EPA-1783

Tami Fordham/R10/USEPA/US
08/03/2011 02:41 PM

To delarson08
cc Peg Lane, Sheila Eckman
bcc
Subject Bristol Bay Watershed Assessment - Intergovernmental Technical Review Team

Hi Delores,
If you have any questions about the meeting please let me know.

Thanks - Tami

907-271-1484

----- Forwarded by Tami Fordham/R10/USEPA/US on 08/03/2011 10:40 AM -----

From: Sheila Eckman/R10/USEPA/US
To: tom.crafford@alaska.gov, sharmon.stafford@alaska.gov, michael.daigneault@alaska.gov, ruth.hamilton.heese@alaska.gov, Paul.anderson2@alaska.gov, williams[redacted] bandrew[redacted], lisa.reimers[redacted], newkgkvc[redacted], gandrewjr[redacted], newhalentriba[redacted], tpcrpr[redacted], [redacted] Guy.adema@nps.gov, Paul.burger@nps.gov, Jeff shearer@nps.gov, ann_rappoport@fws.gov, Phil_brna@fws.gov, michael.buntger@fws.gov, Lori_verbrugge@fws.gov, Keith.cox@noaa.gov, Doug.limpensel@noaa.gov, T75murph@plm.gov, michelle.bonnet@alaska.gov, Jean.gamache@nps.gov
Cc: Alan Boraas <ifasb@uaa.alaska.edu>, "Rebecca S Shaftel" <rsshaftel@uaa.alaska.edu>, Bob Seal <rseal@usgs.gov>, catherine knott[Nonresponsive Personal Email Catherine Knott / Ex. 6] Chris Frissell <chris@pacificrivers.org>, Dan Rinella <andjr@uaa.alaska.edu>, Dave Athons <athons.dave@epa.gov>, Gary Sonnevil <sonnevil.gary@epa.gov>, Heather Dean/R10/USEPA/US@EPA, Jenny Thomas/DC/USEPA/US@EPA, Phil North/R10/USEPA/US@EPA, Patricia McGrath/R10/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Rachel Fertik/DC/USEPA/US@EPA, Jeff Frithsen/DC/USEPA/US@EPA, Glenn Suter/CI/USEPA/US@EPA, Sheila Eckman/R10/USEPA/US@EPA, Richard Parkin/R10/USEPA/US@EPA, Gwen_Kittel@natureserve.org, Paul_Burger@nps.gov, Jim Wigington/COR/USEPA/US@EPA, Thomas Fontaine/COR/USEPA/US@EPA, Barbara Butler/CI/USEPA/US@EPA, Doug.Limpinsel@noaa.gov, Cindi Godsey/R10/USEPA/US@EPA, Guy_adema@nps.gov, tobias@uaa.alaska.edu, Gunnar.Knapp@uaa.alaska.edu, John.Duffield@mso.umt.edu, mwiedmer@uw.edu, ann_rappoport@fws.gov, lori_verbrugge@fws.gov, michael_buntjer@fws.gov, Lorraine Edmond/R10/USEPA/US@EPA, Joe Ebersole/COR/USEPA/US@EPA, Kate Schofield/DC/USEPA/US@EPA, Jason Todd/DC/USEPA/US@EPA, Judy Smith/R10/USEPA/US@EPA, Tami Fordham/R10/USEPA/US@EPA
Date: 08/01/2011 02:52 PM
Subject: Fw: Brisol Bay Watershed Assessment Intergovernmental Technical Team Invitation

---

To the Bristol Bay Watershed Intergovernmental Technical Team:

EPA invites you to attend a meeting of the Bristol Bay Watershed Intergovernmental Technical Team. This group of representatives from State and Federal Governmental Agencies and from Tribal Governments is being brought together to provide opportunities for technical input into the Bristol Bay Watershed Assessment being conducted by EPA.

The objectives for this meeting are to provide an update on the assessment and the approach we

are using to evaluate the Kvichak and Nushagak watersheds, and to seek your scientific and traditional ecological knowledge about the environmental conditions in the area and potential risks from large-scale development.

The Meeting

The meeting will be held at the *Inlet Tower Hotel and Suites at 1200 L St in Anchorage* on Tuesday, August 9, from 1 to 5 p.m. and on Wednesday, August 10 from 8 a.m. to 5 p.m. The hotel offers a complimentary 24-hour shuttle from the airport, train or downtown. Driving directions are available at **http://www.inlettower.com/maps-and-directions.htm** This is a working session, not a public meeting, so attendance is limited to invited State, Federal, and Tribal governments. There will be several opportunities for public input on the assessment later in the process.

Background Materials/Preparation

Attached to this message are:

- Guidelines for the Intergovernmental Technical Team
- Meeting Agenda
- Draft Outline of the Assessment
- Conceptual Diagrams – These are samples of diagrams we will be using as a tool to discuss environmental resources, potential stressors to those resources, and the endpoints of concern. (note: will be sent in follow-up email)
- List of Invitees

We will ask for your input on the outline and the conceptual diagrams. Specifically, we will seek your input on whether we have captured the complex relationships in these watersheds and whether we are looking at the correct endpoints for our evaluation. We will also ask if you have any additional information or data that we should consider as we complete the assessment.

Lodging

A block of rooms has been reserved at the Inlet Tower Hotel and Suites for those in our group who will be travelling to Anchorage. The group rate of $140.00 (plus tax) includes an outstanding breakfast buffet. To reserve a room directly, contact Julie North at 907-222-8713 or Scott Lee at 907-222-8711 and mention that you are with the EPA group to get the special rate and complimentary breakfast voucher. If you have requested invitational travel assistance from EPA, please contact Judy Smith at 503-326-6994 for instructions on reserving a room.

RSVP

Please respond to this email message to let us know if you will be attending this meeting. If another representative from your agency or government will attend in your place, please let us know that person's name and contact information. We are looking forward to seeing you next week.

Questions?

Please contact one of the following EPA staff:

Sheila Eckman 206-553-0455, eckman.sheila@epa.gov
Phil North, 907-714-2483, north.phil@epa.gov
Tami Fordham, 907-271-1484, forham.tami@epa.gov
Judy Smith, 503-326-6994, smith.judy@epa.gov

ATTACHMENTS:

072111_IGGT_Guidelines_FINAL.pdf
080111_BB_IGTT_Meeting_Agenda_0809-1011.pdf
BBA Outline 20110801.pdf
080111_Bristol_Bay_Intergov_tech_team_list_Final.pdf

Sheila M Eckman
Bristol Bay Watershed Assessment Project Manager
EPA Region 10 Office of Ecosystems, Tribal and Public Affairs
(206)553-0455

----- Forwarded by Tami Fordham/R10/USEPA/US on 08/03/2011 10:40 AM -----

From: Sheila Eckman/R10/USEPA/US
To: tom.crafford@alaska.gov, sharmon.stafford@alaska.gov, michael.daigneault@alaska.gov, ruth.hamilton.heese@alaska.gov, Paul.anderson2@alaska.gov, williams[redacted] bandrew[redacted], lisa.reimers[redacted], newkgkvc[redacted], gandrewjr[redacted], newhalentriba[redacted], tpcrpr[redacted], tang[redacted] Guy_adema@nps.gov, Paul_burger@nps.gov, Jeff_shearer@nps.gov, ann_rappoport@fws.gov, Phil_brna@fws.gov, Lori_verbrugge@fws.gov, Keith.cox@noaa.gov, Doug.limpinsel@noaa.gov, T75murph@plm.gov, michelle.bonnet@alaska.gov, Jean_gamache@nps.gov
Cc: Alan Boraas <ifasb@uaa.alaska.edu>, "Rebecca S Shaftel" <rsshaftel@uaa.alaska.edu>, Bob Seal <rseal@usgs.gov>, catherine knott[redacted] Chris Frissell <chris@pacificrivers.org>, Dan Rinella <andjr@uaa.alaska.edu>, Dave Athons <athons.dave@epa.gov>, Gary Sonnevil <sonnevil.gary@epa.gov>, Heather Dean/R10/USEPA/US@EPA, Jenny Thomas/DC/USEPA/US@EPA, Phil North/R10/USEPA/US@EPA, Patricia McGrath/R10/USEPA/US@EPA, Palmer Hough/DC/USEPA/US@EPA, Rachel Fertik/DC/USEPA/US@EPA, Jeff Frithsen/DC/USEPA/US@EPA, Glenn Suter/CI/USEPA/US@EPA, Sheila Eckman/R10/USEPA/US@EPA, Richard Parkin/R10/USEPA/US@EPA, Gwen_Kittel@natureserve.org, Paul_Burger@nps.gov, Jim Wigington/COR/USEPA/US@EPA, Thomas Fontaine/COR/USEPA/US@EPA, Barbara Butler/CI/USEPA/US@EPA, Doug.Limpinsel@noaa.gov, Cindi Godsey/R10/USEPA/US@EPA, Guy_adema@nps.gov, tobias@uaa.alaska.edu, Gunnar.Knapp@uaa.alaska.edu, John.Duffield@mso.umt.edu, mwiedmer@uw.edu, ann_rappoport@fws.gov, lori_verbrugge@fws.gov, michael_buntjer@fws.gov, Lorraine Edmond/R10/USEPA/US@EPA, Joe Ebersole/COR/USEPA/US@EPA, Kate

Nonresponsive Personal Email Catherine Knott / Ex. 6

Schofield/DC/USEPA/US@EPA, Jason Todd/DC/USEPA/US@EPA, Judy Smith/R10/USEPA/US@EPA, Tami Fordham/R10/USEPA/US@EPA
Date: 08/02/2011 08:24 AM
Subject: Bristol Bay Watershed Assessment Conceptual Diagrams

Bristol Bay Intergovernmental Technical Team -

Attached to this message are the Conceptual Diagrams which will be used at next week's meeting to discuss the approach to the watershed assessment.

We suggest that those participating in the IGTT meeting start with the overview and summary concerning use of conceptual diagrams as tools for the Bristol Bay Assessment.

BBA Conceptual Diagram Introduction.pdf

The following files are the detailed conceptual diagrams: 1 = construction & operation / water quantity & habitat effects; 2 = construction & operation / water quality effects; 3 = post-closure / water quantity & quality effects; 4 = accidents & catastrophes. Conceptual diagrams 1 & 2 have preliminary identified high priority pathways highlighted. No high priority pathways are highlighted for conceptual diagrams 3 & 4 and we would like input from the Intergovernmental Team on which should be high priority.

If you cannot view or print these diagrams, don't worry. We will have poster-size diagrams at the meeting and will use those for our discussions.

BBA diagram 1_080111.pdf
BBA diagram 2_080111.pdf
BBA diagram 3_080111.pdf
BBA diagram 4_080111.pdf

Sheila M Eckman
Bristol Bay Watershed Assessment Project Manager
EPA Region 10 Office of Ecosystems, Tribal and Public Affairs
(206)553-0455

BRISTOL BAY WATERSHED ASSESSMENT

INTERGOVERNMENTAL TECHNICAL TEAM GUIDELINES

July 2011

Background:

On February 7, 2011 EPA announced initiation of a watershed assessment of Bristol Bay, focusing primarily on the Kvichak and Nushagak drainages. The assessment will characterize the risks of large-scale developments on the Bristol Bay salmon fishery, and evaluate measures to protect the watersheds and ensure the sustainability of that fishery. EPA will conduct this assessment in an open, public format. The overall process will include:

- Collection and evaluation of scientific and technical information;
- Opportunities for tribal, state and federal experts to contribute to and review the information;
- Public meetings; and
- Tribal consultation

Intergovernmental Technical Team:

The Intergovernmental Technical Team is being convened to address the second bullet above. The purpose of this group is to bring together experts with scientific and traditional ecological knowledge who can provide input on the collection and evaluation of scientific and technical information for the assessment. The group will consist of federal and state agency scientists with expertise in watershed management, fisheries, and related fields, as well as representatives of Tribes in the Bristol Bay area who have expertise in watershed management, fisheries, and can provide traditional ecological knowledge.

This group is not part of the public review process, nor does it substitute for Tribal Consultation. Meetings of the Intergovernmental Technical Team are not public meetings and will not be open to the public. There will be opportunities for public input on the draft assessment at a later time in the process. EPA will consult with the Tribes under a separate process.

Principles for the Intergovernmental Technical Team:

1. EPA welcomes and encourages the representatives to share their understanding of the watersheds, including identification of scientific and traditional tribal data and information which may be helpful in our watershed assessment.
2. EPA will convene a meeting of the group by invitation to present our approach to the watershed assessment, results of our initial characterization of the watersheds, and our understanding about the complex ecological and human relationships that exist in the watershed.
3. EPA will provide, at a minimum, an agenda, a draft watershed assessment outline and a draft Conceptual Diagram in advance of the meeting.
4. The meeting will not be open to the public and will be limited to designated governmental agency and tribal representatives.

5. At the meeting, EPA will provide presentations from the EPA technical team and solicit input from the intergovernmental representatives about our assessment, the completeness of our information, additional sources of information, and findings to date.
6. Meetings of the group will be facilitated and will follow an agenda and ground rules designed to provide maximum opportunities for scientific and traditional knowledge input on the watershed assessment. The focus will be on scientific and technical information, not on legal or policy questions.
7. EPA will provide a period of time after the meeting for the participants to submit additional written comments providing technical information, if they so choose. EPA will not provide a formal written response to additional information provided.
8. The Intergovernmental Technical Team representatives are encouraged to share their knowledge and suggestions with the EPA technical team. EPA welcomes and will seriously consider all input about the watershed assessment but has ultimate responsibility for completing an assessment that is scientifically sound.
9. The Intergovernmental Technical Team is not expected to reach consensus recommendations; rather representatives are encouraged to share their professional expertise individually. However, EPA hopes that convening the group together for a productive interchange of ideas about the characteristics and relationships in the watersheds will contribute to a scientifically sound assessment.
10. All written information or data shared by the team members will be part of EPA's open and transparent process, may be used in the assessment and attributed to individuals, and will be publically releasable.

Expectations for Intergovernmental Technical Team Representatives

EPA expects that each federal, state and tribal representative will contribute his/her scientific, professional, and/or traditional knowledge in good faith and on behalf of the entity he/she represents. Representatives are asked to the meeting to present and share their government's scientific, technical and traditional knowledge on the watershed. Representatives are not being asked to provide legal or policy positions on behalf of the entity they represent or on behalf of non-governmental entities (e.g., environmental groups or corporations) they may be associated with directly or indirectly.

In order to ensure an open and transparent process, representatives will be asked to identify any affiliations with non-governmental entities with a stake in the outcome of the assessment so that EPA can understand and/or address any issues that could potentially harm the integrity of the watershed assessment process. As EPA considers input from the representatives, EPA and others associated with the watershed assessment will also be aware of and take into consideration each party's affiliations with other entities.

BRISTOL BAY INTERGOVERNMENTAL TEAM MEETING

August 9 -10, 2011

MEETING OBJECTIVES:

To update EPA's Tribal, State, and Federal partners on the status of the Bristol Bay Watershed Assessment.

To discuss EPA's approach to the assessment and provide opportunities for questions and suggestions.

To check with our intergovernmental partners to make sure that EPA is aware of existing scientific and traditional knowledge that will help inform the assessment.

AGENDA

August 9, 2011, 1 – 5 p.m.

Welcome – Rick Parkin

Ground Rules – Judy Smith

Introductions – Judy Smith, Sheila Eckman, Tami Fordham

Review Agenda – Sheila Eckman

Overview and Purpose of EPA's Bristol Bay Watershed Assessment – Rick Parkin

Break

Introduction to the Conceptual Diagram – Jeff Frithsen, Kate Schofield

Overview of key assessment topics – EPA Technical Team

- **Fisheries** – Dan Rinella
- **Traditional Ecological Knowledge/Culture** – Catherine Knott
- **Economics** – Gunnar Knapp
- **Wildlife** – Ann Rappoport
- **Potential Development** – Phil North

Wrap-up discussion of first day and preview of tomorrow

<u>August 10, 8 – 5</u>

Review Objectives and Ground Rules – Judy Smith

Roundtable discussion – Sheila Eckman, all participants

> **Reflections, questions and thoughts on the conceptual diagram and key assessment topics**

Break

Overview of Conceptual Diagrams and Assessment Effort – Jeff Frithsen, technical team

> **Introduction to conceptual diagrams**
>
> **High priority pathways**

Lunch

Small group discussion on conceptual diagrams and high priority pathways

> **Provide feedback to EPA on approach and assessment information**

Break

Reports from small groups – Judy Smith

Identify follow-up and action items – Sheila Eckman

Concluding remarks – Rick Parkin

Bristol Bay Watershed Assessment Intergovernmental Technical Team - August 2011

Organization	Name	Email	Phone Number
ADEC	William Ashton	william.ashton@alaska.gov	907-269-6283
ADEC	Allan Nakanishi	allan.nakanishi@alaska.gov	907-269-4028
ADNR	Tom Crafford	tom.crafford@alaska.gov	907-269-8690
ADNR	Sharmon Stambaugh	sharmon.stafford@alaska.gov	907-269-0880
ADF&G	Mike Daigneault	michael.daigneault@alaska.gov	907-267-2172
ADL	Ruth Hamilton Heese	ruth.hamilton.heese@alaska.gov	
ADPH	Paul Anderson, M.D.	Paul.anderson2@alaska.gov	907-[redacted]
Curyung	Kimberly Williams	williams[redacted]	907-[redacted]
Ekwok	Bobby Andrew	bandrew[redacted]	907-[redacted]
Iliamna	Lisa Reimers	lisa.reimers[redacted]	907-[redacted]
Koliganek	Herman Nelson	newkgkvc[redacted]	907-[redacted]
Levelock	Greg Andrew, Jr.	gandrewjr[redacted]	907-[redacted]
Newhalen	Raymond Wassillie	newhalentribal[redacted]	907-[redacted]
Nondalton	Jackie G. Hobson, Jr.	tpcrpr[redacted]	907-[redacted]
South Naknek	Trefon Anguson	tang[redacted]	907-[redacted]

Federal Agencies

NPS	Guy Adema	Guy.adema@nps.gov	907-683-6356
NPS	Paul Burger	Paul.burger@nps.gov	907-644-3577
NPS	Jeff Shearer	Jeff shearer@nps.gov	907-644-3682
NPS	Jean Gamache	Jean.gamache@nps.gov	
FWS	Ann Rapporport	ann_rappoport@fws.gov	907-271-2787
FWS	Phil Brna	Phil_brna@fws.gov	907-271-2440
FWS	Michael Buntger	michael.buntger@fws.gov	907-271-3053
FWS	Lori Verbrugge	Lori_verbrugge@fws.gov	907-269-8011
NOAA	Keith Cox	Keith.cox@noaa.gov	907-789-6603
NOAA	Doug Limpinsel	Doug.limpensel@noaa.gov	907-271-6379
BLM	Ted Murphy	T75murph@plm.gov	907-271-4413

* Working with EPA on Watershed Assessment

*
*

*
*
*

*

Using conceptual diagrams as tools for the Bristol Bay Assessment

A conceptual diagram is a visual representation of hypothesized relationships among human activities and the resulting sources, stressors, and responses—basically, it explicitly lays out how you think a system of interest is (or will be) working. These diagrams can be useful tools throughout an assessment, from structuring and clarifying initial brainstorming, to providing a framework for data collection and analysis, to organizing and presenting results.

Development of conceptual diagrams at the beginning of an assessment facilitates explicit, critical thinking about linkages among system components. Because these diagrams are always works-in-progress, to be revised and updated as the assessment progresses and information accumulates, they encourage transparency by providing a window into the assessment process.

Figure 1 provides a diagrammatic overview of the Bristol Bay Assessment. The assessment focuses on how environmental impacts associated with mine construction, operation, and long-term management (i.e., post-closure activities and maintenance) may affect salmon and resident fishes; effects on wildlife and human populations will be assessed in terms of fish-mediated impacts, although direct effects are recognized (dashed lines). We currently are developing four conceptual diagrams for mine life stage (mine construction & operation; post-closure management) and impact type (water quantity, sediment, and physical habitat; water quality) combinations, as well as a diagram illustrating potential effects of low probability but high impact accidents.

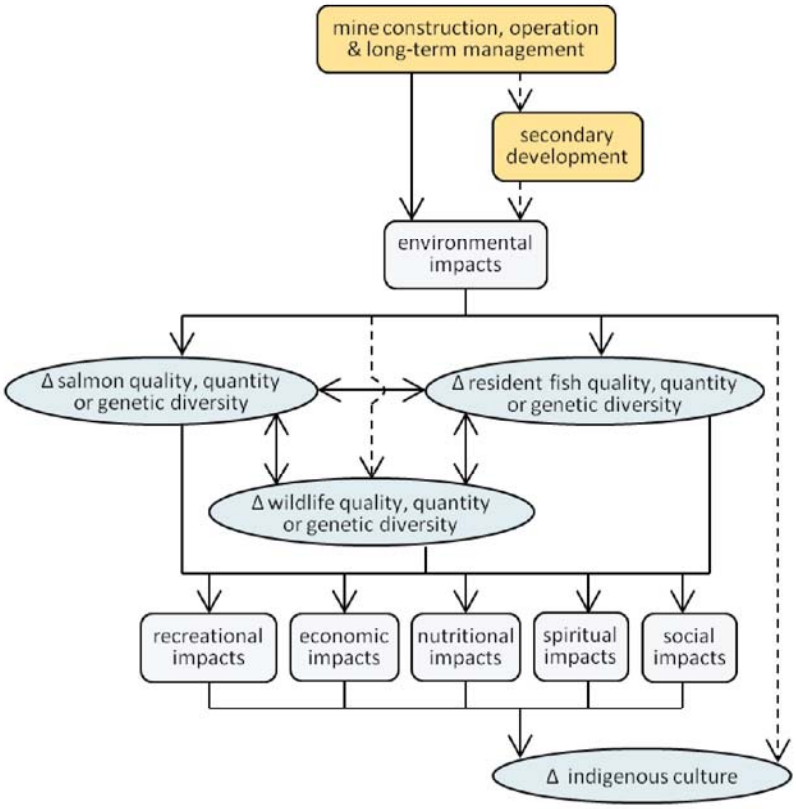
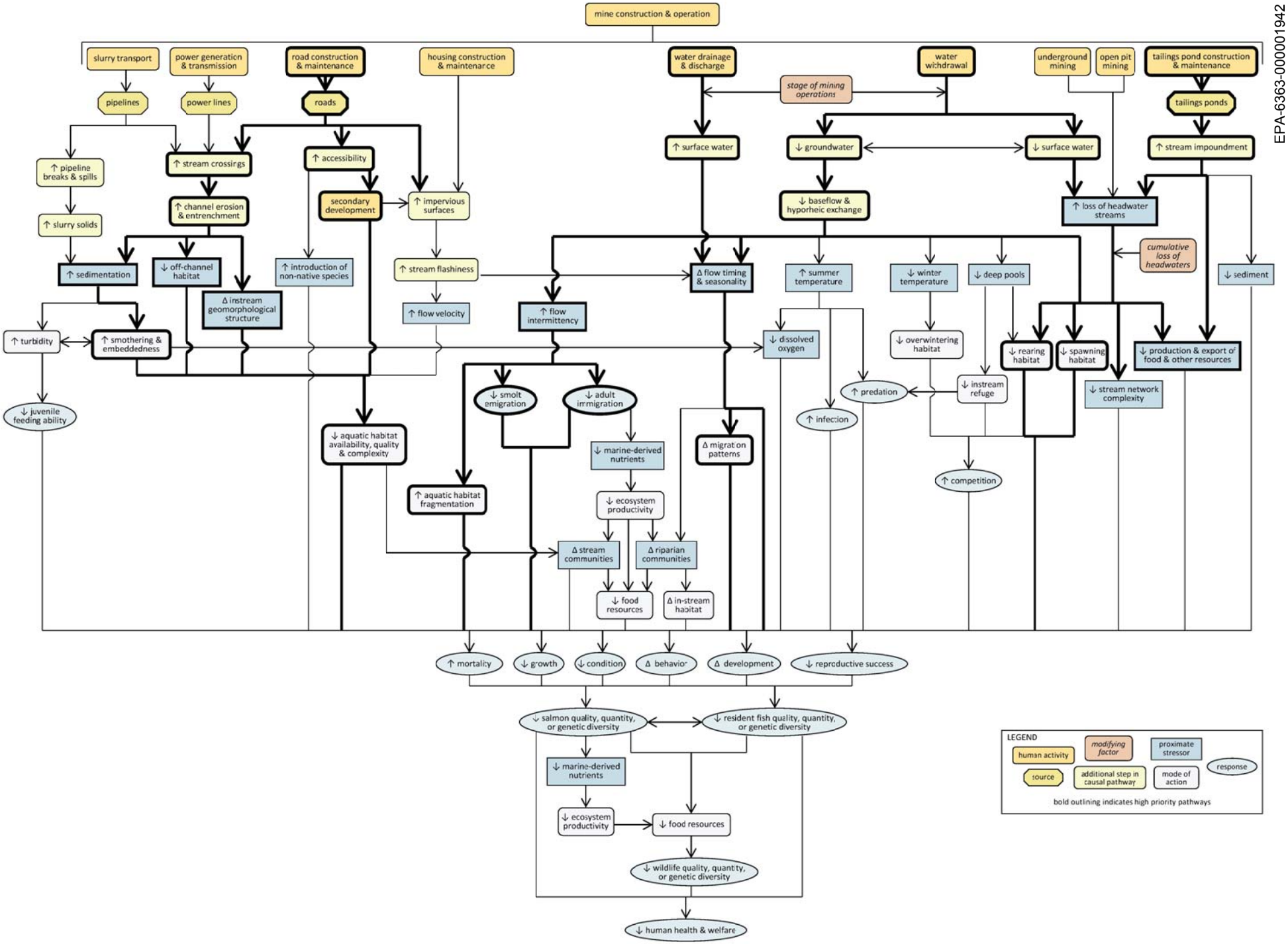


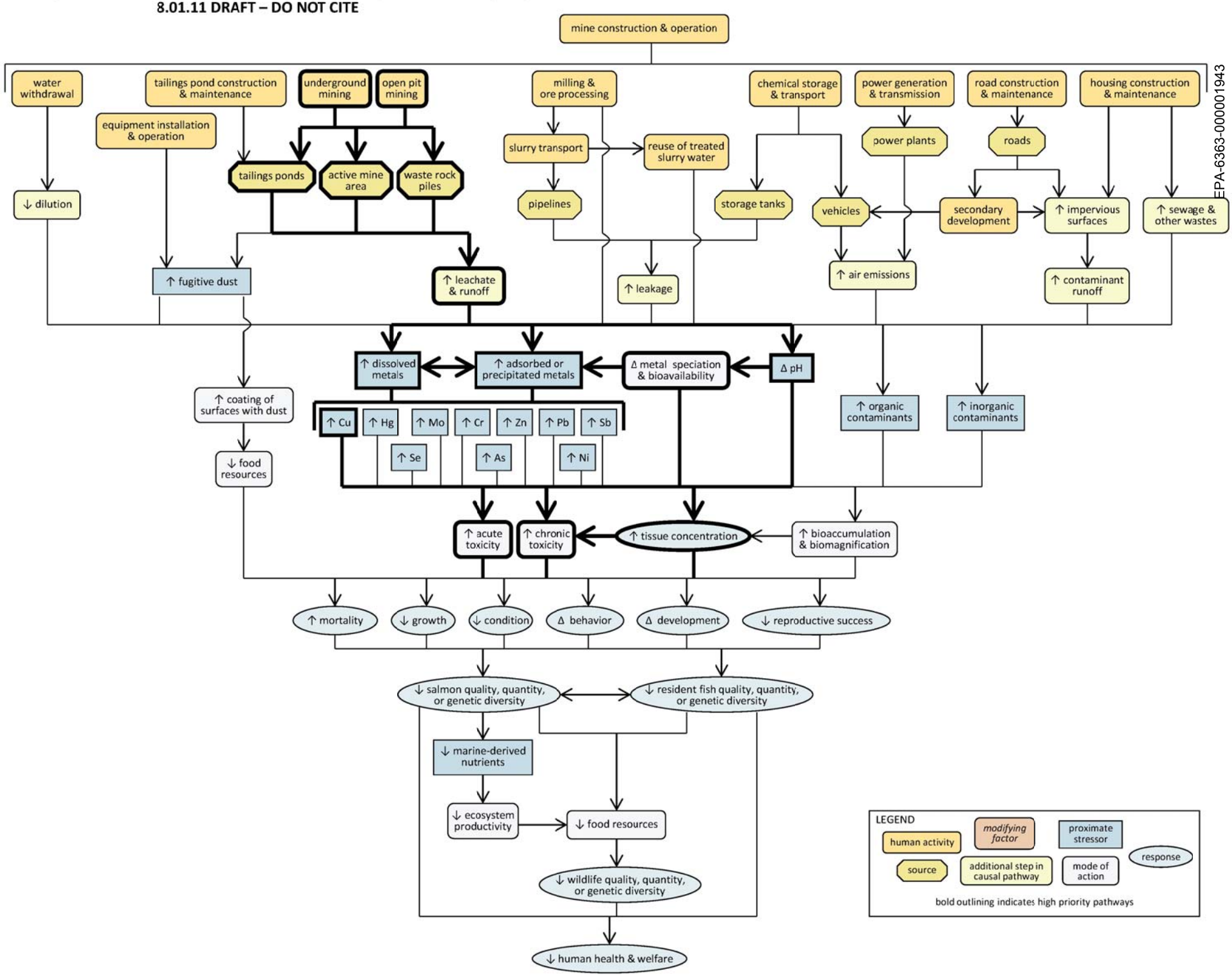
Figure 1. An overview of key components of the Bristol Bay Assessment (solid lines indicate focal pathways for the assessment).

Environmental impacts of mining in Bristol Bay: construction & operation, habitat effects
8.01.11 DRAFT – DO NOT CITE



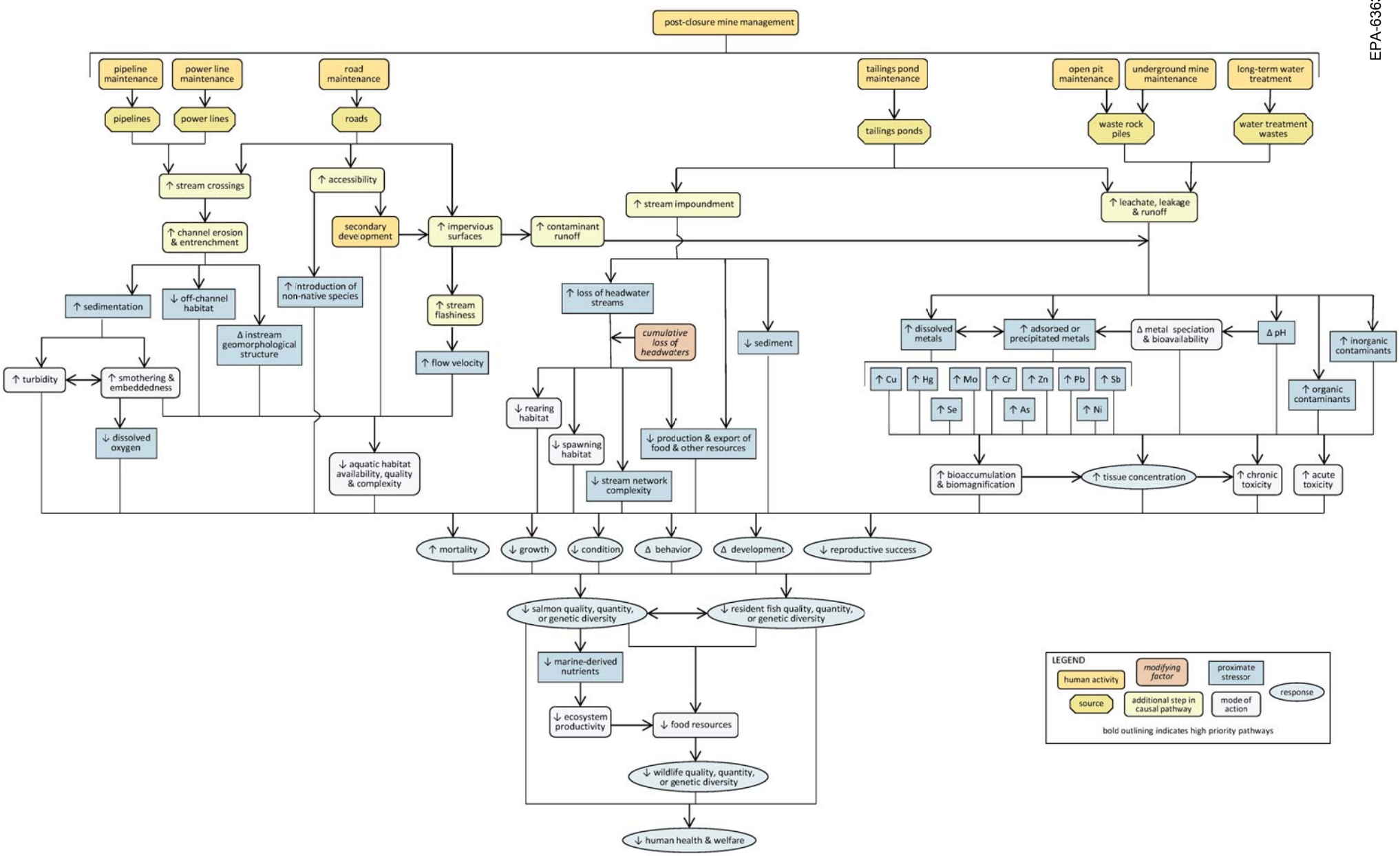
EPA-6363-000001942

Environmental impacts of mining in Bristol Bay: construction & operation, water quality effects
8.01.11 DRAFT – DO NOT CITE

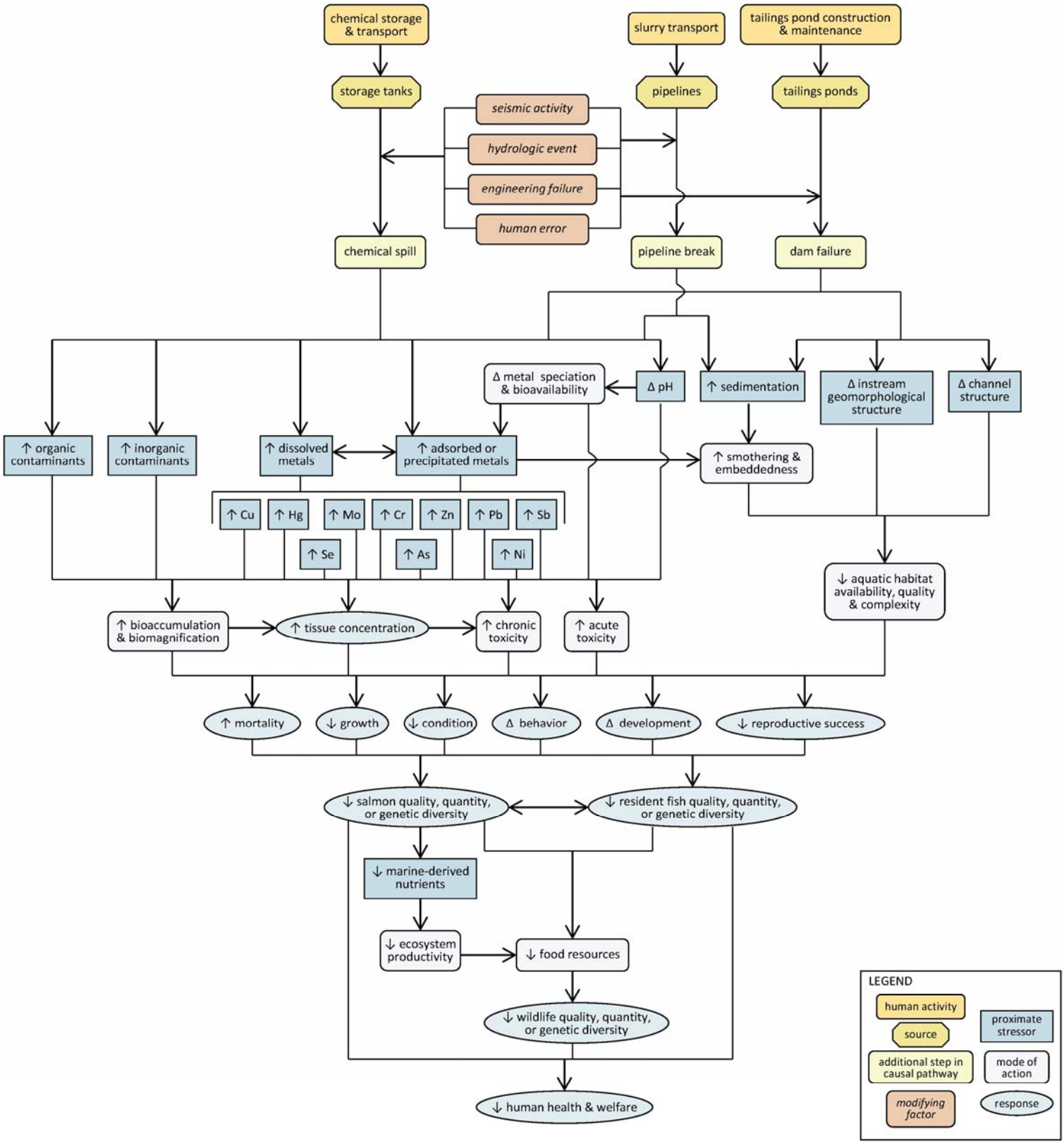


EPA-6363-000001943

Environmental impacts of mining in Bristol Bay: post-closure, water quantity/habitat & water quality effects
8.01.11 DRAFT – DO NOT CITE



EPA-6363-000001944


chemical storage & transport
slurry transport
tailings pond construction & maintenance
storage tanks
pipelines
tailings ponds
seismic activity
hydrologic event
engineering failure
human error
chemical spill
pipeline break
dam failure
Δ metal speciation & bioavailability
Δ pH
↑ sedimentation
Δ instream geomorphological structure
Δ channel structure
↑ organic contaminants
↑ inorganic contaminants
↑ dissolved metals
↑ adsorbed or precipitated metals
↑ smothering & embeddedness
↑ Cu
↑ Hg
↑ Mo
↑ Cr
↑ Zn
↑ Pb
↑ Sb
↑ Se
↑ As
↑ Ni
↓ aquatic habitat availability, quality & complexity
↑ bioaccumulation & biomagnification
↑ tissue concentration
↑ chronic toxicity
↑ acute toxicity
↑ mortality
↓ growth
↓ condition
Δ behavior
Δ development
↓ reproductive success
↓ salmon quality, quantity, or genetic diversity
↓ resident fish quality, quantity, or genetic diversity
↓ marine-derived nutrients
↓ ecosystem productivity
↓ food resources
↓ wildlife quality, quantity, or genetic diversity
↓ human health & welfare
LEGEND
human activity
source
proximate stressor
additional step in causal pathway
mode of action
modifying factor
response

Draft Outline for the Bristol Bay Assessment

The following is a draft outline for the USEPA's Bristol Bay Assessment. The objective of this assessment is to evaluate how future large-scale mining development projects may affect water quality and Bristol Bay's salmon fishery. The geographic scope of this assessment is focused on the Nushagak and Kvichak watersheds of Bristol Bay.

The overall assessment represents an integration of several types of assessment efforts, defined immediately below and represented in the draft outline which follows. The first component is an assessment of condition. This resource characterization (Sections II and III of the outline), synthesizes current conditions within the watersheds of Bristol Bay and determines that condition relative to comparable regional or other reference conditions. The characterization assessment is focused on determining if the Nushagak and Kvichak watersheds of Bristol Bay represent an exceptional resource that might be worthy of special protection. If determined to be an exceptional resource, the characterization assessment will identify those factors in the watershed that make it an exceptional resource. The characterization assessment thus identifies what must be protected to retain an exceptional status.

The second component of the assessment is a predictive risk assessment. It is devoted to estimating the effects of mining on salmon and other non-salmon fish and on the wildlife and humans who benefit from them, based on a generic mining scenario. It is organized on the established Agency frameworks for ecological and cumulative risk assessments. The proposed mining scenario represented in Section IV of the outline, and the results of the predictive risk assessment are provided in Sections V and VI. Risk Characterization (Section VI) includes uncertainties and cumulative risks.

EPA-6363-000001946

Bristol Bay Assessment Outline

Introduction (including prologue and background)

I. Problem Formulation
- Region of Concern
  - Physical environment
  - Ecosystem types and biota
- Reference Regions
  - Fraser River Watershed
  - Others
- Assessment Endpoints
  - Salmon production, genetic diversity and quality
  - Other fish production and quality
  - Wildlife abundance
  - Indigenous culture
- Conceptual Model

II. Characterization of Current Condition
(**Status** is the quality or quantity of the resource or human cultural attribute relative to others such as the Fraser River basin. That is, is it unique or outstanding in some way? **Cause** is the cause of that status. That is, what about Bristol Bay results in its unique or outstanding properties? For example, the abundance and quality of lake habitats cause it to be the largest Sockeye fishery.)
- Salmon
  - Condition
  - Status
  - Causes
- Other Fish
  - Condition
  - Status
  - Causes
- Wildlife
  - Condition
  - Status
  - Causes
- Marine Mammals
  - Condition
  - Status
  - Causes
- Indigenous culture
  - Condition
  - Status
  - Causes
- Economy
  - Condition

EPA-6363-000001947

- Status
- Causes

III. Generic Large-Scale Mining Development Scenario
- Mining
- Waste rock disposal
- Tailings disposal
- Roads
- Pipelines
- Ore processing
- Water withdrawal
- Water addition
- Onsite power generation
- Activities not included
  - Underground mining (tunneling)
  - Offsite power generation
  - Port
  - Secondary development (developments prompted by mine development but not by the mine operator)

Accident and Failure Scenarios
- Tailings pond leakage
- Tailings pond failure
- Pit lake acidification
- Pipeline failure
- Chemical or fuel spill

Assessment Endpoints
- Salmon production, genetic diversity and quality
- Other fish production and quality
- Wildlife abundance
- Indigenous culture

IV. Risk Assessment Analysis—Routine Operations

Salmon and other fish
- Physical footprint
- Hydrology and Stream Habitat Alteration
- Water quality

Wildlife
- Responses to effects on fish

Human health, welfare and culture
- Responses to effects on fish

EPA-6363-000001948

V. Risk Assessment Analysis—Accidents and Failures
- Salmon and other fish
  - Tailings pond leakage
  - Tailings pond failure
  - Pit lake acidification
  - Pipeline failure
  - Chemical spill
- Wildlife
  - Responses to effects on fish
- Indigenous culture
  - Responses to effects on fish

VI. Risk Characterization (organized by identified endpoints)
- Salmon
- Other fish
- Wildlife
- Indigenous culture

VII. Cumulative impacts (qualitative, including secondary development)

VIII. References

EPA-6363-000001949