

Matilija Dam Ecosystem Project

**Fine Sediment Study Group
Final Report**

**DRAFT 1
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Study Group Sponsors
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Acknowledgments

Many thanks to the Ventura County Watershed Protection District for organizing and arranging meeting logistics. Special thanks to Glenda Jackson of the County CEO's office and Tammy Butterworth of the Watershed Protection District for taking copious notes and providing detailed meeting summaries.

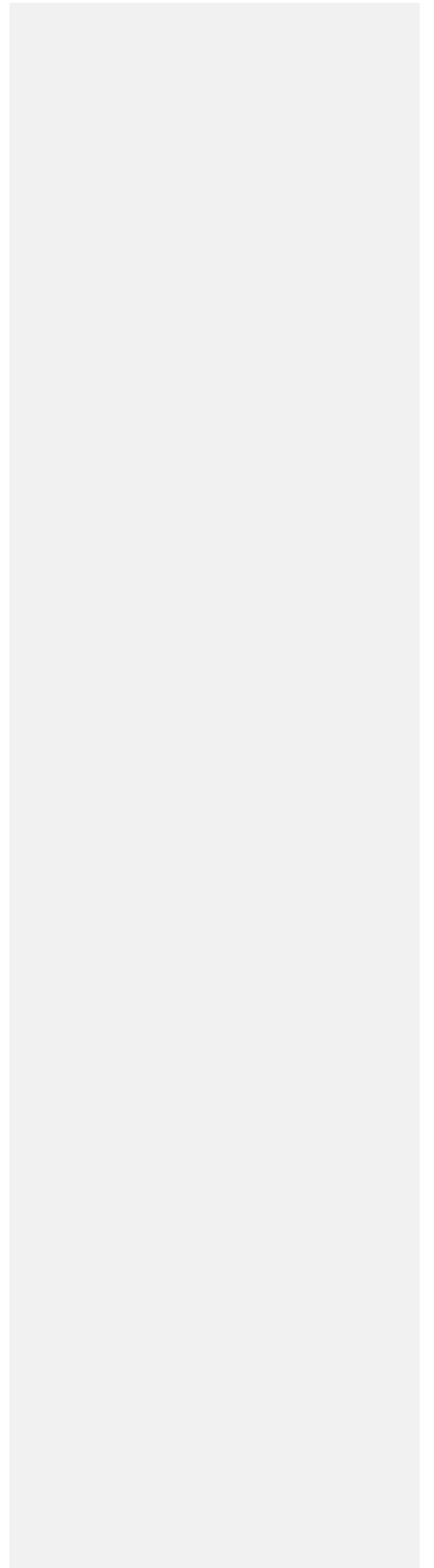


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I. Executive Summary

In the fall and winter of 2010, the Ventura County Watershed Protection District (VCWPD), the U.S. Army Corps of Engineers (Corps) and the State Coastal Conservancy convened a focused study group of key stakeholders to discuss issues relating to the management of the fine sediments that are sequestered behind Matilija Dam. Management of the fine sediments is perhaps the key unresolved problem currently facing the proposed removal of Matilija Dam, as well as implementation of the associated ecosystem restoration program on the Ventura River. The primary goals of the facilitation included identifying technical studies and other investigations that could help produce a consensus solution for fines sediment management that would still conform, to the extent practicable, to the existing environmental and decision documents for the Matilija project .

During the course of four full-day meetings directed by a professional facilitator, the sediment management study group worked together in a collaborative problem-solving process to:

- Define the problems and establish a common understanding of existing options to manage the fine sediments;
- Identify the key concerns and technical questions that needed to be addressed to resolve the fine sediment issue;
- List important operational, regulatory, and environmental constraints; and
- Identify and prioritize the key “data gaps” and information needs that should be the subject of additional technical studies and investigations.

Among the major questions that the Study Group explored in its initial meetings were: What options can be considered to address cost reductions and more acceptable environmental and social impacts associated with the slurry of approximately 2 million cubic yards of fine sediment from Matilija Dam to the Baldwin Road Disposal Area (BRDA) sites, as described in Alternative 4b in the Feasibility Study? What risks do the fine sediments pose to the public water supply and the operations of the water districts, and how do we quantify those risks? How can the Matilija project benefit from pre- and post-removal analyses of other large dam removal projects? And what are the environmental thresholds of fine sediments in the water column for steelhead and other beneficial uses?

During the third meeting, the Study Group agreed that key problem statements and data gaps should be nested within a few scenarios that would conceptually describe alternate (but not necessarily mutually-exclusive) approaches to resolving the fine sediment management issue. The Study Group then focused on three main options:

- **Optimize Alternative 4b:** Modifications to Alternative 4b (slurry to the Baldwin Road Disposal Areas) to reduce the cost of that option and improve its technical feasibility.
- **Hybrid option:** Modifications to Alternative 4b to reduce the amount of water and sediment that must be slurried to the BRDA sites. The potential components of this option could include notching the dam to the existing sediment level and incorporating a large chunk of the fines into the natural restoration of Matilija Canyon.

Full notching and phased natural transport: This option would replace slurry to BRDA with a solution that could include full notching; phased or metered natural transport of fine material; and/or transporting sediment flows by conduit to some point below the Robles Diversion and/or delivery of “clean” water from upstream of Matilija Reservoir to downstream water agencies using already needed coffer dam and pipes. Its primary goals would be to ~~completely~~ avoid slurry of any material downstream, eliminate the need to acquire and bury riverside lands with slurry material, and provide “clean” water to downstream water users during the entire course of the project, and even sediment stabilization period if necessary.

The Study Group then used this framework to further define key constraints and the priority data gaps and information needs to be addressed by additional investigations if a viable consensus solution is to be developed for managing the fines. The use of the proposed strawman framework enabled the Group members to consider combinations of investigations that met the test of optimizing Alternative 4b, by maximizing upstream sequestration, minimizing slurring and reducing costs.

At its final meeting in March, the Study Group reached consensus on a series of recommendations to the Management Team. It identified a list of key data gaps and information needs, many of which centered on water quality issues, habitat and species impacts, and reducing the cost of Alternative 4b.

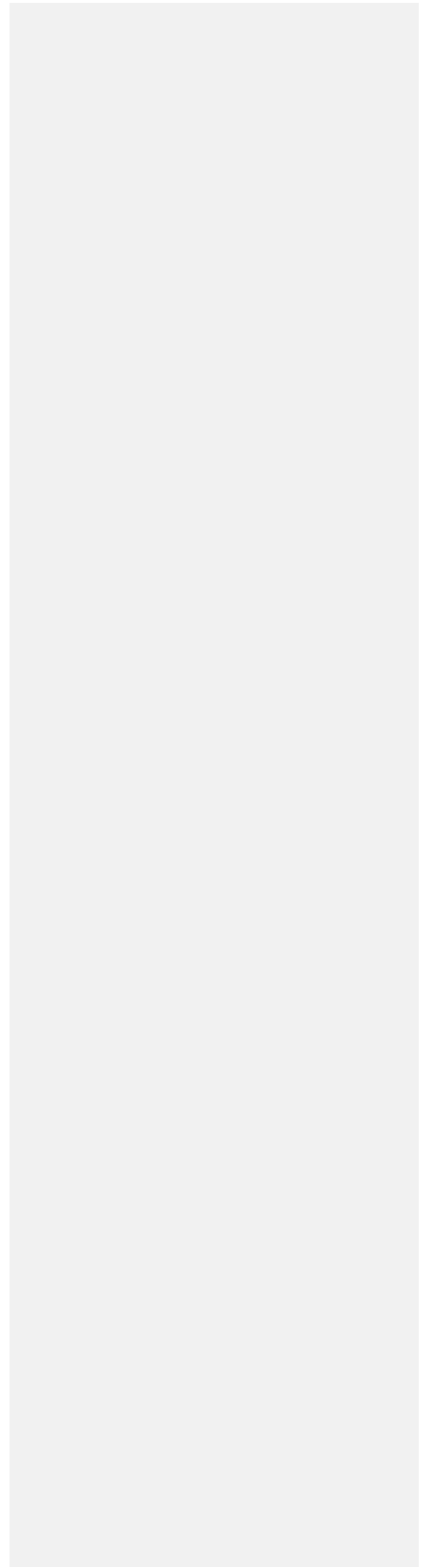
The Group then agreed to recommend that a set of technical studies be undertaken to focus on two major investigations:

1. Matilija Canyon restoration and hybrid alternative analysis: A set of studies to develop a conceptual restoration plan for the area upstream of the dam, with the goal of naturally stabilizing a major volume of the fine sediments within the footprint of the restoration effort for Matilija Canyon. By mixing a significant percent of the fines with coarser material and storing it in appropriate locations as part of the natural restoration of the Canyon, the project could potentially eliminate a major portion of the material that has been proposed for slurry downstream. MS- This paragraph describes the Matilija Canyon restoration studies needed, but not the “hybrid alternatives analysis” studies needed to analyze the hybrid and natural transport alternatives. Will these studies include any of the needed investigations into the hybrid and phased notching and natural transport alternatives as well?

2. Interim notching design: The VCWPD, in partnership with the Coastal Conservancy and others, would investigate the feasibility of notching the dam down to the existing sediment level in the reservoir. The objective would be to lower the height of the dam to prevent any further accumulation of sediment in the reservoir. Because such an action is outside the scope of the current federally-authorized project, the VCWPD would be responsible for identifying and coordinating potential funding resources for any such notching effort..

An integral part of each investigation would be more detailed studies that would respond to the priority data gaps and information needs identified earlier by the team. While the Group did not conduct a thorough analysis of what data gaps or studies would trigger Congressional re-authorization, Recommendation 1 was intended to fall within the current authorized project. . Finally, the Study Group listed areas of expertise that it felt would be needed to participate in or

help oversee these investigations.



II. Background: History of the formation of the Fine Sediment Study Group

The State Coastal Conservancy, VCWPD and the Corps have been active partners and fiscal supporters of the multi-year Federal effort to develop an environmentally and economically sound plan for removing Matilija Dam on the Ventura River. (These three agencies constitute the “Management Team” for the Matilija project.)

A major issue in developing the removal plan for Matilija Dam has been the management of six million cubic yards of fine and coarse sediment that have accumulated behind the dam since its construction in the late 1940s. Utilizing an extensive public stakeholder process, the local Sponsor (VCWPD) and the Corps completed a feasibility study for removal of the Dam. That study included as a preferred alternative, the removal of about two million cubic yards of fine sediment behind the dam and their transport to temporary storage sites located downstream in or along the vicinity of the Baldwin Road bridge in Ojai (Alternative 4b).

After the certification of the project’s EIS/EIR in 2004, initiation of the design phase, Congressional project authorization (WRDA 2007) and extensive subsequent study and investigation, the Corps reported concerns related to increasing construction cost estimates and constructability concerns related to the slurry and disposal of fine sediment at the BRDA sites. The subsequent and initial alternate proposals offered as conceptual plans for managing the fine sediments initially had general support but a soon thereafter later proposal involving extensive cement channel modifications and sediment stockpiling in Matilija Canyon met with opposition and resistance from some of the major stakeholder groups, resource agencies, and other members of the project’s Design Oversight Group (DOG). ((MS- The original sentence implies that the proposal was not necessarily changed and that stakeholders just changed their view from “general support” to “resistance”. It is important to note in the history of the Study Group that the proposal had changed significantly and that this change resulted in “resistance” and the need for the Study Group.))

To help resolve this issue, some stakeholders at the last DOG meeting recommended, and the Management Team (also referred to as the Study Group sponsors) later initiated, a facilitated technical group and dialogue with selected stakeholders. The objectives of the process were to assess the current status of the project, evaluate the utility of additional scientific consultation, and develop a process for resolving the sediment management issue so that final engineering work on the dam removal project could be completed. The Conservancy retained a professional mediation team led by Mary Selkirk from the Center for Collaborative Policy (a program of CSU Sacramento) to assist in this effort.

The first phase of the facilitation process was an issues assessment. After a kick-off meeting with the Management Team in July 2010, Ms. Selkirk conducted a series of interviews over the summer with about fifteen stakeholders, ranging from Meiners Oaks homeowners to representatives of federal and state regulatory and resource agencies.

The purpose of this assessment was to:

- Determine the key technical issues that must be resolved in order for the project to go forward
- Assess whether adequate conditions existed for an effective collaborative dialogue to occur; and
- If the assessment found that a collaborative dialogue would be useful, recommend a process for convening and conducting a study group process

In October 2010, Ms. Selkirk presented the results of her assessment interviews to the Management Team and recommended that they establish a multi-stakeholder, time-limited Study Group to analyze the fine sediment issue. The Study Group would meet for four full days during the winter of 2010-11, and its task would be to identify the major data gaps on fine sediment disposal and recommend additional analyses or investigations that might help resolve how to best manage the fines. The Management Team accepted her recommendations, assisted in organizing the Study Group, and then convened meetings of the Study Group on December 10, 2010, February 2, 24 and March 30, 2011. (See Appendix 7 for a complete roster of Study Group members.)

Study Group Charter

One of the first tasks of the Study Group was to review, revise and adopt its own Charter. The Charter includes the following:

I. Group Mission

II. Scope/tasks of the Group

III. Member roles and responsibilities

IV. Anticipated outcomes/work products

V. Meeting Format and Timeline

VI. Operating Rules, including groundrules, definition of the Group's decision-making process and decision rule, accountability, addressing the media and public noticing and outreach

VII. Staffing

Group members reviewed the draft Charter at their first and second meetings, revised language in some of the sections, including the Mission, definition of "project partners," Decision Rule and Membership, and adopted the final Charter at their third meeting (See Appendix 6).

The final mission statement of the Study Group included a commitment to consider and recommend investigations for further study of solutions that would seek to minimize "changes to the existing environmental and decision documents," i.e. the certified Feasibility Study and the EIS/EIR.

The following Sections of this Report summarize the Group's discussions and consensus recommendations. It should be emphasized, however, that because this report is a summary, it does not capture many of the nuances or complexities of the Group's deliberations or the individual positions of Study Group members. The Appendices to this report, as well as Study Group materials posted on the Matilija Dam website should be consulted for greater detail about the facilitation.

III. Defining the Problem and identifying Data Gaps

The Study Group held its kick-off meeting on December 10, 2010. In addition to an initial review of the draft Charter for the Study Group process, the objectives of the first meeting were to:

- Set the context for the Group's deliberations by establishing a common understanding of the status of the fine sediment disposal options under Alternative 4b (part of the recommended alternative in the Feasibility Study), and the conceptual designs, investigations and plans that had been conducted to date.
- Begin first round of brainstorming on problem definition and associated data gaps. For the purposes of the Group's discussions and as used in this report, the term "data gap" was used to mean technical/scientific uncertainty, the lack of sufficient information about an issue or potential solution, or apparent disagreement about technical or scientific information.

The Corps's project staff, Darrell Buxton and Jim Hutchison, provided a summary of the project benefits and assumptions regarding riparian habitat, fish passage, and restoration of natural processes carried forward from the feasibility study into the design phase, and laid out a summary of the conceptual designs to date. They recapitulated the agreement reached during the feasibility study that the preferred method for dam removal involved removing the dam all at once, rather than incrementally, to minimize chronic negative ecological impacts to fisheries and water quality concerns. Maps were posted around the meeting room for reference.

Mr. Buxton summarized the resulting technical difficulties with slurring that led to the anticipated significant increases in project costs. Those difficulties stemmed principally from the technical challenge of drying and slurring very wet silts and clays, and the associated construction risks of stacking the fine sediments on top of itself in a relatively confined footprint. According to the Corps, after more refined analysis, portions of the slurry system cost estimates increased from \$18 million in the feasibility study to \$51 million in the design phase for the same concept. Jeff Pratt of Ventura County summarized: "... the third issue is risk because you're in the channel much longer than you originally intended so you're going through more than one storm season and that presents huge challenges, liability-wise as well as costs." Group members discussed all of these issues in detail over the course of Mr. Buxton's presentation.

Each Study Group member then identified what each of them saw as the central problem that needed to be addressed for the fine sediment disposal issue to be successfully resolved. The brainstorm yielded the following [as listed on the flip chart notes]:

Overall Design

- What changes to the design or assumptions for Alternative 4b would trigger reauthorization by Corps headquarters and Congress, and
- How would reauthorization risk the project?
- What data do we already have to address the key questions about how to manage the fines?

Water Quality

- What are the potential impacts of fine sediments to the operations of the affected water agencies?
- How do the water quality effects of existing conditions compare to those that would result from full dam removal and/or incremental notching
- What is the dose effect (established level of toxicity) of legacy sediments?

- ~~Are there any potential~~ **What are the** benefits of fine sediment deposition in the watershed ~~or~~ on the downstream floodplain, **coastal wetlands, and marine environment**?
- How do we quantify the risks to the public water supply posed by natural sediment transport, sequestering the fines at BRDA or upstream sites, or other design solutions?

Water Supply

- What supply options (supply alternatives, conservation, transfers, etc.) are available to compensate Casitas for the potential loss of water supply from the river that might result from various design options?

Alternative 4b

- Can the transport to, deposition on, or temporary use of, the BRDA sites be phased so as to reduce the cost or technical complexity of the slurry option?
- What can we learn from analyzing the constructability of a two-phased BRDA [i.e., phasing sediment slurring over time to phase the costs over time] ?
- What needs to be done to “run 4b to ground” and to help define a possible contingency plan?

Natural Processes/Fish Passage

- How would implementation of the Corps’s proposed Upstream Storage Area (USA) concept affect natural processes and NOAA Fisheries/USFWS consultation?
- How would various design options affect habitat in either Matilija Canyon or the downstream sites (e.g. Arundo removal in the reservoir area has provided improved habitat for least Bell’s vireo, which has now returned to the watershed)
- How will fine sediments affect the operations of the Robles Fish Passage Facility?

Cost

- If NOAA has requirements for further analysis that are going to be added in by more detailed planning, how would those requirements impact the total project costs ?
- What is the cost of revising the existing Biological Opinions from NOAA Fisheries and USFWS (note that BO was issued for 4b)?
- Are cost increases a problem?
- What additional cost increment would be a no-go?
- Do we have a feasible project due to cost?
- Are there less expensive alternatives to the Corps’s current design proposals?

New information

- Is there any new data that has been developed over the past 10 years that would change our assumptions regarding [analysis/determination of] adverse fine sediment impacts to fisheries and water supply functions?
- Are there any pre- or post-removal studies of other dam removal projects that would benefit our thinking on Matilija?

At the conclusion of the first meeting, there was general consensus to **focus first on how to make Alternative 4b and the BRDA sites workable and buildable**. In addition, Group members agreed that they needed to develop a common understanding of all the various constraints affecting their deliberations as well as the ultimate recommendations to be made at the conclusion of the Study Group process. All agreed that the second meeting should include a detailed discussion of these constraints, including presentations from each of the relevant regulatory agencies (USACE, DFG, USFWS, NOAA, LARWQCB).

Prioritizing Data Gaps

The second Study Group meeting on February 2, 2011 focused on a more in-depth discussion of the data gaps needed to be addressed to examine how to utilize the preferred Alternative 4b to develop a sediment disposal solution. In follow up to the first meeting, Darrell Buxton provided additional information on the 4b costs and how they were determined.

In addition, the Group devoted much of the second meeting to building an understanding of the legal, financial and regulatory triggers and constraints that could affect the direction of the Group's recommendations. (**Section IV** of this report provides a summary of Study Group discussions of constraints and regulatory triggers that the Project faces, including the Corps presentation, input from the other regulatory agency Group members---USFWS, NOAA, DFG, the LARWQCB---and the Group's broad discussion that followed.)

Building on the earlier discussion of Data Gaps from the first meeting, Ms. Selkirk asked each member of the Study Group to identify the two or three problems or data gaps that each considered being the most critical to the resolution of the fine sediment management issue.

The preliminary priority suggestions from that discussion were the following (from the flip chart summary):

Water Quality/Supply

- Investigate fine sediment effects on the operations of the water agencies
- What guidance can DFG and NMFS provide on the sediment thresholds for anadromous fish?
- Analysis/investigation of Regional Board permit requirements and parameters for sediment, nutrients

4b/BRDA

- What needs to be done to "run BRDA to ground"
- How will sites need to be managed
- Costs: Additional regulatory costs
- Costs: Investigate modified BRDA for cost reductions
- Effects of sediment deposits at the BRDA sites on well water quality

Natural transport and hybrid options

- Scientific evidence on fine sediment impacts of natural transport on water supply: Impacts of notching on wells, Lake Casitas, fisheries
- Hybrid of slurry and natural transport (2a and 4b?), including design of upstream area
- Relevant information and lessons learned from other dam removal projects

Finalizing Data Gaps and developing a consensus approach

The third meeting of the Study Group focused on re-visiting, refining and finalizing the Group's thinking on data gaps and recommendations on fine sediment disposal. Over the course of the morning's deliberations, the Group agreed generally to the priority problem statements and data gaps that had been generated and agreed that they needed to be nested within two to three scenarios that would conceptually describe alternate but not necessarily mutually exclusive approaches to resolving the fine sediment storage and disposal problem.

The Group discussed a series of approaches, starting with "optimizing" 4b ~~as the preferred approach~~(((MS- I do not agree that the group agreed that this was "the preferred approach" over other potentially preferable options being discussed and needing further consideration and investigation))), followed by modifications to 4b that could include some amount of natural

transport.

The following outline summarizes the Group discussion regarding potential design solutions and incorporates the priority data gaps discussed at Meeting #2:

Option 1: “Optimize Alternative 4b.” Further analysis of potential modifications to Alternative 4b (slurry to the Baldwin Road Disposal Areas) to reduce the cost of that option and improve its technical feasibility.

Data gaps and other constraints identified included:

What needs to be done to “run 4b to ground”?

- Engineering to ___% design ?
 - More detailed site-level analysis to refine overall costs
 - Could sites be managed to reduce costs?
 - Could deposition of the slurry material be phased to promote rapid erosion and downstream transport of the material from the BRDA sites?
 - Water Costs
 - Difference in cost if no recycled water, and pump from Meiners Oaks
 - Cost difference of recycling versus Casitas water
 - Cost of maximizing use of water captured from de-silting
 - Re-vegetation Costs:
 - Refine and cost out acceptable re-vegetation standard
 - More detailed site analysis of on-site fauna
 - Cost increases due to dealing with large rocky substrate
- Compare with other comparable dams with sediment issues (e.g. Elhwa, Rogue, [Condit \(2011\)](#))

Option 2. “Hybrid option:” Modifications to 4b to reduce the amount of water and sediment that must be slurried to the BRDA sites. Accomplished through the use of one or more of the following :

- Slurry a portion of (but not all) of the 2m cubic yards to one or more BRDA sites
- Notch the dam to the 2011 sediment level
- Notch the dam and meter natural transport of some portion of the fine material over time
- Sequester (permanently or temporarily) some portion of the fine material upstream of the reservoir (e.g. terraces, below/ land side of the road).
- “Downstream option:” Reduce the sediment risks to the public water supply by transporting natural sediment flows below Robles (see alternative 3 below).

Additional more detailed data gaps and constraints included:

- How do we analyze and quantify the risks to the public water supply from some level of natural transport of fine sediments (and nutrient-laden sediments)?
 - What are the impacts on well water quality as well as management of Lake Casitas?
 - What is the background nutrient level in Lake Casitas?
 - Need to redefine the “without-project alternative:” to account for continued accumulation of sediment in Matilija Reservoir
- How do we analyze and quantify the impacts on steelhead, other aquatic organisms (as well as other beneficial uses) of notching and phased natural transport versus erosion from slurry deposition sites? What are the NMFS/DFG thresholds of sediment impacts on fish? [How do potential project sediment transport rates, and biological impacts, compare to naturally high sediment transport rates in the region due to large basin fires and](#)

resulting erosion?

- Quantify water costs/benefits from slurring less fines
- How to optimize a scenario to account for water costs
- How much can we remove with initial notching and follow-ons
- Costs: does phase notching cost less than slurry?
- Upstream sequestration: Cost of road option, volume of fines required
- Can notching and controlled releases reduce the need to slurry? Cost?
- Is any permanent downstream storage acceptable?
- Could the MODA site be used for only temporary storage of material?
- What can be learned from other dam removal projects?

A strawman design of an “optimized” 4b scenario was proposed by a Group member. This strawman is based on a “toolbox” approach that is intended to capture the most critical elements that contribute to the management solution, and that can be customized in concert with other tools in the toolbox, to yield a workable solution.

+/- 50% BRDA 1, 2, and maybe 3, plus ‘the downstream option’ that is outlined in Option 3 below

**+/- 25% Notching
Interim to sediment line**

+/- 25% Road Bed + physical sequestering upstream (upland & terraces)

100% *Fines handled*

Option 3. Full notching and phased natural transport: This option would replace Alternative 4b with a variation of Alternative 2 and completely avoid slurring any material downstream.

- Full notching of the dam in phases to complete removal
- Phased or metered transport of fine material
- Reduce the sediment risks to the public water supply by use of various design features that might include:
- Temporary-Enhanced functionality of the temporary coffer dam above the Matilija Dam serving the dual purpose of diverting flows around the project site, potential to divert sediment-free flows to water users during the project, potential to transport some sediment in one of two pipes downstream of Robles Diversion while still delivering clean water.
- Divert “clean” water from upstream of Matilija, to North Fork Matilija Creek at coffer dam, and deliver directly to Casitas and other downstream water users during the project.
- Transport sediment flows by conduit below Robles diversion
- Infiltration gallery below the dam
- Treat bypass as a manifold and inject lower VRCWD and MOWD wells
- Enhanced desilting basin
- Divert less water through increased water conservation to contribute to safe yield or mitigate for water loss

The use of the proposed strawman framework enabled the Group members to consider combinations of investigations later that met the test of optimizing current components of

Alternative 4b, by maximizing upstream sequestration in a manner compatible with restoration objectives, minimizing slurring needs, and reducing costs .

Additional data gaps or constraints that were raised by the Group in the course of their discussion included:

- Feasibility, construction complexity of ‘downstream option’
- What is an optimal/practicable diversion (in cfs) of water to Casitas and other diverters?
- Duration and timing of diversions
- Are costs of “downstream option” significantly less than slurring/4b?
- Effects of downstream transport of sediment/nutrients on groundwater wells
- ~~Would it be feasible of to diverting “clean” water to North Fork Matilija around the project site for release back into Matilija Creek and direct delivery in pipes to downstream water users (See Double Barrel By-Pass proposal).~~ (((MS note- I never heard any discussion or proposals to divert water to the North Fork Matilija or what that would accomplish.))?
- Impacts on water rights
- Could the downstream option be permitted/ approved by regulatory agencies as has recently been accomplished at multiple dam removal projects aropund the country? [Learn from those examples.](#)

At the conclusion of Meeting 3, the funding partners provided some framework to the Group members regarding potential funding available for future studies and investigations.

Ms. Selkirk closed the meeting with a “homework assignment” to all members:

Complete and circulate to others a questionnaire with responses to the following questions:

- Are there any other major constraints (or concerns by your organization) to the three major management options [described above]?
- Are there any other major data gaps or information needs [other than those identified above]?
- In your opinion, what are the top three data gaps or information needs that must be answered in order to develop a viable consensus solution to managing the fine sediments in Matilija Reservoir as part of the dam removal project?
- Please draft a summary request for proposals or scope of work, including the expertise needed, to respond to the top data gaps or information needs that you have indentified in the third question above.

The responses of each member organization have been posted on the Matilija project website at <http://www.matilijadam.org/>. Responses from Study Group members were summarized and incorporated into the discussion at the Group’s final meeting on March 30, 2011.

IV. Review and discussion of constraints

During the course of several of the Study Group meetings, representatives of the Corps of Engineers and the regulatory agencies provided an overview of certain issues that will affect the ultimate solution to the fine sediment management problem:

- **Reauthorization concerns**

Staff for **the Corps** discussed the types of changes to the project (as approved by Corps headquarters and authorized by Congress in the 2007 WRDA legislation) that would likely trigger a need to seek reauthorization of the project. Congressional reauthorization is required if the costs of the project change up or down by more than 20 percent of the WRDA 2007 authorized project amount. This is a relatively common occurrence for projects that is addressed through summary budgetary documentation.

Thus, an important question regarding Alternative 4b would be whether the Corps's current cost projections for the BRDA option are high enough to trigger the need for reauthorization, and/or whether Alternative 4b could be sufficiently modified to reduce those costs and still keep the design within the scope of the authorized project

A second potential trigger for reauthorization would be changes to the scope of the project whereby the timeframe for reconnection of the aquatic habitats below and above the dam is modified, thereby affecting the analyses of impacts to fisheries and water quality.

For example, hybrid options that completely substitute slurry of fines with long-term notching and natural transport of the fines would require preparation of a new decision document (General Reevaluation Report) with associated technical appendices and documentation, and technical and policy reviews, a new agreement with the Sponsor to conduct such activities while suspending all further work on the current design phase, and eventual Congressional reauthorization of the project. This issue also raised the question of whether those benefits would change if the "without project" alternative were to be redefined to include the continued accumulation of sediment in the Reservoir until it reaches capacity and begins discharging high sediment loads into the system.

The Corps and most of the group members supported seeking approaches to address data gaps that would not trigger the need for a GRR, while the Corps acknowledged that additional studies were needed to better understand other identified options or modifications to existing options and that a certain level of Corps flexibility and discretion exists to enable significant modifications and project enhancements while avoiding reauthorization.

- **Regulatory constraints**

In response to questions regarding the regulatory thresholds for instream sediment loads, staff of the **Los Angeles Regional Water Quality Control Board** indicated that the Board's main concerns would focus on the duration and timing of sediment pulses, as well as the nutrient levels in the sediments themselves. If sediment levels mimicked natural events, those levels would be less important-detrimental than ones that introduce a chronic sediment problem to the system. And so it is critically import to define what would be considered a "chronic" sediment issue, as well as to understand how sediment thresholds in the Basin Plan should be applied and how a 'beneficial use' should be specified for anadromous fish.

The **California Department of Fish & Game** emphasized that it would need to see a very detailed description of the proposed solution (e.g., at a 65 percent design level) to determine whether the solution could be permitted without major mitigation requirements. Even temporary storage of fine material at the BRDA sites or as part of the restoration of Matilija Canyon could cause the loss of important habitat that would trigger permitting issues. (A major concern of the District and the Corps is whether DFG will accept a programmatic Stream Alteration Agreement for the entire removal project or require mitigation for individual elements of the project).

Both the **National Marine Fisheries Service** and the **US Fish & Wildlife Service** indicated that the final design for the project, no matter how much it varied from the original outlines of Alternative 4b, would likely trigger the need to re-open and perhaps revise their Section 7 consultation and the Biological Opinion that the agencies have issued for the project, but that this was not necessarily a bad thing for the success of the project. For the Fish & Wildlife Service, species of concern include the red-legged frog, least Bell's vireo and willow flycatcher. Other members of the Study Group emphasized that in order to develop a viable consensus solution to management of the fines, it is critical that NMFS (as well as DFG) provide regulatory guidance and design criteria on the sediment thresholds for steelhead and other aquatic species in the river and in relation to naturally occurring high sediment transport events in the region. Numerous, successfully completed and currently active dam removal projects supported by the federal agencies utilized, or are utilizing, natural sediment transport and have detailed studies assessing the impacts of sediment transport on listed species. These studies and federal leads should be consulted to learn more about these other dam removal efforts (Marmot Dam, Rogue River Dams (4), Elwha River Dams (2), and Condit Dam, etc. See previously sent document describing these and other dam removals.

- **Funding constraints**

Both the Corps and the District indicated that while some funds existed for some additional studies by the Bureau of Reclamation on the project, each agency was severely limited in the funds that it had available to undertake new investigations or analyses to respond to the information needs identified by the Study Group. Nevertheless, it is likely that the Coastal Conservancy may be able to finance a limited number of focused studies, either directly or through supplemental grant funding to the District and/or outside consulting firms with specific dam removal expertise.

V. Study Group recommendations

At their final meeting on March 30, 2011, the Study Group reached consensus on their recommendations to the Study Group sponsors. Their deliberations focused on the following:

• Data Gaps on optimizing 4b

The objectives of the final meeting of the Study Group were to reach consensus on the major data gaps or information needs that should be addressed to resolve the fine sediment management issue, as well as consensus on recommended investigations or studies that should be undertaken to address those data gaps. *But two of the underlying issues for that discussion were (a) what does it mean to “run Alternative 4b to the ground”? and (b) what should be the components of an optimal “hybrid [design] solution”?*

Ms. Selkirk indicated that after reviewing stakeholders’ homework, she observed there were two critical data gaps for refining 4b that were common to the regulatory agencies, the resource agencies, stakeholders, funders, and water districts.

- Water Quality
- What are the risks to the public water suppliers in the 4b option?
- What are the risks to the fisheries?
- What are the current conditions in Lake Casitas and the wells that the water districts are already dealing with, so that we know the baseline in terms of what is already in the system and what is anticipated would be coming into the system?
- What would it take to optimize 4b to make it cost effective?
- Are there refinements to the 4b design that could make it more affordable and buildable so that it doesn’t trigger the 20% reauthorization threshold?

During subsequent discussions, the list was further refined to include:

- More detailed habitat analyses to fully understand flora/fauna issues
- Better understanding of the actual sediment composition in the reservoir
- When applied to the BRDA storage sites, what does “temporary” really mean and what would this include
- Could a third-party review of the cost estimates for the BRDA option offer opportunities to reduce costs?
- Can the regulatory agencies participate more fully in the design phase to insure that a buildable project will also be permitted?
- What cost savings could be realized through partial notching of the dam?
- What is the baseline water quality in the river system now and in the future with the dam in place (and if the dam had never been constructed or once the dam is removed)?
- What are acceptable turbidity levels from a fishery standpoint in the river?

Several recurring (but unresolved) issues permeated much of the discussion during the morning and early afternoon: The first was how distinct the notion of “running Alternative 4b to the ground” was from devising an optimal “hybrid solution:” In developing design modifications to 4b to reduce the amount of sediment that needed to be slurried downstream so as to reduce the costs of 4b, weren’t you actually designing a “hybrid approach”? Or in other words, how different was Option 1 (optimize Alternative 4b) from Option 2 (the hybrid option)?

The second issue was how to identify what to do first: Should additional studies or investigations be first conducted to inform the proposed design of the hybrid or modified 4b solution? Or was a defined prototype (or strawman) of that design necessary before you could conduct any such studies?

A third issue revolved around how long could the realization of certain ecosystem benefits be postponed before those delays would trigger a requirement for reformulation and federal reauthorization of the project. As currently authorized by Congress, the project relies on certain assumptions reached during its HEP (Habitat Evaluation Procedure) analysis that major benefits would be achieved within a prescribed period following dam removal. If partial or sequential notching of the dam were to be introduced in order to promote natural sediment transport downstream, such a solution could delay the realization of projected ecosystem benefits and require project reauthorization and the need for a new decision document (GRR), depending on the scope and extent of the delay. However, the group acknowledged that all options involve some degree of “natural” sediment transport downstream and that certain proposal modifications may enable additional short-term, natural sediment transportation downstream with potential costs savings, water reliability, and negligible and potentially beneficial biological impacts.

The use of the proposed strawman framework from Meeting 3 enabled the Group members to consider combinations of investigations that met the test of optimizing Alternative 4b, by maximizing upstream sequestration, minimizing slurring and reducing costs.

A subset of the Study Group caucused and returned with a strawman proposal recommendation to the full Group. This straw proposal recommended proceeding with actions that were **common** to optimizing specific Alternative 4b components while enhancing additional features:

- First: determine the maximum possible upstream area storage -of fine sediments in a manner consistent with ecosystem restoration objectives.
- Then determine how to manage the remainder, either with BRDA sites, natural transport or some combination
- Then consider actions that address the option of interim notching (see Figure 1 below)

Figure 1: “Common to all” actions

The full Group then discussed and approached consensus on the following approach:

- A design for and analysis of potential impacts from an interim notching of the dam elevation down to the existing level of sediment deposition in the reservoir. Such an action would equate to a notch of between 10-20 feet and would be undertaken to prevent further sedimentation behind the dam.
- Preparation of a detailed conceptual plan for restoration of Matilija Canyon (the reservoir area) and an analysis of how an optimal amount of the fine sediments could be incorporated into that restoration.
- What will it look like and how much fine material can be left up behind the dam to minimize costs? How much can we mix with the coarse material? How much can be kept upstream? Need to do research which sediment can be classified as acceptable.

The Study Group concurred in these recommendations and then discussed and refined them to develop more specific ideas about the two basic studies and the companion analyses that would be needed to inform them.

• **Recommended actions on specific studies**

- ***Matilija Canyon restoration and hybrid alternative analysis:*** A set of studies aimed at designing a conceptual restoration plan for the area upstream of the dam, with the goal of naturally stabilizing a major volume of the fine sediments within the footprint of the restoration effort for Matilija Canyon. By securing more fines upstream and revegetating it in appropriate locations as part of the natural restoration of the floodplain, upland terraces, existing road cut and erosion sites, and adjacent canyons of the creek, the project could potentially eliminate a major portion of the material that has been programmed to be slurried downstream—, Efforts should be made to maximize sediment storage in already disturbed areas such as the low elevation roadway and associated landslide zones. In addition, restoring the channel of Matilija Creek, as called for in the Feasibility Plan, would help promote a controlled natural release from temporary storage areas over time.

Preparation of a conceptual restoration plan for the reservoir area would include:

- Determining the upstream storage capacity for the fine sediments in a manner consistent with the restoration objectives for that area specified in the Feasibility Plan
- Developing a natural stream bank stabilization and revegetation plan for the area (potentially including a proposal for a pilot study and drawing on similar, dam removal project “natural” channel stabilization designs); and
- Analyzing the potential on-site and downstream impacts that would result from such a solution

Calculating the volume of fines that could be properly incorporated in the ecosystem restoration project upstream would be the first step in then determining how to design an optimal hybrid solution to manage the remainder of the fine sediments in the reservoir. The next steps would then be to:

- Determine whether some volume could be managed through a process of natural sediment transport that would capitalize on large storm events during the planned notching of the dam as the removal project is implemented. Studies to determine the feasibility of incorporating such an option in a hybrid solution would need to analyze a phased notching of the dam and the controlled release of sediments, as well as investigate the resulting downstream impacts to water quality, steelhead and other biological resources and utilize similarly completed study results at existing dam removal project identified.
- ~~Refine~~ If still needed, following the above investigations, define the design of the downstream Baldwin Road slurry disposal sites (as well as the slurry pipeline system) that would then be required to accommodate the balance of fine materials that could not be effectively managed through an upstream restoration effort or natural transport. Among the objectives of that effort would be to minimize the cost, complexity and adverse impacts of the BRDA component. That analysis ~~could~~ should also include the feasibility of incorporating a variation of the “downstream” or double barrel/bypass” components of the Double Barrel By-Pass proposal that could ensure high water quality objectives for dponwstream water users and wildlife during the project duration, while allowing controlled natural sediment transport and even limited slurry disposal options .

An integral part of these basic studies would be more detailed investigations designed to respond to the priority data gaps and information needs discussed above, as identified by the Study Group earlier in the day as necessary to “optimize Alternative 4b.”

- ***Interim notching design:*** The Watershed Protection District, in partnership with the Coastal Conservancy and others, would investigate the feasibility of notching the dam down to the existing sediment level in the reservoir. The objective of such an action would be to lower the height of the dam to prevent any further accumulation of sediment in the reservoir. Each year that the reservoir traps additional sediment only increases the cost and complexity of the eventual effort that will be needed to manage what’s there now. But because the Corps says that interim notching is beyond the scope of the authorized federal project, both this study and any resulting implementation of such an action would have to be undertaken independently of the Corps’s engineering and funding for the Matilija project. The Watershed Protection District would be responsible for identifying and coordinating potential funding resources for any such notching effort.

An integral part of these basic studies would be more detailed investigations designed to respond to the priority data gaps and information needs discussed above, as identified by the Study Group earlier in the day as necessary to “optimize Alternative 4b.”

While the Group did not conduct a thorough analysis of what data gaps or studies would trigger Congressional re-authorization, Recommendation 1 was intended to fall within the current authorized project.

- **Recommendations on expertise for these studies:**

The Study Group then suggested the following stakeholder teams and experts be asked to contribute to the two studies:

(1) Matilija Canyon restoration and hybrid alternative analysis
Team

- Corps of Engineers
- Watershed Protection District/County
 - Ecosystem restoration expertise is needed for the managing team.

Expertise needed

- Dedicated effective project management
- Ecosystem restoration specialist
- Specialists in sediment modeling & dam removal
- Geotech expert
- Notching
- Bioengineering
- Nutrient loading
- Soils and water quality
- Construction – rocks & mixing
- Groundwater
- Slurry pipeline construction and operations
- Hydraulics modeling
- Construction cost estimates (outside consultants)

(2) Interim notching

Team

- Watershed Protection District
- Coastal Conservancy
- Other funders
- Other interested stakeholders.

Expertise needed

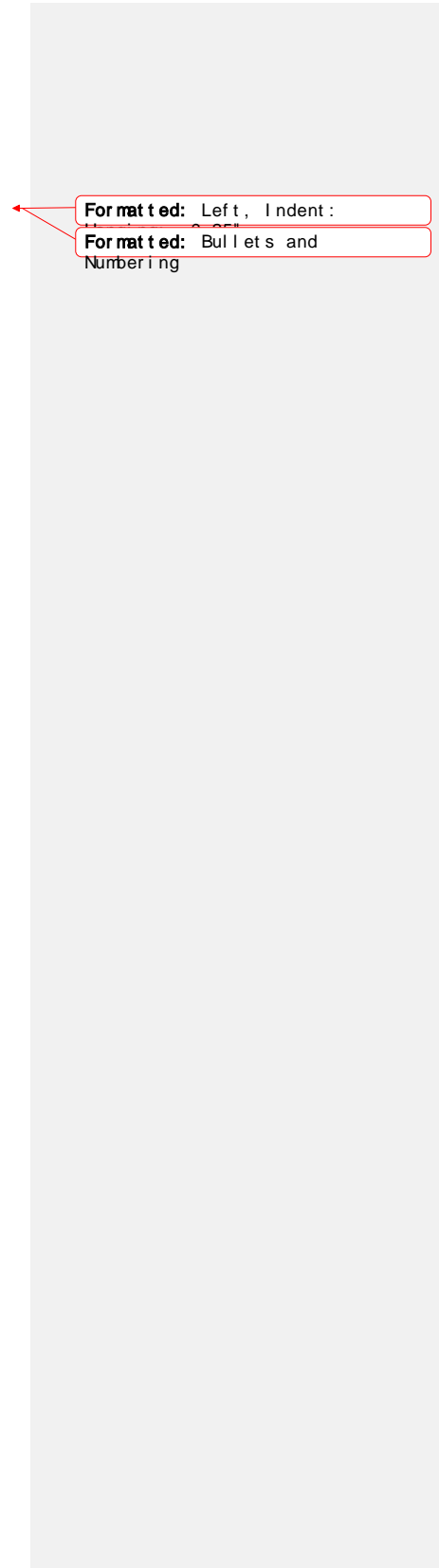
- Bureau of Reclamation
- Structural engineers
- Dam safety expert
- Casitas MWD
- Technical advisory committee
- Regulatory/permitting agencies
- Fluvial – geotech expert
- Someone with permitting expertise
- Sediment transport modeler
- Environmental document experts (CEQA)
- People knowledgeable about local conditions
- Fishery experts
- Resource Agencies
- Water rights experts and staff from the SWRCB, LARWQCB and Dept of Water Resources.

Next Steps

After reaching consensus on a recommendation for proceeding, the Study Group discussed next steps.

Review Final Report

As stipulated in the Charter, a draft final report will be produced for Study Group review. Study Group members' comments will be incorporated and finalized by the Study Group sponsors.



- **Convene a DOG meeting**

Upon completion of the final report, the Group agreed that the Study Group sponsors should convene a meeting of the Design Oversight Group to present the outcomes of the Study Group process.

Study Group members also suggested and discussed the following next steps, though the Group did not make any decisions on these suggestions:

- The use of the proposed strawman framework enabled the Group members to consider combinations of investigations that met the test of optimizing Alternative 4b and hybrid variations, by maximizing compatible upstream sequestration, minimizing slurry and reducing costs.
-
- Convene smaller focused working groups, patterned after the Feasibility Study working groups
- Provide feedback to designated agency teams on criteria for selecting consultants/teams
- Set up a selection committee to review consultants/proposed studies

Appendices:

- Appendix 1: December 10, 2010 draft meeting notes
- Appendix 2: December 10, 2010 meeting: transcribed flip charts
- Appendix 3: February 2, 2011 draft meeting notes
- Appendix 4: February 24, 2011 draft meeting notes
- Appendix 5: Consolidated transcribed flip chart notes, February 2 & February 24 meetings
- Appendix 6: Final Charter
- Appendix 7: Study Group roster
- Appendix 8: Questionnaire & Study Group responses
- Appendix 9: March 30 meeting notes
- Appendix 10: Memorandum on Restoration Concepts, Matilija Coalition, June 2010
- Appendix 11: Dam Removal Sediment Management Examples
- Appendix 12: Write up and Schematic of “Double Barrel By-Pass” ~~concept~~