
CHAPTER 3

PRELIMINARY EVALUATION OF FLOOD PROTECTION ALTERNATIVES

This chapter includes the description and preliminary evaluation of Pajaro River flood protection alternatives identified in Chapter 2. The location, cost, and impacted facilities are subject to change as projects are evaluated further and more information becomes available. Each project alternative evaluation includes the following information:

- Alternative Description
- Flood Protection Level
- Identification of Other Benefits
- Identification of Impacted Facilities
- Implementation Issues
- Cost Estimate

A summary table of the flood protection, engineering and regulatory constraints, other benefits, and a cost estimate for each alternative is provided at the end of the chapter in Table 3-20.

3.1 Identification of Alternatives

A total of 16 alternatives were identified for further evaluation. The alternatives were divided into three categories, including:

- Army Corps of Engineers Lower Pajaro River Flood Protection Project Alternatives
 1. Corps Alternative 1 – Floodwalls and Levee Height Increase
 2. Corps Alternative 3 – Floodwalls and Levee Height Increase with 100 feet and 225 feet Setbacks
- Upstream Alternatives
 3. Land/Flood Easement at Soap Lake
 4. Detention Basin in San Benito Watershed
 5. Raise Existing Dams
 6. Detention Basin at College Lake
 7. New Pacheco Dam
 8. New Soap Lake Dam
 9. New Tres Pinos Dam
 10. New San Benito Dam
 11. New Chittenden Dam
- Downstream Alternatives
 12. Open Channel Bypass
 13. Flood Channel
 14. Underground Bypass
 15. Flood Tunnel
 16. Floodwalls

Concurrent with the Pajaro River Watershed Study, the Army Corps of Engineers (Corps) has been participating in a separate study focused on flow management in the Pajaro River reach downstream of Murphy Road

3. Preliminary Evaluation of Flood Protection Alternatives

Crossing. The Corps has identified five alternatives consisting of a series of projects along the river. The alternatives provide different levels of flood protection, with flooding occurrences varying from a 30-year event to a 65-year event. The following Corps alternatives were evaluated as part of this report:

1. Corps Alternative 1 – Floodwalls and Levee Height Increase
2. Corps Alternative 3 – Floodwalls and Levee Height Increase with 100-foot and 225-foot Setbacks

The remaining three Corps alternatives have not been included in this report. Those alternatives are:

- Corps Alternative 2 – 100-foot Setback
- Corps Alternative 4 – Floodwall In-lieu of Levees
- Corps Alternative 5 – Environmental Corridor

Corps Alternatives 1 and 3 have been chosen for inclusion in this report since they were shown to be cost effective and represent the limits of flood protection provided by the Corps alternatives. Information regarding each of the five alternatives is provided in Appendix A.

3.2 Description of Evaluation Criteria

Alternatives one through sixteen were evaluated based on the following criteria:

- Level of flood protection
- Water supply benefits
- Water quality benefits
 - Ground
 - Surface
- Ground water recharge benefits
- Environmental benefits
 - Enhancement
 - Restoration
- Recreation benefits
- Regulatory compliance
- Open space preservation
- Agricultural preservation
- Public acceptance

The level of flood protection provided by each alternative was defined as a percentage of the difference between the 100-year peak flood flow and the existing channel capacity as shown on Figure 3-1. Figure 3-1 is a graph of the Phase 1 model flood flow discharges at Chittenden at general plan buildout. The general plan buildout runoff provided for land use for the planning horizon between the years 2015 and 2020. The peak discharge at Chittenden is 44,400 cubic feet per second (cfs) in the general plan buildout land use scenario. The channel capacity downstream of Chittenden, assuming Corps levee certification, is 19,000 cfs, creating a potential overflow of about 25,400 cfs in this reach. Flood protection projects in the watershed would either attenuate the 25,400 cfs flow upstream or provide sufficient capacity for conveyance. A project that would reduce this capacity deficit by 2,540 cfs has a defined flood protection benefit of 10%; a project that would reduce the entire capacity deficit would have a flood protection benefit of 100%. Preliminary hydraulic modeling for each alternative provided the estimates of reduction in peak discharge overflow for the 100-year flood event.

3. Preliminary Evaluation of Flood Protection Alternatives

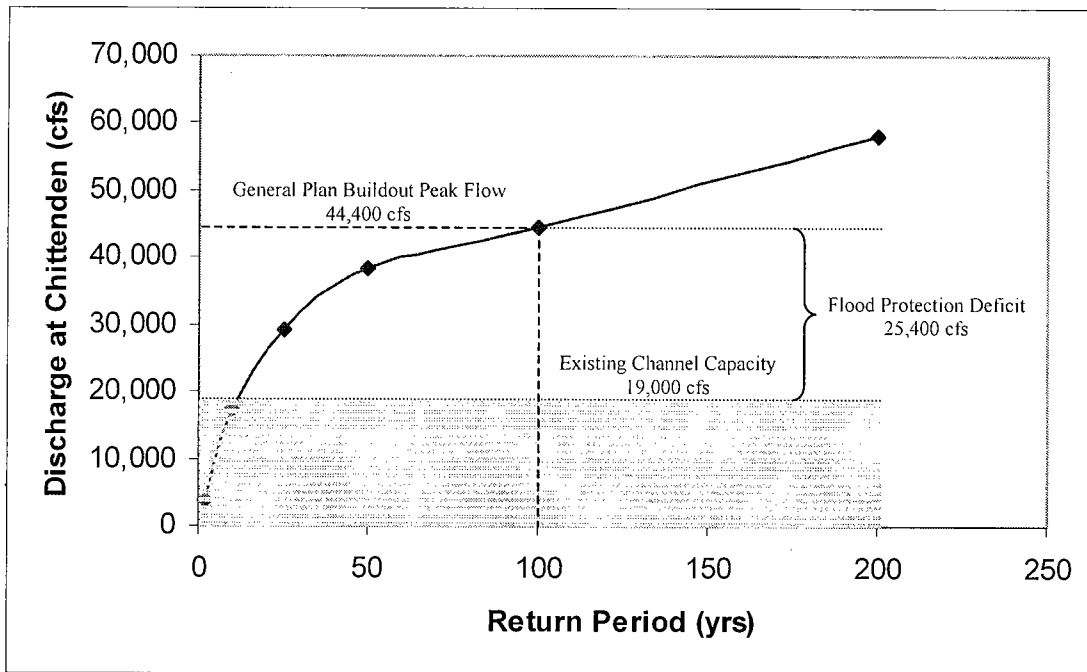


Figure 3-1: 100-year flood protection deficit based on existing Pajaro River channel capacity between Chittenden and the confluence with Salsipuedes Creek.

3.3 Description of Project Alternatives

Alternative 1: Corps Alternative 1 – Floodwalls and Levee Height Increase

Alternative Description

This alternative prevents flooding by providing increased conveyance capacity along the existing river reach. The alternative includes raising the heights of existing floodwalls and levees along the mainstem Pajaro River between Murphy Road Crossing and the river mouth at Monterey Bay. In areas upstream of the Salsipuedes Creek and Pajaro River confluence, the existing levees would be raised to an average height of eleven feet. In the reach of river through the urban area between Watsonville and Pajaro, the average levee height would be five feet and four-foot floodwalls would be constructed. For the remaining reach length downstream to Highway 1 the average height of the levees would be raised to eleven feet. Downstream of Highway 1 to Monterey Bay the average levee height would be raised to ten feet. The Corps estimates that fifty-six acres of land acquisition are required for this project.

Flood Protection

The Corps reported that the Alternative 1 project would provide flood protection during a 30-year flood event with a peak discharge of about 32,000 cfs. This alternative will provide an additional 13,000 cfs of conveyance capacity within the channel. The improvements in Alternative 1 will provide only 51 percent of the 25,400 cfs additional conveyance capacity needed for protection in a 100-year storm event.

Other Benefits

There are no additional benefits associated with this project. Habitat benefits are not available because there are no new opportunities for vegetative growth.

Impacted Facilities

In addition to the agricultural land lost for this project, there are several other impacted structures. Thurwatcher Bridge would need to be raised. Culverts would be required underneath Highway 1. Also, the railroad bridges would need to be replaced and raised four feet.

Implementation Issues

Implementation issues include:

- **Endangered Species Act:** Great care would need to be taken not to disturb or harm any of the species that may live in the impacted area of the project. Due to the size, duration, and nature of the project, this would be a considerable task.
- **Public acceptance/Willing landowners:** As described in Chapter 2.2, there are several issues inherent in acquiring land. The process can be expensive and time consuming. The largest difficulty however is finding willing sellers. An unwilling seller can be forced to give up the land through eminent domain but this not only eliminates many sources of funding but also creates resentment within the public. Property purchased is also taken off the tax rolls resulting in lost revenue to the local jurisdictions. Any land purchased would also be no longer available for farming.
- **Road and railroad crossings:** The significant construction required at road and railroad crossings would be both expensive and a nuisance to the public.

3. Preliminary Evaluation of Flood Protection Alternatives

Cost Estimate

The Corps estimates that the cost for lands, easements, right of ways, relocations, and disposal is \$7.4 million. Construction is \$119.4 million. Engineering, design, supervision, and administration are \$19 million. The total cost for this project is \$145.8 million, of which \$36.4 million is the non-federal share.

Further information about this project can be found in Appendix A.

3. Preliminary Evaluation of Flood Protection Alternatives

Alternative 2: Corps Alternative 3 – Floodwalls and Levee Height Increase with 100 feet and 225 feet Setbacks

Alternative Description

The Corps Alternative 3 is a combination of setback levees and floodwalls. Upstream of the Salsipuedes Creek and Pajaro River confluence there would be 100-ft setback levees that are twelve feet high. Through the urban reach of river between Watsonville and Pajaro, 4-ft floodwalls would be built on the existing levees. From the railroad crossing to Highway 1 there would be 225-ft setback levees that are twelve feet high. Downstream of Highway 1 to Monterey Bay there would be 100-ft setback levees that are twelve feet high. The Corps estimates that 330 acres of land acquisition are required for this project.

Flood Protection

The Corps reported that the Alternative 3 project would provide flood protection during a 65-year flood event with a peak discharge of about 40,300 cfs. This alternative will provide an additional 21,300 cfs of conveyance capacity within the channel. The improvements in Alternative 3 will provide about 84 percent of the 25,400 cfs additional conveyance capacity needed for protection in a 100-year storm event.

Other Benefits

- **Habitat:** Depending on the level of vegetation maintenance, there is an opportunity to establish habitat for riverine species.

Impacted Facilities

In addition to the homes and agricultural land lost for this project, there are several other impacted structures. The Thurwatcher and Highway 1 bridges would be widened. Culverts would be required underneath Highway 1. Also, the railroad bridges would be replaced and raised four feet.

Implementation Issues

Implementation issues include:

- **Endangered Species Act:** Great care must be taken to prevent disturbance or harm to any of the species that may live in the impacted area of the project. Due to the size, duration, and nature of the project, this would be a considerable task.
- **Public acceptance/Willing landowners:** As described in Chapter 2.2, there are several issues inherent in acquiring land. The process can be expensive and time consuming. The largest difficulty however is finding willing sellers. An unwilling seller can be forced to give up the land through eminent domain but this not only eliminates many sources of funding but also creates resentment within the public. Property purchased is also taken off the tax rolls resulting in lost revenue to the local jurisdictions. Any land purchased would also be no longer available for farming.
- **Road and railroad crossings:** The significant construction required at road and railroad crossings would be both expensive and a nuisance to the public.

3. Preliminary Evaluation of Flood Protection Alternatives

Cost Estimate

The Corps estimates that the cost for lands, easements, right of ways, relocations, and disposal is \$20.3 million. Construction is \$133.9 million. Engineering, design, supervision, and administration are \$23.1 million. The total cost for this project is \$177.3 million, of which \$44.3 million is the non-federal share.

Further information can be found in Appendix A.

3. Preliminary Evaluation of Flood Protection Alternatives

Alternative 3: Land/Flood Easement at Soap Lake

This alternative includes either purchasing land or obtaining flood easements for the land within the Soap Lake floodplain. The alternative objective is to maintain the current flood protection benefits provided by Soap Lake by restricting development that changes the flood attenuation properties of the floodplain. The purchase of land or floodplain easements would restrict development and preserve agriculture and open space.

Alternative Description

No structural facilities would be necessary for this alternative, since the area experiences flooding during a 100-yr event. The floodplain area is considered to be about 7,900 acres. The approximate location of the floodplain boundary is shown in Figure 3-2. The northern boundary is roughly based on the limits of FEMA detailed studies of the Uvas/Carnadero and Llagas Creeks that discharge into this area. The floodplains of these creeks extend northwesterly from the Soap Lake floodplain, but are not shown on Figure 3-2.

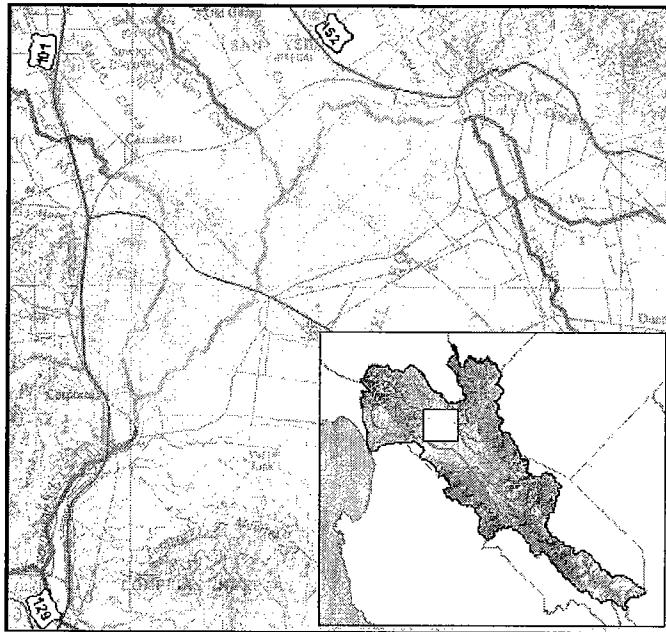


Figure 3-2: Approximate boundaries of the 100-yr floodplain in Soap Lake.

Flood Protection

No additional flood benefit is gained from this project. Instead, it maintains the flood protection that currently exists within the Soap Lake area. Therefore, the 100-yr discharge is expected to remain at 44,400 cfs between the Murphy Road Crossing and the Salsipuedes Creek confluence.

Other Benefits

There are several benefits associated with this project. They include:

- **Surface water quality:** Suspended particles will fall out of suspension as the water velocity and turbulence decreases. This minimizes the sediment deposition in the Pajaro River channel.
- **Groundwater recharge:** Flooding of the Soap Lake floodplain will provide for increasing percolation into the groundwater and recharging the aquifer.

3. Preliminary Evaluation of Flood Protection Alternatives

- **Regulatory compliance:** Both San Benito and Santa Clara have language in their General Plans encouraging open space preservation and discouraging development with detrimental effects downstream.
- **Open space preservation:** Land currently held as open space would remain open space.
- **Agricultural preservation:** Land currently farmed would continue to be farmed.

Impacted Facilities

Due to the nature of the project, existing facilities impacts would not be changed.

Implementation Issues

San Benito and Santa Clara county policies discourage development within the floodplains but do not prohibit development. Further research is needed to determine the likelihood of development within such crucial areas such as Soap Lake or the impacts of zoning the property to prevent future development. Due to increasing pressure to provide housing in the area and employment in the area, the counties will likely experience a great deal of pressure to allow development within the floodplain. If acquisition by the PRWFPA to prevent development is to be avoided, counties will need to revise their land use policies to prohibit development and enforce them. The alternative to using policy to control the development within the floodplain and ensure the maintenance of current flood protection is purchasing the land or flood easement.

As described in Chapter 2.2, there are several issues inherent in acquiring land. The process can be expensive and time consuming. The largest difficulty however is finding willing sellers. An unwilling seller can be forced to give up the land through eminent domain but this not only eliminates many sources of funding but also creates resentment within the public. Property purchased is also taken off the tax rolls resulting in lost revenue to the local jurisdictions.

3. Preliminary Evaluation of Flood Protection Alternatives

Cost Estimate

A cost estimate for the purchase of the Soap Lake floodplain area is listed on Table 3-1.

Table 3-1: Alternative 3 Cost Estimate - Purchase Soap Lake land.

| | Quantity | Unit | Unit Cost | Total |
|------------------------------|----------|-----------|-----------|---------------|
| Construction | | | | |
| Construction Subtotal | | | | \$0 |
| C.O. Contingency | | | | \$0 |
| Total Construction | | | | \$0 |
| Land | 7,900 | acres | 10,000 | \$79,000,000 |
| Implementation | | | | |
| Land Acquisition | | Allowance | 5% | \$4,000,000 |
| Administration | | Allowance | 0% | \$0 |
| Engineering | | Allowance | 0% | \$0 |
| CM | | Allowance | 0% | \$0 |
| Legal | | Allowance | 0% | \$0 |
| CEQA | | Allowance | 0% | \$0 |
| Implementation Subtotal | | | | \$4,000,000 |
| Capital Cost Subtotal | - | - | - | \$83,000,000 |
| Project Contingency | - | Allowance | 25% | \$21,000,000 |
| Total Cost | - | - | - | \$104,000,000 |

The alternative represented by this estimate provides no additional flood protection to the downstream reaches of the Pajaro River. It maintains the current level of protection provided by the natural constriction at Chittenden and floodplain area known as Soap Lake.

For information regarding the source of the unit costs for this estimate, please refer to Appendix B. Appendix B also contains assumptions and limitations of the estimate.

3. Preliminary Evaluation of Flood Protection Alternatives

A cost estimate for the purchase of a flood easement for the Soap Lake floodplain area is listed on Table 3-2.

Table 3-2: Alternative 3 Cost Estimate - Obtain flood easement for Soap Lake land.

| | Quantity | Unit | Unit Cost | Total |
|------------------------------|----------|-----------|-----------|--------------|
| Construction | | | | |
| Construction Subtotal | | | | \$0 |
| C.O. Contingency | | | | \$0 |
| Total Construction | | | | \$0 |
| Land | 7,900 | acres | 3,000 | \$24,000,000 |
| Implementation | | | | |
| Land Acquisition | | Allowance | 5% | \$1,200,000 |
| Administration | | Allowance | 0% | \$0 |
| Engineering | | Allowance | 0% | \$0 |
| CM | | Allowance | 0% | \$0 |
| Legal | | Allowance | 0% | \$0 |
| CEQA | | Allowance | 0% | \$0 |
| Implementation Subtotal | | | | \$1,200,000 |
| Capital Cost Subtotal | - | - | - | \$25,200,000 |
| Project Contingency | - | Allowance | 25% | \$6,300,000 |
| Total Cost | - | - | - | \$31,500,000 |

The alternative represented by this estimate provides no additional flood protection to the downstream reaches of the Pajaro River. It maintains the current level of protection provided by the natural constriction at Chittenden and the floodplain area known as Soap Lake.

For information regarding the source of the unit costs for this estimate, please refer to Appendix B. Appendix B also contains assumptions and limitations of the estimate.

