

Report of the Exposure Scenarios Task Force

Sponsored by the
Hanford Advisory Board, U.S. Department of Energy,
U.S. Environmental Protection Agency, and Washington
Department of Ecology



Submitted to:
U.S. Department of Energy
U.S. Environmental Protection Agency
Washington Department of Ecology

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From The Hanford Exposure Scenario Task Force Steering Group,

What follows in this document is our report of a remarkable effort to begin dealing with some fundamental questions associated with the cleanup of the Hanford site. A large, diverse group of people: the Hanford Advisory Board Exposure Scenario Task Force, met over a seven month period to begin considering how clean is clean enough at Hanford. They did this by looking at the process of conducting risk assessments and developing exposure scenarios for Hanford.

The discussions were sometimes very technical, sometimes very philosophical, but always interesting and illuminating. What you will find in this report are our summaries of those discussions, and in the appendices, detailed meeting notes. What you won't find in this report is the definitive answer to the question: how clean is clean enough? Much more public discussion needs to occur before we have that answer. This report does not represent any kind of consensus advice. It is solely a record of the proceedings of this task force over the period that it met.

With as many as 100 people participating in these meetings, there was a tremendous amount of behind the scenes preparation, involving many people, necessary to make this effort a success. Acknowledgments should go first to the Tri-Party Agreement agencies: the Department of Energy, the Environmental Protection Agency, and the Washington Department of Ecology for sponsoring this effort in response to a request from the Hanford Advisory Board. In particular, we'd like to recognize Dennis Faulk of the Environmental Protection Agency, and John Price of the Washington Department of Ecology for being this task force's champions with the Tri-Party Agreement agencies when they were understandably skeptical. Individual acknowledgements also go to Barbara Wise of Fluor-Hanford whose incomparable organizing skills and encyclopedic knowledge of who's who at Hanford and Hanford history were invaluable; and to Mike Goddu, of Goddu, Henderson and Judson, whose firm, skillful facilitation was essential in making these meetings successful. The imagination, facilitation abilities and administrative skills of Lynn Lefkoff and Ruth Siguenza of Enviroissues were also crucial to the success of this task force.

Hanford cleanup is progressing, and we are now beginning to come to grips with the big questions that have to be answered to complete this immense environmental restoration. In this document, you will gain some insight into stakeholder values concerning risk assessment and exposure scenarios and, we hope, you will find the first conversations in what will be an important, detailed and on going dialog on these critical issues.

To quote Winston Churchill, "This is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning."

Sincerely,

The Hanford Advisory Board Exposure Scenario Task Force Steering Group:


Doug Huston


Gariann Gelston


Greg DeBruler

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History

The Hanford Nuclear Site was the first and the primary plutonium production facility for the United States' nuclear weapons program. Nine reactors, four chemical separations plants, various plutonium processing facilities, and 177 underground high-level nuclear waste tanks made up the heart of the complex which began operations in 1944. Over two thirds of the nation's estimated 111 metric tons of plutonium was produced at Hanford.

Irradiating uranium targets in the neutron flux of reactors produces plutonium. This causes some of the uranium in the targets to absorb a neutron and then radioactively decay to plutonium. After being irradiated, the targets were removed from the reactors and dissolved in corrosive chemicals as the first step in extracting the plutonium. More chemicals were added to separate the plutonium from the other dissolved irradiation products. The plutonium was then further processed to purify it and shape it properly for weapons use.

This production process generated large amounts of radioactive and chemically hazardous wastes. Between the start of operations in 1944 and the completion of fuel reprocessing in the late 1980's, more than 450 billion gallons of radioactive and chemical waste was discharged to the soil. 54 million gallons of liquid high-level radioactive wastes were sent to underground storage tanks. Millions of curies of these radioactive wastes and other radioactive materials remain in facilities, storage tanks and in the soil and groundwater. Hanford has 60 percent of the volume of the nation's military high-level radioactive wastes. Over 1,400 waste sites containing liquid and solid wastes have been identified at Hanford.

In 1989 the Hanford Federal Facility Agreement and Consent Order was signed by the Department of Energy (DOE), the Environmental Protection Agency (EPA) and the Washington Department of Ecology (Ecology). Most commonly known as the Tri-Party Agreement, this document created a schedule for cleaning up the contamination left behind by the years of plutonium production. The Tri-Party Agreement is a legally binding document requiring the Department of Energy to comply with state and federal laws. The major laws governing clean up are the Resource Conservation and Recovery Act, the Model Toxics Control Act, and the Comprehensive Environmental Response, Compensation and Liability Act.

Another important aspect of the shift from operations to cleanup was the initially small, but steadily increasing involvement of the public in Hanford matters. The Tri-Party Agreement contains a public involvement plan. The goal of this plan is to allow the public to be partners in the decisions being made about cleanup at Hanford.

One of the first large-scale, organized public involvement efforts at Hanford was the Future Site Uses Working Group. Organized by the Department of Energy in 1992, the Future Site Uses Working Group was convened:

- To identify a range of potential uses for the Hanford Site,

- To select appropriate cleanup scenarios necessary to make these future uses possible after cleanup,
- To look for common themes among the Group's cleanup scenarios that could be useful in focusing or conducting the cleanup of Hanford.

Composed of a diverse set of regional stakeholders, this group met for a year and produced a report that is still referred to when the Tri-Party Agreement agencies are making cleanup decisions for Hanford.

Following the Future Site Uses Working Group, the Department of Energy created the Tank Waste Task Force. This group was formed to provide:

- principles relevant to Hanford cleanup, and
- values specific to the implementation of the Tank Waste Remediation System.

The Tank Waste Task Force's work was instrumental in making the decision to vitrify the 54 million gallons of high level waste in the tanks.

Under the Federal Advisory Committee Act of 1972, DOE chartered the Hanford Advisory Board in 1994. This group is tasked with providing continuing advice on stakeholder values to the agencies responsible for Hanford cleanup. Operating by consensus, the Hanford Advisory Board brings together many diverse local and regional interests to tackle the difficult issues associated with cleaning up nearly 50 years worth of radioactive and chemical wastes. Through its five committees, the Board works to gain an in depth understanding of cleanup issues and provide meaningful advice. Over its eight-year history, the board has produced over 100 individual pieces of consensus advice.

Why an Exposure Scenarios Task Force?

By the summer of 2001, Hanford cleanup had progressed to the point that the Department of Energy and its regulators were ready to consider post-cleanup exposure scenarios. An exposure scenario is a set of conditions under which people or wildlife could come into contact with radioactive or chemical waste. Based on the amount of waste assumed to be present in the scenario and the conditions under which the people or wildlife are exposed, an exposure dose is calculated. From these calculated exposure levels, risks can be assessed and long-term decisions made about the level of cleanup. As much as possible, exposure scenarios attempt to capture likely post cleanup activities by humans and wildlife. For example, an Inadvertent Intruder Exposure Scenario calculates the radiation and chemical exposure to a person, persons, or animal who might inadvertently come into contact with radioactive or chemical waste. The Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation and Liability Act, and the Model Toxics Control Act either directly or indirectly require the development of exposure scenarios.

In September of 2001, DOE and its regulators presented to the Board a jointly signed letter outlining nine priority areas for the Board to focus on in the coming months:

1. Central Plateau End States
2. River Corridor and Hanford 2012 Plan negotiations
3. Ecological and Baseline Risk Requirements
4. Canyon Disposition Initiative
5. Groundwater Issues
6. Public Involvement
7. Integrated Safety Management System
8. Long Term Stewardship
9. Tank Waste.

Most of these items were already part of Board committee work plans. However, priorities #1, Central Plateau End States; #3, Ecological and Baseline Risk Requirements; and #8, Long Term Stewardship either had no home or called for increased focus.

Following the presentation of the letter by the TPA agencies, the Board held its first discussions on the need for stakeholder input to the process of developing exposure scenarios and conducting risk assessments. These have always been somewhat controversial issues among Hanford's stakeholders, with a wide divergence of opinion as to what is an acceptable risk, what exposure scenarios should be developed, and what constitutes appropriate public input to this process.

Dealing with these questions at this time proved just as difficult. The Board struggled with how to provide the agencies with the input requested. As an interim measure, and to deal with the agencies' urgent request for advice on the 100 and 300 Areas' Tri-Party Agreement Milestone Change Package, the Board created an Ad-Hoc Task Force that met in January of 2002. This Task Force's charge was to develop Board advice on the 100 and 300 Area change package, and make a recommendation to the Board on how to deal with the exposure scenario/risk assessment question. This task force produced advice on the 100 and 300 Area Change package and recommended the creation of another special task force to deal with exposure scenarios and risk assessment. This advice and recommendation were presented to the Board at its February 2002 meeting, where both were adopted.

The Hanford Advisory Board Exposure Scenarios Task Force (Task Force) was to contain a broad spectrum of Hanford stakeholders, both Board and non-Board members. The TPA agencies agreed with the Board proposal and began putting the Task Force together. Three Board members were appointed by the Board as a steering group: Greg deBruler of Columbia Riverkeeper, Gariann Gelston of Pacific Northwest National Laboratory, and Douglas Huston of the Oregon Office of Energy.

Task Force Process

The Task Force had a very specific charter: develop a compilation of stakeholder values about possible exposure scenario development and risk assessment. The Board members on the Task Force were additionally charged with developing Board advice on risk assessment and exposure scenarios should areas of consensus emerge during the Task Force proceedings. The Task Force was instructed to address the most urgent need, Hanford's Central Plateau, first, then move on to addressing the site's River Corridor.

During the five months the Task Force met, members discovered, to their surprise, they share many common ideas and visions for the post-cleanup future of Hanford. Early, frequent and continuing public involvement in the risk assessment and exposure scenario development process was a common theme throughout the meetings. The need for exposure scenarios to be dynamic over time, to consider/calculate risks for as long as the waste remains hazardous, to be conservative, and to consider all reasonably foreseeable uses of the areas in question were also commonly expressed values. Much discussion of long-term stewardship issues also occurred, with the commonly expressed desire that planning for this activity begin now and that it involve a long term, continuing human presence as a way to maintain knowledge and perpetuate understanding of the continuous risks posed by Hanford wastes. Finally, there was a lot of concern voiced over not seeing/understanding a comprehensive groundwater cleanup strategy. This was a major concern to almost all the Task Force members.

This Task Force represents a major milestone in the history of Hanford cleanup. A diverse group of Hanford stakeholders met in intense discussion over a period of five months. During these five months this group tackled some difficult questions, such as: What will Hanford look like when cleanup is done? How do we ensure that the cleanup we have done will be protective of the environment, human health and the health of generations of people, plants, and animals for as long as the waste remains hazardous? We are providing the results of these discussions to the Tri-Party Agencies so they can create exposure scenarios, and do risk analyses that are reflective of the sensitivities, values, and principles voiced by a broad cross section of Hanford's stakeholders as represented by this Task Force.

This report contains a summary of the various discussions held by the Task Force and appendices which contain copies of the Hanford Advisory Board advice developed by the board members on the Task Force, and detailed Task Force meeting notes and information. The two pieces of Board advice represent a consensus of the entire Hanford Advisory Board on the topics of exposure scenarios, cleanup levels and risk. The appendices provide the entire diversity of views of the Task Force and represent the whole range and depth of the discussions and stakeholder concerns, ideas, and values, through flipchart notes and other meeting materials. Contained in this detailed information are many unique and innovative ideas and suggestions. We urge the agencies to refer to both the consensus advice and the detailed information as they work on the important task of determining what exposure scenarios and risk assessments

should be done. We also urge the agencies to seek new opportunities to continue the dialog begun with this Task Force.

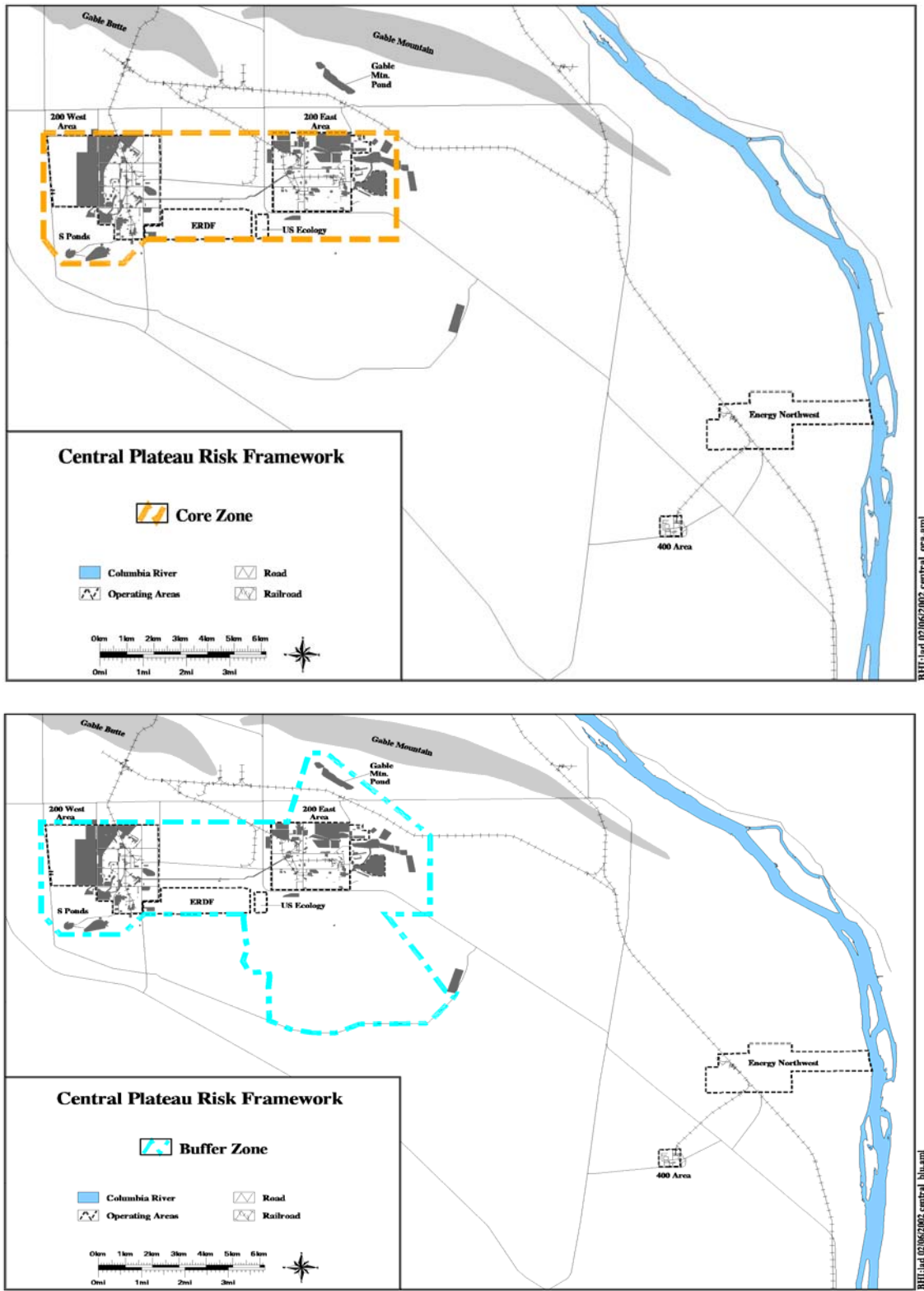
Beginning with the Future Site Uses Working Group, progressing through the Tank Waste Task Force, to the Hanford Advisory Board, to the Hanford Exposure Scenario Task Force, it is possible to glimpse the steady, slow progress of the environmental restoration of Hanford. We have taken another step along that long, difficult road. We urge the Tri-Party Agencies and Hanford's stakeholders to continue this journey with energy and purpose.

Central Plateau Workshops

The Central Plateau is one of the most contaminated sites in the Western Hemisphere and sits at the center of the Hanford site. This area contains the site's former chemical processing plants and waste management facilities. The 200 East and 200 West Areas are part of the plateau, as is the Environmental Restoration Disposal Facility, a solid waste disposal facility. The 200 Areas were used to process, finish, and manage plutonium and other radioactive materials. About 450 billion gallons worth of solid and diluted liquid wastes (radioactive, mixed, and hazardous substances) were disposed in trenches, ditches, and in a landfill. More than 800 waste disposal locations have been identified in the 200 Areas. The Central Plateau also contains 177 underground storage tanks containing about 53 million gallons of liquid high-level radioactive waste, sludge and saltcake. Over 1 million gallons of tank waste has leaked into the soil and has impacted groundwater.

Current plans for the Central Plateau call for the vitrification of the tanks' contents, cleanup of the other chemical and radioactive waste sites, and creation of a core zone which will be a long term waste management area, and a buffer zone around this core zone. Figure 1 shows the Central Plateau proposed core and buffer zones.

Figure 1. Central Plateau Proposed Core Zone and Buffer Zone.



The Task Force held its first meeting to discuss the Central Plateau on the 12th and 13th of March, 2002. Over 100 people attended these two sessions. Attendees included both Board members and non-Board members. (For a list of attendees, see Appendix IV.) Because of the potentially large number of attendees who would not be familiar with Hanford Central Plateau issues, the first day consisted primarily of presentations on the history of the site and the cleanup efforts. The Task Force heard presentations from the Tri-Party agencies on the history of Hanford operations, the regulatory basis for doing exposure scenarios and the proposed risk framework for the Central Plateau post-cleanup condition.

Presentations were given by:

- Dennis Faulk, EPA - Background of the Hanford site.
- John Price, Ecology - Exposure scenarios and their drivers, i.e. Comprehensive Environmental Response, Compensation and Liability Act, Resource Conservation and Recovery Act, and Model Toxics Control Act.
- John Price, Ecology, and John Morse, Department of Energy - The current risk framework and the assumptions being used.
- Jim Daily, Department of Energy - Institutional Controls and Long-term Stewardship.
- Kevin Clarke, Department of Energy - Trust Responsibility of the United States Government to enforce Native American Treaty rights and manage Native American resources.
- Pete Knollmeyer, Department of Energy - The history and legacy of the waste in the Central Plateau and an update on the Cleanup, Constraints, and Challenges Team process.
- John Morse, Department of Energy - Groundwater waste operable units.
- Stuart Harris, Confederated Tribes of the Umatilla Indian Reservation - Native American Exposure Scenarios.

A discussion of general values began near the end of the first day. Task Force members participated in several exercises designed to give each member time to discuss what is important to her/him about Hanford and its cleanup. For example, Task Force participants were asked to comment on the Department of Energy's proposed timeline that was posted at the front of the room. There was a lot of discussion among the Task Force members on this timeline, with many people expressing disagreement with the times indicated.

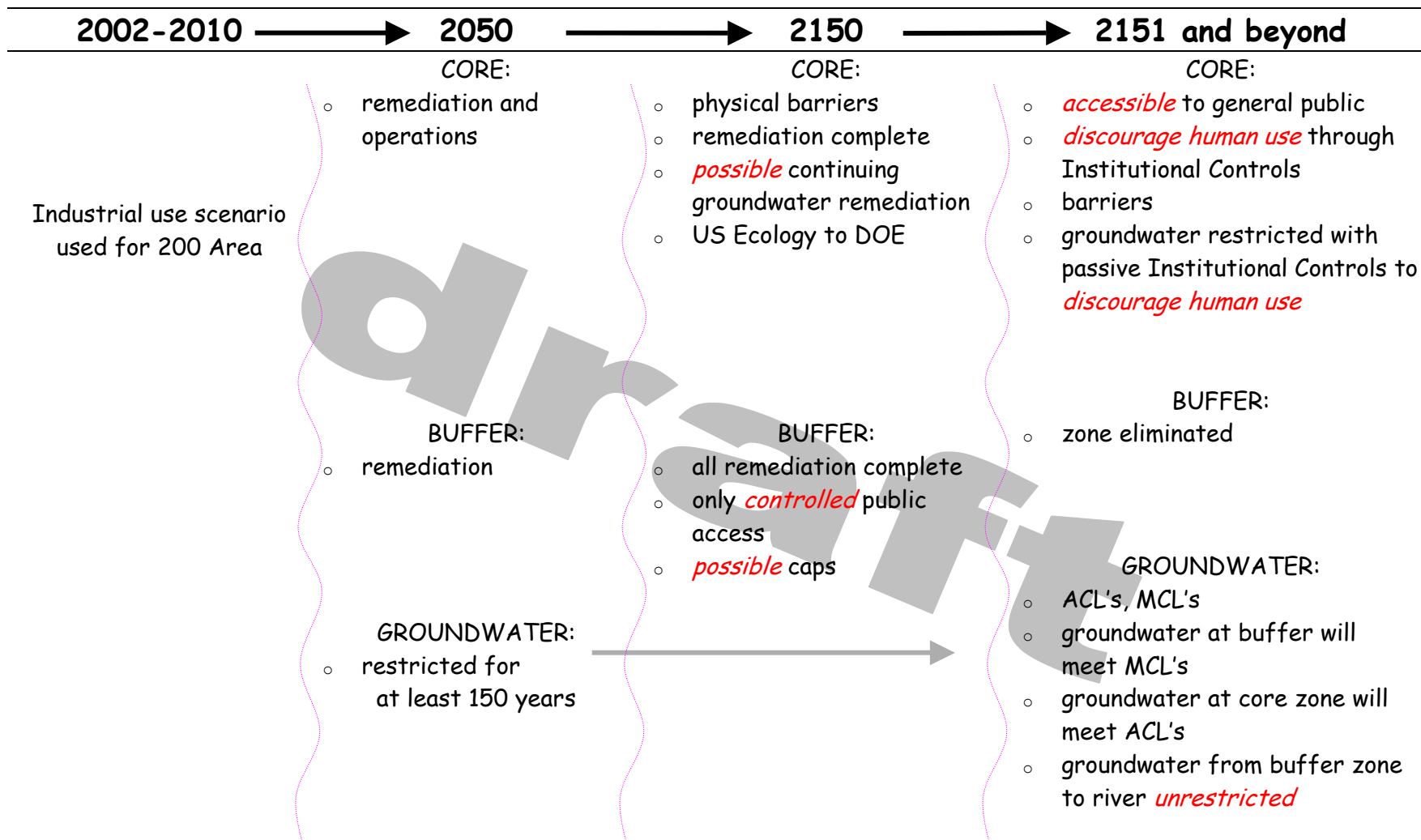
Some of their comments on this timeline were:

- Compliance means at the point of release into the groundwater. Vadose zone contamination must be removed to prevent further groundwater degradation. Waiting 150 years is unacceptable.
- Treaty rights means we have full use of all sustenance resources. Groundwater is a key resource. This timeline is unacceptable.

- The buffer zone should go away and the groundwater is unrestricted sometime in the future but with the emphasis on as soon as possible.
- Groundwater needs to be cleaned up by 2012/2018, set a deadline and enforce it.
- Need a plan to eliminate the need for institutional controls.
- All transuranic waste treated by 2020.
- Time factors are important at Hanford; contamination there at 150 years will be gone by 300 years.
- There is uncertainty about what kind of wastes will be in the environment. May need to re-visit exposure scenarios along with technology.

This proposed timeline is shown in Figure 2.

Figure 2. US DOE's Proposed Timeline for 200 Area Remediation



Note: Items in *italics* indicate areas for further definition/discussion

Another exercise involved a round table discussion where each participant was allowed to speak for a few minutes on what was important to him or her in doing risk assessments and developing exposure scenarios. Some examples of these comments are:

- Protect all citizens.
- Protect the health of the Columbia River and everything that lives near it.
- Make it safe for Tribes to exercise treaty rights.
- Hanford is only one part of the Department of Energy complex.
- It is important to see the whole picture and totality of the waste.
- Stay open to new, better technology.
- Humans are not the only impacted entity.
- Consider equity across generations.

The second day of this meeting was devoted to continuing the dialogue started at the end of the first day, including a discussion about values specific to proposed cleanup timelines and geographic areas. Some highlights of the topics discussed and some of the comments follow:

Assumptions

- Don't assume the site has to be sacrificed.
- Unlined disposal and caps just put off exposure to the future – remove and treat is cleanup.
- Is total unrestricted use unrealistic?
- Risk assessment will be imperfect. Do the best you can.
- May have some small areas we can't give back.

Definitions

- Inadvertent Intruder scenario is a one person, one time scenario – shouldn't it assume repetition?
- What does unrestricted really mean?
- Point of compliance is at the source term.

Stuff to talk about further

- Level of conservatism in a risk assessment should be clear, consistent to the reader to allow comparison with values.
- Need a metric to assign values to risks.
- Groundwater zones should be based on plumes, not on dates.
- Push investment in technology.
- Want to understand the reality of meeting today's requirements. Is there a need to change the requirements?
- Develop Central Plateau as storage so the rest of Hanford can be safe.
- Treaty rights – full use of resources when an area is free from Department of Energy activities.
- Where is the best place for the waste? Look at the big national picture.

- What are the next step questions that need to be answered? How can the task force help?

Interests(I want attention paid to...)

- Want something we can do NOW: stabilize now, contain now, find answers to unanswered questions.
- Most of Oregon population lives along the River and down the Willamette Valley.
- Minimize long-term impacts.
- Focus on high-risk sites for cleanup.
- Think about air in addition to water.

Values (What I care most about)

- Cleanup and costs driven by real reduction in risk.
- Problem definition should drive action (don't do something just to be doing something).
- Don't sell future generations short.
- Clean up in a way that could stand to lose track of historical records and not worry about harm.
- All life is to be respected and treated equally.
- Do no harm, or at least do more good than harm (what we accomplish is worth more than what it costs).
- Pacific NW life is not more important than other lives in the world, compare Hanford risks with other societal risks.

The details on these discussions can be found in Appendix I.

Also on the second day of the March workshop, Board members on the Task Force began to develop draft advice based on common themes that had come forward during the discussions.

The second Task Force meeting, again focusing on the Central Plateau, took place on May 7th and 8th of 2002. Based on feedback from the first meeting, the format of this second session was significantly different. For the May workshop, the Task Force adopted an interactive format. The first day began with some very brief follow-up presentations from the first set of meetings. Next, Task Force members were divided into several groups of about 10 people apiece. These groups were constructed to ensure each contained a balance of views on Hanford issues. The majority of time on both days of the workshop was spent discussing a set of key questions:

- When you think of cleanup of the 200 Area what do you think the future use might be for Core zone? Buffer zone? Groundwater? And in what timeframes? (e.g., 50 years from now? 150 years? 500 years?)
- For the 200 Area, what are the cultural and natural resources, including Tribal resources, which need to be protected? What changes, if any, would you make to the large timeline diagram to adequately protect these resources?

- What type of government controls do you envision for the future? How long do you think government controls will be effective?
- How does ‘equity across generations’ play into decision-making?
- In addition to protecting human health, how should the environment of the 200 Area and surrounds be protected?

As part of these discussions, Task Force members were asked to color a Hanford Site map with their vision of future land use options. These maps and the recorded assumptions relating to timeframe and stewardship are available in Appendix I.

Arriving at consensus on the answers to these questions was not required; in fact, it was discouraged. Instead, the idea was to bring out and emphasize the rich diversity of viewpoints on the subjects of cleanup, risk assessment and exposure scenario development for the 200 Area. Following each discussion period, groups reported their results to the whole Task Force. These group reports are included in Appendix I.

Although arriving at consensus was not required during the discussion of the key questions, common themes did emerge when each group reported the results of its discussions to the whole. These common themes were used by a collection of representatives from each small group, which met at the end of the first day, to frame the dialog for the second day of the workshop.

Figure 3. Common Themes Matrix from May 2002 Workshop. Italics represent each group’s comments, suggestions, assumptions or variations on the common theme.

Common Theme	Cedar group	Fir group	Pine group	Spruce group
Some waste will remain in the core zone when cleanup is complete. Assumption: this waste is stored in such a fashion that it is immobile.	Some waste will remain in the core zone when cleanup is complete. <i>Waste at Hanford should d be managed in a manner protective of human health and the environment.</i>	<i>Assumption: make the core zone as small as possible.</i> Some waste will remain in the core zone when cleanup is complete. This waste is stored in such a fashion that it is immobile (<i>i.e. inaccessible to humans and critters</i>).	Some waste will remain in the core zone when cleanup is complete. Assumption: this waste is stored in such a fashion that it is immobile. <i>The core zone should be as small as possible.</i>	<i>(Need more specifics)</i>
The core zone is a valuable area for which broad beneficial reuse should be pursued. Such reuse will also provide an ongoing, active institutional interest vested in future management of the risks posed by Hanford waste.	The <i>Central Plateau</i> is a valuable area for which broad beneficial reuse should be pursued. Such reuse will also provide an ongoing, active institutional interest vested in future management of the risks posed by Hanford waste.	<i>Continued human presence would provide</i> an ongoing, active institutional interest vested in future management of the risks posed by Hanford waste. <i>One way to ensure that is by using the assets of the core zone for beneficial reuse.</i>	<i>Core zone activities should be limited to active stewardship of waste present at the end of cleanup. This active stewardship should include a long-term presence by an organization or organizations responsible for maintaining institutional knowledge of core zone conditions.</i>	The core zone is a valuable area for which broad beneficial reuse, <i>not limited to surface land use</i> , should be pursued. Such reuse will also provide an ongoing, active institutional interest vested in future management of the risks posed by Hanford waste.
Groundwater remediation should be conducted simultaneously with source term remediation.	<i>(Need more context)</i>	Groundwater remediation <i>must be integrated</i> with source term remediation <i>to address deep vadose transport. Need aggressive technology development and implementation to address groundwater remediation.</i>	Groundwater remediation should be conducted simultaneously with source term remediation. <i>When groundwater remediation is complete, the only groundwater use restrictions would exist within the core zone, and if possible, not even there.</i>	

Common Theme	Cedar group	Fir group	Pine group	Spruce group
DOE needs to be engaged now in developing robust, flexible, and creative management systems to address institutional controls. (One alternative may be a coalition including Tribal nations, local government and other appropriate stakeholders.)	<i>Sound management and cleanup decisions now will begin to build equity over generations. The Tri-Parties need to engage in developing robust, flexible, and creative management systems to address institutional controls.</i>	DOE needs to be engaged now in developing robust, flexible, and creative management systems to address <i>long-term stewardship</i> .		

The agencies should produce a “risk map” that analyzes a range of risks, including the reasonable maximum risk expected over time. This risk map should include: a reasonable maximum exposure to a resident and/or Native American, including groundwater use, in what is currently labeled the Buffer Zone; and a reasonable maximum exposure to a worker/day user in the Core Zone.	The agencies should <i>conduct risk analyses that communicate</i> a range of potential human health and ecological risks, including the reasonable maximum risk expected over time. <i>These analyses</i> should include: a reasonable maximum exposure to a resident and/or Native American, including groundwater use, in what is currently labeled the Buffer Zone; and a reasonable maximum exposure to a worker/day user in the Core Zone.	<i>The agencies should analyze a range of risks, including the reasonable maximum risk expected over time. This must be a transparent process which: 1) presents the interim results to the public; 2) clearly identifies all assumptions; 3) is based on validated models; 4) identifies and quantifies the uncertainties numerically; 5) clearly identifies the conceptual models used and the potential alternative models, as well as the consequences of using these alternative models; 6) validates inventories and enhances site characterization.</i>	The agencies should produce a “risk map” <i>as soon as possible</i> that analyzes a range of risks, including the reasonable maximum risk expected over time. This risk map should include: a reasonable maximum exposure to a resident and/or Native American, including groundwater use, in what is currently labeled the Buffer Zone; and a reasonable maximum exposure to a worker/day user in the Core Zone.	The agencies should produce a “risk map” that analyzes a range of risks, including the reasonable maximum risk expected over time. This risk map should include: a reasonable maximum exposure to a resident and/or Native American, including groundwater use, in what is currently labeled the Buffer Zone; and a reasonable maximum exposure to a worker/day user in the Core Zone. <i>To expand understanding of risks, comparisons should be made to other locations on site, and combinations of sites for living, working, and recreating.</i>
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Common Theme	Cedar group	Fir group	Pine group	Spruce group
What's missing?	<p><i>Risk analysis results should be presented in a "user-friendly" format that depicts the geographic locations of risks over time.</i></p>	<p><i>Recognize what has and has not worked with barriers and design to prevent such failures.</i></p> <p><i>Minimize disturbance to undisturbed land to the extent possible.</i></p> <p><i>The ecological component of cleanup needs to include: inventory of resources, consultation with affected interests, minimized habitat destruction, and isolation of contamination from the biosphere.</i></p>		<p><i>Stewardship should be an active activity involving institutional controls, monitoring, continued maintenance, communication, education, record-keeping, and encouraging use of advance technology for cleanup and economic benefit.</i></p>

In addition to the common themes, the groups also captured significant diverse ideas and other key points.

Key points of interest to Task Force members.

The following are some of the points where Task Force members expressed divergent views:

- Should there be a buffer zone?
 - There is no need for a buffer zone if the core zone is properly protected.
 - There is a need for the buffer zone to aid in protection of humans and the environment.
- The longevity of the core zone.
 - Core zone is forever.
 - Cleanup needs to include a plan for eventual return of the core zone to its original condition.
- Paradigm shift in thinking about 200 area:
 - It is a national sacrifice zone.
 - It is a regional asset.
- Keep the waste here – find constructive avenues (that bring in \$).
- The Central Plateau is more of a resource than just a waste repository.

Many additional “keep in mind” items were also products of the Central Plateau workshops. (A complete listing of all items captured on group flip charts can be found in Appendix I.) Some examples are provided below:

- Need metrics for calculating risk (quantitative or qualitative).
- Need to clarify risk terminology. (Currently there are layers of arbitrary language about risk.)
- Send a positive message to future generations.
- There are advanced technologies yet to be developed at Hanford that can point to future use. (We haven’t started looking...) There is a continuing need to evaluate and apply new technologies.
- Clarification of jurisdiction needs to occur.
- Trust must be developed -- government, public & media.
- Additional exposure pathways should continue to be evaluated (wind, fire, wildlife).
- Optimize measurement to support realistic characterization of waste.
- Define “unrestricted” use.
- Need to validate inventory and models; communicate limitations of the models; model development should be an open process and ensure continuous improvement.
- Stewardship starts now; it should be the responsibility of a coalition with the Tribes as a major member.
- People have the right to understand as well as know.

- Reduce the core size.
 - Make it inaccessible to people and critters
 - Concern: reuse of the core should not invite waste importation. (Differing opinions on importing waste: some members felt importation of some waste was appropriate and even desirable, while others felt no offsite waste should come to Hanford.)
- The cleanup mission requires the maintenance of an adequate infrastructure.
- Consider impacts from offsite conditions (human use, farming, dams) and changes in environmental conditions on site hydrology.
- Groundwater should be remediated at the same time as site cleanup is completed.
- Groundwater cleanup time frame of 150 years is unrealistic. (too long)
- Non-enumerated costs (e.g., habitats, and workers, public) and impacts must be considered and addressed by decision-makers in consultation with affected parties.
- Need an institutional process to ensure that institutional controls do not fail.
- Develop a process by which to address “surprises” found anywhere on the site.
- Accelerate cleanup (e.g., tanks) to the degree practicable to remove or eliminate future year mortgage costs.
- Continue a human presence to maintain long-term institutional knowledge.
- Codify what we’ve done here. (Especially let the Board know what’s happened.)

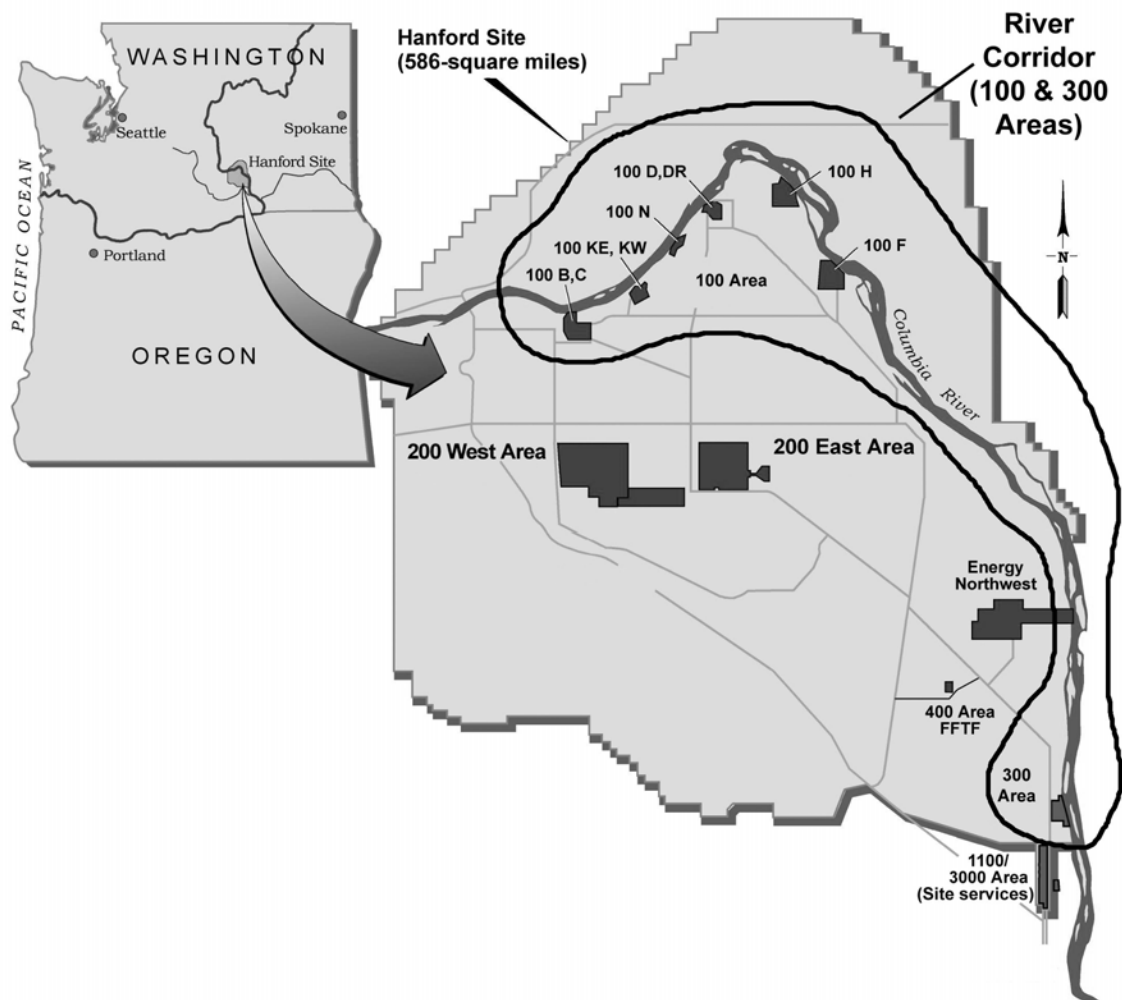
The Board members on the Task Force used the common themes to refine and re-draft the advice begun in March. This advice was presented to the full Board at the June 2002 Board meeting and adopted as HAB consensus advice #132. (See Appendix I for the group notes and Appendix III for the full text of the advice.) In addition, several of the Task Force’s themes have been incorporated into DOE’s initial Performance Management Plan for Accelerated Cleanup on the Hanford Site (DOE/RL-2002-47).

River Corridor Workshops

Following the discussions on the 200 Area, the Task Force began considering exposure scenarios for the River Corridor in its third and fourth meetings in June and July 2002. For these June and July workshops, the Task Force continued its primary purpose of collecting stakeholder values around exposure scenarios for the Tri-Party agencies.

The River Corridor describes that portion of the Hanford site adjacent to the Columbia River. This area includes Hanford's 100 and 300 Areas. The 100 Area contains the nine nuclear reactors and reactor support facilities built along the riverbank. The 300 Area is a 0.52-square mile research complex about 1 mile north of Richland, as well as approximately 1 square mile of additional areas that were used for solid and liquid waste disposal. The Department of Energy fabricated fuel for the 100 Area nuclear reactors in the 300 Area and used other 300 Area facilities for research and development purposes. Over 600 liquid and solid waste sites have been identified in the River Corridor.

Figure 4. Map of the Hanford Site Showing the River Corridor.



Feedback from the May meetings indicated that the small group discussion format was very effective at achieving the Task Force's goals, so this format was used again for the River Corridor workshops. Also, in June, the Task Force heard brief presentations from the Tri-Party agencies and others on the history of Hanford risk assessments and processes for development of the River Corridor exposure scenarios.

Presentations were heard from:

- Greg Hughes, U.S. Fish and Wildlife Service – What the U.S. Fish and Wildlife Service foresees as the future for the River Corridor.
- Mike Goldstein, Environmental Protection Agency - Background of the River Corridor past practices, Future Site Uses Working Group and past 100 Area Workshop, current status (including monument designation), and schedule for the future.
- Dib Goswami, Washington Department of Ecology – Groundwater overview
- Pam Doctor, Department of Energy - The history of risk assessments in the River Corridor past and present.

Following the presentations, participants at the June workshop were asked to discuss the following question:

- What do you see the beneficial uses for the River Corridor and groundwater to be when the cleanup is complete? In what timeframes? How much of a priority is ground water?

Participants were also asked to record thoughts and questions on cards throughout the presentations. These comments and questions were used to focus the discussion for the second day of dialogue. (The contents of these note cards can be found in Appendix II.)

As part of the River Corridor discussions, the Tri-Party agencies asked the Task Force to consider as well the 100 B/C Area Risk Assessment Pilot. The pilot is being designed to support completion of the Final Remedy Record of Decision for the 100 B/C Area. The purposes of the pilot project are:

- Determine how information from the individual waste site Closeout Verification Packages will be used to demonstrate compliance;
- Determine what additional information and actions are needed to demonstrate protectiveness;
- Obtain that additional information and plan for follow-up actions;
- Write a draft baseline human health and ecological risk assessment for the 100 B/C Area; and,
- Integrate Natural Resources Damage Assessment pre-assessment phase with the risk assessment.

As part of the Task Force's effort to consider the 100 B/C Area Pilot Risk Assessment, Gariann Gelston, a member of the Task Force Steering Group, gave a presentation on the

decision flow process for this assessment. This decision flow process is illustrated in Figure 5 below.

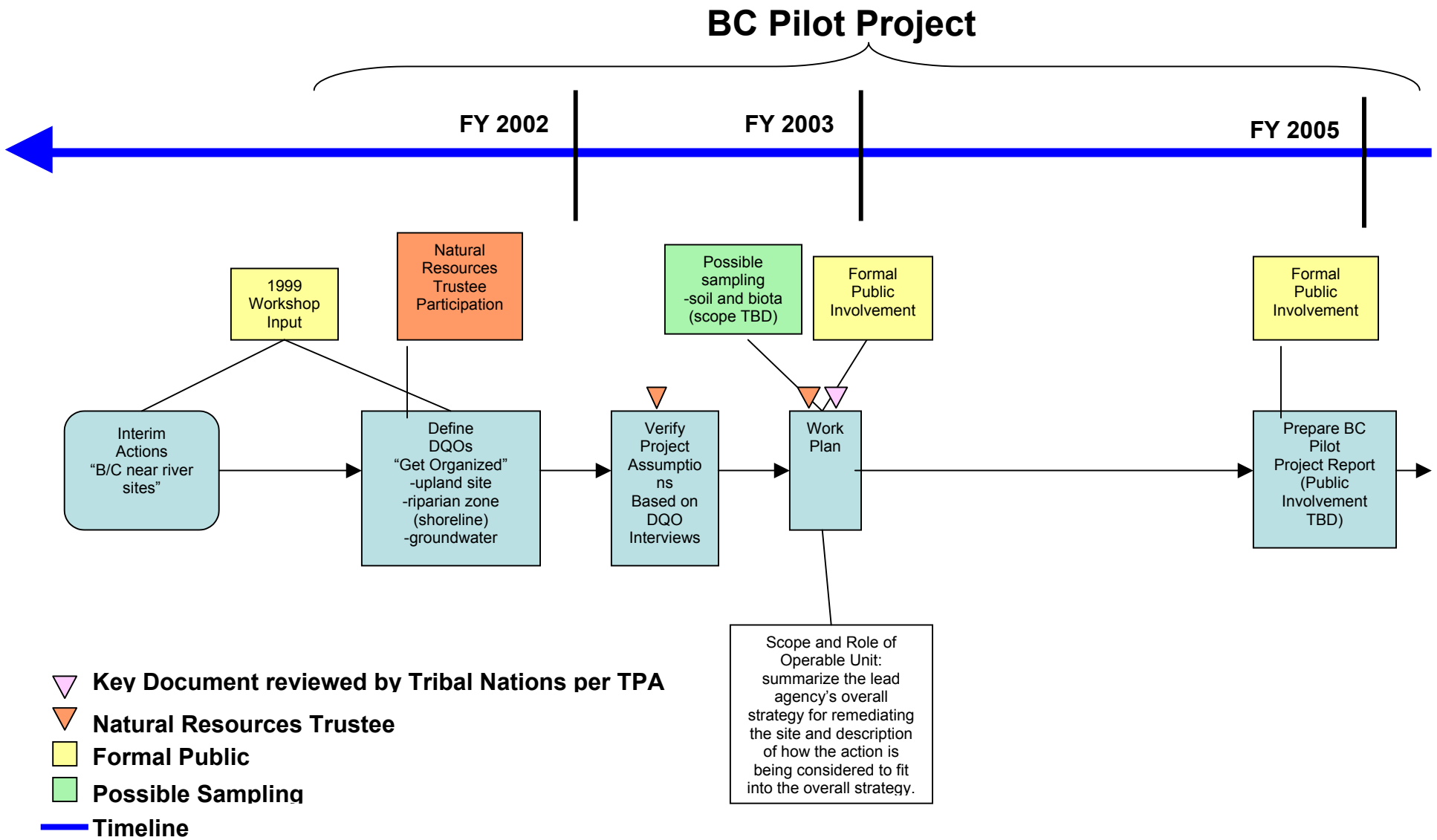
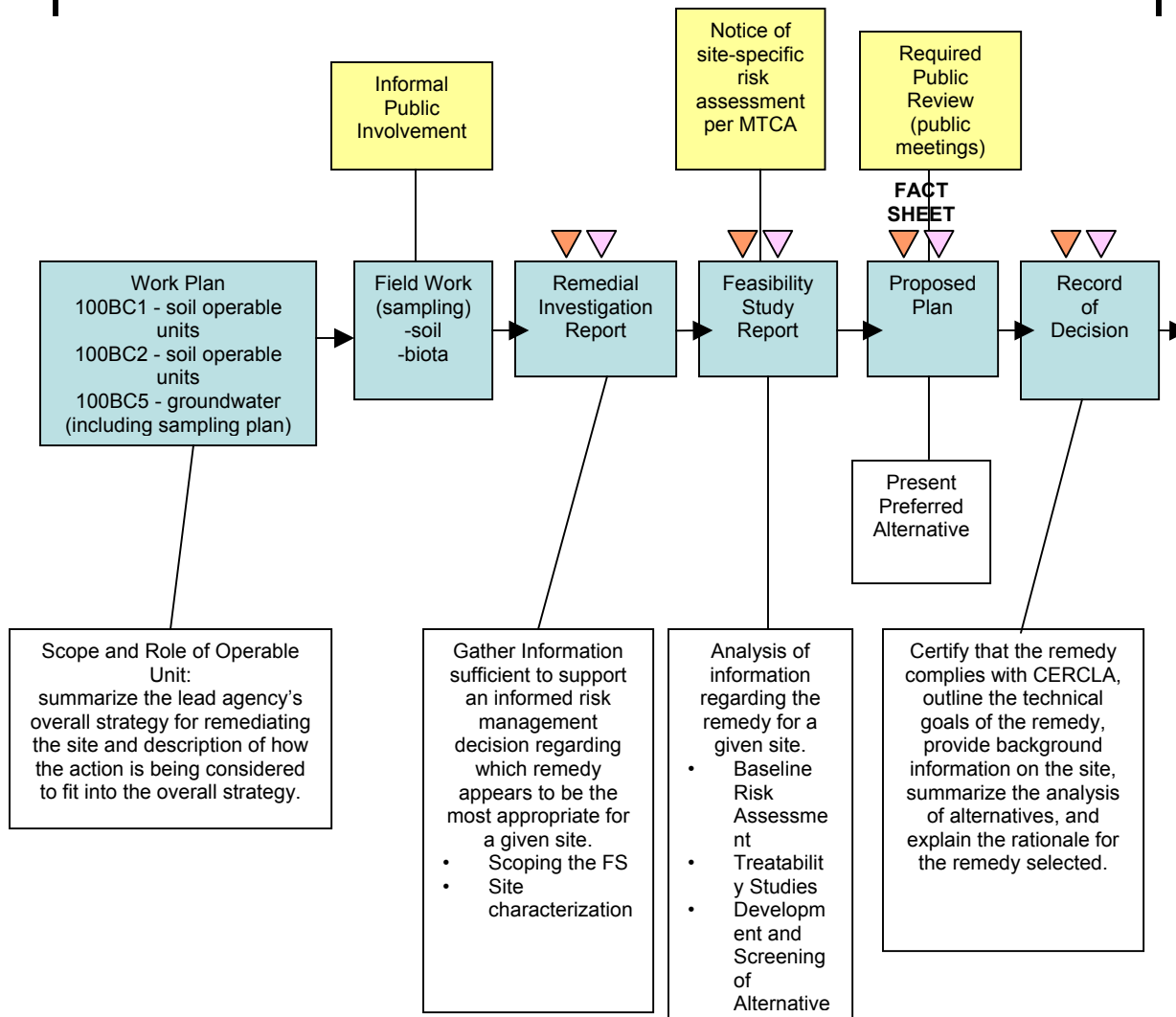
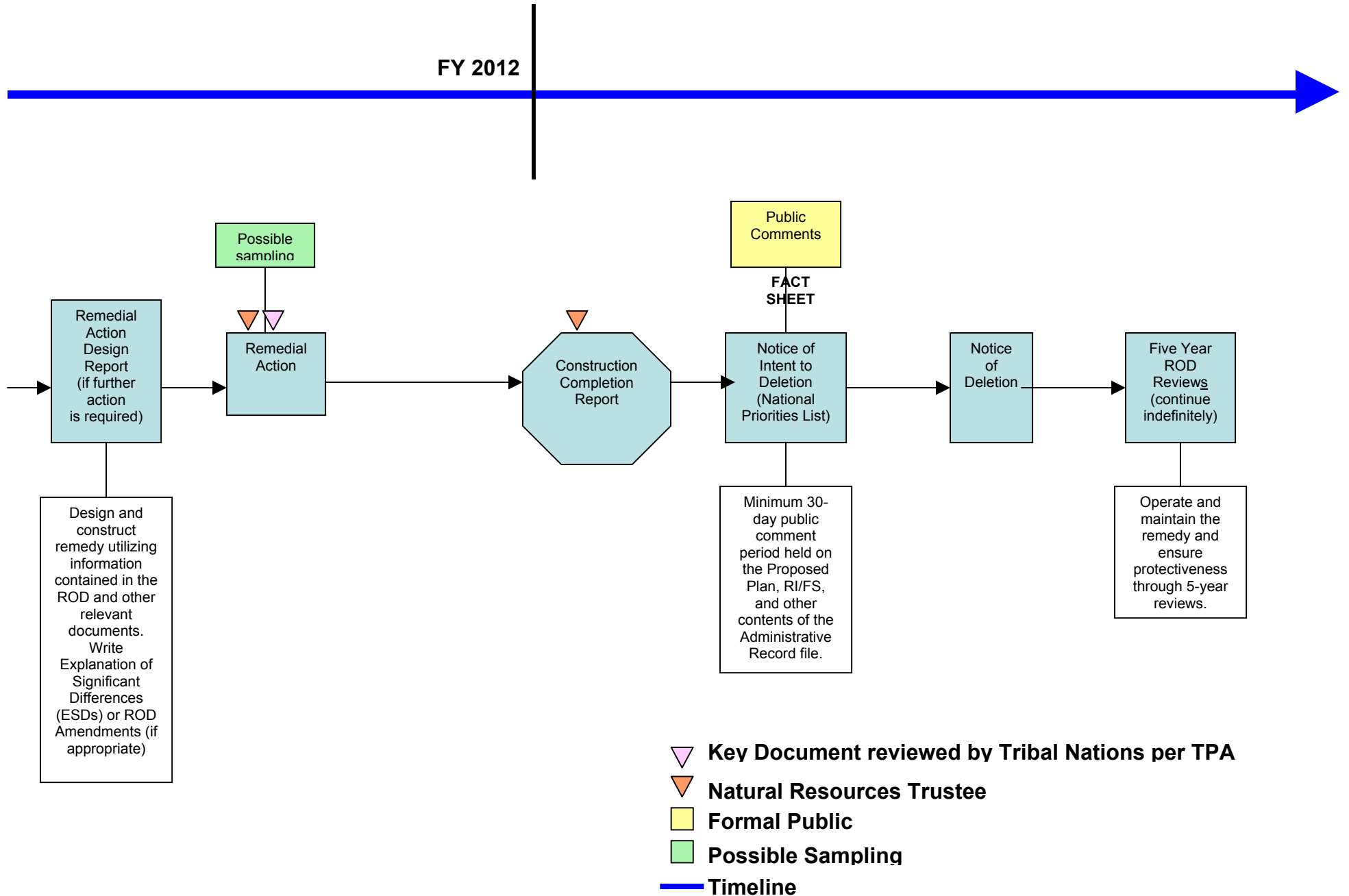


Figure 5. 100 B/C Area Risk Assessment Pilot Decision Flow Diagram



FY 2012



As a result of the presentations and discussion on the first day the Task Force groups addressed the following questions on the second day of discussions:

- What elements would you like to see included in the B/C Pilot? What approach to the pilot do you think is appropriate?
- Consider the Riparian Zone (e.g. how would you suggest the agencies define it?)
- What uses do you see for the Riparian Zone?
- Consider the 300 Area, is the “industrial use” scenario protective enough? How would you modify it?
- What should drive cleanup?
- What do you see as the realistic beneficial uses for the River Corridor? What is your definition of realistic?

The Task Force’s response to these questions was collected on flipcharts and they are available in Appendix II. Some examples of these responses are:

300 Area

- For the 300 Area, is there actually a reasonable future industrial use?
- Need to update assessments – for example, urban residential exposure scenario might be appropriate in about 30 years.
- Groundwater must be restored to drinking water standards.
- How marketable will this area be to industry?

Beneficial Uses

- Salmon spawning.
- Business/Commercial at the south end of river corridor, B Reactor Museum, Vernita boat launch.
- Tribal cultural activities.
- Recreational uses – hiking, swimming, fishing.
- Scientific research.

B/C Pilot

- What are the assumptions? Do we know?
- Public is going to use this heavily as the northern entrance to the monument. This will include heavy use of the shoreline and likely to include children camping.
- Include specific dose response for children.
- Need to address groundwater risk.
- Will standard scenarios be used for B/C Pilot? Should include scenarios such as flooding which could mobilize contaminants.
- Credible events should identify scenarios. Experts should identify credible events and then take them to the public for feedback.
- Define three timeframes: Near future (150 years), mid-future (out to 500 years), far future (beyond 500 years).
- From the monument boundary into the 300 Area should be protected.

- Relationship of public to risk assessment – need an ongoing public process: public involvement opportunities need to be identified, meaningful, appropriate and timely.

The Task Force's fourth and final meeting took place in July of 2002. This meeting again focused on the River Corridor and used the small group discussion format.

Questions framing the July workshop were:

- What are the reasonably anticipated human uses of the River shoreline area and in what timeframes?
- What are the reasonably anticipated uses of the groundwater and in what timeframes?
- Some passive groundwater actions may take decades to restore the groundwater. Is this acceptable if the actions restore and protect use of the Columbia River riparian zone and are protective of the eco-system? Discuss.

A sample of the Task Force response to these questions is:

- There could be homes anywhere along the shoreline.
- Recommend zero population growth along the river shoreline for preservation of the land.
- Need to do risk assessments downstream of Hanford also (verify 0 risk).
- Unrestricted means any useable resource would get some level of use (including islands).
- Some groundwater contaminants will not be removed by natural attenuation – need to prevent them from getting to the river.
- The beneficial use of groundwater is drinking water.
- Are there some contaminants that don't matter if they get to the river?
- Need to deal with up gradient Hanford groundwater problems to prevent recontamination of river corridor groundwater.
- Need early and on-going public involvement in the risk assessment process.
- Need to communicate the analyses separately from the decisions and allow for public input before decisions are made.

Also in July, brief presentations were heard from:

- Stuart Harris (Confederated Tribes of the Umatilla Indian Reservation)– Native American Subsistence Scenario
- Larry Gadbois (Environmental Protection Agency) and Greg deBruler (Columbia Riverkeeper)– Columbia River Comprehensive Impact Assessment. In performing a B/C reactor comprehensive assessment, what Columbia River Comprehensive Impact Assessment modules are included in the process and what modules are not?
- Don Steffek, (U.S. Fish & Wildlife Service) – How U.S. Fish and Wildlife Services Does Ecological Risk Assessments

As in earlier workshops, common themes were identified and groups had the opportunity to discuss the themes in depth and suggest alternative viewpoints. The themes identified in the River Corridor workshops were:

- Need a comprehensive integrated risk assessment –include groundwater, soil, riparian zone, riverbed and river (including river dynamics such as floods). This integrated approach should include the individual sites of the Hanford cleanup goal. Need to state boundary assumptions (including 200 Area groundwater assumptions). This should be a comprehensive, time-phased risk assessment that looks at multiple exposure scenarios and considers off-site risk as well as on-site risk.
- For ecological risk, the Department of Energy should consider bringing in outside expertise to develop a credible ecological risk assessment and will need to figure out how to factor institutional controls into assessments. One suggestion was to emphasize early life stages of fish and macro-invertebrates above and below the Hanford site. For any assessment, the Department of Energy should allow input from any interested parties.
- No existing exposure scenarios should be taken for granted as “right.” The Department of Energy should analyze many scenarios (e.g., industrial use, intruder, recreational worker, child, and Native American). The river and riparian zone exposure scenarios should be consistent between the 100 and 300 Areas.
- Re-look at 300 Area clean up and what constitutes the 300 Area. The Department of Energy should reassess use assumptions. The goal should be to cleanup sections of the 300 Area where feasible to unrestricted use, or use industrial scenario (to ensure balance of variables).
- The Department of Energy should better define B/C Pilot project process (as a template) incorporating public values. The groundwater cleanup should be part of the B/C Pilot study.
- Need risk assessment public involvement plan. The plan should include an ongoing process for formal feedback, including lessons learned, and clearly identify points for public involvement. Need to communicate analyses separate from decisions and allow for public feedback/check-in.
- Cleaning up the riparian zone is important. Expect public use of shoreline to increase. Public wants to use the entire river and shoreline. Specific protection of children should be considered.
- Would accept slower groundwater clean up if it meets standards for shoreline use by the time the cleanup is declared complete.

- Long term stewardship should include effective monitoring and provisions and procedures to take action if problems develop.
- Need to balance cost, worker risk. Understand that the final process will require compromises and long-term risk tradeoffs.
- There is a need to go beyond the minimum legal requirements.

Using the common themes, the original groups were divided up into four new groups to discuss the four major areas of concern in the River Corridor: the 100 B/C Area timeline, groundwater, shoreline and Columbia River Comprehensive Impact Assessment. Some of the larger points made in these discussions were:

Timeline Group:

- Could involve oversight Task Force (to include risk assessment modelers, could be a funded independent group). Conduct early risk studies/run analyses and get independent review. Use holistic approach to establish criteria and end states prior to starting work. (Look at whole picture, not holes.) Get agency agreement on Data Quality Objectives. Final Records of Decision don't give the final picture.

Groundwater Group:

- Vision/goal is groundwater clean to drinking standards and ambient water quality standards by the time the cleanup in the River Corridor is declared complete. River Corridor groundwater can't be separated from 200 Area groundwater. Deal with all up gradient Hanford sources so there is no impact on River Corridor. Up gradient plumes must be shown to have no impact; or, if there is impact, it must be considered. Need dialogue with agencies on assumptions, impacts of different scenarios. Need more aggressive, technology funding, developments and deployment, specific to remediation at Hanford site. Need better technology than what we have now. Bias for action. Focus on seeps as one place to protect users (since it is where groundwater is currently accessible). The groundwater point of compliance should be directly under the waste site.

Shoreline Group:

- Shoreline seeps and upwelling are seen as key contaminant pathways. Cleanup Hanford shoreline so it is safe for tribal use and all others. Shoreline should be defined as: riverbank, riparian zone, seeps, riverbed, and islands. Integrate human and ecological risks, e.g., aquatic habitat, salmon. Tribal use, recreational and residential risk assessment scenarios need to be run for the upland areas (land above the River) for 100/300 Areas, shoreline, and river use. This information is needed to make the proper long term vs. short-term risk tradeoff decisions.

Columbia River Comprehensive Impact Assessment Group:

- Need steering/ management committee with technical expertise to participate with the Tri-Parties on the risk assessment process and for the B/C pilot risk assessment and Hanford site-wide risk assessments. Nine Columbia River Comprehensive Impact Assessment modules should be used as a minimum in all assessments. Use Columbia River Comprehensive Impact Assessment part 2, Requirements Document, which is a comprehensive and holistic approach.
- Tribal use scenario probably covers highest risk. Honoring treaty commitments and trust responsibilities protects all life. Tribal use could mean residential exposure (regular use – lots of time). Impact to individual species needs to be assessed. e.g., genetics - protect for genetic damage or other injuries to any species and individuals.

Other significant or divergent views were also identified. The following are some of the points made.

- Respect the cost of clean up on biota (maybe you don't clean up).
- Make Hanford a wind/solar farm.
- 300 Area industrial scenario is not the responsible scenario. "Urban residential" scenario may be better.
- It is difficult to identify a reasonable timeframe for groundwater cleanup in the 300 Area. No clear idea on time frame for groundwater cleanup.
- There was general consensus that groundwater should be cleaned by the time the Department of Energy releases an area as being clean.

Several key points and "keep in mind" items were also captured in the summary of the River Corridor workshops. Below are several items for consideration. A complete listing of all items captured on group flip charts can be found in Appendix II.

- Be protective of tribal usual and customary needs.
- Freeze the groundwater.
- Check decisions against innovative technology.
- Risk assessments are separate from risk management.
- Both Maximally Exposed Individual and population studies should drive decisions.
- Empirically verify what's driving risk assessments. (Show me the data!)
- Include the riverbed.
- Follow the contamination. (Clean it up where it is.)
- Cut off groundwater contaminants before they reach river pump and treat barriers.
- Incorporate Columbia River Comprehensive Impact Assessment 9 models and Tribal input parameters in the analysis and goals.
- Ecological risk assessments (common definition).

- Valued species or all species? Ecological characterization - identify habitat, species, pathways.
- exposure profile – identify sources and locations; calculate exposure to species.
- ecological effects characterization – collect site-specific data to determine effects to species on site.
- determine values, benefits and cost.

Again, the Board members were asked to identify the common themes in the Task Force's discussions and develop Board advice based on these themes. The advice was presented at the September Board meeting and adopted as HAB consensus advice #135. The advice is available in Appendix III.