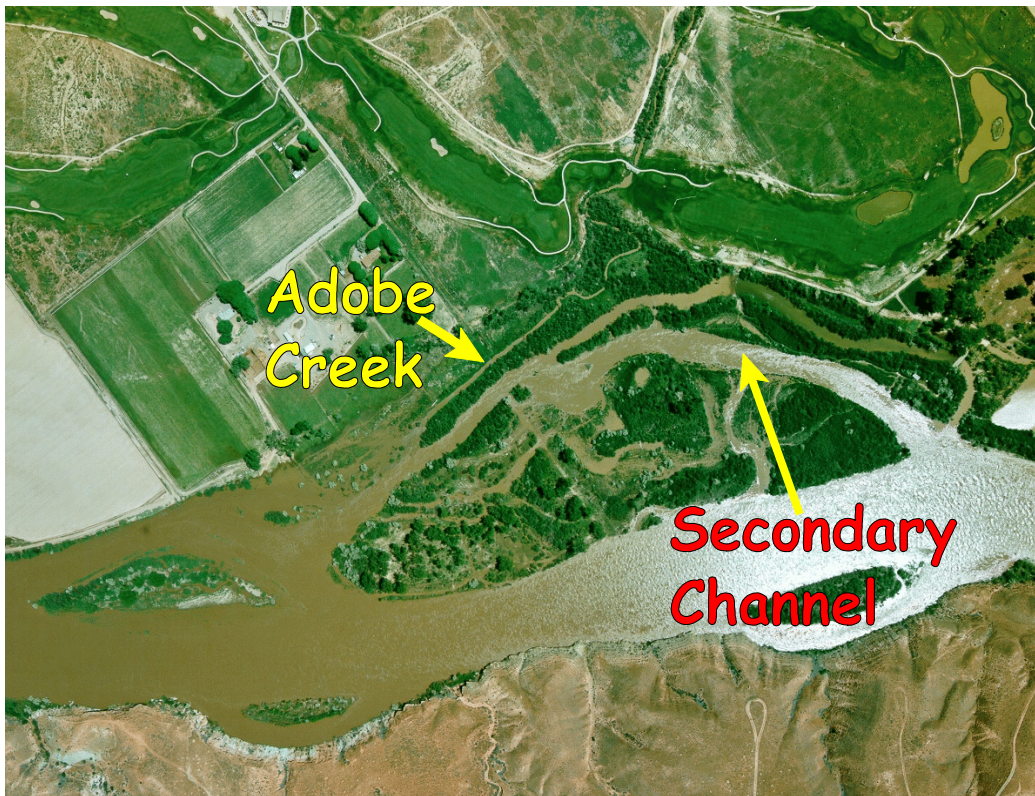


NIWQP Plan for Selenium Remediation at the Adobe Creek Site (River mile 160)

July 2002

Site Description

Adobe Creek is a tributary to the Colorado River carrying irrigation drainage from land served by the Federal Grand Valley Project (operated by the Grand Valley Water Users Association) and by the non-Federal Grand Valley Irrigation Company. It was originally an ephemeral stream which with the advent of irrigation in the Grand Valley became perennial. The mouth is located on the north-south alignment of 18 $\frac{1}{2}$ Road approximately 8 miles west of downtown Grand Junction. At its mouth, Adobe Creek flows into a 0.8 - mile long secondary channel where endangered Colorado pikeminnow have been captured. This channel was created as a result of gravel mining by Mesa County in the 1960's and is believed to be important habitat for pikeminnow and razorback sucker restoration efforts. In the secondary and an adjoining tertiary channel, selenium concentrations ranging from 1 to 26 ppb have been recorded in water samples. Biota samples have a range of 2 to 22 ppm. In recent years, normal (non-flood) flows in Adobe Creek have ranged from 30 - 37 cfs during the irrigation season to 2 - 4 cfs during the non-irrigation season. Selenium concentrations in Adobe Creek have ranged from 10 to 41 ppb.



June 3, 1997 photo (high water during spring runoff; 36,800 cfs at state line gage)

Site Photos



Secondary channel looking upstream towards upper riffle



Lower end of secondary channel looking downstream to the Colorado River

Pre-Project Site Data

Data collected to date are summarized in Table 1 (page 11). Most water and biota samples exceed toxicity guidelines.

Problem and Needs Statements for the Grand Valley

Problem Statement: Selenium concentrations in Colorado River backwater and bottomland habitat in the Grand Valley are at levels that adversely affect reproduction in selenium sensitive species including some aquatic birds and endangered fish.

Needs Statement: Reduce or prevent selenium impacts to fish and wildlife in Colorado River backwater and bottomland habitat in the Grand Valley.

General Site Objectives for the Adobe Creek Site

- Reduce selenium concentrations to 3 ppm or less in food organisms used by endangered fish in the backwater.
- If reasonable, use an adaptive management approach, and
- Besides reducing selenium, enhance the habitat, when possible.

Specific Site Objectives for the Adobe Creek Site

- Provide a method to prevent contaminated flow from Adobe Creek from entering or affecting the secondary channel during the entire year. There is concern about the entire year because female fish may be uptaking selenium for 9 months or so prior to spawning, and other times of the year may be critical for larval survival.
- Protect existing physical conditions in endangered fish habitat (water temperature, channel morphology, etc.), particularly in the pool above the upper riffle.
- Avoid increasing flow through the secondary channel (at the request of landowner, Don Murray). The flow can remain the same with the source being converted from Adobe Creek to river water.
- Minimize annual maintenance requirements of the fix. Consider sediment transport in design of the fix.
- Provide dilution flows if diffuse ground water sources continue to raise selenium concentrations in food organisms in the secondary channel above 3

ppm after Adobe Creek flows are removed from the secondary channel.

Alternatives Considered:

Alt. No.

1. No action
2. Pipe Adobe Creek south across the "island", directly to the Colorado River: Adobe Creek would be routed directly to the river through a 950-ft. long, 48-inch diameter pipeline. The estimated construction cost for the pipeline and a diversion structure in Adobe Creek is \$330,000. The river inlet to the secondary channel would be excavated to increase the flow rate replacing a portion of the pipeline diverted water at a cost of \$5,000. Including design and contract administration at 20%, the total estimated cost would be \$402,000.
3. Pipe Adobe Creek west along the north bank of the River to discharge below end of the secondary channel: This would require a 3,000-ft long, 48-in diameter pipeline. The estimated construction cost for the pipeline and an Adobe Creek diversion structure would be approximately \$540,000. The river inlet to the secondary channel would be excavated to increase the flow rate replacing a portion of the pipeline diverted water at a cost of \$5,000. Including design and contract administration, the total estimated cost would be \$654,000.
4. Enlarge secondary channel inlet to provide flushing flows: the upper end of the Adobe Creek Backwater would be excavated to allow river water to flow through it year-round. This would provide additional high quality water during the entire year, diluting the selenium inflows from Adobe Creek. A flow of approximately 200 cfs would be required to dilute the Adobe Creek water down to the state's selenium standard of 4.6 ppb during the summer irrigation season. The approximate cost for this excavation is \$10,000.
5. Collect and Treat Adobe Creek using reverse osmosis treatment: The treatment plant would be capable of treating 20 cfs of drainwater with a selenium concentration ranging from about 10 to 80 ppb. A 12,000-ft² building, located near the lower end of the Adobe Creek, would contain the treatment plant. The capital cost for this facility would be approximately \$15,000,000 with a \$3,000,000 per year O & M cost.

6. Re-channel Adobe Creek across the "Island": Adobe Creek flow would be re-routed through an excavated channel across the sand/gravel bar section of the island southwesterly to the river. Adobe Creek would still flow through the secondary channel for about 700 feet before entering the new excavated channel, but the lower portion of the secondary channel which is prime fish habitat would be protected.

Evaluation of Alternatives

Alt. No.

1. No action: This is not considered an acceptable option for the NIWQP whose mission is to reduce selenium impacts to endangered fish resulting from return flows from Federal irrigation projects. It would not solve the problem.
2. Pipe Adobe Creek south across the island, directly to the Colorado River: This is the Core Team's preferred plan for addressing the Adobe Creek site selenium issue. It was selected for the following reasons:
 - a. It is a permanent solution requiring a relatively low amount of annual maintenance.
 - b. It removes the prime selenium source from the entire length of the secondary channel.
 - c. It provides a sufficient opportunity for the contaminated water to mix in the Colorado River without affecting the lower (outlet) portion of the secondary channel.
 - d. It may be beneficial to endangered fish by providing an enlarged area of ponded water habitat above the pipe crossing of the secondary channel.

By removing Adobe Creek flows from the secondary channel and allowing some additional inflow from the River via excavation from the inlet to the secondary channel, the Team anticipates selenium concentrations in biota will be significantly reduced. See section entitled Preferred Plan & Recommendations below for more detail on this alternative.
3. Pipe Adobe Creek west along the north bank of the River to discharge below end of the secondary channel: This alternative was eliminated due to its length and significantly higher cost (\$654,000) compared to Alternative 2.
4. Enlarge secondary channel inlet to provide flushing flows: This alternative was eliminated because the large flow (~200 cfs) that would be needed to

dilute Adobe Creek inflow to the 4.6 ppb state standard would be unacceptable to two stakeholders. The reasons for this being unacceptable are:

- a. one landowner does not want flow increased in the secondary channel because it would impede his access to his "island" property via an existing low water crossing, and
- b. this flow rate would likely adversely affect the existing endangered fish habitat by reducing the water temperature in the backwater, reducing the slack water favored by the fish, and possibly changing the channel morphology.

5. Collect and Treat Adobe Creek Backwater using Reverse Osmosis

Treatment: Eliminated due to excessive initial and annual costs.

6. Re-channel Adobe Creek across the Island: Even though this alternative would have a lower initial cost than Alternative 2, it was eliminated for the following reasons:

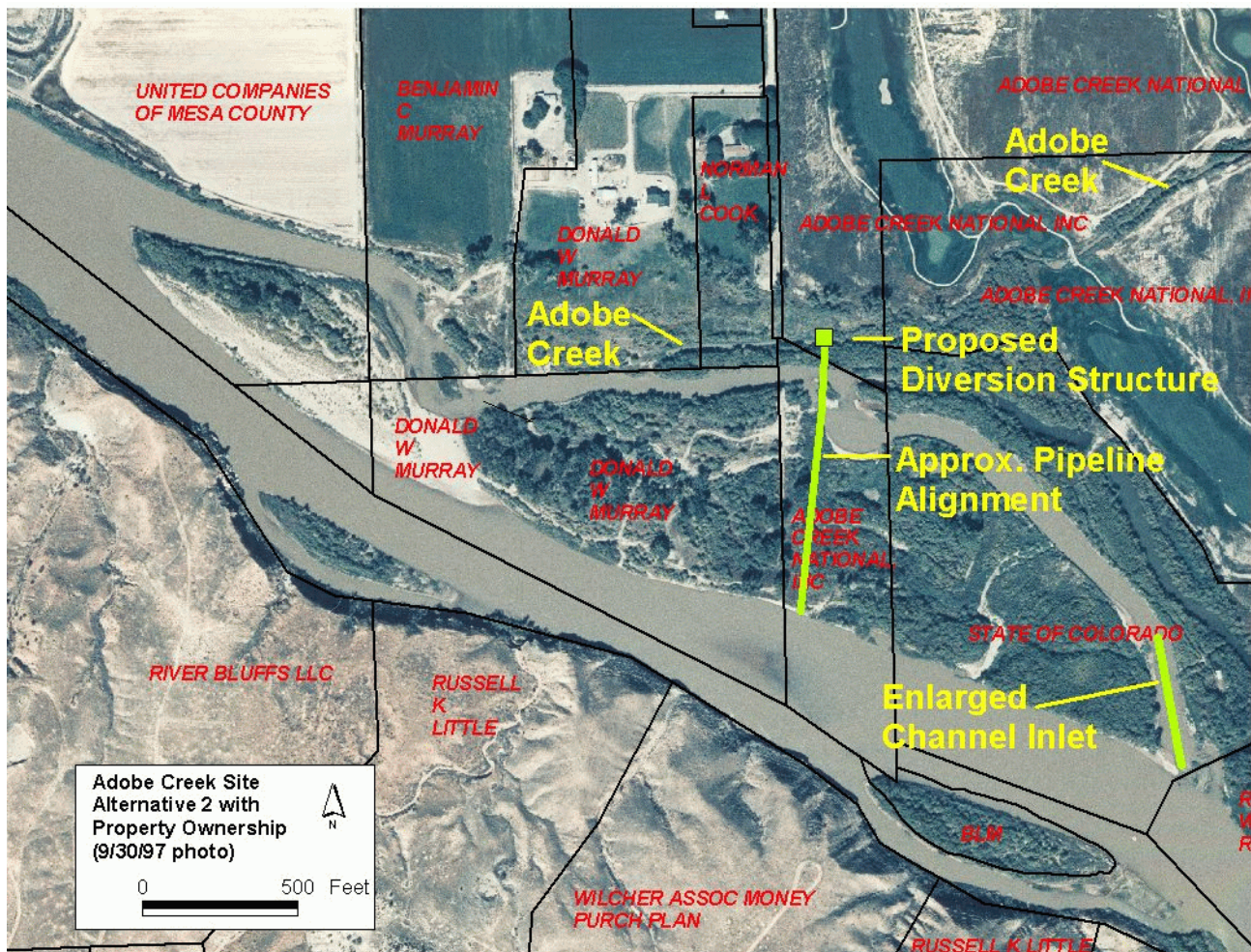
- a. The configuration of the re-routed channel would roughly be perpendicular to the flow of the Colorado River during flood stages likely causing this excavated channel to fill-in each year. Substantial re-excavation of the channel would be required in most, if not all years.
- b. The Core Team believes it is important to provide a more long term solution in this case.
- c. It is not desirable to have a 700-foot reach of the secondary channel still be affected by contaminated water.
- d. There is a possibility that contaminated water entering the Colorado River would not have a sufficient mixing opportunity in the Colorado River and may flow along the river bank re-entering the lower portion of the secondary channel.

Public Involvement

A workshop that invited public comment and discussion regarding the Adobe Creek site and 2 other Grand Valley remediation study sites was held on October 30, 2001. Ten citizens attended the meeting, but no landowners from the Adobe Creek site vicinity attended. Many personal contacts were made, and ongoing coordination has been accomplished by Del Smith including with the following potentially directly affected landowners: Don Murray, Adobe Creek golf course, and United Companies.

Preferred Plan & Recommendations

Alternative 2 is the Core and Interdisciplinary Teams' preferred plan. This would involve piping Adobe Creek south across the "island", directly to Colorado River. The entire normal irrigation season flow (30-37 cfs) and non-irrigation season flows (2-4 cfs) of Adobe Creek would be routed directly to the river through a 950-ft. long, 48-inch diameter pipeline. Infrequent flood flows would be bypassed around the pipeline. The river inlet to the secondary channel would be excavated to increase the flow rate replacing a portion of the pipeline diverted water. The preliminary estimated cost for the pipeline, diversion structure in Adobe Creek and channel excavation is \$402,000. This figure includes contingencies, engineering, design and administrative expenses. It does not include funding for right-of-way acquisition.



The Core Team recommends approval of the preferred plan by the NIWQP Program Manager. Following this approval, the ID Team will proceed with detailed design and planning. Listed below are several needs or issues that should be

considered in the development of a final project design:

1. Verify that the Colorado River channel is relatively stable through this reach, or that the project plan is adaptable to some channel alignment changes.
2. Ensure the existing Adobe Creek channel remains usable as an overflow/bypass for flood passage (i.e., assure no encroachment that might become damageable property for which we might be liable), or provide another means for flood passage.
3. Consider whether removing Adobe Creek flows will create changes in the lower secondary channel detrimental to endangered fish use, e.g., vegetative growth, sediment accumulation. Identify some adaptive management measures that, if needed, could be implemented later on, such as additional excavation of the secondary channel inlet to increase flow.
4. Consider if there are ways to reduce the flow in Adobe Creek in order to reduce the required pipe size and thus, the cost. This will probably involve meeting with Grand Valley Irrigation Co. and Grand Junction Drainage District to identify opportunities in upstream areas.
5. The pipelines, which were preliminarily sized to carry 50 cfs, can probably be reduced to 37+/- cfs according to recent flow measurements, or maybe less if some flow can be reduced or diverted upstream.
6. Provide the county with an evaluation of the impacts of a pipeline crossing structure in the secondary channel on the 100-year flood elevation.
7. Consider a transition from a pipeline to an open ditch immediately below (south) of the secondary channel crossing.
8. Operators of the Adobe Creek golf course presently dispose of some unused irrigation (clean?) water directly into Adobe Creek. Other disposal options will be considered including using this water for dilution in the secondary or tertiary channels. Selenium analysis should be done on a sample before using this water for dilution. This should be coordinated with the Recovery Program.

Easement/Right-of-Way Needs/Status

Construction of the pipeline as envisioned in Alternative 2 will require construction and permanent easements be obtained from the affected landowners. Discussions are underway with the landowners concerning possible donation of the easements.

NEPA Compliance

Initially, a categorical exclusion checklist will be completed and may be sufficient

based on the anticipated impacts of the project. However, if more detailed NEPA analysis is needed, an environmental assessment process will be initiated.

Forecast of Long Term Maintenance & Funding Requirements

Long term maintenance required for Alternative 2 would involve periodically --

1. sluicing or cleaning sediment out of the Adobe Creek diversion structure,
2. maintaining flow into the inlet of the secondary channel by excavation of sediments, and
3. cleaning the ditch portion (if it is not piped) of the Adobe Creek diversion to the river.

It is estimated the annual cost for this work would be approximately \$4,000.

Monitoring Plan

Additional water, sediment and biota samples will be collected prior to the construction of the remediation plan. Pre-project samples will be collected at a new sample site in the lower part of the secondary channel below Don Murray's low water crossing where endangered fish have been found.

After construction, water and biota data will be collected in areas likely to be affected by the diversions of the Adobe Creek flows and by increased flow through the secondary channel. This will include the following sites:

1. Secondary channel upstream of the pipe crossing,
2. Ponded area upstream of the pipe crossing,
3. Secondary channel immediately downstream of the pipe crossing,
4. Lower reach of the secondary channel (below Don Murray's low water crossing), and
5. In the open ditch portion of the Adobe Creek diversion to the river (if pipe is used in this section, there would be no monitoring required).

The measure of success of this remediation project will be how well we meet the objective of reducing selenium concentrations to 3 ppm or less in food organisms used by endangered fish.

Periodic Results/Changes — Changes resulting from the remediation activities will be analyzed at regular intervals, i.e., 1 year, 2 years, etc. Photos will be included. (info to be added in future years)

Record of Periodic Maintenance/Plan Modifications

(info to be added in future years)

