# Sidney Gulch USFS Compound Site Feasibility Study

## Final Report

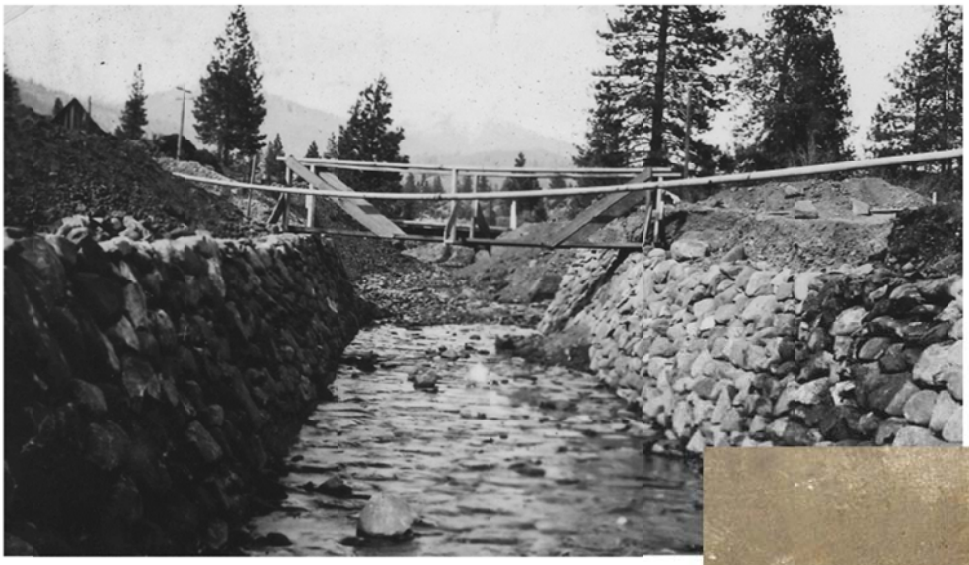

Photo courtesy of Mark Arnold, USFS Archaeologist

Photo courtesy of Loren Everest, USFS Fisheries Biologist

## April 2013 to December 2014

Final Report prepared by Sandra Pérez, 5C Program Manager

Existing conditions basemap, hydraulic model, and concept designs developed by Dimitri Dolci, 5C Resources Technician, and Michael Love & Associates, Inc., in cooperation with a multi-disciplinary team of USFS, NOAA staff, and consulting professionals.

This project was implemented by the Five Counties Salmonid Conservation Program, which is part of the non-profit Northwest CA Resource Conservation & Development Council. Funding was generously provided by the Trinity River Restoration Program Watershed Restoration Grant Program via the Trinity County Resource Conservation District.

## Summary

The Sidney Gulch watershed within the Weaver Creek basin hosts federally threatened Coho salmon within its low gradient segments. Refer to Figure 1 for a map of the Sidney Gulch watershed. However, given the fact that it is a highly urbanized watershed in Weaverville, with numerous encroachments on the riparian areas and instream modifications, fish passage is impaired in many locations. Habitat quality can be very low in many stream segments. Finding practical restoration options that reconcile wildlife, floodplain, and land development uses can be challenging. Nonetheless, Sidney Gulch has great potential for restoration of fish passage and habitat improvement. The segment that runs through the US Forest Service (USFS) compound in Weaverville consists of a simplified concrete channel constructed in 1936 that impedes fish passage of Coho salmon. It conveys smaller 2 and 5 year storm flows throughout all segments within the compound, and likely the 10 year storm. However, the upper reaches begin to overtop at flows just greater than a 10 year storm. Several reaches overtop during a 25 year storm. Conversations to entertain the notion of restoring fish passage and increasing flood capacity over the past twenty years were fruitless with many concerns cited about preserving the 1936 structure and what the impacts might be to the historic value of the compound. However, in 2011 the 5C Program and USFS staff decided to pursue a feasibility study to assess the various considerations, possible challenges, and potential options for restoration of fish passage, flood conveyance, and enhanced sediment transport.

Over the course of nearly two years, all of the factors of concern to the USFS and restoration stakeholders were assessed. Due to the limited availability of USFS staff, 5C Program staff led the effort and hired Michael Love and Associates, Inc. (MLA) and Ross Taylor and Associates (RTA) to help implement the study. All information was regularly coordinated with USFS staff in various disciplines to ensure that USFS concerns and input were considered. A variety of data – primarily topographic, vegetation, and existing infrastructure – was collected and developed into a basemap and HECRAS hydraulic model in order to better evaluate existing conditions and restoration options. During the course of the feasibility study, geotechnical investigations to assess the substrate adjacent to the channel were performed and some initial environmental analysis was conducted. The geotechnical investigation test pits unearthed contaminated soil and water adjacent to the channel. This information was provided to the USFS and County for further consideration. The USFS has requested special funding to perform further testing and develop a course of action for remediation. It is unclear whether this remediation would occur prior to or concurrent with any instream restoration activities that arise out of this feasibility study. However, any information yielded by this effort will be considered in the course of pursuing fish passage restoration in the compound. The data collected was analyzed by MLA in coordination with 5C staff, USFS staff, and consulting professionals. MLA conducted a hydraulic analysis of the overall condition of Sidney Gulch, focusing on the section that supports anadromous fish.

Based on MLA's analysis, a moderately entrenched plane bed channel with coarse gravel and small cobble with forced frequent, smaller pools and other habitat features would be the most appropriate restoration option given current conditions and overall grade of Sidney Gulch. This design concept would have some sinuosity and would be able to convey sediment in a manner similar to upstream and downstream reaches.

# Sidney Gulch Location Map

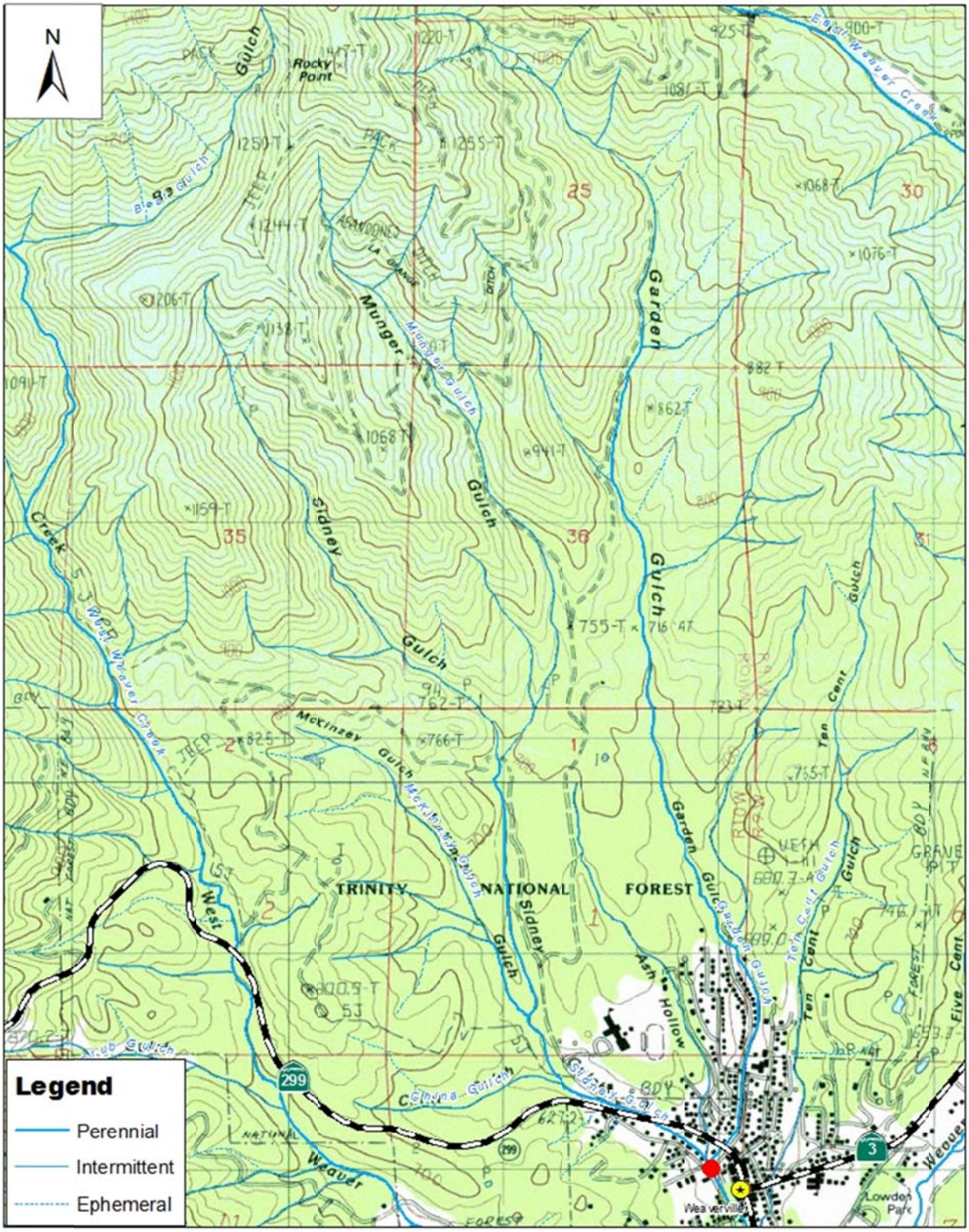


**Figure 1**: The red dot represents the dowstream/southern end of the USFS compound site.

Twenty-five (25) year flows could be accommodated in all segments of the restored compound channel, although some areas could accommodate a 50 year flow. The base data, basemap, and existing conditions model are described in detail in MLA's Technical Memorandum, which is included as Attachment A. In the proposed configuration, it is anticipated that several parking spaces will likely be lost. Several mature trees will need to be removed; although most are considered noxious weeds and would be replaced with native, suitable species that are similar in appearance. The concept stream configuration is not expected to interfere or encroach upon existing or planned structures within the compound. Compound management objectives, such as developing interpretive signage and fostering more native vegetation can be very well incorporated into the proposed fish passage restoration configuration. It is anticipated that urban stream, fish passage, and possibly USFS funding options will be pursued in order to achieve a comprehensive restoration targeting multiple objectives.

In summary, this feasibility study project was successful in assessing suitable options and identifying concepts for fish passage restoration that would also meet Forest Service management goals. A detailed accounting of the project activities over the course of the grant agreement is found in the project progress reports. This final report is intended to summarize the evolution and outcomes of the feasibility study.

## Background

Sidney Gulch is a perennial stream within the Weaver basin watershed in Trinity County that hosts anadromous salmonids including Coho (federally threatened) and Chinook salmon and steelhead trout. It also supports Pacific lamprey, Klamath sucker, and numerous amphibious species. It drains an area approximately 4,050 acres in size and features multiple beneficial uses including cold water fisheries, recreation, riparian habitat and species, and flood management. It is an urban stream with many of its segments running through the community of Weaverville. The segment that runs through the compound is the most simplified of the entire stream. The concrete channel was constructed in 1936 to protect the Weaverville USFS compound, which is a historic structure, from flooding.

Photo courtesy of Mark Arnold, USFS Archaeologist

That section of stream was a complete barrier to migration and cuts off nearly two miles of spawning habitat. The channelized concrete and gunnite stream bed and banks impeded fish passage in nearly all flows. Improved in-stream conditions was a goal of the Urban Stream plan for Sidney Gulch (1990), which was adopted by Trinity County in 1991. To improve instream conditions for fish migration, concrete cylinders and baffles were placed to provide some resting areas.

Photo at left: 5C Program

Photo below: Michael Love & Associates, Inc.

The concrete cylinders installed in 2005 helped by providing limited resting places for migrating salmon and allowing some sediment to collect in some areas. However, all but one fish that have been observed attempting to move upstream through the compound have been unsuccessful and given up in exhaustion. The structures did not benefit juvenile passage. This is of major concern to the watershed stakeholders given the affinity of Sidney Gulch for Coho salmon. General targets for restoration included restoration of fish passage and improvement of water quality (temperature) as well as in-stream and riparian habitat. These restoration concepts have been long discussed by USFS staff and interested stakeholders. Improved in-stream conditions were also a goal of the Urban Stream plan for Sidney Gulch (1990). Many issues and apparently conflicting interests – including historic resources and floodplain protection – prevented the implementation of significant restoration efforts. The 5C Program, of the Northwest CA RC&D Council, approached the USFS to undertake a feasibility study to assess the major challenges to upgrading this section of Sidney Gulch and to identify suitable design options for restoration that would also meet Forest Service management goals.

As a result of an interdisciplinary meeting held at the Weaverville Ranger Station in July 2013, basic project goals and compound management concerns were discussed and developed, as discussed below. These

goals and objectives were refined throughout the course of the feasibility study. 5C Program staff and specialists assessed the focus areas (listed below) in order to identify and explore various options for restoration. This was done in close coordination with Forest Service staff in their respective area of expertise.

## Goals & Objectives

The overall goal of the project was to identify and assess the major challenges to upgrading the section of Sidney Gulch that runs through the USFS compound in Weaverville in order to allow fish passage, improve flood conveyance and sediment transport, improve in-stream and riparian habitat and reduce water temperatures. The results of this study could then be used to develop final designs and project planning, NEPA evaluations, and compliance with State Historic Preservation Office requirements. What is of most importance is achieving the restoration goals in balance with the Forest's management goals for the compound.

Restoration goals:

- Restoring fish passage
- Creating suitable instream habitat for fish and other aquatic species
- Providing riparian habitat & noxious weed management (return to a more natural condition)
- Improving water quality (e.g., temperature) and quantity (as the stream tends to go subsurface)

Compound management concerns:

- Historic value of the Landscape design (overall site stability)
- Flooding: protecting the safety of the employees and the integrity of the structures and property on the compound.
- Parking: providing ample spaces for USFS staff and visitors
- Chemical contamination: the USFS fisheries biologist has documented fish kills; a central drain is desired for the 'backside' portion of the compound to treat urban runoff before it enters the stream.
- Eradicating noxious weeds

## Project Considerations

Listed below are the Focus Areas for the feasibility study. The discussions and conclusions thus far about each one are summarized below.

Physical Site Characteristics

As described above, Sidney Gulch is a highly urbanized stream where the most extensive modifications consist of the 0.21 mile long concrete channel. That concrete channel itself may be modified however without detrimental impacts to USFS needs or historic considerations. What is of concern is the overall

look and feel of the compound, which is discussed in "Historic Resources & Landscape Design" below. Additionally, the USFS Engineer indicated that the Forest is moving towards having stream simulation in their restoration projects rather than concrete channels. The infrastructure surrounding the stream within that segment also represents physical design constraints. This is discussed under "Compound Infrastructure & Management" and "Hydrology" sections below. The upstream and downstream ends of the compound consist of crossings under other public ownerships: Caltrans (upstream) at Highway 299 and County (downstream) at Forest Ave. Ideally, restoration of Sidney Gulch would include modification of both of these crossings to facilitate fish passage, flood conveyance, and sediment transport. The Director of the County Department of Transportation indicated that the County would likely entertain idea of modifying the Forest Ave crossing to create a better transition and potentially restrict fish passage at certain flows. The County has long partnered with the 5C Program in implementing numerous fish passage and sediment reduction projects in several watersheds. On a statewide and even regional level, Caltrans efforts and migration barrier site remediation have often entailed a much longer timeframe to achieve restoration. Caltrans also typically prefers to undertake its projects with internal staffing. As such, the 5C's efforts to undertake a restoration project with Caltrans may not yield any changes within the same general timeframe of the USFS compound restoration efforts. However, NOAA staff has indicated that it would very much like to work with the 5C in approaching Caltrans about this particular site.

Hydrology

The initial model prepared early on in the project was modified to use more recent regression values and correct some settings. The current model of the existing condition indicates that sections of the concrete channel begin to overtop at flows just greater than a 10 year storm. Multiple sections of the channel likely overtop during a 25 year event. The USFS Engineer indicated that designing a new channel to accommodate the 25 year flow would be ideal given that physical constraints and current critical uses make it impractical and infeasible to accommodate larger storms. Too many existing buildings lie in the floodplain of a large storm event. In fact, two buildings (main office and the building on the southeastern side of the compound to the north of Garden Gulch) flooded during the 1997 storm event, which is thought to have been a 25 year event within Weaver Creek (McBain and Trush, 2000). The Forest doesn't have funding or plans to expand, relocate, or somehow augment its office and other building spaces. The USFS Watershed Program Manager suggested that permeable pavement be considered to reduce the flashiness of stormflows through the compound. If funding to restore fish passage and/or improve urban streams cannot accommodate that type of feature, other funds including USFS programs may be explored. The Watershed Program Manager began to inquire about the availability of such funding from the USFS.

Historic Resources & Landscape Design

The USFS Heritage program staff indicated that the stream channel itself was not a contributing element to the historic significance of the compound. Therefore, it was generally agreed that conceptually, the core changes proposed – widening of the channel and modification of the bed and banks – would not in and of themselves drastically alter the original landscape character of the compound. What is important is the look and feel of the compound overall, particularly as viewed from Hwy 299 west of the compound. The key characteristics that would be evaluated to determine the nature of the change to the original landscape character are primarily: the feeling, association, setting, materials, and workmanship of the compound. There is no landscape design for the compound. The USFS Heritage Program Manager, Penelope Del Bene,

related that an easy way to think about gauging the effects of proposed work on these characteristics would be to consider the standpoint of a casual observer and their experience of the compound after restoration work is completed. Therefore, changes to vegetation would be an important focus because those would likely influence the key characteristics than would instream changes to the channel. A tree inventory was conducted (see Habitat Assessments & Fish Passage" section below) to help identify which trees would be affected by the concept design. It was agreed that suitable species with a similar appearance to the existing trees would replace any trees that needed to be removed. Heritage program staff did indicate that there may be historic utilities within the project disturbance area. This is something that would be addressed as the final footprint and design approach completion.

Flow through the compound, including pedestrian, would be a major focus when assessing effects to the compound's landscape character. USFS staff collectively agreed that retaining vehicular access between the front and rear of the compound is not important and that a pedestrian bridge in the current vehicle bridge would be acceptable as a new design feature.

It should be noted that although the Heritage Program Manager whom participated in this project at the beginning, Penelope Del Bene, made a career change during the course of the project, the interim Heritage Manager, Linn Gassaway was in concurrence with the discussions and direction provided by Del Bene. A new Heritage Manager is anticipated in February 2015, but will likely be briefed on the project.

Habitat Assessments & Fish Passage

The channel within the compounds is a barrier to fish passage. As noted in the "Coho Salmon Literature Review for the Sidney Gulch USFS Compound Feasibility Study Project" prepared by Ross Taylor and Associates (RTA) in late April 2014 for this project (included as Attachment B), "The concrete and gunnite floor and walls of the flood control channel create shallow sheet flow with excessive velocities. The channelized reach also lacks pools or other types of low velocity resting areas for migrating fish." Although USFS fisheries staff has observed some adult coho moving up the channel, it was with extreme effort. RTA recommends that replacement of the existing bed with "a natural streambed, a roughened streambed, or a fishway-like series of pools with drops no greater than six inches". It was also recommended that the design incorporate "pools or other types of roughness elements to create resting areas for migrating fish" and "rearing habitat for juvenile salmonids and other resident fish and amphibians". Other considerations such as shade, bank stability, and instream habitat features were also encouraged and will be addressed as the concept design is further developed. It should be noted that during the course of this project, USFS Fish Biologist Eric Wiseman participated in the initial and final meetings. However, a Fisheries Biologist is being hired in January 2015. They will be brought up to speed on the project so that they may participate in future discussions.

As noted above, a tree inventory was conducted to help identify which trees would be affected by the concept design. This was reviewed by the USFS Botanist, who is already working on a plan to eradicate noxious weeds on-site in order to comply with the Noxious Weed Act. She coordinated with Heritage Program Manager Del Bene on the various species proposed to replace the noxious species. Any trees removed as a result of this project would be replaced with suitable, native species. Mature trees that would be particularly relevant to the landscape characteristics would be replaced with ones that have a similar appearance to the existing trees to the maximum extent practical. The tree inventory is shown over the concept design. However, the trees within the proposed footprint of the new channel may not be the

only ones that require removal. Additional trees may need to be removed to facilitate the excavation and construction of the new channel. To the extent practical and possible, existing native trees will be avoided during construction in order to minimize overall tree removal and to preserve shade over the channel (in addition to landscape concerns discussed in "Historic Resources & Landscape Design" above). If practical and feasible, the alignment may be slightly modified in certain places to avoid mature, native trees of particular concern. The design would likely include placement of small, native trees in addition to young seedlings to accelerate the establishment of shade canopy above the stream. It was noted that the instream design might lend itself well to bioengineering practices to ensure the integrity of the banks given the close proximity to various types of infrastructure. It was noted that if willow, commonly used in bioengineering, is proposed, that shorter, more compact species would be preferred.

Compound Infrastructure & Management

In the course of the feasibility study, it was agreed that the proposed concept design would not interfere with the existing building footprints; and no new ones are proposed within the concept design footprint. It was discussed that a buffer of a minimum of 12 ft, ideally 24 ft, from the building on the southeastern side of the compound to the north of Garden Gulch should be factored as the design is further developed. Other existing uses would be minimally impacted. USFS staff indicated that vehicular access over the stream at the current crossing between the main front office and the barracks and garages in the rear does not need to be preserved. USFS staff didn't have much concern with that because the rear of the compound has multiple access points for vehicles on the west and east boundaries. The concept design includes a pedestrian footbridge at that location as well as at the current upstream footbridge location near the Fire office.

Between 15 and 20 parking spaces are estimated to be lost. This accounts for: 1) the loss of 20 designated and 35 undesignated parking spaces due to channel modification on the southwest side of the stream; and 2) the creation of new, more efficient parking areas with approximately 35-40 new spaces on the north side of the compound directly adjacent to and accessed by Highway 299 as well as approximately 20 spaces on the western side around the fire engine bay. USFS staff indicated that this net loss of approximately 15-20 parking spaces would likely be acceptable to achieve the fish passage, habitat, and other restoration goals. The USFS Engineer is anticipated to complete a site plan for the compound within approximately a year.

Geotechnical Investigation

CGI Technical Services, Inc. over saw geotechnical investigations that entailed excavating 10 test pits to a depth of approximately 6 to 6.5 feet. CGI describes the substrate adjacent to the channel as consisting of dense sandy gravels with some cobbles up to 6- inches in diameter at about 5-foot depths. They recommend maximum side-slope for finished slopes of 2H:1V. They indicate that materials on site are suitable for engineering fill, with the exception of clays observed in some of the test pits. Their report is included as Attachment C.

During the course of these investigations, soil and water that smelled of gasoline were discovered in three of the test pits. CGI collected samples and took them to Basic Labs in Redding for testing. Results received at the end of the project indicated gasoline at 5 times over the reporting limit in water samples and in soil samples at 16 times over the reporting limit. The USFS has requested Environmental Compliance and Protection (ECAP) funding to perform additional tests, determine the extent of contamination, and develop

recommendations and cost estimates for cleanup. It is unclear whether the gasoline contamination on the southern bank can be easily and affordably remediated or whether it will become a design constraint.

Economic Considerations

At this initial design stage, it is premature to discuss economic considerations very extensively. The biggest outcome in this regard is the acknowledgment that obtaining resources to improve the compound and possibly raise building foundations or relocate buildings outside of the floodplain of large storm events is highly impractical. It is widely agreed that incorporating many different elements into a final design including permeable pavement, urban runoff treatment facilities, permeable pavement, and interpretive signs would be ideal. However, this depends on the funding sources available to implement the project. A comprehensive approach will be pursued under various funding sources.

Water Conservation

It was acknowledged that water conservation is important to the Forest as well as to conservation stakeholders. However, this issue is subject to the development of the compound site design that the USFS engineers are developing as well as the broader compound management vision. The most practical conservation can be achieved through replacement of water devices (e.g., toilets, faucets) as well as through a possible installation of a greywater system to re-use roof storm runoff for landscaping or other suitable greywater uses. Although the 5C would be happy to help the Forest develop and assess such approaches, those efforts don't easily lend themselves to being incorporated into the restoration design objectives to compete specifically for instream restoration funds, which are anticipated to bear a lion's share of the expense for channel modification. However, pursuit of the restoration objectives discussed here may make requesting water conservation improvement funds for the compound a bit easier.

## Conclusions &Next Steps

As mentioned in the Summary, the proposed concept design consists of a moderately entrenched plane bed channel with coarse gravel and small cobble with forced frequent, smaller pools and other habitat features. The proposed channel would convey a 25 year storm flow, although some segments would convey a 50 year storm. Sediment transport would be similar to reaches of Sidney Gulch upstream and downstream of the USFS compound. Several mature trees will be removed and replaced with native, suitable species that are similar in appearance. Pervious pavement, interpretive signage, and aesthetic design that is consistent with the look and feel of the historic compound would be incorporated into the restoration design to the extent that funding resources permit. Of course the outcome of the additional testing for gasoline contamination and resulting remediation proposals would be factored into the final design. It will be key to continue close collaboration with USFS staff in diverse disciplines to ensure that the factors and concerns discussed here are addressed and accommodated by the final design to the maximum extent practical.

Restoration of the downstream County crossing at Forest Ave would be pursued immediately after, or if possible concurrent with, the implementation of the proposed restoration through the USFS compound. 5C staff in partnership with the USFS would work to pursue restoration of the upstream Caltrans crossing at Highway 299. In conclusion, the feasibility study identified some of the challenges, in regards to achieving restoration, and assessed them as proposed to grantor entities. However, it went beyond simply discussing

restoration options by producing a detailed existing conditions basemap and hydraulic model, and a proposed concept design that can readily be developed into a 60% or higher design.

The primary grant funding for this feasibility study was provided by the Trinity River Restoration Program's Watershed Restoration Grant Program. However, significant time as in-kind was matched by several USFS staff members and the NOAA representative. Many USFS staff members drove from Redding while the NOAA staff member came from Arcata. Therefore, their travel expense was also matched as in-kind to the project.

**Attachments**

A. Technical Memorandum: Preliminary Channel Design Recommendations for the Sidney Gulch Channel Restoration at the USFS Compound in Weaverville, CA. Michael Love & Associates, Inc.

B. Coho Salmon Literature Review for the Sidney Gulch USFS Compound Feasibility Study Project. Ross Taylor and Associates.

C. Geotechnical Study Sidney Gulch Restoration Project, Trinity County, California. CGI Technical Services, Inc.

**References**

Lancaster, Mark and Sandra Pérez. 2004. *Sidney Gulch Urban Stream Plan 2004 Monitoring and Assessment Report.* Trinity County, CA.

McBain and Trush. 2000. *Evaluation of 1997 Flood Impacts on Riparian Berms Along the Trinity River, California*. Hoopa Valley Tribe Fisheries Department, Hoopa, CA.

Trinity County Department of Transportation and Planning. 1990. *Sydney Gulch Urban Stream Plan*. Trinity County, CA.