
COUNTY OF NEVADA
HEALTH AND HUMAN SERVICES AGENCY
950 Maidu Drive
Nevada City, CA 95959

**NORTH SAN JUAN
FIREFLOW FEASIBILITY STUDY**

August 24, 2016



Sauers Engineering, Inc.
Civil & Environmental Engineers
440 Lower Grass Valley Rd., Suite A
Nevada City, CA 95959
Tel. 530-265-8021

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INTRODUCTION

Background

The community of North San Juan is an approximately 480-acre historic townsite located in western Nevada County on State Highway 49, 15 miles northwest of Nevada City and is the only rural center on the larger San Juan Ridge. Fire protection services are provided by the North San Juan Fire Protection District, an all volunteer fire department that includes three fire stations, one located in North San Juan.

Because there is no public water supply, the North San Juan area relies on groundwater wells for the provision of water for both domestic and fire protection uses. Fire protection operations currently rely on a series of ponds and small residential water tanks in various locations around the community for provision of water for fire fighting. This limits firefighting efforts in the commercial core of North San Juan in that the only water available for structure fires must be carried on the fire trucks, water tenders, and other fire fighting apparatus.

In 2015, the County of Nevada was awarded a Community Development Block Grant (CDBG) to fund a feasibility study to look into the provision of a fire protection water system that would provide water storage and pressurized hydrants to the commercial core area consistent with the requirements of the National Fire Protection Standards and the California Fire Code. In February 2016, the County contracted with Sauers Engineering, Inc. of Nevada City to prepare the feasibility study.

Project Kick-off Meeting

A project meeting was held on March 10, 2016 at the North San Juan FPD Station #1. Participants included representatives of the North San Juan FPD, Nevada County Health and Human Services Agency, Planning Department, and Public Works Department, and the feasibility study consultant team. Topics discussed included:

- Definition of the Study Area,
- Fire system requirements including storage, pressure, and flow rate,
- Potential tank and well locations,
- Encroachment permits for both County roads and State Highway 49,
- Easements and rights-of-way on private lands,
- BLM Use Permit for possible use of the transfer station property,
- California Fire Code requirements,
- Fire hydrant locations, spacing,
- Fire system ownership and operation responsibilities,
- Funding sources for construction and operation,
- Existing documents including the North San Juan Rural Center Area Plan 2010, North San Juan Fire Protection Plan 2009, Official Survey Map of North San Juan 1874, Assessor's Parcel Maps, various Record of Survey maps, and Caltrans Right Of Way maps.

PROJECT STUDY AREA

The project study area is along the Highway 49 corridor between the North San Juan Community Center to the west and the Post Office to the east. This is considered the commercial corridor and is generally consistent with what is described in the County's North San Juan Area Plan as the North San Juan Rural Center. Although there are undeveloped commercially zoned parcels outside the project study area, for purposes of this study it is intended that new development would extend the system as necessary in the future to accommodate additional development.

FIRE SYSTEM REQUIREMENTS

Required Fire Flow

The required design fire flow rate and duration are based on the single largest fire flow demand. Fire flow demands for structures are determined by California Fire Code and National Fire Protection Association standards and are based on building type, construction materials, occupancy, size, exposure, and other factors.

According to Tom Browning, NSJFPD Battalion Chief, in working with the Insurance Services Office (ISO), the structure used in determining the fire flow requirements is the combination of historic buildings at the northwest corner of Highway 49 and Flume Street. These are considered Non-Rated Buildings under California Fire Code fire flow calculations, with no fire rated walls between the separate structures. The total area of the combined buildings is 11,200 square feet, and the calculated fire flow demand is 2,750 gallons per minute for a duration of 2 hours.

Required Fire Storage

The amount of fire storage required is based on the required fire flow and duration. In order to provide 2,750 gpm for 2 hours, the minimum required storage would be 330,000 gallons.

Minimum System Pressure

In order to provide an acceptable level of fire protection in a pressurized water system, a minimum pressure is necessary to allow firefighting equipment to maintain continuous operation and avoid delays while on-board tanks attempt to refill. The minimum accepted hydrant pressure during maximum flow conditions is 20 pounds per square inch.

PRELIMINARY FIRE PROTECTION SYSTEM DESIGN

Hydraulic Modeling

In order to determine basic design parameters including minimum tank floor elevation and pipeline diameter, a hydraulic model was created to test various system scenarios. The system was modeled using the Bentley WaterCAD V8i modeling program. The model was used to predict the available fire flow and system pressures for various tank locations and elevations and various diameters of distribution piping.

Tank Base Elevation

Based on the results of the hydraulic modeling, the minimum tank base elevation needed to provide the design fire flow and hydrant pressure is approximately 2,175 feet. This is approximately 53 feet higher in elevation than the highest elevation fire hydrant proposed near the intersection of Highway 49 and Flume Street, which, after accounting for pipeline head losses during a fire flow event, would result in the minimum 20 psi at each of the proposed hydrants.

Pipeline and Fire Hydrant Layout

In order to provide fire protection along the commercial corridor, fire hydrants should be placed along Highway 49 at a maximum spacing of 1,000 feet between hydrants. Hydrants should be placed in locations that are accessible to firefighting apparatus, but that do not pose a hazard to vehicular traffic. Recommended fire hydrant locations include sites adjacent to Highway 49 near the intersections of Flume Street, Sweetland Road, and Oak Tree Road. A single pipeline would be constructed between the hydrants either along the Highway 49 shoulder, or within an easement along the various parcels abutting the highway. In addition, a pipeline would be constructed connecting the Highway 49 pipeline to the water storage tank. Due to the possibility of more favorable consideration for future grant funding, it is recommended that the pipeline and fire hydrant facilities be installed along the south side of Highway 49.

Preliminary Tank Design

In order to meet the required design fire flow and duration, a minimum 330,000 gallon water storage tank will need to be constructed at a base elevation of at least 2,175 feet. For a tank in this size range, the recommended materials for construction would be either welded steel or bolted steel. The water tank would be designed and constructed in accordance with NFPA requirements and American Water Works Association standards, AWWA D-100 for welded steel or AWWA D-103 for bolted steel. Typical dimensions for a tank with a working volume of 330,000 gallons would be 51 feet diameter by 26 feet high tank wall, with the full tank water surface at 24 feet above the floor. The tank would include accessories including a lockable exterior ladder, screened vents, overflow and drain, level indicator, and top and side access hatchways. The tank would be installed on a concrete ring footing and gravel pad, and would be anchored to provide protection during a seismic event. The Preliminary Plans at the end of this report shows the preliminary design for the fire storage tank.

Water Supply Well

As with all other water services in North San Juan, source water for the fire protection system will require a groundwater well. County records of Well Completion Reports for various parcels in North San Juan indicate that well production ranges between 8 gpm and 25 gpm. Well depths typically range between 100 feet and 360 feet.

Once the tank has been filled, the well would typically only be used to keep water in the storage tank topped off. There is an issue with the length of time, depending on the output of the well, it would take to refill the tank if it is emptied due to a fire incident.

Table 1 shows the time required to refill the tank at half empty and empty for various well outputs.

Table 1
Tank Refill Rates for Various Well Outputs

Well Output	Tank Half Empty (165,000 gallons)	Tank Empty (330,000 gallons)
8 gpm	14.3 days	28.6 days
15 gpm	7.6 days	15.3 days
20 gpm	5.7 days	11.5 days
25 gpm	4.6 days	9.2 days

Given the likely frequency of major fires in the project study area, this may or may not pose any real issues, however, NFPA standards would typically require water sources be capable of refilling a fire tank in 8 hours, which in this case would require a source of 690 gpm. This is clearly not practical, so it should be understood that this aspect of the fire system would not meet NFPA standards.

PROJECT ALTERNATIVES

The fire protection system being studied for this report consists of three primary components; a fire storage tank, a groundwater well source of supply, and a pipeline and fire hydrant distribution system. A total of three tank sites, three pipeline alignments, and multiple well sites were analyzed.

Tank Sites

Tank Site Alternative A – Tank Site Alternative A is the Bureau of Land Management (BLM) parcel that is currently the site of the transfer station operated by Waste Management. This site sits at an elevation of 2,176 feet which puts it at the minimum elevation suitable for a tank site.

Tank Site Alternative B – Tank Site Alternative B is located at the south end of Cherokee Street beyond the County maintained road. This site, which is on private property and on a hill, has suitable elevation for a tank site.

Tank Site Alternative C – Tank Site Alternative C is located on Oak Tree Road south of Clarks Road. This site, which is also on private property and on a hill, has suitable elevation for a tank site.

Pipeline Routes

Each of the tank site alternatives has a corresponding pipeline route to connect with the pipeline and hydrants along Highway 49. In addition, three alignments along Highway 49 have been considered.

Pipeline Route Alternative A – From the transfer station tank site, this alignment would follow Flume Street south from the tank to the pipeline along Highway 49.

Pipeline Route Alternative B – From the Cherokee Street tank site, this alignment would follow a privately owned section of Cherokee Street north from the tank, then onto the County maintained section of Cherokee Street to the east, then north along Reservoir Road to the pipeline along Highway 49.

Pipeline Route Alternative C – From the Oak Tree Road tank site, this alignment would follow Oak Tree Road north and west from the tank to the pipeline along Highway 49.

Highway 49 Pipeline Alternatives – Alternatives for the alignment of the pipeline and hydrants along Highway 49 included construction along the north shoulder within the Caltrans right-of-way, construction along the south shoulder within the Caltrans right-of-way, and construction along the south side of the highway in a combination of private property and, where necessary due to obstructions such as buildings, Caltrans right-of-way.

Well Sites

Groundwater wells can be located at the tank site or located anywhere along the pipeline such that it can be connected to the pipeline and pump into the pipeline and tank system. For purposes of this report, it is assumed that for ease of operation and maintenance, and for increased security, the well would be placed on the tank site.

Preferred Alternatives

Two preferred alternatives were to be presented as a result of this report. Of the three tank sites, the Oak Tree Road site, which offers no real advantages over the other two sites, is the furthest site from the North San Juan commercial corridor and would require construction of additional pipeline to reach from the tank to the Highway 49 pipeline. Therefore, Tank Site Alternative C and Pipeline Route Alternative C were eliminated from consideration.

Of the three Highway 49 pipeline alignments, construction along the north side of the highway was considered more difficult due to potential conflicts with the existing buildings and businesses. Also, the portion of the North San Juan community that lies to the south of Highway 49 has been identified as being more favorable in terms of potential future grant funding for projects of this type. Therefore, the alignment along the north shoulder of Highway 49 has been eliminated.

Preliminary Plans at the end of this report shows a preliminary layout of the two preferred alternatives.

EVALUATION OF TANK SITES AND PIPELINE ALIGNMENTS

Alternative A - Transfer Station Tank and Flume Street Pipeline

The Transfer Station Tank would be located on property owned by BLM and currently used through a lease with Waste Management as a refuse and recycling transfer station. According to Heather Daniels, Realty Specialist with the BLM Mother Lode Field Office, placement of a water storage tank and well for fire protection would be an appropriate use on BLM property. BLM would lease the land on a 30 year term, renewable at the end of the 30 years, and would likely qualify for a waiver of fees. If any financing was involved in the construction of the facilities, the lease would at a minimum match the term of the financing. The request for the permit/lease would take 3 to 6 months to process at a minimal cost, likely less than \$2,000.

The pipeline alignment along Flume Street would be constructed under an encroachment permit from Nevada County Department of Public Works. The pipeline and road restoration would be designed and constructed in conformance with Nevada County Improvement Standards.

Alternative B – Cherokee Street Tank and Cherokee Street/Reservoir Road Pipeline

The Cherokee Street Tank would be located on what is currently private property. The site is on a sloping hillside and would require some amount of grading to create a level tank site. Property for the tank site could be acquired as an easement or through purchase in fee title. A fee title purchase would be preferable as it would provide clear permanent ownership of the site and relieve the underlying owner of any liability associated with the operation of the tank and well. It is recommended that a minimum of a quarter of an acre be acquired for the tank and well site.

An easement for the construction and maintenance of the pipeline and for permanent access to the tank site would be required on the private road between the tank site and the County maintained road. The pipeline alignment along Cherokee Street and Reservoir Road would be constructed under an encroachment permit from Nevada County Department of Public Works. The pipeline and road restoration would be designed and constructed in conformance with Nevada County Improvement Standards.

Highway 49 Pipeline and Hydrants

Caltrans ROW – The central roadway through North San Juan is operated and maintained by Caltrans as State Highway 49. After a cursory review of right-of-way plats provided by Caltrans District 03, it appears that the State confined their improvements to Main Street in the original Townsite Map, completed in 1874 by surveyor D. B. Merry. The townsite map is light on details and dimensions, but a review of private surveys in town have shown the narrowest parts of the right-of-way to be about 59 feet. All other roadways shown on the townsite map are considered public roads owned by the County, whether improved or not. In deeding the townsite lots out to private parties, there was never any known deed out for the road rights-of-way and they are understood now to be owned by the public under County government.

Construction along and across Highway 49 within the State's right-of-way would require an encroachment permit issued by the Caltrans District 03 Encroachment Permit Office in Marysville. This section of highway 49 is considered a conventional highway, as compared to a freeway or expressway. The underground facilities would be subject to State-Required Relocation meaning the facility owner would be responsible for identifying and locating, by potholing if necessary, the facilities when requested, and for relocating the facilities should they ever be in conflict with any future Caltrans construction project such as a road widening, turn lane, or signal installation.

For transverse encroachments (crossings perpendicular to the highway), Caltrans requires that new installations under existing roadways be by bore and jack, directional drilling, or other trenchless technology. For pressurized pipelines, Caltrans also requires encasement of the pipeline in a steel carrier pipe.

For longitudinal encroachments, Caltrans requires the facilities to be as close as possible to the right-of-way line and a minimum of 20 feet outside of the clear zone (fog line) if possible. Caltrans typically requires utilization of trenchless technologies for longitudinal encroachments, however they would consider open cut construction in certain circumstances. As with transverse encroachments, Caltrans will require encasement of the pressure pipeline in a steel carrier pipe. For purposes of this study, it is assumed that longitudinal encroachments outside of the travelled way or paved shoulder would be constructed by open trench and encased.

Easements on Private Property – In order to avoid having to obtain a Caltrans encroachment permit for the Highway 49 pipeline, an alternative would be to obtain easements from the properties that abut the State right-of-way. There are as many as 11 parcels, depending on the locations of the fire hydrants, that would be crossed in order to construct the pipeline outside of the Caltrans right-of-way. This is complicated by the fact that one of the properties along the alignment may not be suitable for pipeline construction. The front of the old Toki's building is so close to the highway it would likely force the pipeline into the right-of-way and under the paved shoulder.

Acquisition of property or easements by a public entity for each of the parcels would typically involve the following steps:

- Preliminary discussions with the land owner(s) to hopefully arrive at a design and placement of facilities that are mutually agreeable,
- Design and survey of the parcels and easements based on the facilities design requirements, including legal descriptions,
- Obtaining preliminary title reports on the proposed parcel and easement areas to verify ownership and to identify lien holders that would also have to sign grant deeds or easement deeds to the public entity (holders of mortgages, judgments, mechanic's liens, etc) ,
- It may be prudent to have the jurisdiction's planning department file a "Notice of Exemption" under the California Environmental Quality Act, in case any questions arise,

- Obtaining appraisals of the easements/parcels to be acquired by the public entity,
- Negotiating a sales price with the land owner after the appraisal.
- Only if necessary, eminent domain proceedings to force the sale of the necessary easements or parcels by court order, a process that is typically avoided in Nevada County if at all possible.

PROJECT COST ESTIMATES

Cost estimates were prepared for the construction of the various project alternatives. These estimates include the cost of purchase and installation of materials and equipment under a public works contract, project design, survey, right-of-way acquisition, engineering services during construction, construction inspection, and contingency. Tables 2 through 5 show cost estimates for the various project alternatives

Table 2
Alternative A – Transfer Station Tank and Flume Street Pipeline

Item	Estimated Cost
330,000 gal. Water Storage Tank	\$ 305,000
Tank Site Preparation	\$ 10,000
Well Construction, 300 ft @ \$70/ft	\$ 21,000
Well Pump, Motor, Controls	\$ 15,000
12" PVC C-900 Pipeline, 1,050 ft @ \$120/ft	\$ 126,000
Connection to PG&E	\$ 25,000
Construction Sub-total	\$ 502,000
BLM Lease Permit Application	\$ 2,000
Design Engineering	\$ 40,000
Survey	\$ 15,000
Construction Engineering/Inspection	\$ 15,000
Contingency, 10% of above	\$ 57,000
Total Cost Estimate	\$ 631,000

Table 3
Alternative B – Cherokee Street Tank and Cherokee Street/Reservoir Road
Pipeline

Item	Estimated Cost
330,000 gal. Water Storage Tank	\$ 305,000
Tank Site Preparation	\$ 25,000
Well Construction, 300 ft @ \$70/ft	\$ 21,000
Well Pump, Motor, Controls	\$ 15,000
12" PVC C-900 Pipeline, 1,250 ft @ \$120/ft	\$ 150,000
Connection to PG&E	\$ 25,000
Construction Sub-total	\$ 541,000
Property/Easement Acquisition	\$ 37,000
Design Engineering	\$ 43,000
Survey Including Parcel/Easements	\$19,000
Construction Engineering/Inspection	\$15,000
Contingency, 10% of above	\$ 65,000
Total Cost Estimate	\$ 720,000

Table 4
Highway 49 Pipeline – Caltrans ROW

Item	Estimated Cost
12" HDPE Pipeline, 1,440 ft @ \$60/ft	\$ 86,400
24" Steel Carrier Pipe, 1,440 ft @ \$200/ft	\$ 288,000
Fire Hydrants, 3 @ \$7,500 each	\$ 22,500
Bore and Jack, 60 ft @ \$400/ft	\$ 24,000
Traffic Control	\$ 15,000
Construction Sub-total	\$ 435,900
Caltrans Encroachment Permit Application	\$ 5,000
Design Engineering	\$35,000
Survey	\$14,000
Construction Engineering/Inspection	\$10,000
Contingency, 10% of above	\$ 50,000
Total Cost Estimate	\$ 549,900

Table 5
Highway 49 Pipeline – Private Property Easements

Item	Estimated Cost
12" HDPE Pipeline, 1,440 ft @ \$120/ft	\$ 172,800
24" Steel Carrier Pipe, 200 ft @ \$ 200/ft	\$ 40,000
Fire Hydrants, 3 @ \$7,500 each	\$ 22,500
Bore and Jack, 60 ft @ \$400/ft	\$ 24,000
Traffic Control	\$ 5,000
Construction Sub-total	\$264,300
Caltrans Encroachment Permit Application	\$ 5,000
Easement Acquisitions	\$ 36,000
Design Engineering	\$ 21,000
Survey Including Easements	\$ 36,000
Construction Engineering/Inspection	\$ 10,000
Contingency, 10% of above	\$ 37,000
Total Cost Estimate	\$ 409,300

Depending on the combination of projects implemented, the total project cost estimate for the construction of a water storage tank, well, and pipeline and hydrant distribution system would range from \$1,040,300 to \$1,269,900.

ONGOING OPERATION AND MAINTENANCE COSTS

Along with the cost of construction, the fire protection system owner will have ongoing monthly and annual costs associated with the operation and maintenance of the system. The primary cost of operation will be purchase of electrical power to operate the well. According to PG&E, an electrical service of this type would be billed at an A-1 Rate which is a non-residential small general use rate with a time of use/peak day use rate structure. The basic customer charge for this type of account, not including energy costs, is about \$10 per month. Once the tank has been filled, well usage should be relatively low. The system owner should budget \$20 per month or \$240 per year for electrical service.

Other costs associated with the system include maintenance activities such as exercising of valves, hydrant flushing and testing, repair/replacement of damaged hydrants, and periodic replacement of system components such as the well pump, motor, and pump controls.

FIRE PROTECTION SYSTEM CONSTRUCTION AND OWNERSHIP RESPONSIBILITIES

The local public agency in charge of the construction, ownership, and operation of the fire protection system will have a number of responsibilities. These include:

Project Funding - Typically, the local agency benefitting from a publically funded project would be the party responsible for the funding application and funding agreement. Grants are available for these types of projects, especially in what are considered rural, disadvantaged communities, however, funding for a project of this magnitude would likely come from a combination of grant and loan funds. The agency would be responsible for grant and loan applications including any required planning and preliminary engineering reports, financial reports, legal review, public hearings, environmental review, and other information as may be required by the funding agency. These costs may be considered reimbursable expenses, however they would have to be fronted by the local agency until final funding is secured.

New Revenue Source for Ongoing Expenses – Currently, there is no source of revenue for the ongoing operation of a fire protection system. This is especially true if the project funding included any loan financing. In order for a local agency to qualify for loan funding, there needs to be a verifiable long-term source of funds to guarantee repayment of principal and interest for the term of the loan, as well as to show adequate funds for the ongoing operation, maintenance, and repair of the system. This includes accounting for and saving for future replacement of major system components such as the well pump, motor, pump controls, tank coatings, and fire hydrants. Also, depending on the funding agency, there may be a requirement for additional financial auditing and reporting. Potential funding sources could include some form of parcel charge for those parcels benefitting from the fire protection system such as voter-approved assessment or parcel tax.

Encroachment Permit Applications – Both the contractor and the local agency will be included on encroachment permit applications with Caltrans and Nevada County. The contractor's responsibility will end at the completion of construction, while the local agency will be the permanent permittee for the underground facilities.

BLM Use Permit/Lease – For the Transfer Station site, the local agency would be responsible for obtaining the BLM Use Permit and would be the lessee for the term of the lease.

CEQA Lead Agency – In most cases, when a local agency takes on a project such as this, they will be required to comply with CEQA. That agency would assume the Lead Agency role and be responsible for the preparation of the environmental review documents and completion of the environmental review process.

Property and Easement Acquisitions – The local agency will be responsible for negotiations with property owners and will be the grantee for easements and deeds.

PG&E Customer – The local agency will be the PG&E customer for the electric service at the well and will be responsible for payment of the monthly bill.

Public Works Contract – Construction of this type of project, especially if it is publically funded, would be under a public works contract. The local agency would be considered

as the Owner under the contract and would be responsible to assure all aspects of the design and construction were in compliance with the State's Public Contract Code.

Ongoing Ownership, Operation, Maintenance, and Repair of the System – The local agency owning the system will be responsible for operation, maintenance, and repair of the fire system facilities. This may be accomplished by their own forces or by hiring a contractor.

It would appear that the logical local agency to own the fire protection system would be the North San Juan Fire Protection District, however, because they are an all-volunteer organization, there are concerns as to whether they have the financial or administrative resources to take on a project of this magnitude. NSJFPD has expressed an interest in having another local agency such as Nevada County act on their behalf for purposes of construction and operation of the system. Both the Nevada County Departments of Transportation and Sanitation operate in North San Juan but because their funding sources are restricted, gas tax for Transportation and sewer fees for Sanitation, the County would be legally prohibited from using these forces for the fire protection system. Utilizing County forces would require a new funding source, and because of the County's overhead costs for labor and materials, it would likely be much more cost effective to hire a contractor for periodic maintenance and repairs.

PRELIMINARY PROJECT PLANS

Preliminary plans have been prepared for the Alternative A Transfer Station Tank and Flume Street Pipelines, the Alternative B Cherokee Street Tank and Cherokee Street/Reservoir Road Pipeline, and the Highway 49 Pipeline and Fire Hydrants. Preliminary plans have also been prepared for the water storage tank and well. Preliminary plans are included at the end of this report.

RECOMMENDED PROJECT

Based on the results of this evaluation, the recommended project would be the combination of Alternative A – Transfer Station Tank and Flume Street Pipeline and the Highway 49 Pipeline Private Property Easements. Advantages include:

The long term lease of the BLM property and pipeline construction along Flume Street would avoid having to go through the process of negotiation and purchase of property and easements for the tank site and pipeline, especially considering there is no guarantee the property owner would be cooperative.

Having as much of the Highway 49 pipeline as possible outside of Caltrans right-of-way would significantly reduce construction cost by avoiding having to encase the pipeline, and would also avoid the possibility of having to relocate the pipeline should Caltrans require it in the future.

This would be the lowest cost of construction of the various combinations.



REV	DATE	REVISIONS

North San Juan
Fireflow Feasibility Study

ALTERNATIVES A & B
TANK SITES & PIPELINE LAYOUT

County of Nevada

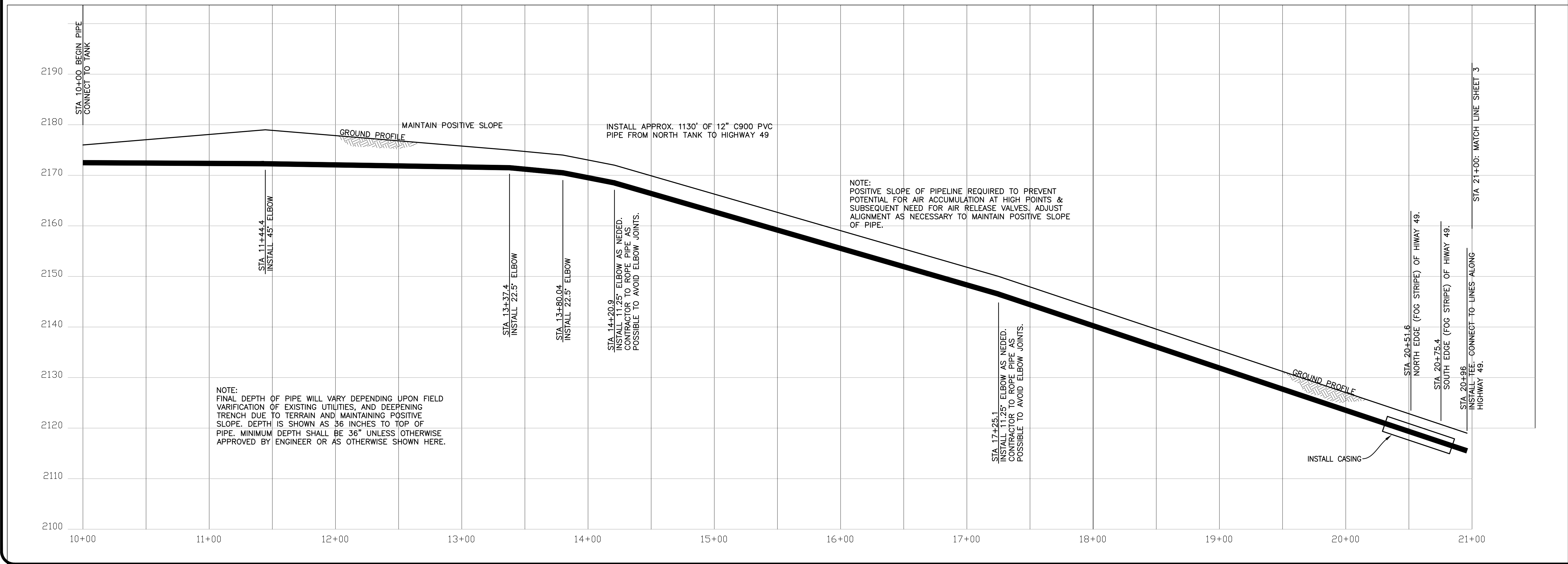
Nevada County

California



Savers Engineering, Inc.
Civil & Environmental Engineers
440A Lower Grass Valley Road, Nevada City, CA 95959
tel (530) 205-8021 www.saverseng.com

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PROJECT NUMBER:	13-001-31
SURVEY BY:	
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DESIGN BY:	K.S.K.
DRAFTING BY:	K.E.M.
CHECKED BY:	D.D.M.
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DATE:	
SCALES:	
HORIZONTAL	
VERTICAL	SHEET: of 22



REV	DATE	REVISIONS

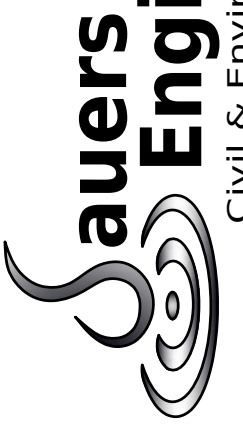
North San Juan
Fireflow Feasibility Study

ALTERNATIVE A
TRANSFER STATION TANK
AND FLUME STREET PIPELINE

County of Nevada

Nevada County

California



Civil & Environmental Engineers
440A Lower Grass Valley Road, Nevada City, CA 95959
tel (530) 265-8021 www.sauerseng.com

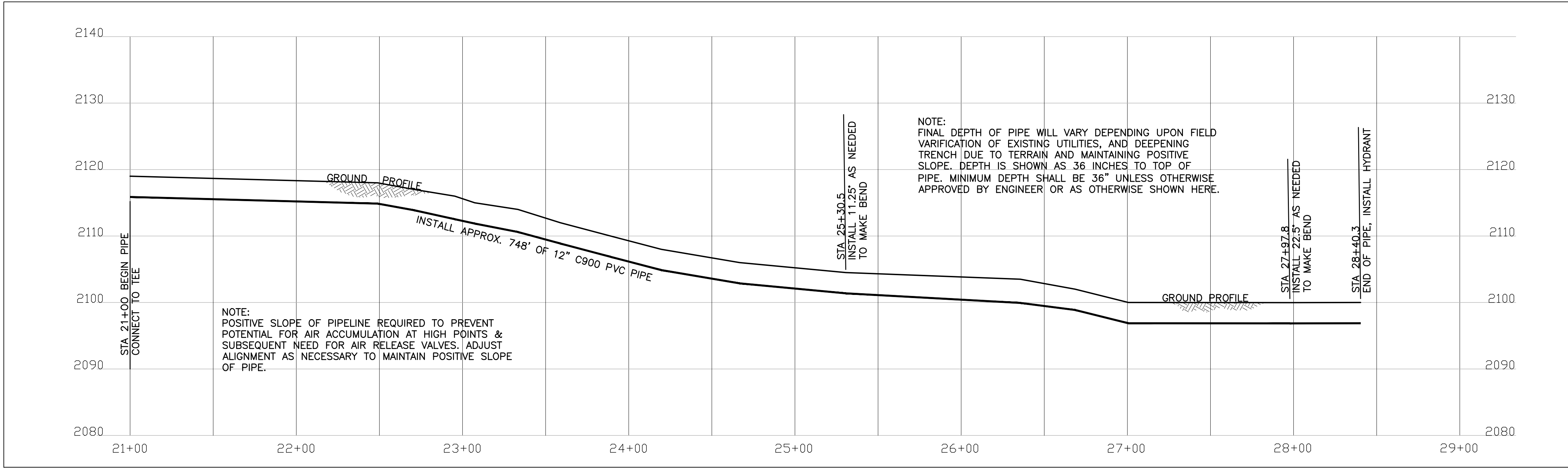
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SURVEY DATE:
DESIGN BY: K.S.K.
DRAFTING BY: K.E.M.
CHECKED BY: D.D.M.

FILE PATH: Camptonville CSD/PhaseII/Design
DATE: JULY 11, 2016

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SHEET: 2 of 22



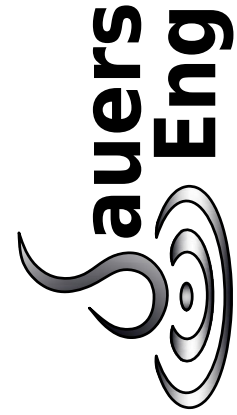
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North San Juan
Fireflow Feasibility Study

ALTERNATIVES A / B
HIGHWAY 49 PLAN & PROFILE
STA. 21+00 - 28+40

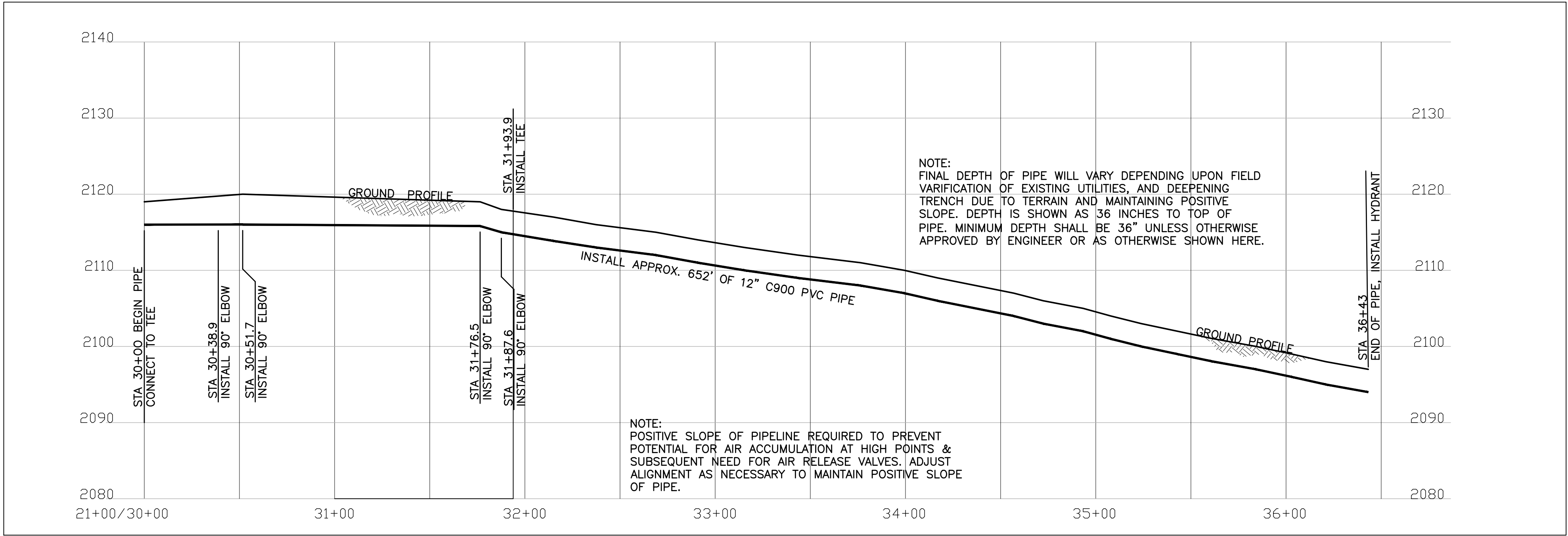
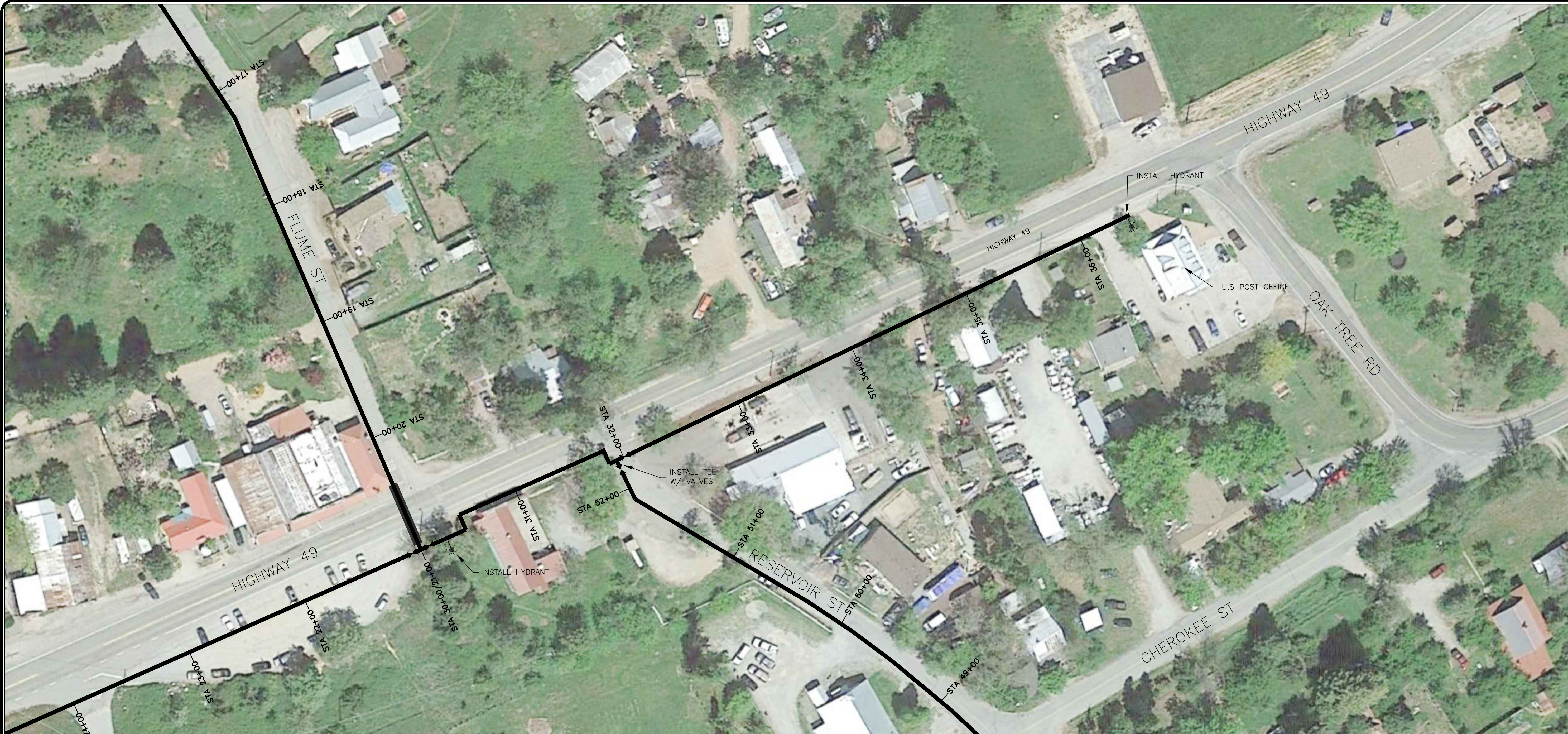
County of Nevada

Nevada County California



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DESIGN BY:	K.E.M.
DRAFTING BY:	D.D.M.
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REV	DATE	REVISIONS

North San Juan
Fireflow Feasibility Study

ALTERNATIVES A/B
HIGHWAY 49 PLAN & PROFILE
STA. 30+00 - 36+43

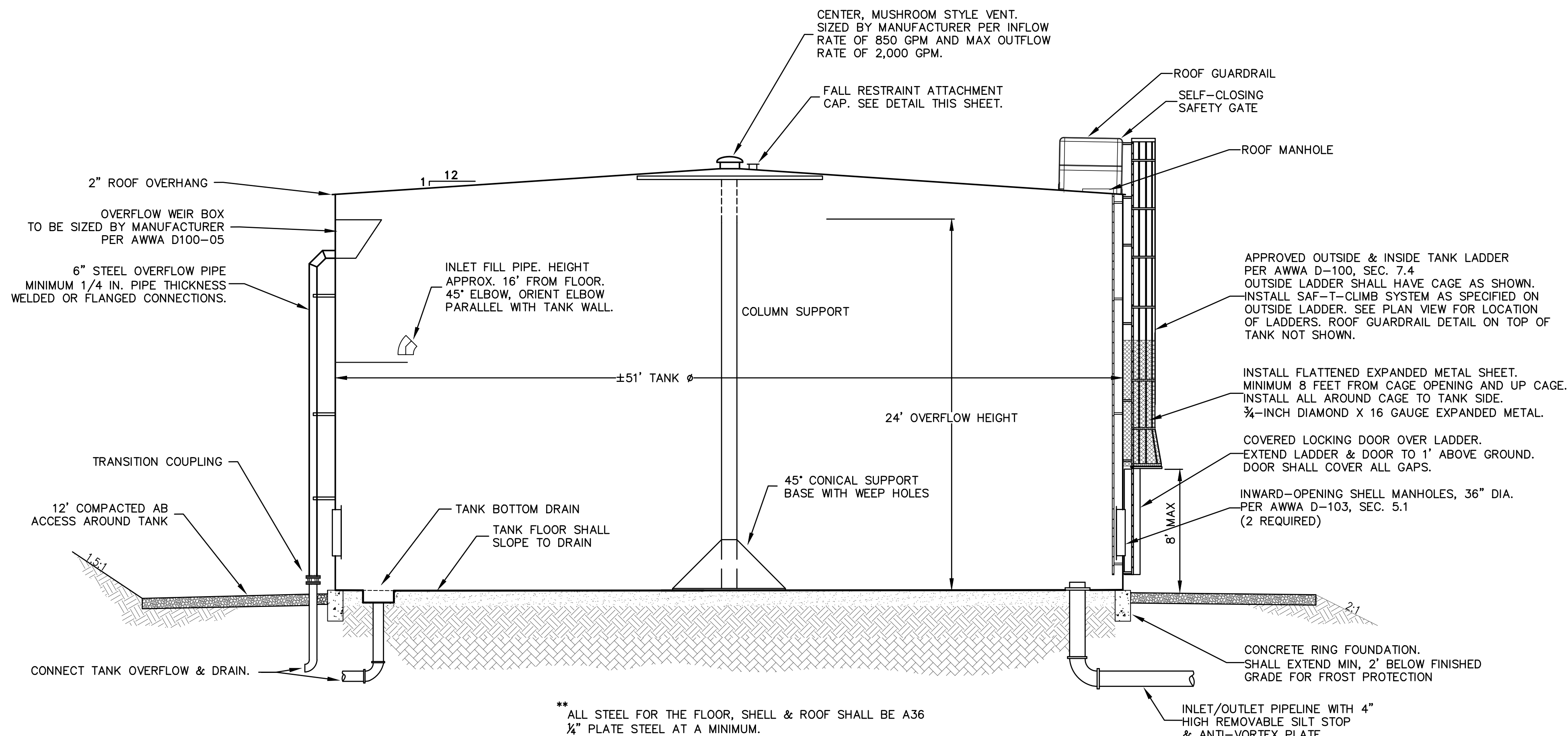
County of Nevada

Nevada County

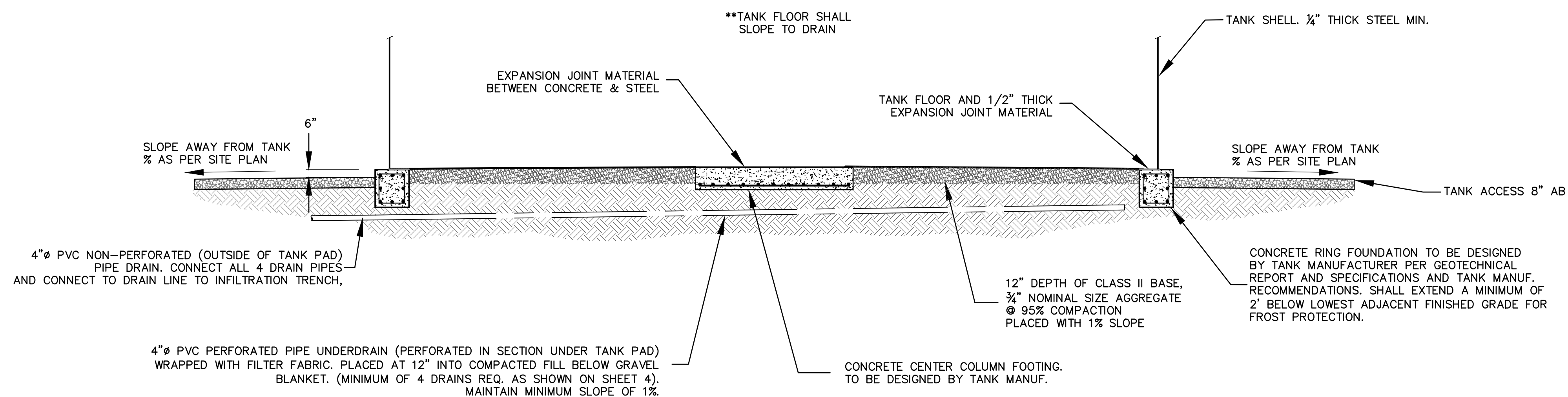
California

Sauers Engineering, Inc.
Civil & Environmental Engineers
440A Lower Grass Valley Road, Nevada City, CA 95959
tel (530) 265-8021 www.sauerseng.com

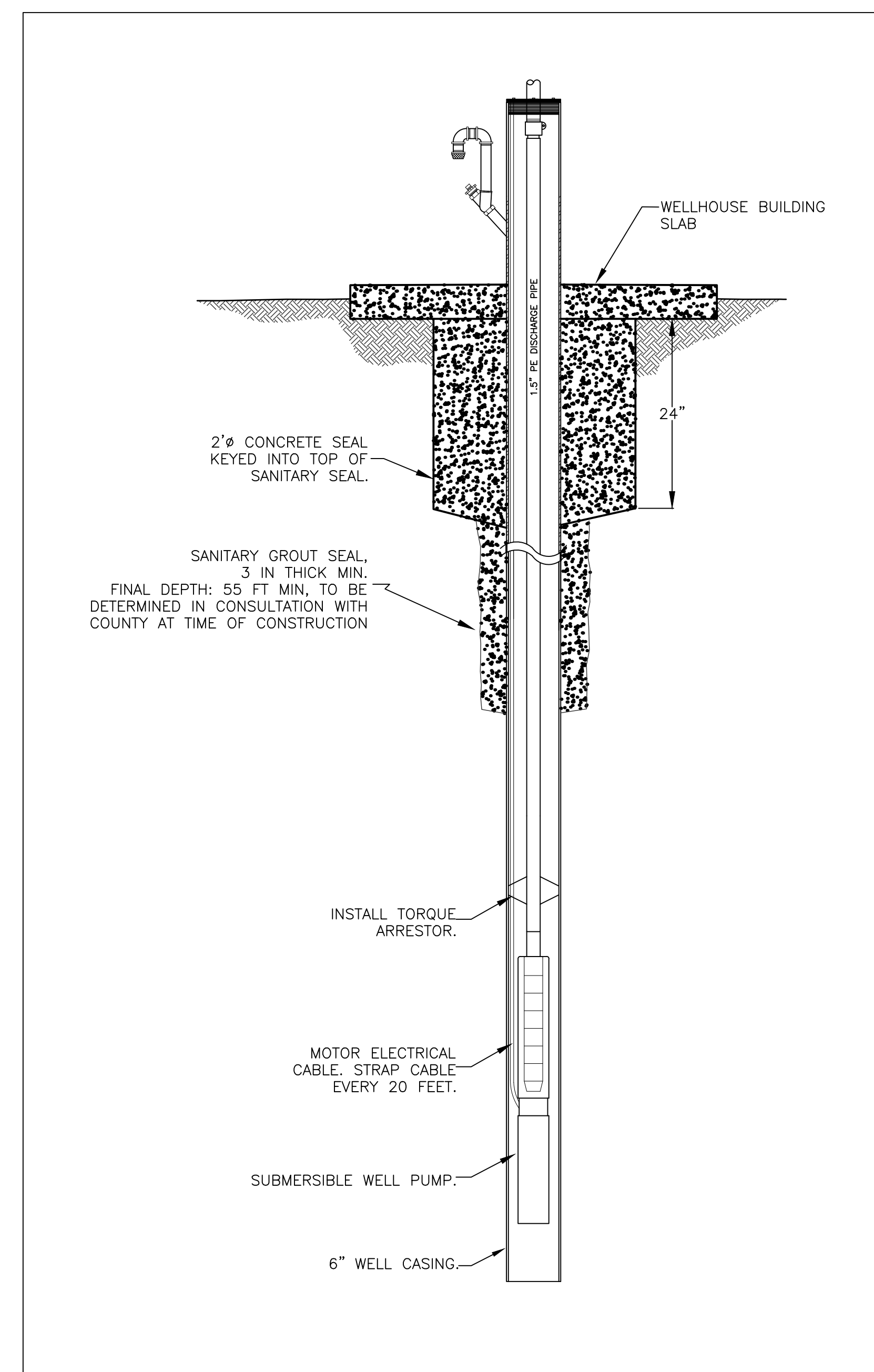
PROJECT NUMBER:	13-001-31
SURVEY BY:	
SURVEY DATE:	
DESIGN BY:	K.S.K.
DRAFTING BY:	K.E.M.
CHECKED BY:	D.D.M.
FILE PATH:	Camptownville CSD/PhaseII/Design
DATE:	JULY 11, 2016
SCALES:	
1"=40' HORIZONTAL	C1
1"=10' VERTICAL	SHEET: 2 of 22



±330,000 GALLON WORKING VOLUME WELDED STEEL TANK
SCALE: 1"=5'



1 TANK FOOTING & PAD DETAIL
SCALE: 1"=5'



3 WELL DETAIL
Scale: N.T.S.

REV	DATE	REVISIONS

North San Juan
Fireflow Feasibility Study

STORAGE TANK DETAILS
WELL DETAILS

County of Nevada

California

Nevada County

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BAR IS ONE INCH ON ORIG. DRAWING
IF BAR DOES NOT MEASURE ONE INCH,
ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 13-001-31
SURVEY BY:
SURVEY DATE:
DESIGN BY: K.S.K.
DRAFTING BY: K.E.M.
CHECKED BY: D.D.M.

FILE PATH: Camptonville CSD/PhaseII/Design

DATE: JULY 11, 2016

SCALES:
1"=60'
HORIZONTAL

1"=15'
VERTICAL

C1

SHEET: 2 of 22