COUNTY of FREDERICK
Department of Public Works
540/665-5643
FAX: 540/678-0682

MEMORANDUM

TO: Public Works Committee

FROM: Joe C. Wilder, Director of Public Works JCW

SUBJECT: Meeting of January 25, 2022

DATE: January 19, 2022

There will be a meeting of the Public Works Committee on Tuesday, January 25, 2022 at 8:00 a.m. **in the conference room located on the second floor of the north end of the County Administration Building at 107 North Kent Street, Suite 200.** The agenda thus far is as follows:

1. Discussion/update on sinkhole issue in Crystal Lake/Cherokee Dam in the Shawneeland Sanitary District.
   (Attachment 1)

2. Public Works project updates.

3. Miscellaneous Reports:
   a. Tonnage Report: Landfill
      (Attachment 2)
   b. Recycling Report
      (**Attachment 3)**
   c. Animal Shelter Dog Report:
      (Attachment 4)
   d. Animal Shelter Cat Report
      (Attachment 5)
   e. Shawneeland Sanitary District Advisor Committee Special meeting minutes
      (Attachment 6)
   f. 2021 Holiday Usage Summary
      (Attachment 7)

JCW/kco

Attachments: as stated

Harrisonburg Office
1356 N. Main Street
Harrisonburg, VA 22802
Phone: 540-434-0400
Fax: 540-434-0447

Winchester Office
220 Imboden Drive, Suite A
Winchester, VA 22603
Phone: 540-313-4270
Fax: 540-434-0447

Viola Engineering, PC

December 2, 2021

Joe Wilder, Director of Public Works [email: jwilder@fcva.us]
Frederick County, Virginia
107 N. Kent Street
Winchester, VA 22601

RE: Revision 1 - Report of Geophysical Investigation
Crystal Lake Sinkhole Investigation (Cherokee Dam)
152 Tomahawk Trail, Winchester, VA
VEPC Project No: PTL-212862

Mr. Wilder:

A three-dimensional (3D) electrical resistivity imaging (ERI) survey was performed at the referenced site to evaluate recently developed karst features located along the southeastern bank of Crystal Lake. Site investigation and report preparation were conducted in accordance with Frederick County Task Order 2017-13 (Date: 10/27/2021) and scope of services developed by our office (Proposal Date: 10/21/2021). The lake and earthen impoundment, Cherokee Dam, are owned and operated by Frederick County with funding provided by the Shawneeland Sanitary District. Site karst hazards are well documented at Crystal Lake, and subsurface topology has impacted the performance of the lake dating back to its construction in the 1960's. Investigation and sinkhole remediation activities have taken place over the past 20 years with fluctuating drainage rates occurring throughout the lakes operational history. Sometime in early October 2021, two (2) well defined sinkholes developed along the eastern shore of the lake; subsequently, accelerating lake drainage to a rate measured at approximately 150 gallons a minute at the spring located north of the historic Council House. As a result, the lake water elevation dropped approximately 10 to 15 feet. This prompted a subsurface evaluation of geologic conditions to ascertain potential remediation scope and estimated costs. A three-dimensional electrical resistivity survey (ERI) was conducted, by our office, to evaluate subsurface sinkhole drainage conditions. A 3D rectangle survey section was established, as shown on the attached Location Plan, with six (6) parallel ERI survey lines conducted with electrode spacing maintained at eight (8) feet.

Figure 1. Dam Construction

Three-dimensional resistivity imaging is a geophysical technique utilized to measure the in-situ resistivity of earth materials, i.e., how difficult it is to pass an induced electrical current through the subsurface. Resistivity is the inverse of conductivity. Therefore, resistivity imaging is a measurement of the conductivity of the subsurface materials at the site. Generally, soils are more conductive than competent bedrock and can be imaged with this technique. Karst terrain soils associated with sinkholes, voids, solution channels, bedrock seeps and incipient sinkholes are typically cohesive and very moist. Therefore, they are more

conductive than the surrounding bedrock or other soils. In addition, voids and caves can possibly be imaged provided a contrasting resistivity gradient exists between the target and the surrounding earth materials.

SITE EXPLORATION

Cherokee Dam is located perpendicular to the strike of bedrock underlain by various geological formations, several of which include soluble limestone. We understand the site and dam embankment is underlain by several geologic formations with limestone inclusions that are solution prone according to published maps, review of previous site study, and grouting program performed by Hayward Baker.

Based on a review of the grouting program, we summarize that grouting began in November 2008 and was terminated in April of 2009. A total of 33 borings were injected with grout to depths of 150 feet, as referenced from the top of the dam, with a cement grout/bentonite additive. Records indicate a total of 2097 cubic yards of grout was injected to develop a subsurface curtain that appeared to minimize water flow through subsurface voids at depth. However, it was stated some leakage is inevitable in this karst geology. We conclude that it is nearly impossible to effectively stop leakage in karst geology nor can any grouting plan guarantee similar future sinkhole development will not occur. However, targeted remediation can significantly reduce the likelihood of drainage through karst development and reduce subsurface drainage rates.

A three-dimensional ERI survey along six (6) parallel lines running east to west along the downstream slope and toe of Cherokee Dam. The study included a dipole-dipole array resistivity survey utilizing the Advanced Geosciences, Inc. (AGI) SuperSting R-8/IP Passive Earth Resistivity System. The ERI lines were spaced approximately 16 feet apart with a length of 664 feet each. The resistivity lines were established with an electrode spacing of 8 feet to gain a maximum resolution and imaging depth of approximately four (4) and 130 feet, respectively. Anomalous resistivity zones were mapped in an effort to identify flow paths which traverse the survey area to distinguish potential remediation areas. Further, resistivity imaging data was processed and inverted using AGI's proprietary 3-D resistivity inversion software, EarthImager 3-D, to generate the inverted resistivity sections. Terrain correction was performed utilizing high resolution elevation data obtained from USGS 3DEP one-meter Light Detection and Ranging (LiDAR) bare earth elevation maps. Electrodes were located in the field with multi-band RTK GNSS receivers with a nominal location accuracy of less than three (3) centimeters.

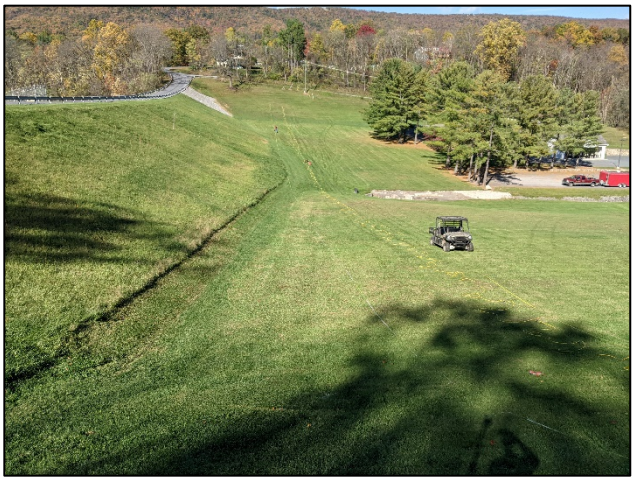


Figure 2. ERI Field Investigation

SUBSURFACE CONDITIONS

Electrical resistivity imaging is a nondestructive investigation technique that can be utilized to detect large anomalously deep and/or wet soils of the type commonly associated with incipient sinkholes or saturated soils, fractures, or pockets between more competent rock. Resistivity imaging was utilized as an indicator of potential wet soils or flow paths and not as an absolute identifier of the problem. In general, higher

resistivity values are interpreted to represent non-porous competent bedrock or dry soil conditions, and conversely, lower conductivity values are interpreted to represent moist or saturated soils and/or water filled voids, fractures, and other structural discontinuities within the bedrock/soil mass.

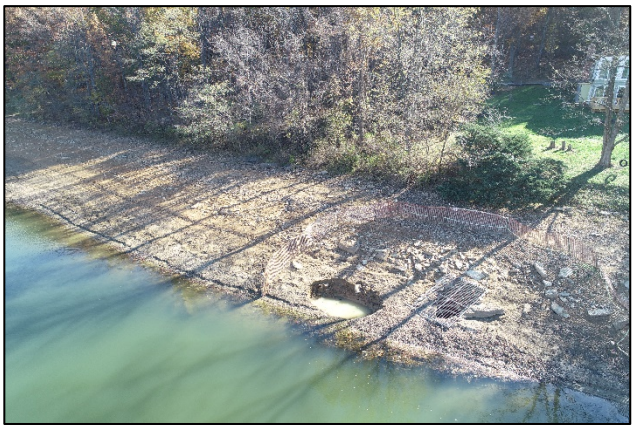


Figure 3. Sinkhole Development Along Shoreline

Resistivity imaging of the project site suggests variable moisture conditions beneath estimated top of bedrock likely indicated zones of water infiltration. Zones of higher resistive material likely represent competent bedrock while lower resistivity values were observed along the existing dam outfall barrel and buried piping (siphons). A discontinuous low resistivity zone is noted on all ERI sections along the eastern edge of the ERI data. This area is indicative of fractured bedrock harboring water flow. Further, it is believed the contact between dissimilar geologic formations is closer to the site than is mapped leading to accelerated bedrock degradation. A zone of probable remediation was identified along the eastern extents of the survey area as mapped on the attached Location Plan and Inverted Resistivity Sections. An area of low resistivity subsurface conditions was noted due west of the dam outfall pipe only in a handful of sections. It is believed this hydraulic feature is derived from water infiltration at the surface near the end of the outfall pipe.

CONSTRUCTION RECOMMENDATIONS

We understand Crystal Lake is a prominent feature of the Shawnee Land community and is admired by many residents. However, extensive subsurface remediation of previous karst features has left some weary of significant capital expenses for its continued operation. Multiple remediation options are available with varying probability of long-term success; however, any remediation approach selected will not guarantee the end to sinkhole development within the local geology going forward.

Currently (as revised 12/2/21), Crystal Lake elevation has dropped to a consistent level of 157 inches below normal pool elevation and flow measured at the spring box below the Council House has stabilized to 136 gpm (down from 175 gpm) and flowing with negligible turbidity. These factors may remain constant for a period of time to permit remediation, if so elected. Some well-suited methods, arranged in ascending cost, may include:

1.) Grouting of near-surface voids, deep remediation excluded, in the existing karst features to include backfilling existing sinkholes (2) at the surface to promote public safety leaving existing deep conditions unchecked. This would be economically achieved by rough grading an access lane to near the karst features to permit backfilling with 2000 psi lean concrete with 50 lbs of bentonite metered into the concrete while discharging. The concrete volume may be expanded by including bank boulders to the concrete/grout mix during discharge. We estimate a budget cost of $7,500 to complete this alternative. However, once the sinkholes are backfilled, the advantage of filling with polymer grout is lost without drilling addition holes to inject grout to better fill voids if decided at a later date.

2.) Near surface and drainage path filling with water-activated semi-rigid polyurethane foam injection resin. Dye tracing is conducted to ascertain travel time through karst drainage paths. Specially

formulated foam is pumped into the exposed sinkhole(s) and proportioned to activate at set intervals to plug subsurface conditions. Chemicals are certified to NSF 61-5 (approved for contact with drinking water – see attached Certified Product Listing). Please refer to attached Case History for more information provided by Mr. Stuart Baber of American Concrete Services. We suggest that Mr. Baber be contacted for additional Case Histories of grouting sinkholes in karst geology for further consideration.

3.) Deep chemical grouting to develop drainage curtain walls downstream from the dam. Areas noted on attached location plans.

4.) Extensive grouting similar to remediation activities conducted for previous karst feature remediation downstream and/or within reservoir. Areas noted on attached location plans.

Based on the 2009 remediation history and existing subsurface flow that developed after a period of 13 years, we recommend injecting a polyurethane resin at this time to minimize subsurface flows as mentioned. This approach incorporates additional deep remediation at a fraction of the cost of conventional pressure grouting. The resin can be properly mixed with an accelerant to cause a solid plug to set at a precise time to effectively fill the karst void(s) along the drainage path. Further, our review of products and procedures indicates that the resin can be pumped into the existing sinkhole, which avoids drilling injection borings along the dam embankment thereby reducing cost and time for completion. We suggest that a preferred Contractor be contacted to evaluate the site to determine a budget cost to restore the lakes level to near normal utilizing a polyurethane resin. Based on a quote for 500 gallons of bulk material, we estimate a cost to remediate Crystal Lake ranging between $60,000 and $380,000 depending on the severity of voids in the underlying karst geology. Upon completion, we recommend that the exposed throat of the sinkhole(s) be backfilled with a lean concrete (2000 psi concrete) amended with high yield bentonite gel (powder) at a typical rate of 50 pounds/cubic yard of concrete. This will provide a tight sealing plug that will promote public safety. Further site remediation work may be required in the future, as this approach will plug the current karst drainage path. Active maintenance, incorporating this or comparable techniques, may likely result in a lower total site remediation cost if future subsurface leaks develop. We recommend that Mr. Stuart Baber be invited to speak of this process at the next Homeowners Board Meeting based on his expertise and to answer questions accordingly.

VIOLA ENGINEERING, PC

LIMITATIONS

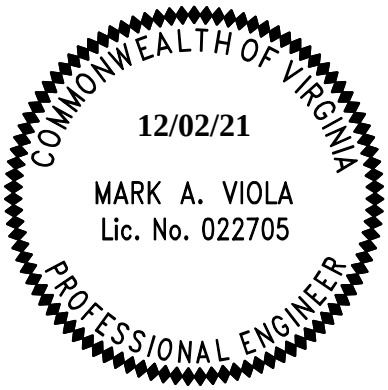
This report has been prepared in order to aid in the evaluation of this site and to assist remediation activities related to existing karst conditions. Our scope is limited to the specific project and location described, and the project description represents our understanding of the significant aspects relevant to soil and geologic characteristics. The interpretations and recommendations in this report are based solely on the information available at the time this report was prepared. Subsurface conditions may vary from those encountered at the survey locations.

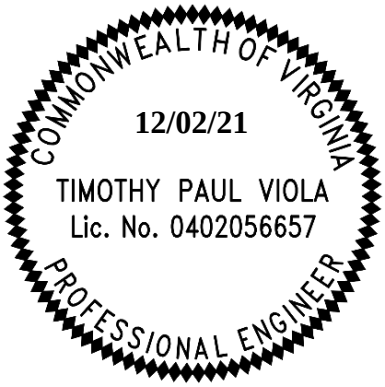
Further exploration activities can be provided to aid in targeted remediation activities as site planning progresses. We appreciate the opportunity to provide engineering exploration services on this project. If we can be of any other assistance, please do not hesitate to contact us.

Respectfully,

[redacted]

Mark A. Viola, PE
Owner, Principal Engineer





[redacted]

Timothy P. Viola, PE
Project Engineer

Attachments: Location Plan (1 Sheet, Raster)
Inverted Resistivity Sections (8 Sheets, Raster)
Location Plan & Inverted Resistivity Sections (External Link, Vector)
Certified Product Listing & SDS - AP Fill 720-Polyurethane Injection Resin
Case History - 2016 Leon Lake Emergency Seepage Repair Plan & Grout Plan

Attachment 2

COUNTY of FREDERICK
Department of Public Works
540/665-5643
FAX: 540/678-0682

MEMORANDUM

TO: Public Works Committee

FROM: Joe C. Wilder, Director of Public Works JCW

SUBJECT: Monthly Tonnage Report - Fiscal Year 21/22

DATE: January 4, 2022

The following table shows the tonnage for the current fiscal year. The average monthly tonnage for fiscal years 03/04 through 21/22 is also listed below:

FY 03-04: **AVERAGE PER MONTH: 16,348 TONS (UP 1,164 TONS)**
FY 04-05: **AVERAGE PER MONTH: 17,029 TONS (UP 681 TONS)**
FY 05-06: **AVERAGE PER MONTH: 17,785 TONS (UP 756 TONS)**
FY 06-07: **AVERAGE PER MONTH: 16,705 TONS (DOWN 1,080 TONS)**
FY 07-08: **AVERAGE PER MONTH: 13,904 TONS (DOWN 2,801 TONS)**
FY 08-09: **AVERAGE PER MONTH: 13,316 TONS (DOWN 588 TONS)**
FY 09-10: **AVERAGE PER MONTH: 12,219 TONS (DOWN 1,097 TONS)**
FY 10-11: **AVERAGE PER MONTH: 12,184 TONS (DOWN 35 TONS)**
FY 11-12: **AVERAGE PER MONTH: 12,013 TONS (DOWN 171 TONS)**
FY 12-13: **AVERAGE PER MONTH: 12,065 TONS (UP 52 TONS)**
FY 13-14: **AVERAGE PER MONTH: 12,468 TONS (UP 403 TONS)**
FY 14-15: **AVERAGE PER MONTH: 13,133 TONS (UP 665 TONS)**
FY 15-16: **AVERAGE PER MONTH: 13,984 TONS (UP 851 TONS)**
FY 16-17: **AVERAGE PER MONTH: 14,507 TONS (UP 523 TONS)**
FY 17-18: **AVERAGE PER MONTH: 15,745 TONS (UP 1,238 TONS)**
FY 18-19: **AVERAGE PER MONTH: 16,594 TONS (UP 849 TONS)**
FY 19-20: **AVERAGE PER MONTH: 16,973 TONS (UP 379 TONS)**
FY 20-21: **AVERAGE PER MONTH: 16,803 TONS (DOWN 170 TONS)**
FY 21-22: **AVERAGE PER MONTH: 18,362 TONS (UP 1,559 TONS)**

MONTH	FY 2018-2019	FY 2019-2020	FY 2020-2021	FY 2021-2022
JULY	17,704	17,956	17,677	17,893
AUGUST	18,543	17,267	16,517	21,437
SEPTEMBER	14,799	17,985	16,789	19,306
OCTOBER	18,158	22,528	20,127	18,215
NOVEMBER	15,404	17,304	15,432	16,927
DECEMBER	14,426	14,362	15,496	16,391
JANUARY	13,973	14,913	14,480	
FEBRUARY	12,764	13,380	12,030	
MARCH	17,079	15,533	18,758	
APRIL	20,313	17,475	18,627	
MAY	19,443	17,010	17,105	
JUNE	16,519	17,968	18,594	

JCW/gmp

Attachment 3

RECYCLING REPORT - FY 21/22

MONTH	GLASS	PLAST	AL CANS	STEEL CANS	PAPER	OCC	SHOES/TEX	ELEC	SCRAP	TOTAL
JUL	0	40,740		12,520	45,120	123,500	3,500	27,940	286,082	539,402
AUG		12,240		8,320	53,280	104,140	4,340	25,840	248,900	457,060
SEP		27,440		8,740	53,740	107,280	4,840		264,760	466,800
OCT		15,050		13,080	40,360	113,260	3,280	28,860	251,260	465,150
NOV		17,040		7,360	39,280	116,440	3,900	26,680	199,180	409,880
DEC		16,760		14,260	70,520	127,200	6,720	23,500	191,900	450,860
JAN		4,040		4,980	13,760					22,780
FEB										0
MAR										0
APR										0
MAY										0
JUN										0
TOTAL	0	133,310	0	69,260	316,060	691,820	26,580	132,820	1,442,082	2,811,932
FY 20-21		283,300	0	154,330	717,120	1,540,682	45,620	362,600	3,123,261	6,226,913
FY 19-20	0	454,859	37,370	108,974	854,350	1,174,530	55,100	391,900	3,209,400	6,286,483
FY 18-19	0	430,963	47,082	96,494	998,815	1,243,232	83,104	467,720	2,909,857	6,277,267
FY 17-18	0	465,080	53,224	94,530	1,066,300	1,080,087	37,260	536,420	2,874,709	6,207,610
FY 16-17	372,600	430,435	41,002	89,976	1,082,737	1,009,153	37,220	495,500	2,687,241	6,245,864
FY 15-16	919,540	428,300	52,077	97,252	1,275,060	974,493	48,820	480,400	2,376,344	6,652,286
FY 14-15	895,600	407,703	40,060	97,515	1,272,660	893,380	49,440	532,283	1,890,729	6,079,370
FY 13-14	904,780	417,090	39,399	99,177	1,281,105	902,701	37,800	611,580	1,639,225	5,932,937
FY 12-13	913,530	410,338	45,086	102,875	1,508,029	878,450	39,700	502,680	1,321,938	5,722,626
FY 11-12	865,380	398,320	43,884	99,846	1,492,826	840,717	37,920	484,600	1,432,678	5,696,171
FY 10-11	949,185	378,452	42,120	98,474	1,404,806	824,873	41,700	467,920	1,220,107	5,427,637
FY 09-10	1,123,671	370,386	42,844	96,666	1,235,624	671,669	21,160	435,680	1,348,398	5,346,098
FY 08-09	762,810	322,928	23,473	55,246	1,708,302	564,957	28,780	404,760	1,097,151	4,968,407
FY 07-08	794,932	284,220	15,783	40,544	1,971,883	545,692	0	498,110	1,172,880	5,324,044
FY 06-07	600,464	200,720	11,834	29,285	1,684,711	441,321	0	382,574	550,070	3,900,979
FY 05-06	558,367	190,611	12,478	28,526	1,523,162			381,469	204,220	2,898,833
FY 04-05	549,527	193,224	11,415	27,525	1,552,111			273,707	25,080	2,632,589
FY 03-04	541,896	174,256	11,437	31,112	1,443,461			156,870	336,230	2,695,262
FY 02-03	413,627	146,770	9,840	23,148	1,381,195			62,840	171,680	2,209,100
FY 01-02	450,280	181,040	10,565	25,553	1,401,206			54,061	58,140	2,180,845
FY 00-01	436,615	198,519	10,367	24,988	1,759,731				9,620	2,439,840
FY 99-00	422,447	177,260	10,177	22,847	1,686,587				44,180	2,363,498
FY 98-99	402,192	184,405	9,564	22,905	1,411,950				48,810	2,079,826
FY 97-98	485,294	136,110	13,307	29,775	1,830,000					2,494,486
FY 96-97	373,106	211,105	23,584	46,625	1,690,000					2,344,420
FY 95-96	511,978	167,486	28,441	44,995	1,553,060					2,305,960
TO DATE	14,247,821	6,009,678	548,737	1,234,855	33,150,206	8,547,406	342,540	6,225,034	17,634,721	87,941,078

FREDERICK COUNTY ESTHER BOYD ANIMAL SHELTER FY 2021-2022 Attachment 4

DOG REPORT

MONTH	ON HAND AT FIRST OF MONTH	RECEIVED AT KENNEL	BROUGHT IN BY ACO	BITE CASES	BORN AT KENNEL	ADOPTED	RECLAIMED	DISPOSED	DIED AT KENNEL	ESCAPED/ STOLEN	CARRIED OVER NEXT MONTH
JULY	29	14	23	1	0	13	25	4	0	0	25
AUG	25	11	31	1	0	6	26	2	0	0	34
SEP	34	27	28	1	0	22	25	1	0	0	42
OCT	42	15	23	1	0	19	24	1	0	0	37
NOV	37	13	35	3	9	19	31	1	0	0	46
DEC	46	19	21	4	0	24	22	0	0	0	44
JAN											
FEB											
MAR											
APR											
MAY											
JUN											
TOTAL	213	99	161	11	9	103	153	9	0	0	228

In the month of December - 90 dogs in and out of kennel. 0 dogs transferred to other agencies.

FREDERICK COUNTY ESTHER BOYD ANIMAL SHELTER FY 2021-2022 Attachment 5

CAT REPORT

MONTH	ON HAND AT FIRST OF MONTH	RECEIVED AT KENNEL	BROUGHT IN BY ACO	BITE CASES	BORN AT KENNEL	ADOPTED	RECLAIMED	DISPOSED	DIED AT KENNEL	ESCAPED/ STOLEN	CARRIED TO NEXT MONTH
JULY	87	60	24	2	0	33	1	28	0	0	111
AUG	111	34	4	2	4	27	0	27	3	0	98
SEP	98	27	6	1	9	26	0	3	1	0	111
OCT	111	27	2	1	1	29	0	9	5	0	99
NOV	99	24	3	1	4	30	1	8	0	0	92
DEC	92	26	3	1	0	49	1	3	0	0	69
JAN											
FEB											
MAR											
APR											
MAY											
JUN											
TOTAL	598	198	42	8	18	194	3	78	9	0	580

In the month of December - 122 cats in and out of shelter. 0 cats transferred to other agencies.

MEMORANDUM

TO: Joe C. Wilder, Director of Public Works

FROM: Rhonda L. Sargent, Chairperson, Shawneeland Sanitary District Advisory Committee (SSDAC)

SUBJECT: Cherokee Lake Sinkhole(s) Remediation Recommendation

DATE: January 18, 2022

Attached you will find minutes from the special SSDAC meeting held on January 10, 2022, as well as the minutes from the subcommittee meeting held on January 5, 2022 . The latter was formed to discuss the remediation options presented in Viola Engineering's report as well as possible funding options.

During their meeting, the subcommittee voted to make a recommendation to the SSDAC at the special meeting held on January 10, 2022 that the resin injection option at a cost of up to $380,000 be approved. Consequently, the SSDAC voted unanimously to approve recommending that public works proceed with the necessary discussions and steps to proceed with the resin injection option as well as a request to pull funds from Shawneeland's reserve fund in the amount of $380,000 to have the remediation performed.

Thank you in advance for your cooperation in this matter.

/rls

Attachments: as stated

Shawneeland Sanitary District Advisory Committee (SSDAC) - Minutes of January 10, 2022

The meeting was called to order at 7:10pm.

Those in attendance were Barry Van Meter, Jeff Stevens, George Bishop, Rhonda Sargent, Kevin Alderman, Director of Public Works - Joe Wilder, and 4 residents. Ken Baker SSDAC member and Supervisor Shawn Graber were absent.

New Business:

Cherokee Lake Engineering Evaluation – Final Report:

- Mark from Viola Engineering updated the information from their study from Cherokee Lake as well as the three (3) remediation methods and associated costs. As stated previously, they conducted a study downstream from where the sinkholes have developed. It has been determined that during this evaluation, that the leaks are located are in the same area that was repaired approximately 15 years ago.
- Most recently, the highest flow out was determined to be 177 gallons per minute (g.p.m.).
- The options are to do nothing, perform a grouting operation or inject a polyurethane resin into the sinkholes after performing dye tracing to determine the exact locations where the resin needs to be injected.
- If nothing is done, there will be no cost.
- It is estimated that the grouting option would cost approximately $7,500. However, during the event which occurred over a decade ago, extensive grouting was performed to remediate the issue. Now, the lake is leaking again, and, in the same locations that were repaired previously. If the county were to opt for this

method to repair the current leakage, then the same thing will occur in the future.

- If the injection of the polyurethane resin option is selected, the cost is estimated at approximately $60,000 to $380,000 depending on the amount of work and materials required for the remediation. The material will not deteriorate from being in contact with water. The only thing that can deteriorate this material is UV light. It will not contaminate drinking water and make it unsafe.
- With the latter process, the dye test would consist of injecting approximately 150 gallons of dye and timing how long it takes before the dye comes out the areas leaking. This allows for a more precise placement of the resin.
- Joe Wilder explained that there is a history of the lake being affected by sinkholes - they were present in the late 90's and most recently in 2008. The dam itself was constructed in 1960.
- The issue lies with the type of geology surrounding the lake and dam. It consists of mostly Limestone and Shale.
- In 2008, a dye analysis was performed and it was determined that the water came from the Council House and Springhouse/box.
- If the Resin option was chosen and the funds for the repair was approved by the board of supervisors, the funds would be available by the middle of March and work could begin within approximately two (2) weeks from that time.

Cherokee Lake Remediation Information/Demonstration:

- Stuart Baber of American Concrete Services attended the meeting and did a presentation of the polyurethane resin. This demonstration was a manual demonstration utilizing the material and mixing it with water to show how the resin forms.
- It is a fast acting material; however, outdoor temperatures and water temperatures can make a difference in its

reaction time. If necessary, the material can be heated.

- It is anticipated that the following would be required to perform the remediation a generator, an electric pump, 2 hammer drills and an equipment operator. Consequently, this would mean that it would not be necessary to request permission from adjacent property owners to access the area(s) to be repaired.
- No road closures would be required to perform the remediation.
- The repair would require approximately 250 to 500 gallons of the resin. Once it's topped off, rods would then be driven down approximately ten (10) to 15 feet into these areas to permit spreading of additional material.
- Mr. Baber estimated the remediation cost to be approximately $50,000 to $100,000.
- Filters would be placed/used in the middle of the lake to ensure no product seepage into the lake.
- Turn-around time from initiation to completion (i.e., area preparation, injection and cleanup) would be approximately three (3) to five (5) days.
- This product has been used to remediate a nine (9) foot by 20 foot dam in Washington State.
- The resin material/process has been used to repair leaks of up to 1,000 g.p.m.

Questions/comments from the citizens:

- Two citizens spoke in favor making the necessary repairs to the lake.

Subcommittee Report:

- During the November 17, 2021 SSDAC meeting a subcommittee was formed to discuss the remediation options as well as possible funding options (i.e., grants, etc.) The subcommittee met on January 5, 2022

and based on their discussion, made a recommendation to the SSDAC at the special meeting held on January 10, 2022 that the resin injection option be approved. See attached subcommittee report/minutes.

Presentation:

- George Bishop prepared and presented a PowerPoint presentation based on the information discussed during the subcommittee meeting held on January 5, 2022.

Action:

- After discussing the subcommittee's recommendation to select the polyurethane resin remediation method and its proposed cost, the SSDAC had some discussion related to the costs associated with what the American Concrete Services representative stated during his presentation versus the amount stated in the engineering report. Two committee members were hesitant to request permission to take the amount of $380,000 from Shawneeland's reserve fund.
- The chairperson indicated that requesting the larger amount is more feasible considering that amount of time that it takes to go through the process (i.e., recommendation by the SSDAC to public works, then review and action by the public works committee, then to the finance committee for their recommendation and then to the board of supervisors for final approval) to request funds. In other words, if the funds requested were not adequate to cover the costs, then it would be necessary to through the procedure once again to request additional funds to complete the necessary work which may delay completion of the project. Consequently, the chairperson informed the rest of the SSDAC that whatever funds were not

spent performing this repair would be returned to Shawneeland's reserve fund. After this discussion, a motion was made by George and seconded by Barry. A vote was taken and the recommendation to select this repair option and request the amount of $380,000 be taken from Shawneeland's reserve fund and placed in the appropriate line item to pay for the remediation was unanimously approved.

Rhonda adjourned the meeting at 8:30pm.

Shawneeland Sanitary District Advisory Committee
Subcommittee Meeting Minutes
January 5, 2022

Sanitary District Office, 50 Tomahawk Trail

Time: 7 PM

Subcommittee Attendees:

Committee Members Present: Andrea Poe, Jeny Guy and George D. Bishop

Committee Members Absent: Alec Bouldin and Kenneth Baker

Staff and others present: Joe C. Wilder, Director of Public Works, Kevin Alderman, Manager, Shawneeland Sanitary District and Rhonda Sargent, SSDAC Chairman

Minutes Taker: Andrea Poe

Agenda
1. Call meeting to order
2. Attendance
3. Recent Cherokee Lake engineering evaluation summary/discussion
4. Available grants for Cherokee Lake remediation
5. Decide on the best method presented by the engineering evaluation
6. Adjourn the Meeting

Meeting Minutes

- Meeting was called to order at 7:05 PM.
- Joe Wilder - There is a divide of geology where a joint is causing a leaking issue with sink holes opening. The geologic joint has karst limestone along east side of lake and shale geology on west side of lake. The leak is occurring where the two geologies contact each other. Nearly $1,000,000 was spent reducing the leaks using grouting during the last remediation in 2008. Communication is occurring to discuss how to address the current leaking issues. New technology may offer some options not previously available. The upcoming committee meeting will provide additional information regarding the solutions available from Viola Engineering. Reserve money will have to be used to fix the leak. The Reserve is currently around $1.48 million. One (1) year's budget is the goal for the reserve total. Chemical grouting may be the solution but must be done while the sink holes are open before closing them.
- Jeny Guy - How much is the dam compromised?
- Joe Wilder - The leak is 40-60 ft below the bottom of the dam making it not a large concern because the zone is far below.
- Joe - The chemicals used can be activated for controlling how it expands. We could work with Viola or collect bids from other companies. Specialty contractors can be hired

- Rhonda Sargent - Does this company with Viola have any videos of before and after?
- George D. Bishop - What would be the responsibilities of the Shawneeland Sanitary District crew?
- Joe Wilder - A road would have to be created to allow for the work to be done at the sites. Chert is hard rock that is present making fill necessary to build an access road.
- George D. Bishop - Using just concrete does not seem sustainable.
- Joe Wilder - Plugging the crack with the chemical grouting is a possible long-term fix. The engineers have evaluated multiple methods, but the many springs present prevent certain methods from being viable options.
- Kevin Alderman - There may be a property on the lake that may make building an access road more cost effective.
- Joe Wilder - The Advisory Committee may recommend the Subcommittee speak with the landowners of the properties bordering the lake to be granted access.
- Joe Wilder - During the special called 1/10/22 SSDAC meeting, examples may be provided to demonstrate how the technology has been applied successfully.
- George D. Bishop and Rhonda Sargent - A video demonstration would benefit the attendees at the next meeting.
- Jeny Guy - Any concerns for the aquifers should be validated and addressed at the next meeting.
- It was unanimously decided by the subcommittee that the deep chemical grouting would be the best option as a long-term solution at a cost of up to $380,000.
- Joe- The decisions from the subcommittee will pass to the advisory committee, followed by public works, and the finance committee and then the board of supervisors.

Grants

- Shawneeland does not meet the criteria for the Natural Resources Conservation Service Virginia's Environmental Quality Incentives Program and Virginia Department of Conservation and Recreation grant. No other explored grants were applicable.
- Andrea Poe- Pursuit and acquisition of other grants would require the recreational area be transformed for more conservation purposes rather than private recreational. The lake would likely cease to exist.
- Meeting was adjourned at 8:45.

Next Meeting Agenda 1/10

1. Call meeting to order
2. Cherokee Lake engineering evaluation- final report
   (Informational purposes only)
3. Subcommittee comments - The subcommittee will report on discussed grants, costs/benefits, and the current reserve to make a recommendation to the advisory committee.
4. Public Comments
5. Adjourn the meeting

COUNTY of FREDERICK
Department of Public Works
540/665-5643
FAX: 540/678-0682

MEMORANDUM

TO: Public Works Committee

FROM: Gloria Puffinburger, Solid Waste Manager

SUBJECT: 2021 Holiday Usage Summary;
Citizens' Convenience Sites

DATE: January 19, 2022

During the 2021 holiday season, staff conducted traffic counts at the county's two busiest sites, Greenwood and Albin, from Christmas Eve through Sunday, January 2. During the period, an average of 634 vehicles visited the Greenwood facility each day and 622 vehicles utilized the Albin facility.

As is traditionally the busiest trash day of the year, 460 vehicles were recorded at the Greenwood facility and 560 at the Albin convenience site during the 5-hour Sunday shift on December 26. This is a drop from 2020 traffic totals since the sites were open only five hours, not the normal full day of 11 hours. 30-yard open top containers were staged at the Greenwood, Double Toll Gate and Gore facilities in order to keep those facilities open during the entire Sunday shift. The containers were filled at each location and each hold about two tons of uncompacted refuse.

Overall, the county's ten neighbor convenience sites accepted 423 tons of refuse attributable to the Christmas season and ending New Year's Eve, December 31, an increase of five percent over 2020. The Geenwood facility accounted for 65 tons of the total refuse and Albin, 69 tons. Heavier than normal trash flows continued through the post New Year's weekend.

Staff would like to thank the trustees of the Community Inmate Workforce who worked with us at the Greenwood and Albin facilities on December 26, off-loading vehicles and diverting cardboard.

/gmp