# Appendix D - Evaluation of Interim Solutions

# Appendix D Interim Solutions

## D.1 Introduction

The implementation of long-term improvements is projected to take 5 to 8 years. To reduce the number of years of flooding impacts, the partner agencies requested the assessment of possible interim solutions that could be implemented sooner. The primary goals of interim solutions would be to address immediate safety concerns caused by roadway flooding and to prevent erosion of the banks of Lake Merced where overflows occur. A successful interim solution would solve these problems cost effectively, be compatible with long term solutions, and be capable of implementation in a relatively short time period.

Three interim solution alternatives were developed and evaluated: a Diversion to Impound Lake, a Diversion to South Lake, and armoring the banks of South Lake with Rip Rap. The evaluation of these alternatives, which are presented below, includes the following: a description of proposed facilities, hydraulic analysis, permitting and regulatory requirements, implementation schedule, project cost, and benefits and limitations. Based on these factors, a conclusion and recommended course of action are presented at the end of this section.

*Safety concerns and erosion problems are evident.*

**Figure D-1 Flooding on John Muir Drive from Vista Grande canal**

### D.1.1 Interim Solutions Design Assumptions

To effectively develop and evaluate alternatives for interim solutions, design hydraulic criteria had to be established. These criteria were derived from previous studies, as presented in this chapter.

Based on data from these studies, storm water flow to Vista Grande canal under existing conditions during a 10-year design storm is approximately 680 cfs, and the capacity of Vista Grande Tunnel is approximately 170 cfs. Under these conditions, 510 cfs overflows to Lake Merced uncontrolled by overtopping John Muir Drive. Interim solutions were therefore developed to allow 170 cfs to flow through Vista Grande canal and divert 510 cfs to Lake Merced in a controlled manner.

## D.1.2 Alternative 1 – Diversion to Impound Lake

**Figure D-2 Overview of Alternative 1, Diversion to Impound Lake**


### *Description*

Alternative 1, Diversion to Impound Lake, would divert flow in excess of the tunnel capacity to Impound Lake via a concrete weir structure installed in Vista Grande canal, four 48-inch diameter pipes under John Muir drive and a concrete outfall at Impound Lake. The banks of Impound Lake would be lined with rip rap below the outlet structure to the normal lake level to prevent erosion. After implementation of a long term solution, the rip rap would be removed and the banks would be restored. Figure D-3 through Figure D-5 are schematic diagrams of the facilities for this alternative.

**Figure D-3 Section View of Alternative 1**

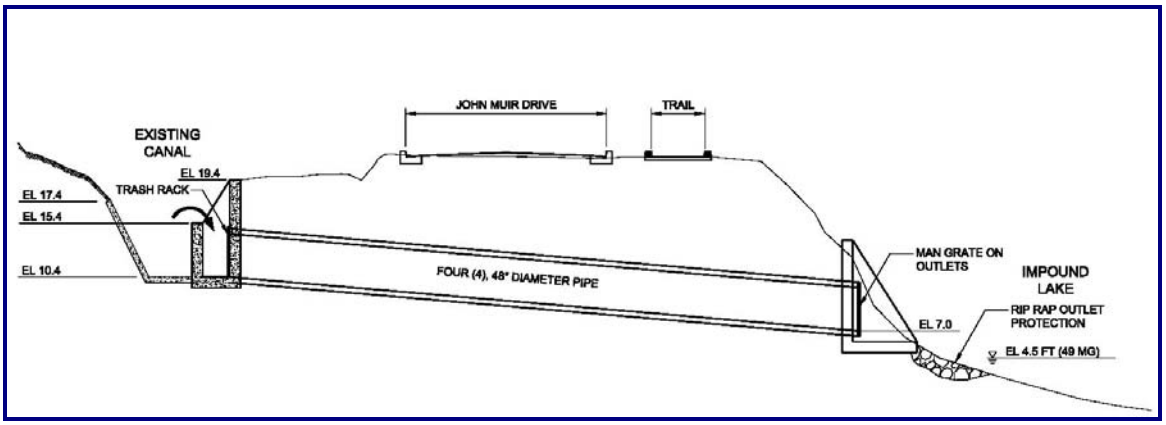


**Figure D-4 Weir Structure**

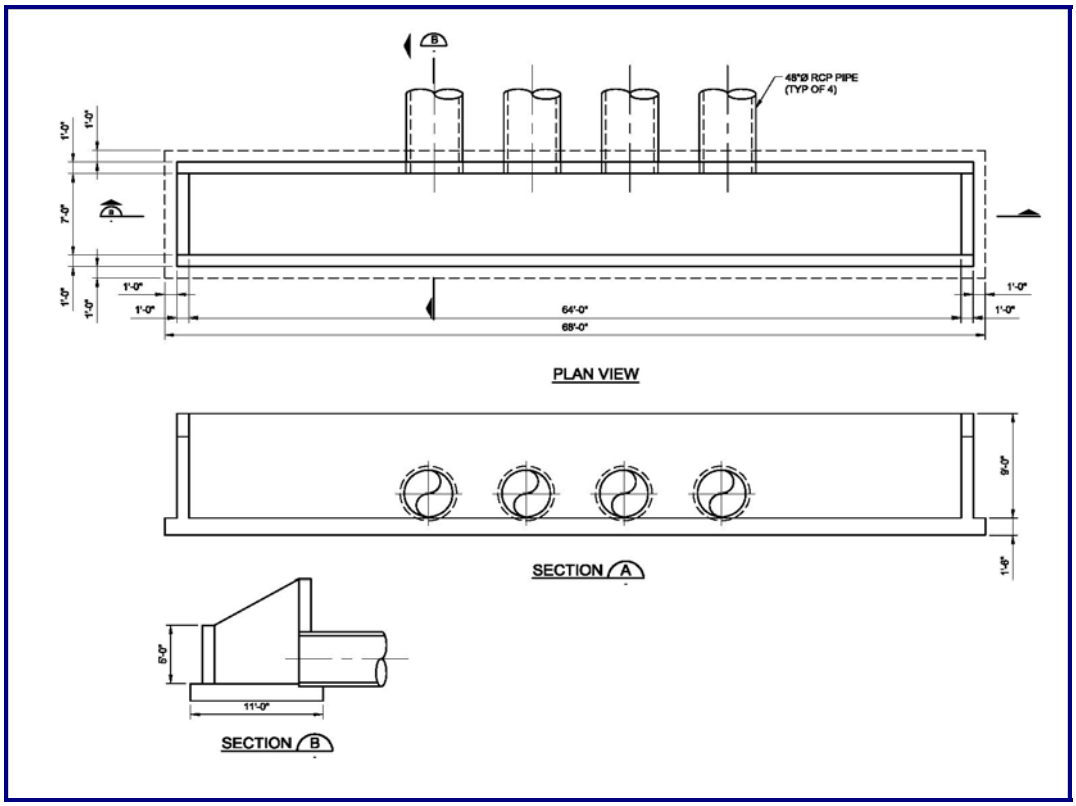
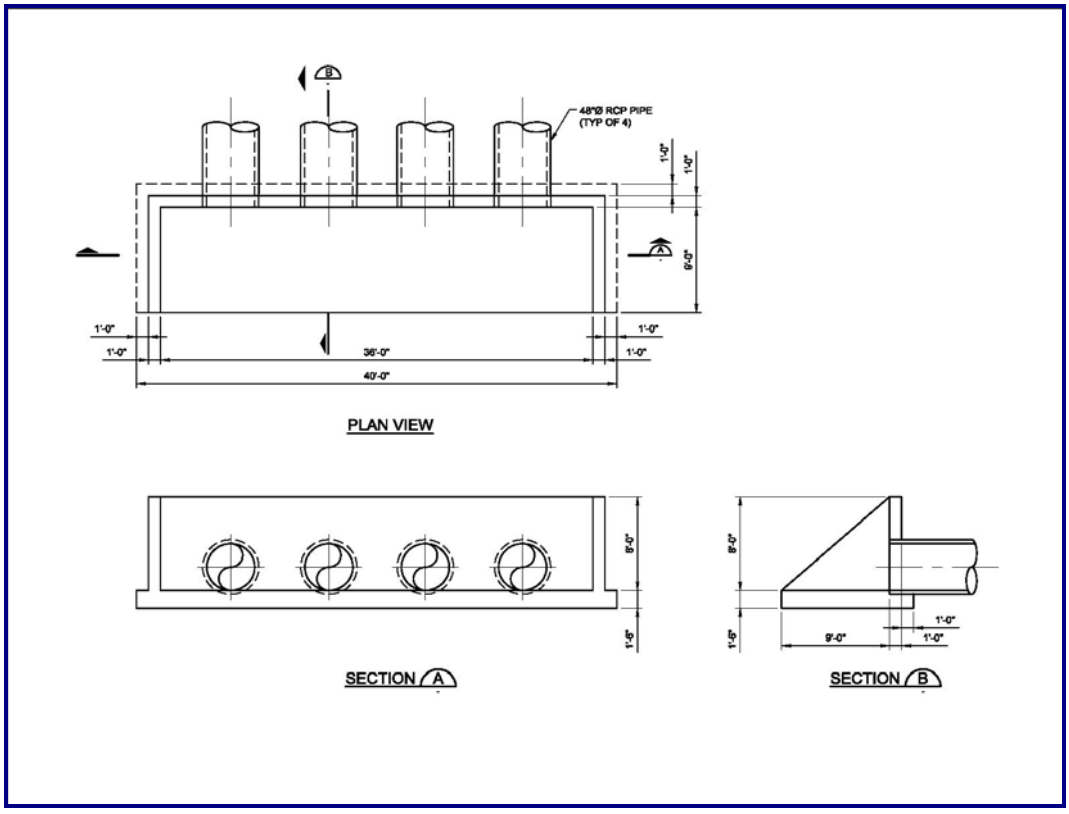



**Figure D-5 Outlet Structure**



### *Hydraulic Analysis*

The weir elevation on the structure in the canal would be installed at a level equal to the water depth necessary for the canal to convey 170 cfs. Setting the weir at this level will lower the hydraulic grade line in the canal as much as possible, while still allowing 170 cfs to flow to the tunnel. The weir would be set at an elevation of approximately 15.4 feet., which would allow a depth in the canal of 5 feet before overflowing. With a weir length of 64 feet, 2 feet of water over the crest of the weir is required to pass 510 cfs. The elevation of the top of existing concrete in the canal where the structure would be installed would be approximately 17.4 feet, which is equal to the water elevation in the canal required for 510 cfs to pass over the weir. An additional 5 (±) feet of freeboard would be available from the top of concrete to the elevation of the roadway. Four 48-inch pipes installed at 1.75% slope would carry 510 cfs from the weir structure, under John Muir Drive to Impound Lake flowing approximately 60% full.

### *Permitting and Regulatory Requirements*

Each Interim Solution Option is expected to trigger regulatory involvement from several state and federal agencies. Table D-3 summarizes the permitting requirements that have been identified for the proposed interim solutions.

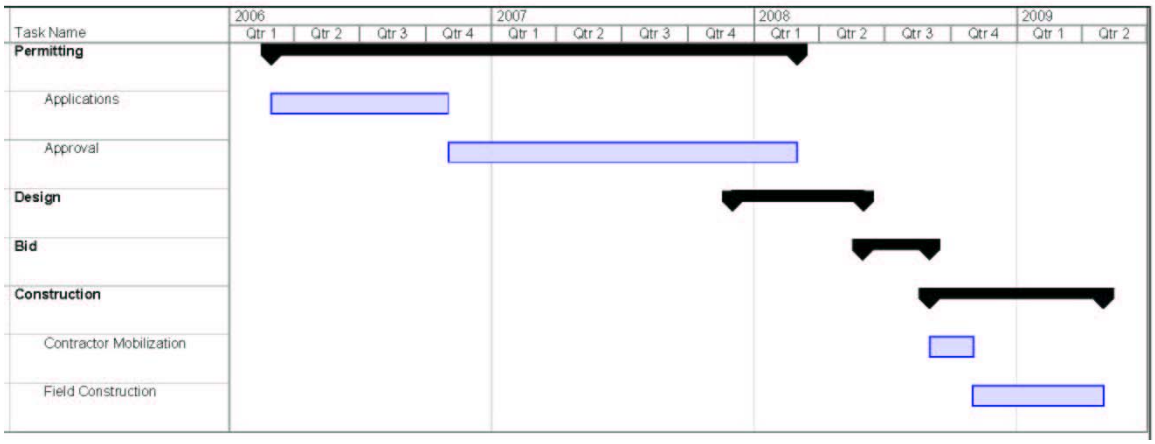
**Table D-1 Summary of Permit Requirements Interim Solutions**

| Agency | Permit or Requirement | Authority | Cause for Permitting Action | Time Frame |
|---|---|---|---|---|
| US Army Corps of Engineers (the Corps) | §404 Permit<br><br>§10 Permit | Clean Water Act<br><br>River and Harbors Act | Lake Merced is a part of the "waters of the United States". The status of the Vista Grande canal is unclear but it may also be considered a part of the "waters of the United States". The Diversion to Impound Lake and the Diversion to South Lake would require modifications to the canal, and all three interim solutions would require the installation of erosion control devices on the banks of Impound Lake, triggering a permit from the Corps. | 4-6 months – Individual Permit<br>45-60 days - Nationwide Permit<br><br>An additional year or more if a biological opinion is required |
| US Fish and Wildlife Service | §7 Consultation | Endangered Species Act | The area around the Vista Grande canal may contain the appropriate habitat for endangered species. The Corps will consult with USFWS during the permit process. If endangered species or their habitat are believed to be affected, USFWS will prepare a biological opinion under a §7 Consultation. | 1-3 years |
| San Francisco Regional Water Quality Control Board (RWQCB) | §401 Permit - Water Quality Certification | Clean Water Act §401 | Under §401 of the Clean Water Act, any activity subject to a permit from a federal agency must be by the appropriate state that the activity meets all state water quality standards. Since all of the interim solutions would likely require a permit from the Corps a §401permit would be required. | 60 days after application is deemed complete. Up to one year of additional time may be requested from the Corps. |
| | §402 Permit - NPDES: General Construction Activity Storm Water Permit | Clean Water Act §402 | Required for any construction activity that disturbs more than five acres of land, or if the overall program disturbs more than five acres of land. While each of the proposed interim solutions would not disturb more than five acres of land, these interim solutions could be permitted as part of the overall watershed study. If this was the case, a General Construction Activity Storm Water Permit would be required. | Approximately six months |

| | | | | |
|---|---|---|---|---|
| California Department of Fish and Game (CDFG) | Streambed Alteration Agreement (§1602 permit) | Fish and Game Code §1602 | Required before undertaking any activity that will significantly change any river, stream, or lake. The jurisdiction of CFG includes the Vista Grande canal and Lake Merced so any of the proposed interim solutions would require a streambed alteration agreement. | 30 days after application submittal to evaluate completeness; 60 days after application is deemed complete. |
| California Coastal Commission (CCC) and/or Local Coastal Programs (LCPs) | Coastal Development Permit or Public Works Plan | California Coastal Act of 1976; Federal Coastal Zone Management Act | Required for any development in the coastal zone. The coastal zone begins at the shoreline and extends from 500 yards to 5 miles inland. The coastal zone extends around Lake Merced and includes the Vista Grande canal Area. | Six months to two years |

Since all three of the interim solution options allow untreated storm water to continue to flow directly into Lake Merced, they will be most easily permitted if they are presented as part of a long-term program that will eliminate the discharge of untreated storm water to Lake Merced. As shown in Table D-3, the permitting requirements for any of the interim solutions are extensive.

### *Implementation Schedule*




The schedule includes time necessary for preparing permit applications, obtaining permit approval, design, bidding and construction. Design should begin approximately three quarters of the way through permit approval because regulatory agencies generally require a portion of design to be complete before granting final approval. The remaining tasks are dependent upon the previous tasks being complete before they can begin.

Assuming permitting begins in February 2006, this schedule would result in four rainy seasons of potential flooding (2005, 2006, 2007 and 2008) with construction complete in summer of 2009. Permitting would require an estimated 2 years, including time to prepare permit applications and gain approval. Design is expected to take 6 months, bidding 3 months and 8 months for construction.

### Project Cost

The estimated cost to implement Alternative 1 is about$2,144,000. Table D-2 is a cost breakdown for this alternative. The cost estimate includes environmental compliance, mitigation of environmental

impacts, and design and permitting and construction costs. Construction cost includes removing rip rap and restoring the banks of Impound Lake after implementation of a long term solution. A 30% contingency has been added to the construction cost and is typical for conceptual design level cost estimates. Operation and maintenance costs are not included in the cost estimate.

**Table D-2 Impound Lake Diversion Alternative Cost Estimate**

| Item | Unit | Unit Cost | No. Units | Total |
|---|---|---|---|---|
| Weir Structure | LS | $ 113,390 | 1 | $ 113,390 |
| Outlet Structure | LS | $ 57,500 | 1 | $ 57,500 |
| 48" RCP | LF | $ 476,350 | 1 | $ 476,350 |
| Road Restoration | LS | $ 89,040 | 1 | $ 89,040 |
| Bank Restoration | LS | $ 69,200 | 1 | $ 69,200 |
| Mobilization/Demobilization, Bonds and Insurance (10%) | LS | $ 80,550 | 1 | $ 80,550 |
| Temporary Erosion Control (2%) | LS | $ 16,110 | 1 | $ 16,110 |
| Traffic Control (1%) | LS | $ 8,050 | 1 | $ 8,050 |
| Construction Engineering (5%) | LS | $ 40,270 | 1 | $ 40,270 |
| Subtotal | | | | $ 950,460 |
| Contingency (30%) | LS | $ 285,140 | 1 | $ 285,140 |
| Construction Cost Estimate | | | | $ 1,235,600 |
| Environmental Compliance | LS | $ 500,000 | 1 | $ 500,000 |
| Mitigation | AC | $ 250,000 | 0.15 | $ 37,500 |
| Engineering and Permitting (30%) | LS | $ 370,680 | 1 | $ 370,680 |
| **Total Capital Cost Estimate** | | | | **$ 2,143,780** |

## *Benefits and Limitations*

Alternative 1, Impound Lake Diversion, addresses safety concerns and bank erosion issues by preventing the flooding of John Muir Drive during a 10-year storm event. This alternative requires a relatively low capital cost (significantly lower than Alternative 2) and the loss of habitat of about .04 acres is considerably lower than the other two alternatives. Assuming mitigation requirements of 3:1, this alternative would require about 0.15 acres of mitigation.

This alternative would take approximately 3 to 3½ years to implement, which would mean at least four rainy seasons without protection or addressing safety concerns. There would be a loss of a small amount of habitat at Impound Lake, but there is documentation, (SFRPD, 2005) that the habitat at Impound Lake is of higher value than the habitat at South Lake. The impacts of discharging storm water with higher than ambient levels of coliform, nutrients and some metals and other pollutants will need to be addressed in the permitting/environmental compliance process. This alternative is not compatible with the long term solutions and therefore would be abandoned when a long term solution is implemented.

## D.1.3 Alternative 2 – Diversion to South Lake

**Figure D-6 Overview of Alternative 2, Diversion to South Lake**


### *Description*

Alternative 2, Diversion to South Lake, would divert flow in excess of the tunnel capacity to South Lake via a concrete overflow structure installed in Vista Grande canal, 27 rows of 2 feet x 5 feet box culverts under John Muir Drive and a concrete outlet structure at South Lake. To avoid conflict between the proposed box culverts and an existing 10 feet x 24 feet combined sewer box, John Muir Drive would have to be raised between one and 2.5 feet for a length of approximately 440 feet. The banks of South Lake below the outlet structure would be lined with rip rap to the normal lake level to prevent erosion. Figure D-7 through Figure D-9 are schematic diagrams of the required facilities for this alternative.

**Figure D-7 Section View of Alternative 2**

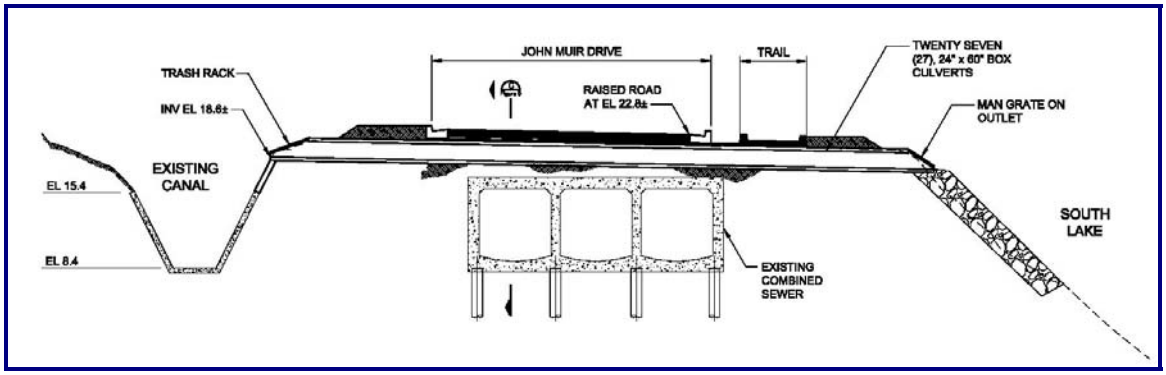


**Figure D-8 Overflow and outlet structure**

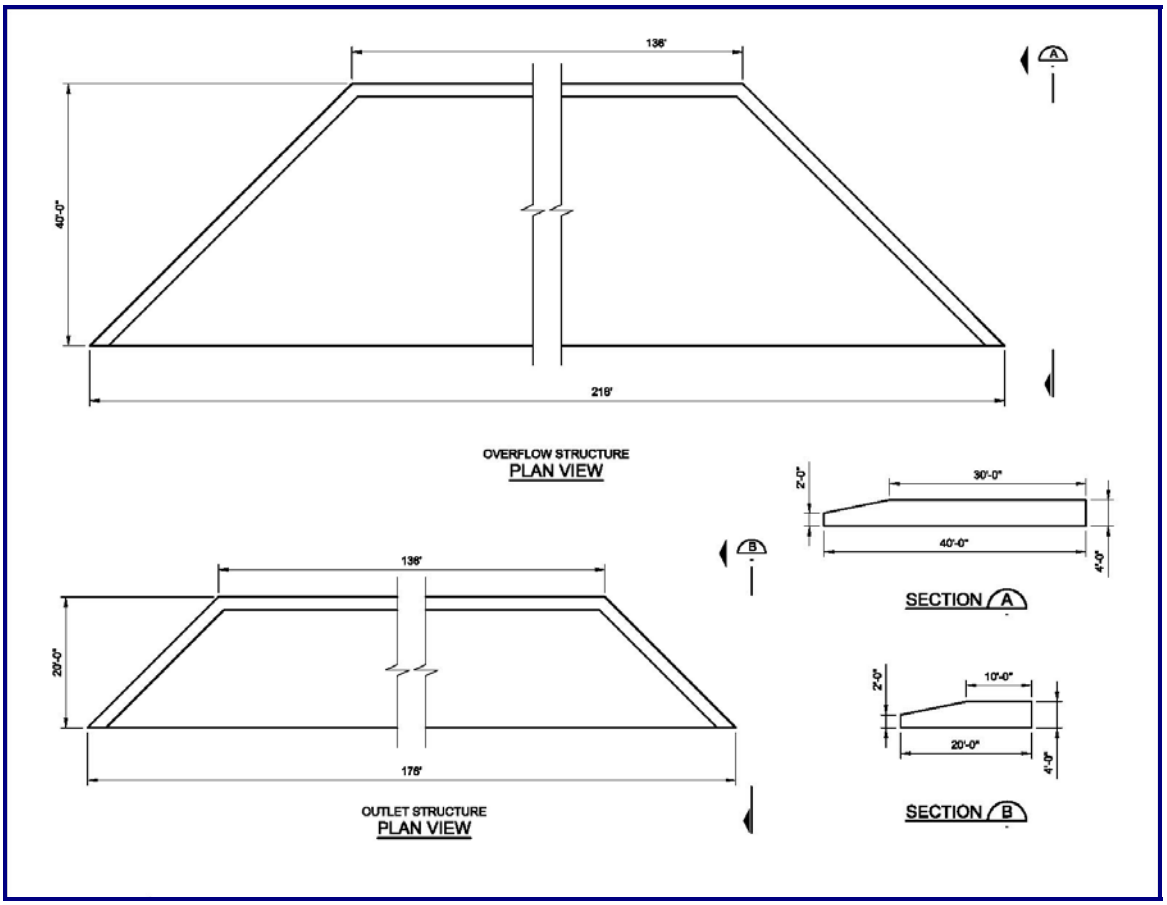
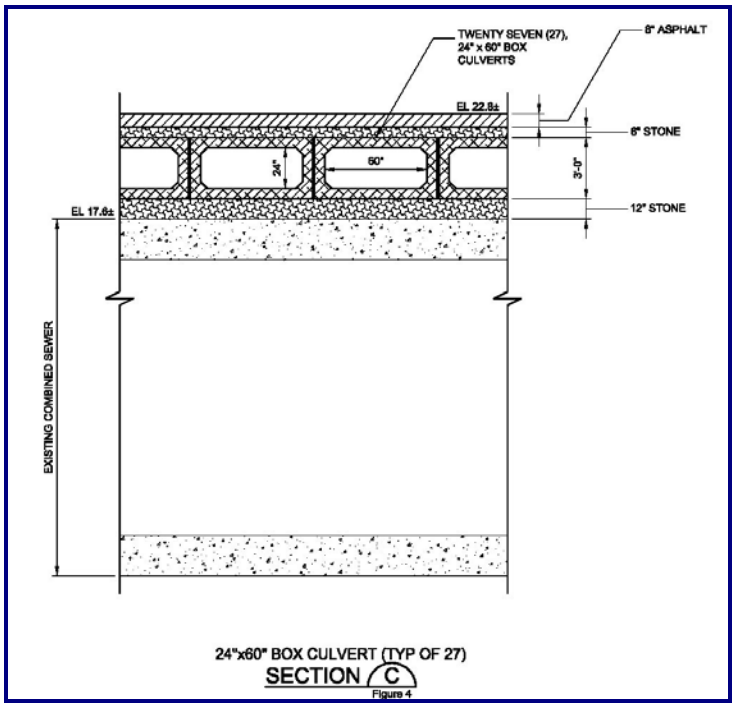



**Figure D-9 Section view through the existing combined sewer and proposed box culverts.**



### Hydraulic Analysis

It is assumed that a maximum of 170 cfs will be conveyed through the canal regardless of water depth because of the capacity restriction of the downstream tunnel. If the proposed overflow structure is installed at an elevation higher than the minimum water level required in the channel to carry 170 cfs (assuming no downstream restrictions) and low enough to keep the water level below the roadway during a 10-year storm event, then roadway flooding will be eliminated.

The elevation of the overflow structure in the canal would be set at approximately 18.6 feet, which is the lowest possible elevation that would allow installation of the box culverts while avoiding the existing combined sewer box. The level of the existing road at its lowest point (the natural overflow location) is approximately 20.5 feet. When the water level (hydraulic grade line) in the canal rises above 18.6 feet, flow in excess of 170 cfs would be diverted through the outlet structure to South Lake via the box culverts. In order to carry 510 cfs, the water depth in the box culverts would be about one foot. At this depth, the hydraulic grade line would be 19.6 feet, which is below the elevation of the road's lowest point; therefore, the roadway would not flood.

In order to be effective, this alternative should be installed at the natural overflow location (lowest point in the roadway), because if it is installed at another location where the roadway is higher, there is a possibility that the road would still flood at the natural overflow location.

### Permitting and Regulatory Requirements

Each Interim Solution Option is expected to trigger regulatory involvement from several state and federal agencies. Table D-3 summarizes the permitting requirements that have been identified for the proposed interim solutions.

**Table D-3 Summary of Permit Requirements Interim Solutions**

| Agency | Permit or Requirement | Authority | Cause for Permitting Action | Time Frame |
|---|---|---|---|---|
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| US Fish and Wildlife Service | §7 Consultation | Endangered Species Act | The area around the Vista Grande canal may contain the appropriate habitat for endangered species. The Corps will consult with USFWS during the permit process. If endangered species or their habitat are believed to be affected, USFWS will prepare a biological opinion under a §7 Consultation. | 1-3 years |
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| | §402 Permit - NPDES: General Construction Activity Storm Water Permit | Clean Water Act §402 | Required for any construction activity that disturbs more than five acres of land, or if the overall program disturbs more than five acres of land. While each of the proposed interim solutions would not disturb more than five acres of land, these interim solutions could be permitted as part of the overall watershed study. If this was the case, a General Construction Activity Storm Water Permit would be required. | Approximately six months |

| | | | | |
|---|---|---|---|---|
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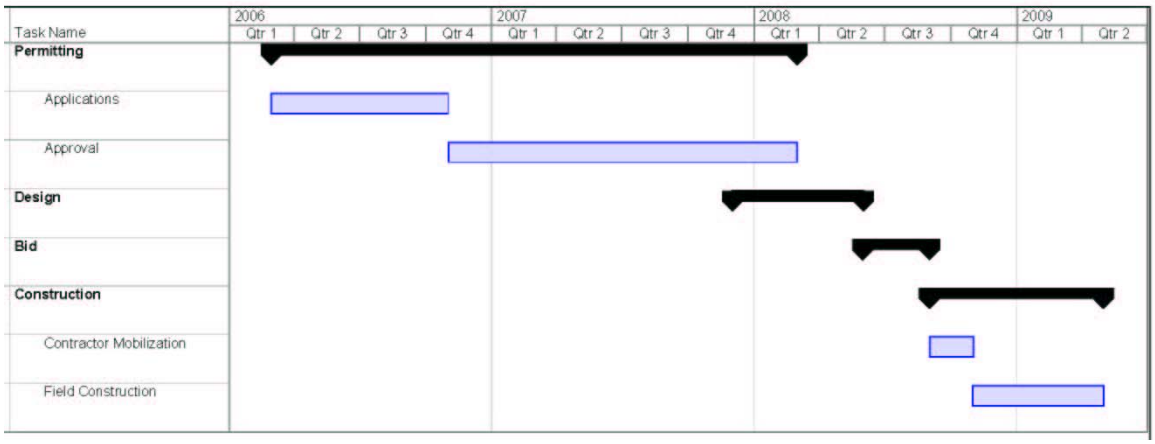
| California Coastal Commission (CCC) and/or Local Coastal Programs (LCPs) | Coastal Development Permit or Public Works Plan | California Coastal Act of 1976; Federal Coastal Zone Management Act | Required for any development in the coastal zone. The coastal zone begins at the shoreline and extends from 500 yards to 5 miles inland. The coastal zone extends around Lake Merced and includes the Vista Grande canal Area. | Six months to two years |

Since all three of the interim solution options allow untreated storm water to continue to flow directly into Lake Merced, they will be most easily permitted if they are presented as part of a long-term program that will eliminate the discharge of untreated storm water to Lake Merced. As shown in Table D-3, the permitting requirements for any of the interim solutions are extensive.

### *Implementation Schedule*




The schedule for Alternative 2 is identical to the schedule for Alternative 1 because the projects are similar. The implementation schedule includes time necessary for preparing permit applications, obtaining permit approval, design, bidding and construction. Design should begin approximately three quarters of the way through permit approval because regulatory agencies generally require a portion of the design to be complete before granting final permit approval. The remaining tasks are dependent upon the previous tasks being complete before they can begin.

Assuming permitting begins in February 2006, this schedule would result in four rainy seasons of potential flooding (2005, 2006, 2007 and 2008) with construction complete in summer 2009. Permitting would require an estimated 2 years, including time to prepare permit applications and gain approval. Design is expected to take 6 months, bidding 3 months and 8 months for construction.

## Project Cost

The estimated cost to implement Alternative 2 is about $10,716,000. Table D-4 below is a cost breakdown for this alternative. The cost estimate includes environmental compliance, mitigation of environmental impacts, and design and permitting and construction costs. Construction cost includes removing rip rap and restoring the bank of South Lake after implementation of a long term solution. A 30% contingency has been added to the construction cost and is typical for conceptual design level cost estimates. Operation and maintenance costs are not included in the cost estimate.

**Table D-4 South Lake Diversion Alternative Cost Estimate**

| Item | Unit | Unit Cost | No. Units | Total |
|---|---|---|---|---|
| Wingwall/Overflow Structure | LS | $ 397,600 | 1 | $ 397,600 |
| Outlet Structure | LS | $ 209,900 | 1 | $ 209,900 |
| 5'x2' Box Culverts | LS | $1,675,070 | 1 | $ 1,675,070 |
| Road Restoration | LS | $1,432,200 | 1 | $ 1,432,200 |
| Bank Restoration | LS | $1,032,000 | 1 | $ 1,032,000 |
| Mobilization/Demobilization, Bonds and Insurance (10%) | LS | $ 474,680 | 1 | $ 474,680 |
| Temporary Erosion Control (2%) | LS | $ 94,940 | 1 | $ 94,940 |
| Traffic Control (1%) | LS | $ 47,470 | 1 | $ 47,470 |
| Construction Engineering (5%) | LS | $ 237,340 | 1 | $ 237,340 |
| Subtotal | | | | $ 5,601,200 |
| Contingency (30%) | LS | $1,680,360 | 1 | $ 1,680,360 |
| Construction Cost Estimate | | | | $ 7,281,560 |
| Environmental Compliance | LS | $ 500,000 | 1 | $ 500,000 |
| Mitigation | AC | $ 250,000 | 3 | $ 750,000 |
| Engineering and Permitting (30%) | LS | $2,184,470 | 1 | $ 2,184,470 |
| Total Capital Cost Estimate | | | | $ 10,716,030 |

## Benefits and Limitations

Alternative 2, South Lake Diversion would address safety concerns and bank erosion issues by preventing flooding of John Muir Drive during a 10-year storm event. This option would essentially allow water to go where it naturally goes today, but it would flow under the road in a controlled manner rather than over the road.

The limitations of this alternative are significant. First, it would take 3 to 3 ½ years to implement this alternative, which means at least four rainy seasons without protecting the roadway or the banks, and without addressing public safety concerns. Second, the capital cost is very high and the facility would be abandoned when long term solutions are in place. Finally, loss of habitat would be approximately 0.92 acres, which is a significant impact considering the quality of habitat surrounding Lake Merced. Mitigation would be required at a 3:1 ratio, or approximately 3 acres. As with all interim solutions, the impacts of discharging storm water with higher than ambient levels of coliform, nutrients and some metals and other pollutants will need to be addressed in the permitting/environmental compliance process.

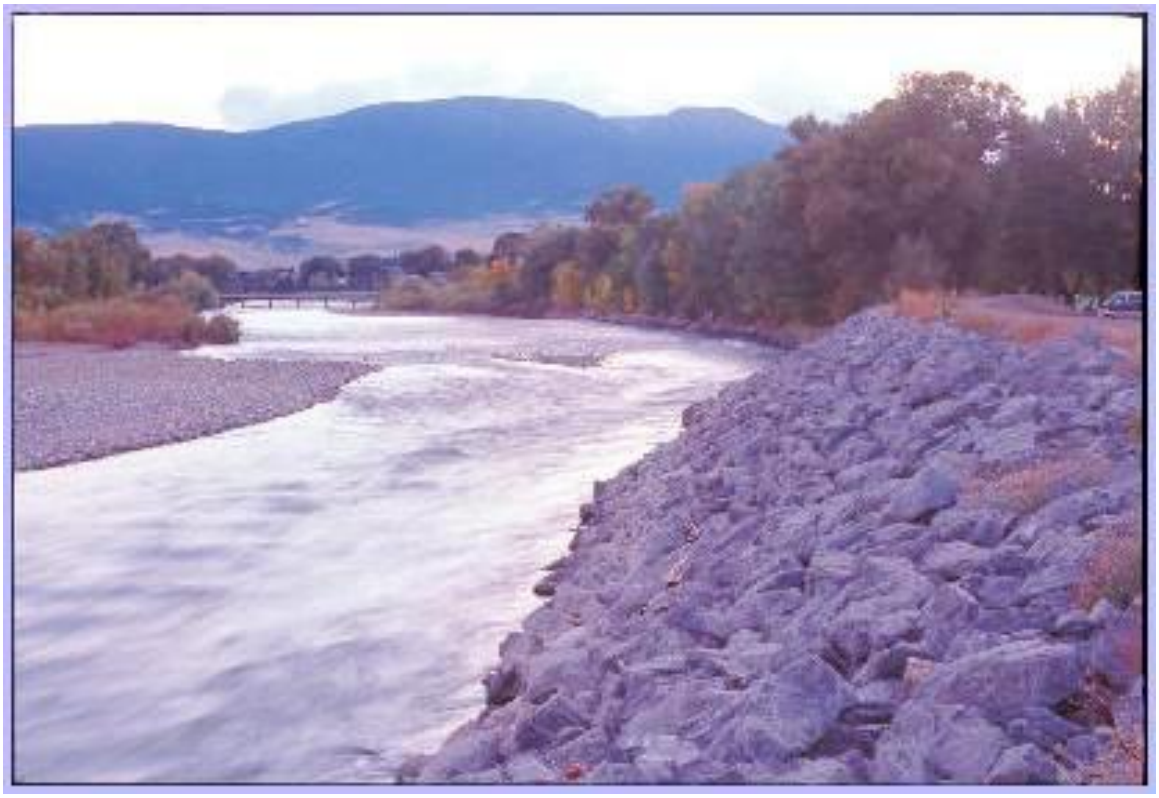
## D.1.4 Alternative 3 – Rip Rap at South Lake

**Figure D-10** ***Overview of Alternative 3, Rip Rap at South Lake***


### *Description*

Alternative 3, Rip Rap at South Lake would consist of armoring the banks of South Lake with rip rap where overflows presently occur. The width of rip rap would be approximately 300 feet along John Muir Drive and extend from the roadway to normal lake level. After implementation of a long term solution, the rip rap would be removed and the banks would be restored. Figure D-11 shows an installation of rip rap similar to what would be proposed under this alternative.

**Figure D-11 Typical rip rap installation to protect the banks of a waterway.**



## Hydraulic Analysis

Preliminary hydraulic analysis based on the existing roadway profile indicates that the flow path when John Muir Drive is flooded during a 10-year storm event is approximately 300 feet wide. Rip rap would be installed on the banks of South Lake for the width of the flow path. Storm water would overtop the roadway and flow to the lake as it does currently.

## Permitting and Regulatory Requirements

Each Interim Solution Option is expected to trigger regulatory involvement from several state and federal agencies. Table D-3 summarizes the permitting requirements that have been identified for the proposed interim solutions.

**Table D-5 Summary of Permit Requirements Interim Solutions**

| Agency | Permit or Requirement | Authority | Cause for Permitting Action | Time Frame |
|---|---|---|---|---|
| US Army Corps of Engineers (the Corps) | §404 Permit<br><br>§10 Permit | Clean Water Act<br><br>River and Harbors Act | Lake Merced is a part of the "waters of the United States". The status of the Vista Grande canal is unclear but it may also be considered a part of the "waters of the United States". The Diversion to Impound Lake and the Diversion to South Lake would require modifications to the canal, and all three interim solutions would require the installation of erosion control devices on the banks of Impound Lake, triggering a permit from the Corps. | 4-6 months – Individual Permit<br>45-60 days - Nationwide Permit<br><br>An additional year or more if a biological opinion is required |
| US Fish and Wildlife Service | §7 Consultation | Endangered Species Act | The area around the Vista Grande canal may contain the appropriate habitat for endangered species. The Corps will consult with USFWS during the permit process. If endangered species or their habitat are believed to be affected, USFWS will prepare a biological opinion under a §7 Consultation. | 1-3 years |
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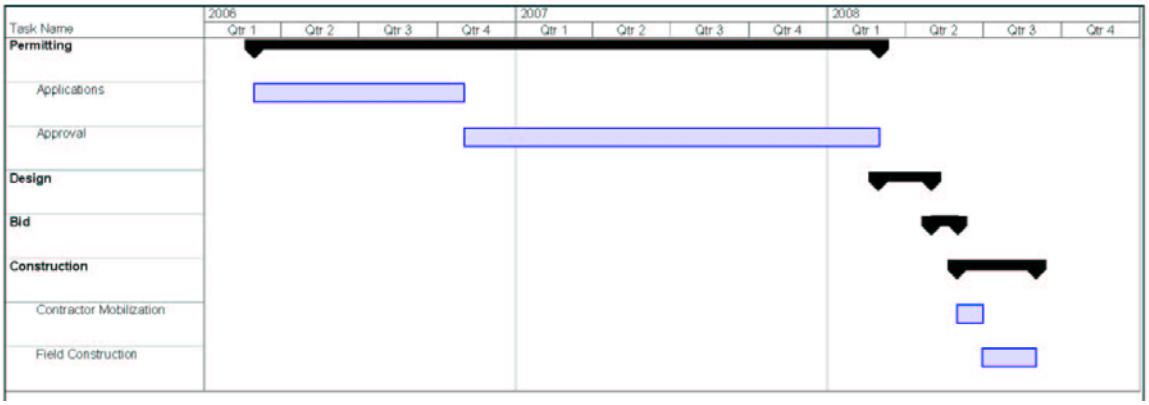
| | §402 Permit - NPDES: General Construction Activity Storm Water Permit | Clean Water Act §402 | Required for any construction activity that disturbs more than five acres of land, or if the overall program disturbs more than five acres of land. While each of the proposed interim solutions would not disturb more than five acres of land, these interim solutions could be permitted as part of the overall watershed study. If this was the case, a General Construction Activity Storm Water Permit would be required. | Approximately six months |

| | | | | |
|---|---|---|---|---|
| California Department of Fish and Game (CDFG) | Streambed Alteration Agreement (§1602 permit) | Fish and Game Code §1602 | Required before undertaking any activity that will significantly change any river, stream, or lake. The jurisdiction of CFG includes the Vista Grande canal and Lake Merced so any of the proposed interim solutions would require a streambed alteration agreement. | 30 days after application submittal to evaluate completeness; 60 days after application is deemed complete. |
| California Coastal Commission (CCC) and/or Local Coastal Programs (LCPs) | Coastal Development Permit or Public Works Plan | California Coastal Act of 1976; Federal Coastal Zone Management Act | Required for any development in the coastal zone. The coastal zone begins at the shoreline and extends from 500 yards to 5 miles inland. The coastal zone extends around Lake Merced and includes the Vista Grande canal Area. | Six months to two years |

Since all three of the interim solution options allow untreated storm water to continue to flow directly into Lake Merced, they will be most easily permitted if they are presented as part of a long-term program that will eliminate the discharge of untreated storm water to Lake Merced. As shown in Table D-3, the permitting requirements for any of the interim solutions are extensive.

## *Implementation Schedule*




The schedule above includes time necessary for preparing permit applications, obtaining permit approval, design, bidding and construction. All of these tasks rely upon the task ahead of them being complete before they can begin. Design for this project should not begin until permit approval has been granted because the design is simple and straightforward. Permitting should be accomplishable without formal design drawings and there is no reason to begin design until it is certain that the project can be built.

Assuming permitting begins in February 2006, this schedule would result in three seasons of potential flooding (2005, 2006, and 2007) with construction being complete in summer 2008. Permitting would require an estimated 2 years including time to prepare permit applications and gain approval. Design is expected to take 2 months, bidding 1 months and 3 months for construction.

## *Project Cost*

The estimated cost to implement Alternative 3 is about $3,571,000. Table D-6 is a cost breakdown for this alternative. The cost estimate includes environmental compliance, mitigation of environmental impacts, design and permitting and construction costs. Construction cost includes removing rip rap and restoring the bank of South Lake after implementation of a long term solution. A 30% contingency has

been added to the construction cost and is typical for conceptual design level cost estimates. Operation and maintenance costs are not included in the cost estimate.

**Table D-6 Rip Rap at South Lake Cost Estimate**

| Item | Unit | Unit Cost | No. Units | Total |
|---|---|---|---|---|
| Grading | LS | $ 20,000 | 1 | $ 20,000 |
| Rip Rap Placement | SY | $ 148 | 6667 | $ 986,720 |
| Bank Shaping and Plantings | SF | $ 2 | 4000 | $ 8,000 |
| Mobilization/Demobilization, Bonds and Insurance (10%) | LS | $ 100,670 | 1 | $ 100,670 |
| Temporary Erosion Control (2%) | LS | $ 20,130 | 1 | $ 20,130 |
| Traffic Control (1%) | LS | $ 10,070 | 1 | $ 10,070 |
| Construction Engineering (5%) | LS | $ 50,340 | 1 | $ 50,340 |
| Subtotal | | | | **$ 1,195,930** |
| Contingency (30%) | LS | $ 358,780 | 1 | $ 358,780 |
| Construction Cost Estimate | | | | **$ 1,554,710** |
| Environmental Compliance | LS | $ 500,000 | 1 | $ 500,000 |
| Mitigation | AC | $ 250,000 | 4.2 | $ 1,050,000 |
| Engineering and Permitting (30%) | LS | $ 466,410 | 1 | $ 466,410 |
| **Total Capital Cost Estimate** | | | | **$ 3,571,120** |

## Benefits and Limitations

Installing rip rap at South Lake addresses bank erosion issues related to flooding of John Muir Drive by protecting the soil from being washed away during an overflow. The cost of the project is in the same range as Alternative 1 and is significantly lower than Alternative 2. The implementation period for this alternative is projected to be one year shorter than both Alternatives 1 and 2, but would still require three years to implement.

A significant limitation with this alternative is that it does not address safety concerns associated with flooding of the roadway. The roadway will flood, as it does presently, during a 10-year storm event, posing a safety risk to motorists and pedestrians. This alternative would also require the largest loss of habitat of the three alternatives. A total of 1.38 acres of habitat would be lost, which would require 4.2 acres of mitigation at a 3:1 ratio. As previously mentioned, the impacts of discharging storm water with higher than ambient levels of coliform, nutrients and some metals and other pollutants will need to be addressed in the permitting/environmental compliance process.