(Released to public December 12, 2011)

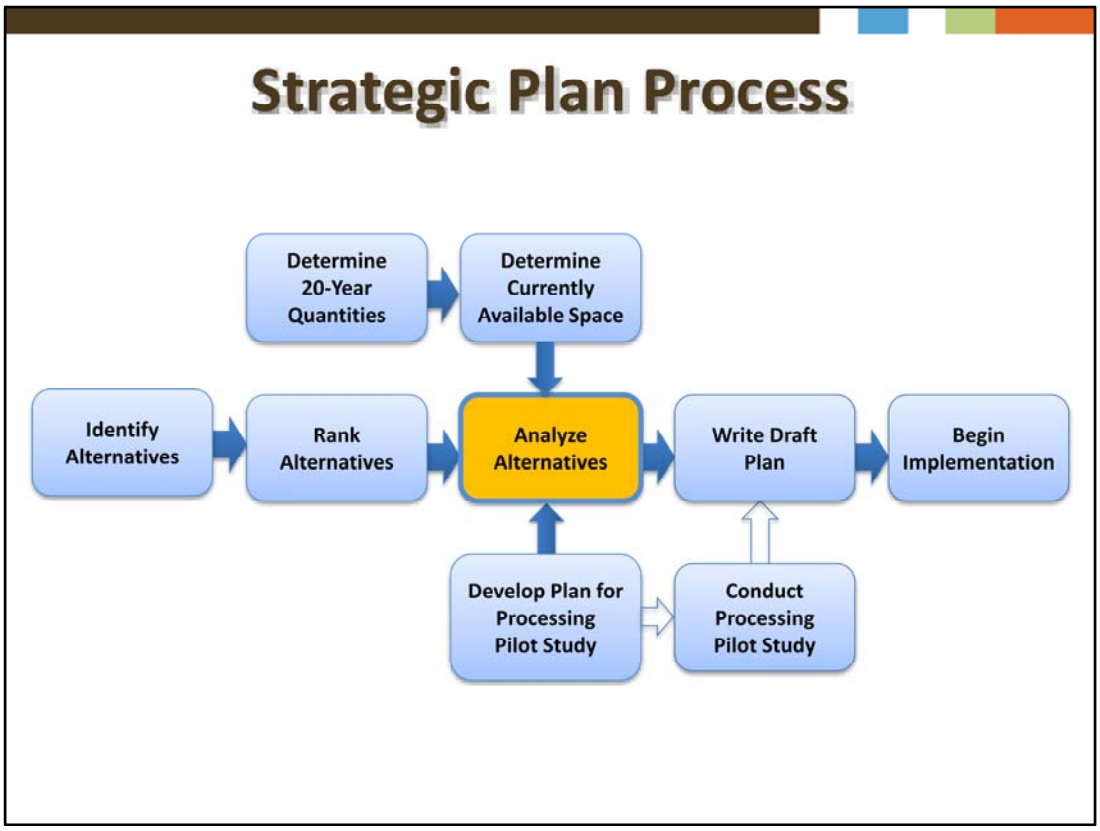
Sediment Management Strategic Plan
Stakeholder Task Force Meeting # 5

Analysis to Date of
Alternatives for Pacoima & Morris Reservoirs

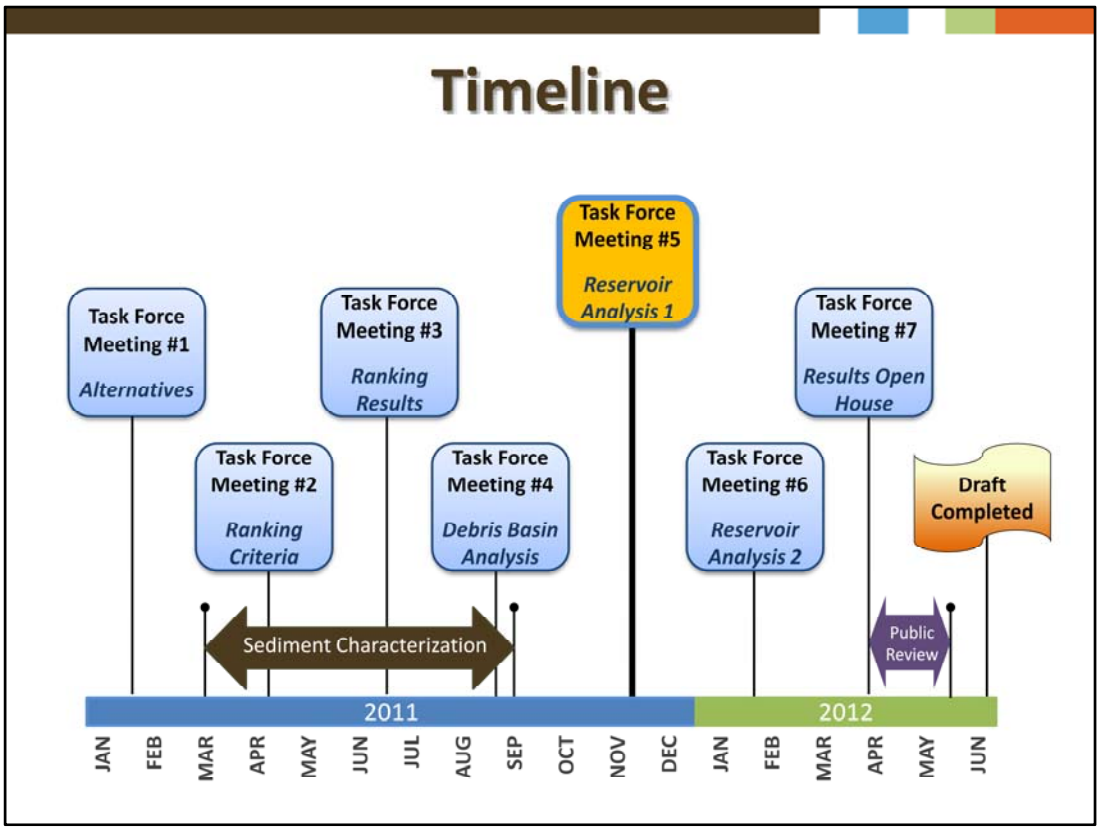
November 15, 2011

Goal

Manage sediment in order to provide for the flood risk management and water conservation needs of the region while balancing environmental, social, and economic concerns.

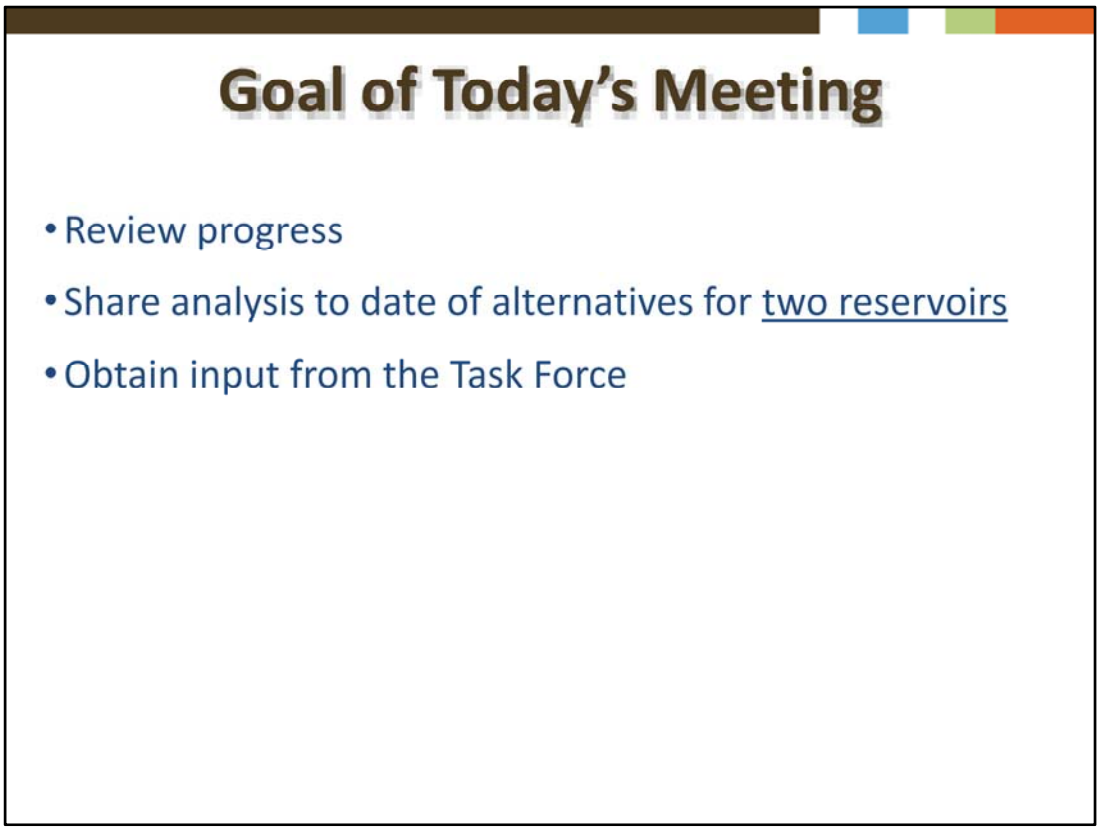


The schematic depicts the Sediment Management Strategic Plan process. We currently are analyzing alternatives.



Given the complexity of managing sediment at the reservoirs, the discussion of the analysis was broken up into a few meetings. During this meeting, Task Force Meeting # 5, we will introduce you to Pacoima and Morris Reservoirs and present the analysis to date on the two. In a subsequent meeting in January or February, we will discuss the complete analysis of alternatives for Pacoima and Morris Reservoirs and present the recommendations for managing sediment at the two reservoirs.

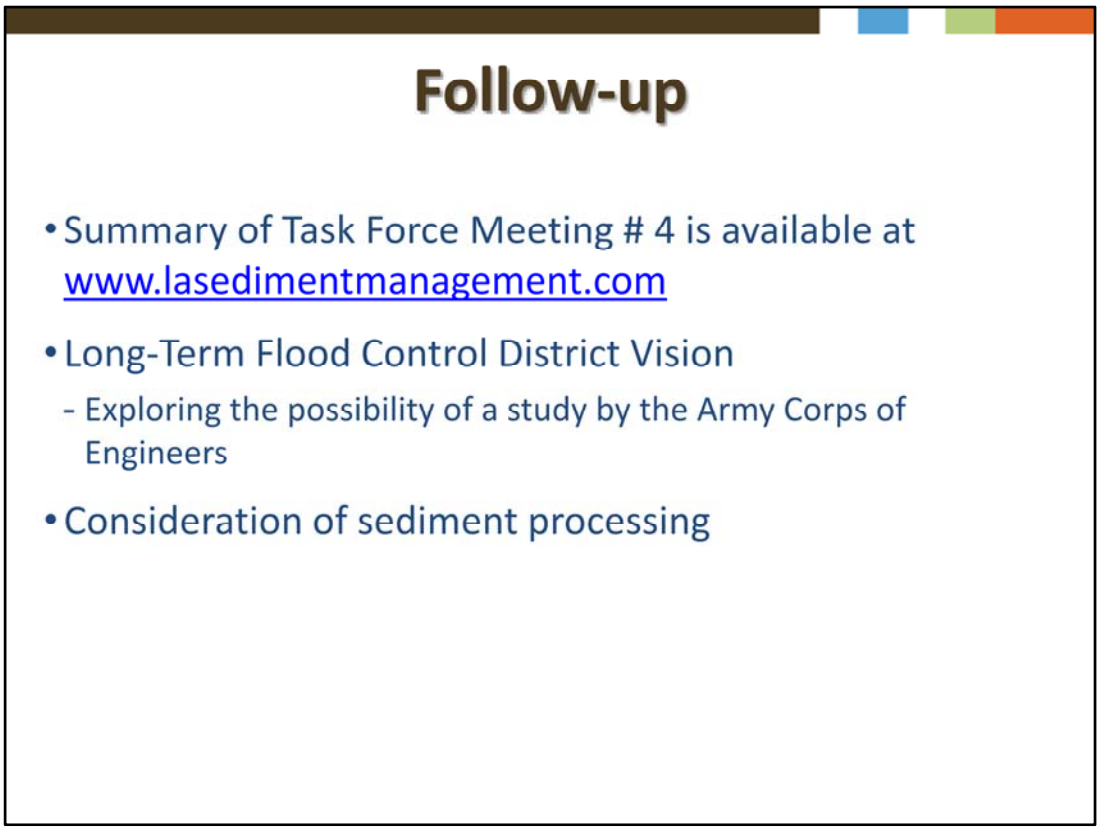
A seventh Task Force meeting, during which we will provide information about the analysis and recommendations for all subgroups of debris basins and all reservoirs, is anticipated to be held in the coming spring. The meeting will serve to quickly provide all the information and facilitate review and comments during the public comment period we are incorporating into the development of the Sediment Management Strategic Plan.



The focus of today's meeting is on two of the reservoirs, Pacoima & Morris Reservoirs, and the analysis of alternatives to date. We will continue to analyze the alternatives for the two reservoirs given your input.

Agenda

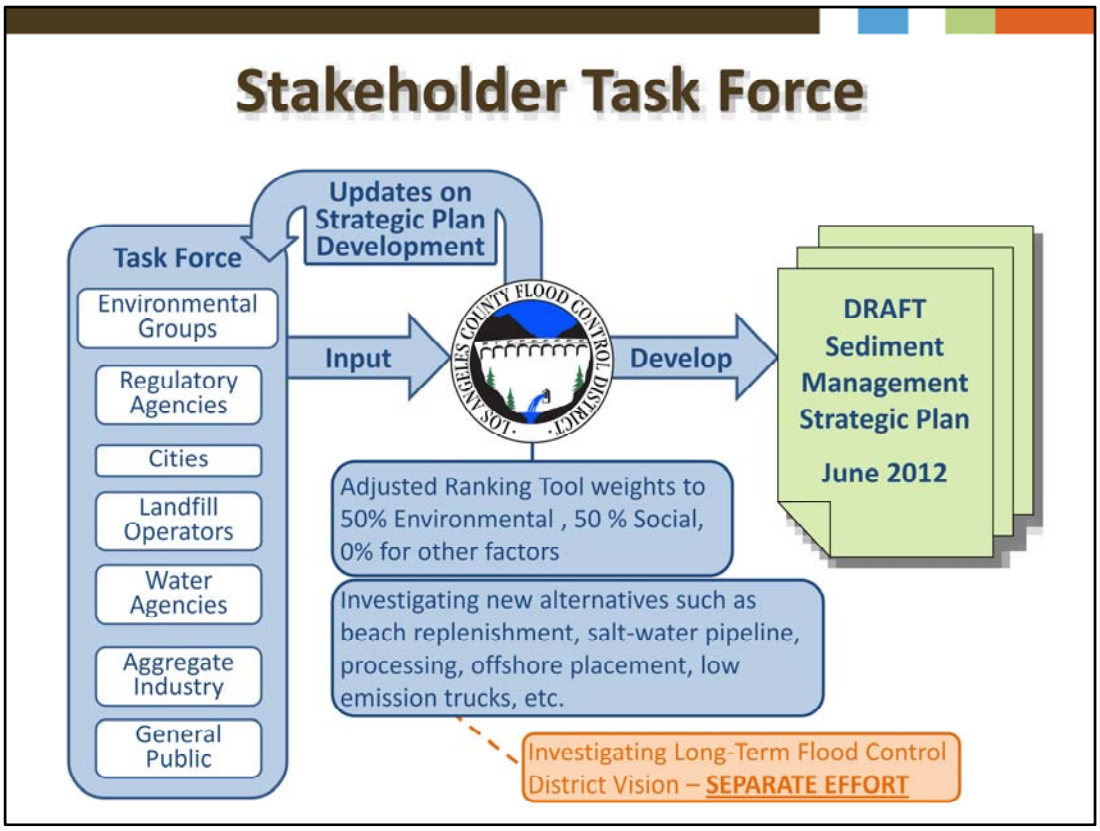
- Progress review
- Follow-up from 4th Task Force Meeting
- Reservoir analysis to date – Pacoima & Morris Reservoirs
- *Devil's Gate Environmental Impact Report process*
  → *Brief update*
- Next steps



During the last meeting we presented the planning quantities for the Strategic Plan and discussed sediment management alternatives for two subregional groups of debris basins. The summary of the previous meeting is on our webpage. Comments on the summary can be emailed to SedimentMgmtPlan@dpw.lacounty.gov.

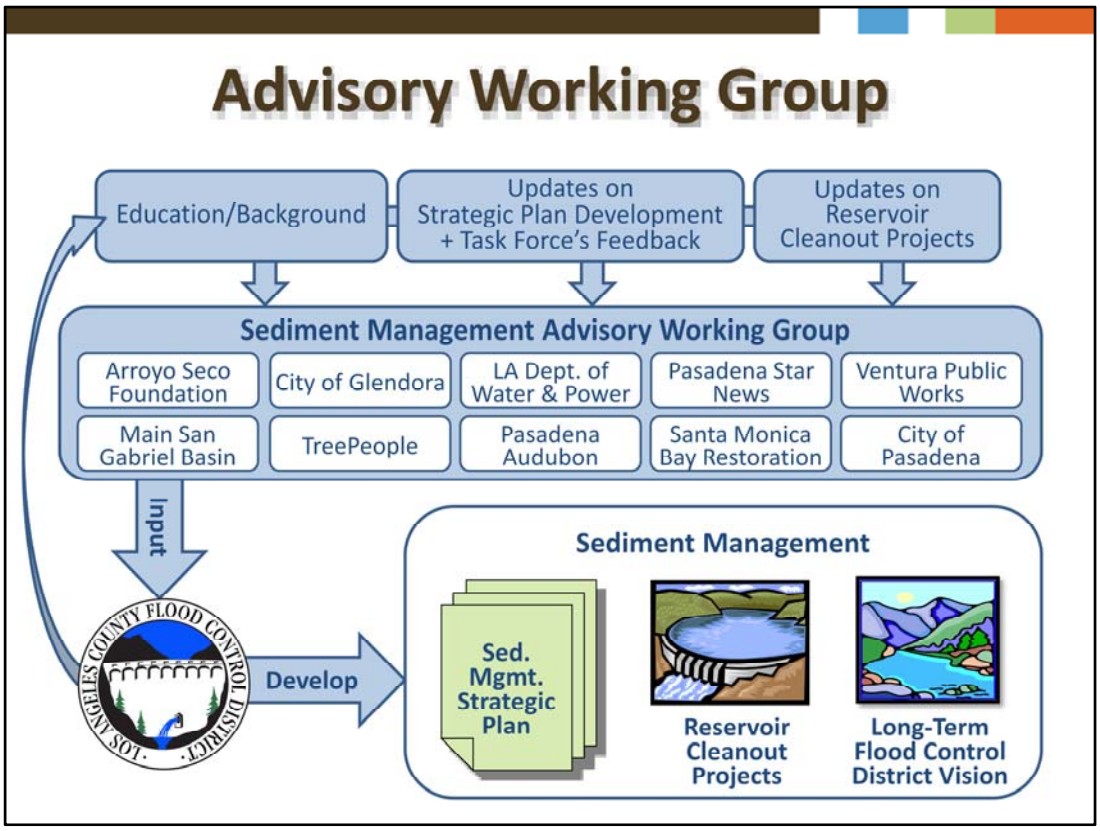
During previous meetings, a long-term vision for the Flood Control District has garnered much discussion. We have proactively investigated this idea and have begun exploring the possibilities, challenges, and procedures to make this happen with the help of the Army Corps of Engineers.

We have made some progress on our investigation of the possibility of processing sediment from the debris basins and reservoirs into a useable product. This will be discussed more later during the presentation.



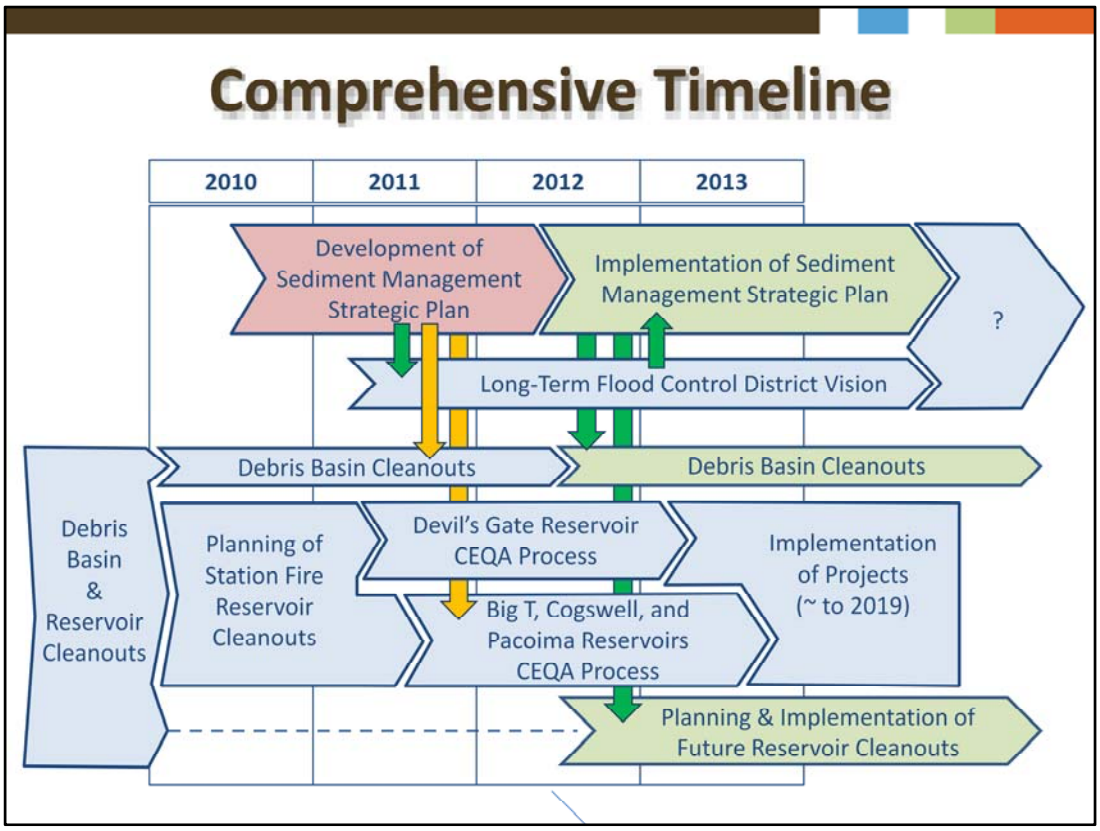
During previous meetings, there has been some interest and confusion regarding the difference between the Stakeholder Task Force and the Advisory Working Group.

The Stakeholder Task Force was formed specifically to help with the development of the Sediment Management Strategic Plan. During Stakeholder Task Force meetings, the Flood Control District provides updates on the development of the Strategic Plan and seeks input from the Stakeholder Task Force. Some of the key input provided by the Stakeholder Task Force was regarding the ranking tool and the investigation of new alternatives. We also heard the request for a long-term vision from this group. While it is not intended for this Stakeholder Task Force to meet after the draft of the Strategic Plan is completed, we will be including the public through community meetings or other meetings as we work on other projects related to the management of sediment.



The Advisory Working Group is a smaller group that was created to provide a broad perspective on the various sediment management efforts based on the diverse experiences and key roles in the stakeholder community of members of the Advisory Working Group. The group is comprised of representatives from water agencies, environmental groups, and city/county agencies as well as the media. The Advisory Working Group is providing input on: 1) The Strategic Plan, 2) Reservoir Cleanout Projects, and 3) the development of a Long-Term Flood Control District Vision. As part of our updates to the Advisory Working Group on the Strategic Plan, we provide them with the same information we provide the Stakeholder Task Force during the Task Force meetings along with the input we have received from the Task Force.

Members of the Advisory Working Group have expressed their willingness to hear from Task Force members and others. Their emails are now provided on the sediment management website at www.lasedimentmanagement.com/advisory.aspx.



This schematic shows the various projects related to sediment management and how they relate to each other.

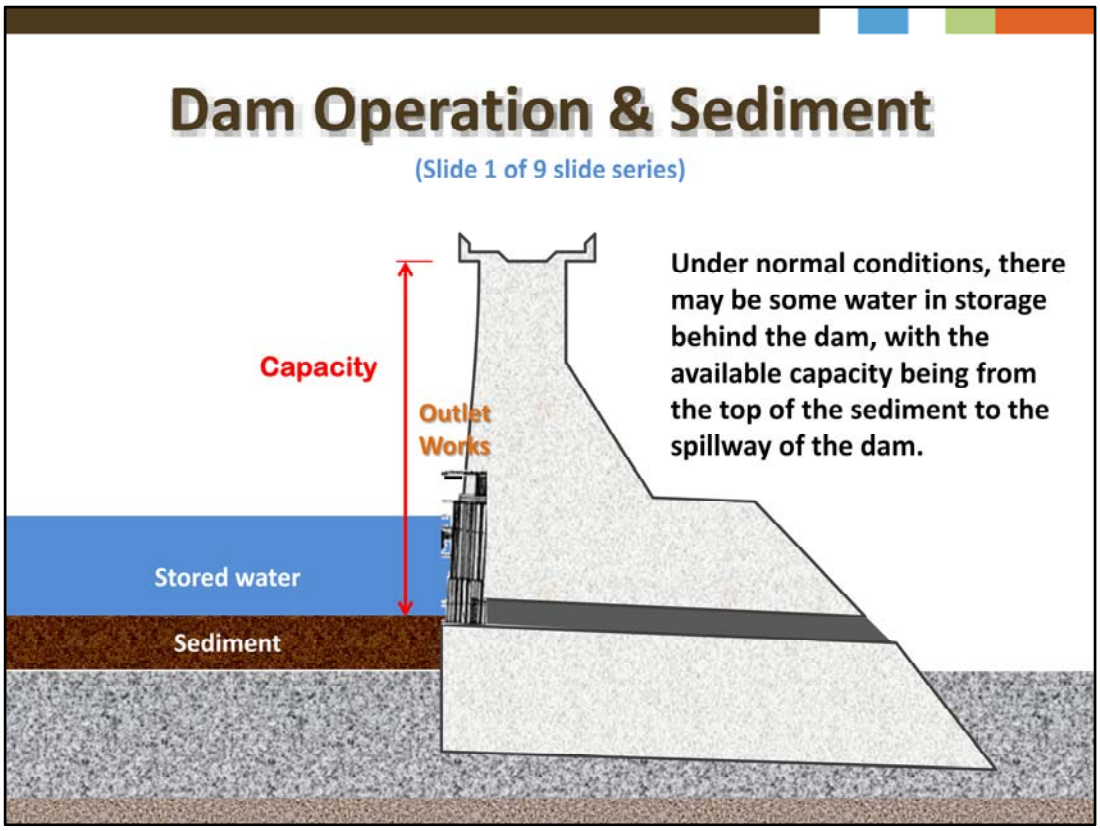
The Flood Control District has been cleaning out debris basins and reservoirs for many decades as part of its role in providing flood risk management and water conservation for the region. The Station Fire of 2009 impacted the watersheds of various reservoirs, which in turn increased sediment flows and the risk of additional large flows of sediment into those reservoirs, thus resulting in the need to clean those reservoirs. The planning effort for the cleanout of the affected reservoirs began in 2010, with the various cleanouts anticipated to be completed around 2019. In the meantime, debris basins continue to be cleaned out as needed.

Concurrently to working on the previously discussed efforts, the Flood Control District is working on the development of the Sediment Management Strategic Plan. While being developed and where possible, aspects of the Strategic Plan will be used in the ongoing debris basin cleanouts and the concurrent planning efforts for the cleanouts of the reservoirs affected by the Station Fire. Implementation of the Strategic Plan is anticipated to begin in 2012 and will impact future debris basin cleanouts and the planning and implementation of future reservoir cleanouts.

The development of a Long-Term Vision for the Flood Control District is another effort related to the management of sediment, an effort which was born from the input received while working on the development of the Strategic Plan. It is anticipated that as the Long-Term Vision is developed aspects of it will be incorporated into the implementation of the Strategic Plan and that in the future the Strategic Plan and the vision may merge into one.

Agenda

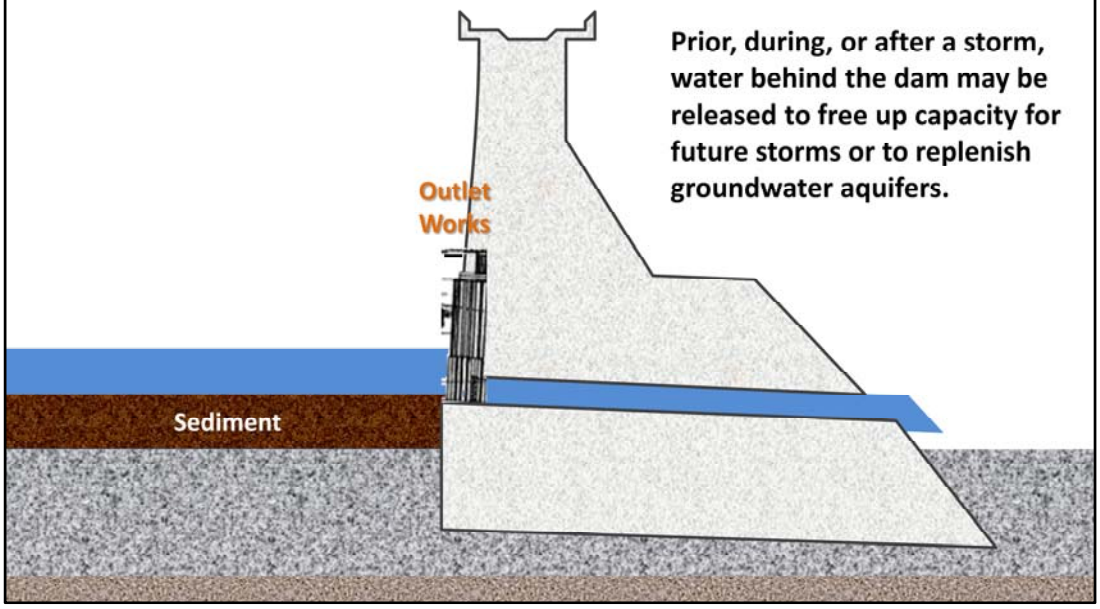
- Progress review
- Follow-up from 4th Task Force Meeting
- Reservoir analysis to date – Pacoima & Morris Reservoirs
- *Devil's Gate Environmental Impact Report process*
  → *Brief update*
- Next steps



This slide and subsequent slides help to illustrate how dams operate and the relationship between dams and sediment. It is important to note that while one may think that the accumulation of sediment behind dams is an unforseeen detrimental effect, dams are indeed meant to hold back sediment, a function which helps to manage flood risk for communities downstream of the dam.

Dam Operation & Sediment

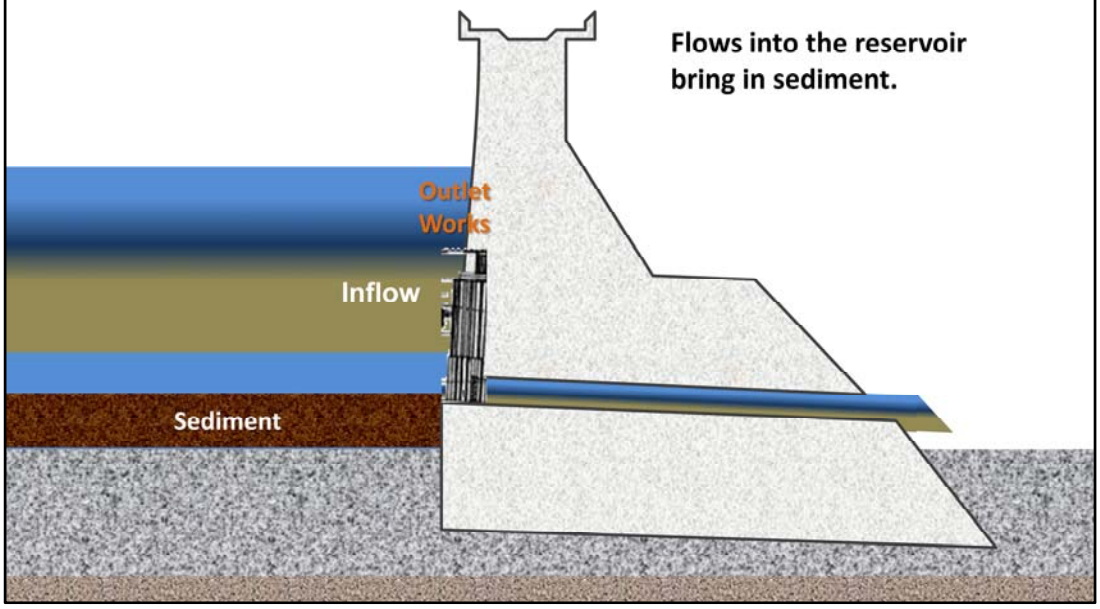
(Slide 2 of 9 slide series)



Prior, during, or after a storm, water behind the dam may be released to free up capacity for future storms or to replenish groundwater aquifers.

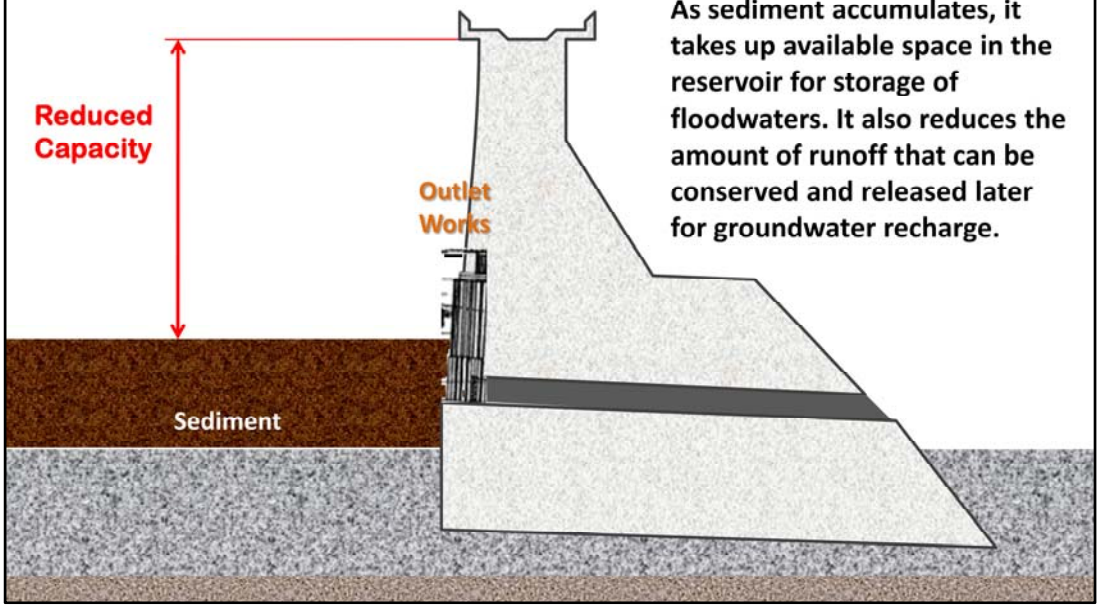
Dam Operation & Sediment

(Slide 3 of 9 slide series)



Dam Operation & Sediment

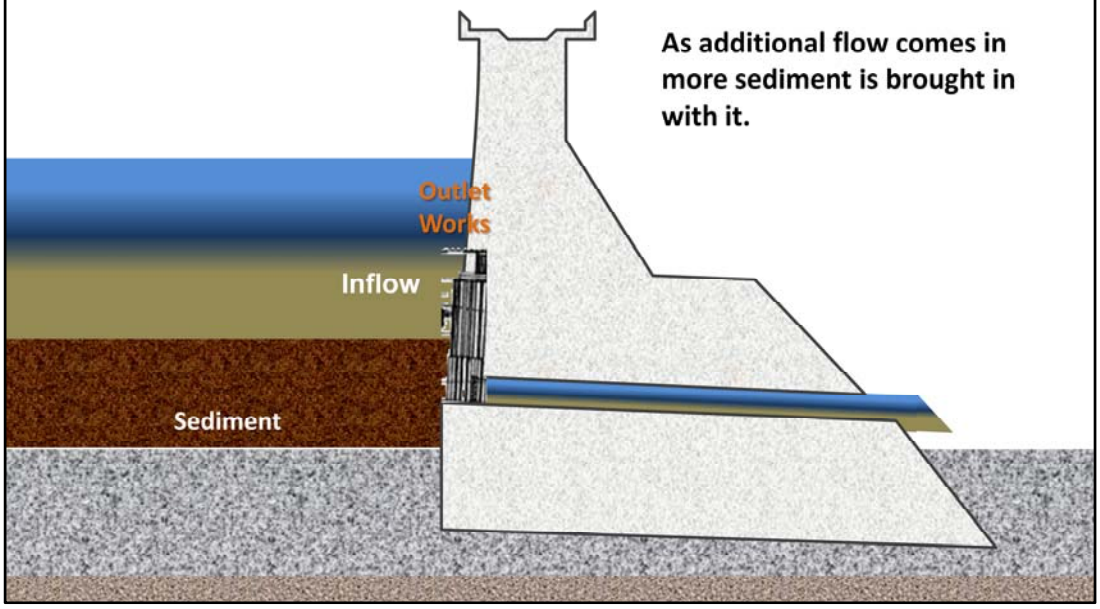
(Slide 4 of 9 slide series)



As sediment accumulates, it takes up available space in the reservoir for storage of floodwaters. It also reduces the amount of runoff that can be conserved and released later for groundwater recharge.

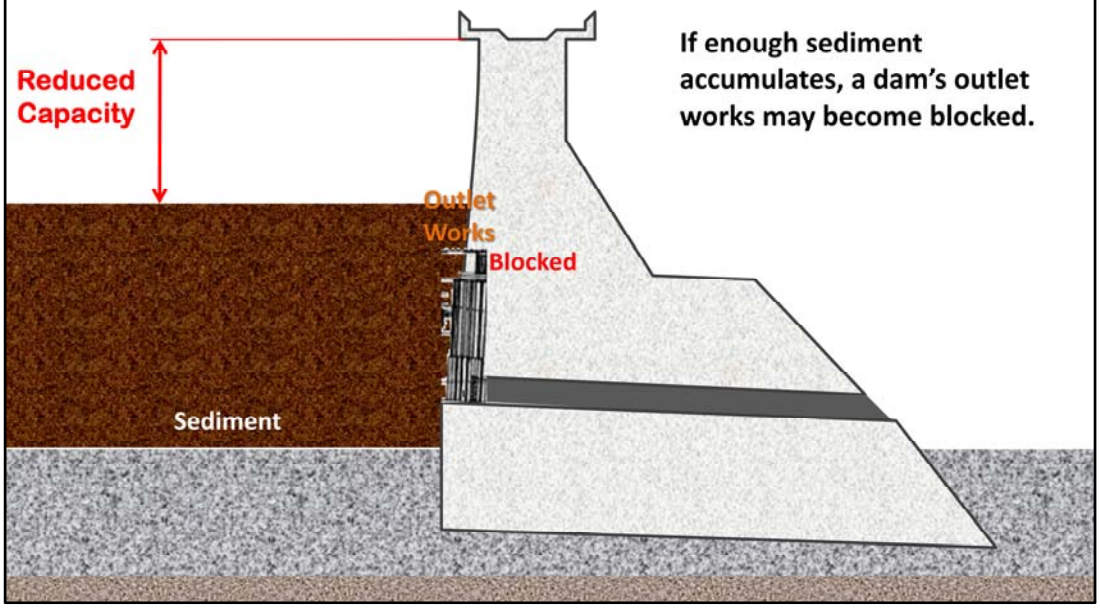
Dam Operation & Sediment

(Slide 5 of 9 slide series)



Dam Operation & Sediment

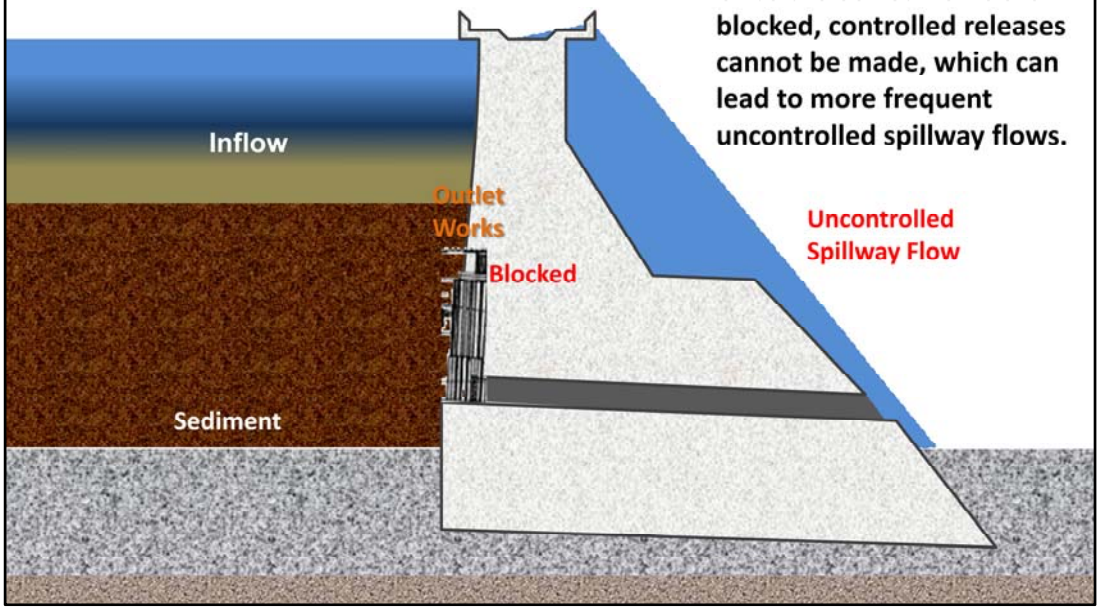
(Slide 6 of 9 slide series)



Dam Operation & Sediment

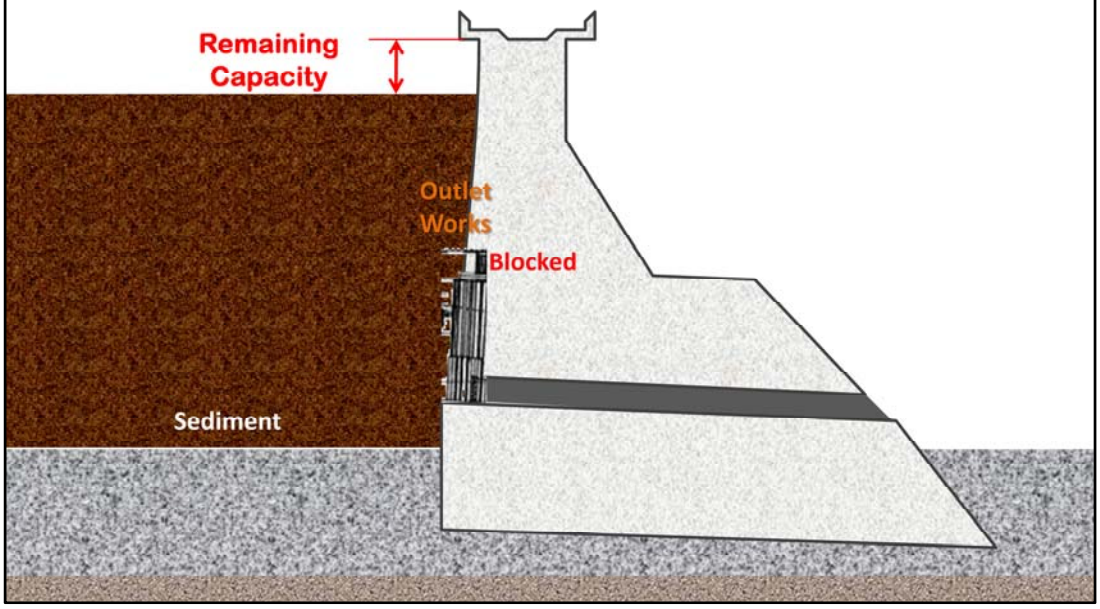
(Slide 7 of 9 slide series)

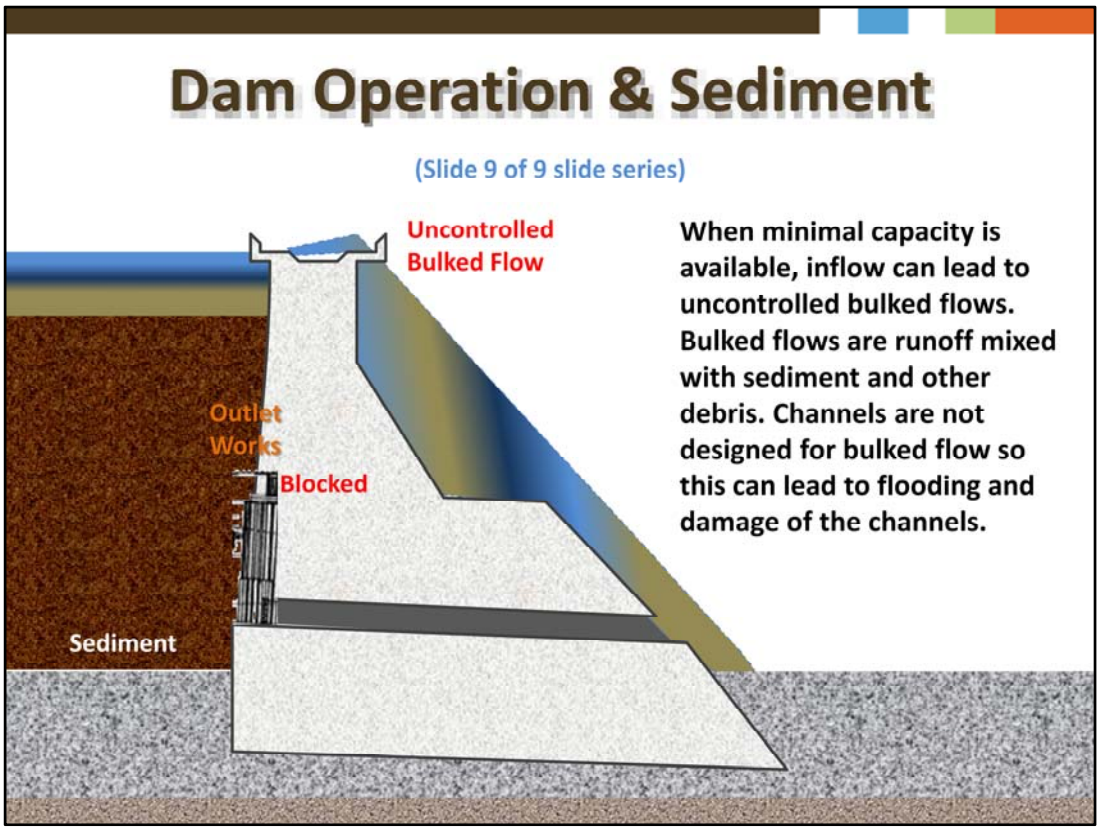
Once the outlet works are blocked, controlled releases cannot be made, which can lead to more frequent uncontrolled spillway flows.



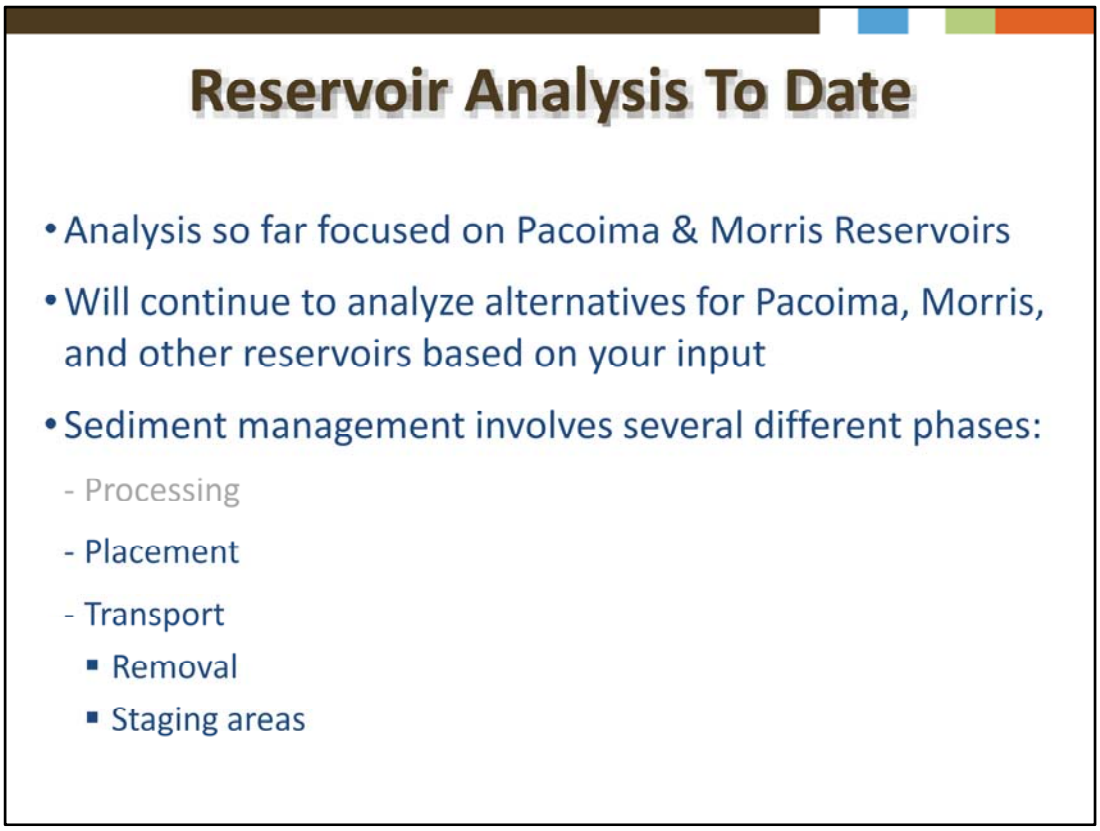
Dam Operation & Sediment

(Slide 8 of 9 slide series)



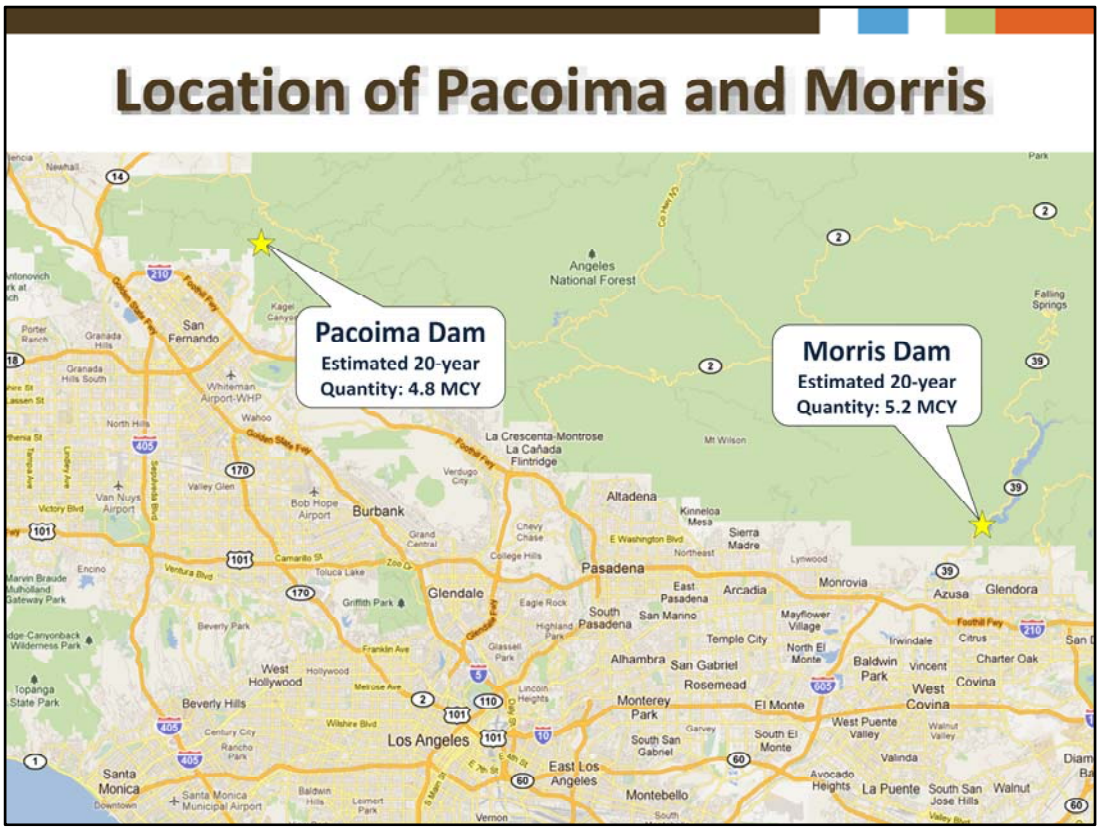


As indicated earlier, a dam's function in managing the risk of flooding includes the ability for it to hold back sediment. The potentially damaging bulked flows described here result from a dam's inability to capture sediment.



Due to the many complexities of sediment management at reservoirs, we are continuing to analyze the sediment management alternatives for Pacoima and Morris Reservoirs. This presentation is to share the analysis to date. The input received will be used as we continue to analyze the alternatives for the two reservoirs as well as the other reservoirs.

We have previously split the various phases of sediment management into processing, placement, and transport. While analyzing the transport alternatives we realized sediment removal and staging areas play an important role in the transport alternatives.



The 20-year planning sediment quantity for Pacoima and Morris Reservoirs are 4.8 million cubic yards (MCY) and 5.2 MCY respectively. As a reference, if the Rose Bowl were to be filled up to the rim, it would hold a volume of approximately 400,000 cubic yards.

Placement Alternatives

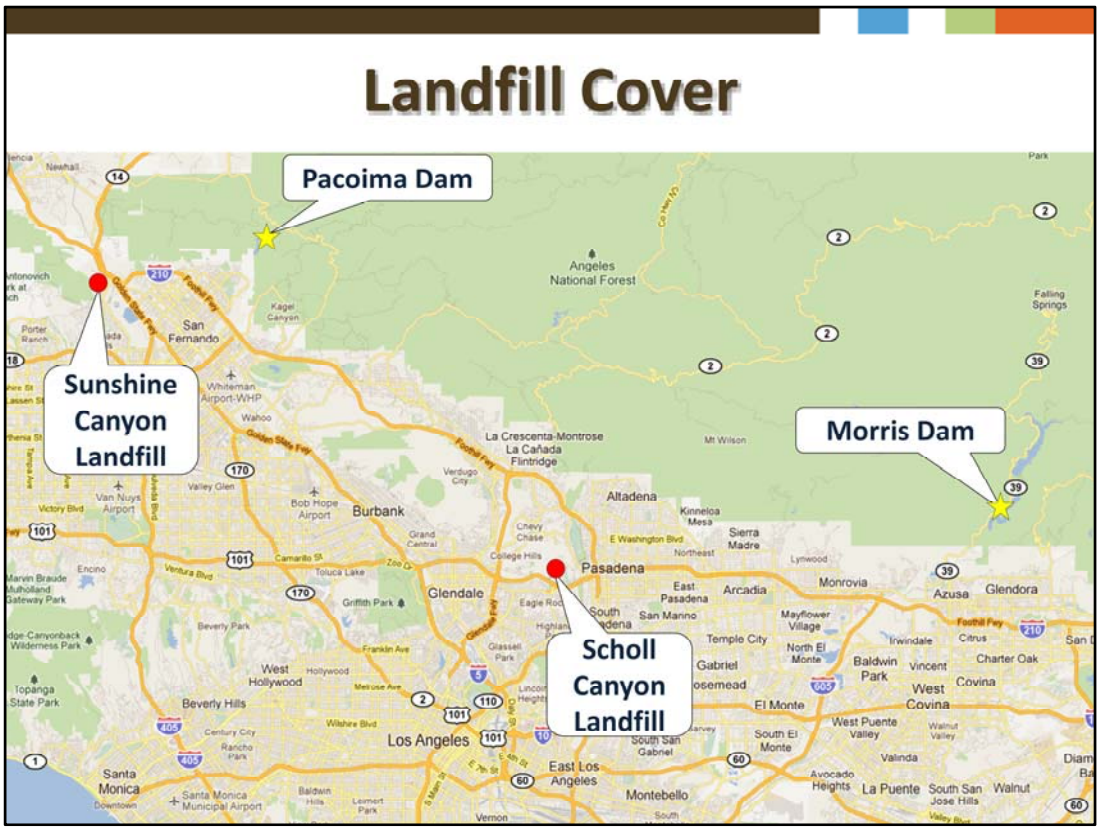
Ranking based on environmental & social factors only.

Alternate Description	Score	Rank
Landfill Cover	9.3	1
Place at Pits	9.0	2
New SPS with Recoverable Habitat	8.5	5
Beach Sand	7.5	7
*Use Active SPSs **	7.3	8
Offshore Placement	7.3	8
New SPS near Residential and/or Location with Sensitive Habitat	6.8 – 2.5	10 to 15

* Active SPSs will continue to be used for immediate needs.

During the previous phase of analysis, alternatives were ranked based on a 50% weight on environmental concerns and the remaining 50% on social concerns (Refer to Task Force Meeting # 3 documents for additional info about the ranking of alternatives). As previously indicated, during this phase of the analysis, we are also evaluating the alternatives based on performance, implementability, and cost. Similarly to how all the alternatives were investigated for debris basins, all the alternatives are being investigated for the reservoirs. Given the differences between the two types of facilities, the results of the analysis may differ.

The table here shows the ranking for the placement alternatives. The following slides present some of the key findings for these alternatives.

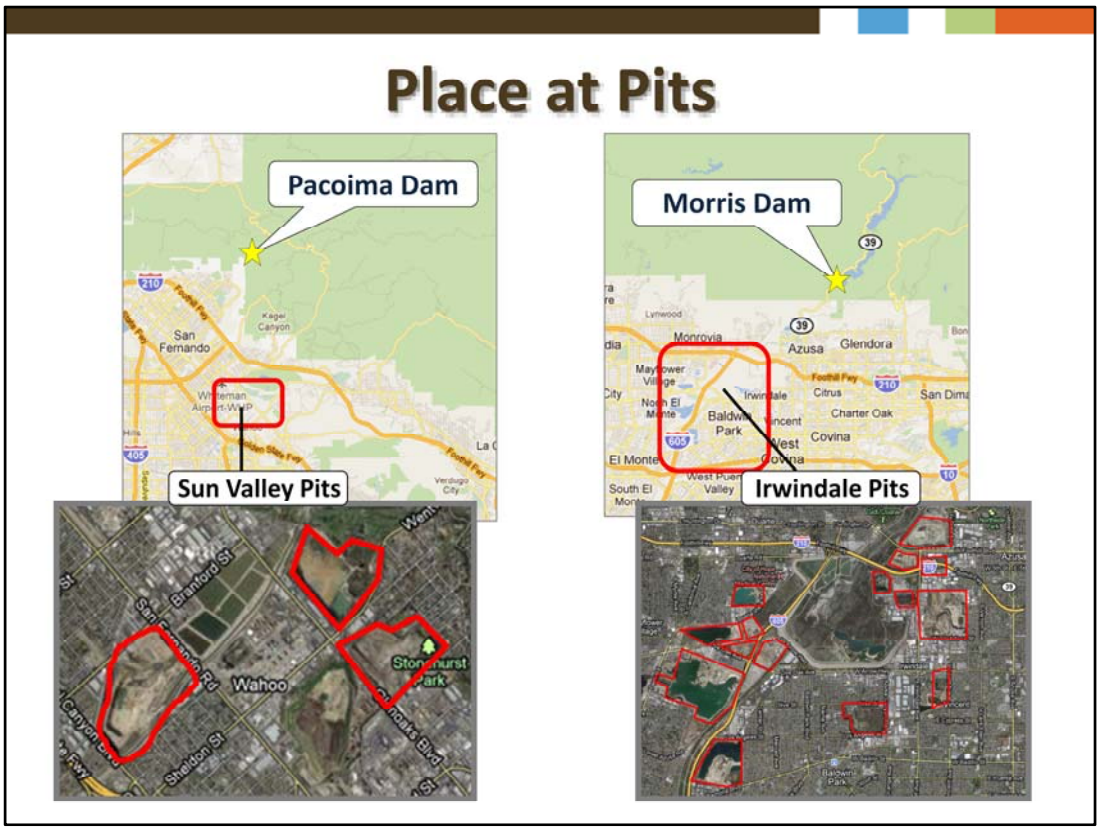


Sunshine Canyon Landfill is the largest landfill near Pacoima Reservoir (~8.5 miles away). The landfill is interested in receiving sediment from the Flood Control District and is able to stockpile sediment if it is not immediately needed for cover. The tipping fee is anticipated to be approximately $5 or less per ton of sediment. The landfill is expected to be operational until 2037.

Scholl Canyon Landfill is the largest landfill near Morris Reservoir (~22 miles). Similar to Sunshine Canyon Landfill, Scholl Canyon landfill is interested in receiving sediment from the Flood Control District and is able to stockpile sediment if it is not immediately needed for cover. The tipping fee is anticipated to be approximately $4 per ton with a $30 per load minimum.

A major concern with using sediment from the reservoirs as landfill cover is that landfills' cover needs and tipping fees may fluctuate.

The use of sediment for landfill cover would not be able to be the single solution for the placement of sediment from the reservoirs. However, it may be able to provide part of the capacity needed.



There are 19 pits that have been identified as potential sites for sediment placement. There are 3 pits in the Sun Valley area and 16 pits in the Irwindale area. The Flood Control District has been in contact with the various pit owners (7 in total) and continues to discuss the possibility of their use. More information will be provided later based on additional discussions.

Beach Nourishment

Example: Redondo Beach

- Possibly 20% of processed sediment could be placed at beach (Need to meet specific requirements)
- Approx. 40-50 miles
- Partnership needed

For beach nourishment, there are a number of options in terms of placement. We know that Broad Beach in Malibu has a current need for about 600,000 CY. However, this need or quantity is not reoccurring. We know that in Redondo Beach sand washed off the beach falls into an offshore canyon, which creates a recurring need for beach replenishment. For this reason, we looked at Redondo Beach as an appropriate example for the beach nourishment alternative.

It has been estimated that of the reservoir sediment processed, only approximately 20% of that quantity would be suitable for beach placement because each beach has specific requirements as to color and grain size so that the placed sand matches the existing. An additional concern is that Redondo Beach is approximately 40-50 miles from Pacoima and Morris Reservoirs.

The Flood Control District is open to partnering with other agencies to use the sediment captured in the facilities under its jurisdiction as a source of sand for beach replenishment.

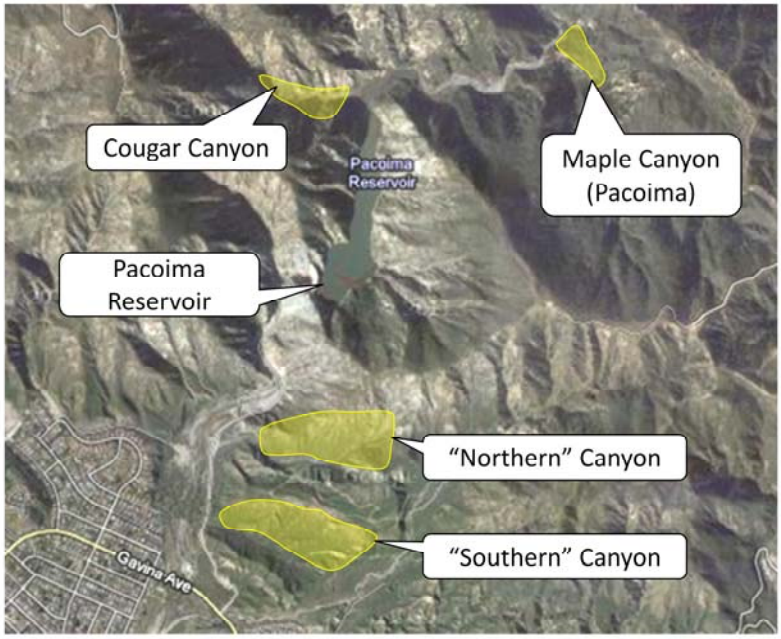
Offshore Placement

LA-2 (San Pedro) Ocean Disposal Site

- Operated by EPA & Army Corps
- Approx. 50 miles from Pacoima & Morris Reservoirs
- Per Federal Code of Regulations, no discharge is permitted if there is a practicable alternative

An existing Ocean Disposal Site for the placement of sediment has been located off the coast of San Pedro. This site is operated jointly by the EPA and the Army Corps of Engineers. This location is approximately 50 miles from Pacoima and Morris Reservoirs. Although this site exists, it is our understanding that the Federal Code of Regulations does not allow sediment to be placed at Ocean Disposal Sites unless there is no other practicable alternative. If other alternatives are exhausted, this alternative could be investigated further.

New SPS Alternative for Pacoima



Four canyon sites close to Pacoima Reservoir that have been burned in recent fires have been identified as potential new sediment placement sites (SPSs) for Pacoima Reservoir. While it is understood that there are environmental concerns associated with the development of an SPS at any of these sites, due to the concerns with transporting large quantities of sediment long distances we will be exploring these sites so that we all may compare the impacts of developing an SPS at these sites with the impacts of the other alternatives for Pacoima Reservoir.

Transportation Alternatives

Ranking for distances of 10-20 miles, based on environmental & social factors only.

Transportation Alternatives	Score	Rank
Truck to Existing Rail Network	8.0	1
Low Emission Trucking	7.8	2
Standard Trucking	7.5	3
Slurry Pipelines	7.5	3
Sluicing in Existing Channels	7.0	5
Cable/Bucket Systems	6.5	6
Conveyor Systems	6.3	7
Trucking In Channels	5.8	8
New Rail Lines*	3.8	9

* New Rail Lines are not currently being evaluated due to the high environmental and social concerns.

Similar to the placement alternatives, we are evaluating the transportation alternatives beyond the initial ranking and are now analyzing performance, implementability, and cost concerns in addition to environmental and social concerns. With the exception of new rail lines, we are evaluating all the transportation alternatives for the sediment at Pacoima and Morris Reservoirs. New rail lines are not being evaluated due to the high environmental and social concerns.

Sediment Removal Alternatives

(Slide 1 of 3 slide series)

- Dry excavation
  - Requires reservoir to be completely drained.
  - Equipment requires vehicular access.

Excavation

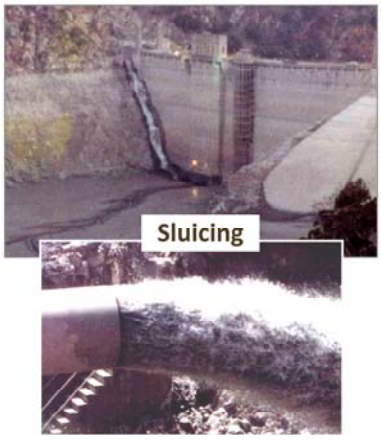
Before sediment can be transported and placed somewhere, it must be removed from the reservoir. There are a few methods of removing sediment from reservoirs.

As the name suggests, dry excavation requires dry conditions. Therefore, in order to remove accumulated sediment behind a dam by dry excavation, the reservoir behind the dam must be drained. Given the region's need for water, when a reservoir must be drained an effort is made to drain it in a manner so that as much of the existing pool as possible is recharged into groundwater basins. Once the reservoir is drained, equipment must be brought into the reservoir to dig out the sediment. The sediment can then be transported by methods such as trucks or conveyors.

Sediment Removal Alternatives

(Slide 2 of 3 slide series)

- Sluicing
  - Normally requires complete draining of reservoir. Some material can be moved without completely draining.



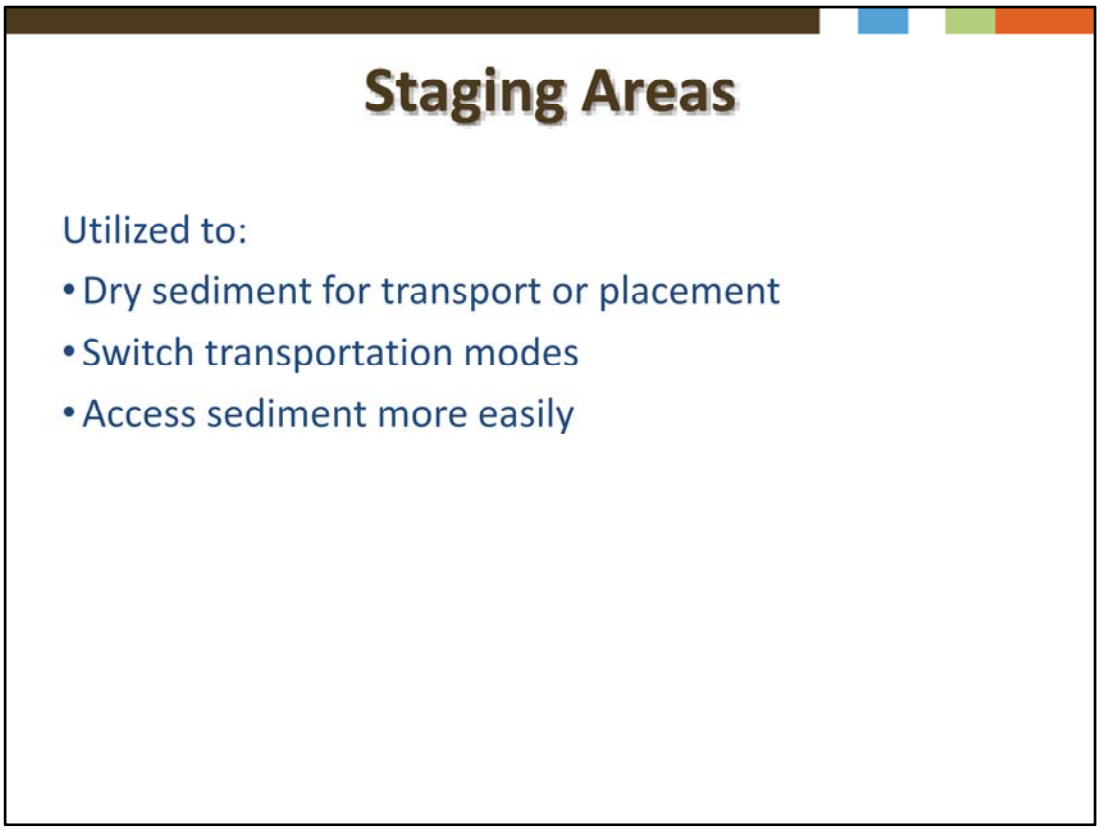
Another method of removing sediment in a reservoir is sluicing. Sluicing involves draining the reservoir to expose the accumulated sediment to incoming water flows so that the water can pick up the sediment and carry it through the dam through the dam's sluice gates or valves. In order to optimize sediment movement through the dam, equipment is often used in the reservoir to push sediment into the stream flow. Some of the sediment that is picked up by the water settles in the waterway as it travels downstream. Typically, the sediment laden water is impounded in a reservoir or other facility downstream, allowed to settled, and then removed.Sluicing is especially useful for reservoirs with limited access.

Sediment Removal Alternatives

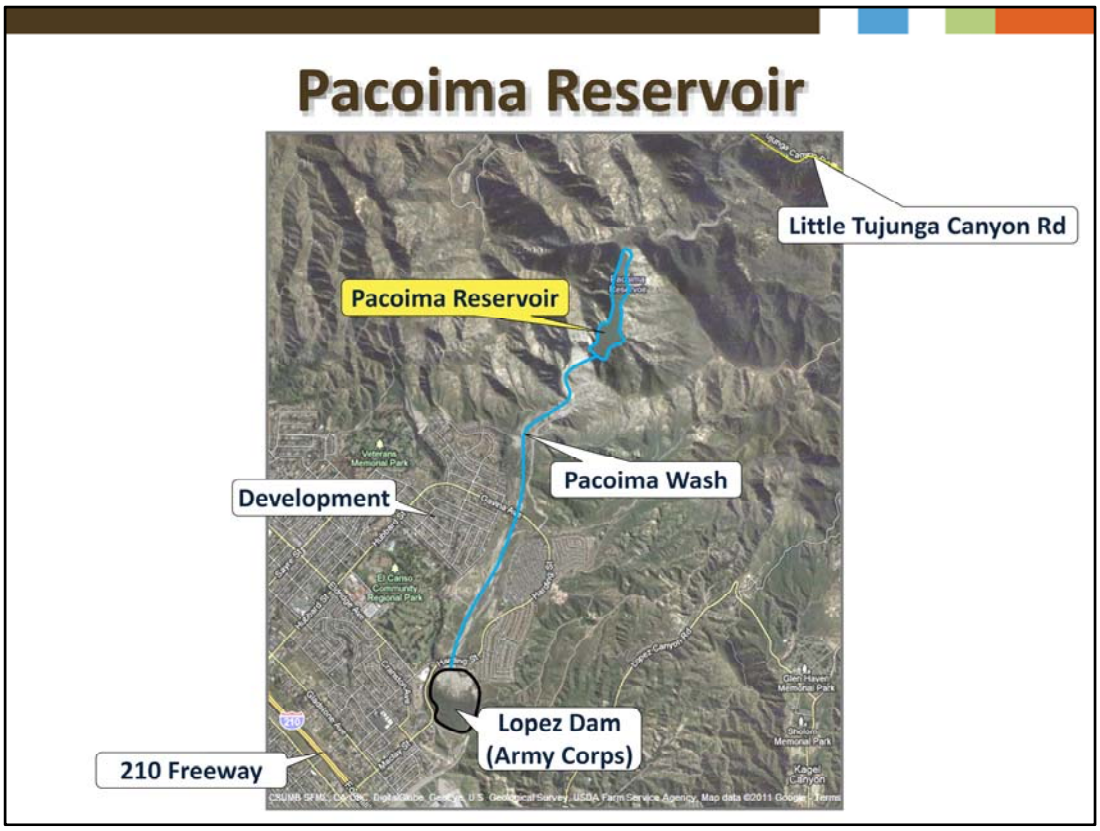
(Slide 3 of 3 slide series)

- Dredging
  - Reservoir does not need to be drained.

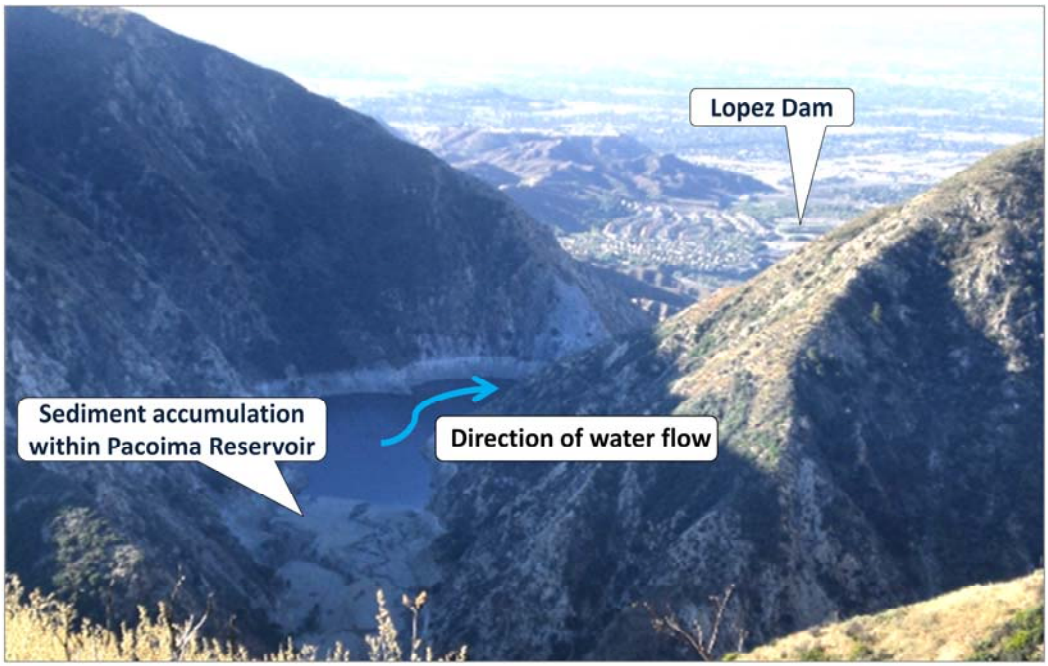
Another alternative is dredging, which allows for the sediment at the bottom of a pool of water to be excavated. A dredge acts much like an underwater vacuum cleaner. A major benefit of dredging is that it does not require the reservoir to be drained. Other benefits include the ability to dredge during the winter months and the potential for smaller cleanouts.



Once sediment is removed, and depending on the mode of transportation and placement location, there may be the need for a staging area near the reservoir or between the reservoir and final destination. Several staging areas are being investigated as part of the analysis for the reservoirs.



Pacoima Reservoir was built not only to manage the risk of floods but also to help meet our region's water needs. Water released from Pacoima Reservoir is spread at 3 spreading grounds downstream – Lopez Spreading Grounds (not to be confused with Lopez Dam), Pacoima Spreading Grounds, and Dominguez Gap Spreading Grounds. Depending on how wet the year is, the water conserved helps meet the yearly need of 3,000 – 50,000 families of 4.

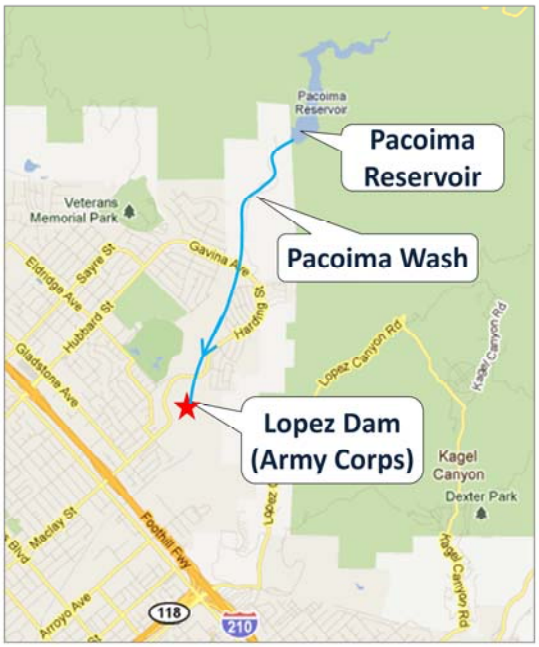


Pacoima Reservoir is long and narrow with steep canyon walls. There is no existing vehicular access to the body of the reservoir. There is an extremely degraded access road from the back of the reservoir off Little Tujunga Canyon Road.

Vehicular access to Pacoima Wash is available downstream of the dam.

Sluicing - Pacoima

- Farthest end point = Lopez Dam
- Only method used previously at Pacoima
- Last used in 1983
- Larger material cannot be sluiced; it stays in reservoir
- Possible immediate and delayed impacts on ground water recharge



Sluicing to Lopez Dam has been the only that Pacoima has been cleaned out in the past. Unfortunately, not all the sediment can be sluiced. Large material must be removal by other methods.

There are both immediate and delayed impacts to sluicing. The delayed impacts result from the settling of material as the sediment laden water travels downstream. The sediment that settles in the channel can be washed out and deposited in spreading grounds downstream in subsequent years, impacting groundwater recharge for several years.

Staging Areas - Pacoima

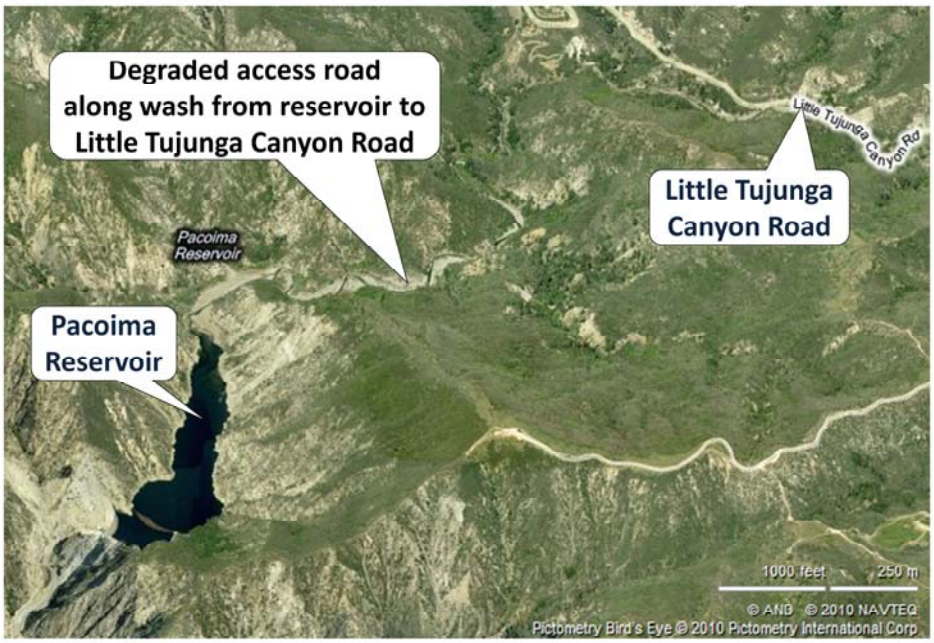
- Along Pacoima Wash
  - Environmentally sensitive
- Lopez Dam
  - Army Corps facility
  - Environmentally sensitive
  - Capacity needed for flood risk management

With sluicing, a staging area is necessary to allow the sediment to settle and dry out.

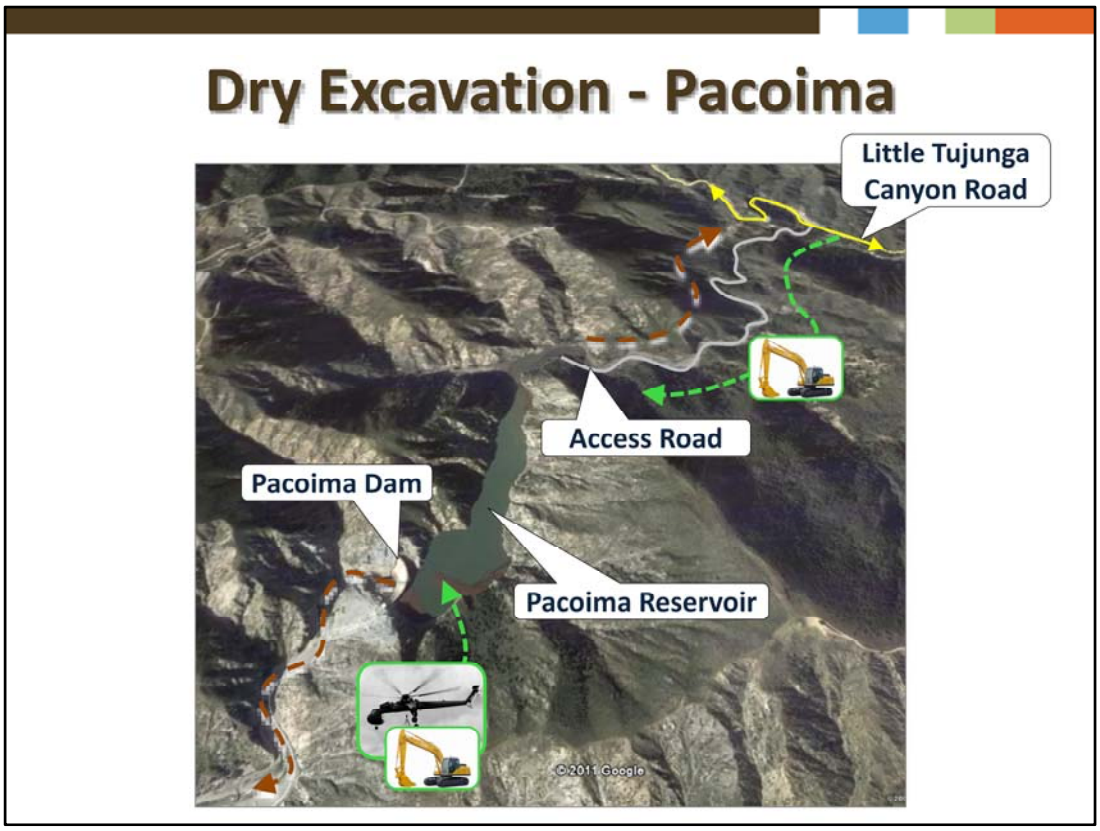
A staging area along Pacoima Wash would have environmental impacts.

Lopez Dam, which has been used as a staging area during past sluicing events, is being considered for future sluicing events. This site is owned and operated by the Army Corps of Engineers, thus the Flood Control District would need to coordinate any use of this site with the Army Corps. Impacts to habitat and to Lopez Dam's capability to manage flood risk are of concerns that need to be analyzed.

Access to the Reservoir - Pacoima



As mentioned earlier, when sluicing is employed, the larger material remains in the reservoir. In order to regain the reservoir's full capacity, all sediment, including the larger material, would need to be removed. Removal of the larger material would require access to the reservoir. In the case of Pacoima, the only land access to the reservoir is from the back. There is an existing degraded access road along the wash that extends from the reservoir to Little Tujunga Canyon Road. The access road could potentially be restored to accommodate transport of the larger material. Potential alternatives for transport from the reservoir to Little Tujunga Canyon Road include trucks (regular and low emissions) and conveyor belts . Each alternative has its benefits and its downfalls. For example, while one may provide higher efficiency, the other may be less impactful while operating.



If dry excavation is pursued, equipment would need to be brought into the drained reservoir. There are two ways to bring the equipment in. One way would be through a repaired access road between the reservoir and Little Tujunga Canyon Road (the existing road is degraded). The other way would be to fly in equipment.

Given the limited access, there are only two potential routes for the sediment that has been excavated to then be removed. One would be through the dam via a conveyor. The other would be through the repaired back access road by conveyor and/or trucks.

Removing all of the sediment accumulated in the reservoir versus only the large sediment that stays in the reservoir after a sluicing or dredging operation would require a larger back access road. Furthermore, there are efficiency concerns with transporting all of the sediment (not just the larger material) through the back access road due to the windingness and narrowness of the access road and Little Tujunga Canyon Road.

Use of dry excavation to remove all the sediment from Pacoima Reservoir would affect water conservation. We would only be able to conserve as much water as the spreading grounds can take in during dewatering; we would lose the rest to the ocean. There would also be additional traffic on Little Tujunga Canyon Road. Another drawback is that dry excavation can only be conducted during the dry season.

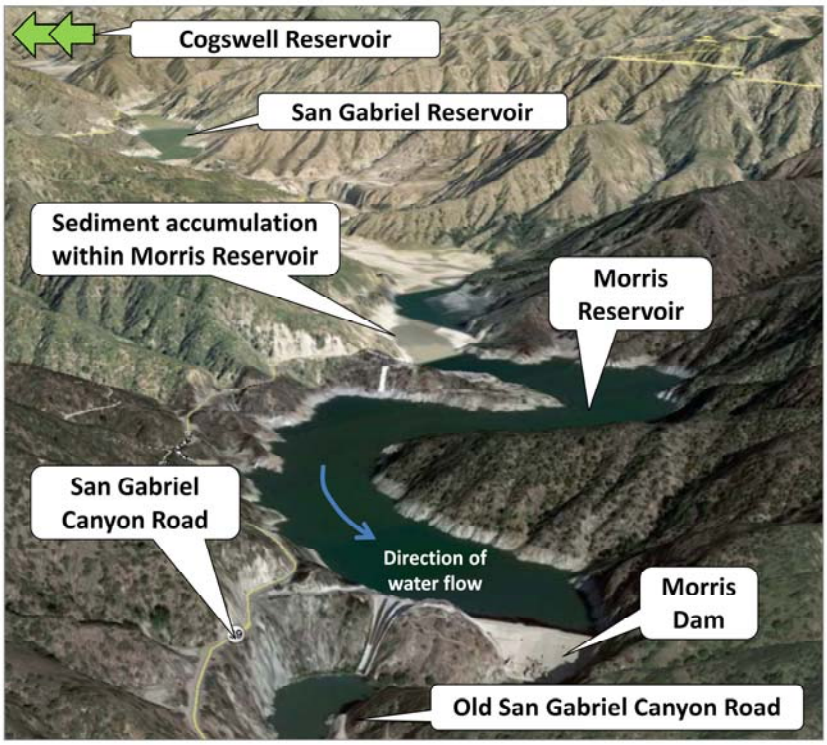
Dredging - Pacoima

- Maintain the water in the reservoir
- Routed through a valve or over the top of the dam
- Employ a more regular cleanout regime
- Can't dredge all material
  - Need an addition cleanout method

Dredging would allow for the maintenance of the water in the reservoir. For Pacoima, a dredge pipeline could possibly be routed either through a valve in the dam or over the top of the dam and then continued in a slurry pipeline downstream to a staging area where it would need to be dewatered.

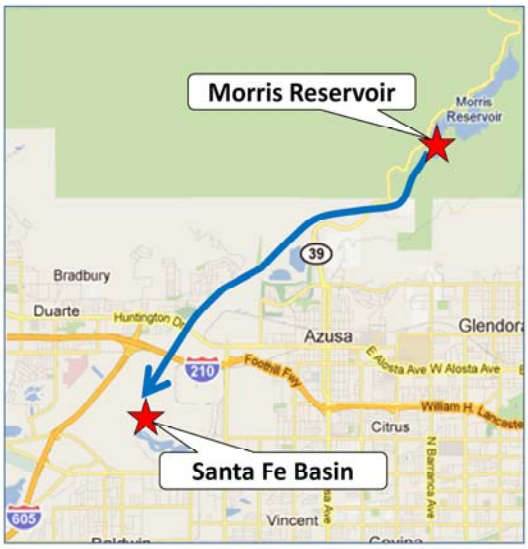
Use of dredging could result in a more regular cleanout regime as it can be conducted during the winter months. One of the downsides to dredging is that not all material can be removed with the dredge. Similar to sluicing, an additional method would need to be utilized to remove larger material and debris.

Morris Reservoir was built during the 1930s for water conservation only. Morris Reservoir is the last of a series of 3 reservoirs in the San Gabriel Mountains, within the Angeles National Forest. The reservoir is north of Azusa and east of San Gabriel Canyon Road. Downstream of Morris Reservoir is the Army Corps' Santa Fe Basin.



Morris Reservoir is long and narrow. Directly upstream is San Gabriel Dam. Further upstream from that is Cogswell Reservoir.

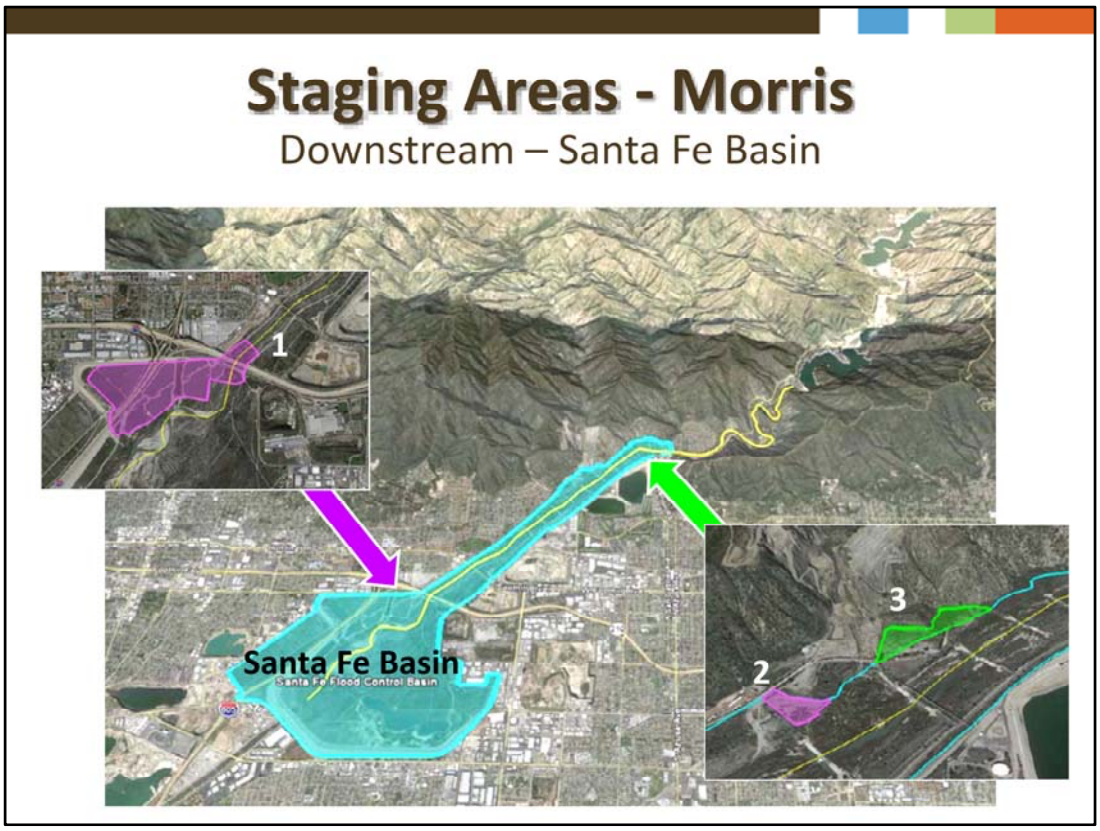
Sluicing - Morris



Due to the absence of sluice gates, sluicing at Morris Reservoir would involve removal of the needle valves to prevent damage. Because Morris Reservoir is at the bottom of a series of dams, the water source for sluicing can be controlled, that is, the water needed for sluicing can be released from San Gabriel or Cogswell Reservoirs.

The likely location where the sluiced sediment carrying water would be impounded would be Santa Fe Basin, which is owned by the Army Corps. We are also investigating other staging areas upstream of Santa Fe Basin. It is likely that an in-stream staging area would have major environmental impacts. The shallow slope of channel may cause sediment to settle within the stream.

Additionally, sluicing is typically only conducted during dry season. In order to regain the full capacity of Morris Reservoir, the larger sediment that would be left behind in the reservoir by a sluicing operation would need to be excavated and transported through San Gabriel Canyon Road or some other method.



There appear to be 3 possible staging areas within Santa Fe Basin. The site labeled as 1 has previously been disturbed by quarry operations. The other two potential areas, labeled as 2 and 3, are categorized as “Inactive and/or Future Recreation” areas by the Army Corps. Use of these areas would need to be coordinated with the Army Corps.

Access to Reservoir - Morris

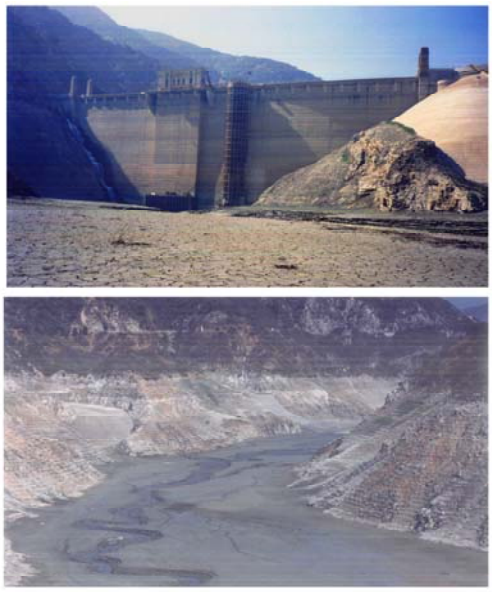
San Gabriel Canyon Road (State Route 39) is a major arterial, runs along the west side of the reservoir. Access to the reservoir could be established from this road.

Old San Gabriel Canyon Road is an unpaved roadway that begins at San Gabriel Canyon Road and runs along the east side of San Gabriel Canyon. The road varies in width, but can accommodate two-way traffic for the majority of its length. Approximately 3, 500 feet of the roadway is washed out and would have to be rebuilt if it is to be used for vehicular access.

Morris Reservoir – Sediment Removal

Dry Excavation

- Drain the reservoir
- Reduce water conservation
- Remove large quantities over a short time
- Can only remove during the dry season



Dry excavation at Morris Reservoir would require draining the reservoir and removal of a large quantity over a short period of time. This method of removal can only happen over the dry season. This process requires environmental documents and permits. By dewatering the reservoir, there is the possibility of negatively impacting water conservation. An access road from San Gabriel Canyon Road down into the reservoir would need to be established. Trucks or conveyors could then be used to transport the sediment out of the reservoir.

Morris Reservoir – Sediment Removal

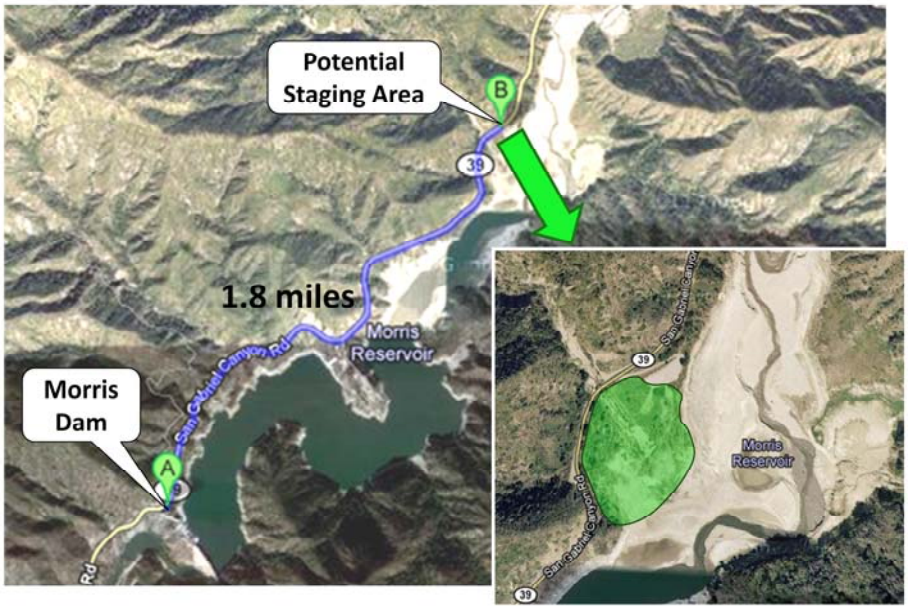
Dredging

In order to dredge at Morris sediment would have to be pumped either up over the dam or through an outlet valve. With dredging at the other reservoirs, the water is retained in the reservoir and it can be conducted during all seasons.

A slurry pipeline could be placed in along Old San Gabriel Canyon Road – which needs repair as a portion has been washed out. A staging area would be needed to dry the material. Again, dredging cannot handle all of the material. Another method would need to be employed for larger material.

Morris Reservoir – Staging Areas

Upstream - Area Near Helipad



There is an area approximately 1.8 miles upstream of the dam and adjacent to a helipad that has been identified as a potential staging area.

Regional Transportation

- **Trucking in Channels**
  - Invert slabs of the channel do not have the structural capacity to sustain repeated heavy loadings.
- **New Rail Lines**
  - Higher capital cost and greater environmental and social challenges than all other modes.
- **Two-Way Salt Water Pipeline**
  - Significant environmental concerns for salt water contamination of local surface water and groundwater.
- **Cable Bucket System**
  - Public resistance over or near residential areas or through scenic areas is anticipated to be very high.

As a result of the analysis to this point, it is recommended to no longer continue analysis on these alternatives

Pacoima & Morris Reservoirs Analysis To Date

Discussion

Agenda

- Progress review
- Follow-up from 4th Task Force Meeting
- Reservoir analysis to date – Pacoima & Morris Reservoirs
- *Devil's Gate Environmental Impact Report process*
  → *Brief update*
- Next steps

Next Steps

- Complete analysis for Pacoima and Morris
- Present the completed analysis and recommendations for Pacoima and Morris (Task Force Meeting #6)
- Complete analysis for the remaining reservoirs and subgroups of debris basins
- Share the findings and recommendations for all the reservoirs and debris basins and initiate the public review period (Task Force Meeting # 7)

Thank you

Comments or questions?
Sediment Management Strategic Plan → SedimentMgmtPlan@dpw.lacounty.gov
Devil's Gate or other reservoir cleanouts → reservoircleanouts@dpw.lacounty.gov

For additional information about either
please visit www.lasedimentmanagement.com