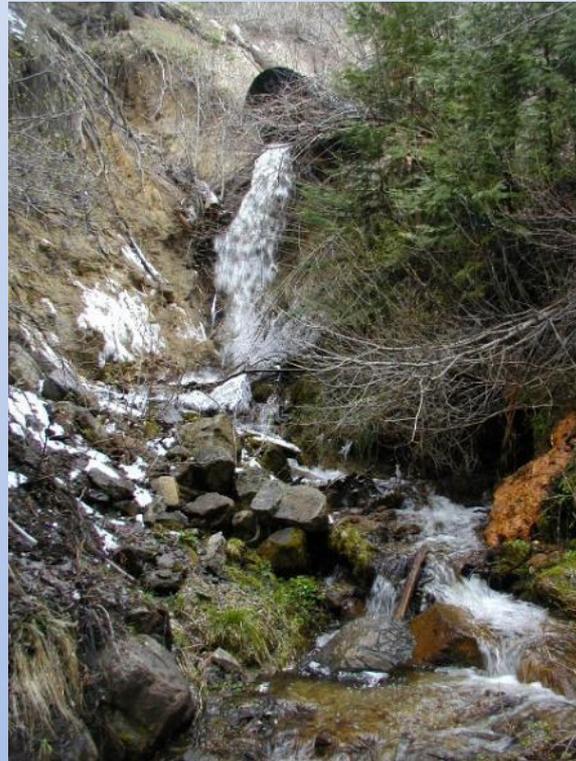


# NDOT's Clear Creek Erosion Control Program And Projects



**Eric Yount, P.E.  
NDOT Hydraulics Section**

# **NDOT's Clear Creek Erosion Control Program And Projects**

- **Clear Creek Erosion Control Program**
- **US 50 Storm Drain Projects**
- **USGS Water Quality Monitoring Data**
- **NDOT Ground Water Monitoring**



# US 50/Clear Creek History

- **Kings Canyon toll road was main lake access around the turn of the century**
- **Old Clear Creek road was popular with toll dodgers and wasn't paved till 1928 (\$230,000)**
- **In 1956, US 50 construction began through the Clear Creek Watershed**
- **Roadway opened October 4<sup>th</sup>, 1957 in preparation for 1960 Winter Olympics in Squaw Valley**

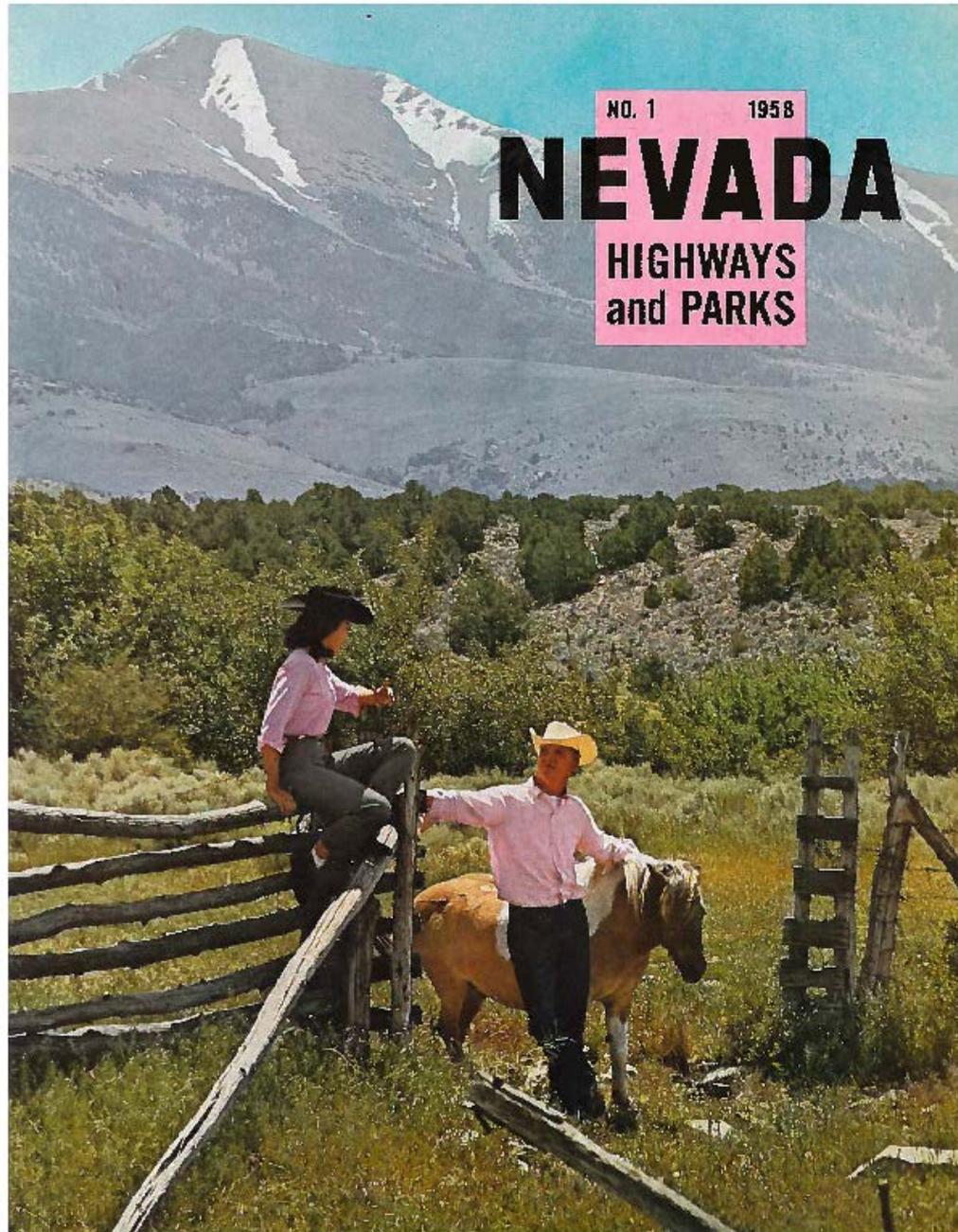
# US 50 Construction



NO. 1 1958

# NEVADA

HIGHWAYS  
and PARKS



# New Highway to the Sky...

## Historic Clear Creek Grade to Lake Tahoe is Modernized



Even before it was opened to traffic last October, the new Clear Creek grade to Lake Tahoe had gained quite a reputation as a record smasher.

For one thing, its cost of more than two and a half million dollars made it the most expensive road job yet undertaken in the 40-year history of the Nevada Highway Department.

For another, the project was completed with unusual speed—in a year, almost to the day, after it was begun—several months less than the time allotted in the contract.

Then there are the statistics of the construction—the fact, for example, that more earth was moved to form the huge fills and cuts than on any previous job in Nevada or, for that matter, in many other western states. These cuts, up to 30 stories high, are the big wedges carved out of mountainsides above the new alignment. Of similar proportions are the fills or earth “bridges” carrying the highway across canyons and gullies. Construction of the new route through the Lake Tahoe foothills called for more than a dozen of these very large fills and cuts and involved the displacement of 3.5 million cubic yards of earth. One of the largest of the cuts is tiered with three benches set 60 feet apart vertically, these acting as shelves to protect the road from falling rocks.

In carrying out the mammoth project, the contractor, Isbell Construction Company of Reno, threw millions of dollars' worth of equipment into the job, and kept crews working 18 hours a day. At night, huge spotlights made it possible for the heavy trucks, diesel-powered shovels and turnpills to operate. By day, tons of explosives were set off to loosen earth which would be moved by this huge equipment. As much as 100,000 cubic yards of earth were so handled in a single week, an achievement seldom duplicated in road work.

Still another distinction may be claimed by the contractor in connection with this job. It was the Isbell firm which built the old Clear Creek grade, the first modern highway to the lake from the east, 30 years ago.

While construction statistics tell a lot about the new highway, they by no means present the whole story. The only way to really know this road is to drive it yourself, an experience you won't regret or soon forget.

The new grade begins about three miles south of Carson City, at the point where U. S. 50 turns from the valley and heads abruptly for the hills. You will recognize the new highway at once by its four lanes, generous and well-marked median strip, and by its comfortably wide shoulders.

Promise of a pleasant trip is evidenced from the





Blasting out the largest cut on the new grade. Drilling took two weeks.



A huge cut near completion. Across top it is 600 feet wide.



Loading powder for the blast above.



A fleet of eight huge turepulls moved tons of earth.

start. Immediately after you leave the valley, you find yourself gliding along the face of the mountains, moving effortlessly from curve into curve as you continue to climb. This is the way it will go during the entire 9-mile trip to the top at Spooners Summit.

Its altitude, generally 200 feet higher than the old grade, is certainly the most interesting feature of the new alignment. From the greater heights of the road you are treated to a series of views that are little short of spectacular—glimpses of the flat Carson Valley, its ranches and the towns of Minden and Gardnerville; the Sierra Nevada giants far to the south; and the bald hills to the east.

From many parts of the new grade you catch

glimpses, too, of the old Clear Creek grade, so named because it follows the banks of Clear Creek much of the way toward the summit. Twisting, curving and confined to the bottom of its canyon, the old alignment seems hopelessly antiquated from the heights of the new grade. Yet, only a year ago it was still carrying the traffic to and from the lake—carrying it, yes—but not well. Its many blind and difficult curves and its narrow, 2-lane width made passing impossible much of the time, and when there were many cars on the road traffic slowed to a 15 mile-per-hour pace or less. So frustrating was travel on the grade under these conditions that the scenery and anticipation of Lake Tahoe were completely forgotten. On the



Final clean-up after the big blast shown at left went off.



All repairs were made in Isbell's field shop set up at Clear Creek.



The highway crewmen survey final grades and center line.



Maders asphalt mixers could lay a mile of surface mix in 8 hours.



Work begins on the new alignment. Below is seen the old road.

new highway, four lanes keep traffic moving easily at all times and the 50 mile-per-hour speed limit still allows a much faster and safer trip than previously was possible.

Need for the highway has long been felt. Some thirty years ago, 1929 to be exact, a 16-hour traffic count taken in July showed that only 438 cars were using the road. In a similar period last year, over 3,600 vehicles were recorded. With the great rise in travel expected due to the 1960 Winter Olympics in nearby Squaw Valley and the increasing year-around popularity of the Lake Tahoe resort area, this highway had to be built to handle the load. And handle it, it does. Traffic studies completed since the road was opened show

surprising increases, partly accounted for, no doubt, by the hundreds of drivers whose only destination is pleasure. It won't surprise any of the traffic engineers to find that the new highway will soon be carrying up to 8,000 to 10,000 cars a day. From the era of covered-wagon travel, the Clear Creek highway has come a long way.

Historically, the Clear Creek road was in use before the rush began to the mines at Virginia City. It was one of the earliest trails into the Sierra but handled most traffic after lumber began to be hauled from the lake to the Comstock mines. Around the turn of the century, the Kings Canyon road immediately west of Carson City had become the best road to the lake. This was a toll road,

however, and the Clear Creek road held its popularity with the so-called toll dodgers—wagon drivers who refused to pay the tolls over the Kings Canyon road.

The first paved road over the Clear Creek route, very modern for its day in view of the light traffic, was begun in 1927 and completed in 1928 at a cost of about \$230,000. Several improvements followed, notably in 1931 and 1951. Total construction costs for the new and old grades and maintenance costs on the old grade add up to four million dollars, making it the most costly stretch of highway in the Nevada system.

For the opening of the new highway last October 4, short but appropriate ceremonies were held. Present for the occasion were the members

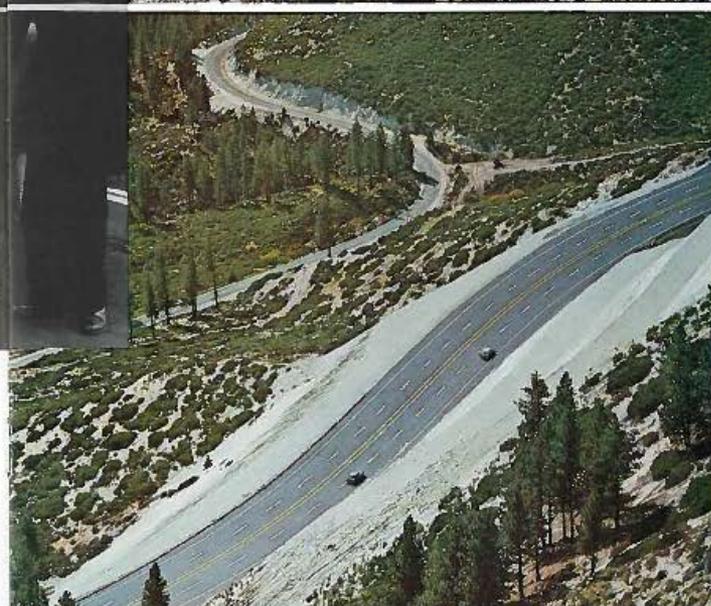
of the Highway Board—Governor Charles H. Russell, Attorney General Harvey Dickerson and State Controller Peter Merialdo. State Highway Engineer H. D. Mills and other highway officials. Also present were many state and county officials, representatives from chambers of commerce and city governments in California and Nevada, members of the Isbell family and—most colorful—a group of horseless carriages and passengers in costume from the Horseless Carriage Club of Reno. After a short invocation by the Reverend John T. Harvey of Carson City, Nevada's First Lady, Mrs. Charles Russell, snipped a ribbon and opened the new road over Clear Creek to traffic. A new chapter in the life of the historic old trail had officially begun.



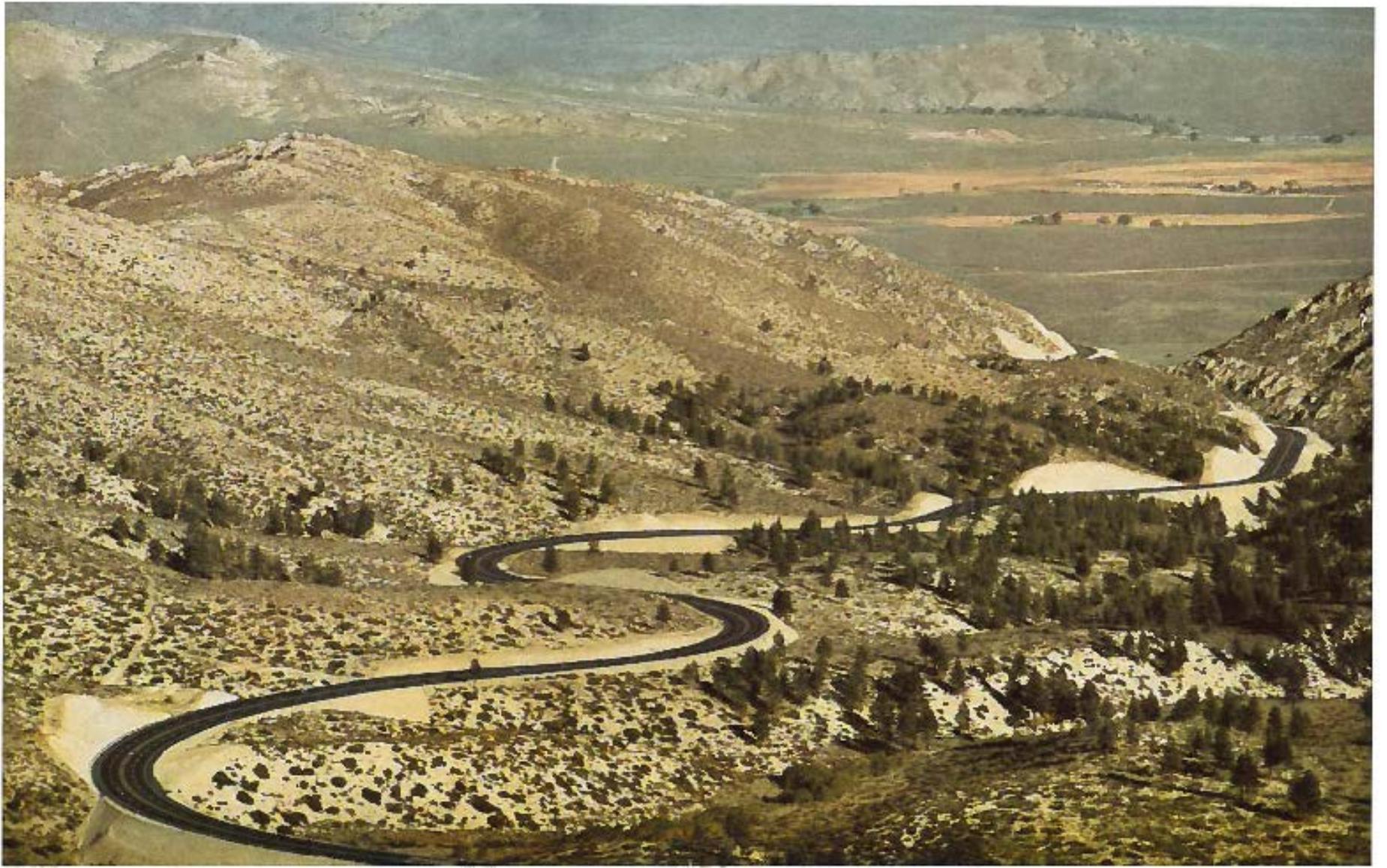
Some of the officials who came to watch or participate in the Clear Creek opening—Secretary of State John Koontz, Wilmer Isbell of the Isbell Construction Company, State Highway Engineer H. D. Mills, Attorney General Harvey Dickerson, Governor Charles H. Russell, Mrs. C. V. Isbell, Mr. C. V. Isbell, Mrs. Charles H. Russell and State Controller Peter Merialdo.



These before-and-after views of the Clear Creek project, with the old highway curving into the canyon below, show how steep is the terrain over which the new alignment passes. The first step called for the removal of all trees and underbrush from the right-of-way, an operation that took several weeks to complete.



This is the completed highway, its wide, smooth surface shown in sharp contrast to the old grade. Because several months will be needed for the earth in the big fills to settle, a hard-topped, permanent surface will be added later over the existing asphalt.



The new Clear Creek Highway—See story on page 8.

# Interesting facts

- **9 mile trip to the summit**
- **200' above Old Clear Creek Road**
- **\$2.5 million – most expensive NDOT project in the 40 year history of NDOT at the time**
- **3.5 million CY of earth displaced**
- **100,000 CY handled in a single week**
- **Completed by Isbell construction in 1 year (ahead of schedule)**

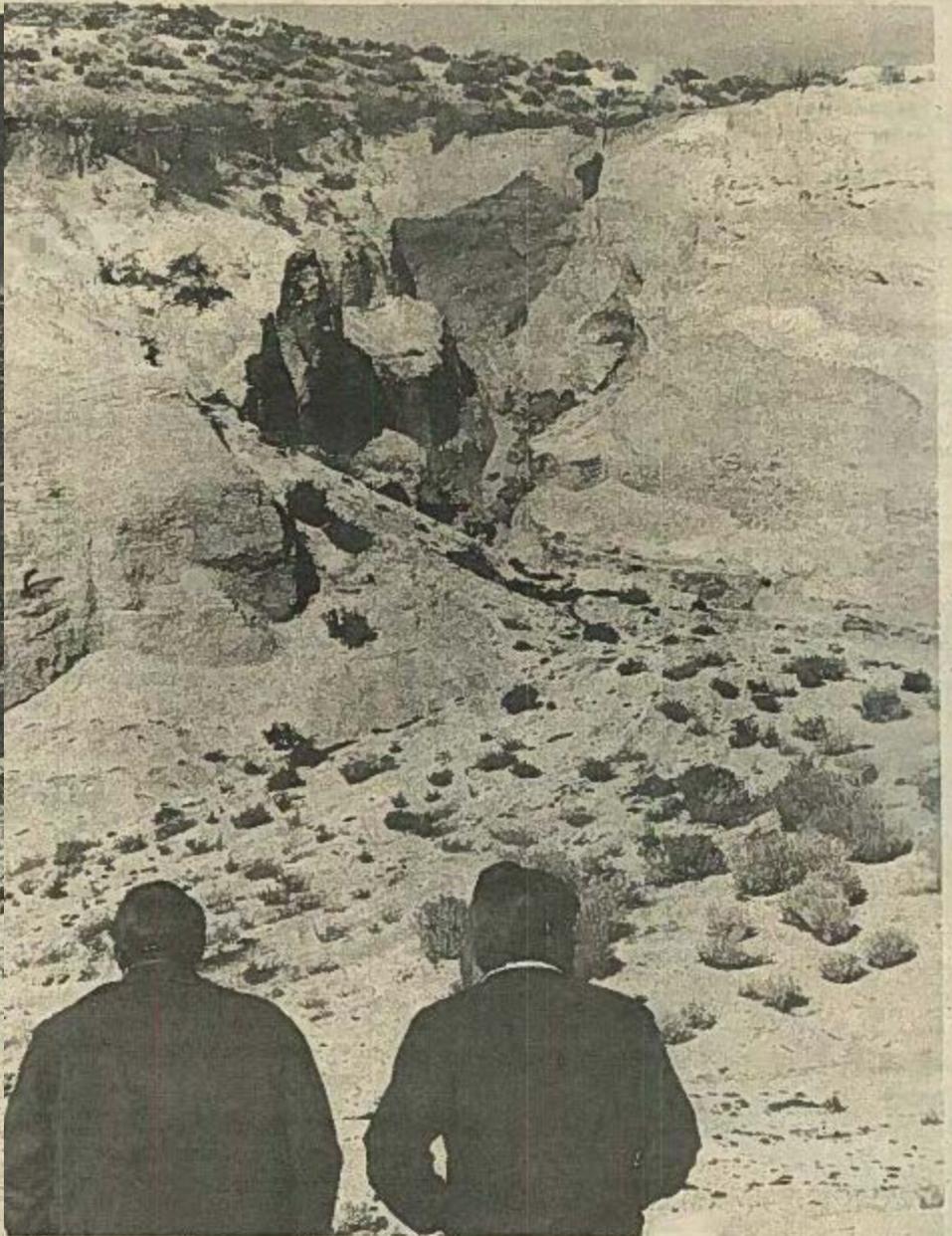
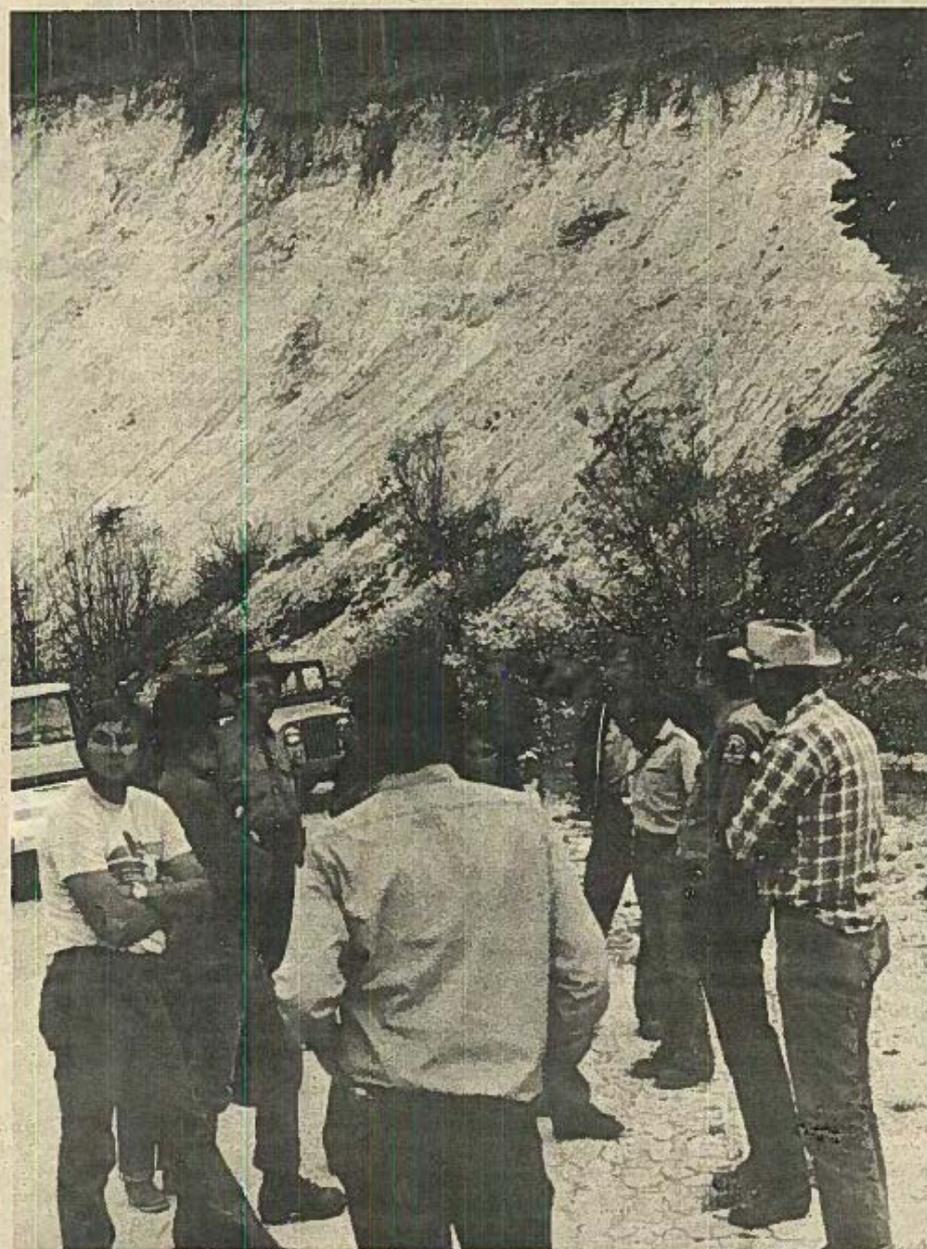


THE HONEYMOON IS OVER!

**Well - At Least for the Drainage**

# Erosion - 1976

Sunday, November 14, 1976 — APPLE TREE —



# Erosion - A Historical Problem

- **Concentrated flows to about 100 discharge points on steep, highly erosive slopes, causing severe erosion downstream of US 50.**
- **Eroded drainages and transported sediment began to impact the more than 200 private properties, tribal parcels, and agency owned land.**
- **Impacts extended well beyond the NDOT R/W**
- **Property impacts were vocalized, broadcast through media, and lawsuits threatened.**

# Erosion



# Erosion



# Erosion



# Why Did This Happen???

- Erosion occurs naturally – accelerated downstream of 50 only
- The nature of the runoff to the natural drainages was completely changed.
- Pavement (impervious on-site) drainage was introduced to drainages that had never experience this type of runoff before.
- The area of the pavement is relatively small; however:
  - Steep Slopes
  - Decomposed Granite – very erosive like sand
  - Run off volume increased for small storm events
  - Run off peak increased for small storm events
  - Run off frequency increased to almost every storm event
  - Upset the natural balance that had developed over millions of years.

# The Clear Creek Erosion Control Program Was Born

- **Because of severe Erosion Problems in the Watershed mostly outside of NDOT R/W, Specific Protection Area in NDOT's MS4 Permit (2<sup>nd</sup> only to Tahoe)**

**The program is intended to protect and mitigate impacts to:**

**NDOT R/W**

**Old Clear Creek Road**

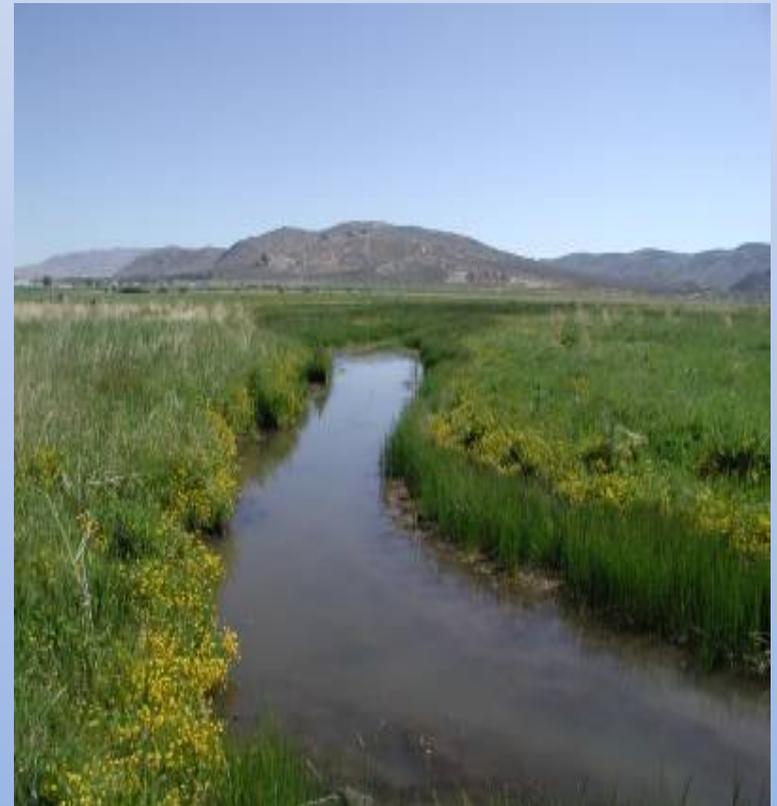
**Private property**

**Tribal Property**

**US Forest Service**

**Other public property**

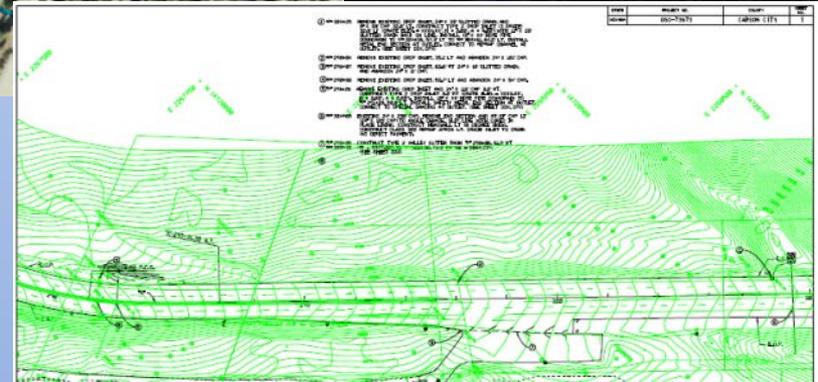
**Protect the health of Clear Creek and the rest of the watershed**



# NDOT Solutions

## Holistic Multi-Pronged Approach – Have A Plan:

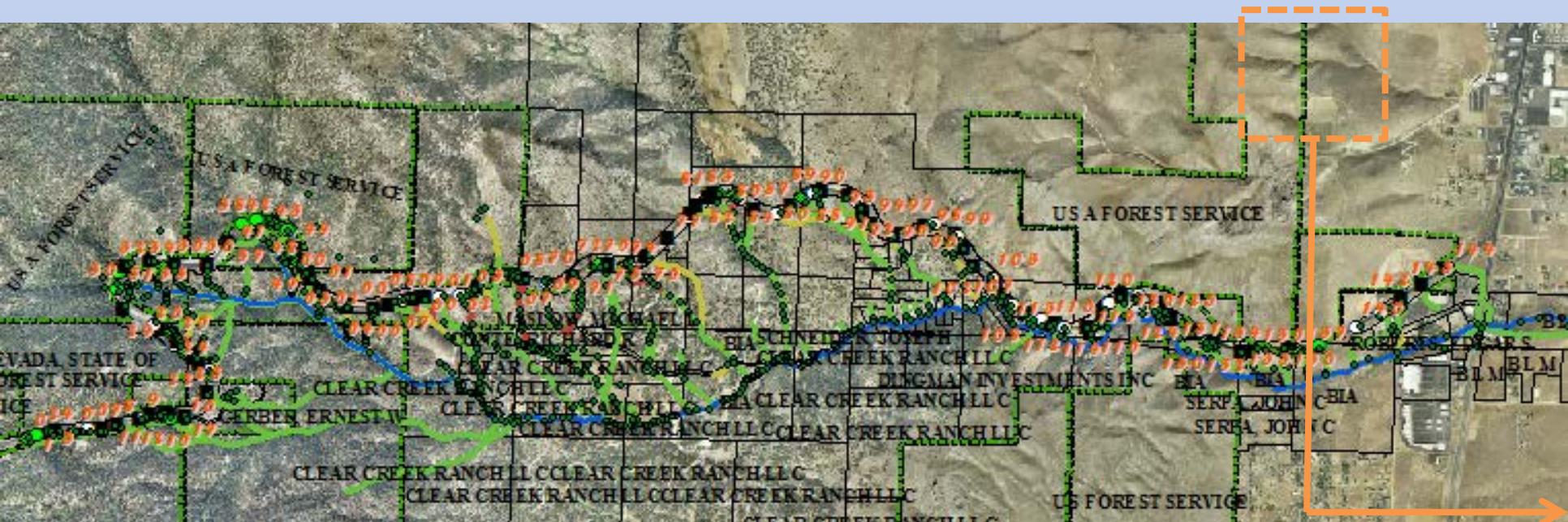
- Assessment - GIS
- Cooperative agreement with the Carson Valley Conservation District
- Began design on the US 50 Storm Drain Projects from US 395 to Spooner Summit
- Utilized Maintenance forces to stabilize some of the flow paths
- Continued analysis, monitoring, and documentation of problems and fixes within the watershed



# Assessment

- In 2003, a study was completed by PBS&J evaluating the scour susceptibility of 47 miles of drainages tributary to Clear Creek below US 50.
- 8.3 miles of these tributaries were determined to be moderate to severely erosive.
- We have expanded on this initial assessment to kick off our statewide GIS asset management and facility inventory effort

Resulting GIS Database:



# Assessment

Drop Inlets

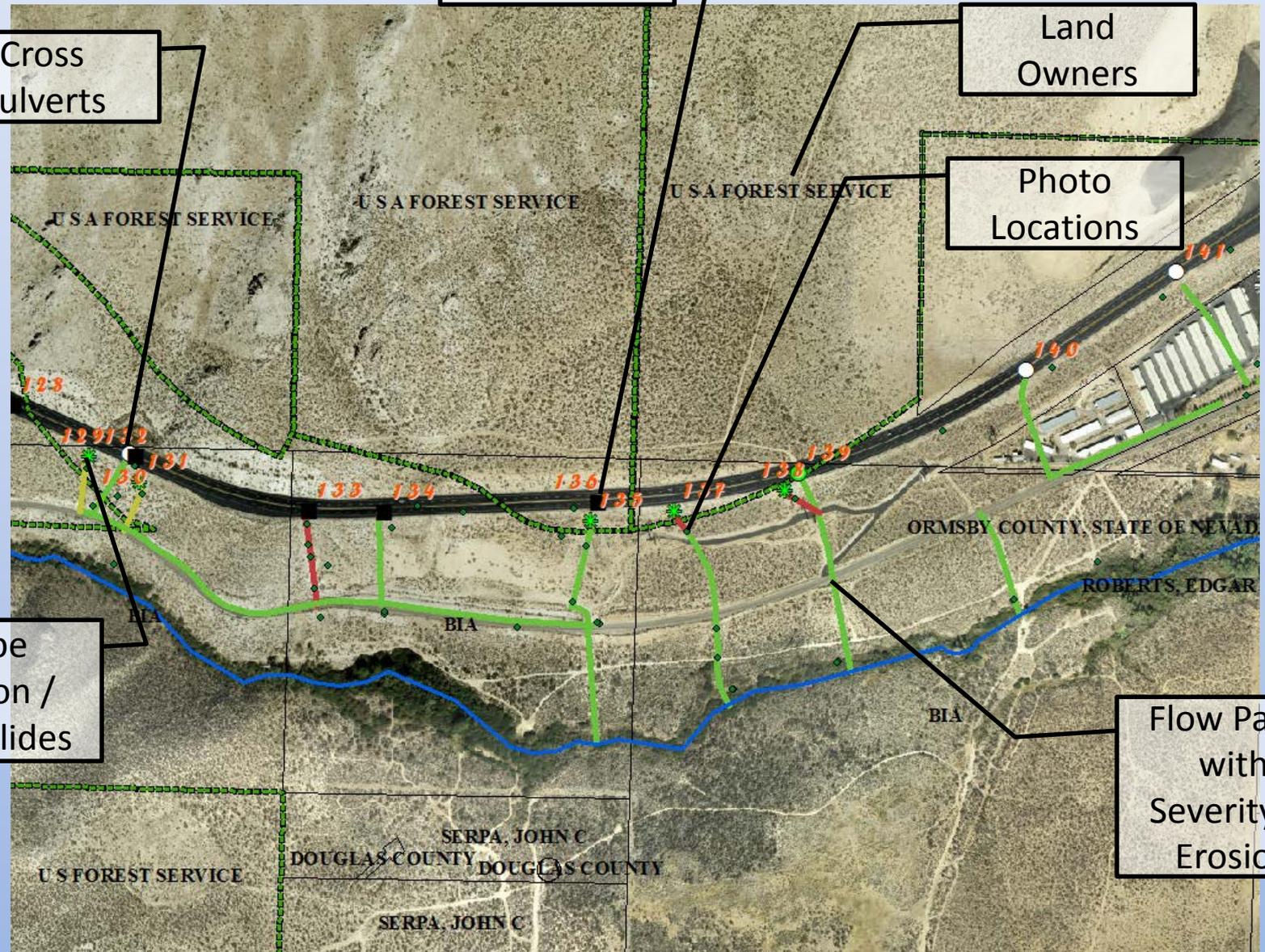
Cross Culverts

Land Owners

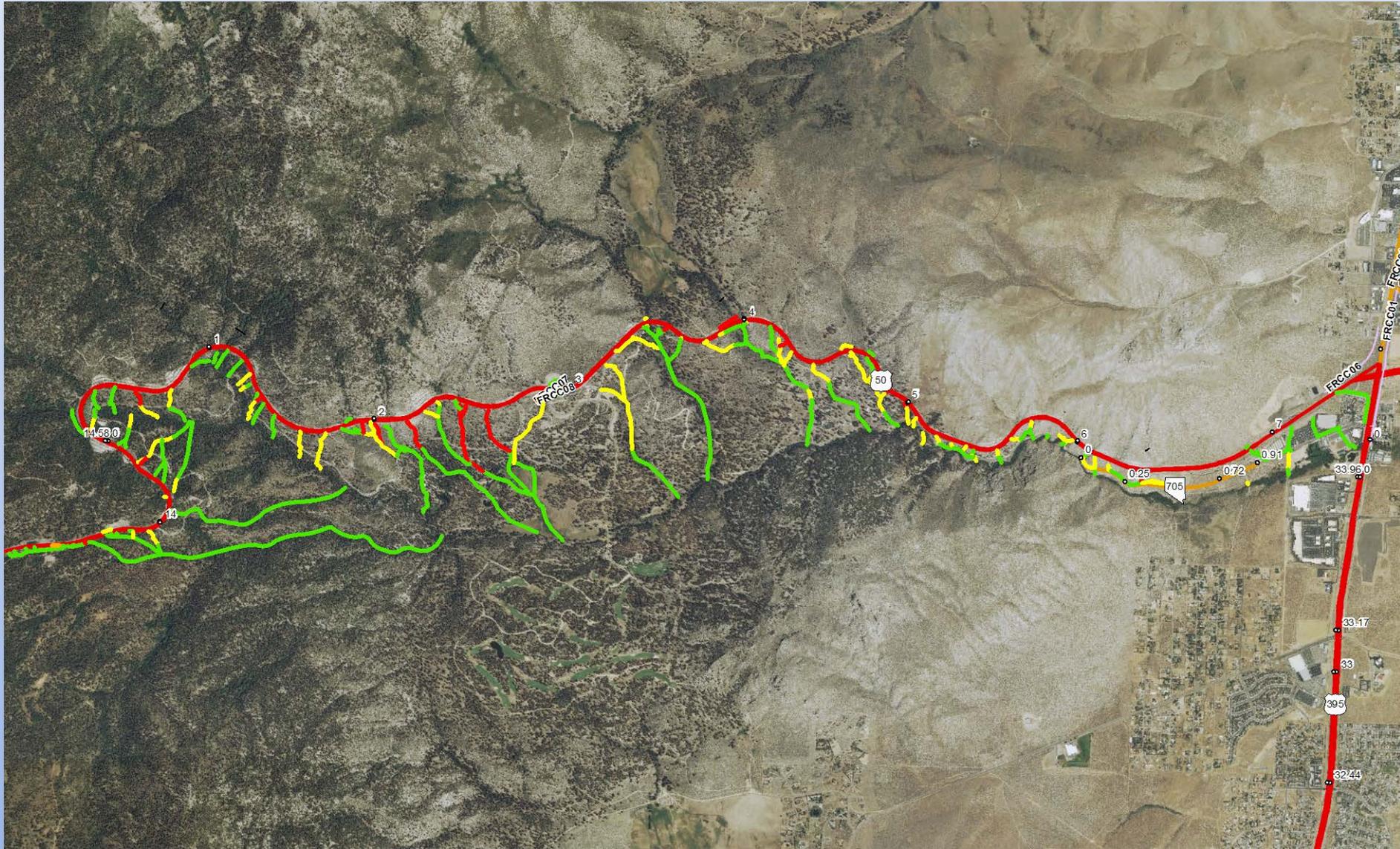
Photo Locations

Slope Erosion / Land Slides

Flow Paths with Severity of Erosion



# GIS – Planning tool



# **NDOT Solutions – Carson Valley**

## **Conservation District**

- **August 2004, NDOT executed agreement with CVCD**
  - **Aid in mitigation efforts throughout the watershed**
  - **Work began spring of 2005**
- **1<sup>st</sup> agreement for 2005 – 2014 (extended once)**
  - **\$3.7 mill committed and spent**
  - **Mitigated 90% of drainages directly impacting private property**
  - **Critical in mitigating our impacts that otherwise wouldn't have been possible**
  - **Great cooperative effort between CVCD, Other Local Agencies, Private Property owners, & NDOT**
- **2<sup>nd</sup> agreement for 2015-2018**
  - **\$2 mill committed**

# NDOT Solutions – Stabilization Strategies

- Permanent, Low Maintenance Solutions
- Armor – Preferred Rip Rap channel lining (Water Quality Benefit)
- Pipe flow down steep slopes where Rip Rap isn't feasible
- Stabilize to a logical terminus/stable point
- Distribute/Bleed flow off at numerous points along US 50.
- Remove on-site pavement contributions from problem drainages to stable drainages
- Perpetuate off-site run off in historic flow paths
- Monitor and correct as necessary.

# NDOT Solutions

Before



After



**Before**



**After**



**Before**



**After**



**Before**



**After**



**Before**



**After**



**Before**



**After**



**Before**



**After**



**Before**



**After**



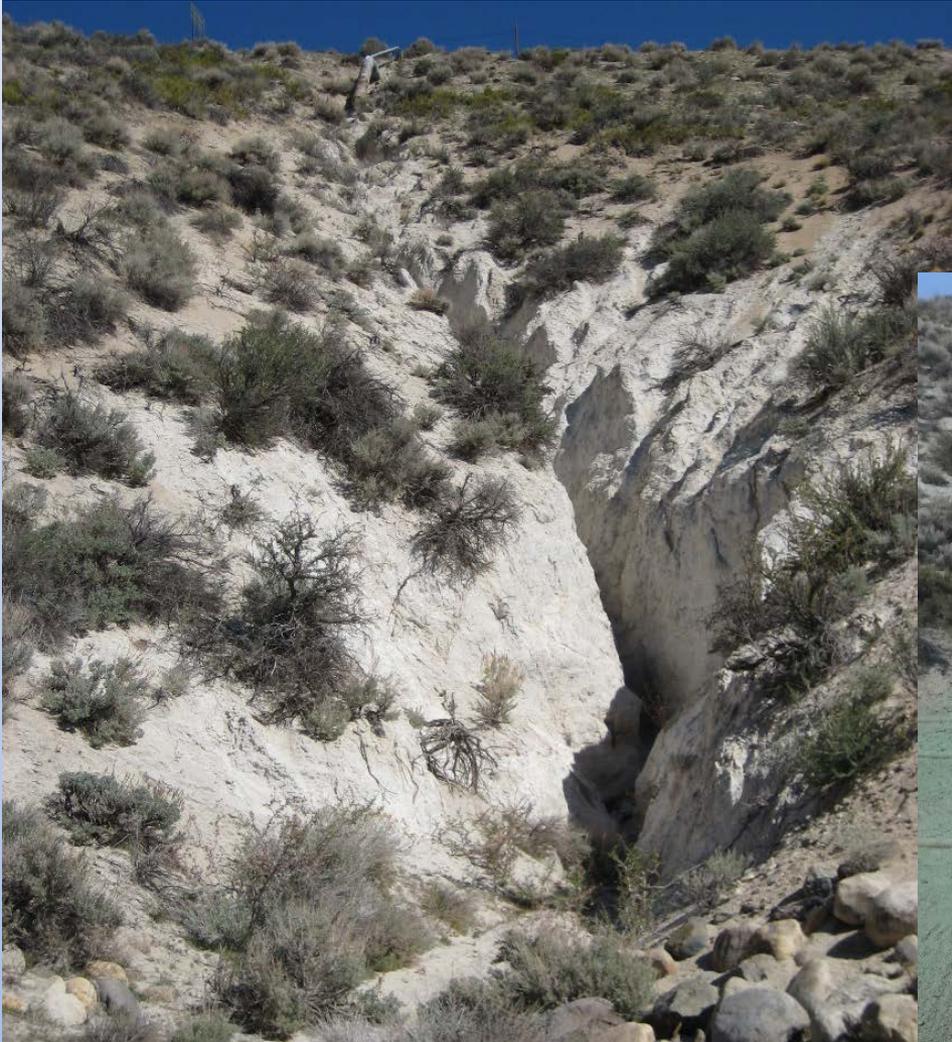
# Before



# After



**Before**



**After**



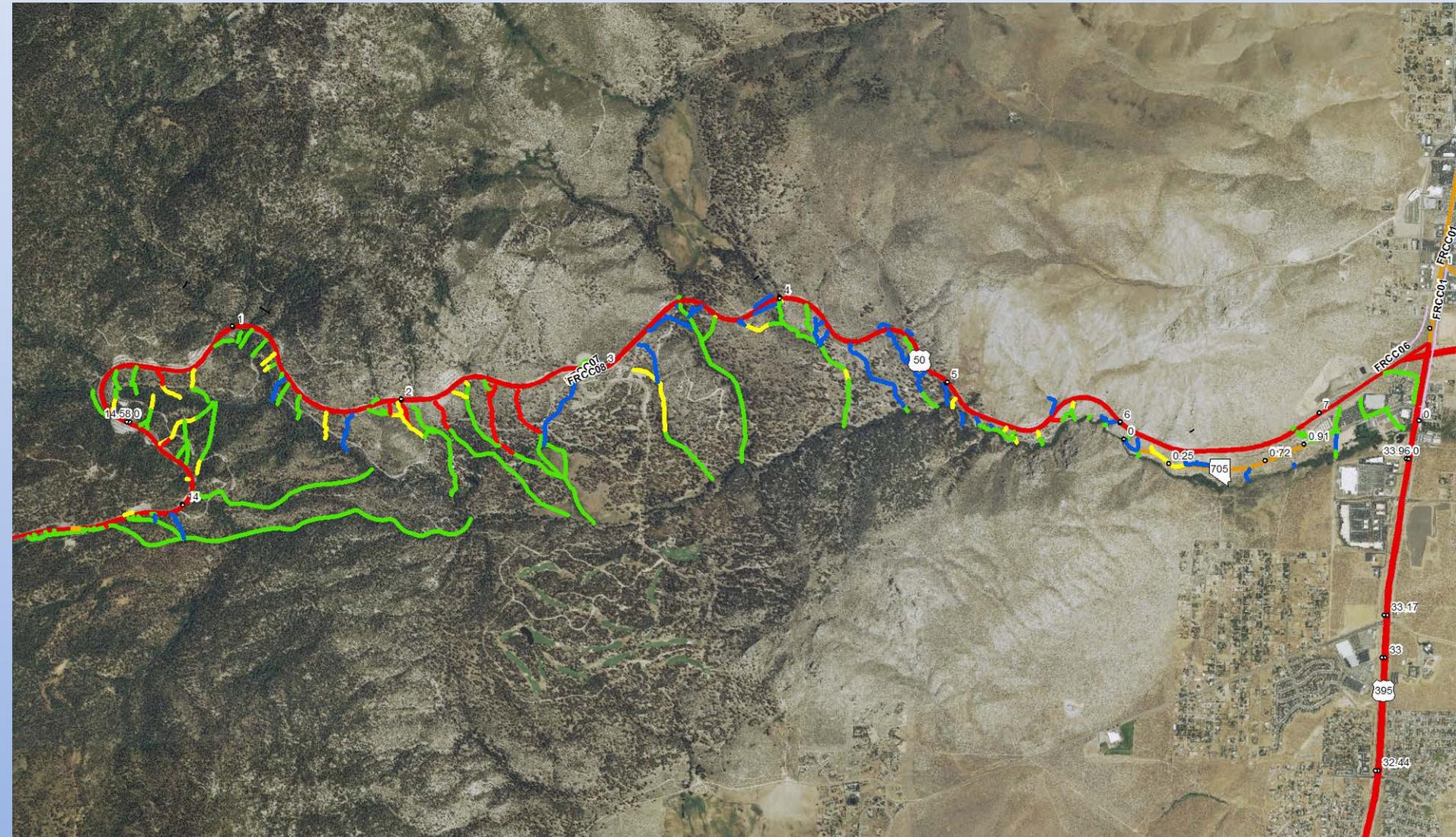
**Before**

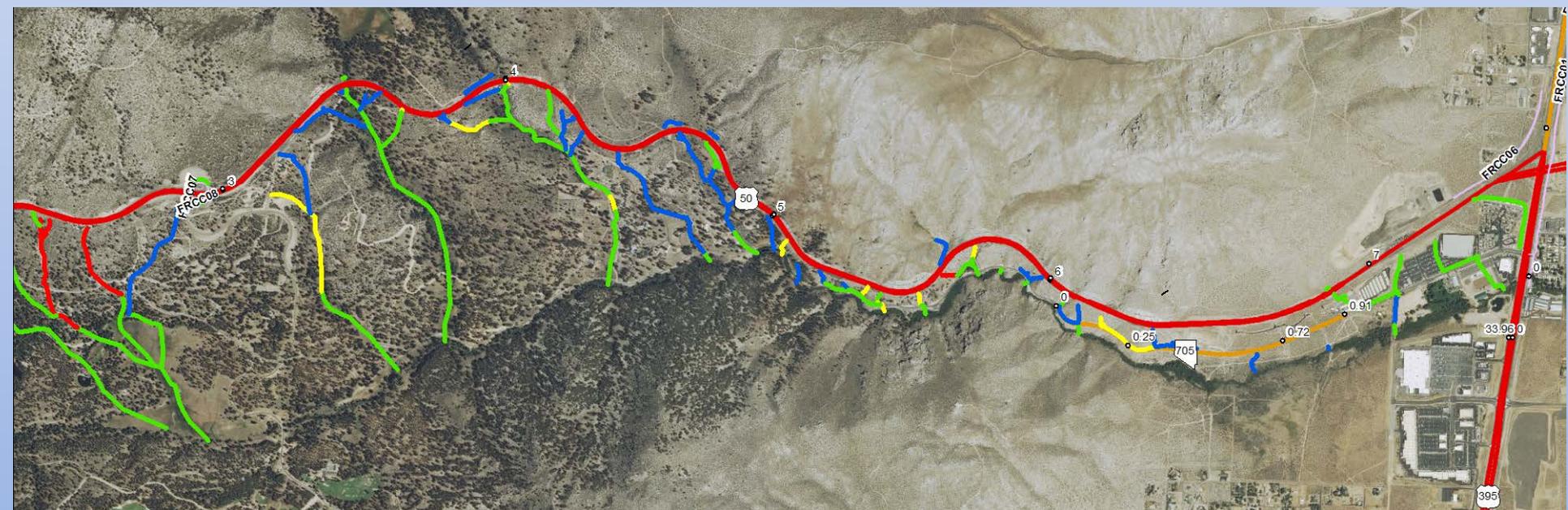
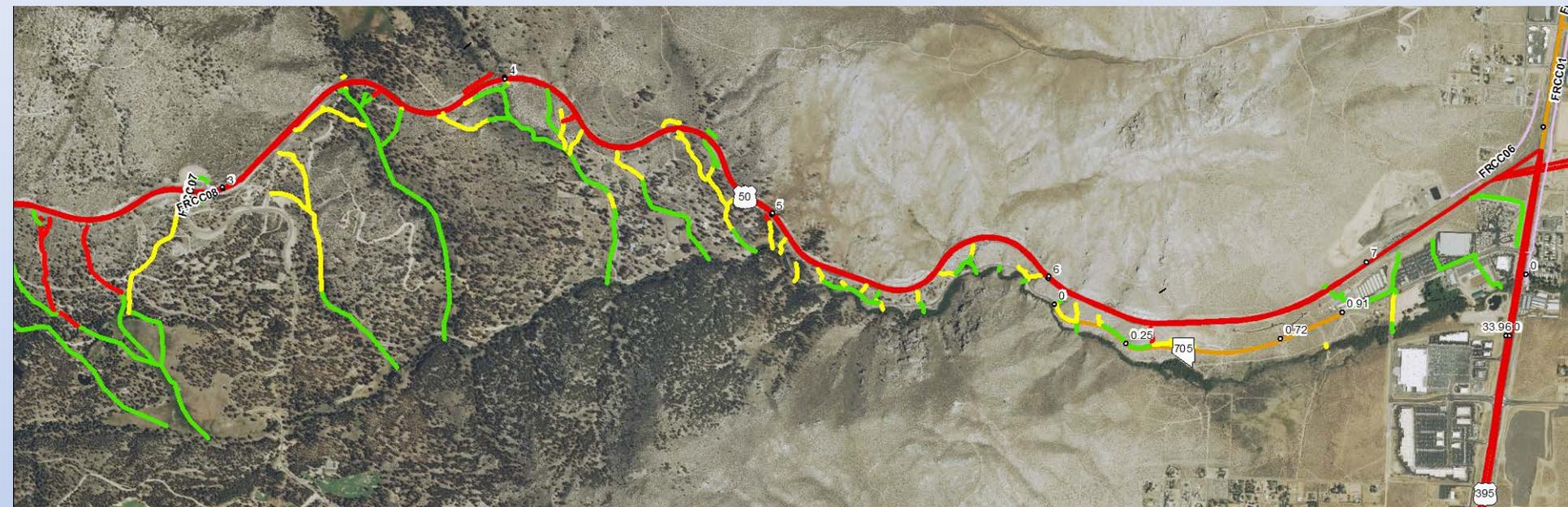


**After**



# Program Accomplishments





# Program Accomplishments

- **2010 Construction program**
  - Approximately 3300 feet of drainages stabilized.
- **2011 Construction program**
  - Approximately 3600 feet of drainages stabilized.
- **2012 Construction program**
  - Approximately 3800 feet of drainages stabilized.
- **2013 Construction program**
  - Approximately 1600 feet of drainages stabilized.
  - Detention Basin – remove/mitigate impacts to 1620' of drainage.
  - Slot Channel
- **2014 Construction program**
  - Approximately 5000 feet of drainages stabilized.

# And - Program Failures



# And Fixes – Again!

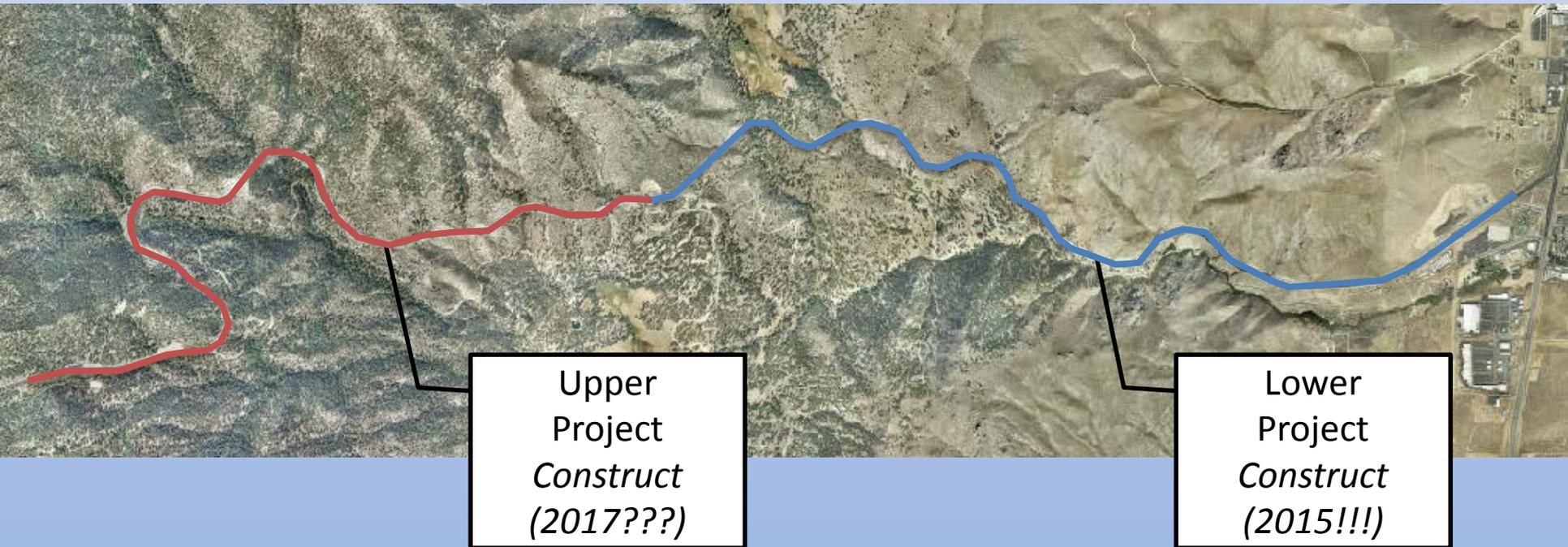


# Still Lots More To DO



# US 50 Storm Drain Projects

- Two Construction Contracts:
  - Lower NTP June 2015 – Bid at \$1.2 mill – Yeah!!!
  - Upper at 60% design level – 2017 construction schedule
    - Environmental process mostly complete
    - Estimating \$4 million for Upper
  - Program reduced work from \$40 mill \$11 mill



# US 50 Storm Drain Project Elements

- Replacement of deteriorating pipes and drop inlets throughout the watershed
- Slip-lining of existing pipes
- Construction of riprap channels
- Construction of storm drains



# USGS Water Quality Monitoring Clear Creek Watershed

- Monitoring began as part of the States MS4 permit in 2004.
- 1<sup>st</sup> Report for 2004 to 2007 available.
- 2<sup>nd</sup> agreement for 2009 to 2012
  - Report available soon.
- 3<sup>rd</sup> agreement for 2013 to 2016.
  - Report expected end of 2017.
  - \$493,000
    - \$247,000 (NDOT)
    - \$247,000 (Federal USGS Matching Funds)



Prepared in cooperation with the Nevada Department of Transportation

**Sediment Loads and Yield, and Selected Water-Quality Parameters in Clear Creek, Carson City and Douglas County, Nevada, Water Years 2004–07**

Scientific Investigations Report 2009–5005

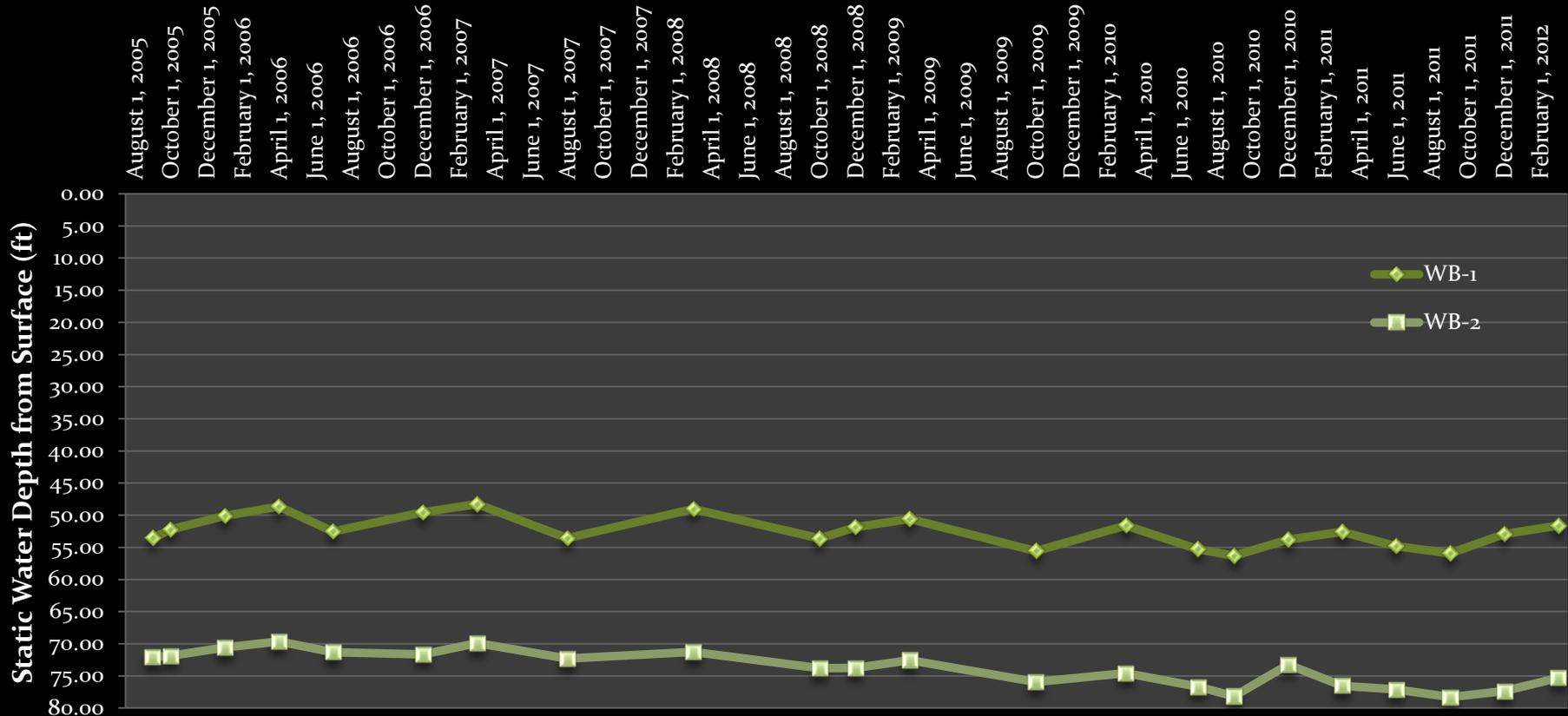
U.S. Department of the Interior  
U.S. Geological Survey



# NDOT Ground Water Monitoring

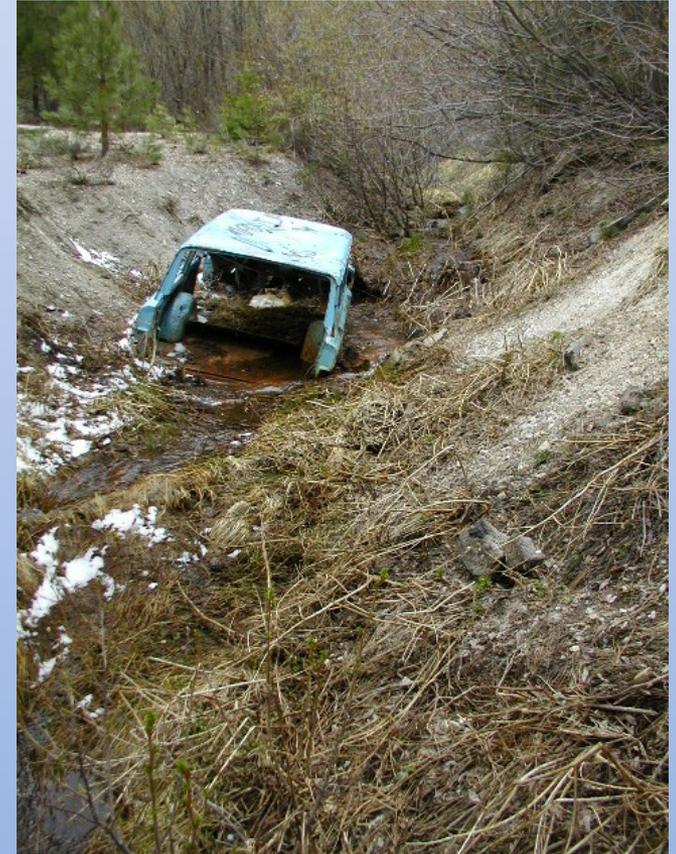
## Recorded Static Water Levels: Depth from Ground Level

Measurement Date



# Problems, Concerns, Delays:

- **Funding**
- **Right-of-Way may need to be acquired**
- **Additional survey needs to be completed**
- **Environmental clearance/NEPA takes time**
- **Challenging issues needing Creative solutions**
- **Moving target - new problems/failures**





Questions?