling (360) 407-6908, by email at bapaf461@ecy.wa.gov, or by mail at P.O. Box 47703, Olympia WA 98504-7703.

Regarding particulate sampling methods, Ecology has investigated methods of sampling effluent particulates (Ecology, 1993b) and concluded that although effluent centrifugation is a useful method of screening discharges for the presence of organic pollutants and may be useful for quantifying organic pollutant loads (with some improvements over existing techniques), the expense of centrifugation warranted the further research of less costly techniques to characterize suspended particulates such as sediment traps and surrogate indicators (e.g., sludge). Work on sediment traps has continued with the extensive deployment and use of water column sediment traps (Ecology, 1996c) in Commencement Bay and the development and trial usage of in-line stormwater sediment traps (Ecology, 1996d).

Comment 2. ". . . We strongly urge the elimination of both mixing zones and sediment impact zones as incompatible with the goal of no impact on biological resources. . . . If Ecology were to make a good faith effort to avoid locating sediment impact zones in all the "areas of special importance" described in the standards, it would be next to impossible ever to authorize one. . . . If sediment impact zones are to be tolerated as a temporary measure, the regulations must clearly require that the size of the zone be decreased with each successive permit cycle. Such ratcheting down would be the only way to "reduce and ultimately eliminate adverse effects . . . from surface sediment contamination" (WAC 173-204-100(2)). . . . In addition, the regulations must require notification of the public when a sediment impact zone is under consideration. The regulations currently require only a "reasonable effort to identify and notify" landowners, adjacent landowners and lessees affected by the proposed sediment impact zone. This does not allow for adequate input from everyone affected by the impact zone. Contaminated sediments can easily affect the general public, as well as landowners and adjacent landowners."

Response: Ecology does not intend to modify the provisions which allow the department to issue SIZs. With the exception of the SIZs by rule issued for salmon

netpens in WAC 173-204-412; the department has not authorized any SIZs. The SMS rule currently allows SIZs to be issued for discharges that will exceed SQS within ten years, subject to a variety of requirements. In concept, the most important requirement is that the discharge will not exceed the sediment impact zone maximum criteria of WAC 173-204-420 within ten years. Unlike water quality dilution zones, which in some cases can allow dilution of greater than 200 to 1, SIZs allow only a modest increase in allowable sediment concentration. Of the 47 sediment impact zone maximum chemical criteria, 10 are the same as the SQS (therefore no SIZ allowed), over half are less than double the SQS, and only two are greater than 10 times the SQS. As noted, other requirements for SIZs include the locational considerations of WAC 173-204-415(3) which specifies that when authorizing SIZs, the department must consider and minimize impacts to sensitive areas (including, but not limited to, spawning areas, nursery areas, waterfowl feeding areas, shellfish harvest areas, tribal areas of significance, and areas used for primary contact public recreation).

The department does not intend to revise the SIZ reduction goal of WAC 173-204-400(1)(b), which states that the department's policy shall be to minimize the number, size, and adverse effects of all SIZs, and to eventually eliminate all SIZs. The efficacy of the procedures for the above policy, as contained in WAC 173-204-415(5), (6), (7), and (8) have not been determined because at this time no SIZs have been issued.

The department does not intend to revise the public notice requirements for SIZs. Currently, SIZs are already subject to numerous public notice requirements, including the same requirements as all discharge permits. If the department determines a SIZ is both necessary and allowable, the public will be either notified through the draft NPDES permit process or through a separate public notice. In both cases, the public will have at least 30 days to provide comments. These public notice procedures are in addition to the requirements of WAC 173-204-415(2)(e) and (f) which state that the department will notify affected landowners, lessees, port districts, Department of Natural Resources, the Corps and other parties determined appropriate by the department.

Comment 3. "Continue to make source control a top priority in the SMS Rule."

Response: Ecology agrees that source control should be a top priority. However, this is primarily a matter of resource allocation. Consequently, we do not believe this is an issue that can be addressed through changes in the SMS rule. The extent to which sediment source control is made a top priority is a programmatic issue that will be determined by the department based on balancing available resources between sediment activities and other environmental activities. Recently, the department has joined with other state and federal agencies to form the Cooperative Sediment Management Program for addressing sediment contamination in Puget Sound. As part of the Cooperative Sediment Management Program, the agencies have agreed that source control should be a top priority.

Comment 4. "Part IV of the SMS must incorporate a stormwater source control strategy for public and private dischargers that sets clearly defined requirements for source control efforts, allows dischargers to plan and prioritize their efforts, and protects dischargers from Clean Water Act "compliance liability" when they fulfill source control expectations. ...the rule should place an emphasis on head-of-the-pipe controls, such as use of best management practices (BMPs), and on accelerated source-control for high-priority problem discharges. The rule should give public and private dischargers who are fulfilling reasonable source control expectations reasonable compliance time-frames for meeting the sediment quality standards."

Response: The comment above seems to indicate that the commenting party would prefer a strictly technology-based (versus standards-based) approach to stormwater sediment source control. We do not at this time envision making such a change in the SMS. The foundation of the SMS rule is the sediment criteria of WAC 173-204-320, 420 and 520, and eventually discharges must be controlled such that they do not cause sediments to exceed the applicable sediment standards. However, WAC 173-204-400(2) does require that all discharges be conditioned so that the discharge is operating with all known, available, and reasonable methods of treatment (AKART) and BMPs prior to application for a SIZ. In the case of stormwater discharges existing prior to adoption of the SMS in 1991, WAC 173-204-410(6)(d) allows for the department to issue SIZs to discharges as long as there is an approved time schedule for implementing BMPs. The time schedule for BMP implementation would be determined by the permit manager for the discharge, and would obviously address water quality concerns as well as sediment quality concerns. The long-term "compliance liability" would be based on actual effectiveness of the BMPs as compared with the predicted effectiveness for those BMPs to protect sediment quality.

Comment 5. WASP Modeling: "We strongly support Ecology efforts to implement these management tools. However, based on our experience, the application of this model is complex and requires specific expertise (not provided in existing Ecology documentation). ...We recommend that:

- Ecology identify specific staff (WASP experts) to work upfront with consultants to clarify model application and approach issues;
- Ecology enter into an agreement with EPA to provide WASP support for CERCLA projects. This support must include technical working groups (to clarify model application and approach issues) and extend beyond a model results "review" capacity; and
- Ecology establish a WASP Technical Work Group to work through a specific application of WASP (Thea Foss and Wheeler-Osgood waterways, for example)."

Response: We do not believe this is an issue that can be addressed through changes in the SMS rule. However, we do agree that application of the WASP is complex and

requires expertise in order to be used. However, there are consultants available with expertise in using the model. The department is currently in the initial phase of an effort to move into more of a review and technical assistance mode with regard to WASP modeling support to the SMS source control program. Permittees whose discharges have been identified as having the potential to cause sediment contamination may be required to perform modeling. The department has staff that will be able to provide technical assistance and to review the results of the modeling, but assistance and review of ongoing WASP modeling will be limited to permit required modeling.

With regard to sediment modeling documentation, Ecology has a number sediment modeling-related reports or manuals that are available to the public, including (all Ecology documents): Sediment Source Standards User Manual (1993), Puget Sound Contaminated Sediment Impact and Recovery Zone Workshop Summary (1989), Recommended Sediment Impact and Recovery Zone Models and Case Study Analysis (1991), Sediment Modeling Variables in Puget Sound Workshop Summary (1991), WASP Sensitivity Analysis (1992), WASP Application Guidance Manual (1993), WASP Implementation and Model Modifications Manual (1993). Contact Sharon R. Brown at Ecology, P.O. Box 47703, Olympia WA, 98504-7703 or via email at sbro461@ecy.wa.gov for further questions on Ecology's sediment modeling.

Regarding the recommendation that Ecology enter into an agreement with EPA for WASP modeling support at CERCLA sites, it is unclear if the commenting party is asking the department or EPA to agree to supply the support. While the WASP model is an EPA product, EPA Region 10 staff have generally been unavailable for modeling for predictions of sediment contamination. The department has limited sediment modeling staff available, but that staff is funded by water quality permit fees and is therefore dedicated to sediment source control modeling and is not available for CERCLA or MTCA cleanup modeling projects, e.g., natural recovery implications.

Due to resource limitations the department does not at this time anticipate forming a technical work group for working with consultants engaged in WASP modeling. However, as stated above, the department will work with individual permittees (and their consultants) who are subject to WASP modeling requirements. It may be possible that, in time, as more discharges are subject to WASP modeling requirements, it would be to all parties' advantage to form a workgroup instead of the department providing individual permit technical assistance. The department will reassess the workgroup option as the number discharges with modeling requirements increases.

Comment 6. "Increased emphasis on controlling the discharges from storm water, industrial sources and non-point sources needs to be the keystone to the sediment management program. ...These discharge controls need to encompass all aspects of state and local permitting actions. The discharge control program should use a mix

of baseline general permits and specific individual permits to address watersheds or drainage areas needing special attention."

Response: The above comment does not appear focused on any revision of the SMS, but on the programmatic implementation of sediment source control for point and nonpoint discharges. The components of the sediment source control program as mentioned in the comment (individual permits, general permits, and watershed specific efforts) are already in place. The next questions would be, how well is the program working and how can we improve it? The department will continue its efforts to address these questions in the coming years.

Comment 7. SMS Guidance for Sampling and Analysis Plans: "Before this guidance is finalized, however, we believe that it should be reviewed by the SMS Implementation Committee."

Response: In June of 1996, the SMS Implementation Committee was provided with draft copies of the Sampling and Analysis Plan Appendix (SAPA), with a comment period deadline of July 31, 1996. The SAPA is an appendix to both the SCUM1 and the Sediment Cleanup Standards User Manual (SCUM2). At this time, the draft SAPA is the most complete guidance by Ecology on the development of sediment sampling and analysis plans that meet SMS requirements. We expect the SAPA to be finalized in 1997, and it will be updated as necessary along with the associated user manuals. When completed, the SAPA will be sent to the individuals listed on our mailing lists as SCUM1 and SCUM2 recipients. The draft SAPA, as well as order forms for SCUM1 and SCUM2 are available by calling 360 407-6908, by email at bapa461@ecy.wa.gov, or by mail at P.O. Box 47703, Olympia WA 98504-7703.

Part IV. F. Specific Comments - Sediment Cleanup

The SMS define a sediment cleanup decision process for managing contaminated sediments. This decision process is contained in Part V of the rule (WAC 173-204-500 through 590) and includes procedures and policies for (1) identifying potential sediment cleanup sites (e.g. clusters of potential concern), (2) performing hazard assessments, (3) identifying, ranking, listing and delisting sediment cleanup sites, (4) characterizing sediment contamination and evaluating cleanup alternatives, (5) selecting cleanup standards and sediment cleanup actions, and (6) performing sediment cleanup actions.

Ecology received numerous comments on these provisions during the triennial review process. In general, commenters appear to support the continued use of this process to guide sediment cleanup decisionmaking. However, Ecology received several recommendations on ways to reduce barriers or provide more incentives to expedite and streamline the cleanup process. For purposes of reviewing and responding to these recommendations, Ecology has separated the comments into the

following categories:

- Consistency with State and Federal Cleanup Regulations: Overlapping and duplicative requirements can increase regulatory uncertainty which may increase study costs and/or cause project delays. Several commenters recommended that Ecology clarify the relationships between cleanup requirements in the SMS rule, the MTCA Cleanup Regulation (Chapter 173-340 WAC) and federal Superfund requirements. Ecology has reviewed these comments and believes that some of the issues can be addressed through revisions to the SMS rule. However, several of the issues raised by commenters are beyond the scope of the SMS rule and will require broader discussions among state and federal agencies (See Comments 1- 4).
- Cleanup Study Plan/Report Requirements: Commenters noted that uncertainties associated with report requirements can slow down and complicate the cleanup process. Several commenters recommended that Ecology clarify the requirements for cleanup study plans and cleanup study reports. Ecology has reviewed these comments and intends to revise the SMS rule to clarify the content of these two documents (See Comments 5 and 6).
- Administrative Options for Pursuing Sediment Cleanup: Several commenters recommended that Ecology explore ways to provide more procedural flexibility for sediment cleanup actions. Ecology has reviewed these comments and believes that the SMS rule should be revised to better reflect the wide range of circumstances under which sediment cleanup actions are undertaken (See Comments 7 - 11).
- Focus Sediment Cleanup on the Most Contaminated Sediments: Several commenters expressed the opinion that focusing cleanup actions on the worst sites would avoid gridlock in the cleanup process and result in greater environmental improvements. Ecology received several recommendations identifying various approaches for implementing this concept. Ecology believes that several recommendations have merit and intends to explore rule revisions to incorporate those approaches (See Comments 12 - 16).
- Role of Natural Recovery in the Sediment Cleanup Process: The SMS rule allows Ecology and cleanup proponents to consider the potential for natural recovery of contaminated sediments (e.g. sedimentation, mixing, biodegradation etc.) when defining the appropriate cleanup action for a particular site. Several commenters recommended that Ecology give greater recognition and provide more explicit guidance on the role of natural recovery in the sediment cleanup decision process. Ecology has reviewed these comments and concluded that the rule should be amended to provide additional information and clarification on natural recovery (See Comments 17

- 19).

- Disposal Sites for Contaminated Sediments: Numerous studies and reports have concluded that limited disposal capacity for contaminated sediments is a significant barrier for many sediment cleanup projects. Several commenters highlighted the importance of this issue. Ecology is currently working with other state and federal agencies and the Washington Public Ports Association to evaluate and site a multi-user disposal facility (See Comment 20).

Ecology also received several cleanup-related comments that did not directly relate to reducing barriers and/or streamlining the cleanup process. These comments and Ecology's responses are addressed under general cleanup issues.

Consistency with State and Federal Cleanup Regulations

Comment 1. "Part V of the SMS does not adequately recognize that many contaminated sedimentary sites are already the focus of remedial actions pursuant to the Federal CERCLA. This inadequacy in the current rule leaves the regulated community guessing as to what level of effort will provide finality to a remedial action. ...Ecology will have wasted valuable resources in the station cluster screening, WAC 173-204-510, and the hazard assessment, WAC 173-204-530, stages by performing analysis which will, in large part, be duplicative of ongoing Federal remedial investigation. The State and Federal governments should decide which regulatory process best provides for the protection of the environment and human health and administer that one process for final site remediation. Overlapping and inconsistent regulations have and continue to be the focus of regulatory efforts. To provide some assurance of finality the rule should include a specific acknowledgment that remedial actions on a sediment site, undertaken pursuant to Federal regulations, will be taken into account under the SMS. ...the rule should incorporate this criterion early in the sediment cleanup decision-making process, e.g., at the screening sediment stations cluster stage, WAC 173-204-510. The delisting provision in WAC 173-204-540(6) should be modified in a similar fashion."

Response: Ecology agrees with the two key principles reflected in this comment. First, we agree that it is important that federal and state governments avoid unnecessary duplication of effort. Toward that end, Ecology routinely considers sediment data/information collected during federal Superfund investigations when preparing the Contaminated Sediment Site List. Once a site is listed, Ecology considers the status of ongoing cleanup actions (including CERCLA actions) to determine whether detailed site investigations or cleanup actions are needed. Indeed, Ecology and EPA closely coordinate activities at CERCLA sites in order to avoid duplication. Ecology believes that the failure to include CERCLA sites on the Contaminated Sediment Site List would be inconsistent with directives in the PSWQA Management Plan which are designed to provide a comprehensive listing of contaminated sediment areas in Puget Sound.

Ecology also agrees that it is important to strive to maximize regulatory predictability. Toward that end, Ecology considers that the SMS rule is an ARAR for most federal Superfund sites. [The one exception is the Commencement Bay Superfund site where the Record of Decision was signed prior to the adoption of the SMS rule.] In general, Ecology does not revisit a site that EPA has determined to be adequately remediated (e.g. protective, complies with SMS rule) unless new sources and effects of contamination are identified. **Ecology intends to discuss the issue of including CERCLA sites in future SMS Site List updates with the SMS Implementation Committee.**

Comment 2. "It is unclear in the Sediment Management Standards (SMS) or the Sediment Cleanup Standards User Manual whether a party undertaking a MTCA sediment cleanup should follow the SMS for guidance on preparing cleanup study plans and sampling plans, should follow the MTCA regulations for guidance on preparing RI/FSs and sampling and analysis plans, or should follow some combination of the two. If the party undertaking the MTCA sediment cleanup should follow only MTCA regulatory guidance, the SMS or SMS guidance should be clarified accordingly. On the other hand, if the party undertaking the MTCA sediment cleanup should follow both sets of regulatory guidance the regulations should be made consistent and comparable. Presently, the SMS and the MTCA regulations use different terminology and require different contents for cleanup study plans and sampling and analysis plans. Compare WAC 173-204-560 (cleanup study plan) with WAC 173-340-350 (RI/FS) and WAC 173-204-600 (sampling)."

Response: Ecology agrees with the need to clarify terminology and contents of cleanup study plans/sampling plans required under the SMS rule and the RI/FS requirements in the MTCA cleanup regulation. In examining these issues, Ecology will attempt to balance the sometimes competing needs for regulatory flexibility and regulatory predictability. For example, the SMS rule provides the flexibility for cleanup proponents to integrate the cleanup study plan and report with information and decision-making requirements of multiple regulatory authorities. Consequently, the scope of the cleanup study plan is admittedly broad in order to capture all ranges of contaminated sediment sites. Ecology has trained sediment staff who have considerable experience implementing the SMS rule. These staff should be consulted by project proponents to determine how best to resolve inconsistencies between the two rules.

Ecology agrees that inconsistencies between the two regulations regarding sampling plans exist. The Port of Seattle has submitted rule language to clarify the requirements for cleanup study plans and reports. In addition to modifying the requirements for cleanup study plans and reports, Ecology will also prepare draft language designed to clarify that when a sediment cleanup action occurs under the authority of Chapter 70.105D, compliance with MTCA procedures will satisfy the SMS procedural requirements as long as the site has been appropriately characterized and the cleanup action results in compliance with applicable sediment cleanup levels

specified in the SMS rule. Ecology agrees with many of the suggested rule changes provided by the Port of Seattle and will develop draft SMS rule language for discussion with the SMS Implementation Committee on the issue of improving consistency and clarity between the SMS and MTCA Cleanup rules.

Comment 3. Sediment Cleanup Decision Process: "It is unclear what the difference is between the MTCA and SMS hazardous assessment, particularly since the WARM (Washington Ranking Method) does not include a sediment module. Until such time Ecology develops SEDRANK, clarification is necessary on what constitutes a SMS hazardous assessment or how a MTCA WARM process can identify a sediment cleanup site. Further, Ecology must clarify regulatory authority at existing CERCLA sites. The identification of "potential clusters of concern" and other SMS cleanup actions is duplicative and unnecessary."

Response: The MTCA and SMS hazard assessment processes differ in the way that data are obtained. The SMS developed a hazard assessment process that involves the collection and evaluation of existing information. This requires going to the public, affected parties, and other resource agencies and asking for existing supplemental site specific information. The quality of information received may range from anecdotal to data reports. At this time, SEDRANK (the SMS hazard assessment model) has been finalized and is used to rank contaminated sediment sites. SEDRANK utilizes many types of information such as natural resources, public exposure pathways, physical parameters, source control information, and toxicity. Ecology has developed a sediment module for the Washington Ranking Method although resource constraints have precluded its use to-date. Ecology is currently studying ways to integrate the two programs so that the SEDRANK rankings can help prioritize and allocate resources for MTCA sediment cleanups in the Toxics Cleanup Program.

Comment 4: "We also ask that Ecology seriously consider moving the sediment cleanup standards portion of the SMS rule into the MTCA rule. Placing the sediment cleanup standards portion of the SMS Rule into the MTCA Rules would reduce existing inconsistencies and redundancies between the rules and generally serve the interests of regulatory reform. Doing so would also give recognition to the fact that the primary authority for dictating sediment cleanup process and policies is the MTCA (and not the WPCA)."

Response: Ecology has reviewed this issue and agrees that reducing inconsistencies and redundancies is an important factor in accelerating sediment cleanup actions. However, Ecology also believes that changes of this magnitude are somewhat premature in that (1) Ecology has not been provided with specific examples where inconsistencies have inappropriately slowed-down cleanup actions, (2) Ecology believes many of the specific changes recommended by the Port of Seattle (see comments #2 and #3) will eliminate any inconsistencies and redundancies between the two rules, (3) inclusion of the sediment cleanup decision process within the SMS rule was designed to eliminate the potential misuse of the sediment quality criteria,

and (4) placing the sediment cleanup decision process into the MTCA cleanup process will increase the potential for inconsistencies between those sections and other parts of the current SMS rule.

Cleanup Study Plan/ Report Requirements

Comment 5: WAC 173-204-560(4) Cleanup study. Cleanup study plan site investigation and cleanup alternatives evaluation requirements. "This section also needs some work, as many people have found it confusing. The main problem is that it doesn't differentiate clearly between what is needed in the cleanup study *plan* and what is needed in the cleanup study *report*. Everything is listed under the cleanup study plan; some of this information could not actually be provided until after the cleanup study is conducted (e.g., the locations where SQS and CSLs are exceeded, evaluation of cleanup alternatives). I would suggest moving the contents that apply only to the cleanup study report into subsection (7) for clarity; this was done in SCUM 2 but would be helpful also to do in the rule."

I would particularly suggest moving subsection (4)(b)(ii) into the cleanup study report, and clarifying that we're looking for contour maps here showing the results of the investigation. These contours are different from the rest of the site conditions map, which should be provided in the cleanup study plan. We should reference the TIM on recommendations for reporting sediment data.

Response: Ecology understands that the wording in the SMS relating to cleanup study plan and report can be confusing. Consequently, Ecology will develop rule changes to more clearly identify that section 560(4) identifies the range of topics that may be appropriate to include as part of a cleanup study plan to be eventually reported in the cleanup study report. Ecology will also review this section to increase consistency with provisions in the Sediment Cleanup Users Manual and increase consistency with similar provisions in the MTCA rules (see above). The Port of Seattle has submitted rule language to clarify the requirements for cleanup study plans and cleanup study reports. **Ecology agrees with many of the suggested rule changes and will prepare draft rule revisions for review and discussion by the SMS Implementation Committee.**

While Ecology does not agree with the suggestion to move subsection (4)(b)(ii) into the cleanup study report subsection, we agree that we need to clarify that we're looking for contour maps here showing the results of the investigation within the cleanup report, not the study plan. Also, given that the TIM on sediment data reporting is partially obsolete, Ecology does not recommend its citation.

Comment 6: "We also should recognize somewhere in this section that many of these cleanups are associated with upland MTCA or CERCLA sites. In these cases, certain modifications should be allowed. In particular, information on site history and existing conditions, weather, geology, etc. already provided in the upland work plan need not be repeated in the sediments work plan, which is often an attachment or addendum to the upland work plan. Second, our cleanup study report is written as if it would include the contents of both an RI and an FS, but these reports are usually separate under MTCA or CERCLA. For larger sites it is often easier to separate the two evaluations."

Response: Ecology understands that in this age of diminishing resources it is necessary to reduce overlap when applicable. Ecology's intent in the original development of the SMS rule was to provide sufficient flexibility to reference other documents. If the original information is easily found in other parts or volumes of the same document, the contractor can cite the location of such required information. However, if the information exists in another report that Ecology may not have direct or immediate access to, then a more thorough compilation may be required. Ecology also intends to modify WAC 173-204-560(7) to explicitly recognize that the agency/regulator community have the flexibility to prepare the cleanup study report as separate RI and FS volumes for larger or more complicated contaminated sediment sites.

Administrative Options for Pursuing Cleanup Actions

Comment 7: "Ecology should further address "independent" and "interim" cleanup actions in any revisions to the SMS. Ecology should consider issuing partial or conditional water quality certifications for such actions, or adopting a simplified procedure for their review and approval. "Independent" and "interim" actions should be encouraged to the greatest extent possible, such as provided for under MTCA, WAC 173-340-510(5)."

Response: Ecology agrees that policies need to be developed to address independent and interim cleanup actions. We are presently working on developing such policies and will recommend additional discussion in the SMS Implementation Committee on the issue of interim cleanup actions, including the potential advantages and disadvantages of incorporating interim actions in the SMS rule. Ecology also intends to examine the recent recommendations on independent cleanup actions from the MTCA PAC (MTCA PAC, 1996) to determine whether certain types of sediment cleanup actions can proceed more independently than is currently the case. There are also several concepts in the draft policy paper on water-front sediment cleanup (Friedman-Thomas, 1994) which may be useful in identifying scenarios where cleanup actions could proceed more independently.

Ecology understands the concerns associated with the 401 water quality certifications and Coastal Zone Management Act (CZMA) consistency determinations. However, it

is important to recognize that water quality certifications, which are required for any in-water work, is an issue which will affect other branches within Ecology as well as other agencies. Resolution of this issue will require cross-programmatic and inter-agency discussions and may be addressed during the Cooperative Sediment Management Program's pilot project in Bellingham Bay. The Corps of Engineers recently published updated Nationwide Permits for 39 types of activities including the cleanup of hazardous and toxic waste (U.S. Army Corps of Engineers, 1997). Cleanup activities authorized through a cleanup order from Ecology or EPA do not require an individual 401 certification/CZMA determination. In these cases, the 401 certification/CZMA determination conditions are placed directly into the Ecology cleanup order.

At this time, the department is also working with the Corps to incorporate sediment cleanup decision-making into the checklist of activities that are necessary before the Corps will accept a 404 application. In addition, staff are considering the development of a joint suitability determination for those projects which have both sediment cleanup and dredging/filling components. For example, the first incidental cleanup, including a nearshore confined disposal facility, has been approved in Everett.

Comment 8: WAC 173-204-550(3) Types of cleanup and authority. "This section needs major revision, as we all know. I think the best way would be to modify the current "incidental" and "partial" language, and replace it with language that is consistent with the two policies that we are near finishing on 401 certifications/cleanups and the waterfront policy, both of which contain language addressing partial characterizations and cleanups. We may want to replace "incidental" with a category related to dredging and/or construction and discuss the three types of permit requirements that may be added for these activities in contaminated sites. Similarly, under the partial cleanup section, we may want to acknowledge the few cases we've come up with where partial characterization may be OK. Also under partial cleanup, we have listed in the new waterfront policy a variety of reasons why partial cleanup may be appropriate, and only one of these reasons is currently listed in the rule. In both cases, we may want to reference the appropriate policies for more detail, and emphasize that the department will exercise its judgment in these cases."

Response: The department has been working on developing a policy on the extent of characterization/cleanup that would be required of an urban waterfront construction proponent, i.e. a partial cleanup policy. At this time, finalization of that policy has been delayed. However, it is identified in the Sediment Cleanup Strategy: An Interagency Overview (Ecology et. al., 1995) as one of five technical/policy guidances to be developed by an intergovernmental staff group. All of the recommendations for clearer differentiation between department initiated and voluntary cleanups are valid. Ecology intends to work with the SMS Implementation Committee on development of revised rule language to better define types of cleanup in 173-204-550(3).

Comment 9: "Finally, with respect to "department-initiated" and "voluntary" - the MTCA group has been finding that there really is something in between these two that's sort of "semi-voluntary." These situations may be addressed with a pre-pay position or somehow have increased oversight by the agencies. Perhaps we want to replace these terms with ones that more accurately reflect the enforcement vehicle that's being used. In other words, you could differentiate between three or four levels of oversight: 1) those projects under an agreed order, consent decree, or unilateral order . . . 2) those projects with a prepayment agreement or which have otherwise arranged for a high level of discussion and oversight . . . 3) those projects being conducted primarily because they want a 401 certification . . . and 4) those projects that are being conducted entirely voluntarily These cleanups may use some other vehicle (e.g., interagency memorandum of agreement) to effect cleanup. We may want to add a subsection encouraging entities with jurisdiction over multiple sites to develop such management plans in each area."

Response: As discussed above, Ecology intends to work with the SMS Implementation Committee to clarify the types of cleanup actions specified in WAC 173-204-550(3).

Comment 10: "I think we also need a section that allows for interim actions to address imminent threats or when final cleanup cannot be completed (for example, if it is believed that recontamination may occur). This would be different from partial cleanup in that, similar to MTCA, it could allow for interim actions to be conducted without a full alternative analysis when the action is obvious and sensible and will not foreclose future cleanup options or when the threat is great enough that time is critical. I can think of two cases already where this would be a big help."

Response: Ecology agrees that the SMS rule should be revised to allow parties to conduct interim actions. Ecology believes that the interim action provisions in the MTCA cleanup regulation (WAC 173-304-430) are a good starting point for discussions on how to address this issue.

Comment 11: "Reduce barriers and provide incentives for voluntary cleanups. . . . Absent Ecology's willingness to issue conditional or partial certifications, it becomes nearly impossible to obtain the federal permits necessary for undertaking the activities typically involved in a voluntary cleanup."

Response: The department agrees that voluntary cleanups should be encouraged and will make every effort to streamline and expedite the permitting process. Inter-agency coordination and permit streamlining will be addressed during the Cooperative Sediment Management Program's pilot project in Bellingham Bay.

Focus Sediment Cleanup on the Most Contaminated Sediments

Comment 12: "Focus active cleanup efforts on hotspots to accelerate cleanup at the worst sites."

Response: Ecology agrees with the general concept of focusing cleanup efforts on the most highly contaminated sediments (e.g. hotspots) in order to accelerate cleanup at the worst sites. This concept is consistent with recommendations from the Sediment Cleanup Work Group which was formed in 1994 to advise the Agency Directors (Ecology, DNR, COE, EPA Region 10, PSWQA) on ways to expedite sediment cleanup (among other issues). The Workgroup's final report recommends that "...agencies should focus on 'hotspot' cleanups to accelerate cleanup at the worst sites..." where hot spots are defined as "...the area that exceeds the MCUL (cleanup "trigger")..." The Work Group also recommended that "...[i]n the lesser contaminated portions of a site, rely on source control, natural recovery, voluntary cleanup, and monitoring..." (Sediment Cleanup Work Group, 1994).

This general concept is also reflected in the Agency Directors' response to the Workgroup's hot spot recommendation:

The agencies agree. To accomplish this, Ecology will modify how it currently implements the sediment cleanup process outlined in the SMS rule. Some of these modifications will be incorporated into the rule during the triennial review process.

Ecology will implement the hotspot approach at the point in the process where a formal ranked site list is published for each bay. Prior to that point, Ecology will continue to conduct the early public notice/hazard assessment on all areas which exceed the sediment quality standards in order to receive all available sediment data.

Sites will include only those adjacent sediment stations that exceed the SMS regulatory trigger ("cleanup screening level" - CSL). Those areas which are not defined as hotspot sites yet pose potential concern (*i.e.*, exceed the sediment quality standards but not the CSL) will be tracked for future monitoring and additional characterization (Ecology et. al., 1995).

During the triennial review process, commenters have identified several approaches and rule amendments designed to focus active cleanup measures on the most contaminated sediments. Approaches recommended by one or more commenters include the following:

- Revise the procedures for identifying and listing sediment cleanup sites;
- Establish the CSLs at the "Moderate Adverse Effects Level"; and
- Limit active sediment cleanup to areas where sediment contamination levels would exceed the MCUL after 10 years.

These recommended approaches are discussed in the following sections.

Comment 13: The Port of Seattle recommended that Ecology define cleanup sites where there are three or more contiguous stations which exceed the Cleanup Screening Levels (CSLs).

Response: Ecology used a three-station approach similar to the one recommended by the Port of Seattle when preparing the first SMS Contaminated Sediment Site List (1996e). [Note: the approach used by Ecology does not include the use of new CSLs based on "moderate adverse effects levels" as recommended by the Port of Seattle (see Comment #14 below).] The department intends to evaluate the continued use of this approach and, if appropriate, develop SMS rule amendments for public review and comment.

Comment 14: Set new CSL at EIS "moderate adverse effects level"

Response: Ecology has reviewed this issue and continues to believe that the "minor adverse effects level" forms the appropriate basis for the CSLs. This is based upon consideration of several factors:

- Regulatory Consistency: The current approach establishes a common biological effects level for regulatory decisions on dredging, source control and cleanup. This arrangement ensures that Ecology will not be permitting discharges or allowing dredged material disposal sites that will later become future cleanup sites.
- Relationship to Other Parts of the Rule: It is important to consider the use of the "minor adverse effects level" in the context of other rule provisions (or proposed changes) which are designed to mitigate cost impacts. For example, the rule provides for a 10 year compliance period which serves to mitigate the costs of active cleanup measures. Second, the rule requires consideration of spatial extent as well as magnitude of contamination levels when making cleanup decisions.
- Balancing Multiple Factors: The Final Environmental Impact Statement prepared for the SMS rule (Ecology, 1990b) recommended selection of the 2AET for CSL, because the 2AET, and not the Highest Apparent Effects Threshold value (HAET) (termed moderate adverse effects), was protective of ecological health. This is in accordance with the purpose of the SMS rule which is to "reduce and ultimately eliminate adverse effects on biological resources and significant health threats to humans...". The criteria used to screen and select an appropriate AET level for the CSL was derived from CERCLA, Clean Water Act, PSWQA, and MTCA requirements or guidelines. Thus, Ecology's choice of using the 2AET for the CSL is consistent with many federal and state positions. The environmental impact statement and the draft rule were

reviewed by the public who also supported adoption of the 2AET as protective of ecological health. Several members of the SMS Workgroup recommended that the CSL "be set at the degree of biological effects allowed at the PSDDA nondispersive unconfined open water disposal sites" (Ecology, 1990d). It is very important that all the programs managing contaminated sediments use compatible screening levels to avoid interprogram conflicts. Ecology's decision to set the CSL at the 2AET was a compilation of many technical recommendations at the state and national level and was supported by the public and stakeholders.

Comment 15: "A minimalist approach should also be used when a mechanical clean-up is needed. The process should favor removal of the minimum amount of contaminated sediment (a hotspot) to the cleanup screening level (CSL). The subject site would then be re-evaluated using the multiple sampling techniques established for site identification. Those sites that have "cluster" values below CSL but above SQS would be placed into a monitoring condition to determine if natural recovery will suffice for management of the remaining contaminants. This approach can be incorporated into WAC 173-204 sections 550 through 590 dealing with clean-up evaluation, selection and impact zones."

Response: The SMS rule (WAC 173-204-580 (3)) and the Sediment Cleanup User's Manual (Ecology, 1991) currently provide the flexibility to implement this approach on a case-by-case basis. Specifically, Ecology may approve cleanup actions which involve (1) active cleanup of areas which exceed the CSL and (2) natural recovery/source control for areas with sediment concentrations below the CSL but above the SQS. Where natural recovery is considered as a remedial alternative, monitoring is required to confirm modeled recovery rates. As part of a Sediment Recovery Zone, monitoring schedules are required to verify expected rates and degree of recovery with triggers for initiating active remediation where recovery is not adequate. Clusters that do not exceed the CSL are called "station clusters of low concern" and are monitored, as data becomes available. WAC 173-204-510(4) states that "Station clusters of low concern shall receive no further consideration for active cleanup, unless new information indicates an increase of chemical contamination at the stations in question."

Discussions with Ecology site managers indicate that final decisions on most sediment cleanup sites are generally consistent with this approach. However, Ecology recognizes that the regulated community believes that additional guidance/rule revisions are needed to fully implement this approach in a manner that increases regulatory certainty and predictability. Ecology also understands the ongoing concerns expressed by environmental groups and tribal representatives for continued progress and accountability for the cleanup of contaminated sediments.

Ecology intends to work with the SMS Implementation Committee to identify and

evaluate rule revisions/guidance that will serve to accelerate cleanup of hotspot areas. Based on our review of the triennial review comments and implementation experience, there are several key issues that will need to be evaluated prior to identifying specific revisions to the SMS rule and/or guidance. These include:

- Degree of site investigation required to characterize the active cleanup and natural recovery areas;
- Procedures for establishing site-specific cleanup standards;
- Measures needed to ensure the long-term effectiveness of hotspot cleanup actions; and
- Responsibilities and requirements for monitoring natural recovery/source control effectiveness.

Comment 16: "The sediment management program recognizes that benefit analysis must be a part of the process for "applying sediment standards as the basis for management..." There is Ecology advisory committee consensus that in most cases, mechanical cleanup methods present more of a hazard to the environment than leaving the sediments alone. Many cases have verified that limited "hot spot" cleanups would achieve most of the program's goals with minimal damage to the environment, and also reduce demand on agency and business resources. The benefit analysis concept should be incorporated in WAC 173-204-100 (2)."

Response: Ecology does not support inclusion of the benefit analysis concept (which usually is understood to include a comparison of costs and benefits) into the SMS rule at this time. Ecology understands this comment to suggest that benefit, (i.e., cost/benefit) be adopted into SMS rule section 100, Authority and purpose, to effect a requirement for cost/benefit studies on individual sediment management activities, e.g., evaluation of an individual cleanup site.

One concern Ecology has with this recommendation is the technical and policy uncertainty concerning the meaning, scope and resource implications of completing cost/benefit analyses on individual cleanup sites. Ecology considers application of cost/benefit studies to individual sediment management activities as burdensome for both Ecology and the regulated community.

Also, the APA cost/benefit analyses only apply to state agency administrative processes in rulemaking, and were not intended to apply to individual rule implementation activities. With the recent cost/benefit revisions to the APA, Ecology will conduct cost/benefit studies for each recommended revision of the SMS rule, as appropriate, in compliance with the APA.

When the SMS was adopted in 1991, Ecology complied with all APA requirements. This included completing a Small Business Economic Impact Statement to comply with the State Economic Policy Act, Chapter 43.21H RCW and the Regulatory

Fairness Act, Chapter 19.85 RCW. Much of the focus in the SMS Small Business Economic Impact Statement was on the costs of cleanup to business and local government.

In order to enable sediment cleanup efforts, the SMS Workgroup stakeholders agreed to incorporate into the rule considerations of cost, technical feasibility, and net environmental effects to establish site (or site unit) cleanup levels within an identified acceptable range, and to evaluate cleanup action alternatives. At the time, using cost as a consideration to establish cleanup levels was unprecedented. Ecology anticipates future SMS Implementation Committee discussions on continued use of these considerations and their relationship to benefit analyses.

For further information on Ecology's review of APA requirements, economic analysis and cost/benefit studies, the Economic and Regulatory Research Section has prepared a draft document: Ecology Economics Resource Book, June 1996. Public review and comment on this document is encouraged. To obtain a copy of this document please contact:

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Role of Natural Recovery in the Sediment Cleanup Process

Comment 17: WAC 173-204-540(6)(a) Ranking and listing of sites. Site delisting. "A subsection (iii) should be added to this section because there is a third way that a site could be delisted - if it has naturally recovered since it was put on the list. I am beginning to think this may happen quite often. All then a person would have to do to get it delisted would be to submit site characterization data showing that the site no longer exceeds CSLs."

Response: Ecology agrees that recognition of natural recovery for site delisting is necessary. We will propose draft rule language stating that recovery may occur without active cleanup, but must be proven with sampling results. Ecology will develop rule changes in subsections 540(6)(a), and (b) as well as include a definition of natural recovery in section 200 of the SMS rule. Ecology is careful to understand and differentiate between natural recovery occurring versus off-site transport of pollutants. Ecology does not consider offsite transport to be included within the definition of natural recovery. The difference between these two processes will be clarified by the proposed definition of natural recovery in the rule.

Delisting of a site from the SMS Contaminated Sediment Site List is appropriate where monitoring or confirmation sampling indicates that a site has achieved the established site specific cleanup standards. Such confirmatory sampling and reporting, for Ecology's review and consideration for delisting, must comply with parts V and VI of the SMS rule (WAC 173-204-500 to 610).

Comment 18: Natural Recovery as a Remedial Alternative: "We recommend that Ecology establish a Technical Work Group to discuss:

- The role of natural recovery in sediment remediation strategies;
- Sediment dynamics important to natural recovery processes;
- Methods for quantifying sediment processes;
- Methods for performing natural recovery evaluations (models); and
- The regulatory application of natural recovery."

Response: Ecology agrees that more technical review of natural recovery processes would be valuable. However, the department does not intend to form a Technical Work Group to discuss these issues at this time because it requires diverting resources from other higher priority tasks. Many technical forums presently exist; the SMARM, the PSDDA technical workgroups, the PSEP protocols, and Ecology's SMS Implementation Committee. The role of natural recovery can be discussed in any of these forums. Ecology welcomes any technical issue papers or comments on the subject.

Comment 19: "...Once effective discharge source control is in-place, a process of monitoring sediment recovery should be commenced. If it can be shown that the sediments will naturally recover to the "Cleanup Screening Level" and ultimately below the "Sediment Quality Standards" within a reasonable time frame (10/25 years respectively) then no mechanical cleanup action should be taken."

Response: Natural recovery may be appropriate if recovery to site specific cleanup standards will occur within a reasonable time (e.g., 10 years), that interim risks to biological resources and human health are acceptable and that the fate of contaminants do not pose risks off-site (i.e., transfer between media or transport off-site are not acceptable means to achieve recovery). It is up to the Ecology site manager to determine how best to meet the regulatory requirements for cleanup and to consider the costs and benefits of the applicable remediation options.

Where natural recovery is considered as a remedial alternative, monitoring will be required. As part of a Sediment Recovery Zone, monitoring schedules would be developed to verify expected rates and degree of recovery with triggers for initiating active remediation where recovery is not adequate.

Disposal Sites for Contaminated Sediments

Comment 20: "No sediment removal actions should be required until an environmentally and economically satisfactory multi-user sediment disposal site has been constructed. This site should be part of a larger scheme for the management of contaminated sediment from channel dredging and cleanup actions. When available, Ecology should encourage the use of inland fill or shoreline development projects as the recipients for cleanup dredged material. This encouragement could take the form of relaxing selected regulatory requirements for the collection, monitoring, and liability associated with the final disposition of the sediment."

Response: Ecology is participating in the siting process for a multi-user disposal site (MUDS). The MUDS process is in its infancy. An actual MUDS site may not be available until the year 2000. Ecology is working hard to meet the needs of contaminated sediment disposal without a multi-user disposal facility yet available. For example, we just finished working with the Port of Everett to site a nearshore contaminated sediment disposal area. This project was very successful because it served both development and cleanup needs using a streamlined permitting process. Methods for disposal of contaminated sediments are always available upon agreement among affected parties and agencies.

General Rule Clarifications

Comment 21: WAC 173-204-510(2) Screening sediment station clusters of potential concern. "The first sentence says 'A station cluster is defined as any number of stations from the inventory...' This sentence should be revised to indicate a minimum of three stations."

Response: Ecology agrees with this comment and will propose rule language that will clarify that a minimum of three stations are needed to define a station cluster.

Comment 22: WAC 173-204-530(2) Hazard assessment. Hazard assessment requirements. "Again, to ensure timely response to requests for information, I would add a time requirement to this as follows: 'Onsite dischargers, lessees, landowners, and adjacent dischargers shall submit, *within 30 days of the department's request...*'"

Response: Ecology agrees that a time requirement for submittal of hazard assessment data is necessary to be consistent with the MTCA Cleanup rule and to ensure a coordinated SMS/MTCA site identification and public notification process. The cover letter accompanying the SMS rule request for information to support hazard assessment does require a response "within 30 days." However, this response time is not mandated by the SMS rule and Ecology's experience has been that information is often sent to Ecology well beyond the 30 day deadline. This complicates and delays internal Ecology coordination activities between the SMS and MTCA programs on site identification. **Ecology will propose rule language that will require 30 day**

response times for both hazard assessment, WAC 173-204-530, and cleanup action decision public notice, WAC 173-204-580. However, the Sediment Management Unit would like to remain flexible for late data submittals when approved by the department.

Comment 23: "Baywide plans for habitat restoration, dredge disposal, sediment cleanup and agency cooperation/coordination should be established prior to any sediment cleanup action. These plans should focus on the means to meet sediment management goals with the least disruption of the environment and lowest resource requirements of the agencies, governments and property owners involved. Baywide plans should also address issues of natural resource trustees to ensure that their needs are blended into the overall effort. Also, baywide plans may be incorporated into watershed management plans when waste/stormwater discharge parameters indicate a need to create a coordinated effort to manage sediment."

Response: Ecology agrees with the call for baywide application of broad sediment management goals and is participating in the Cooperative Sediment Management Program which will address many of these issues. One of the program's goals is to eliminate conflicting sediment management policies and coordinate sediment cleanup and source control efforts on a bay-wide basis. Seven state and federal agencies are involved in a pilot project which will work with local agencies and interested parties in a selected urban bay, Bellingham Bay, to identify specific issues that affect sediment quality and develop and implement a comprehensive, priority-driven sediment management plan. While the pilot project will be working to integrate sediment source control, cleanup, disposal, habitat mitigation and other aquatic land use issues, site specific sediment cleanup actions will continue as required by priority or opportunity. In addition, the regulatory and proprietary agencies will be testing new approaches to streamline and expedite permitting of sediment related actions.

Part V. Port of Seattle Recommended Triennial Review Revisions to the Sediment Management Standards Rule, Chapter 173-204 WAC

The following specific revisions to the SMS rule were proposed by the Port of Seattle and Preston, Gates and Ellis and submitted as comments and a revised rule as part of the SMS rule 1996 Annual Review (see Appendix A, III.).

WAC 173-204-130 Administrative policies.

Comment 1. "Inserted a phrase in WAC 173-204-130(3) to clarify that chemical concentration criteria are among the provisions of the Sediment Management Standards that need to be modified regularly to ensure that they continue to accurately reflect the latest scientific knowledge as established through ongoing validation and refinement."

Response: While Ecology supports use of latest scientific knowledge in the implementation and continued development of the SMS rule, inclusion of "criteria" in this section would not be consistent with the intent of this section, would be open to broad misinterpretation by the public and would be burdensome to Ecology. Ecology will recommend additional discussion in the SMS Implementation Committee on this issue, including the potential advantages/disadvantages of incorporating "criteria" in section 130(3) of the SMS rule

Section 130(3) currently reads:

"It shall be the goal of the department to modify this chapter so that methods such as confirmatory biological tests, sediment impact zone models, use of contaminated sediment site ranking models, etc., continue to accurately reflect the latest scientific knowledge as established through ongoing validation and refinement."

Clearly, the intent of this section speaks to use of scientific tools and technical methods e.g., WASP, the AET method, not the end result(s) of the use of those methods which may incorporate substantial policy decisions, e.g., SIZ criteria. Ecology's ability to identify, evaluate, coordinate, endorse and adopt any latest scientific knowledge is often time intensive and routinely subject to technical, policy and resource considerations. Ecology's experience with development of new or updated sediment criteria, e.g., freshwater, human health, has demonstrated the effect of these considerations and increased time delays due to legislative and political considerations.

Inclusion of criteria in this section could be interpreted as Ecology accepting the requirement to "routinely" conduct criteria development tasks regardless of Ecology's acknowledged limitations to effect criteria development and adoption, and regardless of the value of such criteria development activities. Quite easily this new commitment could prove burdensome to Ecology's current development and implementation activities related to the SMS rule.

Ecology's update of the 1988 AET sediment values began in late 1992. Ecology plans to identify, evaluate and propose changes to the existing SMS chemical criteria in 1997. Ecology's future sediment chemical criteria development activities will be based on its review of the status, value and priority of other, ongoing sediment technical development activities, fulfillment of Ecology's past development commitments (see Appendix B) and new technical development needs. Ecology will continue to provide annual and triennial SMS rule reviews to present and discuss these technical development needs and Ecology's recommendations with key stakeholders and the public.

Comment 2. "Inserted additional protocols to minimize, track and identify interferences that lead to false positives in bioassay tests as an example of an alternate technical method that can be proposed under WAC 173-204-130(4)."

Response: Any person may currently propose additional protocols to address the potential for false positives in sediment bioassays within the context of using alternate technical methods approved by Ecology, as required under section 130(4) of the SMS rule. As stated in this Administrative policies section, Ecology maintains a record of applications for use of alternate technology. Review of this limited record has not identified any request for use of revised bioassay protocols to address the potential for false positives.

When Ecology determines that latest scientific methods necessitate changes to the SMS sediment bioassay protocols, Ecology works to revise the PSEP Protocols, as appropriate, because their use is required by the SMS rule. The recommended change to section 130(4) seems most pertinent to potential revision of the PSEP Bioassay Protocols and inappropriate as a specific change to the policy statement provided in section 130(4). Ecology has identified above (see Bioassay comments), the review of artifact toxicity is most appropriately addressed through use and revision of the current PSEP Protocols. For these reasons, Ecology does not agree with the recommended change to section 130(4). However, Ecology will recommend additional discussion in the SMS Implementation Committee on this issue, including the potential advantages/disadvantages of revising the SMS rule based on this comment.

Comment 3. "Revised WAC 173-204-130(6) to clarify that Ecology will conduct an annual review of the Sediment Management Standards and, based upon its annual review, make any necessary revisions to the rule on at least a triennial basis to ensure that the rule continues to accurately reflect the latest scientific knowledge."

Response: Ecology agrees that it is important to continually review and when appropriate revise the SMS rule to reflect the latest scientific information. However, the department is concerned that the Port's proposed rule language would **require** the department to make any and all changes that reflect latest scientific knowledge, regardless of value. Ecology does not agree that limiting the department's use of best professional judgment to determine appropriate changes to scientific methods or placing strict regulatory time limitations on itself for revisions of the SMS rule will provide needed flexibility to address resource, technical, policy or political considerations that delay adoption of latest scientific knowledge. And this proposed time limitation does not necessarily guarantee that Ecology would make such rule changes on time. Ecology's sediment management program will not necessarily be improved by increased regulatory burden placed upon Ecology within the SMS rule. **Ecology recommends additional discussion in the SMS Implementation Committee on this issue, including the potential advantages/ disadvantages of revising the SMS rule based on this comment.**

Currently, if any person finds Ecology's SMS rule adoption topics and/or schedule unacceptable, that person may use existing administrative, legislative or judicial relief processes identified in APA, Chapter 34.05 RCW to address these issues. These

procedures enable the public with multiple alternatives to address the perceived need for adoption of needed regulatory change(s).

Above all else, Ecology has established a record of continued coordination and discussion with key stakeholders concerning revision and implementation of the SMS rule. Ecology is not intentionally delaying any revision of the SMS rule and our SMS rule revision plans have continually been shared with the SMS Implementation Committee stakeholders since original rule adoption in 1991. Ecology believes the SMS Implementation Committee is the most appropriate forum to initially identify and discuss needed SMS rule revisions. As in the past, Ecology will provide Implementation Committee stakeholders with current plans, schedule and rationale for revision of the SMS rule.

Comment 4. "Revised WAC 173-204-130(7) to clarify that Ecology will consider new or additional scientific information which is available concerning the efficacy of the existing regulations, including testing protocols, as one of the factors in evaluating the Sediment Management Standards for necessary revisions."

Response: Ecology interprets that the Port of Seattle intended to specifically address revision of bioassay protocols and **all other SMS rule requirements** (emphasis added) based on new or additional scientific information. Simply put, all rule requirements should be judged on "efficacy" using latest scientific knowledge. Ecology understands the term "efficacy" to mean the power to produce effects or intended results. Ecology does not agree that review of all requirements within the rule based on latest scientific knowledge is possible or appropriate. Many of the SMS rule requirements are based in-part on policy, economic considerations or combinations of all three for which simple comparisons to latest scientific methods are not appropriate or possible.

Ecology does agree that the intent of section 130(7) was to address use of latest scientific knowledge to update identified scientific methods in the SMS rule to address improved performance of these methods (please see comment #1 above). The difficulty in using a review of latest scientific methods to update methods in the SMS rule is obtaining scientific agreement on latest and best science, and decision making concerning "the level of acceptable uncertainty" associated with existing and proposed methods. Ecology recommends additional discussion with the SMS Implementation Committee concerning an addition to section 130(7) to address consideration of the efficacy of the scientific methods used in the SMS rule.

WAC 173-204-200 Definitions.

Comment 5. "Added a definition for "moderate adverse effects," the level above which station clusters of potential concern are defined as sediment cleanup sites under the rule."

Response: Ecology's has identified some inconsistency in the Port's definition and use of the "moderate adverse effects" criteria, and a discrepancy with the similarly named endpoint in the SMS rule EIS (Ecology, 1990b). The Port's proposed chemical CSLs do represent the EIS "moderate adverse effects" level, i.e., the HAET. The HAET represents the level at which three of the four 1988 AET biological indicators would show an adverse effect, but not all four. Any chemical level above the HAET would therefore represent a biological condition where all four biological indicators would be expected to be adversely affected.

However, within its recommended revisions to the SMS rule, the Port recommends that a cleanup site be defined as three or more contiguous stations where the chemistry and level of biological effects exceed the CSL. The Port defines that biological effects above the CSL (a cleanup site confirmation), to mean both an acute and a chronic biological test must show an effect. The biological condition that the Port requires for a cleanup site definition most closely corresponds to the SMS EIS "severe effects level," i.e., greater than the HAET where all biological indicators would be expected to demonstrate an adverse effect. The Port's recommended one acute and one chronic biological hit is somewhat inconsistent in comparison to this condition where all biological indicators would be expected to be affected.

At this time, Ecology does not support revision of the definitions for "no adverse effects" or "minor adverse effects" levels currently identified in the SMS rule. As identified in the EIS, Chapter 6: Evaluation of the Alternatives, Ecology continues to support the current SMS rule "minor adverse effects" level (EIS Alternative 2) based on review of:

- Protection of Human Health;
- Protection of the Environment;
- Compliance with ARARs;
- Technical Feasibility;
- Scientific Certainty;
- Cost Effectiveness; and
- Regulatory Precedence.

WAC 173-204-310 Sediment quality standards designation procedures.

Comment 6. "Revised WAC 173-204-310(2)(b) to allow the optional use of benthic community testing as a third tier determinant of sediment quality when evaluating cleanup strategies or undertaking cleanup actions under the rule. In those situations where it is used, sediments with a healthy community would be treated as having no adverse effects even if the sediments had chemical levels above the criteria screening levels and had failed one or more of the bioassay. Ecology would approve the benthic community testing protocols to be used under its alternate technical method authority of WAC 173-204-130(4)."

Response: Ecology believes there are several technical and policy uncertainties that preclude use of benthic community assessment data as a stand-alone third tier biological effects screen, in the near future. Ecology recommends additional discussion of this comment in the SMS IC and in other regional sediment forums, e.g., the SMARM. For additional information on Ecology's response, please see section III.C. Specific Comments - Bioassay / Benthic Community Structure, comment #3.

WAC 173-204-315 Confirmatory marine sediment biological tests.

Comment 7. "Inserted additional protocols to minimize, track, and identify interferences that lead to false positives in bioassay tests as an example in WAC 173-204-315(1) of a proposal for an alternate technical method."

Response: Ecology's response to the same comment in Port of Seattle's comment #2 under section 130 above is repeated below.

Any person may currently propose additional protocols to address the potential for false positives in sediment bioassay within the context of using alternate technical methods approved by Ecology, as required under section 130(4) of the SMS rule. As stated in this Administrative policies section, Ecology does maintain a record of applications for use of alternate technology. Review of this limited record has not identified any request for use of revised bioassay protocols to address the potential for false positives.

When Ecology determines that latest scientific methods necessitate changes to the SMS sediment bioassay protocols, Ecology works to revise the PSEP Protocols, as appropriate, because their use is required by the SMS rule. The recommended change to section 130(4) seems most pertinent to potential revision of the PSEP Bioassay Protocols and inappropriate as a specific change to the policy statement provided in section 130(4). Ecology has identified above (see Bioassay comments), the review of artifact toxicity is most appropriately addressed through use and revision of the current PSEP Protocols. For these reasons, Ecology does not agree with the recommended change to section 130(4), 315(1) or 320(3)..

Comment 8. "Deleted microtox test from WAC 173-204-315(1)(b)(iii) and WAC 173-204-315(2)(e) as an approved chronic effect test because of the great potential for false positives associated with this test."

Response: At this time, Ecology does not recommend any revision to, or deletion of the Microtox[®] test. Ecology understands that national scientific development is ongoing concerning the Microtox[®] test, there are confounding results regionally from use of the test but no apparent scientific consensus, regionally or nationally, concerning recommended changes to the test. The Microtox[®] test is an ecologically relevant, cost effective test and a substantive part of the SMS rule chemical and

biological criteria. Ecology does not consider the concerns with the Microtox[®] test to warrant a revision of the SMS rule, until additional regional and national scientific clarity and agreement is available concerning the use of this test.

As identified in section III.D. Specific Comments - Bioassay / Benthic Community Structure above, the SMS rule requires use of the PSEP Bioassay Protocols, which were revised and updated in 1995. Based on Ecology review of and coordination on the revisions of the PSEP Protocols, we are not aware that potential false positive response in Microtox[®] was mentioned as an issue of concern.

Additionally, Ecology believes the above comment by the Port of Seattle is based primarily on a technical paper: Confounding Issues in Microtox Bioassay recently presented by Jack Word, Battelle Marine Science Laboratory, at the May 1996 SMARM. The paper presented information from a "recent study", *The Toxicity of Sulfur to Microtox from Acetonitrile Extracts of Contaminated Sediments*, 1992 which identified the concern that elemental sulfur in sediments may cause false hit determinations in the organic extract Microtox[®] test. Ecology's review of the SMARM paper raises questions concerning the appropriateness of applying this study's results to the SMS saline extract Microtox[®] test, whether elemental sulfur is found in significant quantity in surface sediments tested by the SMS rule to be of concern and whether additional regional and national peer review on this issue is appropriate.

Interestingly, both the PSDDA and SMS programs have identified that recent performance of the Microtox[®] bioassay on Puget Sound marine sediments has demonstrated insensitivity to contaminant levels that historically have caused an adverse effect (hit) in this bioassay. The reason(s) for this tendency of the Microtox[®] bioassay to show no effects where the historical database (SEDQUAL) would have predicted a Microtox[®] hit are unknown, but suggest one or more interfering factors. But, the key point here is that Puget Sound sediment programs have recently experienced confounding results from the Microtox[®] bioassay that suggest false negative responses, not false positive. It should be noted that the PSDDA program has suspended use of the saline microtox test because of apparent lack of sensitivity and concordance with toxicity responses of the other bioassay in the testing suite.

Confounding the issue of the appropriate use of Microtox[®] are two other key factors. Contrary to the recent nonresponsiveness of Microtox[®] to contaminated Puget Sound marine sediments, Ecology's review and use of Microtox[®] on contaminated freshwater sediments in Washington State has demonstrated good sensitivity/normal response expected from the Microtox[®] bioassay. Of course, the freshwater Microtox[®] test does not use a saline extract of sediments, but rather a distilled, deionized water extract that is osmotically adjusted for the test animal.

Finally, the Azur Corporation (formerly Microbics Corp.) has conducted two recent interlaboratory studies of Microtox[®] which looked primarily at sensitivity of the different extract protocols versus the solid phase test. However, the results of the

studies have not been published to-date. Ecology will continue to coordinate with Azur and work to obtain and evaluate national and regional developments concerning use of the Microtox[®] test for consideration of recommended revisions to the SMS rule.

WAC 173-204-320 Marine sediment quality standards.

Comment 9. "Table 1 to be revised based upon the results of the AET recalculation being performed."

Response. Ecology intends to revise Table I in the SMS rule to take into account updated AET values. However, it is important to understand that the availability of updated AET values will not necessarily result in automatic changes to Table I. Prior to revising Table I, Ecology will evaluate how well the revised chemical criteria predict adverse biological impacts (i.e., sensitivity and efficiency). This is consistent with the approach used in adopting the original sediment chemical criteria in 1991. At that time, Ecology's explained that adoption of sediment quality standards criteria (no effects criteria) would primarily be based on reliability analyses, i.e., the ability to predict adverse biological effects, regardless of the method used to derive the sediment value. Additionally, selection of the SMS regulatory levels sediment criteria, e.g., CSL, were based on review of several considerations as identified in the SMS Final Environmental Impact Statement:

- Protection of Human Health;
- Protection of the Environment;
- Compliance with ARARs;
- Technical Feasibility;
- Scientific Certainty;
- Cost Effectiveness; and
- Regulatory Precedence.

Ecology has begun a process of listing and describing the AET/SMS rule criteria development stages which acknowledges the need for additional implication analyses and policy discussions with members of the SMS Implementation Committee prior to changing the SMS rule based on the new AET values. Coordinated evaluation of the alternatives to change the SMS rule criteria based on the 1994 AETs may be cost and time intensive and may result in additional delays to revisions of the SMS rule. Additionally, due to recent revisions of the APA, Chapter 34.05 RCW rule adoption processes are more complex, in particular to develop cost/benefit studies to support revised regulatory endpoints proposed for adoption.

Ecology maintains its commitment to revise the SMS rule in a manner which focuses on the use of best available science, reliance on rule implementation experience through multiple and diverse statutory authorities and responsiveness to stakeholder

and peer review comments. This commitment will continue to be communicated and coordinated with key stakeholders represented on the SMS Implementation Committee.

Comment 10. "Inserted reference to optional third tier biological community testing in WAC 173-204-320(3)."

Response. Ecology recommends additional discussion of this comment in the SMS IC and in other regional sediment forums, e.g., the SMARM. For additional information on Ecology's response, please see section III.C. Specific Comments - Bioassay / Benthic Community Structure, comment #3, page 47.

Comment 11. "Deleted reference to microtox test in WAC 173-204-320(3)(e) because of the great potential for false positives associated with this test."

Response. Please see response to WAC 173-204-315, Comment #8 above.

WAC 173-204-420 Sediment impact zone maximum criteria.

Comment 12. "Table II to be revised upon the results of the AET recalculation being performed."

Response. While Ecology's work on the 1994 AETs is based strongly on use of the 1988 AET method, we do not agree that is the sole criterion for revision of the chemical criteria within the SMS rule. Ecology has begun a process of listing and describing the AET/SMS rule criteria development stages which acknowledges the need for additional implication analyses and policy discussions with members of the SMS Implementation Committee prior to changing the SMS rule based on the new AET values. Coordinated evaluation of the alternatives to change the SMS rule criteria based on the 1994 AETs may be cost and time intensive and may result in additional delays to revisions of the SMS rule. Additionally, due to recent revisions of the APA, Chapter 34.05 RCW rule adoption processes are more complex, in particular to develop cost/benefit studies to support revised regulatory endpoints proposed for adoption.

Ecology maintains its commitment to revise the SMS rule in a manner which focuses on the use of best available science, reliance on rule implementation experience through multiple and diverse statutory authorities and responsiveness to stakeholder and peer review comments. This commitment will continue to be communicated and coordinated with key stakeholders represented on the SMS Implementation Committee.

WAC 173-204-500 Sediment cleanup decision process and policies.

Comment 13. "Inserted phrase in WAC 173-204-500(1) to clarify that the cleanup

decision process for managing contaminated sediments is under the authority of the state Water Pollution Control Act (ch. 90.48 RCW) and Model Toxics Control Act (ch. 70.105D RCW)."

Response: Ecology agrees that Chapters 90.48 and 70.105D RCW are the principal authorities for managing the cleanup decision process for contaminated sediments. Although the SMS rule cites many additional authorities that provide authority and guidance to Ecology concerning the cleanup decision process, e.g., the Puget Sound Water Quality Authority Act, Chapter 90.70 RCW, Ecology will propose a revision of SMS section 500(1) to cite Chapters 90.48 and 70.105D RCW as principal cleanup authorities.

Comment 14. "Revised WAC 173-204-500(1)(c) to clarify that the cleanup decision process includes ranking, listing and delisting cleanup sites."

Response: Ecology agrees and will propose a rule revision to add listing and delisting to the generic description of the cleanup process in WAC 173-204-500(1)(c). The generic description of the cleanup process identified in WAC 173-204-500(1) will be improved by adding the reference to the listing and delisting cleanup functions which are currently addressed in rule section WAC 173-204-540 Ranking and list of sites.

Comment 15. "Revised WAC 173-204-500(1) to require Ecology to reconduct its hazard assessment to identify sediment cleanup sites and its site ranking each time that the chemical concentration criteria of the rule are modified to reflect the latest scientific knowledge."

Response: Ecology agrees that changes to the criteria will warrant a reevaluation of site identifications and rankings. Once formal changes to the chemical, biological, or other applicable criteria are amended to the rule, Ecology intends to update the Contaminated Sediment Site List, as resources allow. However, Ecology does not support changing the SMS rule to add a requirement for Ecology to complete this action.

Comment 16. "Revised WAC 173-204-500(3) to provide an exception to the cleanup study plan requirements under the rule in those situations where a similar plan has been prepared under the Model Toxics Control Act."

Response: The SMS and MTCA programs within the department are heavily coordinating to ensure that duplication of effort for those involved in cleanup is minimized. We are working to streamline the process. Due to the complexities associated with sediment remediation and the fact that no in-water work can be accomplished without the appropriate state or federal permits, a true MTCA independent cleanup is not applicable. Thus, some MTCA cleanups may meet SMS requirements, but not all MTCA type cleanups can substitute. The department will

develop some draft policies soon to address coordination of various cleanup methods.

The contents of the SMS cleanup study plan and report are such that the document can be integrated into information and decision-making requirements of multiple regulatory authorities. The scope of the cleanup study plan is admittedly broad in order to capture all ranges of contaminated sediment sites. However, Ecology agrees that inconsistencies between the two regulations regarding sampling plans exist. The Port of Seattle has submitted rule language to clarify the requirements for cleanup study plans and reports. In addition to modifying the requirements for cleanup study plans and reports, Ecology will also draft some language for section 100 of the rule which will state that when a site is undergoing a MTCA ordered cleanup, MTCA procedures can be followed as long as the media-specific requirements of the SMS are complied with to appropriately characterize the site and meet sediment cleanup levels. **Ecology is in agreement with many of the suggested rule changes and will develop draft SMS rule language for discussion with the SMS Implementation Committee on the issue of consistency and clarity between the SMS and MTCA Cleanup rules. The changes will make the SMS more consistent and comparable with MTCA.**

Ecology has trained sediment staff who have considerable experience implementing the SMS rule. These staff should be consulted by project proponents to determine how best to resolve inconsistencies between the two rules.

Comment 17. "Added a policy in WAC 173-204-500(4) to require Ecology to focus sediment cleanup actions at the worst sites. Sites will include only those adjacent sediment stations that exceed the Sediment Management Standards regulatory trigger ("cleanup screening level" -- CSL)."

Response. Ecology agrees that we need to prioritize our cleanup efforts and is working to focus and accelerate efforts at the worst sites. To comply with the Sediment Cleanup Workgroup recommendations of December 1994, Ecology's Contaminated Sediment Site List identifies only those sites meeting the hotspot definition. The Workgroup agreed that Ecology would begin using the hot spot approach but only on an experimental basis. Some members of the workgroup strongly disagreed with amending the rule before the method has been proven to work satisfactorily. If it is proven to expedite cleanup and does not neglect areas harmful to the environment that would have been addressed under the traditional clustering method, then the rule will be amended as part of this triennial review process.

Also, please see the response to the same issue identified in IV.F. Cleanup, Comment #12, page 89.

WAC 173-204-510 Identifying sediment station clusters of potential concern.

Comment 18. "Revised section to reflect that the sediment station clusters of potential concern are identified based upon the minimum cleanup levels criteria rather than the cleanup screening levels criteria."

Response: As Ecology understands the Port of Seattle revisions, the MCUL would be used to "screen" station clusters of potential concern for cleanup and this level on a chemical and biological level would remain the same as currently in the SMS rule. Exceptions to this would be that the Port expects revisions to the chemical criteria based on the 1994 AET and exclusion of the Microtox[®] test, both which could substantially change the criteria. Ecology is concerned that these changes and use of the term "minimum cleanup level" as a screening process term need further evaluation. Given Ecology's rejection of the Port's suggested CSL recommendations, (see IV.F. Comment #14, page 90) further evaluation of the Port's changes to all cleanup criteria should appropriately wait for completion of implementation activities, as recommended by the Cleanup Work Group.

WAC 173-204-520 Minimum cleanup levels criteria.

Comment 19. "Revised section to reflect that the sediment station clusters of potential concern are identified based upon the minimum cleanup levels criteria rather than the cleanup screening levels criteria."

Response: Ecology does not support this recommended revision. Please see the response to the comment above.

Comment 20. "Table III to be revised based upon the results of the AET recalculation being performed."

Response: Ecology intends to revise Table III to take into account updated AET values. However, it is important to recognize that the updated AET values will not necessarily result in automatic changes to Table III. Prior to revising Table III, Ecology will evaluate how well the revised chemical criteria predict biological impacts (i.e., sensitivity and efficiency). Ecology has begun a process of listing and describing the AET/SMS rule criteria development stages which acknowledges the need for additional implication analyses and policy discussions with members of the SMS Implementation Committee prior to changing the SMS rule based on the new AET values. Coordinated evaluation of the alternatives to change the SMS rule criteria based on the 1994 AETs may be cost and time intensive and may result in additional delays to revisions of the SMS rule. Additionally, due to recent revisions of the APA, Chapter 34.05 RCW rule adoption processes are more complex, in particular to develop cost/benefit studies to support revised regulatory endpoints proposed for adoption.

Ecology maintains its commitment to revise the SMS rule in a manner which focuses on the use of best available science, reliance on rule implementation experience through multiple and diverse statutory authorities and responsiveness to stakeholder and peer review comments. This commitment will continue to be communicated and coordinated with key stakeholders represented on the SMS Implementation Committee.

WAC 173-204-525 Cleanup screening levels criteria [new].

Comment 21. "Inserted new section to reflect that the sediment cleanup sites are identified based upon a cleanup screening levels criteria set at the "moderate adverse effects" level rather than the "minor adverse effects" level."

Response: Ecology does not agree with the recommended changes to the site identification process or definition of the CSL recommended by this comment. For more detailed discussion, please see section IV.F. Comment #14, page 90 above.

Comment 22. "Table IV to be inserted based upon the "moderate adverse effects" level considered in the Environmental Impact Statement for the Sediment Management Standards (1990) as revised per the results of the AET recalculation being performed."

Response: Same as above

WAC 173-204-530 Hazard assessment and site identification,

Comment 23. "Revised the procedures in WAC 173-204-530(4) to identify cleanup sites. Sites will include only those adjacent sediment stations that exceed the Sediment Management Standards regulatory trigger ("cleanup screening level" -- CSL). Those areas which are not defined as hotspot sites yet pose potential concern (i.e., exceed the sediment quality standards but not the CSL) will be tracked by Ecology for future monitoring and additional characterization."

Response: The Sediment Cleanup Workgroup's final report (Ecology, 1994c) defines hot spots as "the area that exceeds the MCUL (cleanup "trigger")." For the SMS that translates to any station which exceeds the CSL. A hot spot site is one in which all stations included in that site exceed the CSL. Ecology has used the hot spot approach during site identification for the publication of the Contaminated Sediment Site List under direction from the Sediment Cleanup Workgroup (Sediment Cleanup Strategy: An Interagency Overview, Ecology et. al., 1995.) The Workgroup could only reach consensus on this issue by agreeing to not immediately amend the rule to accommodate the hot spot concept. All parties agreed to try the hot spot approach for site identification on a trial basis. Ecology recommends further discussion on this recommendation in the SMS Implementation Committee.

WAC 173-204-540 Ranking, listing and deleting sites.

Comment 24. "Added a provision to WAC 173-204-540(3) to confirm that ranking considerations will be made on a consistent basis using the procedure described in Sediment Ranking System ("SEDRANK"), January 1990, and all additions and revisions thereto or other procedures approved by the department."

Response: WAC 173-204-540(2) defines SEDRANK as the site ranking tool to be used by the department. Ecology can repeat this in the following section for emphasis, as the Port rule language suggests, if warranted and will propose such in the draft rule language.

Comment 25. "Added a provision to WAC 173-204-540(5)(a)(ii) to clarify the types of cleanup authorized under the rule."

Response: The suggested change replaces "voluntary" cleanup with "independent" cleanup. Use of the term independent implies a cleanup under the MTCA definition of independent which is not applicable to sediment cleanup due to the legal requirements for obtaining a Clean Water Act, section 401 Water Quality Certification. Ecology agrees that clarification of types of cleanup is necessary and will recommend draft rule language for consideration by the SMS Implementation Committee. For further discussion please see the section titled "Administrative Options for Pursuing Sediment Cleanup" in the Cleanup Comments portion of the responsiveness summary.

Comment 26. "Added a provision to WAC 173-204-540(6) to clarify that a site may be delisted on the basis of site specific information gathered during field investigations on the site."

Response: Ecology agrees that this section needs expansion and clarification and will propose draft rule language to account for delisting based on further site characterization from field investigations, e.g, natural recovery.

Comment 27. "Added a provision to WAC 173-204-540(6) to recognize the role of natural recovery and providing for delisting when natural recovery is adequately demonstrated."

Response: Ecology agrees that recognition of natural recovery for site delisting is necessary. We will propose rule language stating that recovery may occur without active cleanup, but must be proven with sampling results. Ecology will develop rule changes in subsections 540(6)(a), and (b) as well as include a definition of natural recovery in the definitions section of the rule. We should be careful to understand when natural recovery is actually occurring versus off-site transport of pollutants. The difference between these two processes will be clarified by the proposed definition of natural recovery in the rule.

Delisting of a site from the Contaminated Sediment Site List is appropriate where monitoring or confirmation sampling indicates that a site has achieved the established site-specific cleanup standards. Such confirmatory sampling and reporting, for Ecology's review and consideration for delisting, will be conducted in accord with parts V and VI of the SMS (WAC 173-204-500 to 610).

WAC 173-204-550 Types of cleanup and authority.

Comment 28. "Inserted phrases on section to clarify that cleanups of contaminated sediments can occur under the authority of the state Water Pollution Control Act (ch. 90.48 RCW) and Model Toxics Control Act (ch. 70.105D RCW) as appropriate to the source of contaminants requiring cleanup."

Response: The source of contaminants is only one consideration in determining cleanup authority. There are many other relevant factors which are also accounted for such as: site size, multiple or single media contamination, level of contamination, number of known/unknown liable parties, level of assurance required, amount of public concern, and type of cleanup. (Ecology, 1991). If we acknowledge one factor specifically in the rule, then we should also directly acknowledge all of the other factors. At this time, Ecology recommends no changes to this section of the SMS rule.

Comment 29. "Revised the types of cleanup actions described in WAC 173-204-550(3) to reduce barriers to independent and incidental cleanups and to make the types of cleanup actions described parallel to similar provisions in the MTCA Rules. As revised, these provisions allow for independent cleanups to take place without oversight or guidance from Ecology and incidental cleanups to proceed more independently than they have been able to do in the past."

Response: Ecology acknowledges the need for further clarification and direction on types of cleanup and will be proposing draft rule language to address these needs. Some of the Port's suggestions will be incorporated. For a more detailed discussion of types of cleanup please refer to the section titled "Types of Cleanup" in the Cleanup Comments portion of the responsiveness summary.

Comment 30. "Revised the description of partial cleanup actions in WAC 173-204-550(3)(e) to clarify that such cleanups may occur as part of an incidental cleanup."

Response: Ecology agrees that for interim cleanups, partial cleanups of the "hot spot" should be allowed as long as the interim cleanup does not forego future cleanup options for the remainder of the contaminated site. For interim cleanups, the extent of cleanup required is determined on a case-by-case basis by the site manager, and should not be strictly framed in rule language. Instead, the department is developing a policy and guidance on how to conduct an interim cleanup action. Ecology is in agreement with some of the Port's suggested rule changes and will incorporate them

into recommended draft rule language.

WAC 173-204-560 Cleanup study.

Comment 31. "Revised WAC 173-204-560(1) to provide an exception to the cleanup study plan requirements under the rule in those situations where a similar plan has been prepared under the Model Toxics Control Act."

Response: The contents of the SMS cleanup study plan and report are such that the document can be integrated into information and decision-making requirements of multiple regulatory authorities. The scope of the cleanup study plan is admittedly broad in order to capture all ranges of contaminated sediment sites. However, Ecology agrees that inconsistencies between the two regulations regarding sampling plans exist. Ecology is in agreement with most of the Port's suggested rule changes and will incorporate them into recommended draft rule revisions. The changes will make the SMS more consistent and comparable with MTCA.

The Ecology program which enforces MTCA has trained sediment staff who are intimately knowledgeable with the SMS rule. These staff should be consulted by the project proponent to determine how best to resolve inconsistencies between the two rules.

Comment 32. "Revised WAC 173-204-560(1) to clarify that, although a cleanup study plan and report must be prepared by the person undertaking the cleanup, the department need only review and approve the cleanup study plan and report in the case of department or other person initiated cleanups."

Response: During development of the SMS rule in 1990, the rule development workgroup discussed and acknowledged that for the sediment media, there is no corollary to "independent" cleanup that occurs for example in land-based soil cleanups. This is because Ecology must review all in-water activities under authority of the federal Clean Water Act section 401, Certification, to ensure all proposed in-water activities meet state laws. Ecology does not support changing its current role for certification of in-water activities and plans to continue to review and approve all sediment cleanup plans and reports. Therefore, Ecology does not support the recommended change to the SMS rule.

Comment 33. "Revised WAC 173-204-560(2) through (7) to differentiate more clearly between what is required in a cleanup study plan and cleanup study report, to make the SMS Rule provisions more consistent with those in the Sediment Cleanup Standards Users Manual, and to make the SMS Rule provisions more consistent with similar provisions of the MTCA Rules."

Response: Ecology agrees that the wording in the SMS rule relating to cleanup study plan and report is a bit confusing and will propose rule changes to alleviate the

discrepancies. Ecology is in agreement with many of the Port's suggested rule changes and will incorporate them into the draft rule revisions. The changes will make the SMS more consistent and comparable with MTCA.

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