

**MINUTES OF MEETING  
CAVE ROCK ESTATES GENERAL IMPROVEMENT  
DISTRICT**

**Friday, January 24, 2025**

**1:30pm**

This meeting of the Cave Rock Estates General Improvement District Board of Trustees will be held Friday, January 24, 2025 at 1:30 pm at 1317 Winding Way, Glenbrook NV 89413. The on line Teams login is: [https://teams.microsoft.com/l/meetup-join/19%3ameeting\\_N2I3MTg2NDYtODhiOC00YTM1LWlyYjktMTFkM2Y2YTFlZWU1%40thread.v2/0?context=%7b%22Tid%22%3a%22f7e124e1-3cbb-4714-b90e-d08652874b65%22%2c%22Oid%22%3a%224fe9cf07e903-465a-9024-0d13b2e6f3e2%22%7d](https://teams.microsoft.com/l/meetup-join/19%3ameeting_N2I3MTg2NDYtODhiOC00YTM1LWlyYjktMTFkM2Y2YTFlZWU1%40thread.v2/0?context=%7b%22Tid%22%3a%22f7e124e1-3cbb-4714-b90e-d08652874b65%22%2c%22Oid%22%3a%224fe9cf07e903-465a-9024-0d13b2e6f3e2%22%7d)  
Phone in: 213.282.5258  
ID: 569427526#

Copies of the agenda were posted at the following locations at least 3 business days prior to the meeting day: Cave Rock Drive street sign below the Cave Rock Villas, Cave Rock/Winding Way street sign, and the street sign at the corner of Wren/Pheasant Lane and Winding Way. Electronic copies of the agenda can be found at <https://NoticeNV.gov> and <https://www.CaveRockGID.org>

1. **CALL TO ORDER:** Meeting called to order by Dick Dernbach at 1:31 pm.
2. **ROLL CALL - Establish Quorum:** Mike Smart, Norman Hauge, Dick Dernbach, Perry Muhr (via Teams) and Mark Holmlund

**GUESTS:** Marge Hauge and Jim McCanna

3. **PUBLIC COMMENT** - None

**DISCUSSION AND ACTION MAY TAKE PLACE ON ANY OF THE FOLLOWING ITEMS:**

**4. Approval of Agenda**

Mark made the motion to approve the agenda with a second by Norm. All Ayes

**5. Approval of minutes of regular meeting on December 16, 2024**

Perry made the motion to approve the minutes of the regular meeting on December 16, 2024 with a second by Mark. All ayes

6. **Nevada Tahoe Conservation District presentation on drainage and erosion at Cave Rock Estates - Presentation was made by Megan Kelly and Dominique Fellers**

A discussion of the history of working together was presented. The basin was addressed including the authorization of utilization for storage, slot drain, drop inlet in 2015-16. Mark remarked upon the damage from run-off recently which has stimulated renewed discussion. Following the severe winters, this issue became renewed for evaluation. Megan suggested creating a memo to the Committee on Storm Water Quality to get on the priority list for funding. The memo was created which will be used for pursuit of grant funding.

NCTD walked the neighborhood and created a document to detail the catchments and issues noted. The Trustees reviewed the document during the meeting. This document will help to define the projects moving forward. Areas 1-17 were found to be of priority in the CREGID as follows:

1. Winding Way - top area where there is a Forest Service Road - eroding the side of the roadway. This could be a area for possible federal funding.
2. Eroding ditch and slopes along Winding Way. Slopes are steep and may require retaining walls in combination with boulders/erosion mats.
3. Very steep area of Winding Way (at the bottom and at the top)- may dig out ditch along with sediment containers. Landscape contractors have put in a mitigation which is only temporary. The water needs to have a place to go which will be an expensive project. A curb and gutter may also be needed to catch and appropriately drain the water.
4. Area #3 - Robin Circle - drop inlet should collect water which is not functioning. The water is eroding a parcel along the roadway. Dick elaborated on other problems in this area.
5. Area #4 - 1339 Winding Way above the trailhead. Drain is overwhelmed or clogged. The water is flowing from the street above (Gull Court). This will need to be verified.
6. US Forest Service Parcel has erosion with railroad ties. This could be a federal funding issue.
7. Area #15 at Gull Court - rock needs to be removed along with the sediment removal. Concrete retaining walls would be recommended. The current configuration is original.
8. Area #6 - on Chukkar - much runoff eroding the entire area - how to address is under consideration to reduce the amount of flow/velocity going down
9. Area #7 - end of Wren Circle - discharges onto another parcel owned by Douglas County (NDSL funding). This could be addressed by rip wrap.
10. Area #8 - Cave Rock Drive - drop inlet is being bypassed and going onto a Forest Service Road. 1322 Cave Rock Road has made a modification which may need to be addressed by this study.
11. 1331 Winding Way - berm above home was causing a problem with the foundation. Installation of curb and gutter will allow for mitigation in this area. A discussion of the most appropriate curb/gutter systems will need further evaluation. Rolled curb and gutters are best, but are cost expensive.

Other issues:

10. Area #10 -1318 Cave Rock Drive - a drop inlet may be required as there is a failure to drain rather than crossing the road and causing further run-off and erosion.

11. Area #20 - 1354 Winding Way - accessing the propane tank around the back of the home eroding 1095 Wren Circle - need to re-direct and clean the basin - rocks and a stump are causing issues.
12. Retaining wall on Robin Circle
13. Retaining wall on Cave Rock Drive near Wren Circle 1
14. 1551 Cave Rock Drive-retaining wall stabilization
15. Minor stabilization along Chukkar - draining across the road
16. Chukkar Drive cul-de-sac needs fixing - the upper part of Chukkar could fix this issue

Budgetary aspects - engineer estimate is provided and discussed - \$2 million for construction and repair for all 17 issues.

This is already on the list of funding sources - grant funding from federal funding and other sources. \$300 million remains available. For four years, \$30 million has been allocated, but this has diminished to \$3 million in the past two years. A new budget is needed for the Lake Tahoe Restoration Act (LTRA). A 20% match is required, which could come from federal funding. This could be up to a 50% match.

#### Next Steps - Phase One

Preparation of the budget - Planning/Permitting/Design = \$345,000

NDSL - would be a 25% match from CREGID (required by the Tahoe Bond Act)

Plan would be to produce a "shovel ready plan" - \$86,000 would be required from CREGID.

With the match funding being authorized by the Board, this could proceed by entering into a contract in which CREGID approves accepting the funding of \$250,000 from NDSL along with the matching fund to create the design for construction in 2026.

Megan and Dominique (NTCD) will provide all of the plans and oversee the work.

The full funding would be retained by CREGID for the costs associated with the project.

#### Questions and Discussion by the Board:

1. Regarding running utility lines underground was addressed. This could be included in the design per area working with NV Energy which has an "underground management plan" - perhaps could get CREGID on the list. 50% could be paid by NV Energy. This could be handled by sub-contractors with oversight by NCTD.
2. Regarding the retaining walls, F&B provided a bid on the rock retaining walls. Concrete walls may be preferred, longer lasting and more appropriate.
3. Upcoming financials - creating of special accounts may be needed to sign to assurances that the work will be overseen and completed. Chris would be the contact person.
4. Possibility of extending the natural gas lines - may be another project to consider.

The Board will meet once again in March to consider proceed with the project. The timeline would be to begin the federal projects/permits. The 30% design would be presented in June. Hoping to have bids ready to go in February, 2026, pending the

receipt of the needed grant funding. This could modify the project. Construction would be done between May and October, 2026.

This will be submitted as an Environment Improvement Project to be submitted to TRPA for approval and possible funding. NCTD will coordinate this effort on behalf of CREGID.

Other sources could be considered including HUD and others. Lake Tahoe Restoration funds may be more readily available.

Chris will be contacted by Mark to further discuss plans for the CREGID meeting to be in February or March.

The Board thanked Megan and Dominique for the outstanding presentation and support.

#### **7. Discussion, nomination, and approval Board Chairperson, Secretary, and Treasurer**

Board Chairperson - nomination of Mark Holmlund was made by Norm - All ayes

Secretary - nomination of Dick Dernbach was made by Mike Smart - All ayes

Treasurer - nomination of Norm Hauge was made by Dick - All ayes

These will be two year terms of office beginning immediately.

Mike Smart has been officially appointed as a Trustee for two year term. All Trustees have been officially sworn in and may participate as full Trustees.

#### **8. Change CREGID bank account(s) for increased returns and changes to signatories**

Marge Hauge provided the history of bank accounts in our local area. All documentation has been submitted to local representative. The Treasurer and one other member will need to meet with the Wells Fargo representative to allow the CREGID to have enhanced interest on accounts. Marge Hauge will remain on the account to advise only. Norm will be the signatory on all transactions. An appointment will be scheduled for a personal meeting. The two appointees from the Board will be allowed to transfer funds between accounts.

Mark made the motion to appoint Norm Hauge and Mike Smart as the two signatories. The motion was seconded by Dick. All ayes.

#### **9. Grant application process-previously discussed**

#### **10. Entrance tree and monument lighting**

The lighting on the tree is in disrepair with very few lights. The estimate is \$18,000 currently for re-lighting the tree. There is a flood light at the base of the tree which could be much less expensive. This may require a determination of whether the bulbs may be burned out. It is unclear as to the condition of the timer/photo sensor on the breaker box. Mark suggested that Perry serves as the "point person" to handle the issues related to the re-lighting of the tree in the most expedient fashion.

Mike made the motion to authorize up to \$2,000 for any costs associated with assessment and re-lighting of the tree. The motion was seconded by Dick. All ayes.

**11. Discussion and approval of road maintenance:  
Retaining walls - previously discussed**

**Drain cleaning-previously discussed**

**Road runoff mitigation-previous discussed**

**Entrance gate**

Dick reviewed the costs of \$16,800 for Eastern Sierra Engineering for the full project. The board previously approved up to \$6,000. Extra expenses could inflate the actual costs up to \$21,000 including \$5,800 for the cost of the scope of the project.

The preliminary (limited proposal cost) would be \$6,000 including \$400 for permits to Douglas County. The gate design has been presented to them. The survey may be required to determine the exact location. Dick will further investigate the obligation of the CREGID for the full costs once engaging this firm for \$5,800. He will further clarify the terms included in this commitment.

There is a two week time frame to accept the terms of the proposal. Dick has the authority to utilize the Board's pre-authorized \$6,000 to sign the agreement with Eastern Sierra Engineering.

**12. General Discussion Not to be Acted On**

Marge Hauge addressed the Board regarding an owner's construction which is illegal. Douglas County has "red tagged" the construction project. The district attorney is now involved. The easement/set-back from the street has been violated as a part of the construction which is in violation for the building code. The CREGID has no jurisdiction in this case.

Mark will follow-up with Ralph Miller to receive the contact list for that CREGID.

Dick formally acknowledged the work of Colin Dawson and Linda Rooney for their support for the CREGID.

Items for the next agenda:

Gate Update

Tree Lighting

Special Meeting to discuss matching funding for projects for erosion and retaining wall retrofits.

**13. ADJOURNMENT**

The motion was made by Dick to adjourn the meeting with a second by Mike. All ayes.

The meeting was adjourned at 3:25pm.

Respectfully submitted,

Dick Dernbach, Secretary  
Cave Rock Estates General Improvement District

January 22, 2025

Richard Dembach  
Cave Rock Estates General Improvement District  
P.O. Box 10426  
Zephyr Cove, NV 89448-2426

**Subject: Initial Engineering Services Agreement for Gate Feasibility**

Dear Richard:

Eastern Sierra Engineering, P.C. (ESE) is pleased to present this agreement to assist the Cave Rock Estates General Improvement District (District) relating to the installation of a motorized gate to control vehicle access to the District. This proposal covers the initial efforts to assist the District in submitting the gate project to the Douglas County Planning Division.

Our scope of services for this initial effort includes the following:

Based on estimated roadway grades and the gate location and cut sheets already provided, we will prepare a drawing in PDF and 11x17 hard copy format showing the gate location, using parcel line information from Douglas County GIS and available aerial photography. This drawing will reflect to the extent feasible requirements placed on the gate installation by applicable agencies based on the District's discussions and meetings with them. The applicable agencies are expected to include Douglas County Community Development, Douglas County Public Works, Tahoe Regional Planning Agency, Nevada Department of Transportation (if there is potential for stacked vehicles to impact US Highway 50), Tahoe Douglas Fire District, and Douglas County Sheriff's Office. In addition to the agency requirements, we will include snow removal requirements on the drawing, as related to ESE by the District.

Upon the District's approval of the drawing, we will assist the District in submitting the gate project to Douglas County Community Development, Planning Division. At this time, we anticipate that the project will require submittal of a Minor Design review application, and that items such as the conceptual drainage and traffic studies, and tax receipt and title report (we assume the gate and related improvements will be located within public right-of-way) will not be required, and that the gate cut sheets already provided to ESE will suffice for floor plan and elevation purposes. We also assume that showing the utility alignment for gate power will suffice for this stage of design, and that the District will submit the application to the County and pay associated fees.

We assume that the District's meetings and discussions with the affected agencies will not require our attendance or participation. We do not intend to perform any utility or subsurface investigations. We assume that power and communication connections are readily available throughout the District's road rights-of-way and will not impact the location of the proposed gate.

Our fee for the scope listed above is \$5,800. We will invoice the District on the basis of time and materials. Additional work outside the above-outlined scope of work shall be billed according to the attached Standard Rates for Technical Services.

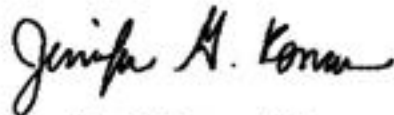
We anticipate that a draft of gate drawing will be submitted to the District within two weeks of receiving the signed agreement. The Minor Design Review package will be delivered within six weeks of receiving the comments from the District on the draft gate drawing.

We estimate that the civil and electrical service engineering and surveying costs associated with the submittal of the building permit application to the Douglas County Building Division will be \$16,800. We assume that there will be minimal comments on the Minor Design Review submittal. We assume that the District will prepare and submit the TRPA application using the information prepared for the minor design review and that comments from the conditional TRPA permit will be incorporated into the building permit submittal for the District to obtain the final TRPA permit. The estimated cost also assumes that the gate manufacturer will provide full design, including structural and electrical design, for the gate and that TRPA will not require visual evaluation or simulations.

ESE currently maintains a policy of professional liability insurance.

We greatly appreciate the opportunity to provide this proposal and we look forward to working with you on this project. If you have any questions or comments, or require additional information, please contact me at [jroman@esengr.com](mailto:jroman@esengr.com) or (775) 902-8157.

Sincerely,  
EASTERN SIERRA ENGINEERING, P.C.



Jennifer G. Roman, PE  
Principal Engineer

Enclosures: General Conditions  
2025 Standard Rates for Technical Services

Client agrees to the Scope of Work described in this proposal and the General Conditions attached and incorporated herein.

By: Richard Dernbach  
Printed

Richard Dernbach  
Signature

Owner/Agency: Cave Rock Estates GID

Title: Secretary

Date: 02/02/2025 Phone: 775 721 2212

Email: Truckspan@AOL.com



# Technical Memorandum



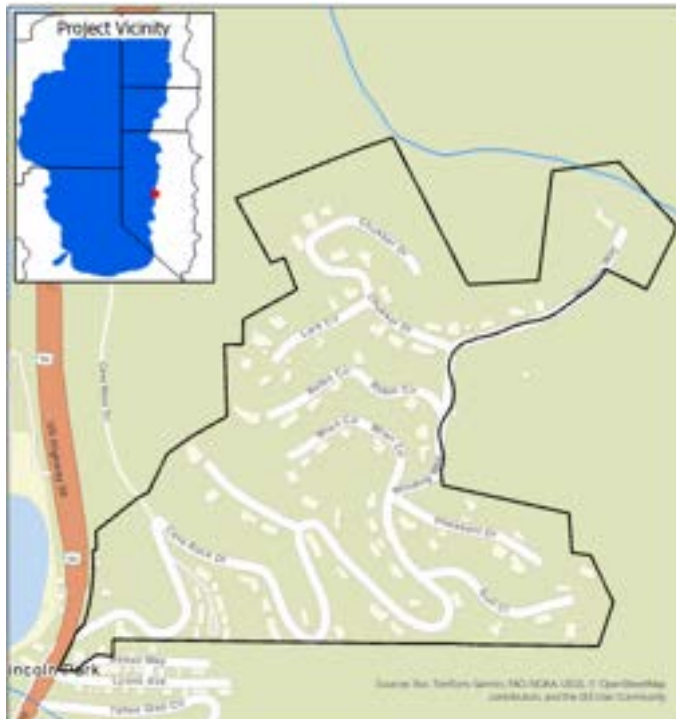
To: Chris LaCasse, Nevada Division of State Lands  
From: Nevada Tahoe Conservation District  
Date: 12/4/2024  
Re: Cave Rock General Improvement District Existing Conditions Assessment Memo

The Cave Rock Estates stormwater system was constructed in 1991 as an Environmental Improvement Project with funding from the USFS and the Nevada Division of State Lands (NDSL). A subsequent water quality improvement project to address source control and erosion issues was completed in 2004, and the detention basin at the entrance to the neighborhood was retrofitted with subsurface draining capacity in 2015. The Cave Rock General Improvement District (CRGID) is responsible for neighborhood stormwater maintenance and contributed to both previous projects.

Currently, seasonal drainages modified by historical development have led to sediment overflow and erosion concerns on NDSL and CRGID properties. NDSL will grant the CRGID funds to hire the Nevada Tahoe Conservation District to prepare a detailed hydrology concept plan identifying conveyance issues, solutions to deficiencies in the existing stormwater system, and potential areas recommended for renovation and retrofitting, such as retaining walls.

## PROJECT LOCATION

The Cave Rock General Improvement District is located within Douglas County, in Zephyr Cove, Nevada. The nearest cross streets are Highway 50 and Cave Rock Drive. See Figure 1 below for Project vicinity.



**Figure 1. Project Area Location.**

# Technical Memorandum



## CATCHMENTS

The watershed area and sub-watersheds (or catchments) were delineated by NTCD using 2010 USGS 1 foot LiDAR and ESRI ArcGIS Pro 3.4.0 software. Catchments were then refined to incorporate the effects of the existing drainage system throughout the neighborhood. Field verification served as verification to the catchment delineation. Figure 2 displays the catchment boundaries and outfall locations for the existing condition. There are five stormwater outfalls in the Project area. All stormwater discharges to the bedfilter basin near the bottom of the catchment (Outfall 1) except for stormwater from catchments 2, 3, 4 and 5 (or Outfalls 2, 3, 4 and 5). The largest catchment is 1A with approximately 49 acres and 1C is the second largest catchment at 14 acres. Both catchments include large acreage of non-urban forested upland. All catchments are steep, with the roads abutted by wood and concrete retaining walls to help terrace the roads, leaving little opportunities for stormwater collection and infiltration improvements.

The contributing watershed to the Cave Rock GID is approximately 111 acres. The watershed was divided into seventeen (17) existing catchments based on outlets and areas of concern. The catchments will assist with design calculations during future planning. The bedfilter basin near the bottom of the neighborhood is large enough to treat all stormwater runoff from the neighborhood. Thus, addressing erosion issues and redirecting flow to the bedfilter basin will encompass the majority of design planning work for the Cave Rock GID Water Quality Improvement Project.

## EXISTING CONDITIONS: AREAS OF CONCERN

NTCD performed a field visit to locate all potential erosion and hillslope failures within the CRGID boundary. NTCD noted seventeen (17) areas of concern to consider for design improvements. The following 17 areas are ranked in order of concern based on NTCD's visual observations. Each area of concern includes a photo(s), brief description of the issue, a potential retrofit to resolve the issue, and potential next steps (if needed). Figure 3 shows the areas of concern within the Cave Rock GID.

# Technical Memorandum

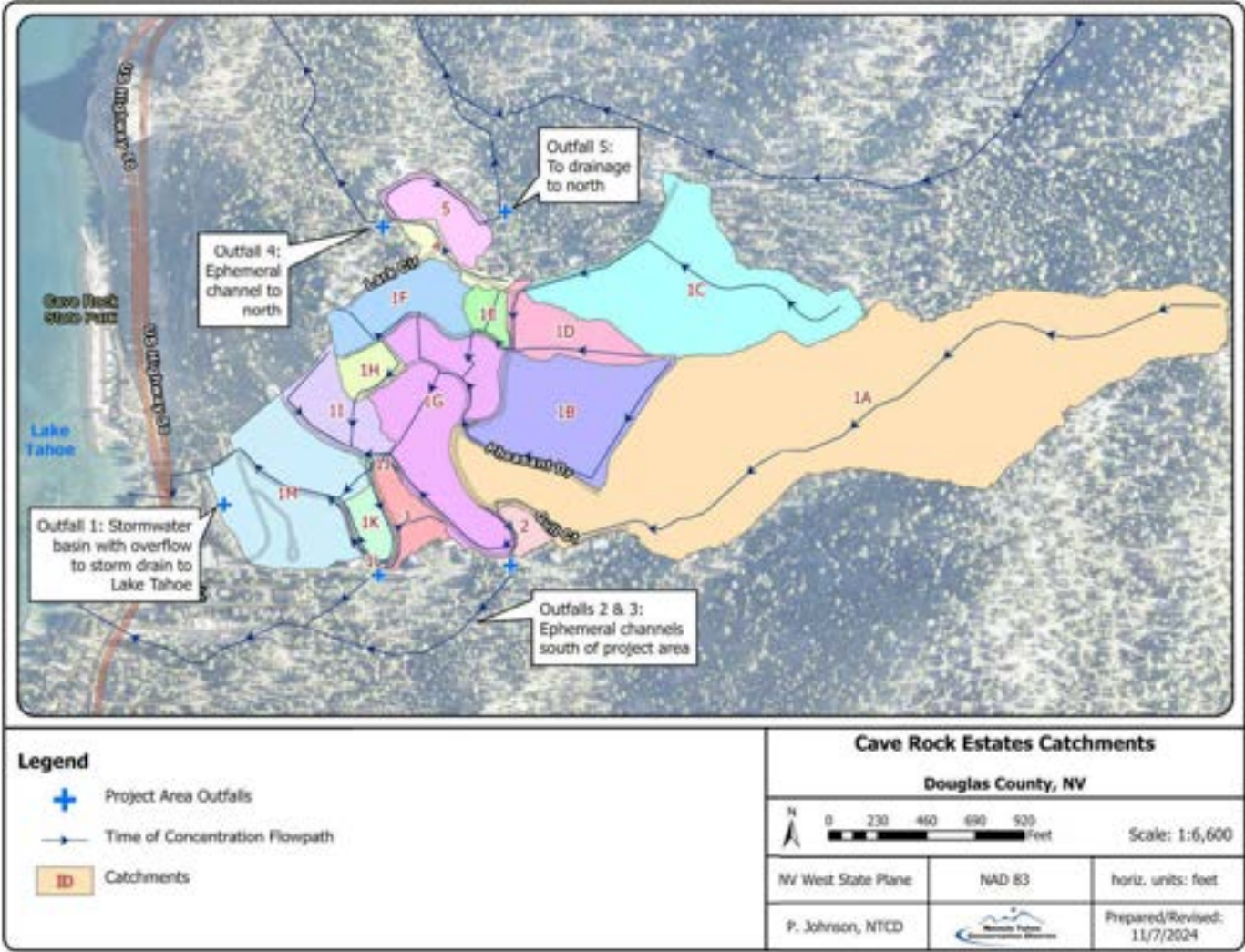


Figure 2. Cave Rock Estates Catchments for the Cave Rock General Improvement District Water Quality Improvement Project.



# Technical Memorandum

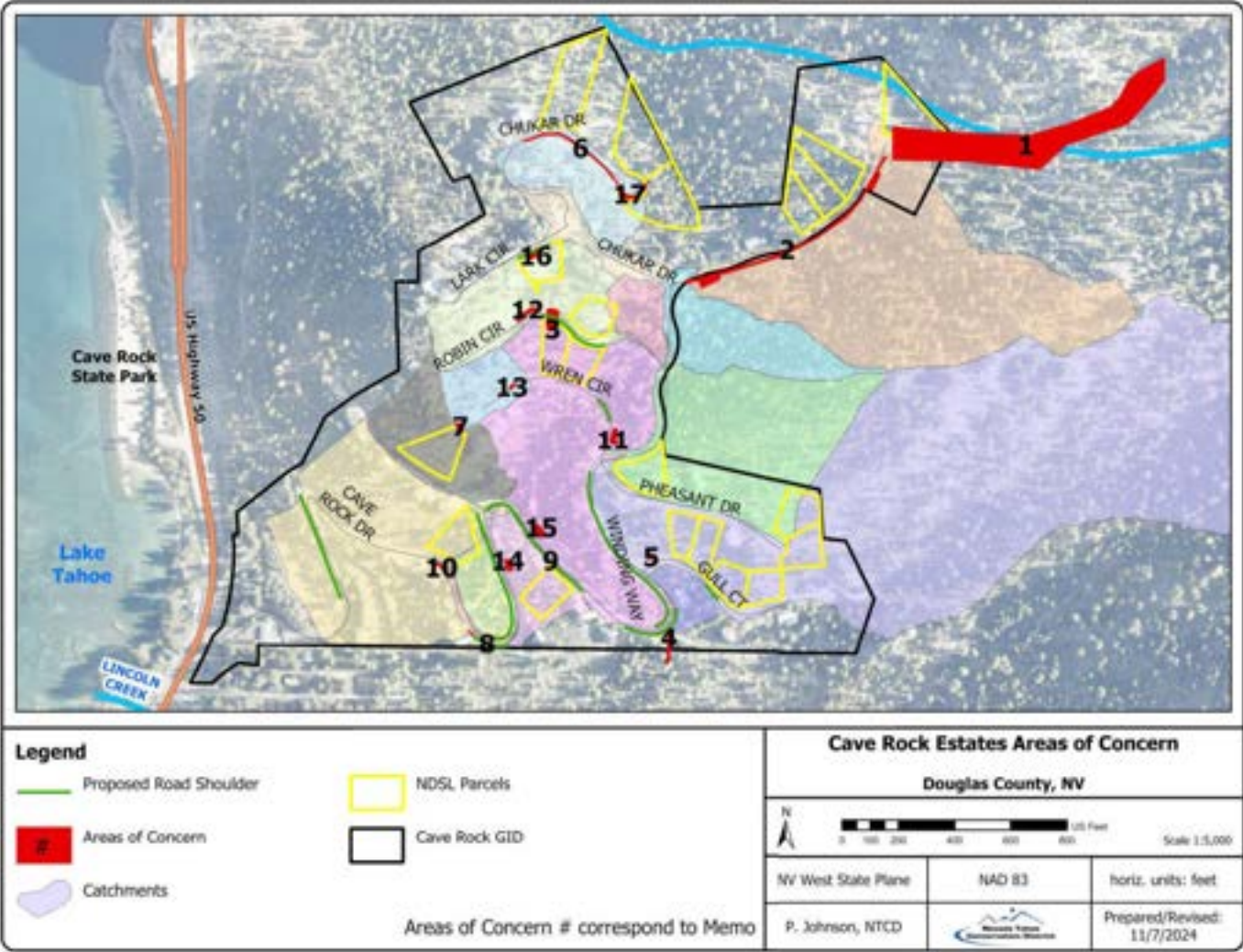


Figure 3. Cave Rock Estates Areas of Concern

# Technical Memorandum



## Area of Concern #1



### Issue:

When the neighborhood was designed, a road grade was installed on a US Forest Service parcel (APN 1418-27-812-010) to continue building homes off the cul de sac of Winding Way/Crane Court. The road grade has become a hiking trail and runoff is eroding the trail, eroding NDSL parcel (APN 1418-27-712-016 or Tahoe 486-0), and eroding the Winding Way/Crane Court roadside ditch. The CRGID has installed coir logs, water bars and two dirt drainage ditches on NDSL property to alleviate the stormwater runoff onto Winding Way/Crane Court.

### Retrofit:

Remove the road grade and revegetate the area, using coir logs to stabilize the site. Remove and restore the 1-foot wide and 1-foot-deep dirt drainage ditches with rock lined drainage ditches and add water bars where necessary to convey runoff.



# Technical Memorandum



## Area of Concern #2



### Issue:

Eroding hillslope into the Winding Way/Crane Court roadside ditch

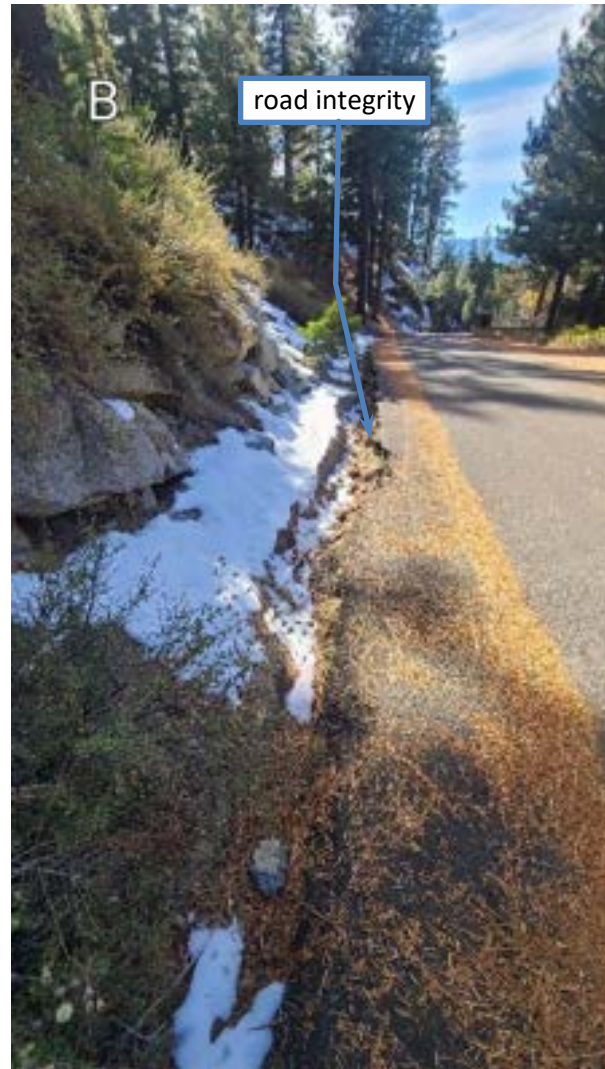
### Retrofit:

Remove excess sediment at base of slope, stabilize slope with coir logs and erosion control blankets.

# Technical Memorandum



eroding ditch



road integrity

## Issue:

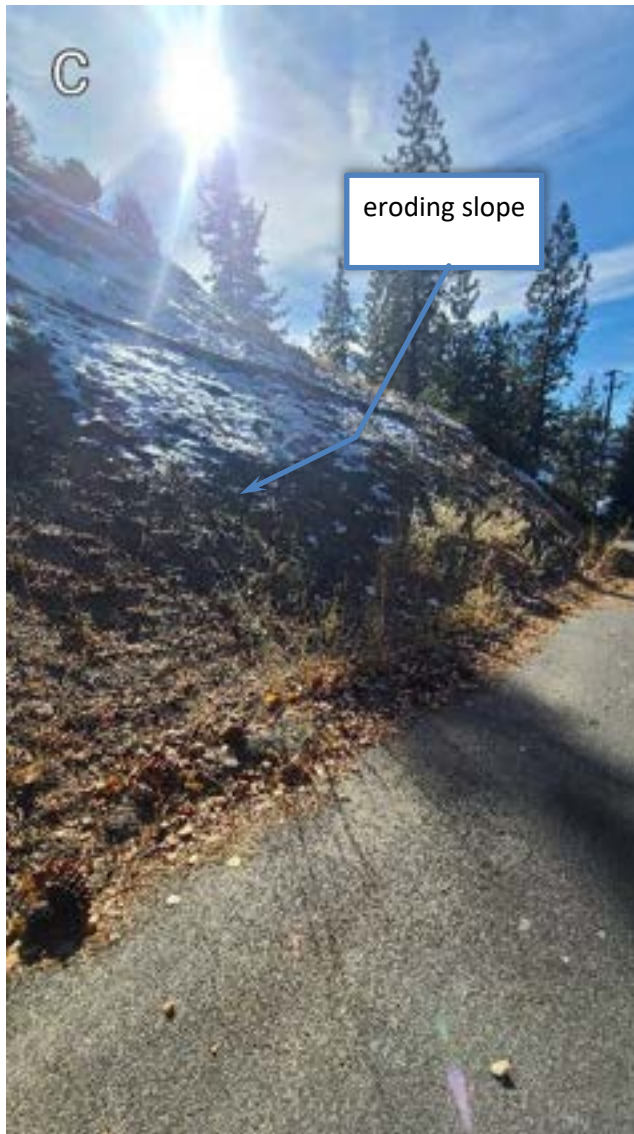
Upland road grade and Winding Way/Crane Court road runoff is eroding roadside ditch, compromising integrity of the road itself.

## Retrofit:

Regrade the ditch, rock line the ditch, and install a series of sediment cans to reduce maintenance on the ditch.



# Technical Memorandum

**Issue:**

Eroding hillslope into the Winding Way/Crane Court roadside ditch. Old coir logs and green plastic netting visible from previous attempt to stabilize slope

**Retrofit:**

Remove excess sediment at base of slope, stabilize slope with coir logs and erosion control blankets, install rock lined ditch along roadside. 4-foot concrete retaining suggested to stabilize slope and prevent debris from clogging the roadside ditch.



# Technical Memorandum



## Area of Concern #3



### Issue:

Robin Circle road runoff is not accumulating at the drainage inlet and conveyance pipe along the inside of the road, probably due to the pipe being clogged. The outside of the road has no AC berm (curb & gutter), so when road runoff accumulates, it is discharging down the natural hillslope, NDSL parcel (APN 1418-27-810-007). The hillslope has a 5-foot headcut which could compromise the road integrity and the 12" CMP conveyance pipe outlet cannot be located.

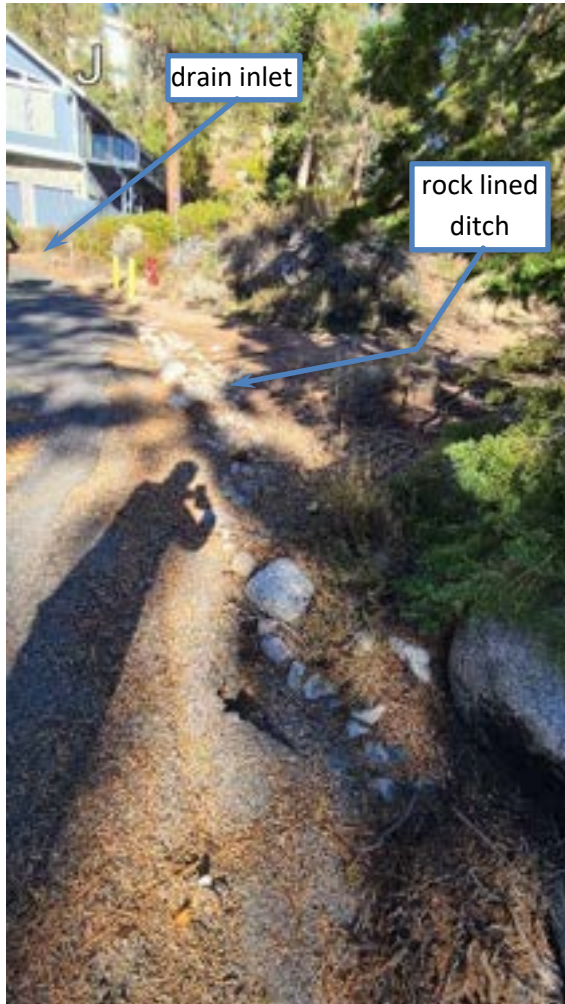
### Retrofit:

Replace the drainage inlet with a sediment can equipped with sump and install a new conveyance pipe. Perform a hydrologic analysis to determine the appropriate placement for the sediment can and pipe size, adding a rock line ditch below the conveyance pipe outlet. Restore the 5-foot headcut with native fill/rocks, revegetate the hillslope and stabilize it with coir logs and erosion control blanket. If all road runoff is directed to the sediment can, the road integrity should be fine. If not, then install rolled curb & gutter on the outside of the road to prevent hillslope and road damage.

# Technical Memorandum



## Area of Concern #4



### Issue:

Winding Way road runoff overwhelms or bypasses the drainage inlet on Winding Way and is eroding the roadside. The existing rock lined ditch has been filled in with debris and is no longer functioning as designed. Eventually the runoff reaches a hillside and it is causing erosion near the hiking trails and onto a US Forest Service parcel (APN 1418-00-002-009).

### Retrofit:

1. Install a double catch basin with sump to increase runoff and large debris retention
2. Add vertical L curb & gutter to redirect runoff back to Winding Way
3. Reestablish the rock lined ditch behind the curb & gutter
4. Revegetate the area and stabilize the slope with coir logs and erosion control blankets, both private and USFS parcel



# Technical Memorandum



## **Issue:**

Road runoff is eroding the hillslope on private and US Forest Service parcel (APN 1418-00-002-009).

## **Retrofit:**

Due to steep slopes and no equipment access route to the drainage route, slope stabilization using coir logs and erosion control blankets where possible are the best retrofit option. Stormwater infrastructure along Winding Way should alleviate the amount of runoff onto the parcels and the slope stabilization should help aggregate material in the drainage routes.

# Technical Memorandum



path of erosion



**Issue:**

Missing AC berm and railroad ties along Winding Way allow road runoff to exit the road and flow down the hillslope creating erosion at 1339 Winding Way.

**Retrofit:**

Install new L vertical curb and gutter to keep road runoff flowing down Winding Way

# Technical Memorandum



## Area of Concern #5



### Issue:

Failing 3-foot wood retaining wall along Gull Court

### Retrofit:

Remove excess sediment from hillslope collapse, replace rocks and install concrete retaining wall



# Technical Memorandum



## Area of Concern #6



### Issue:

Chukar Drive road runoff is eroding the roadside ditch and compromising the road integrity

### Retrofit:

Regrade the ditch, reestablish and install new rock line ditch, and then install a series of sediment cans to reduce ditch maintenance. Revegetate and install slope stabilization on cut hillslopes.

# Technical Memorandum



## Area of Concern #7



### Issue:

Wren Circle road runoff accumulates and discharges off the end of the cul de sac creating hillslope erosion onto an NDSL parcel (APN 1418-27-810-014).

### Retrofit:

Add rock, creating a small settling area, and coir logs to attenuate the road runoff flow.

# Technical Memorandum



## Area of Concern #8



### Issue:

Cave Rock Drive road runoff bypasses or overwhelms the drainage inlet, continues downhill bypassing the old AC berm and is eroding the hillslope onto USFS parcel (APN 1418-00-002-009).

### Retrofit:

Install a double catch basin with sump along with vertical curb and gutter. The double catch basin will attenuate the flow and large debris, and the vertical curb and gutter will convey the road runoff to the double catch basin. The vertical curb and gutter below the double catch basin will prevent runoff eroding the USFS parcel hillslope by keeping the runoff moving down Cave Rock Drive.

# Technical Memorandum



## Issue:

Cave Rock Drive road runoff conveys along the edge of the road into an AC swale at 1322 Cave Rock Drive. If the runoff overtops the AC swale, the runoff will pond on 1322 Cave Rock Drive's driveway until it ponds deep enough to continue flowing downhill along the road edge. NTCD believes a homeowner and/or CRGID discussion is warranted to reveal any issues at this parcel, which could result in additional stormwater infrastructure not included in the cost estimate.

## Retrofit:

Ideally convey all Cave Rock Drive road runoff to the other side of the road. If not possible, perhaps the homeowner/CRGID discussion reveals a solution for an engineer to design.



# Technical Memorandum



## Area of Concern #9



### Issue:

After AC berm along Winding Way ends, the Winding Way road runoff discharges onto 1331 Winding Way, eroding the slope and flooding the home on the property. The property owner constructed a rock line swale to attenuate the flow and route the runoff away from the home foundation.

### Retrofit:

Install rolled curb and gutter down the length of Winding Way to the Cave Rock Drive intersection.

# Technical Memorandum



## Area of Concern #10



### Issue:

The AC berm is failing at 1318 Cave Rock Drive and road runoff is eroding the hillslope, with potential to flood the property.

### Retrofit:

Install rolled curb & gutter to convey road runoff to a new catch basin (with sump) and conveyance pipe. The conveyance pipe will cross Cave Rock Drive and tie into the existing drainage inlet and conveyance pipe. Depending on hydrologic analysis, the existing conveyance pipe running the length of Cave Rock Drive may have to be upsized to accommodate additional road runoff.

# Technical Memorandum



## Area of Concern #11



### Issue:

Road runoff from Winding Way and Pheasant Drive is conveyed into a drainage inlet which discharges to an asphalt curb on Wren Circle. The asphalt curb routes the runoff to a small basin. When the basin fills, the runoff overflows into a rock lined ditch along Wren Circle. Unfortunately, the 1354 Winding Way homeowner accesses the propane tank on the property at this location and drives over the rock lined ditch, which has compromised the ditch. Runoff now flows down Wren Circle creating a freeze/thaw condition over the road and is creating hillslope erosion at 285 Wren Circle due to an old failing AC berm.

### Retrofit:

Install new AC berm along Wren Circle and reestablish the rock lined ditch. Installing a driveway conveyance pipe (or larger ditch easily accessible for large vehicles) for access to the 1354 Winding Way property owner's propane tank will reduce maintenance on the rock lined channel.



# Technical Memorandum



**Issue:**

Small basin on Wren Circle is overwhelmed with runoff.

**Retrofit:**

Perform maintenance on the small basin to increase capacity and reestablish the rock lined ditch.



# Technical Memorandum



## Area of Concern #12



### Issue:

Failing 3-foot wood retaining wall along Robin Circle

### Retrofit:

Remove excess sediment from hillslope collapse and replace the wood retaining wall with a concrete retaining wall.

# Technical Memorandum



## Area of Concern #13



failing retaining wall

### Issue:

Failing 3-foot wood retaining wall along Wren Circle

### Retrofit:

Remove excess sediment from hillslope collapse, rebuild and replace the rock stabilization and install a concrete retaining wall.

# Technical Memorandum



## Area of Concern #14



### Issue:

Eroded hillslope above 3-foot wood retaining wall along Cave Rock Drive.

### Retrofit:

Remove excess sediment from hillslope collapse, revegetate the hillslope and stabilize the slope with erosion control blanket and coir logs.

# Technical Memorandum



## Area of Concern #15



### Issue:

Eroded hillslope above 4-foot wood retaining wall along Cave Rock Drive.

### Retrofit:

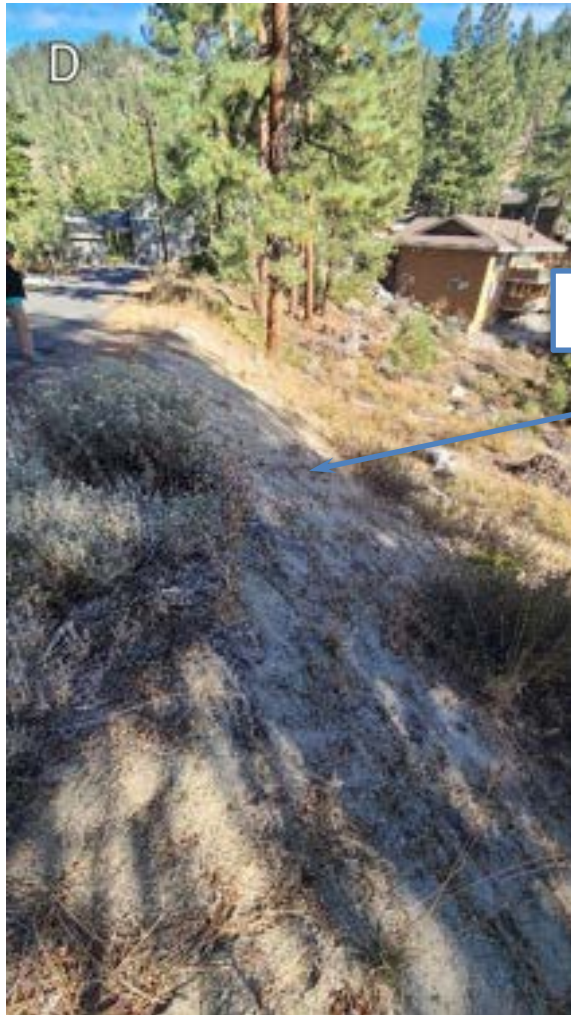
Remove excess sediment from hillslope collapse, revegetate the hillslope and stabilize the slope with erosion control blanket and coir logs.



# Technical Memorandum



## Area of Concern #16



### Issue:

Lark Circle road runoff converges at low point and discharges onto NDSL property (APN 1418-27-710-002); minimal erosion rills

### Retrofit:

Install AC berm (or rolled curb and gutter) along Lark Circle, revegetate the hillslope and stabilize the hillslope with coir logs and erosion control blankets.

# Technical Memorandum



## Area of Concern #17



### Issue:

Chukar Drive road runoff and hillslope runoff pond in cul de sac, then overflows onto NDSL property (APN 1418-27-712-007) creating minimal erosion.

### Retrofit:

Establish a rock lined ditch around the cul de sac and drainage route onto the NDSL parcel along with slope revegetation and stabilization with coir logs and erosion control blankets. Implementing the Area of Concern #6 may alleviate this issue as well.

# Technical Memorandum



## ENGINEER'S COST ESTIMATE FOR IMPLEMENTATION

The following Table 1 provides an engineer's cost estimate per Area of Concern based on NTCD's field observations of the Cave Rock Estates neighborhood. An in-depth engineering analysis should be performed to validate the areas of concern, the proposed retrofit solutions, and the engineer's cost estimate per area.

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**Table 1. Engineer's Cost Estimate per Area of Concern.**

| <b>Cave Rock GID WQIP</b><br><b>Quick Engineers Estimate</b><br><i>(for budget purposes only)</i><br>11/27/24 |                                                     |      |           |          |                   |
|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------|-----------|----------|-------------------|
| Item #                                                                                                        | Item Description                                    | Unit | Unit Cost | Quantity | Value             |
| 1                                                                                                             | Remove road grade (1400LF)                          | SF   | \$2       | 16800    | \$ 33,600         |
|                                                                                                               | Rock line the drainages                             | SF   | \$20      | 50       | \$ 1,000          |
|                                                                                                               | Install water bars (every 200LF)                    | EA   | \$500     | 7        | \$ 3,500          |
|                                                                                                               | Road revegetation (seed)                            | SF   | \$2       | 16800    | \$ 33,600         |
|                                                                                                               | Mobilization/Demobilization (10%)                   |      |           |          | \$ 7,170          |
|                                                                                                               | Temporary Erosion Controls (3%)                     |      |           |          | \$ 2,151          |
|                                                                                                               | <b>Sub-Total</b>                                    |      |           |          | <b>\$ 81,021</b>  |
| 2                                                                                                             | Large rock, slope stabilization, dirt offhaul       | CY   | \$50      | 745      | \$ 37,272         |
|                                                                                                               | Rock line the ditch                                 | SF   | \$20      | 3000     | \$ 60,000         |
|                                                                                                               | Sediment cans                                       | EA   | \$8,000   | 2        | \$ 16,000         |
|                                                                                                               | Retaining wall for sediment cans                    | LF   | \$600     | 20       | \$ 12,000         |
|                                                                                                               | Slope revegetation (seed)                           | SF   | \$2       | 6700     | \$ 13,400         |
|                                                                                                               | Stabilize slope (coir logs/erosion control blanket) | SF   | \$10      | 3500     | \$ 35,000         |
|                                                                                                               | 4ft concrete retaining wall                         | LF   | \$600     | 115      | \$ 69,000         |
|                                                                                                               | Road repair                                         | LF   | \$60      | 135      | \$ 8,100          |
|                                                                                                               | Mobilization/Demobilization (10%)                   |      |           |          | \$ 25,077         |
|                                                                                                               | Temporary Erosion Controls (3%)                     |      |           |          | \$ 7,523          |
|                                                                                                               | <b>Sub-Total</b>                                    |      |           |          | <b>\$ 283,373</b> |
| 3                                                                                                             | Sediment can                                        | EA   | \$8,000   | 1        | \$ 8,000          |
|                                                                                                               | Replace 12" CMP pipe (increase size)                | LF   | \$300     | 35       | \$ 10,500         |
|                                                                                                               | Rock line ditch below CMP pipe                      | SF   | \$20      | 150      | \$ 3,000          |
|                                                                                                               | Hillslope repair (native fill/rocks)                | SF   | \$20      | 750      | \$ 15,000         |
|                                                                                                               | Slope revegetation (seed)                           | SF   | \$2       | 100      | \$ 200            |
|                                                                                                               | Stabilize slope (coir logs/erosion control blanket) | SF   | \$10      | 100      | \$ 1,000          |
|                                                                                                               | Road repair <sup>1</sup>                            | LF   | \$60      | 50       | \$ 3,000          |
|                                                                                                               | Rolled curb & gutter <sup>2</sup>                   | LF   | \$60      | 200      | \$ 12,000         |
|                                                                                                               | Mobilization/Demobilization (10%)                   |      |           |          | \$ 5,270          |
|                                                                                                               | Temporary Erosion Controls (3%)                     |      |           |          | \$ 1,581          |
|                                                                                                               | <b>Sub-Total</b>                                    |      |           |          | <b>\$ 59,551</b>  |
| 1- road repair not necessary as of 11/26/2024                                                                 |                                                     |      |           |          |                   |
| 2- if drainage report shows all water can flow to sediment can, then rolled CG not necessary                  |                                                     |      |           |          |                   |



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| <b>Cave Rock GID WQIP</b><br><b>Quick Engineers Estimate (continued)</b><br><b>(for budget purposes only)</b><br>11/25/24 |                                                     |    |          |     |                   |
|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----|----------|-----|-------------------|
|                                                                                                                           |                                                     |    |          |     |                   |
| 4                                                                                                                         | Vertical curb & gutter                              | LF | \$50     | 240 | \$ 12,000         |
|                                                                                                                           | Double Type 4R Catch Basin w/ sump                  | EA | \$12,000 | 1   | \$ 12,000         |
|                                                                                                                           | Reestablish rock lined ditch                        | SF | \$60     | 240 | \$ 14,400         |
|                                                                                                                           | Rock/tree fall revegetation <sup>3</sup>            | EA | \$300    | 3   | \$ 900            |
|                                                                                                                           | Drainage revegetation 50LF                          | SF | \$2      | 200 | \$ 400            |
|                                                                                                                           | Drainage revegetation 150LF onto USFS               | SF | \$2      | 600 | \$ 1,200          |
|                                                                                                                           | Stabilize slope (coir logs/erosion control blanket) | SF | \$10     | 600 | \$ 6,000          |
|                                                                                                                           | Mobilization/Demobilization (10%)                   |    |          |     | \$ 4,690          |
|                                                                                                                           | Temporary Erosion Controls (3%)                     |    |          |     | \$ 1,407          |
|                                                                                                                           | <b>Sub-Total</b>                                    |    |          |     | <b>\$ 52,997</b>  |
| 5                                                                                                                         | Large rock, slope stabilization, dirt offhaul       | CY | \$50     | 170 | \$ 8,483          |
|                                                                                                                           | 4ft concrete retaining wall                         | LF | \$6,000  | 50  | \$ 300,000        |
|                                                                                                                           | Mobilization/Demobilization (10%)                   |    |          |     | \$ 30,848         |
|                                                                                                                           | Temporary Erosion Controls (3%)                     |    |          |     | \$ 9,255          |
|                                                                                                                           | <b>Sub-Total</b>                                    |    |          |     | <b>\$ 348,586</b> |
| 6                                                                                                                         | Large rock, slope stabilization, dirt offhaul       | CY | \$50     | 70  | \$ 3,483          |
|                                                                                                                           | Rock line the ditch                                 | SF | \$60     | 900 | \$ 54,000         |
|                                                                                                                           | Sediment cans                                       | EA | \$8,000  | 2   | \$ 16,000         |
|                                                                                                                           | Retaining wall for sed cans                         | LF | \$600    | 20  | \$ 12,000         |
|                                                                                                                           | Slope revegetation (seed)                           | SF | \$2      | 450 | \$ 900            |
|                                                                                                                           | Stabilize slope (coir logs/erosion control blanket) | SF | \$10     | 450 | \$ 4,500          |
|                                                                                                                           | Road repair                                         | LF | \$60     | 100 | \$ 6,000          |
|                                                                                                                           | Mobilization/Demobilization (10%)                   |    |          |     | \$ 9,688          |
|                                                                                                                           | Temporary Erosion Controls (3%)                     |    |          |     | \$ 2,907          |
|                                                                                                                           | <b>Sub-Total</b>                                    |    |          |     | <b>\$ 109,478</b> |
| 7                                                                                                                         | Rock line the basin/channel                         | SF | \$60     | 60  | \$ 3,600          |
|                                                                                                                           | Stabilize slope (coir logs/erosion control blanket) | SF | \$10     | 60  | \$ 600            |
|                                                                                                                           | Mobilization/Demobilization (10%)                   |    |          |     | \$ 420            |
|                                                                                                                           | Temporary Erosion Controls (3%)                     |    |          |     | \$ 126            |
|                                                                                                                           | <b>Sub-Total</b>                                    |    |          |     | <b>\$ 4,746</b>   |
| 8                                                                                                                         | Double Type 4R Catch Basin w/ sump                  | EA | \$20,000 | 1   | \$ 20,000         |
|                                                                                                                           | Vertical curb & gutter                              | LF | \$50     | 125 | \$ 6,250          |
|                                                                                                                           | Driveway conveyance pipe <sup>4</sup>               | LF | \$200    | 40  | \$ 8,000          |
|                                                                                                                           | Concrete swale                                      | LF | \$75     | 15  | \$ 1,125          |
|                                                                                                                           | Mobilization/Demobilization (10%)                   |    |          |     | \$ 3,538          |
|                                                                                                                           | Temporary Erosion Controls (3%)                     |    |          |     | \$ 1,061          |
|                                                                                                                           | <b>Sub-Total</b>                                    |    |          |     | <b>\$ 39,974</b>  |
| 3- use rock/tree removed from site for drainage improvements                                                              |                                                     |    |          |     |                   |
| 4- 1322 Cave Rock Drive homeowner driveway appears to receive road runoff, ask homeowner if it an issue                   |                                                     |    |          |     |                   |

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| <b>Cave Rock GID WQIP</b>                   |                                                     |    |          |      |                   |
|---------------------------------------------|-----------------------------------------------------|----|----------|------|-------------------|
| <b>Quick Engineers Estimate (continued)</b> |                                                     |    |          |      |                   |
| <i>(for budget purposes only)</i>           |                                                     |    |          |      |                   |
| 11/25/24                                    |                                                     |    |          |      |                   |
|                                             |                                                     |    |          |      |                   |
| 9                                           | Rolled Curb & Gutter                                | LF | \$60     | 500  | \$ 30,000         |
|                                             | Mobilization/Demobilization (10%)                   |    |          |      | \$ 3,000          |
|                                             | Temporary Erosion Controls (3%)                     |    |          |      | \$ 900            |
|                                             | <b>Sub-Total</b>                                    |    |          |      | <b>\$ 33,900</b>  |
| 10                                          | Rolled Curb & Gutter                                | LF | \$60     | 150  | \$ 9,000          |
|                                             | Type 4R Catch Basin w/ sump                         | EA | \$12,000 | 1    | \$ 12,000         |
|                                             | 18" CMP                                             | LF | \$300    | 35   | \$ 10,500         |
|                                             | Upsize 18" CMP to 24" CMP down Cave Rock Dr.        | LF | \$350    | 536  | \$ 187,600        |
|                                             | Mobilization/Demobilization (10%)                   |    |          |      | \$ 21,910         |
|                                             | Temporary Erosion Controls (3%)                     |    |          |      | \$ 6,573          |
|                                             | <b>Sub-Total</b>                                    |    |          |      | <b>\$ 247,583</b> |
| 11                                          | Basin Maintenance (250 SF)                          | EA | \$4,111  | 1    | \$ 4,111          |
|                                             | Reestablish rock lined ditch                        | SF | \$60     | 540  | \$ 32,400         |
|                                             | Driveway conveyance pipe                            | LF | \$200    | 25   | \$ 5,000          |
|                                             | AC Berm                                             | LF | \$20     | 150  | \$ 3,000          |
|                                             | Mobilization/Demobilization (10%)                   |    |          |      | \$ 4,451          |
|                                             | Temporary Erosion Controls (3%)                     |    |          |      | \$ 1,335          |
|                                             | <b>Sub-Total</b>                                    |    |          |      | <b>\$ 50,298</b>  |
| 12                                          | Large rock, slope stabilization, dirt offhaul       | CY | \$50     | 225  | \$ 11,261         |
|                                             | 4ft concrete retaining wall                         | LF | \$600    | 100  | \$ 60,000         |
|                                             | Mobilization/Demobilization (10%)                   |    |          |      | \$ 7,126          |
|                                             | Temporary Erosion Controls (3%)                     |    |          |      | \$ 2,138          |
|                                             | <b>Sub-Total</b>                                    |    |          |      | <b>\$ 80,525</b>  |
| 13                                          | Large rock, slope stabilization, dirt offhaul       | CY | \$50     | 225  | \$ 11,261         |
|                                             | 4ft concrete retaining wall                         | LF | \$600    | 100  | \$ 60,000         |
|                                             | Mobilization/Demobilization (10%)                   |    |          |      | \$ 7,126          |
|                                             | Temporary Erosion Controls (3%)                     |    |          |      | \$ 2,138          |
|                                             | <b>Sub-Total</b>                                    |    |          |      | <b>\$ 80,525</b>  |
| 14                                          | Large rock, slope stabilization, dirt offhaul       | CY | \$50     | 135  | \$ 6,767          |
|                                             | Slope revegetation (seed)                           | SF | \$2      | 2400 | \$ 4,800          |
|                                             | Stabilize slope (coir logs/erosion control blanket) | SF | \$10     | 2400 | \$ 24,000         |
|                                             | Mobilization/Demobilization (10%)                   |    |          |      | \$ 3,557          |
|                                             | Temporary Erosion Controls (3%)                     |    |          |      | \$ 1,067          |
|                                             | <b>Sub-Total</b>                                    |    |          |      | <b>\$ 40,190</b>  |

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| <b>Cave Rock GID WQIP</b>                   |                                                     |    |      |      |                     |
|---------------------------------------------|-----------------------------------------------------|----|------|------|---------------------|
| <b>Quick Engineers Estimate (continued)</b> |                                                     |    |      |      |                     |
| <i>(for budget purposes only)</i>           |                                                     |    |      |      |                     |
| 11/25/24                                    |                                                     |    |      |      |                     |
|                                             |                                                     |    |      |      |                     |
| 15                                          | Large rock, slope stabilization, dirt offhaul       | CY | \$50 | 70   | \$ 3,483            |
|                                             | Slope revegetation (seed)                           | SF | \$2  | 1200 | \$ 2,400            |
|                                             | Stabilize slope (coir logs/erosion control blanket) | SF | \$10 | 1200 | \$ 12,000           |
|                                             | Mobilization/Demobilization (10%)                   |    |      |      | \$ 1,788            |
|                                             | Temporary Erosion Controls (3%)                     |    |      |      | \$ 537              |
|                                             | <b>Sub-Total</b>                                    |    |      |      | <b>\$ 20,208</b>    |
| 16                                          | AC berm (or rolled CG)                              | LF | \$60 | 250  | \$ 15,000           |
|                                             | Slope revegetation (seed)                           | SF | \$2  | 500  | \$ 1,000            |
|                                             | Stabilize slope (coir logs/erosion control blanket) | SF | \$10 | 500  | \$ 5,000            |
|                                             | Mobilization/Demobilization (10%)                   |    |      |      | \$ 2,100            |
|                                             | Temporary Erosion Controls (3%)                     |    |      |      | \$ 630              |
|                                             | <b>Sub-Total</b>                                    |    |      |      | <b>\$ 23,730</b>    |
| 17                                          | Rock line ditch and drainage                        | SF | \$60 | 450  | \$ 27,000           |
|                                             | Slope revegetation (seed)                           | SF | \$2  | 1500 | \$ 3,000            |
|                                             | Stabilize slope (coir logs/erosion control blanket) | SF | \$10 | 1500 | \$ 15,000           |
|                                             | Mobilization/Demobilization (10%)                   |    |      |      | \$ 4,500            |
|                                             | Temporary Erosion Controls (3%)                     |    |      |      | \$ 1,350            |
|                                             | <b>Sub-Total</b>                                    |    |      |      | <b>\$ 50,850</b>    |
| <b>Total</b>                                |                                                     |    |      |      | <b>\$ 1,607,535</b> |
| <b>20% Contingency</b>                      |                                                     |    |      |      | <b>\$ 1,929,042</b> |

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## NEXT STEPS: PHASE 1- PLANNING, PERMITTING AND DESIGN

While NTCD's field analysis revealed areas of concern for the Cave Rock Estates neighborhood, and this Memo provides retrofit solutions, an in-depth engineering analysis should be performed as Phase I of the Cave Rock GID WQIP to reinforce all areas of concern were identified and the retrofit solutions proposed are reasonable. Phase I of the Cave Rock GID WQIP includes Planning, Permitting and Design with a \$345,230 estimated budget (Table 2 below). Phase II of the Project includes implementation for construction at an estimated \$1,969,024, including a 20% contingency, materials testing and NTCD construction management. Table 1 above is an engineer's estimate for construction of each known area of concern and Table 3 below shows the overall cost breakdown for Phase II- Implementation.



# Technical Memorandum



Table 2. Phase I- Planning, Permitting and Design Budget.

| Cave Rock GID Water Quality Improvement Project Budget, December 2024 |             |             |                              |                     |              |
|-----------------------------------------------------------------------|-------------|-------------|------------------------------|---------------------|--------------|
| PHASE I- Planning, Permitting & Design                                |             |             |                              |                     |              |
| Category                                                              | Total Hours | Rate        | NDSL Funds                   | Total Cash Budget   | Total Budget |
| Senior Project Engineer                                               | 426         | up to \$110 | \$46,860.00                  | \$46,860.00         | \$46,860.00  |
| Project Engineer                                                      | 604         | up to \$70  | \$42,280.00                  | \$42,280.00         | \$42,280.00  |
| Staff Engineer                                                        | 772         | up to \$63  | \$48,636.00                  | \$48,636.00         | \$48,636.00  |
| ES IV/III                                                             | 354         | up to \$85  | \$30,090.00                  | \$30,090.00         | \$30,090.00  |
| Wages (salary and fringe)                                             |             |             | \$167,866.00                 | <b>\$167,866.00</b> | \$167,866.00 |
| Personnel Costs (adjusts annually)                                    |             |             | 15%                          | \$25,179.90         | \$25,179.90  |
| Travel (vehicle mileage)                                              |             |             | Approved Federal Rate \$0.67 | \$1,050.00          | \$1,050.00   |
| Supplies and recurring costs                                          |             |             |                              | \$2,000.00          | \$2,000.00   |
| Sub-total                                                             |             |             | \$196,095.90                 | <b>\$196,095.90</b> | \$196,095.90 |
| Overhead & Admin (adjusts annually)                                   |             |             | 35%                          | \$68,633.57         | \$68,633.57  |
| Permits (biological, cultural)                                        |             |             |                              | \$25,000.00         | \$25,000.00  |
| Contracts (Survey, Geotechnical)                                      |             |             |                              | \$55,500.00         | \$55,500.00  |
| TOTAL                                                                 |             |             | \$345,229.47                 | <b>\$345,229.47</b> | \$345,230.00 |

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**Table 3. Phase II- Implementation Budget.**

| Cave Rock GID Water Quality Improvement Project Budget, December 2024 |             |             |                              |                       |                       |
|-----------------------------------------------------------------------|-------------|-------------|------------------------------|-----------------------|-----------------------|
| PHASE II- Implementation                                              |             |             |                              |                       |                       |
| Category                                                              | Total Hours | Rate        | NDSL Funds                   | Total Cash Budget     | Total Budget          |
| Senior Project Engineer                                               | 60          | up to \$110 | \$6,600.00                   | \$6,600.00            | \$6,600.00            |
| Project Engineer                                                      | 60          | up to \$70  | \$4,200.00                   | \$4,200.00            | \$4,200.00            |
| Staff Engineer                                                        | 60          | up to \$63  | \$3,780.00                   | \$3,780.00            | \$3,780.00            |
| ES IV/III                                                             | 60          | up to \$85  | \$5,100.00                   | \$5,100.00            | \$5,100.00            |
| <b>Wages (salary and fringe)</b>                                      |             |             | <b>\$19,680.00</b>           | <b>\$19,680.00</b>    | <b>\$19,680.00</b>    |
| <b>Personnel Costs (adjusts annually)</b>                             |             |             | 15%                          | <b>\$2,952.00</b>     | <b>\$2,952.00</b>     |
| <b>Travel (vehicle mileage)</b>                                       |             |             | Approved Federal Rate \$0.67 | <b>\$1,008.00</b>     | <b>\$1,008.00</b>     |
| <b>Supplies and recurring costs</b>                                   |             |             | \$50.00                      | <b>\$50.00</b>        | <b>\$50.00</b>        |
| <b>Sub-total</b>                                                      |             |             | <b>\$23,690.00</b>           | <b>\$23,690.00</b>    | <b>\$23,690.00</b>    |
| <b>Overhead &amp; Admin (adjusts annually)</b>                        |             |             | 35%                          | <b>\$8,291.50</b>     | <b>\$8,291.50</b>     |
| <b>Permits</b>                                                        |             |             | \$0.00                       | <b>\$0.00</b>         | <b>\$0.00</b>         |
| <b>Contracts (Survey, Geotechnical)</b>                               |             |             | \$0.00                       | <b>\$0.00</b>         | <b>\$0.00</b>         |
| <b>Contractor (Construction, Materials Testing)</b>                   |             |             | <b>\$1,937,042.00</b>        | <b>\$1,937,042.00</b> | <b>\$1,937,042.00</b> |
| <b>TOTAL</b>                                                          |             |             | <b>\$1,969,023.50</b>        | <b>\$1,969,023.50</b> | <b>\$1,969,024.00</b> |