



STATE OF TENNESSEE  
**DEPARTMENT OF ENVIRONMENT AND CONSERVATION**

Division of Solid Waste Management  
William R. Snodgrass Tennessee Tower  
312 Rosa L. Parks Avenue, 14<sup>th</sup> Floor  
Nashville, Tennessee 37243

October 17, 2023

Porchia Hernandez  
Denali Water Solutions  
3308 Bernice Avenue  
Russellville, AR 72802

**CERTIFIED MAIL**  
**#7021 0950 0001 7916 0787**  
**RETURN RECEIPT REQUESTED**

**RE: Permit-By-Rule for a Solid Waste Land Application Facility and Beneficial Use Proposal  
Determination – Denali Water Solutions, Cooper/Haynes - LND380000103**

Dear Ms. Hernandez:

The Tennessee Department of Environment and Conservation (TDEC), Division of Solid Waste Management (DSWM) has reviewed your Permit-By-Rule and Beneficial Use request received July 10, 2023, and revised October 11, 2023. The application requested multiple waste streams for land application and beneficial use, including food residuals and dissolved air flotation (DAF) residuals.

This letter will serve as official notice that DSWM has approved your Permit-By-Rule notification for the referenced 1,143 acres (identified as BH-1, BH-2, BH-3, BH-4, BH-5, CC-1, CC-2, and CC-3 field sites), located in Haywood County at 1262 Gillespie Road, Brownsville, TN 38012 (latitude 35.665174, longitude - 89.209123) for land application of food processing residuals. This facility shall be deemed to have a Permit-By-Rule for food processing residuals, provided the criteria of Rule 0400-11-01-.02(2)(b)6 of Tennessee's Solid Waste Processing and Disposal Regulations are met, including the permit conditions as submitted with your application. The registration number for this facility is LND380000103.

Rule 0400-11-01-.01(2) prohibits DAF residuals from being part of a Land Application Permit-By-Rule approval; however, this letter will serve as official notice that DSWM has determined that per Rule 0400-11-01-.02(1)(b)3(xxi), the proposed use of the DAF residuals in your proposal constitutes a beneficial use of solid waste when used in the manner proposed.

With the issuance of this Permit-By-Rule, there is an annual maintenance fee required, pursuant to Tennessee Rule 0400-11-01-.07(3), for this land application site. The annual fee is \$100.00. You will receive an annual maintenance fee invoice in August 2024 from the TDEC Fiscal Services Division that will indicate Denali Water Solutions owes \$100.00.

If you have any questions concerning this letter or decision, please contact Zach Zosel of the DSWM Jackson Environmental Field Office at [Zach.Zosel@tn.gov](mailto:Zach.Zosel@tn.gov) or 731-695-0282.

Sincerely,

A handwritten signature in black ink, reading "Lisa A. Hughey".

Lisa A. Hughey, CHMM  
Director

cc: Clifton Jeter, DSWM, Jackson Environmental Field Office Manager  
[Records.SWM@tn.gov](mailto:Records.SWM@tn.gov)





# **Management Plan for the Land Application of Organic Residuals**

## **Permit Application**

### **Haywood County, Tennessee**

June 30, 2023  
Updated August 28, 2023

**Plan Prepared By:**  
Porchia Hernandez  
3308 Bernice Ave  
Russellville, AR 72802

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## 1.0 EXECUTIVE SUMMARY

Denali operates land application of food processing residuals for beneficial use fertilizer operations in Tennessee. Food processing residuals includes wastewater residuals from various food & vegetable processing plants, animal processing plants, and animal food processing plants. The general types of wastewater residuals generated from these facilities include, but are not limited to, processing wash-down rinse water, DAF skimmings, waste activated sludge, wastewater lagoon sludge, and restaurant wastewater residuals. Wastewater residuals will be land applied for beneficial use to farm fields and pastures. This plan addresses the requirements and conditions for the proper beneficial-use land application of residuals in Haywood County, Tennessee.

### PROPOSED FACILITY AND SITE LOCATION

The proposed farm site is located in Haywood County, approximately 35.667606, -89.286211. The properties are owned by Becky Haynes and Chris Cooper. The South Fork of the Forked Deer River is the closest stream located on the sites. The fields are currently being used to grow row crops.

Aerial and site topographic maps are located in **Appendix B**.

### OPERATION SUMMARY

Land application for beneficial use is an economical, agriculturally accepted, and practical means of managing organic wastewater residuals.

In the case of liquid organic wastewater residuals, the material will be loaded at the generating facility and hauled directly to the land application sites via sealed tanker trucks. Tanker trucks will be leak-proof and always maintained in sanitary conditions. Once the material arrives at a land application site, it may be land applied directly from the truck or temporarily placed in a mobile frac tank. Residuals placed in mobile frac tanks will be removed and land applied with a tractor and buggy. Depending upon the generating source type and specific material characteristics, the residuals may be either injected with a tractor and buggy equipped with plows and sub-soil injectors, or surface applied.

In the case of dewatered residuals, the material will be collected at the generating facility and hauled via open top container trucks to the land application sites. The material will be offloaded at the application site into a spreader buggy for surface application. The material may then be disked in depending on the material characteristics and field conditions.

## 2.0 PERFORMANCE STANDARDS

### MINIMIZATION OF PROPAGATION, HARBORAGE, OR ATTRACTION OF DISEASE VECTORS

Residuals are land applied and spread evenly across the farm site. These liquid-based residuals quickly dry and soak into the soil to release the beneficial organic based nutrients. The land application at the agronomic rate for the crop being grown at the farm site will effectively recover the food-based residuals as a nutrient to feed soil microbes and allow for the breakdown of organic matter in the residuals and provide crop available nutrients that can be taken up by the roots of the crop.



## MINIMIZATION OF POTENTIAL FOR SOLID WASTE RELEASES TO THE ENVIRONMENT

Land application at the appropriate agronomic rate using a sub-soil injection method or immediate incorporation of the residuals will minimize the potential for the residual material to be released from the field site. The buffer setbacks for the field discussed in this application will also work as a preventative measure.

## MINIMIZATION OF POTENTIAL HARM TO PUBLIC

The land application at the field site is conducted on private property. The general public are not allowed at the field site, and the landowner will post no trespassing signs on the farm site to prevent public access.

## 3.0 DESIGN STANDARDS

### ONSITE STORAGE

There is to be no permanent storage at the proposed land application site therefore no financial assurance is needed.

### FLOODPLAIN

Field BH-1 is located in a flood hazard area. To prevent potential washout, Denali subsurface injects the material into the soil. According to NRCS, from months May to November the depth to water table is greater than 200cm, 6.5 feet. Land application will not occur on this field from December to April. Additionally, during times of wet weather when there could be the possibility of flooding, land application activity is not conducted.

A FEMA flood hazard map is presented in **Appendix B**.  
A NRCS depth to water table map is present in Appendix B.

### WETLANDS

The proposed site is not located in a wetland area.  
A soil survey map is presented in **Appendix D**.

### KARST TOPOGRAPHY

A USGS sink hole map is presented in **Appendix B**.

### APPLICATION BOUNDARIES

Land application will not take place:

- a. 500 feet from a dwelling;
- b. 500 feet from any domestic water supply well;
- c. 100 feet from a stream;
- d. 1000 feet from a public water supply well;
- e. 20 feet from a public roadway;
- f. On a slope exceeding 8 percent (except for slopes where incorporation is practiced, in which case the maximum acceptable slope for land application is 12 percent);
- g. In an area having a minimum depth of less than 3 feet to the seasonal high water table;



h. In areas with karst features such as caves and open sinkholes, land application will not be permitted within 200 feet and will have a vegetative buffer zone;

i. To soils that are saturated, frozen, or covered with snow during rain or when precipitation is imminent, meaning a substantial natural occurrence of precipitation that could cause significant damage to property or threaten human life in the near future.

All boundaries and buffers will be flagged during land application.

Aerial maps of the proposed site and associated fields with boundaries noted are presented in **Appendix B**.

## **RESIDUAL CHARACTERIZATION**

Food processing residuals are primarily organic solids or semi-solid residues produced by wastewater treatment processes at food processing plants, animal processing plants, and animal food processing plants. DENALI provides a valuable and essential service to these processing facilities by removing accumulated organic wastewater residuals from their plants and onsite wastewater treatment facilities. Although volumes may vary depending upon the facility type and specific processing activities, these residuals must often be removed on a daily basis to allow continuous, efficient processing plant and wastewater treatment operations.

Wastewater residuals may also accumulate in lagoons and holding ponds at industrial wastewater treatment facilities, referred to as Digested Lagoon Residuals. They must be removed from time to time in order for these facilities to maintain design capacity and treatment requirements. Wastewater residuals are a rich source of valuable plant available nutrients required for plant growth and provide valuable soil conditioning properties when land applied properly.

DAF skimmings are a common product of wastewater pretreatment systems which employ flocculates and dissolved air to remove the solids from wastewater. Flocculated solids float to the surface where they are skimmed off and collected. DAF skimmings from poultry and other food processing facilities contain valuable plant-available nutrients and have very low metals concentrations. Skimmings from different sources vary slightly in nutrient concentration and solids content.

Restaurant wastewater residuals are solids and rinse water collected in the grease trap interceptor from commercial food preparation kitchens. The food processing facilities produce dairy products, juice drinks, swine, and poultry products for direct human consumption. The mixture is of vegetable oils, animal fats, water and semi-solid material that collects in the grease traps which are situated in the wastewater outflow lines. Its composition is typically about 90% water, 5% oil and grease, and 5% organic solids. This material is collected by a third party and goes through a secondary separation, the solids, including oils and greases, are collected by the third party for further refining and the water fraction is collected by Denali for land application.

Generally, these materials do not contain hazardous waste or are a significant source of heavy metals. Since the facilities generating the wastes are food processing facilities, all chemicals and materials used in the processing are required to be "food grade". Denali, with the assistance of facility management, determine no hazardous waste constituents are present in prohibited quantities based on generator knowledge. Material samples are tested for plant nutrients, percent solids, other parameters of concern based on generator knowledge.

Analytical results for residuals are presented in **Appendix C**.



## 4.0 OPERATIONAL STANDARDS

The food processing material is to be land applied for beneficial use as fertilizer. The land application site is utilized for producing seasonal crops that are typically used as animal feeds. Representative samples of the residuals from each source to be land applied will be analyzed and the results will be expressed in mg/kg (dry basis), or in mg/l (wet basis) as specified by the permit. Nutrient loading rate tabulations will be calculated based on the nitrogen uptake rate for the crops being grown. Typically, nutrient loading rates are based on the Plant Available Nitrogen (PAN) uptake of the cover crop. Application rates are based off the PAN value calculated in the loading rate tabulation. At the proposed application rates neither the nutrient uptake rates for the crop nor the hydraulic loading rates will be exceeded during land application of the field site. The total metals applied are forecasted based on the proposed application rate for the life of the land application site.

Loading Rate Tabulations for each source are located in **Appendix C**.

## 5.0 RECORD KEEPING AND REPORTING

Prior to application, the appropriate volume to be applied to each field area will be determined based upon the nutrient content of the material, the nutrient requirements of the crop to be grown following application, and the acreage to which material is to be applied. At the land application site, daily field logs will be maintained which document the application dates, time, volume, crop to be grown, and field number. Annually, a report will be generated which includes the information from the daily field logs, the total volume applied in gallons per acre, the total nutrients and metals applied in pounds per acre, laboratory analyses of the land applied residuals, and soil analyses. This information will be submitted to TDEC, the generating facility, and to the landowner.

Denali's sampling plan regarding soil and residuals is presented in **Appendix E**.




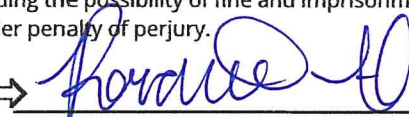
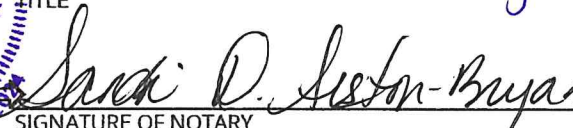
**Appendix A  
Land Use  
Agreements**





STATE OF TENNESSEE  
DEPARTMENT OF ENVIRONMENT AND CONSERVATION  
DIVISION OF SOLID WASTE MANAGEMENT  
WILLIAM R. SNODGRASS TENNESSEE TOWER  
312 ROSA L. PARKS AVENUE, 14TH FLOOR  
NASHVILLE, TN 37243

**SOLID WASTE PERMIT BY RULE NOTIFICATION**

<b>1. TYPE OF PERMIT- BY- RULE REQUESTED</b>		<b>ID# TDEC USE ONLY</b>	
<input type="checkbox"/> COMPOST FACILITY	<input checked="" type="checkbox"/> LAND APPLICATION	<input type="checkbox"/> TIRE STORAGE FACILITY	
<input type="checkbox"/> CONVENIENCE CENTER	<input type="checkbox"/> PROCESSING FACILITY	<input type="checkbox"/> TRANSFER STATION	
<b>2. FACILITY INFORMATION</b>		<b>FACILITY LOCATION COUNTY</b>	
FULL LEGAL NAME OF FACILITY <b>Denali Water Solutions</b>		<b>Haywood</b>	
PHYSICAL LOCATION OR ADDRESS OF FACILITY <b>1262 Gillespie Rd</b>		LATITUDE (DECIMAL DEGREES) <b>35.6551741</b>	
CITY <b>Brownsville</b>		LONGITUDE (DECIMAL DEGREES) <b>-89.2809123</b>	
STATE <b>TN</b>		ZIP <b>38012</b>	
FACILITY MAILING ADDRESS <b>P.O. Box 399</b>		FACILITY EMAIL <b>porchia.hernandez@denaliwater.com</b>	
CITY <b>Dardanelle</b>		STATE <b>AR</b>	
ZIP <b>72834</b>			
FACILITY MANAGER OR SITE OPERATOR <b>Fentress Bryan</b>		PHONE (WITH AREA CODE) <b>(479) 699-0032</b>	
AFFILIATION OF SITE OPERATOR (IF DIFFERENT FROM PERMITTEE) <b>Area Manager</b>			
<b>3. APPLICANT (PERMITTEE)</b>			
APPLICANT NAME <b>Porchia Hernandez</b>		PHONE (WITH AREA CODE) <b>(479) 312-2094</b>	
RESPONSIBLE OFFICIAL / TITLE <b>Environmental Manager</b>		EMAIL <b>porchia.hernandez@denaliwater.com</b>	
RESPONSIBLE OFFICIAL MAILING ADDRESS <b>3308 Bernice Ave</b>		CITY <b>Russellville</b>	
STATE <b>AR</b>		ZIP <b>72802</b>	
LANDOWNER NAME <b>Chris Cooper</b>		LANDOWNER MAILING ADDRESS <b></b>	
CITY <b></b>		STATE <b></b>	
ZIP <b></b>			
LANDOWNER SIGNATURE 		LANDOWNER SIGNATURE <b></b>	
LANDOWNER SIGNATURE <b></b>		DATE <b></b>	
<b>4. WASTE HANDLING</b>			
DESCRIPTION OF ACTIVITIES AND WASTES HANDLED OR PROCESSED <b>Land application of food processing residuals for beneficial use as a fertilizer material.</b>		AMOUNT OF WASTE HANDLED, PROCESSED OR STORED <b>600.00</b>	
WEIGHT TONS / DAY		VOLUME YARDS / DAY	
STORAGE MAX CU YARDS			
<b>5. CERTIFICATION REQUIRED</b>			
I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision. The submitted information is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury.			
SIGNATURE OF RESPONSIBLE OFFICIAL 		PRINTED NAME <b>Porchia Hernandez</b>	
TITLE <b>Environmental Manager</b>		DATE <b>7/10/23</b>	
SIGNATURE OF NOTARY 		DATE COMMISSION EXPIRES <b>2-13-24</b>	





STATE OF TENNESSEE  
DEPARTMENT OF ENVIRONMENT AND CONSERVATION  
DIVISION OF SOLID WASTE MANAGEMENT  
WILLIAM R. SNODGRASS TENNESSEE TOWER  
312 ROSA L. PARKS AVENUE, 14TH FLOOR  
NASHVILLE, TN 37243

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<input type="checkbox"/> CONVENIENCE CENTER	<input type="checkbox"/> PROCESSING FACILITY	<input type="checkbox"/> TRANSFER STATION	
<b>2. FACILITY INFORMATION</b>		FACILITY LOCATION COUNTY	
FULL LEGAL NAME OF FACILITY		LATITUDE (DECIMAL DEGREES)	
Denali Water Solutions		35.653611	
PHYSICAL LOCATION OR ADDRESS OF FACILITY		LONGITUDE (DECIMAL DEGREES)	
CITY STATE ZIP		89.279444	
TN			
FACILITY MAILING ADDRESS		FACILITY EMAIL	
3308 Bernice Ave		porchia.hernandez@denaliwater.com	
CITY STATE ZIP		Russellville AR 72802	
FACILITY MANAGER OR SITE OPERATOR		PHONE (WITH AREA CODE)	
Fentress Bryan		(479) 699-0032	
AFFILIATION OF SITE OPERATOR (IF DIFFERENT FROM PERMITTEE)		Area Manager	
<b>3. APPLICANT (PERMITTEE)</b>			
APPLICANT NAME		PHONE (WITH AREA CODE)	
Porchia Hernandez		(479) 312-2094	
RESPONSIBLE OFFICIAL / TITLE		EMAIL	
Environmental Manager		porchia.hernandez@denaliwater.com	
RESPONSIBLE OFFICIAL MAILING ADDRESS		CITY STATE ZIP	
3308 Bernice Ave		Russellville AR 72082	
LANDOWNER NAME		LANDOWNER MAILING ADDRESS	
Becky Haynes		CITY STATE ZIP	
		TN	
⇒ <i>Becky Haynes</i>		LANDOWNER SIGNATURE	
LANDOWNER SIGNATURE		LANDOWNER SIGNATURE	
LANDOWNER SIGNATURE		DATE	
<b>4. WASTE HANDLING</b>			
DESCRIPTION OF ACTIVITIES AND WASTES HANDLED OR PROCESSED		AMOUNT OF WASTE HANDLED, PROCESSED OR STORED	
Land application of food processing residuals for beneficial use as a fertilizer material.		600.00	
WEIGHT TONS / DAY		VOLUME YARDS / DAY	
		STORAGE MAX CU YARDS	
<b>5. CERTIFICATION REQUIRED</b>			
I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision. The submitted information is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury.			
⇒ <i>Porchia Hernandez</i>		Porchia Hernandez	
SIGNATURE OF RESPONSIBLE OFFICIAL		PRINTED NAME	
Environmental Mgr		7/10/23	
TITLE		DATE	
⇒ <i>Sandi D. Alston-Bryan</i>		2-13-24	
SIGNATURE OF NOTARY		DATE COMMISSION EXPIRES	
(NOTARY SEAL)			



**Appendix B  
Land Application Site  
Information**

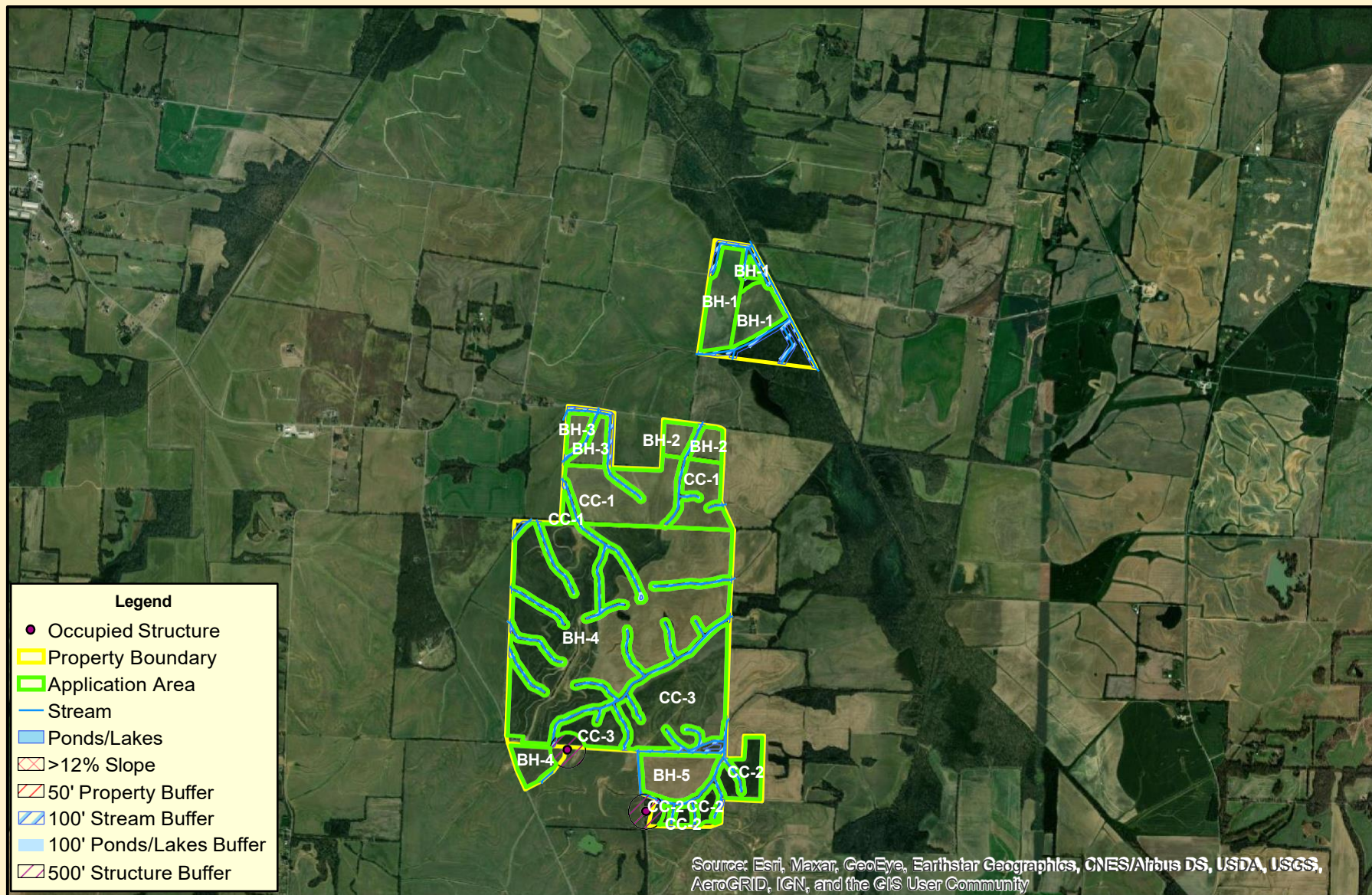


## Denali Water Solutions

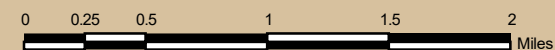
### Haywood County Land List

<u>Field ID</u>	<u>Owner</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Acrege</u>	<u>Nearest Stream</u>	<u>Distance to Stream</u>
BH-1	Becky Haynes	35.690842N	89.274031W	93	South Fork Forked Deer River	100'
BH-2	Becky Haynes	35.679891N	89.278094W	32	Stream of South Fork Forked Deer River	100'
BH-3	Becky Haynes	35.679627N	89.289250W	29	Stream of South Fork Forked Deer River	100'
BH-4	Becky Haynes	35.667606N	89.286211W	570	Stream of South Fork Forked Deer River	100'
BH-5	Becky Haynes	35.652587N	89.279646W	50	Stream of South Fork Forked Deer River	100'
CC-1	Chris Cooper	35.6747478	-89.2781398	152	Stream of South Fork Forked Deer River	100'
CC-2	Chris Cooper	35.6551741	-89.2809123	47	Stream of South Fork Forked Deer River	100'
CC-3	Chris Cooper	35.6586636	-89.2828765	170	Stream of South Fork Forked Deer River	100'



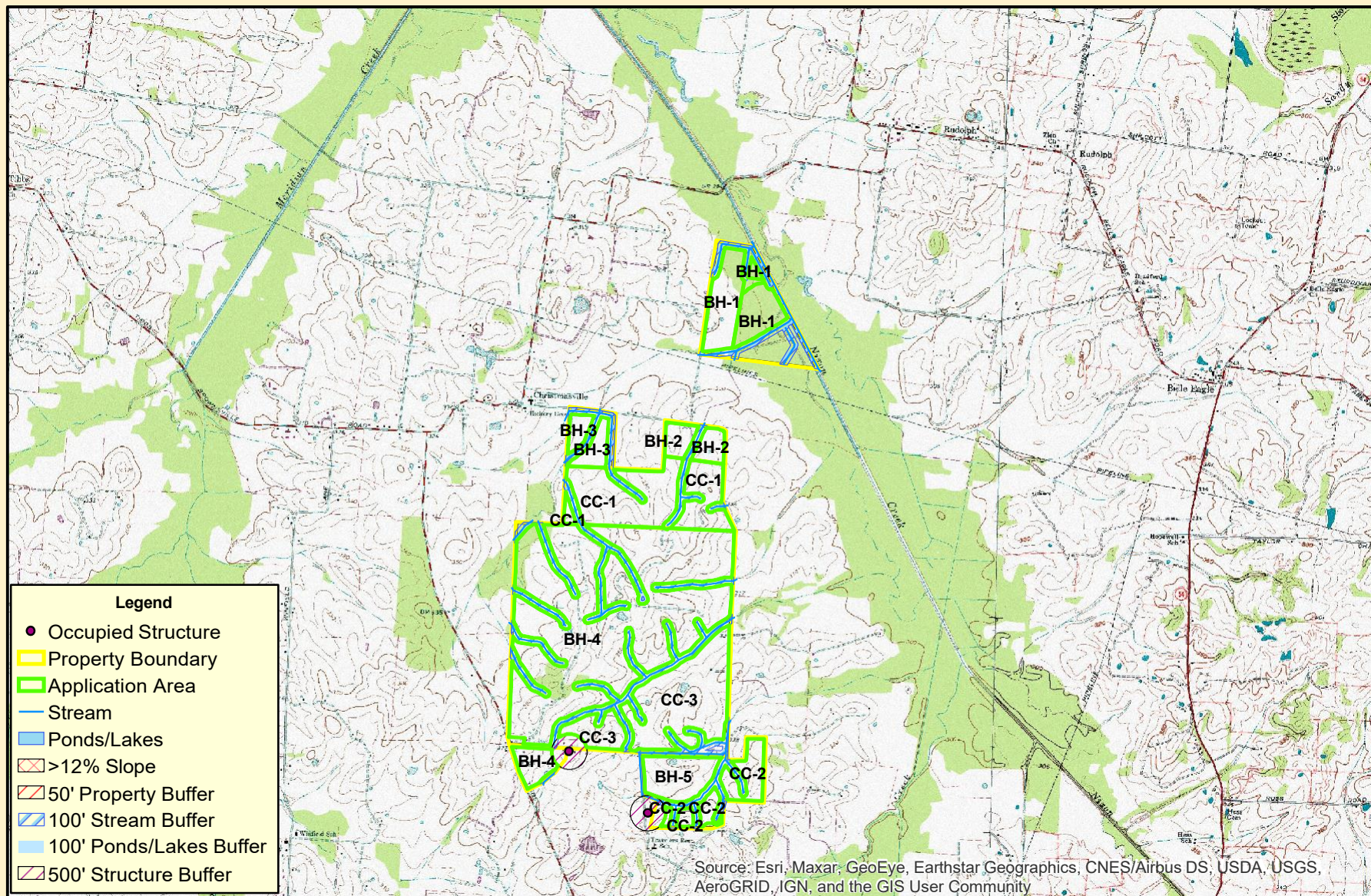


**TN3**



Becky Haynes & Chris Cooper  
Haywood County, Tennessee



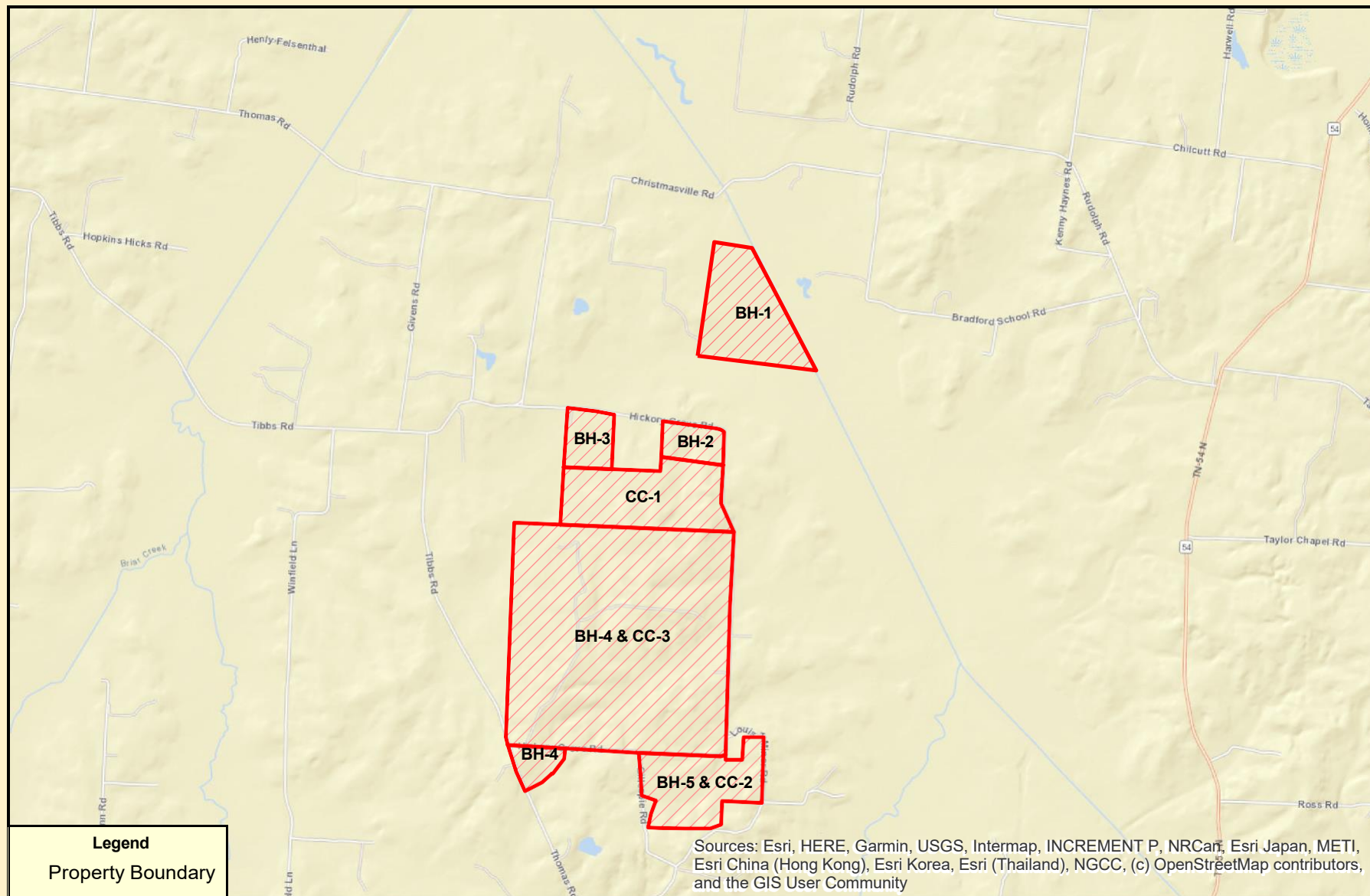


**TN3**

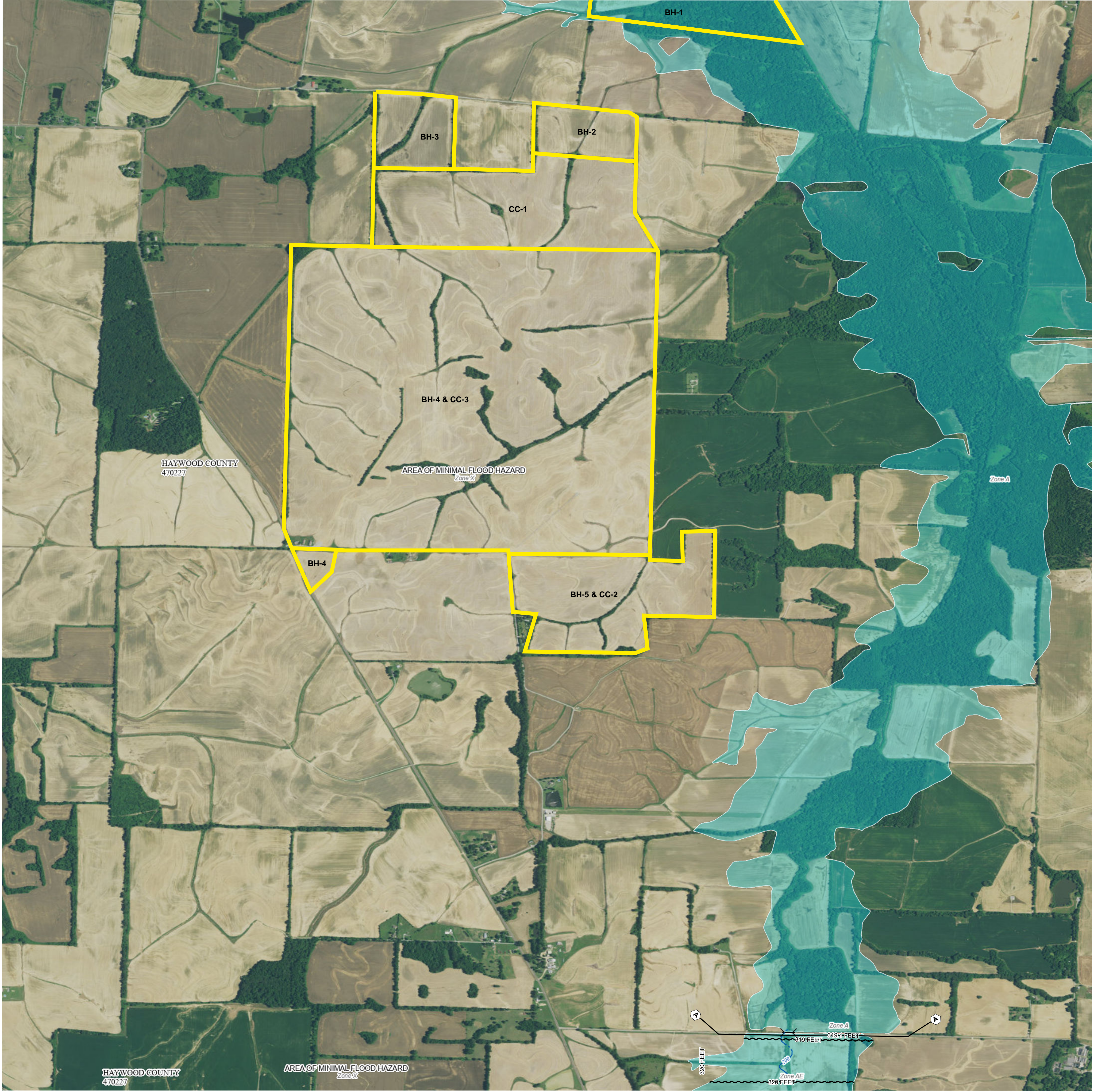


Becky Haynes & Chris Cooper  
Haywood County, Tennessee



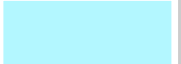
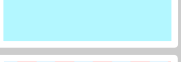








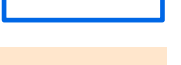



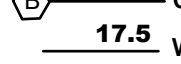
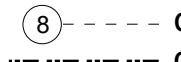

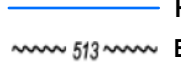










FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE)
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee See Notes Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
OTHER AREAS		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
GENERAL STRUCTURES		Levee, Dike, or Floodwall
		Cross Sections with 1% Annual Chance
		Water Surface Elevation
		Coastal Transect
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
OTHER FEATURES		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Property Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-6627) or visit the FEMA Flood Map Service Center website at <https://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

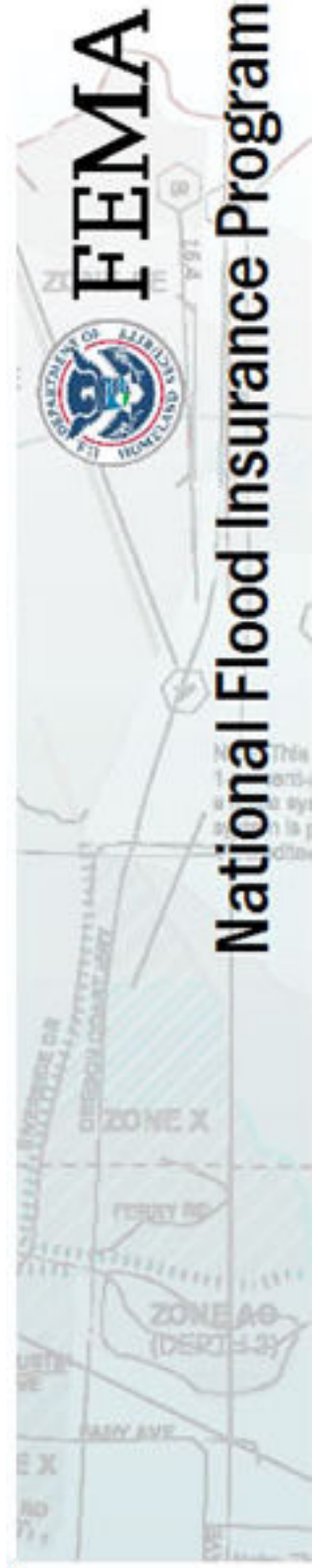
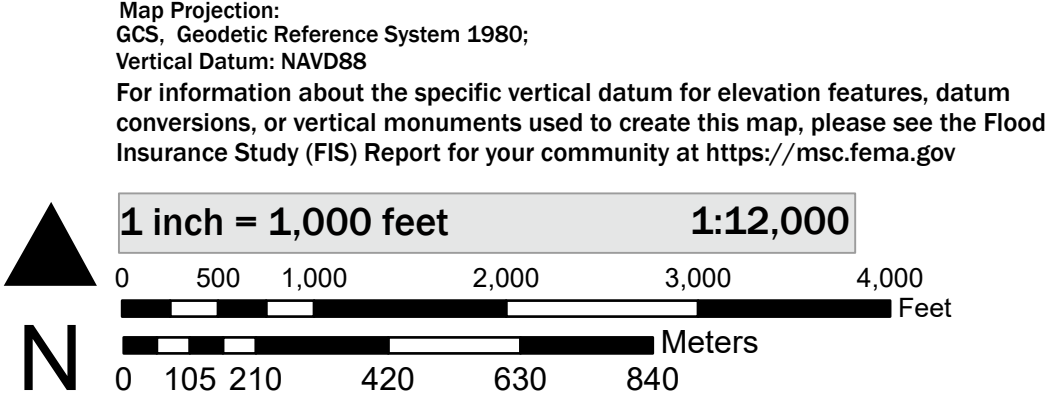
To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **7/5/2023 12:34 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at <https://www.fema.gov/media-library/assets/documents/118418>

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

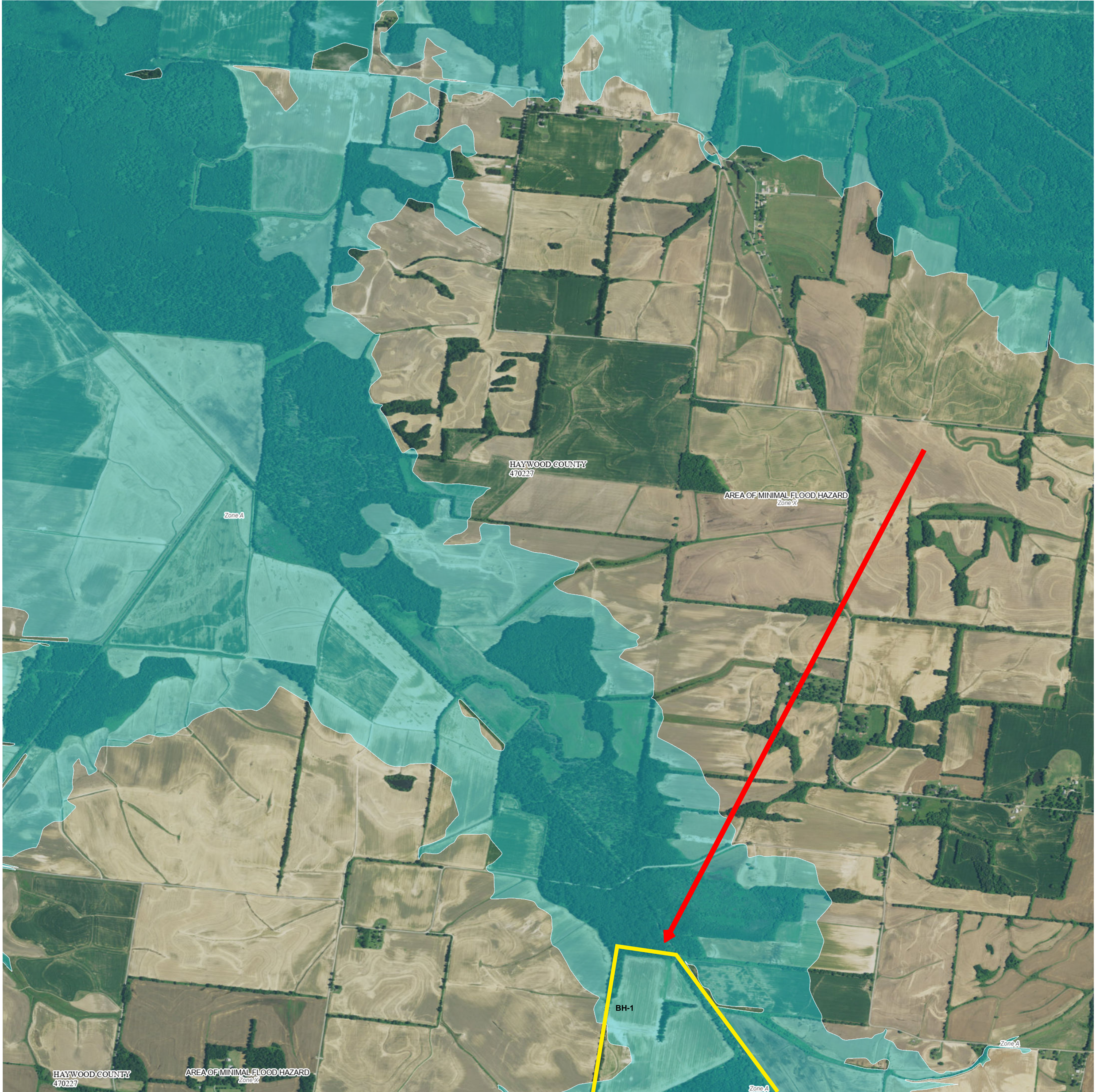


NATIONAL FLOOD INSURANCE PROGRAM  
FLOOD INSURANCE RATE MAP

PANEL 120 OF 400








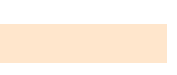
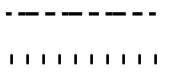
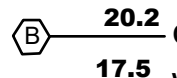
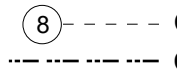






Panel Contains:	NUMBER	PANEL
COMMUNITY HAYWOOD COUNTY	470227	0120





FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee See Notes <i>Zone X</i>
OTHER AREAS		Area with Flood Risk due to Levee <i>Zone D</i>
		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
OTHER AREAS		Effective LOMRs
		Area of Undetermined Flood Hazard <i>Zone D</i>
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		Cross Sections with 1% Annual Chance
		Water Surface Elevation
		Coastal Transect
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Property Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-6627) or visit the FEMA Flood Map Service Center website at <https://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

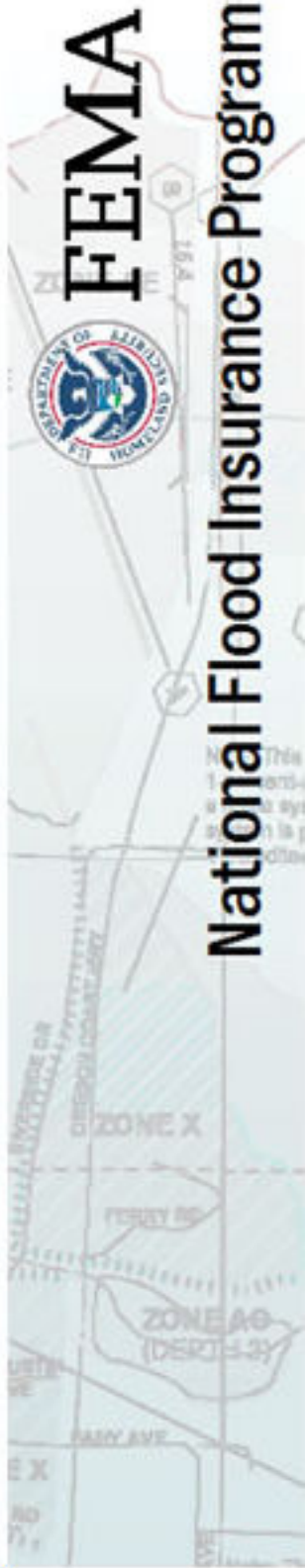
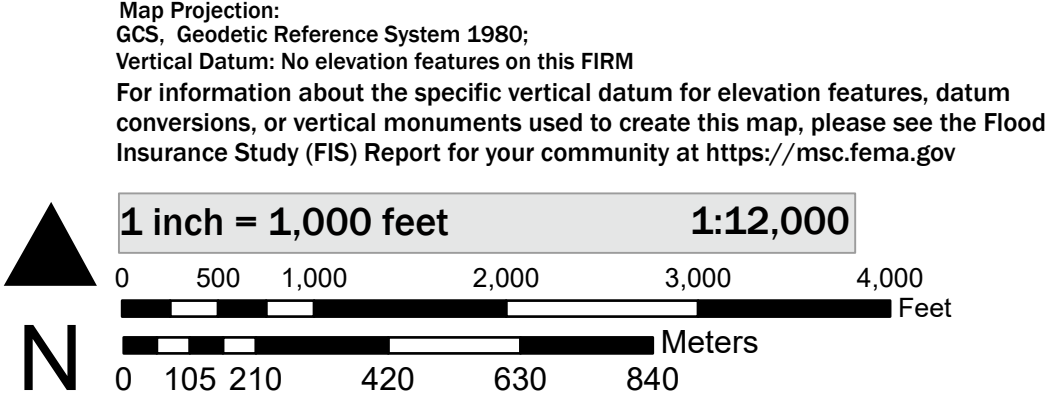
To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **7/5/2023 12:43 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at <https://www.fema.gov/media-library/assets/documents/118418>

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

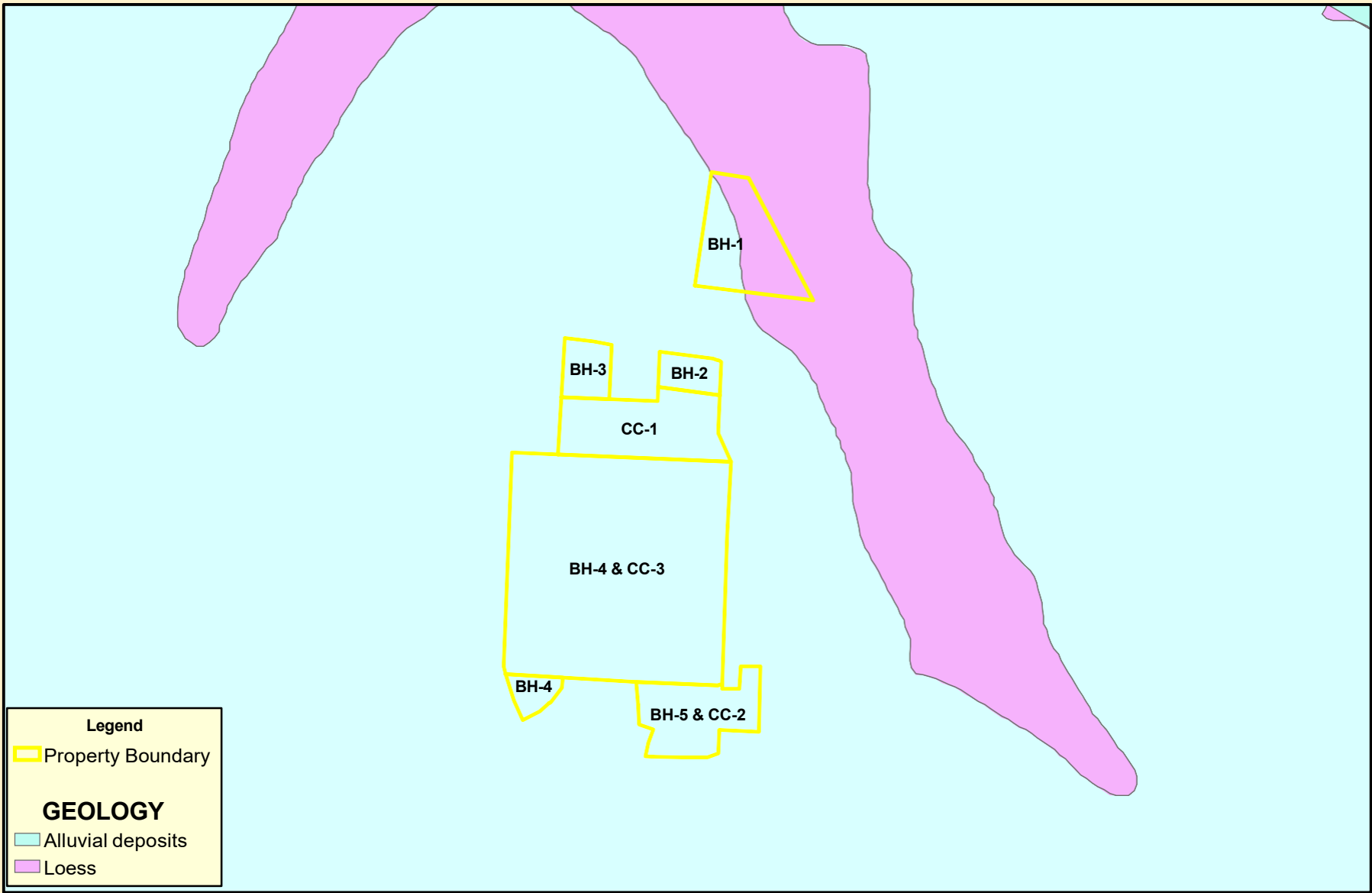


NATIONAL FLOOD INSURANCE PROGRAM  
FLOOD INSURANCE RATE MAP


PANEL 110 OF 400

Panel Contains:	NUMBER	PANEL
COMMUNITY HAYWOOD COUNTY	470227	0110







**Legend**

 Property Boundary

**GEOLOGY**

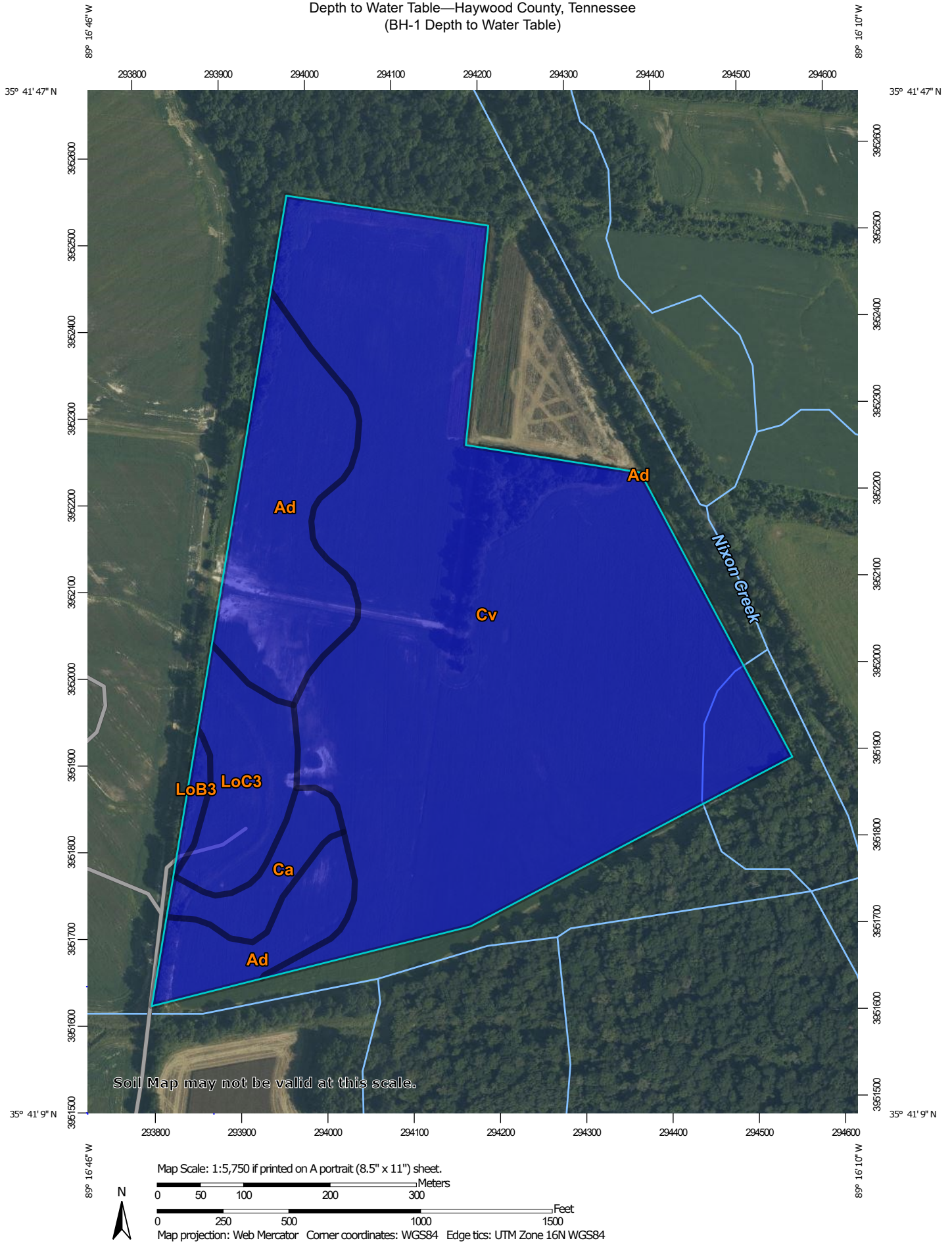
 Alluvial deposits

 Loess

	<h1>TN3</h1>	<p>0 0.25 0.5 1 1.5 2 Miles</p> <p>Becky Haynes &amp; Chris Cooper Haywood County, Tennessee</p>
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# Depth to Water Table—Haywood County, Tennessee (BH-1 Depth to Water Table)






Depth to Water Table—Haywood County, Tennessee  
(BH-1 Depth to Water Table)







## MAP LEGEND

### Area of Interest (AOI)




 Area of Interest (AOI)

### Soils







#### Soil Rating Polygons


-  0 - 25
-  25 - 50
-  50 - 100
-  100 - 150
-  150 - 200
-  > 200
-  Not rated or not available

#### Soil Rating Lines


-  0 - 25
-  25 - 50
-  50 - 100
-  100 - 150
-  150 - 200
-  > 200
-  Not rated or not available

#### Soil Rating Points






-  0 - 25
-  25 - 50
-  50 - 100
-  100 - 150
-  150 - 200
-  > 200

 Not rated or not available


### Water Features

 Streams and Canals

### Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL:  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Haywood County, Tennessee  
Survey Area Data: Version 22, Sep 15, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 9, 2019—Sep 15, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



## Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
Ad	Adler silt loam, 0 to 2 percent slopes, frequently flooded	>200	16.5	17.2%
Ca	Calloway silt loam	>200	3.0	3.1%
Cv	Convent silt loam, frequently flooded	>200	69.7	72.6%
LoB3	Loring silt loam, 1 to 5 percent slopes, severely eroded	>200	0.7	0.8%
LoC3	Loring silt loam, 5 to 8 percent slopes, severely eroded	>200	6.0	6.3%
<b>Totals for Area of Interest</b>			<b>95.9</b>	<b>100.0%</b>

## Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

## Rating Options

*Units of Measure:* centimeters

*Aggregation Method:* Dominant Component

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Lower

*Interpret Nulls as Zero:* No

*Beginning Month:* May

*Ending Month:* November



**Appendix C**  
**Residual Analytical Data**



**Materials to be Land Applied**

<b>Facility Name</b>	<b>Residual Type</b>	<b>Processed Material</b>
Bongard - Humboldt	DAF - Food Processing	Cheese
Conagra - Humboldt	DAF - Food Processing	Ice Cream Toppings
CSC Sugar	DAF - Food Processing	Sugar & Syrup
Darling Ingridients -Union City	DAF - Animal Processing	Animal Feed
Ecovation	DAF - Food Processing, Cake, & Off Spec Yogurt	Yogurt
Sonocco - Develeye	DAF - Food Processing	Condiments
Tyson - Humboldt	DAF - Animal Processing	Poultry
Tyson - Newbern	DAF - Animal Processing	Poultry
Tyson - Union City	DAF - Animal Processing	Poultry
Williams Sausage	DAF - Food Processing	Pork



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/17/2023  
Received : 05/03/2023

Report Number : **23-123-0211**

**REPORT OF ANALYSIS**

Lab No : **86931**  
Sample ID : **Bongard**

Matrix: **Solids**  
Sampled: **5/3/2023 7:30**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Organic Matter	<b>93.2</b>	%	0.100	1	05/16/23 11:00	VVP	ASTM D2974
Neutralizing Value (%CCE)	<b>5.9</b>	%	0.1	1	05/07/23 11:45	DXT	AOAC 955.01
Moisture	<b>96.6</b>	%		1	05/10/23 16:45	JLS	SW-DRYWT
Ammonia Nitrogen	<b>3260</b>	mg/Kg - dry	2940	1	05/09/23 13:00	JPJ	4500NH3C-2011
Biochemical Oxygen Demand (5-day)	<b>765000</b>	mg/Kg - dry	176000	1	05/04/23 08:15	JJZ	5210B-2016
Chloride	<b>8440</b>	mg/Kg - dry	1180	10	05/09/23 17:21	SRJ	9056A
Conductivity	<b>579</b>	µS/cm		1	05/12/23 15:57	CMF	2510B-2011
Nitrate (NO3-N)	<294	mg/Kg - dry	294	10	05/09/23 17:21	SRJ	9056A
Nitrite (NO2-N)	<294	mg/Kg - dry	294	10	05/09/23 17:21	SRJ	9056A
Nitrate+Nitrite-N	<294	mg/Kg - dry	294	10	05/09/23 17:21		9056A
HEM: Oil and Grease	<b>62600</b>	mg/Kg - dry	8410	1	05/08/23 12:07	DRD	SW-9071B
pH	<b>7.3</b>	s.u.		1	05/11/23 15:30	CNB	9045D
Total Solids	<b>3.37</b>	%	0.010	1	05/10/23 16:45	JLS	2540G-2011
Total Volatile Solids	<b>51.6</b>	%	0.010	1	05/10/23 16:45	JLS	2540G-2011
Total Kjeldahl Nitrogen	<b>21400</b>	mg/Kg - dry	7910	1	05/05/23 13:06	ANH	4500NORGD-2011
Phosphorus	<b>52900</b>	mg/Kg - dry	147	1	05/04/23 21:33	TJS	6010D
Arsenic	<14.7	mg/Kg - dry	14.7	1	05/04/23 21:33	TJS	6010D
Boron	<73.5	mg/Kg - dry	73.5	1	05/04/23 21:33	TJS	6010D
Cadmium	<2.94	mg/Kg - dry	2.94	1	05/04/23 21:33	TJS	6010D
Calcium	<b>8410</b>	mg/Kg - dry	1470	1	05/05/23 22:37	TJS	6010D
Chromium	<b>34.7</b>	mg/Kg - dry	7.35	1	05/05/23 22:37	TJS	6010D
Copper	<14.7	mg/Kg - dry	14.7	1	05/05/23 22:37	TJS	6010D
Lead	<b>13.5</b>	mg/Kg - dry	8.82	1	05/05/23 22:37	TJS	6010D

**Qualifiers/  
Definitions**

DF

Dilution Factor

MQL

Method Quantitation Limit



20513

Denali Water Solutions  
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Sample ID : **Bongard**

Matrix: **Solids**  
Sampled: **5/3/2023 7:30**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Magnesium	<b>665</b>	mg/Kg - dry	147	1	05/04/23 21:33	TJS	6010D
Manganese	<b>21.4</b>	mg/Kg - dry	14.7	1	05/04/23 21:33	TJS	6010D
Mercury	<5.50	mg/Kg - dry	5.50	1	05/10/23 12:11	FDS	7471A
Molybdenum	<7.35	mg/Kg - dry	7.35	1	05/04/23 21:33	TJS	6010D
Nickel	<b>26.9</b>	mg/Kg - dry	7.35	1	05/05/23 22:37	TJS	6010D
Potassium	<b>1940</b>	mg/Kg - dry	294	1	05/04/23 21:33	TJS	6010D
Selenium	<14.7	mg/Kg - dry	14.7	1	05/04/23 21:33	TJS	6010D
Sodium	<b>32100</b>	mg/Kg - dry	735	1	05/04/23 21:33	TJS	6010D
Zinc	<b>54.1</b>	mg/Kg - dry	36.8	1	05/05/23 22:37	TJS	6010D
Sulfur	<b>4440</b>	mg/Kg - dry	294	1	05/04/23 21:33	TJS	6010D

### Qualifiers/ Definitions

DF

Dilution Factor

MQL

Method Quantitation Limit



# Loading Rate Tabulation

Environmental



Facility: Bongards - Humboldt

Analysis Date: 5/3/2023

Analysis Note:

Product: DAF

State: TN

Application Type: Subsurface

AIC Control # 23-123-0211

Internal ID: 7094

PAN:  $20\% \times (\text{TKN} - \text{Ammonia}) + 100\% \times \text{Ammonia} + \text{NO}_3 + \text{NO}_2$

Parameter	Concentration (mg/kg)		Limits
	dry	wet	
PAN	7182.00	242.0334	
Ammonia	3260.00	109.8620	
TKN	21400.00	721.1800	
Nitrates/Nitrites	294.00	9.9078	
Organic N	18140.00	611.3180	
Arsenic	14.70	0.4954	75 mg/kg
Cadmium	2.94	0.0991	85 mg/kg
Chromium	34.70	1.1694	3000 mg/kg
Copper	14.70	0.4954	4300 mg/kg
Lead	13.50	0.4550	840 mg/kg
Mercury	5.50	0.1854	57 mg/kg
Molybdenum	7.35	0.2477	75 mg/kg
Nickel	26.90	0.9065	420 mg/kg
Phosphorus	52900.00	1782.7300	
Potassium	1940.00	65.3780	
Selenium	14.70	0.4954	100 mg/kg
Zinc	54.10	1.8232	7500 mg/kg
Iron			
Sodium	32100.00	1081.7700	
Barium			
Silver			
Calcium	8410.00	283.4170	
Magnesium	665.00	22.4105	
Manganese	21.40	0.7212	
Chloride	8440.00	284.4280	
Sulfur	4440.00	149.6280	
Oil & Grease		6	
BOD	765,000		
pH	7.30		
% Solids	3.37		
% Vol Solids	51.60		
% Moisture	96.60		
lbs/gallon	7.50		
dry tons/load	0.76		

Pounds per 6000 gallon(s) load:

Plant-available nitrogen: 10.89

Phospate (P2O5): 183.7100

Potash (K2O): 3.5300

SP:

Max. Allowable App Rate at:

Crop	PAN	App Rate
Corn	150	81,818
Bermuda Pasture	240	130,909
Soybeans	60	32,727
Wheat	75	40,909



# Client Sample Results

Client: Denali Water Solutions  
Project/Site: Conagra-Humboldt

Job ID: 192-2558-1

Client Sample ID: Conagra-Humboldt

Date Collected: 06/08/23 14:00

Date Received: 06/09/23 16:43

Lab Sample ID: 192-2558-1

Matrix: Solid

## Method: LA 29B SAR - Sodium Adsorption Ratio

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium Adsorption Ratio	13		1.0	NONE			06/21/23 18:20	1

## Method: SW846 6010D - Metals (ICP)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<4.6		4.6	mg/Kg	✱	06/15/23 14:24	06/21/23 12:30	1
Cadmium	<0.37		0.37	mg/Kg	✱	06/15/23 14:24	06/21/23 12:30	1
Chromium	<0.92		0.92	mg/Kg	✱	06/15/23 14:24	06/21/23 12:30	1
Copper	5.7		0.92	mg/Kg	✱	06/15/23 14:24	06/21/23 12:30	1
Lead	<3.7		3.7	mg/Kg	✱	06/15/23 14:24	06/21/23 12:30	1
Molybdenum	<0.92		0.92	mg/Kg	✱	06/15/23 14:24	06/21/23 12:30	1
Nickel	<0.92		0.92	mg/Kg	✱	06/15/23 14:24	06/23/23 11:16	1
Phosphorus	1200		92	mg/Kg	✱	06/15/23 14:24	06/21/23 14:06	10
Potassium	820		92	mg/Kg	✱	06/15/23 14:24	06/21/23 12:30	1
Selenium	<6.4		6.4	mg/Kg	✱	06/15/23 14:24	06/21/23 12:30	1
Zinc	18		0.92	mg/Kg	✱	06/15/23 14:24	06/21/23 12:30	1
Sulfur	500		9.2	mg/Kg	✱	06/15/23 14:24	06/23/23 11:16	1
Boron	<9.2		9.2	mg/Kg	✱	06/15/23 14:24	06/22/23 16:11	1
Calcium	1500		92	mg/Kg	✱	06/15/23 14:24	06/21/23 14:06	10
Magnesium	160		4.6	mg/Kg	✱	06/15/23 14:24	06/21/23 12:30	1
Manganese	3.4		0.18	mg/Kg	✱	06/15/23 14:24	06/22/23 16:11	1
Sodium	2000		92	mg/Kg	✱	06/15/23 14:24	06/21/23 12:30	1

## Method: SW846 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.097		0.097	mg/Kg		06/15/23 10:39	06/15/23 13:51	1

## General Chemistry

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (SM 2540G-2015)	95		0.010	%			06/16/23 12:14	1
Total Volatile Solids (SM 2540G-2015)	95		0.010	% by Wt			06/13/23 11:31	1
Total Solids (SM 2540G-2015)	5.2		0.010	%			06/16/23 12:14	1
pH (SW846 9045C)	3.8	HF	0.05	SU			06/13/23 11:41	1
Electrical Conductivity (1:1 Ratio) (SW846 9050A)	990		2.0	umhos/cm			06/14/23 12:06	1
Limestone Equivalency (AOAC 955.01)	<0.20		0.20	% by Wt			06/15/23 16:35	1
HEM (Oil & Grease) (ARDPCE AR OG_TPH)	2100		240	mg/Kg			06/14/23 14:07	1

## Method: ASTM D2974 - Moisture, Ash and Organic Matter

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Ash Content	2.0		0.001	% by Wt			06/16/23 14:08	1

Client Sample ID: Conagra-Humboldt

Date Collected: 06/08/23 14:00

Date Received: 06/09/23 16:43

Lab Sample ID: 192-2558-1

Matrix: Solid

Percent Solids: 5.2

## Method: SW846 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	<1.9		1.9	mg/Kg	✱	06/13/23 10:21	06/14/23 21:09	1

Eurofins Arkansas



# Client Sample Results

Client: Denali Water Solutions  
Project/Site: Conagra-Humboldt

Job ID: 192-2558-1

**Client Sample ID: Conagra-Humboldt**

**Lab Sample ID: 192-2558-1**

**Date Collected: 06/08/23 14:00**

**Matrix: Solid**

**Date Received: 06/09/23 16:43**

**Percent Solids: 5.2**

## Method: SW846 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography (Continued)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1221	<1.9		1.9	mg/Kg	✱	06/13/23 10:21	06/14/23 21:09	1
PCB-1232	<1.9		1.9	mg/Kg	✱	06/13/23 10:21	06/14/23 21:09	1
PCB-1242	<1.9		1.9	mg/Kg	✱	06/13/23 10:21	06/14/23 21:09	1
PCB-1248	<1.9		1.9	mg/Kg	✱	06/13/23 10:21	06/14/23 21:09	1
PCB-1254	<1.9		1.9	mg/Kg	✱	06/13/23 10:21	06/14/23 21:09	1
PCB-1260	<1.9		1.9	mg/Kg	✱	06/13/23 10:21	06/14/23 21:09	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Tetrachloro-m-xylene	72		47 - 115	06/13/23 10:21	06/14/23 21:09	1
DCB Decachlorobiphenyl (Surr)	79		52 - 122	06/13/23 10:21	06/14/23 21:09	1

## General Chemistry

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Ammonia (as N) (SM 4500 NH3 G-2011)	810		190	mg/Kg	✱	06/12/23 14:55	06/13/23 13:48	1
Total Kjeldahl Nitrogen (SM 4500 NorgC-2011)	6700		2300	mg/Kg	✱	06/12/23 17:09	06/16/23 09:19	5
Biochemical Oxygen Demand (SM 5210 B-2016)	410000		93	mg/Kg	✱		06/10/23 18:11	99.9
Chloride (SW846 9056A)	1500		36	mg/Kg	✱		06/10/23 07:59	1
Nitrate Nitrite as N (SW846 9056A)	<9.1		9.1	mg/Kg	✱		06/10/23 07:59	1



# Loading Rate Tabulation

Environmental



Facility: ConAgra Foods - Humboldt

Analysis Date: 6/9/2023

Analysis Note:

Product: DAF

State: TN

Application Type: Subsurface

AIC Control # 192-2558-1

Internal ID: 7197

PAN:  $20\% \times (\text{TKN} - \text{Ammonia}) + 100\% \times \text{Ammonia} + \text{NO}_3 + \text{NO}_2$

Parameter	Concentration (mg/kg)		Limits
	dry	wet	
PAN	1997.10	103.8492	
Ammonia	810.00	42.1200	
TKN	6700.00	348.4000	
Nitrates/Nitrites	9.10	0.4732	
Organic N	5890.00	306.2800	
Arsenic	4.60	0.2392	75 mg/kg
Cadmium	0.37	0.0192	85 mg/kg
Chromium	0.92	0.0478	3000 mg/kg
Copper	5.70	0.2964	4300 mg/kg
Lead	3.70	0.1924	840 mg/kg
Mercury	0.10	0.0050	57 mg/kg
Molybdenum	0.92	0.0478	75 mg/kg
Nickel	0.92	0.0478	420 mg/kg
Phosphorus	1200.00	62.4000	
Potassium	820.00	42.6400	
Selenium	6.40	0.3328	100 mg/kg
Zinc	18.00	0.9360	7500 mg/kg
Iron			
Sodium	2000.00	104.0000	
Barium			
Silver			
Calcium	1500.00	78.0000	
Magnesium	160.00	8.3200	
Manganese	3.40	0.1768	
Chloride	1500.00	78.0000	
Sulfur	500.00	26.0000	
Oil & Grease		0	
BOD			
pH	3.80		
% Solids	5.20		
% Vol Solids	95.00		
% Moisture	95.00		
lbs/gallon	7.50		
dry tons/load	1.17		

Pounds per 6000 gallon(s) load:

Plant-available nitrogen: 4.67

Phospate (P2O5): 6.4300

Potash (K2O): 2.3000

SP:

Max. Allowable App Rate at:

Crop	PAN	App Rate
Corn	150	180,000
Bermuda Pasture	240	288,000
Soybeans	60	72,000
Wheat	75	90,000



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/18/2023  
Received : 05/03/2023

Report Number : **23-123-0213**

# **REPORT OF ANALYSIS**

Lab No : **86937**

Sample ID : **CSC Sugar**

Matrix: **Solids**

Sampled: **5/2/2023 15:30**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Organic Matter	<b>29.6</b>	%	0.100	1	05/16/23 11:00	VVP	ASTM D2974
Neutralizing Value (%CCE)	<b>3.0</b>	%	0.1	1	05/07/23 11:45	DXT	AOAC 955.01
Ammonia Nitrogen	<100	mg/Kg	100	1	05/09/23 13:00	JPJ	4500NH3C-2011
Biochemical Oxygen Demand (5-day)	<b>38800</b>	mg/Kg	12000	1	05/04/23 08:15	JJZ	5210B-2016
Chloride	<b>5220</b>	mg/Kg	393	100	05/09/23 18:38	SRJ	9056A
Nitrate (NO3-N)	<246	mg/Kg	246	100	05/09/23 18:38	SRJ	9056A
Nitrite (NO2-N)	<246	mg/Kg	246	100	05/09/23 18:38	SRJ	9056A
Nitrate+Nitrite-N	<246	mg/Kg	246	100	05/09/23 18:38		9056A
HEM: Oil and Grease	<329	mg/Kg	329	1	05/08/23 12:07	DRD	SW-9071B
Total Kjeldahl Nitrogen	<b>328</b>	mg/Kg	183	1	05/05/23 13:09	ANH	4500NORGD-2011
Phosphorus	<b>23.5</b>	mg/Kg	5.00	1	05/04/23 21:43	TJS	6010D
Arsenic	<0.500	mg/Kg	0.500	1	05/04/23 21:43	TJS	6010D
Boron	<2.50	mg/Kg	2.50	1	05/04/23 21:43	TJS	6010D
Cadmium	<0.100	mg/Kg	0.100	1	05/04/23 21:43	TJS	6010D
Calcium	<b>97.1</b>	mg/Kg	50.0	1	05/05/23 22:47	TJS	6010D
Chromium	<0.250	mg/Kg	0.250	1	05/05/23 22:47	TJS	6010D
Copper	<b>1.92</b>	mg/Kg	0.500	1	05/05/23 22:47	TJS	6010D
Lead	<0.300	mg/Kg	0.300	1	05/04/23 21:43	TJS	6010D
Magnesium	<b>20.4</b>	mg/Kg	5.00	1	05/04/23 21:43	TJS	6010D
Manganese	<b>0.566</b>	mg/Kg	0.500	1	05/04/23 21:43	TJS	6010D
Mercury	<0.596	mg/Kg	0.596	1	05/10/23 12:14	FDS	7471A
Molybdenum	<b>0.321</b>	mg/Kg	0.250	1	05/04/23 21:43	TJS	6010D
Nickel	<0.250	mg/Kg	0.250	1	05/05/23 22:47	TJS	6010D

## **Qualifiers/ Definitions**

DF

Dilution Factor

MQL

Method Quantitation Limit



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/18/2023  
Received : 05/03/2023

Report Number : **23-123-0213**

## REPORT OF ANALYSIS

Lab No : **86937**

Sample ID : **CSC Sugar**

Matrix: **Solids**

Sampled: **5/2/2023 15:30**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Potassium	<b>27.8</b>	mg/Kg	10.0	1	05/04/23 21:43	TJS	6010D
Selenium	<0.500	mg/Kg	0.500	1	05/04/23 21:43	TJS	6010D
Sodium	<b>5580</b>	mg/Kg	25.0	1	05/05/23 22:47	TJS	6010D
Zinc	<1.25	mg/Kg	1.25	1	05/05/23 22:47	TJS	6010D
Sulfur	<b>131</b>	mg/Kg	10.0	1	05/04/23 21:43	TJS	6010D

### Qualifiers/ Definitions

DF

Dilution Factor

MQL

Method Quantitation Limit



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project CSC Sugar

Information :

Report Date : 06/19/2023  
Received : 06/05/2023

Report Number : **23-156-0130**

## REPORT OF ANALYSIS

Lab No : **83470**

Sample ID : **CSC Sugar**

Matrix: **Solids**

Sampled: **6/5/2023 8:00**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Soluble Salts	<b>14.0</b>	dS/m	0.01	1	06/16/23 10:43	JVP	Soluble Salts
Moisture	<b>95.2</b>	%		1	06/09/23 15:54	KDO	SW-DRYWT
pH	<b>3.7</b>	s.u.		1	06/07/23 16:00	CNB	9045D
Total Solids	<b>5.04</b>	%	0.010	1	06/12/23 17:33	CJR	2540G-2011

### Qualifiers/ Definitions

DF

Dilution Factor

MQL

Method Quantitation Limit



# Loading Rate Tabulation

Environmental



Facility: CSC Sugar - Covington TN

Analysis Date: 5/2/2023

Analysis Note:

Product: DAF

State: TN

Application Type: Subsurface

AIC Control # 23-123-0213 & 23-156-0'

Internal ID: 7093

PAN:  $20\% \times (\text{TKN} - \text{Ammonia}) + 100\% \times \text{Ammonia} + \text{NO}_3 + \text{NO}_2$

Parameter	Concentration (mg/kg)		Limits
	dry	wet	
PAN	637.60	32.1350	
Ammonia	100.00	5.0400	
TKN	328.00	16.5312	
Nitrates/Nitrites	492.00	24.7968	
Organic N	228.00	11.4912	
Arsenic	0.50	0.0252	75 mg/kg
Cadmium	0.10	0.0050	85 mg/kg
Chromium	0.25	0.0126	3000 mg/kg
Copper	1.92	0.0968	4300 mg/kg
Lead	0.30	0.0151	840 mg/kg
Mercury	0.60	0.0300	57 mg/kg
Molybdenum	0.32	0.0162	75 mg/kg
Nickel	0.25	0.0126	420 mg/kg
Phosphorus	23.50	1.1844	
Potassium	27.80	1.4011	
Selenium	0.50	0.0252	100 mg/kg
Zinc	1.25	0.0630	7500 mg/kg
Iron			
Sodium	5580.00	281.2320	
Barium			
Silver			
Calcium	97.10	4.8938	
Magnesium	20.40	1.0282	
Manganese	0.57	0.0285	
Chloride	5220.00	263.0880	
Sulfur	131.00	6.6024	
Oil & Grease		0	
BOD			
pH	3.70		
% Solids	5.04		
% Vol Solids			
% Moisture	95.20		
lbs/gallon	7.50		
dry tons/load	1.13		

Pounds per 6000 gallon(s) load:

Plant-available nitrogen: 1.45

Phospate (P2O5): 0.1200

Potash (K2O): 0.0800

SP:

## Max. Allowable App Rate at:

Crop	PAN	App Rate
Corn	150	900,000
Bermuda Pasture	240	1,440,000
Soybeans	60	360,000
Wheat	75	450,000



20513

Denali Water Solutions

Ms. Vanya Colburn

P.O. Box 399

Dardanelle , AR 72834

Project MO3

Information : Darpro Union City DARPUNC

Report Date : 05/30/2023

Received : 05/17/2023

Report Number : **23-137-0171**

**REPORT OF ANALYSIS**

Lab No : **95240**

Matrix: **Solids**

Sample ID : **Darpro Union City DARPUNC**

Sampled: **5/17/2023 9:30**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Moisture	<b>99.3</b>	%	0.010	1	05/24/23 16:50	JLS	2540G-2011
Ammonia Nitrogen	<b>1830</b>	mg/Kg	100	1	05/30/23 06:50	JPJ	4500NH3C-2011
Chloride	<b>602</b>	mg/Kg	40.0	10	05/24/23 20:15	SRJ	9056A
Nitrate (NO3-N)	<10.0	mg/Kg	10.0	10	05/24/23 20:15	SRJ	9056A
Nitrite (NO2-N)	<10.0	mg/Kg	10.0	10	05/24/23 20:15	SRJ	9056A
Nitrate+Nitrite-N	<10.0	mg/Kg	10.0	10	05/24/23 20:15		9056A
HEM: Oil and Grease	<281	mg/Kg	281	1	05/24/23 10:23	DRD	SW-9071B
pH	<b>8.3</b>	s.u.		1	05/23/23 16:00	CNB	9045D
Total Solids	<b>0.685</b>	%	0.010	1	05/24/23 16:50	JLS	2540G-2011
Total Volatile Solids	<b>98.0</b>	%	0.010	1	05/24/23 16:50	JLS	2540G-2011
Total Kjeldahl Nitrogen	<b>2270</b>	mg/Kg	244	1	05/22/23 15:26	ANH	4500NORGD-2011
Phosphorus	<b>306</b>	mg/Kg	5.00	1	05/20/23 09:48	BKN	6010D
Arsenic	<0.500	mg/Kg	0.500	1	05/20/23 09:48	BKN	6010D
Cadmium	<0.100	mg/Kg	0.100	1	05/20/23 09:48	BKN	6010D
Chromium	<0.250	mg/Kg	0.250	1	05/20/23 09:48	BKN	6010D
Copper	<b>0.955</b>	mg/Kg	0.500	1	05/20/23 09:48	BKN	6010D
Lead	<0.300	mg/Kg	0.300	1	05/20/23 09:48	BKN	6010D
Mercury	<0.171	mg/Kg	0.171	1	05/24/23 13:18	FDS	7471A
Molybdenum	<0.250	mg/Kg	0.250	1	05/20/23 09:48	BKN	6010D
Nickel	<0.250	mg/Kg	0.250	1	05/20/23 09:48	BKN	6010D
Potassium	<b>388</b>	mg/Kg	10.0	1	05/20/23 09:48	BKN	6010D
Selenium	<0.500	mg/Kg	0.500	1	05/20/23 09:48	BKN	6010D
Sodium	<b>624</b>	mg/Kg	25.0	1	05/20/23 09:48	BKN	6010D
Zinc	<b>4.16</b>	mg/Kg	1.25	1	05/20/23 09:48	BKN	6010D

**Qualifiers/  
Definitions**

DF  
MQL

Dilution Factor  
Method Quantitation Limit

L

Limit Exceeded



# Loading Rate Tabulation

Environmental



Facility: Darling Ingredients - Darling - Union City

Analysis Date: 5/17/2023

Analysis Note:

**Product:** DAF  
**State:** TN  
**Application Type:** Subsurface  
**PAN:**  $20\% \times (\text{TKN} - \text{Ammonia}) + 100\% \times \text{Ammonia} + \text{NO}_3 + \text{NO}_2$

**AIC Control #** 23-137-0171

**Internal ID:** 7108

Parameter	Concentration (mg/kg)		Limits
	dry	wet	
PAN	1928.00	13.2068	
Ammonia	1830.00	12.5355	
TKN	2270.00	15.5495	
Nitrates/Nitrites	10.00	0.0685	
Organic N	440.00	3.0140	
Arsenic	0.50	0.0034	75 mg/kg
Cadmium	0.10	0.0007	85 mg/kg
Chromium	0.25	0.0017	3000 mg/kg
Copper	0.96	0.0065	4300 mg/kg
Lead	0.30	0.0021	840 mg/kg
Mercury	0.17	0.0012	57 mg/kg
Molybdenum	0.25	0.0017	75 mg/kg
Nickel	0.25	0.0017	420 mg/kg
Phosphorus	306.00	2.0961	
Potassium	388.00	2.6578	
Selenium	0.50	0.0034	100 mg/kg
Zinc	4.16	0.0285	7500 mg/kg
Iron			
Sodium	624.00	4.2744	
Barium			
Silver			
Calcium			
Magnesium			
Manganese			
Chloride	602.00	4.1237	
Sulfur			
Oil & Grease		0	
BOD			
pH	8.30		
% Solids	0.69		
% Vol Solids	98.00		
% Moisture	99.30		
lbs/gallon	7.50		
dry tons/load	0.15		

Pounds per 6000 gallon(s) load:

**Plant-available nitrogen:** 0.59

**Phospate (P2O5):** 0.2200

**Potash (K2O):** 0.1400

**SP:**

**Max. Allowable App Rate at:**

<u>Crop</u>	<u>PAN</u>	<u>App Rate</u>
Corn	150	900,000
Bermuda Pasture	240	1,440,000
Soybeans	60	360,000
Wheat	75	450,000



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/17/2023  
Received : 05/03/2023

Report Number : **23-123-0214**

## REPORT OF ANALYSIS

Lab No : **86941**

Sample ID : **ECO Cake**

Matrix: **Solids**

Sampled: **5/2/2023 15:05**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Organic Matter	<b>91.7</b>	%	0.100	1	05/16/23 11:00	VVP	ASTM D2974
Neutralizing Value (%CCE)	<b>5.7</b>	%	0.1	1	05/07/23 11:45	DXT	AOAC 955.01
Moisture	<b>76.6</b>	%		1	05/09/23 17:15	JLS	SW-DRYWT
Ammonia Nitrogen	<b>692</b>	mg/Kg - dry	427	1	05/09/23 13:00	JPJ	4500NH3C-2011
Biochemical Oxygen Demand (5-day)	<b>1910000</b>	mg/Kg - dry	427000	1	05/04/23 08:15	JJZ	5210B-2016
Chloride	<b>868</b>	mg/Kg - dry	171	10	05/09/23 19:04	SRJ	9056A
Conductivity	<b>502</b>	µS/cm		1	05/12/23 15:57	CMF	2510B-2011
Nitrate (NO3-N)	<42.7	mg/Kg - dry	42.7	10	05/09/23 19:04	SRJ	9056A
Nitrite (NO2-N)	<42.7	mg/Kg - dry	42.7	10	05/09/23 19:04	SRJ	9056A
Nitrate+Nitrite-N	<42.7	mg/Kg - dry	42.7	10	05/09/23 19:04		9056A
HEM: Oil and Grease	<b>299000</b>	mg/Kg - dry	607	1	05/08/23 12:07	DRD	SW-9071B
pH	<b>4.5</b>	s.u.		1	05/11/23 15:30	CNB	9045D
Total Solids	<b>23.4</b>	%	0.010	1	05/09/23 17:15	JLS	2540G-2011
Total Volatile Solids	<b>96.1</b>	%	0.010	1	05/09/23 17:15	JLS	2540G-2011
Total Kjeldahl Nitrogen	<b>49100</b>	mg/Kg - dry	1140	1	05/05/23 13:10	ANH	4500NORGD-2011
Phosphorus	<b>7610</b>	mg/Kg - dry	21.4	1	05/04/23 21:48	TJS	6010D
Arsenic	<2.14	mg/Kg - dry	2.14	1	05/04/23 21:48	TJS	6010D
Boron	<10.7	mg/Kg - dry	10.7	1	05/04/23 21:48	TJS	6010D
Cadmium	<0.427	mg/Kg - dry	0.427	1	05/04/23 21:48	TJS	6010D
Calcium	<b>2990</b>	mg/Kg - dry	214	1	05/05/23 23:03	TJS	6010D
Chromium	<b>6.37</b>	mg/Kg - dry	1.07	1	05/05/23 23:03	TJS	6010D
Copper	<b>40.2</b>	mg/Kg - dry	2.14	1	05/05/23 23:03	TJS	6010D
Lead	<1.28	mg/Kg - dry	1.28	1	05/05/23 23:03	TJS	6010D

### Qualifiers/ Definitions

DF

Dilution Factor

MQL

Method Quantitation Limit



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/17/2023  
Received : 05/03/2023

Report Number : **23-123-0214**

## REPORT OF ANALYSIS

Lab No : **86941**

Sample ID : **ECO Cake**

Matrix: **Solids**

Sampled: **5/2/2023 15:05**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Magnesium	<b>362</b>	mg/Kg - dry	21.4	1	05/04/23 21:48	TJS	6010D
Manganese	<b>8.50</b>	mg/Kg - dry	2.14	1	05/04/23 21:48	TJS	6010D
Mercury	<0.714	mg/Kg - dry	0.714	1	05/10/23 12:18	FDS	7471A
Molybdenum	<b>1.31</b>	mg/Kg - dry	1.07	1	05/04/23 21:48	TJS	6010D
Nickel	<b>3.31</b>	mg/Kg - dry	1.07	1	05/05/23 23:03	TJS	6010D
Potassium	<b>1060</b>	mg/Kg - dry	42.7	1	05/04/23 21:48	TJS	6010D
Selenium	<2.14	mg/Kg - dry	2.14	1	05/04/23 21:48	TJS	6010D
Sodium	<b>1380</b>	mg/Kg - dry	107	1	05/04/23 21:48	TJS	6010D
Zinc	<b>50.4</b>	mg/Kg - dry	5.34	1	05/05/23 23:03	TJS	6010D
Sulfur	<b>2910</b>	mg/Kg - dry	42.7	1	05/04/23 21:48	TJS	6010D

### Qualifiers/ Definitions

DF

Dilution Factor

MQL

Method Quantitation Limit



11675

Denali Water Solutions  
Ms. Vanya Colburn  
P.O. Box 3036  
Russellville , AR 72802

Project FPR Cake  
Information : Covington, TN

Report Date : 07/31/2023  
Received : 07/10/2023

Report Number : **23-191-0127**

## REPORT OF ANALYSIS

Lab No : **97877**

Sample ID : **TN3-Unilever- Covington**

Matrix: **Solids**

Sampled: **6/25/2023 0:00**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Bulk Density	<b>53</b>	g/100cc		1	07/18/23 10:00	JRF	ULK DENSITY (DRY
Moisture	<b>82.4</b>	%		1	07/11/23 16:57	KDO	SW-DRYWT
Ammonia Nitrogen	<b>727 H</b>	mg/Kg - dry	568	1	07/28/23 07:30	JPJ	4500NH3C-2011
Nitrate (NO3-N)	<56.8	mg/Kg - dry	56.8	10	07/14/23 10:02	NFP	9056A
Nitrite (NO2-N)	<56.8	mg/Kg - dry	56.8	10	07/14/23 10:02	NFP	9056A
Nitrate+Nitrite-N	<56.8	mg/Kg - dry	56.8	10	07/14/23 10:02		9056A
pH	<b>4.9</b>	s.u.		1	07/11/23 16:40	CNB	9045D
Total Solids	<b>17.6 H</b>	%	0.010	1	07/11/23 16:57	KDO	2540G-2011
Total Kjeldahl Nitrogen	<b>47800</b>	mg/Kg - dry	2240	1	07/17/23 13:39	ANH	4500NORGD-2011
Phosphorus	<b>11700</b>	mg/Kg - dry	28.4	1	07/13/23 19:40	TJS	6010D
Potassium	<b>1730</b>	mg/Kg - dry	56.8	1	07/17/23 13:42	JTR	6010D

### Qualifiers/ Definitions

DF

Dilution Factor

H

Beyond holding time



# Loading Rate Tabulation

Environmental - Dewatering



Facility: Nalco Contract Operations - Ecovation Covington

Analysis Date: 5/2/2023

Analysis Note:

Product: Cake  
State: TN  
Application Type: Surface  
PAN:  $20\% \times (\text{TKN} - \text{Ammonia}) + 50\% \times \text{Ammonia} + \text{NO}_3 + \text{NO}_2$

AIC Control #: 23-123-0214  
Internal ID: 7082

Parameter	Concentration (mg/kg)		Limits
	dry	lbs/ton	
PAN	9891.70	19.7834	
Ammonia	727.00	1.4540	
TKN	47800.00	95.6000	
Nitrates/Nitrites	113.60	0.2272	
Organic N	47073.00	94.1460	
Arsenic	2.14	0.0043	75 mg/kg
Cadmium	0.43	0.0009	85 mg/kg
Chromium	6.37	0.0127	3000 mg/kg
Copper	40.20	0.0804	4300 mg/kg
Lead	1.28	0.0026	840 mg/kg
Mercury	0.71	0.0014	57 mg/kg
Molybdenum	1.31	0.0026	75 mg/kg
Nickel	3.31	0.0066	420 mg/kg
Phosphorus	11700.00	23.4000	
Potassium	1730.00	3.4600	
Selenium	2.14	0.0043	100 mg/kg
Zinc	50.40	0.1008	7500 mg/kg
Iron			
Sodium	1380.00	2.7600	
Barium			
Silver			
Calcium	2990.00	5.9800	
Magnesium	362.00	0.7240	
Manganese	8.50	0.0170	
Chloride	868.00	1.7360	
Sulfur	2910.00	5.8200	
Oil & Grease	30		
BOD			
PCB			
Fecal Coliform			
TCLP			
pH	4.90		
% Solids	17.60		
% Vol Solids	96.10		
% Moisture	82.40		
Density	4.50 lbs/gallon	909.00 lbs/yd <sup>3</sup>	

Tons per load at  
1 ton/load

Dry tons/load: 0.18  
PAN/DT: 19.78  
PAN/WT: 3.4820  
Phosphate (P<sub>2</sub>O<sub>5</sub>): 9.4300  
Potash (K<sub>2</sub>O): 0.7200

Max. Allowable App Rate at:

Crop	PAN	App Rate
Corn	150	300,000
Bermuda Pasture	240	480,000
Soybeans	60	120,000
Wheat	75	150,000



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/17/2023  
Received : 05/03/2023

Report Number : **23-123-0215**

# **REPORT OF ANALYSIS**

Lab No : **86942**

Sample ID : **ECO Yogurt**

Matrix: **Solids**

Sampled: **5/2/2023 15:10**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Organic Matter	<b>30.8</b>	%	0.100	1	05/16/23 11:00	VVP	ASTM D2974
Neutralizing Value (%CCE)	<b>3.1</b>	%	0.1	1	05/07/23 11:45	DXT	AOAC 955.01
Moisture	<b>75.3</b>	%		1	05/09/23 17:15	JLS	SW-DRYWT
Ammonia Nitrogen	<b>405</b>	mg/Kg - dry	405	1	05/09/23 13:00	JPJ	4500NH3C-2011
Biochemical Oxygen Demand (5-day)	<b>1210000</b>	mg/Kg - dry	405000	1	05/04/23 08:15	JJZ	5210B-2016
Chloride	<b>2940</b>	mg/Kg - dry	1620	100	05/09/23 19:30	SRJ	9056A
Conductivity	<b>951</b>	µS/cm		1	05/12/23 15:57	CMF	2510B-2011
Nitrate (NO3-N)	<405	mg/Kg - dry	405	100	05/09/23 19:30	SRJ	9056A
Nitrite (NO2-N)	<405	mg/Kg - dry	405	100	05/09/23 19:30	SRJ	9056A
Nitrate+Nitrite-N	<405	mg/Kg - dry	405	100	05/09/23 19:30		9056A
HEM: Oil and Grease	<b>135000</b>	mg/Kg - dry	1130	1	05/08/23 12:07	DRD	SW-9071B
pH	<b>3.6</b>	s.u.		1	05/11/23 15:30	CNB	9045D
Total Solids	<b>24.7</b>	%	0.010	1	05/09/23 17:15	JLS	2540G-2011
Total Volatile Solids	<b>99.9</b>	%	0.010	1	05/09/23 17:15	JLS	2540G-2011
Total Kjeldahl Nitrogen	<b>14500</b>	mg/Kg - dry	1060	1	05/05/23 13:11	ANH	4500NORGD-2011
Phosphorus	<b>3240</b>	mg/Kg - dry	20.2	1	05/06/23 03:46	BKN	6010D
Arsenic	<2.02	mg/Kg - dry	2.02	1	05/06/23 03:46	BKN	6010D
Boron	<10.1	mg/Kg - dry	10.1	1	05/06/23 03:46	BKN	6010D
Cadmium	<0.405	mg/Kg - dry	0.405	1	05/06/23 03:46	BKN	6010D
Calcium	<b>3200</b>	mg/Kg - dry	202	1	05/06/23 03:46	BKN	6010D
Chromium	<1.01	mg/Kg - dry	1.01	1	05/06/23 03:46	BKN	6010D
Copper	<2.02	mg/Kg - dry	2.02	1	05/06/23 03:46	BKN	6010D
Lead	<1.21	mg/Kg - dry	1.21	1	05/06/23 03:46	BKN	6010D

## **Qualifiers/ Definitions**

DF

Dilution Factor

MQL

Method Quantitation Limit



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/17/2023  
Received : 05/03/2023

Report Number : **23-123-0215**

**REPORT OF ANALYSIS**

Lab No : **86942**

Sample ID : **ECO Yogurt**

Matrix: **Solids**

Sampled: **5/2/2023 15:10**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Magnesium	<b>462</b>	mg/Kg - dry	20.2	1	05/06/23 03:46	BKN	6010D
Manganese	<2.02	mg/Kg - dry	2.02	1	05/06/23 03:46	BKN	6010D
Mercury	<0.696	mg/Kg - dry	0.696	1	05/10/23 12:20	FDS	7471A
Molybdenum	<1.01	mg/Kg - dry	1.01	1	05/06/23 03:46	BKN	6010D
Nickel	<1.01	mg/Kg - dry	1.01	1	05/06/23 03:46	BKN	6010D
Potassium	<b>5380</b>	mg/Kg - dry	405	10	05/08/23 11:35	TJS	6010D
Selenium	<2.02	mg/Kg - dry	2.02	1	05/06/23 03:46	BKN	6010D
Sodium	<b>2100</b>	mg/Kg - dry	101	1	05/06/23 03:46	BKN	6010D
Zinc	<b>14.7</b>	mg/Kg - dry	5.06	1	05/06/23 03:46	BKN	6010D
Sulfur	<b>1160</b>	mg/Kg - dry	40.5	1	05/06/23 03:46	BKN	6010D

**Qualifiers/  
Definitions**

DF

Dilution Factor

MQL

Method Quantitation Limit



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Ecovation - Yogurt

Information :

Report Date : 06/21/2023  
Received : 06/05/2023

Report Number : **23-156-0131**

## REPORT OF ANALYSIS

Lab No : **83471**

Sample ID : **Ecovation - Yogurt**

Matrix: **Solids**

Sampled: **6/5/2023 8:00**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Moisture	<b>97.0</b>	%		1	06/09/23 15:54	KDO	SW-DRYWT
Ammonia Nitrogen	<3330	mg/Kg - dry	3330	1	06/21/23 07:00	JPJ	4500NH3C-2011
Nitrate (NO3-N)	<333	mg/Kg - dry	333	10	06/06/23 20:42	SRJ	9056A
Nitrite (NO2-N)	<333	mg/Kg - dry	333	10	06/06/23 20:42	SRJ	9056A
Nitrate+Nitrite-N	<333	mg/Kg - dry	333	10	06/06/23 20:42		9056A
Total Solids	<b>2.92</b>	%	0.010	1	06/12/23 17:33	CJR	2540G-2011
Total Kjeldahl Nitrogen	<b>11200</b>	mg/Kg - dry	6900	1	06/08/23 15:18	ANH	4500NORGD-2011
Phosphorus	<b>3120</b>	mg/Kg - dry	167	1	06/09/23 06:17	TJS	6010D
Potassium	<b>6800</b>	mg/Kg - dry	333	1	06/09/23 06:17	TJS	6010D

### Qualifiers/ Definitions

DF

Dilution Factor

MQL

Method Quantitation Limit



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/17/2023  
Received : 05/03/2023

Report Number : **23-123-0216**

**REPORT OF ANALYSIS**

Lab No : **86943**

Sample ID : **ECO DAF**

Matrix: **Solids**

Sampled: **5/2/2023 15:00**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Organic Matter	<b>96.6</b>	%	0.100	1	05/16/23 11:00	VVP	ASTM D2974
Neutralizing Value (%CCE)	<b>2.5</b>	%	0.1	1	05/07/23 11:45	DXT	AOAC 955.01
Moisture	<b>96.7</b>	%		1	05/09/23 17:15	JLS	SW-DRYWT
Ammonia Nitrogen	<b>5790</b>	mg/Kg - dry	3030	1	05/09/23 13:00	JPJ	4500NH3C-2011
Biochemical Oxygen Demand (5-day)	<b>1300000</b>	mg/Kg - dry	364000	1	05/04/23 08:15	JJZ	5210B-2016
Chloride	<b>6730</b>	mg/Kg - dry	1210	10	05/09/23 19:56	SRJ	9056A
Conductivity	<b>394</b>	µS/cm		1	05/12/23 15:57	CMF	2510B-2011
Nitrate (NO3-N)	<303	mg/Kg - dry	303	10	05/09/23 19:56	SRJ	9056A
Nitrite (NO2-N)	<303	mg/Kg - dry	303	10	05/09/23 19:56	SRJ	9056A
Nitrate+Nitrite-N	<303	mg/Kg - dry	303	10	05/09/23 19:56		9056A
HEM: Oil and Grease	<b>226000</b>	mg/Kg - dry	8060	1	05/08/23 12:07	DRD	SW-9071B
pH	<b>4.6</b>	s.u.		1	05/11/23 15:30	CNB	9045D
Total Solids	<b>3.33</b>	%	0.010	1	05/09/23 17:15	JLS	2540G-2011
Total Volatile Solids	<b>92.3</b>	%	0.010	1	05/09/23 17:15	JLS	2540G-2011
Total Kjeldahl Nitrogen	<b>46400</b>	mg/Kg - dry	6820	1	05/05/23 13:14	ANH	4500NORGD-2011
Phosphorus	<b>7700</b>	mg/Kg - dry	152	1	05/06/23 03:51	BKN	6010D
Arsenic	<15.2	mg/Kg - dry	15.2	1	05/06/23 03:51	BKN	6010D
Boron	<75.8	mg/Kg - dry	75.8	1	05/06/23 03:51	BKN	6010D
Cadmium	<3.03	mg/Kg - dry	3.03	1	05/06/23 03:51	BKN	6010D
Calcium	<b>6760</b>	mg/Kg - dry	1520	1	05/06/23 03:51	BKN	6010D
Chromium	<7.58	mg/Kg - dry	7.58	1	05/06/23 03:51	BKN	6010D
Copper	<b>44.5</b>	mg/Kg - dry	15.2	1	05/06/23 03:51	BKN	6010D
Lead	<9.09	mg/Kg - dry	9.09	1	05/06/23 03:51	BKN	6010D

**Qualifiers/  
Definitions**

DF

Dilution Factor

MQL

Method Quantitation Limit



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/17/2023  
Received : 05/03/2023

Report Number : **23-123-0216**

## REPORT OF ANALYSIS

Lab No : **86943**

Sample ID : **ECO DAF**

Matrix: **Solids**

Sampled: **5/2/2023 15:00**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Magnesium	<b>794</b>	mg/Kg - dry	152	1	05/06/23 03:51	BKN	6010D
Manganese	<b>16.1</b>	mg/Kg - dry	15.2	1	05/06/23 03:51	BKN	6010D
Mercury	<5.45	mg/Kg - dry	5.45	1	05/10/23 12:21	FDS	7471A
Molybdenum	<7.58	mg/Kg - dry	7.58	1	05/06/23 03:51	BKN	6010D
Nickel	<7.58	mg/Kg - dry	7.58	1	05/06/23 03:51	BKN	6010D
Potassium	<b>5240</b>	mg/Kg - dry	303	1	05/06/23 03:51	BKN	6010D
Selenium	<15.2	mg/Kg - dry	15.2	1	05/06/23 03:51	BKN	6010D
Sodium	<b>10700</b>	mg/Kg - dry	758	1	05/06/23 03:51	BKN	6010D
Zinc	<b>80.6</b>	mg/Kg - dry	37.9	1	05/06/23 03:51	BKN	6010D
Sulfur	<b>3360</b>	mg/Kg - dry	303	1	05/06/23 03:51	BKN	6010D

### Qualifiers/ Definitions

DF

Dilution Factor

MQL

Method Quantitation Limit



# Loading Rate Tabulation

Environmental



Facility: Nalco Contract Operations - Ecovation Covington

Analysis Date: 5/2/2023

Analysis Note:

**Product:** DAF  
**State:** TN  
**Application Type:** Subsurface  
**PAN:**  $20\% \times (\text{TKN} - \text{Ammonia}) + 100\% \times \text{Ammonia} + \text{NO}_3 + \text{NO}_2$

**AIC Control #** 23-123-0216

**Internal ID:** 7096

Parameter	Concentration (mg/kg)		Limits
	dry	wet	
PAN	14215.00	473.3595	
Ammonia	5790.00	192.8070	
TKN	46400.00	1545.1200	
Nitrates/Nitrites	303.00	10.0899	
Organic N	40610.00	1352.3130	
Arsenic	15.20	0.5062	75 mg/kg
Cadmium	3.03	0.1009	85 mg/kg
Chromium	7.58	0.2524	3000 mg/kg
Copper	44.50	1.4819	4300 mg/kg
Lead	9.09	0.3027	840 mg/kg
Mercury	5.45	0.1815	57 mg/kg
Molybdenum	7.58	0.2524	75 mg/kg
Nickel	7.58	0.2524	420 mg/kg
Phosphorus	7700.00	256.4100	
Potassium	5240.00	174.4920	
Selenium	15.20	0.5062	100 mg/kg
Zinc	80.60	2.6840	7500 mg/kg
Iron			
Sodium	10700.00	356.3100	
Barium			
Silver			
Calcium	6760.00	225.1080	
Magnesium	794.00	26.4402	
Manganese	16.10	0.5361	
Chloride	6730.00	224.1090	
Sulfur	3360.00	111.8880	
Oil & Grease		23	
BOD			
pH	4.60		
% Solids	3.33		
% Vol Solids	92.30		
% Moisture	96.70		
lbs/gallon	7.50		
dry tons/load	0.75		

Pounds per 6000 gallon(s) load:

**Plant-available nitrogen:** 21.30

**Phospate (P2O5):** 26.4200

**Potash (K2O):** 9.4200

**SP:**

**Max. Allowable App Rate at:**

<u>Crop</u>	<u>PAN</u>	<u>App Rate</u>
Corn	150	42,857
Bermuda Pasture	240	68,571
Soybeans	60	17,143
Wheat	75	21,429



# Loading Rate Tabulation

Environmental



Facility: Nalco Contract Operations - Ecovation Covington

Analysis Date: 5/2/2023

Analysis Note:

Product: Yogurt

State: TN

Application Type: Subsurface

AIC Control # 23-123-0215 & 23-156-0'

Internal ID: 7081

PAN:  $20\% \times (\text{TKN} - \text{Ammonia}) + 100\% \times \text{Ammonia} + \text{NO}_3 + \text{NO}_2$

Parameter	Concentration (mg/kg)		Limits
	dry	wet	
PAN	5570.00	162.6440	
Ammonia	3330.00	97.2360	
TKN	11200.00	327.0400	
Nitrates/Nitrites	666.00	19.4472	
Organic N	7870.00	229.8040	
Arsenic	2.02	0.0590	75 mg/kg
Cadmium	0.41	0.0118	85 mg/kg
Chromium	1.01	0.0295	3000 mg/kg
Copper	2.02	0.0590	4300 mg/kg
Lead	1.21	0.0353	840 mg/kg
Mercury	0.70	0.0203	57 mg/kg
Molybdenum	1.01	0.0295	75 mg/kg
Nickel	1.01	0.0295	420 mg/kg
Phosphorus	3120.00	91.1040	
Potassium	6800.00	198.5600	
Selenium	2.02	0.0590	100 mg/kg
Zinc	14.70	0.4292	7500 mg/kg
Iron			
Sodium	2100.00	61.3200	
Barium			
Silver			
Calcium	3200.00	93.4400	
Magnesium	462.00	13.4904	
Manganese	2.02	0.0590	
Chloride	2940.00	85.8480	
Sulfur	1160.00	33.8720	
Oil & Grease		14	
BOD			
pH	3.60		
% Solids	2.92		
% Vol Solids	99.90		
% Moisture	97.00		
lbs/gallon	7.50		
dry tons/load	0.66		

Pounds per 6000 gallon(s) load:

Plant-available nitrogen: 7.32

Phosphate (P2O5): 9.3900

Potash (K2O): 10.7200

SP:

Max. Allowable App Rate at:

Crop	PAN	App Rate
Corn	150	128,571
Bermuda Pasture	240	205,714
Soybeans	60	51,429
Wheat	75	64,286



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/18/2023  
Received : 05/03/2023

Report Number : **23-123-0217**

**REPORT OF ANALYSIS**

Lab No : **86944**

Sample ID : **Sonoco Develey**

Matrix: **Solids**

Sampled: **5/3/2023 7:45**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Organic Matter	<b>92.4</b>	%	0.100	1	05/16/23 11:00	VVP	ASTM D2974
Neutralizing Value (%CCE)	<b>3.0</b>	%	0.1	1	05/07/23 11:45	DXT	AOAC 955.01
Moisture	<b>99.3</b>	%		1	05/10/23 16:45	JLS	SW-DRYWT
Ammonia Nitrogen	<100	mg/Kg	100	1	05/09/23 13:00	JPJ	4500NH3C-2011
Biochemical Oxygen Demand (5-day)	<b>6190</b>	mg/Kg	2000	1	05/04/23 08:15	JJZ	5210B-2016
Chloride	<b>161</b>	mg/Kg	40.0	10	05/09/23 20:22	SRJ	9056A
Conductivity	<b>195</b>	µS/cm		1	05/12/23 15:57	CMF	2510B-2011
Nitrate (NO3-N)	<10.0	mg/Kg	10.0	10	05/09/23 20:22	SRJ	9056A
Nitrite (NO2-N)	<10.0	mg/Kg	10.0	10	05/09/23 20:22	SRJ	9056A
Nitrate+Nitrite-N	<10.0	mg/Kg	10.0	10	05/09/23 20:22		9056A
HEM: Oil and Grease	<258	mg/Kg	258	1	05/10/23 12:09	SMS	SW-9071B
pH	<b>3.3</b>	s.u.		1	05/11/23 15:30	CNB	9045D
Total Solids	<b>0.703</b>	%	0.010	1	05/10/23 16:45	JLS	2540G-2011
Total Volatile Solids	<b>83.9</b>	%	0.010	1	05/10/23 16:45	JLS	2540G-2011
Total Kjeldahl Nitrogen	<164	mg/Kg	164	1	05/05/23 13:15	ANH	4500NORGD-2011
Phosphorus	<b>44.0</b>	mg/Kg	5.00	1	05/06/23 03:57	BKN	6010D
Arsenic	<0.500	mg/Kg	0.500	1	05/06/23 03:57	BKN	6010D
Boron	<2.50	mg/Kg	2.50	1	05/06/23 03:57	BKN	6010D
Cadmium	<0.100	mg/Kg	0.100	1	05/06/23 03:57	BKN	6010D
Calcium	<b>76.9</b>	mg/Kg	50.0	1	05/06/23 03:57	BKN	6010D
Chromium	<0.250	mg/Kg	0.250	1	05/06/23 03:57	BKN	6010D
Copper	<b>2.33</b>	mg/Kg	0.500	1	05/06/23 03:57	BKN	6010D
Lead	<0.300	mg/Kg	0.300	1	05/06/23 03:57	BKN	6010D

**Qualifiers/  
Definitions**

DF

Dilution Factor

MQL

Method Quantitation Limit



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/18/2023  
Received : 05/03/2023

Report Number : **23-123-0217**

## REPORT OF ANALYSIS

Lab No : **86944**

Sample ID : **Sonoco Deveyey**

Matrix: **Solids**

Sampled: **5/3/2023 7:45**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Magnesium	<b>15.9</b>	mg/Kg	5.00	1	05/06/23 03:57	BKN	6010D
Manganese	<0.500	mg/Kg	0.500	1	05/06/23 03:57	BKN	6010D
Mercury	<0.177	mg/Kg	0.177	1	05/10/23 12:22	FDS	7471A
Molybdenum	<0.250	mg/Kg	0.250	1	05/06/23 03:57	BKN	6010D
Nickel	<0.250	mg/Kg	0.250	1	05/06/23 03:57	BKN	6010D
Potassium	<b>37.9</b>	mg/Kg	10.0	1	05/06/23 03:57	BKN	6010D
Selenium	<0.500	mg/Kg	0.500	1	05/06/23 03:57	BKN	6010D
Sodium	<b>204</b>	mg/Kg	25.0	1	05/06/23 03:57	BKN	6010D
Zinc	<b>2.55</b>	mg/Kg	1.25	1	05/06/23 03:57	BKN	6010D
Sulfur	<b>39.9</b>	mg/Kg	10.0	1	05/06/23 03:57	BKN	6010D

### Qualifiers/ Definitions

DF

Dilution Factor

MQL

Method Quantitation Limit



# Loading Rate Tabulation

Environmental



Facility: Sonoco Recycling - Develey Mustard

Analysis Date: 5/3/2023

Analysis Note:

**Product:** DAF  
**State:** TN  
**Application Type:** Subsurface  
**PAN:** 20% × (TKN - Ammonia) + 100% × Ammonia + NO3 + NO2

**AIC Control #** 23-123-0217

**Internal ID:** 7092

Parameter	Concentration (mg/kg)		Limits
	dry	wet	
PAN	122.80	0.8633	
Ammonia	100.00	0.7030	
TKN	164.00	1.1529	
Nitrates/Nitrites	10.00	0.0703	
Organic N	64.00	0.4499	
Arsenic	0.50	0.0035	75 mg/kg
Cadmium	0.10	0.0007	85 mg/kg
Chromium	0.25	0.0018	3000 mg/kg
Copper	2.33	0.0164	4300 mg/kg
Lead	0.30	0.0021	840 mg/kg
Mercury	0.18	0.0012	57 mg/kg
Molybdenum	0.25	0.0018	75 mg/kg
Nickel	0.25	0.0018	420 mg/kg
Phosphorus	44.00	0.3093	
Potassium	37.90	0.2664	
Selenium	0.50	0.0035	100 mg/kg
Zinc	2.55	0.0179	7500 mg/kg
Iron			
Sodium	204.00	1.4341	
Barium			
Silver			
Calcium	76.90	0.5406	
Magnesium	15.90	0.1118	
Manganese	0.50	0.0035	
Chloride	161.00	1.1318	
Sulfur	39.90	0.2805	
Oil & Grease		0	
BOD			
pH	3.30		
% Solids	0.70		
% Vol Solids	83.90		
% Moisture	99.30		
lbs/gallon	7.50		
dry tons/load	0.16		

Pounds per 6000 gallon(s) load:

**Plant-available nitrogen:** 0.04

**Phospate (P2O5):** 0.0300

**Potash (K2O):** 0.0100

**SP:**

**Max. Allowable App Rate at:**

<u>Crop</u>	<u>PAN</u>	<u>App Rate</u>
Corn	150	150,000
Bermuda Pasture	240	240,000
Soybeans	60	60,000
Wheat	75	75,000



# Loading Rate Tabulation

Environmental



Facility: Tyson Foods Inc - Tyson Humboldt

Analysis Date: 5/2/2023

Analysis Note:

**Product:** DAF  
**State:** TN  
**Application Type:** Subsurface  
**PAN:** 20% × (TKN - Ammonia) + 100% × Ammonia + NO3 + NO2

**AIC Control #** 23-123-0255

**Internal ID:** 7090

Parameter	Concentration (mg/kg)		Limits
	dry	wet	
PAN	18394.00	266.7130	
Ammonia	14500.00	210.2500	
TKN	30400.00	440.8000	
Nitrates/Nitrites	714.00	10.3530	
Organic N	15900.00	230.5500	
Arsenic	35.70	0.5177	75 mg/kg
Cadmium	7.14	0.1035	85 mg/kg
Chromium	17.90	0.2596	3000 mg/kg
Copper	35.70	0.5177	4300 mg/kg
Lead	21.40	0.3103	840 mg/kg
Mercury	12.70	0.1842	57 mg/kg
Molybdenum	17.90	0.2596	75 mg/kg
Nickel	17.90	0.2596	420 mg/kg
Phosphorus	6700.00	97.1500	
Potassium	3080.00	44.6600	
Selenium	35.70	0.5177	100 mg/kg
Zinc	121.00	1.7545	7500 mg/kg
Iron			
Sodium	1790.00	25.9550	
Barium			
Silver			
Calcium	4420.00	64.0900	
Magnesium	943.00	13.6735	
Manganese	35.70	0.5177	
Chloride	2860.00	41.4700	
Sulfur	2260.00	32.7700	
Oil & Grease		2	
BOD			
pH	7.10		
% Solids	1.45		
% Vol Solids	65.10		
% Moisture	98.60		
lbs/gallon	7.50		
dry tons/load	0.33		

Pounds per 6000 gallon(s) load:

**Plant-available nitrogen:** 12.00

**Phospate (P2O5):** 10.0100

**Potash (K2O):** 2.4100

**SP:**

**Max. Allowable App Rate at:**

<u>Crop</u>	<u>PAN</u>	<u>App Rate</u>
Corn	150	75,000
Bermuda Pasture	240	120,000
Soybeans	60	30,000
Wheat	75	37,500



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/19/2023

Received : 05/03/2023

Report Number : **23-123-0255**

**REPORT OF ANALYSIS**

Lab No : **86991**

Sample ID : **Tyson Humboldt DAF**

Matrix: **Solids**

Sampled: **5/2/2023 15:45**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Organic Matter	<b>90.6</b>	%	0.100	1	05/16/23 11:00	VVP	ASTM D2974
Neutralizing Value (%CCE)	<b>6.5</b>	%	0.1	1	05/11/23 14:53	DXT	AOAC 955.01
Moisture	<b>98.6</b>	%		1	05/12/23 16:30	JLS	SW-DRYWT
Ammonia Nitrogen	<b>14500</b>	mg/Kg - dry	7140	1	05/09/23 14:45	JPJ	4500NH3C-2011
Biochemical Oxygen Demand (5-day)	<b>391000</b>	mg/Kg - dry	171000	1	05/04/23 08:15	JJZ	5210B-2016
Chloride	<2860	mg/Kg - dry	2860	10	05/10/23 22:01	SRJ	9056A
Conductivity	<b>239</b>	µS/cm		1	05/12/23 15:50	CMF	2510B-2011
Nitrate (NO3-N)	<714	mg/Kg - dry	714	10	05/10/23 22:01	SRJ	9056A
Nitrite (NO2-N)	<714	mg/Kg - dry	714	10	05/10/23 22:01	SRJ	9056A
Nitrate+Nitrite-N	<714	mg/Kg - dry	714	10	05/10/23 22:01		9056A
HEM: Oil and Grease	<18200	mg/Kg - dry	18200	1	05/15/23 08:15	DRD	SW-9071B
pH	<b>7.1</b>	s.u.		1	05/11/23 15:30	CNB	9045D
Total Solids	<b>1.45</b>	%	0.010	1	05/12/23 16:30	JLS	2540G-2011
Total Volatile Solids	<b>65.1</b>	%	0.010	1	05/12/23 16:30	JLS	2540G-2011
Total Kjeldahl Nitrogen	<b>30400</b>	mg/Kg - dry	16100	1	05/08/23 16:17	ANH	4500NORGD-2011
Phosphorus	<b>6700</b>	mg/Kg - dry	357	1	05/11/23 07:27	BKN	6010D
Arsenic	<35.7	mg/Kg - dry	35.7	1	05/11/23 07:27	BKN	6010D
Boron	<179	mg/Kg - dry	179	1	05/11/23 07:27	BKN	6010D
Cadmium	<7.14	mg/Kg - dry	7.14	1	05/11/23 07:27	BKN	6010D
Calcium	<b>4420</b>	mg/Kg - dry	3570	1	05/11/23 07:27	BKN	6010D
Chromium	<17.9	mg/Kg - dry	17.9	1	05/11/23 07:27	BKN	6010D
Copper	<35.7	mg/Kg - dry	35.7	1	05/11/23 07:27	BKN	6010D
Lead	<21.4	mg/Kg - dry	21.4	1	05/11/23 07:27	BKN	6010D

**Qualifiers/  
Definitions**

DF

Dilution Factor

MQL

Method Quantitation Limit



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/19/2023  
Received : 05/03/2023

Report Number : **23-123-0255**

## REPORT OF ANALYSIS

Lab No : **86991**

Sample ID : **Tyson Humboldt DAF**

Matrix: **Solids**

Sampled: **5/2/2023 15:45**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Magnesium	<b>943</b>	mg/Kg - dry	357	1	05/11/23 07:27	BKN	6010D
Manganese	<35.7	mg/Kg - dry	35.7	1	05/11/23 07:27	BKN	6010D
Mercury	<12.7	mg/Kg - dry	12.7	1	05/10/23 13:03	FDS	7471A
Molybdenum	<17.9	mg/Kg - dry	17.9	1	05/11/23 07:27	BKN	6010D
Nickel	<17.9	mg/Kg - dry	17.9	1	05/11/23 07:27	BKN	6010D
Potassium	<b>3080</b>	mg/Kg - dry	714	1	05/11/23 07:27	BKN	6010D
Selenium	<35.7	mg/Kg - dry	35.7	1	05/11/23 07:27	BKN	6010D
Sodium	<1790	mg/Kg - dry	1790	1	05/11/23 07:27	BKN	6010D
Zinc	<b>121</b>	mg/Kg - dry	89.3	1	05/11/23 07:27	BKN	6010D
Sulfur	<b>2260</b>	mg/Kg - dry	714	1	05/11/23 07:27	BKN	6010D

### Qualifiers/ Definitions

DF

Dilution Factor

MQL

Method Quantitation Limit



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/19/2023  
Received : 05/03/2023

Report Number : **23-123-0254**

**REPORT OF ANALYSIS**

Lab No : **86990**

Sample ID : **Tyson Newbern DAF**

Matrix: **Solids**

Sampled: **5/3/2023 8:30**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Organic Matter	<b>90.2</b>	%	0.100	1	05/16/23 11:00	VVP	ASTM D2974
Neutralizing Value (%CCE)	<b>2.5</b>	%	0.1	1	05/11/23 14:53	DXT	AOAC 955.01
Moisture	<b>95.5</b>	%		1	05/12/23 16:30	JLS	SW-DRYWT
Ammonia Nitrogen	<b>9400</b>	mg/Kg - dry	2220	1	05/09/23 14:45	JPJ	4500NH3C-2011
Biochemical Oxygen Demand (5-day)	<b>991000</b>	mg/Kg - dry	267000	1	05/04/23 08:15	JJZ	5210B-2016
Chloride	<b>1100</b>	mg/Kg - dry	889	10	05/10/23 21:35	SRJ	9056A
Conductivity	<b>597</b>	µS/cm		1	05/12/23 15:50	CMF	2510B-2011
Nitrate (NO3-N)	<222	mg/Kg - dry	222	10	05/10/23 21:35	SRJ	9056A
Nitrite (NO2-N)	<222	mg/Kg - dry	222	10	05/10/23 21:35	SRJ	9056A
Nitrate+Nitrite-N	<222	mg/Kg - dry	222	10	05/10/23 21:35		9056A
HEM: Oil and Grease	<b>85300</b>	mg/Kg - dry	5980	1	05/15/23 08:15	DRD	SW-9071B
pH	<b>5.3</b>	s.u.		1	05/11/23 15:30	CNB	9045D
Total Solids	<b>4.47 H</b>	%	0.010	1	05/12/23 16:30	JLS	2540G-2011
Total Volatile Solids	<b>91.7 H</b>	%	0.010	1	05/12/23 16:30	JLS	2540G-2011
Total Kjeldahl Nitrogen	<b>41800</b>	mg/Kg - dry	4730	1	05/08/23 16:16	ANH	4500NORGD-2011
Phosphorus	<b>5160</b>	mg/Kg - dry	111	1	05/11/23 07:22	BKN	6010D
Arsenic	<11.1	mg/Kg - dry	11.1	1	05/11/23 07:22	BKN	6010D
Boron	<55.6	mg/Kg - dry	55.6	1	05/11/23 07:22	BKN	6010D
Cadmium	<2.22	mg/Kg - dry	2.22	1	05/11/23 07:22	BKN	6010D
Calcium	<b>14100</b>	mg/Kg - dry	1110	1	05/11/23 07:22	BKN	6010D
Chromium	<b>11.0</b>	mg/Kg - dry	5.56	1	05/11/23 07:22	BKN	6010D
Copper	<b>85.8</b>	mg/Kg - dry	11.1	1	05/11/23 07:22	BKN	6010D
Lead	<6.67	mg/Kg - dry	6.67	1	05/11/23 07:22	BKN	6010D

**Qualifiers/  
Definitions**

DF Dilution Factor  
MQL Method Quantitation Limit

H Beyond holding time



20513

Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle , AR 72834

Project Sludge/Biosolids Testing

Information :

Report Date : 05/19/2023  
Received : 05/03/2023

Report Number : **23-123-0254**

**REPORT OF ANALYSIS**

Lab No : **86990**

Sample ID : **Tyson Newbern DAF**

Matrix: **Solids**

Sampled: **5/3/2023 8:30**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Magnesium	<b>2060</b>	mg/Kg - dry	111	1	05/11/23 07:22	BKN	6010D
Manganese	<b>77.1</b>	mg/Kg - dry	11.1	1	05/11/23 07:22	BKN	6010D
Mercury	<3.91	mg/Kg - dry	3.91	1	05/10/23 13:01	FDS	7471A
Molybdenum	<5.56	mg/Kg - dry	5.56	1	05/11/23 07:22	BKN	6010D
Nickel	<b>6.11</b>	mg/Kg - dry	5.56	1	05/11/23 07:22	BKN	6010D
Potassium	<b>951</b>	mg/Kg - dry	222	1	05/11/23 07:22	BKN	6010D
Selenium	<11.1	mg/Kg - dry	11.1	1	05/11/23 07:22	BKN	6010D
Sodium	<b>1870</b>	mg/Kg - dry	556	1	05/11/23 07:22	BKN	6010D
Zinc	<b>316</b>	mg/Kg - dry	27.8	1	05/11/23 07:22	BKN	6010D
Sulfur	<b>2170</b>	mg/Kg - dry	222	1	05/11/23 07:22	BKN	6010D

**Qualifiers/  
Definitions**

DF Dilution Factor  
MQL Method Quantitation Limit

H Beyond holding time



# Loading Rate Tabulation

Environmental



Facility: Tyson Foods - Newbern TN

Analysis Date: 5/3/2023

Analysis Note:

**Product:** DAF  
**State:** TN  
**Application Type:** Subsurface  
**PAN:**  $20\% \times (\text{TKN} - \text{Ammonia}) + 100\% \times \text{Ammonia} + \text{NO}_3 + \text{NO}_2$

**AIC Control #** 23-123-0254

**Internal ID:** 7091

Parameter	Concentration (mg/kg)		Limits
	dry	wet	
PAN	16102.00	719.7594	
Ammonia	9400.00	420.1800	
TKN	41800.00	1868.4600	
Nitrates/Nitrites	222.00	9.9234	
Organic N	32400.00	1448.2800	
Arsenic	11.10	0.4962	75 mg/kg
Cadmium	2.22	0.0992	85 mg/kg
Chromium	11.00	0.4917	3000 mg/kg
Copper	85.80	3.8353	4300 mg/kg
Lead	6.67	0.2981	840 mg/kg
Mercury	3.91	0.1748	57 mg/kg
Molybdenum	5.56	0.2485	75 mg/kg
Nickel	6.11	0.2731	420 mg/kg
Phosphorus	5160.00	230.6520	
Potassium	951.00	42.5097	
Selenium	11.10	0.4962	100 mg/kg
Zinc	316.00	14.1252	7500 mg/kg
Iron			
Sodium	1870.00	83.5890	
Barium			
Silver			
Calcium	14100.00	630.2700	
Magnesium	2060.00	92.0820	
Manganese	77.10	3.4464	
Chloride	1100.00	49.1700	
Sulfur	2170.00	96.9990	
Oil & Grease		9	
BOD			
pH	5.30		
% Solids	4.47		
% Vol Solids	91.70		
% Moisture	95.50		
lbs/gallon	7.50		
dry tons/load	1.01		

Pounds per 6000 gallon(s) load:

**Plant-available nitrogen:** 32.39

**Phospate (P2O5):** 23.7700

**Potash (K2O):** 2.3000

**SP:**

## Max. Allowable App Rate at:

<u>Crop</u>	<u>PAN</u>	<u>App Rate</u>
Corn	150	28,125
Bermuda Pasture	240	45,000
Soybeans	60	11,250
Wheat	75	14,063



# Client Sample Results

Client: Denali Water Solutions  
Project/Site: Tyson-Union City

Job ID: 192-2562-1

Client Sample ID: Tyson-Union City

Lab Sample ID: 192-2562-1

Date Collected: 06/08/23 15:00

Matrix: Solid

Date Received: 06/09/23 16:43

## Method: LA 29B SAR - Sodium Adsorption Ratio

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium Adsorption Ratio	4.5		1.0	NONE			06/21/23 18:20	1

## Method: SW846 6010D - Metals (ICP)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<4.9		4.9	mg/Kg	✱	06/15/23 14:24	06/21/23 12:45	1
Cadmium	<0.40		0.40	mg/Kg	✱	06/15/23 14:24	06/21/23 12:45	1
Chromium	3.1		0.99	mg/Kg	✱	06/15/23 14:24	06/21/23 12:45	1
Copper	31		0.99	mg/Kg	✱	06/15/23 14:24	06/21/23 12:45	1
Lead	<4.0		4.0	mg/Kg	✱	06/15/23 14:24	06/21/23 12:45	1
Molybdenum	<0.99		0.99	mg/Kg	✱	06/15/23 14:24	06/21/23 12:45	1
Nickel	2.1		0.99	mg/Kg	✱	06/15/23 14:24	06/23/23 11:34	1
Phosphorus	2500		99	mg/Kg	✱	06/15/23 14:24	06/21/23 14:24	10
Potassium	620		99	mg/Kg	✱	06/15/23 14:24	06/21/23 12:45	1
Selenium	<6.9		6.9	mg/Kg	✱	06/15/23 14:24	06/21/23 12:45	1
Zinc	37		0.99	mg/Kg	✱	06/15/23 14:24	06/21/23 12:45	1
Sulfur	1700		99	mg/Kg	✱	06/15/23 14:24	06/23/23 11:31	10
Boron	<9.9		9.9	mg/Kg	✱	06/15/23 14:24	06/22/23 16:30	1
Calcium	1100		99	mg/Kg	✱	06/15/23 14:24	06/21/23 14:24	10
Magnesium	210		4.9	mg/Kg	✱	06/15/23 14:24	06/21/23 12:45	1
Manganese	8.0		0.20	mg/Kg	✱	06/15/23 14:24	06/22/23 16:30	1
Sodium	620		99	mg/Kg	✱	06/15/23 14:24	06/21/23 12:45	1

## Method: SW846 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.10	mg/Kg		06/15/23 10:39	06/15/23 13:54	1

## General Chemistry

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (SM 2540G-2015)	82		0.010	%			06/16/23 12:14	1
Total Volatile Solids (SM 2540G-2015)	98		0.010	% by Wt			06/13/23 11:31	1
Total Solids (SM 2540G-2015)	18		0.010	%			06/16/23 12:14	1
pH (SW846 9045C)	4.3	HF	0.05	SU			06/13/23 11:41	1
Electrical Conductivity (1:1 Ratio) (SW846 9050A)	2800		2.0	umhos/cm			06/14/23 12:06	1
Limestone Equivalency (AOAC 955.01)	<0.20		0.20	% by Wt			06/15/23 16:35	1
HEM (Oil & Grease) (ARDPCE AR OG_TPH)	71000		230	mg/Kg			06/14/23 14:07	1

## Method: ASTM D2974 - Moisture, Ash and Organic Matter

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Ash Content	1.7		0.001	% by Wt			06/16/23 14:08	1

Client Sample ID: Tyson-Union City

Lab Sample ID: 192-2562-1

Date Collected: 06/08/23 15:00

Matrix: Solid

Date Received: 06/09/23 16:43

Percent Solids: 17.7

## Method: SW846 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	<0.56		0.56	mg/Kg	✱	06/13/23 10:21	06/14/23 22:04	1

Eurofins Arkansas



# Client Sample Results

Client: Denali Water Solutions  
Project/Site: Tyson-Union City

Job ID: 192-2562-1

**Client Sample ID: Tyson-Union City**

**Lab Sample ID: 192-2562-1**

**Date Collected: 06/08/23 15:00**

**Matrix: Solid**

**Date Received: 06/09/23 16:43**

**Percent Solids: 17.7**

## Method: SW846 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography (Continued)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1221	<0.56		0.56	mg/Kg	✱	06/13/23 10:21	06/14/23 22:04	1
PCB-1232	<0.56		0.56	mg/Kg	✱	06/13/23 10:21	06/14/23 22:04	1
PCB-1242	<0.56		0.56	mg/Kg	✱	06/13/23 10:21	06/14/23 22:04	1
PCB-1248	<0.56		0.56	mg/Kg	✱	06/13/23 10:21	06/14/23 22:04	1
PCB-1254	<0.56		0.56	mg/Kg	✱	06/13/23 10:21	06/14/23 22:04	1
PCB-1260	<0.56		0.56	mg/Kg	✱	06/13/23 10:21	06/14/23 22:04	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Tetrachloro-m-xylene	75		47 - 115	06/13/23 10:21	06/14/23 22:04	1
DCB Decachlorobiphenyl (Surr)	72		52 - 122	06/13/23 10:21	06/14/23 22:04	1

## General Chemistry

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Ammonia (as N) (SM 4500 NH3 G-2011)	3000		280	mg/Kg	✱	06/12/23 14:55	06/13/23 14:30	5
Total Kjeldahl Nitrogen (SM 4500 NorgC-2011)	21000		3400	mg/Kg	✱	06/12/23 17:09	06/16/23 10:03	25.71
Biochemical Oxygen Demand (SM 5210 B-2016)	230000		74	mg/Kg	✱		06/10/23 18:26	98.3
Chloride (SW846 9056A)	630		11	mg/Kg	✱		06/10/23 08:40	1
Nitrate Nitrite as N (SW846 9056A)	7.3		2.7	mg/Kg	✱		06/10/23 08:40	1



# Loading Rate Tabulation

Environmental



Facility: Tyson Foods - Union City

Analysis Date: 6/9/2023

Analysis Note:

**Product:** DAF  
**State:** TN  
**Application Type:** Subsurface  
**PAN:** 20% × (TKN - Ammonia) + 100% × Ammonia + NO3 + NO2

**AIC Control #** 192-2562-1

**Internal ID:** 7194

Parameter	Concentration (mg/kg)		Limits
	dry	wet	
PAN	6607.30	1189.3140	
Ammonia	3000.00	540.0000	
TKN	21000.00	3780.0000	
Nitrates/Nitrites	7.30	1.3140	
Organic N	18000.00	3240.0000	
Arsenic	4.90	0.8820	75 mg/kg
Cadmium	0.40	0.0720	85 mg/kg
Chromium	3.10	0.5580	3000 mg/kg
Copper	31.00	5.5800	4300 mg/kg
Lead	4.00	0.7200	840 mg/kg
Mercury	0.10	0.0180	57 mg/kg
Molybdenum	0.99	0.1782	75 mg/kg
Nickel	2.10	0.3780	420 mg/kg
Phosphorus	2500.00	450.0000	
Potassium	620.00	111.6000	
Selenium	6.90	1.2420	100 mg/kg
Zinc	37.00	6.6600	7500 mg/kg
Iron			
Sodium	620.00	111.6000	
Barium			
Silver			
Calcium	1100.00	198.0000	
Magnesium	210.00	37.8000	
Manganese	8.00	1.4400	
Chloride	630.00	113.4000	
Sulfur	1700.00	306.0000	
Oil & Grease		7	
BOD			
pH	4.30		
% Solids	18.00		
% Vol Solids	98.00		
% Moisture	82.00		
lbs/gallon	7.50		
dry tons/load	4.05		

Pounds per 6000 gallon(s) load:

**Plant-available nitrogen:** 53.52

**Phospate (P2O5):** 46.3700

**Potash (K2O):** 6.0300

**SP:**

**Max. Allowable App Rate at:**

<u>Crop</u>	<u>PAN</u>	<u>App Rate</u>
Corn	150	16,667
Bermuda Pasture	240	26,667
Soybeans	60	6,667
Wheat	75	8,333



20513

Denali Water Solutions  
Mr. John Pipkin  
P.O. Box 399  
Dardanelle , AR 72834

Project William Sausage  
Information :

Report Number : **23-081-0018**

**REPORT OF ANALYSIS**

Report Date : 04/06/2023

Received : 03/21/2023

Lab No : **84348**

Matrix: **Solids**

Sample ID : **William Sausage**

Sampled: **3/21/2023 8:00**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Moisture	<b>99.2</b>	%	0.010	1	03/28/23 17:29	CJD	2540G-2011
Ammonia Nitrogen	<b>503</b>	mg/Kg	100	1	04/03/23 12:30	JPJ	4500NH3C-2011
Chloride	<b>42.8</b>	mg/Kg	40.0	10	03/24/23 16:45	SRJ	9056A
Nitrate (NO3-N)	<10.0	mg/Kg	10.0	10	03/24/23 16:45	SRJ	9056A
Nitrite (NO2-N)	<10.0	mg/Kg	10.0	10	03/24/23 16:45	SRJ	9056A
Nitrate+Nitrite-N	<10.0	mg/Kg	10.0	10	03/24/23 16:45		9056A
HEM: Oil and Grease	<b>1040</b>	mg/Kg	142	1	03/28/23 09:08	DRD	SW-9071B
pH	<b>7.5</b>	s.u.		1	03/28/23 16:00	CNB	9045D
Total Solids	<b>0.774</b>	%	0.010	1	03/28/23 17:29	CJD	2540G-2011
Total Volatile Solids	<b>67.7</b>	%	0.010	1	03/28/23 17:29	CJD	2540G-2011
Total Kjeldahl Nitrogen	<b>544</b>	mg/Kg	50.0	1	03/24/23 13:37	ANH	4500NORGD-2011
Phosphorus	<b>90.6</b>	mg/Kg	5.00	1	03/24/23 01:09	TJS	6010D
Arsenic	<0.500	mg/Kg	0.500	1	03/24/23 01:09	TJS	6010D
Cadmium	<0.100	mg/Kg	0.100	1	03/24/23 01:09	TJS	6010D
Chromium	<b>4.23</b>	mg/Kg	0.250	1	03/24/23 01:09	TJS	6010D
Copper	<b>2.03</b>	mg/Kg	0.500	1	03/24/23 01:09	TJS	6010D
Lead	<0.300	mg/Kg	0.300	1	03/24/23 01:09	TJS	6010D
Mercury	<0.178	mg/Kg	0.178	1	03/28/23 11:48	FDS	7471A
Molybdenum	<0.250	mg/Kg	0.250	1	03/24/23 01:09	TJS	6010D
Nickel	<b>2.49</b>	mg/Kg	0.250	1	03/24/23 01:09	TJS	6010D
Potassium	<b>149</b>	mg/Kg	10.0	1	03/24/23 01:09	JTR	6010D
Selenium	<0.500	mg/Kg	0.500	1	03/24/23 01:09	TJS	6010D
Sodium	<b>101</b>	mg/Kg	25.0	1	03/24/23 01:09	TJS	6010D
Zinc	<b>17.3</b>	mg/Kg	1.25	1	03/24/23 01:09	TJS	6010D

**Qualifiers/  
Definitions**

DF Dilution Factor  
MQL Method Quantitation Limit

L Limit Exceeded



# Loading Rate Tabulation

Environmental



Facility: Williams Sausage and Company - Willams Sau

Analysis Date: 3/21/2023

Analysis Note:

Product: Sludge

State: TN

Application Type: Subsurface

AIC Control # 23-081-0018

Internal ID: 6943

PAN:  $20\% \times (\text{TKN} - \text{Ammonia}) + 100\% \times \text{Ammonia} + \text{NO}_3 + \text{NO}_2$

Parameter	Concentration (mg/kg)		Limits
	dry	wet	
PAN	521.20	4.0341	
Ammonia	503.00	3.8932	
TKN	544.00	4.2106	
Nitrates/Nitrites	10.00	0.0774	
Organic N	41.00	0.3173	
Arsenic	0.50	0.0039	75 mg/kg
Cadmium	0.10	0.0008	85 mg/kg
Chromium	4.23	0.0327	3000 mg/kg
Copper	2.03	0.0157	4300 mg/kg
Lead	0.30	0.0023	840 mg/kg
Mercury	0.18	0.0014	57 mg/kg
Molybdenum	0.25	0.0019	75 mg/kg
Nickel	2.49	0.0193	420 mg/kg
Phosphorus	90.60	0.7012	
Potassium	149.00	1.1533	
Selenium	0.50	0.0039	100 mg/kg
Zinc	17.30	0.1339	7500 mg/kg
Iron			
Sodium	101.00	0.7817	
Barium			
Silver			
Calcium			
Magnesium			
Manganese			
Chloride	42.80	0.3313	
Sulfur			
Oil & Grease		0	
BOD			
pH	7.50		
% Solids	0.77		
% Vol Solids	67.70		
% Moisture	99.20		
lbs/gallon	7.50		
dry tons/load	0.17		

Pounds per 6000 gallon(s) load:

Plant-available nitrogen: 0.18

Phospate (P2O5): 0.0700

Potash (K2O): 0.0600

SP:

Max. Allowable App Rate at:

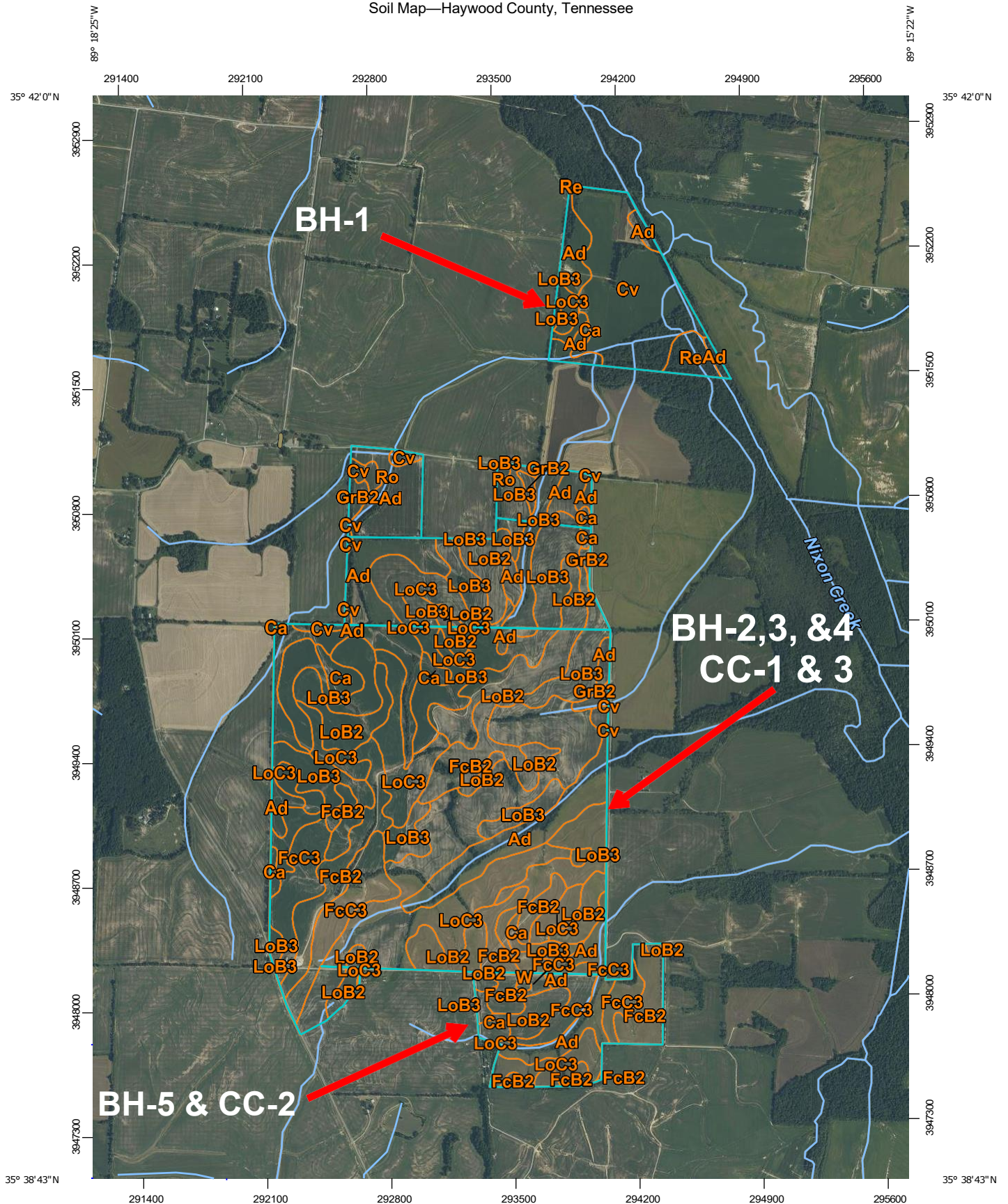
Crop	PAN	App Rate
Corn	150	150,000
Bermuda Pasture	240	240,000
Soybeans	60	60,000
Wheat	75	75,000



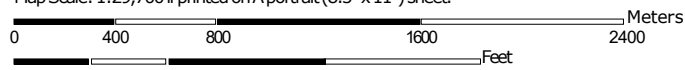
**Appendix D**  
**Soil Survey Maps and Soil**  
**Analyticals**



# Soil Map—Haywood County, Tennessee



Map Scale: 1:29,700 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84



Natural Resources  
Conservation Service


Web Soil Survey  
National Cooperative Soil Survey

6/20/2023  
Page 1 of 3



## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils


 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

### Special Point Features

 Blowout

 Borrow Pit


 Clay Spot


 Closed Depression


 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water


 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot


 Sinkhole

 Slide or Slip


 Sodic Spot

 Spoil Area

 Stony Spot


 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

### Water Features

 Streams and Canals


### Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Haywood County, Tennessee

Survey Area Data: Version 22, Sep 15, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 9, 2019—Sep 15, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ad	Adler silt loam, 0 to 2 percent slopes, frequently flooded	272.4	17.9%
Ca	Calloway silt loam	41.3	2.7%
Cv	Convent silt loam, frequently flooded	121.6	8.0%
FcB2	Felician silt loam, 2 to 5 percent slopes, moderately eroded, northern phase	137.8	9.1%
FcC3	Felician silt loam, 5 to 8 percent slopes, severely eroded, northern phase	114.1	7.5%
GrB2	Grenada silt loam, 1 to 5 percent slopes, eroded	23.0	1.5%
LoB2	Loring silt loam, 1 to 5 percent slopes, eroded	178.0	11.7%
LoB3	Loring silt loam, 1 to 5 percent slopes, severely eroded	301.9	19.9%
LoC3	Loring silt loam, 5 to 8 percent slopes, severely eroded	312.7	20.6%
Re	Rosebloom silt loam, frequently flooded	13.2	0.9%
Ro	Routon silt loam	4.0	0.3%
W	Water	0.9	0.1%
<b>Totals for Area of Interest</b>		<b>1,520.9</b>	<b>100.0%</b>



## Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named, soils that are similar to the named components, and some minor components that differ in use and management from the major soils.

Most of the soils similar to the major components have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Some minor components, however, have properties and behavior characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.



Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

## Report—Map Unit Description

### Haywood County, Tennessee

#### Ad—Adler silt loam, 0 to 2 percent slopes, frequently flooded

##### Map Unit Setting

National map unit symbol: 2zdd9



*Elevation:* 180 to 500 feet  
*Mean annual precipitation:* 50 to 53 inches  
*Mean annual air temperature:* 47 to 71 degrees F  
*Frost-free period:* 175 to 303 days  
*Farmland classification:* All areas are prime farmland

#### **Map Unit Composition**

*Adler, frequently flooded, and similar soils:* 89 percent  
*Minor components:* 11 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### **Description of Adler, Frequently Flooded**

##### **Setting**

*Landform:* Alluvial fans, flood plains  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Convex  
*Across-slope shape:* Linear  
*Parent material:* Silty alluvium

##### **Typical profile**

*Ap - 0 to 5 inches:* silt loam  
*Bw - 5 to 23 inches:* silt loam  
*C - 23 to 80 inches:* silt loam

##### **Properties and qualities**

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Moderately well drained  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)  
*Depth to water table:* About 8 to 36 inches  
*Frequency of flooding:* NoneFrequent  
*Frequency of ponding:* None  
*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)  
*Available water supply, 0 to 60 inches:* Very high (about 13.8 inches)

##### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2w  
*Hydrologic Soil Group:* B/D  
*Ecological site:* F134XY014AL - Northern Non-Acid Floodplain - PROVISIONAL  
*Hydric soil rating:* No

#### **Minor Components**

##### **Morganfield, frequently flooded**

*Percent of map unit:* 7 percent  
*Landform:* Alluvial fans, flood plains



*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Convex, linear  
*Across-slope shape:* Convex, linear  
*Ecological site:* F134XY014AL - Northern Non-Acid Floodplain -  
PROVISIONAL  
*Hydric soil rating:* No

**Convent, frequently flooded**

*Percent of map unit:* 4 percent  
*Landform:* Natural levees  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Convex  
*Across-slope shape:* Linear  
*Ecological site:* F134XY015AL - Northern Non-Acid Moderately Wet  
Floodplain - PROVISIONAL  
*Hydric soil rating:* No

**Ca—Calloway silt loam**

**Map Unit Setting**

*National map unit symbol:* m12j  
*Elevation:* 280 to 440 feet  
*Mean annual precipitation:* 45 to 61 inches  
*Mean annual air temperature:* 50 to 70 degrees F  
*Frost-free period:* 206 to 220 days  
*Farmland classification:* All areas are prime farmland

**Map Unit Composition**

*Calloway and similar soils:* 91 percent  
*Minor components:* 9 percent  
*Estimates are based on observations, descriptions, and transects of  
the mapunit.*

**Description of Calloway**

**Setting**

*Landform:* Loess hills  
*Landform position (three-dimensional):* Base slope  
*Parent material:* Loess

**Typical profile**

*H1 - 0 to 30 inches:* silt loam  
*H2 - 30 to 60 inches:* silt loam

**Properties and qualities**

*Slope:* 0 to 1 percent  
*Depth to restrictive feature:* 14 to 38 inches to fragipan  
*Drainage class:* Somewhat poorly drained  
*Capacity of the most limiting layer to transmit water  
(Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)  
*Depth to water table:* About 10 to 32 inches  
*Frequency of flooding:* None



*Frequency of ponding:* None  
*Available water supply, 0 to 60 inches:* Low (about 3.4 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2w  
*Hydrologic Soil Group:* D  
*Hydric soil rating:* No

**Minor Components**

**Routon**

*Percent of map unit:* 9 percent  
*Landform:* Stream terraces  
*Hydric soil rating:* Yes

**Cv—Convent silt loam, frequently flooded**

**Map Unit Setting**

*National map unit symbol:* m12n  
*Elevation:* 20 to 150 feet  
*Mean annual precipitation:* 45 to 61 inches  
*Mean annual air temperature:* 50 to 70 degrees F  
*Frost-free period:* 206 to 220 days  
*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Convent and similar soils:* 100 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Convent**

**Setting**

*Landform:* Flood plains  
*Landform position (three-dimensional):* Talf  
*Parent material:* Silty alluvium

**Typical profile**

*H1 - 0 to 11 inches:* silt loam  
*H2 - 11 to 60 inches:* silt loam

**Properties and qualities**

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Somewhat poorly drained  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)  
*Depth to water table:* About 18 to 48 inches  
*Frequency of flooding:* NoneFrequent  
*Frequency of ponding:* None  
*Available water supply, 0 to 60 inches:* Very high (about 13.1 inches)



#### **Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 5w

*Hydrologic Soil Group:* C

*Ecological site:* F134XY015AL - Northern Non-Acid Moderately

Wet Floodplain - PROVISIONAL

*Hydric soil rating:* No

### **FcB2—Feliciana silt loam, 2 to 5 percent slopes, moderately eroded, northern phase**

#### **Map Unit Setting**

*National map unit symbol:* 2y71v

*Elevation:* 300 to 540 feet

*Mean annual precipitation:* 49 to 55 inches

*Mean annual air temperature:* 46 to 72 degrees F

*Frost-free period:* 190 to 245 days

*Farmland classification:* All areas are prime farmland

#### **Map Unit Composition**

*Feliciana, northern phase, and similar soils:* 94 percent

*Minor components:* 6 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### **Description of Feliciana, Northern Phase**

##### **Setting**

*Landform:* Divides

*Landform position (two-dimensional):* Summit

*Landform position (three-dimensional):* Interfluvium

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Parent material:* Fine-silty noncalcareous loess

##### **Typical profile**

*Ap - 0 to 6 inches:* silt loam

*Bt1 - 6 to 25 inches:* silty clay loam

*Bt2 - 25 to 41 inches:* silt loam

*Bt3 - 41 to 60 inches:* silt loam

##### **Properties and qualities**

*Slope:* 2 to 5 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Well drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water*

*(Ksat):* Moderately high to high (0.60 to 2.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water supply, 0 to 60 inches:* High (about 11.9 inches)



### **Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 2e

*Hydrologic Soil Group:* B

*Ecological site:* F134XY003AL - Northern Loess Interfluvium -  
PROVISIONAL

*Hydric soil rating:* No

### **Minor Components**

#### **Loring, northern phase**

*Percent of map unit:* 6 percent

*Landform:* Loess hills

*Landform position (two-dimensional):* Summit

*Landform position (three-dimensional):* Interfluvium

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Ecological site:* F134XY012AL - Northern Loess Fragipan Upland -  
PROVISIONAL

*Hydric soil rating:* No

## **FcC3—Feliciano silt loam, 5 to 8 percent slopes, severely eroded, northern phase**

### **Map Unit Setting**

*National map unit symbol:* 2y729

*Elevation:* 300 to 540 feet

*Mean annual precipitation:* 50 to 54 inches

*Mean annual air temperature:* 47 to 71 degrees F

*Frost-free period:* 182 to 220 days

*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Feliciano, northern phase, and similar soils:* 95 percent

*Minor components:* 5 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Feliciano, Northern Phase**

#### **Setting**

*Landform:* Divides

*Landform position (two-dimensional):* Summit

*Landform position (three-dimensional):* Interfluvium

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Parent material:* Fine-silty noncalcareous loess

#### **Typical profile**

*Ap - 0 to 4 inches:* silt loam

*Bt1 - 4 to 27 inches:* silty clay loam

*Bt2 - 27 to 60 inches:* silt loam



*Bt3 - 60 to 78 inches: silt loam*

**Properties and qualities**

*Slope: 5 to 8 percent*

*Depth to restrictive feature: More than 80 inches*

*Drainage class: Well drained*

*Runoff class: Medium*

*Capacity of the most limiting layer to transmit water*

*(Ksat): Moderately high to high (0.60 to 2.00 in/hr)*

*Depth to water table: More than 80 inches*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Available water supply, 0 to 60 inches: High (about 10.9 inches)*

**Interpretive groups**

*Land capability classification (irrigated): None specified*

*Land capability classification (nonirrigated): 4e*

*Hydrologic Soil Group: B*

*Ecological site: F134XY003AL - Northern Loess Interfluve -  
PROVISIONAL*

*Hydric soil rating: No*

**Minor Components**

**Loring**

*Percent of map unit: 5 percent*

*Landform: Loess hills*

*Landform position (two-dimensional): Summit*

*Down-slope shape: Convex*

*Across-slope shape: Linear*

*Ecological site: F134XY012AL - Northern Loess Fragipan Upland -  
PROVISIONAL*

*Hydric soil rating: No*

**GrB2—Grenada silt loam, 1 to 5 percent slopes, eroded**

**Map Unit Setting**

*National map unit symbol: m12r*

*Elevation: 260 to 430 feet*

*Mean annual precipitation: 45 to 61 inches*

*Mean annual air temperature: 50 to 70 degrees F*

*Frost-free period: 206 to 220 days*

*Farmland classification: All areas are prime farmland*

**Map Unit Composition**

*Grenada and similar soils: 100 percent*

*Estimates are based on observations, descriptions, and transects of  
the mapunit.*

**Description of Grenada**

**Setting**

*Landform: Loess hills*



*Landform position (three-dimensional):* Base slope  
*Parent material:* Loess

**Typical profile**

*H1 - 0 to 9 inches:* silt loam  
*H2 - 9 to 18 inches:* silt loam  
*H3 - 18 to 22 inches:* silt loam  
*H4 - 22 to 60 inches:* silt loam

**Properties and qualities**

*Slope:* 1 to 5 percent  
*Depth to restrictive feature:* 18 to 36 inches to fragipan  
*Drainage class:* Moderately well drained  
*Capacity of the most limiting layer to transmit water*  
*(Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)  
*Depth to water table:* About 12 to 29 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water supply, 0 to 60 inches:* Low (about 4.9 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2e  
*Hydrologic Soil Group:* D  
*Hydric soil rating:* No

**LoB2—Loring silt loam, 1 to 5 percent slopes, eroded**

**Map Unit Setting**

*National map unit symbol:* m136  
*Elevation:* 280 to 460 feet  
*Mean annual precipitation:* 45 to 61 inches  
*Mean annual air temperature:* 50 to 70 degrees F  
*Frost-free period:* 206 to 220 days  
*Farmland classification:* All areas are prime farmland

**Map Unit Composition**

*Loring and similar soils:* 100 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Loring**

**Setting**

*Landform:* Loess hills  
*Landform position (three-dimensional):* Crest  
*Parent material:* Loess

**Typical profile**

*H1 - 0 to 6 inches:* silt loam  
*H2 - 6 to 26 inches:* silt loam  
*H3 - 26 to 57 inches:* silt loam  
*H4 - 57 to 60 inches:* silt loam



#### **Properties and qualities**

*Slope:* 1 to 5 percent  
*Depth to restrictive feature:* 14 to 35 inches to fragipan  
*Drainage class:* Moderately well drained  
*Capacity of the most limiting layer to transmit water*  
*(Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)  
*Depth to water table:* About 11 to 29 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water supply, 0 to 60 inches:* Low (about 4.7 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2e  
*Hydrologic Soil Group:* C/D  
*Hydric soil rating:* No

### **LoB3—Loring silt loam, 1 to 5 percent slopes, severely eroded**

#### **Map Unit Setting**

*National map unit symbol:* m137  
*Elevation:* 280 to 460 feet  
*Mean annual precipitation:* 45 to 61 inches  
*Mean annual air temperature:* 50 to 70 degrees F  
*Frost-free period:* 206 to 220 days  
*Farmland classification:* Not prime farmland

#### **Map Unit Composition**

*Loring and similar soils:* 100 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### **Description of Loring**

##### **Setting**

*Landform:* Loess hills  
*Landform position (three-dimensional):* Crest  
*Parent material:* Loess

##### **Typical profile**

*H1 - 0 to 4 inches:* silt loam  
*H2 - 4 to 14 inches:* silt loam  
*H3 - 14 to 44 inches:* silt loam  
*H4 - 44 to 60 inches:* silt loam

#### **Properties and qualities**

*Slope:* 1 to 5 percent  
*Depth to restrictive feature:* 14 to 35 inches to fragipan  
*Drainage class:* Moderately well drained  
*Capacity of the most limiting layer to transmit water*  
*(Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)



*Depth to water table:* About 11 to 29 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water supply, 0 to 60 inches:* Low (about 3.8 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 3e  
*Hydrologic Soil Group:* D  
*Hydric soil rating:* No

**LoC3—Loring silt loam, 5 to 8 percent slopes, severely eroded**

**Map Unit Setting**

*National map unit symbol:* 2v7sk  
*Elevation:* 280 to 490 feet  
*Mean annual precipitation:* 35 to 63 inches  
*Mean annual air temperature:* 47 to 71 degrees F  
*Frost-free period:* 189 to 240 days  
*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Loring and similar soils:* 100 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Loring**

**Setting**

*Landform:* Loess hills  
*Landform position (two-dimensional):* Backslope  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Linear  
*Across-slope shape:* Concave  
*Parent material:* Loess

**Typical profile**

*Ap - 0 to 5 inches:* silt loam  
*Bt - 5 to 20 inches:* silt loam  
*Btx - 20 to 65 inches:* silt loam

**Properties and qualities**

*Slope:* 5 to 8 percent  
*Depth to restrictive feature:* 14 to 30 inches to fragipan  
*Drainage class:* Moderately well drained  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)  
*Depth to water table:* About 11 to 14 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water supply, 0 to 60 inches:* Low (about 4.5 inches)



**Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4e

*Hydrologic Soil Group:* D

*Hydric soil rating:* No

**Re—Rosebloom silt loam, frequently flooded**

**Map Unit Setting**

*National map unit symbol:* m13q

*Elevation:* 280 to 340 feet

*Mean annual precipitation:* 45 to 61 inches

*Mean annual air temperature:* 50 to 70 degrees F

*Frost-free period:* 206 to 220 days

*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Rosebloom and similar soils:* 100 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Rosebloom**

**Setting**

*Landform:* Flood plains

*Landform position (three-dimensional):* Talf

*Parent material:* Silty alluvium

**Typical profile**

*H1 - 0 to 26 inches:* silt loam

*H2 - 26 to 60 inches:* silty clay loam

**Properties and qualities**

*Slope:* 0 to 2 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Poorly drained

*Capacity of the most limiting layer to transmit water*

*(Ksat):* Moderately high to high (0.57 to 1.98 in/hr)

*Depth to water table:* About 0 to 12 inches

*Frequency of flooding:* NoneFrequent

*Frequency of ponding:* None

*Available water supply, 0 to 60 inches:* Very high (about 12.2 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 5w

*Hydrologic Soil Group:* B/D

*Hydric soil rating:* Yes



## Ro—Routon silt loam

### Map Unit Setting

*National map unit symbol:* m13v  
*Elevation:* 260 to 460 feet  
*Mean annual precipitation:* 45 to 61 inches  
*Mean annual air temperature:* 50 to 70 degrees F  
*Frost-free period:* 206 to 220 days  
*Farmland classification:* Prime farmland if drained

### Map Unit Composition

*Routon and similar soils:* 100 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Routon

#### Setting

*Landform:* Stream terraces  
*Landform position (three-dimensional):* Tread  
*Parent material:* Loess over silty alluvium

#### Typical profile

*H1 - 0 to 18 inches:* silt loam  
*H2 - 18 to 60 inches:* silt loam

#### Properties and qualities

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Poorly drained  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)  
*Depth to water table:* About 0 to 12 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water supply, 0 to 60 inches:* Very high (about 12.3 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 3w  
*Hydrologic Soil Group:* C/D  
*Hydric soil rating:* Yes

## W—Water

### Map Unit Setting

*National map unit symbol:* m142  
*Mean annual precipitation:* 45 to 61 inches  
*Mean annual air temperature:* 50 to 70 degrees F  
*Frost-free period:* 206 to 220 days



*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Water:* 100 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Data Source Information**

Soil Survey Area: Haywood County, Tennessee

Survey Area Data: Version 22, Sep 15, 2022



## SOIL ANALYSIS

Client : Denali Water Solutions Ms. Vanya Colburn 15797 State Hwy 155 E Dardanelle AR 72834	Grower : TN3- New Permit	Report No: 23-172-0781 Cust No: 20513 Date Printed: 06/22/2023 Date Received : 06/21/2023 PO: Page : 1 of 8
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Lab No: 35101

Field:

Sample ID: BH-1

Test	Method	Results	SOIL TEST RATINGS					Calculated Cation Exchange Capacity
			Very Low	Low	Medium	Optimum	Very High	
Soil pH	1:1	5.0						12.6 meq/100g
Buffer pH	SMP	6.41						%Saturation
Phosphorus (P)	M3	61 mg/kg						%sat meq
Potassium (K)	M3	141 mg/kg						K 2.9 0.4
Calcium (Ca)	M3	1125 mg/kg						Ca 44.6 5.6
Magnesium (Mg)	M3	159 mg/kg						Mg 10.5 1.3
Sulfur (S)								H 41.3 5.2
Boron (B)								Na 0.9 0.1
Copper (Cu)	M3	1.6 mg/kg						K/Mg Ratio: 0.27
Iron (Fe)								Ca/Mg Ratio: 4.25
Manganese (Mn)								
Zinc (Zn)								
Sodium (Na)	M3	27 mg/kg						
Soluble Salts	SS1:2	0.25 dS/m						
Organic Matter	LOI	2.9%						
Estimated N Release		102 lbs/acre						
Nitrate Nitrogen	NO3N	23 mg/kg						

## SOIL FERTILITY GUIDELINES

Crop : Corn

Yield Goal : 150 bu/acre

Rec Units: LB/ACRE

(lbs)	LIME	(tons)	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Mg	S	B	Cu	Mn	Zn	Fe
5500		2.8	137	30	83	0			0			
Crop :												
Rec Units:												

Comments :

### Corn

Limestone application is targeted to bring soil pH to 6.0.

- Greater N efficiency for corn may be achieved by splitting the N application. Apply 1/4 to 1/3 of the N prior to or at planting and the remainder as sidedress when corn is 8-24 inches high.
- For early planted corn or no till corn, apply a starter fertilizer at least 2 inches from the seed at a rate of 10-20 lbs N/Acre and 30-60 lbs P<sub>2</sub>O<sub>5</sub>/Acre.



## SOIL ANALYSIS

Client : Denali Water Solutions Ms. Vanya Colburn 15797 State Hwy 155 E Dardanelle AR 72834	Grower : TN3- New Permit	Report No: 23-172-0781 Cust No: 20513 Date Printed: 06/22/2023 Date Received : 06/21/2023 PO: Page : 2 of 8
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Lab No: 35102

Field:

Sample ID: BH-2

Test	Method	Results	SOIL TEST RATINGS					Calculated Cation Exchange Capacity
			Very Low	Low	Medium	Optimum	Very High	
Soil pH	1:1	6.5						7.6 meq/100g
Buffer pH								%Saturation
Phosphorus (P)	M3	10 mg/kg						%sat meq
Potassium (K)	M3	58 mg/kg						K 2.0 0.1
Calcium (Ca)	M3	1161 mg/kg						Ca 76.4 5.8
Magnesium (Mg)	M3	118 mg/kg						Mg 12.9 1.0
Sulfur (S)								H 7.9 0.6
Boron (B)								Na 0.8 0.1
Copper (Cu)	M3	1.0 mg/kg						K/Mg Ratio: 0.15
Iron (Fe)								Ca/Mg Ratio: 5.92
Manganese (Mn)								
Zinc (Zn)								
Sodium (Na)	M3	14 mg/kg						
Soluble Salts	SS1:2	0.11 dS/m						
Organic Matter	LOI	2.0%						
Estimated N Release		84 lbs/acre						
Nitrate Nitrogen	NO3N	5 mg/kg						

## SOIL FERTILITY GUIDELINES

Crop : Corn

Yield Goal : 150

bu/acre

Rec Units:

LB/ACRE

(lbs)	LIME	(tons)	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Mg	S	B	Cu	Mn	Zn	Fe
0		0	173	104	128	0			0			
Crop :												Rec Units:

Comments :

### Corn

- Greater N efficiency for corn may be achieved by splitting the N application. Apply 1/4 to 1/3 of the N prior to or at planting and the remainder as sidedress when corn is 8-24 inches high.
- For early planted corn or no till corn, apply a starter fertilizer at least 2 inches from the seed at a rate of 10-20 lbs N/Acre and 30-60 lbs P<sub>2</sub>O<sub>5</sub>/Acre.



## SOIL ANALYSIS

Client :  
Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle AR 72834

Grower :  
TN3- New Permit

Report No: 23-172-0781  
Cust No: 20513  
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Lab No: 35103

Field:

Sample ID: BH-3

Test	Method	Results	SOIL TEST RATINGS					Calculated Cation Exchange Capacity
			Very Low	Low	Medium	Optimum	Very High	
Soil pH	1:1	6.4						7.6 meq/100g
Buffer pH								%Saturation
Phosphorus (P)	M3	47 mg/kg						%sat meq
Potassium (K)	M3	141 mg/kg						K 4.8 0.4
Calcium (Ca)	M3	1159 mg/kg						Ca 76.3 5.8
Magnesium (Mg)	M3	83 mg/kg						Mg 9.1 0.7
Sulfur (S)								H 9.2 0.7
Boron (B)								Na 1.2 0.1
Copper (Cu)	M3	1.5 mg/kg						K/Mg Ratio: 0.52
Iron (Fe)								Ca/Mg Ratio: 8.38
Manganese (Mn)								
Zinc (Zn)								
Sodium (Na)	M3	21 mg/kg						
Soluble Salts	SS1:2	0.26 dS/m						
Organic Matter	LOI	2.4 %						
Estimated N Release		92 lbs/acre						
Nitrate Nitrogen	NO3N	16 mg/kg						

## SOIL FERTILITY GUIDELINES

Crop : Corn

Yield Goal : 150 bu/acre

Rec Units: LB/ACRE

(lbs)	LIME	(tons)	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Mg	S	B	Cu	Mn	Zn	Fe
0		0	151	49	67	0			0			

Crop :

Rec Units:

Comments :

### Corn

- Greater N efficiency for corn may be achieved by splitting the N application. Apply 1/4 to 1/3 of the N prior to or at planting and the remainder as sidedress when corn is 8-24 inches high.
- For early planted corn or no till corn, apply a starter fertilizer at least 2 inches from the seed at a rate of 10-20 lbs N/Acre and 30-60 lbs P<sub>2</sub>O<sub>5</sub>/Acre.



## SOIL ANALYSIS

Client : Denali Water Solutions Ms. Vanya Colburn 15797 State Hwy 155 E Dardanelle AR 72834	Grower : TN3- New Permit	Report No: 23-172-0781 Cust No: 20513 Date Printed: 06/22/2023 Date Received : 06/21/2023 PO: Page : 4 of 8
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Lab No: 35104

Field:

Sample ID: BH-4

Test	Method	Results	SOIL TEST RATINGS					Calculated Cation Exchange Capacity
			Very Low	Low	Medium	Optimum	Very High	
Soil pH	1:1	6.3						7.0 meq/100g
Buffer pH								%Saturation
Phosphorus (P)	M3	12 mg/kg						%sat meq
Potassium (K)	M3	65 mg/kg						K 2.4 0.2
Calcium (Ca)	M3	1047 mg/kg						Ca 74.8 5.2
Magnesium (Mg)	M3	107 mg/kg						Mg 12.7 0.9
Sulfur (S)								H 10.0 0.7
Boron (B)								Na 0.7 0.1
Copper (Cu)	M3	0.9 mg/kg						K/Mg Ratio: 0.18
Iron (Fe)								Ca/Mg Ratio: 5.89
Manganese (Mn)								
Zinc (Zn)								
Sodium (Na)	M3	12 mg/kg						
Soluble Salts	SS1:2	0.1 dS/m						
Organic Matter	LOI	2.3%						
Estimated N Release		90 lbs/acre						
Nitrate Nitrogen	NO3N	6 mg/kg						

## SOIL FERTILITY GUIDELINES

Crop : Corn

Yield Goal : 150

bu/acre

Rec Units:

LB/ACRE

(lbs)	LIME	(tons)	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Mg	S	B	Cu	Mn	Zn	Fe
0		0	171	100	123	0			0			

Crop :

Rec Units:

Comments :

### Corn

- Greater N efficiency for corn may be achieved by splitting the N application. Apply 1/4 to 1/3 of the N prior to or at planting and the remainder as sidedress when corn is 8-24 inches high.
- For early planted corn or no till corn, apply a starter fertilizer at least 2 inches from the seed at a rate of 10-20 lbs N/Acre and 30-60 lbs P<sub>2</sub>O<sub>5</sub>/Acre.



## SOIL ANALYSIS

Client : Denali Water Solutions Ms. Vanya Colburn 15797 State Hwy 155 E Dardanelle AR 72834	Grower : TN3- New Permit	Report No: 23-172-0781 Cust No: 20513 Date Printed: 06/22/2023 Date Received : 06/21/2023 PO: Page : 5 of 8
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Lab No: 35105

Field:

Sample ID: BH-5

Test	Method	Results	SOIL TEST RATINGS					Calculated Cation Exchange Capacity
			Very Low	Low	Medium	Optimum	Very High	
Soil pH	1:1	6.7						8.1 meq/100g
Buffer pH								%Saturation
Phosphorus (P)	M3	24 mg/kg						%sat meq
Potassium (K)	M3	93 mg/kg						K 2.9 0.2
Calcium (Ca)	M3	1298 mg/kg						Ca 80.1 6.5
Magnesium (Mg)	M3	104 mg/kg						Mg 10.7 0.9
Sulfur (S)								H 4.9 0.4
Boron (B)								Na 0.7 0.1
Copper (Cu)	M3	1.2 mg/kg						K/Mg Ratio: 0.27
Iron (Fe)								Ca/Mg Ratio: 7.49
Manganese (Mn)								
Zinc (Zn)								
Sodium (Na)	M3	13 mg/kg						
Soluble Salts	SS1:2	0.14 dS/m						
Organic Matter	LOI	2.1 %						
Estimated N Release		86 lbs/acre						
Nitrate Nitrogen	NO3N	6 mg/kg						

## SOIL FERTILITY GUIDELINES

Crop : Corn

Yield Goal : 150

bu/acre

Rec Units:

LB/ACRE

(lbs)	LIME	(tons)	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Mg	S	B	Cu	Mn	Zn	Fe
0		0	171	77	102	0			0			

Crop :

Rec Units:

Comments :

### Corn

- Greater N efficiency for corn may be achieved by splitting the N application. Apply 1/4 to 1/3 of the N prior to or at planting and the remainder as sidedress when corn is 8-24 inches high.
- For early planted corn or no till corn, apply a starter fertilizer at least 2 inches from the seed at a rate of 10-20 lbs N/Acre and 30-60 lbs P<sub>2</sub>O<sub>5</sub>/Acre.



## SOIL ANALYSIS

Client : Denali Water Solutions Ms. Vanya Colburn 15797 State Hwy 155 E Dardanelle AR 72834	Grower : TN3- New Permit	Report No: 23-172-0781 Cust No: 20513 Date Printed: 06/22/2023 Date Received : 06/21/2023 PO: Page : 6 of 8
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Lab No: 35106

Field:

Sample ID: CC-1

Test	Method	Results	SOIL TEST RATINGS					Calculated Cation Exchange Capacity
			Very Low	Low	Medium	Optimum	Very High	
Soil pH	1:1	5.8						10.0 meq/100g
Buffer pH	SMP	6.74						%Saturation
Phosphorus (P)	M3	12 mg/kg						%sat meq
Potassium (K)	M3	86 mg/kg						K 2.2 0.2
Calcium (Ca)	M3	1368 mg/kg						Ca 68.4 6.8
Magnesium (Mg)	M3	113 mg/kg						Mg 9.4 0.9
Sulfur (S)								H 19.0 1.9
Boron (B)								Na 0.7 0.1
Copper (Cu)	M3	1.2 mg/kg						K/Mg Ratio: 0.23
Iron (Fe)								Ca/Mg Ratio: 7.28
Manganese (Mn)								
Zinc (Zn)								
Sodium (Na)	M3	16 mg/kg						
Soluble Salts	SS1:2	0.1 dS/m						
Organic Matter	LOI	2.3%						
Estimated N Release		90 lbs/acre						
Nitrate Nitrogen	NO3N	10 mg/kg						

## SOIL FERTILITY GUIDELINES

Crop : Corn

Yield Goal : 150

bu/acre

Rec Units:

LB/ACRE

(lbs)	LIME	(tons)	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Mg	S	B	Cu	Mn	Zn	Fe
2000		1	163	100	125	0			0			

Crop :

Rec Units:

Comments :

### Corn

Limestone application is targeted to bring soil pH to 6.0.

- Greater N efficiency for corn may be achieved by splitting the N application. Apply 1/4 to 1/3 of the N prior to or at planting and the remainder as sidedress when corn is 8-24 inches high.
- For early planted corn or no till corn, apply a starter fertilizer at least 2 inches from the seed at a rate of 10-20 lbs N/Acre and 30-60 lbs P<sub>2</sub>O<sub>5</sub>/Acre.



## SOIL ANALYSIS

Client :  
Denali Water Solutions  
Ms. Vanya Colburn  
15797 State Hwy 155 E  
Dardanelle AR 72834

Grower :  
TN3- New Permit

Report No: 23-172-0781  
Cust No: 20513  
Date Printed: 06/22/2023  
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Lab No: 35107

Field:

Sample ID: CC-2

Test	Method	Results	SOIL TEST RATINGS					Calculated Cation Exchange Capacity
			Very Low	Low	Medium	Optimum	Very High	
Soil pH	1:1	6.7						8.7 meq/100g
Buffer pH								%Saturation
Phosphorus (P)	M3	24 mg/kg						%sat meq
Potassium (K)	M3	82 mg/kg						K 2.4 0.2
Calcium (Ca)	M3	1419 mg/kg						Ca 81.6 7.1
Magnesium (Mg)	M3	110 mg/kg						Mg 10.5 0.9
Sulfur (S)								H 4.6 0.4
Boron (B)								Na 0.7 0.1
Copper (Cu)	M3	1.2 mg/kg						K/Mg Ratio: 0.22
Iron (Fe)								Ca/Mg Ratio: 7.77
Manganese (Mn)								
Zinc (Zn)								
Sodium (Na)	M3	14 mg/kg						
Soluble Salts	SS1:2	0.25 dS/m						
Organic Matter	LOI	2.6%						
Estimated N Release		96 lbs/acre						
Nitrate Nitrogen	NO3N	6 mg/kg						

## SOIL FERTILITY GUIDELINES

Crop : Corn

Yield Goal : 150

bu/acre

Rec Units:

LB/ACRE

(lbs)	LIME	(tons)	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Mg	S	B	Cu	Mn	Zn	Fe
0		0	171	77	110	0			0			

Crop :

Rec Units:

Comments :

### Corn

- Greater N efficiency for corn may be achieved by splitting the N application. Apply 1/4 to 1/3 of the N prior to or at planting and the remainder as sidedress when corn is 8-24 inches high.
- For early planted corn or no till corn, apply a starter fertilizer at least 2 inches from the seed at a rate of 10-20 lbs N/Acre and 30-60 lbs P<sub>2</sub>O<sub>5</sub>/Acre.



## SOIL ANALYSIS

Client : Denali Water Solutions Ms. Vanya Colburn 15797 State Hwy 155 E Dardanelle AR 72834	Grower : TN3- New Permit	Report No: 23-172-0781 Cust No: 20513 Date Printed: 06/22/2023 Date Received : 06/21/2023 PO: Page : 8 of 8
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Lab No: 35108

Field:

Sample ID: CC-3

Test	Method	Results	SOIL TEST RATINGS					Calculated Cation Exchange Capacity
			Very Low	Low	Medium	Optimum	Very High	
Soil pH	1:1	5.6						8.4 meq/100g
Buffer pH	SMP	6.73						%Saturation
Phosphorus (P)	M3	24 mg/kg						%sat meq
Potassium (K)	M3	65 mg/kg						K 2.0 0.2
Calcium (Ca)	M3	1061 mg/kg						Ca 63.2 5.3
Magnesium (Mg)	M3	106 mg/kg						Mg 10.5 0.9
Sulfur (S)								H 23.8 2.0
Boron (B)								Na 0.7 0.1
Copper (Cu)	M3	0.9 mg/kg						K/Mg Ratio: 0.18
Iron (Fe)								Ca/Mg Ratio: 6.02
Manganese (Mn)								
Zinc (Zn)								
Sodium (Na)	M3	14 mg/kg						
Soluble Salts	SS1:2	0.11 dS/m						
Organic Matter	LOI	2.2%						
Estimated N Release		88 lbs/acre						
Nitrate Nitrogen	NO3N	13 mg/kg						

## SOIL FERTILITY GUIDELINES

Crop : Corn

Yield Goal : 150

bu/acre

Rec Units:

LB/ACRE

(lbs)	LIME	(tons)	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Mg	S	B	Cu	Mn	Zn	Fe
2500		1.3	157	77	123	0			0			
Crop :												Rec Units:

Comments :

### Corn

Limestone application is targeted to bring soil pH to 6.0.

- Greater N efficiency for corn may be achieved by splitting the N application. Apply 1/4 to 1/3 of the N prior to or at planting and the remainder as sidedress when corn is 8-24 inches high.
- For early planted corn or no till corn, apply a starter fertilizer at least 2 inches from the seed at a rate of 10-20 lbs N/Acre and 30-60 lbs P<sub>2</sub>O<sub>5</sub>/Acre.



20513

Denali Water Solutions

Ms. Vanya Colburn

P.O. Box 3036

Russellville , AR 72811

Project Tennessee Soil Samples  
Information :

Report Date : 07/07/2023

Report Number : **23-172-0109**

**REPORT OF ANALYSIS**

Received : 06/21/2023

Lab No : **89520**

Sample ID : **BH-1**

Matrix: **Solids**

Sampled:

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Calcium (saturated paste)	<b>9.00</b>	meq/L	0.005	1	07/07/23 14:45	SWL	Saturate Paste
Magnesium (saturated paste)	<b>2.23</b>	meq/L	0.008	1	07/07/23 14:45	SWL	Saturate Paste
Sodium (saturated paste)	<b>0.757</b>	meq/L	0.004	1	07/07/23 14:45	SWL	Saturate Paste
Sodium Absorption Ratio	<b>0.319</b>			1	07/07/23 14:45	SWL	Saturate Paste
Chromium, Hexavalent	<0.509	mg/Kg	0.509	1	06/30/23 16:20	ABB	3060A 7196A
Arsenic	<b>6.89</b>	mg/Kg	0.500	1	06/24/23 01:28	JTR	6010D
Cadmium	<b>0.337</b>	mg/Kg	0.100	1	06/24/23 01:28	JTR	6010D
Copper	<b>11.0</b>	mg/Kg	0.500	1	06/24/23 01:28	JTR	6010D
Lead	<b>9.92</b>	mg/Kg	0.300	1	06/24/23 01:28	JTR	6010D
Mercury	<0.167	mg/Kg	0.167	1	06/23/23 14:45	FDS	7471A
Nickel	<b>12.2</b>	mg/Kg	0.250	1	06/24/23 01:28	JTR	6010D
Selenium	<0.500	mg/Kg	0.500	1	06/24/23 01:28	JTR	6010D
Zinc	<b>38.2</b>	mg/Kg	1.25	1	06/24/23 01:28	JTR	6010D

**Qualifiers/  
Definitions**

DF Dilution Factor  
MQL Method Quantitation Limit

L Limit Exceeded



20513

Denali Water Solutions

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Project Tennessee Soil Samples  
Information :

Report Date : 07/07/2023

Report Number : **23-172-0109**

**REPORT OF ANALYSIS**

Received : 06/21/2023

Lab No : **89521**

Sample ID : **BH-2**

Matrix: **Solids**

Sampled:

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Calcium (saturated paste)	<b>7.93</b>	meq/L	0.005	1	07/07/23 14:45	SWL	Saturate Paste
Magnesium (saturated paste)	<b>1.63</b>	meq/L	0.008	1	07/07/23 14:45	SWL	Saturate Paste
Sodium (saturated paste)	<b>0.483</b>	meq/L	0.004	1	07/07/23 14:45	SWL	Saturate Paste
Sodium Absorption Ratio	<b>0.221</b>			1	07/07/23 14:45	SWL	Saturate Paste
Chromium, Hexavalent	<0.500	mg/Kg	0.500	1	06/30/23 16:20	ABB	3060A 7196A
Arsenic	<b>8.97</b>	mg/Kg	0.500	1	06/24/23 01:34	JTR	6010D
Cadmium	<b>0.434</b>	mg/Kg	0.100	1	06/24/23 01:34	JTR	6010D
Copper	<b>9.85</b>	mg/Kg	0.500	1	06/24/23 01:34	JTR	6010D
Lead	<b>11.5</b>	mg/Kg	0.300	1	06/24/23 01:34	JTR	6010D
Mercury	<0.185	mg/Kg	0.185	1	06/23/23 14:47	FDS	7471A
Nickel	<b>11.5</b>	mg/Kg	0.250	1	06/24/23 01:34	JTR	6010D
Selenium	<0.500	mg/Kg	0.500	1	06/24/23 01:34	JTR	6010D
Zinc	<b>31.4</b>	mg/Kg	1.25	1	06/24/23 01:34	JTR	6010D

**Qualifiers/  
Definitions**

DF Dilution Factor  
MQL Method Quantitation Limit

L Limit Exceeded



20513

Denali Water Solutions

Ms. Vanya Colburn

P.O. Box 3036

Russellville , AR 72811

Project Tennessee Soil Samples  
Information :

Report Number : **23-172-0109**

**REPORT OF ANALYSIS**

Report Date : 07/07/2023

Received : 06/21/2023

Lab No : **89522**

Sample ID : **BH-3**

Matrix: **Solids**

Sampled:

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Calcium (saturated paste)	<b>12.1</b>	meq/L	0.005	1	07/07/23 14:45	SWL	Saturate Paste
Magnesium (saturated paste)	<b>2.06</b>	meq/L	0.008	1	07/07/23 14:45	SWL	Saturate Paste
Sodium (saturated paste)	<b>1.13</b>	meq/L	0.004	1	07/07/23 14:45	SWL	Saturate Paste
Sodium Absorption Ratio	<b>0.424</b>			1	07/07/23 14:45	SWL	Saturate Paste
Chromium, Hexavalent	<1.00	mg/Kg	2.00	2	06/30/23 16:20	ABB	3060A 7196A
Arsenic	<b>5.10</b>	mg/Kg	0.500	1	06/24/23 01:39	JTR	6010D
Cadmium	<b>0.247</b>	mg/Kg	0.100	1	06/24/23 01:39	JTR	6010D
Copper	<b>7.19</b>	mg/Kg	0.500	1	06/24/23 01:39	JTR	6010D
Lead	<b>9.17</b>	mg/Kg	0.300	1	06/24/23 01:39	JTR	6010D
Mercury	<0.167	mg/Kg	0.167	1	06/23/23 14:48	FDS	7471A
Nickel	<b>8.76</b>	mg/Kg	0.250	1	06/24/23 01:39	JTR	6010D
Selenium	<0.500	mg/Kg	0.500	1	06/24/23 01:39	JTR	6010D
Zinc	<b>28.9</b>	mg/Kg	1.25	1	06/24/23 01:39	JTR	6010D

**Qualifiers/  
Definitions**

DF Dilution Factor  
MQL Method Quantitation Limit

L Limit Exceeded



20513

Denali Water Solutions

Ms. Vanya Colburn

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Project Tennessee Soil Samples  
Information :

Report Date : 07/07/2023

Report Number : **23-172-0109**

**REPORT OF ANALYSIS**

Received : 06/21/2023

Lab No : **89523**

Sample ID : **BH-4**

Matrix: **Solids**

Sampled:

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Calcium (saturated paste)	<b>7.87</b>	meq/L	0.005	1	07/07/23 14:45	SWL	Saturate Paste
Magnesium (saturated paste)	<b>2.22</b>	meq/L	0.008	1	07/07/23 14:45	SWL	Saturate Paste
Sodium (saturated paste)	<b>1.73</b>	meq/L	0.004	1	07/07/23 14:45	SWL	Saturate Paste
Sodium Absorption Ratio	<b>0.768</b>			1	07/07/23 14:45	SWL	Saturate Paste
Chromium, Hexavalent	<0.500	mg/Kg	0.500	1	06/30/23 16:20	ABB	3060A 7196A
Arsenic	<b>8.30</b>	mg/Kg	0.500	1	06/24/23 01:45	JTR	6010D
Cadmium	<b>0.296</b>	mg/Kg	0.100	1	06/24/23 01:45	JTR	6010D
Copper	<b>8.10</b>	mg/Kg	0.500	1	06/24/23 01:45	JTR	6010D
Lead	<b>10.9</b>	mg/Kg	0.300	1	06/24/23 01:45	JTR	6010D
Mercury	<0.167	mg/Kg	0.167	1	06/23/23 14:52	FDS	7471A
Nickel	<b>11.0</b>	mg/Kg	0.250	1	06/24/23 01:45	JTR	6010D
Selenium	<0.500	mg/Kg	0.500	1	06/24/23 01:45	JTR	6010D
Zinc	<b>30.7</b>	mg/Kg	1.25	1	06/24/23 01:45	JTR	6010D

**Qualifiers/  
Definitions**

DF Dilution Factor  
MQL Method Quantitation Limit

L Limit Exceeded



20513

Denali Water Solutions

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Russellville , AR 72811

Project Tennessee Soil Samples  
Information :

Report Date : 07/07/2023

Report Number : **23-172-0109**

**REPORT OF ANALYSIS**

Received : 06/21/2023

Lab No : **89524**

Sample ID : **BH-5**

Matrix: **Solids**

Sampled:

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Calcium (saturated paste)	<b>6.65</b>	meq/L	0.005	1	07/07/23 14:45	SWL	Saturate Paste
Magnesium (saturated paste)	<b>1.12</b>	meq/L	0.008	1	07/07/23 14:45	SWL	Saturate Paste
Sodium (saturated paste)	<b>0.371</b>	meq/L	0.004	1	07/07/23 14:45	SWL	Saturate Paste
Sodium Absorption Ratio	<b>0.188</b>			1	07/07/23 14:45	SWL	Saturate Paste
Chromium, Hexavalent	<0.511	mg/Kg	0.511	1	06/30/23 16:20	ABB	3060A 7196A
Arsenic	<b>7.67</b>	mg/Kg	0.500	1	06/24/23 01:50	JTR	6010D
Cadmium	<b>0.374</b>	mg/Kg	0.100	1	06/24/23 01:50	JTR	6010D
Copper	<b>9.85</b>	mg/Kg	0.500	1	06/24/23 01:50	JTR	6010D
Lead	<b>9.86</b>	mg/Kg	0.300	1	06/24/23 01:50	JTR	6010D
Mercury	<0.164	mg/Kg	0.164	1	06/23/23 14:54	FDS	7471A
Nickel	<b>11.9</b>	mg/Kg	0.250	1	06/24/23 01:50	JTR	6010D
Selenium	<0.500	mg/Kg	0.500	1	06/24/23 01:50	JTR	6010D
Zinc	<b>37.8</b>	mg/Kg	1.25	1	06/24/23 01:50	JTR	6010D

**Qualifiers/  
Definitions**

DF Dilution Factor  
MQL Method Quantitation Limit

L Limit Exceeded



20513

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Russellville , AR 72811

Project Tennessee Soil Samples  
Information :

Report Date : 07/07/2023

Report Number : **23-172-0109**

## REPORT OF ANALYSIS

Received : 06/21/2023

Lab No : **89525**

Matrix: **Solids**

Sample ID : **CC-1**

Sampled:

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Calcium (saturated paste)	<b>5.91</b>	meq/L	0.005	1	07/07/23 14:22	SWL	Saturate Paste
Magnesium (saturated paste)	<b>0.987</b>	meq/L	0.008	1	07/07/23 14:22	SWL	Saturate Paste
Sodium (saturated paste)	<b>0.364</b>	meq/L	0.004	1	07/07/23 14:22	SWL	Saturate Paste
Sodium Absorption Ratio	<b>0.196</b>			1	07/07/23 14:22	SWL	Saturate Paste
Chromium, Hexavalent	<0.503	mg/Kg	0.503	1	06/30/23 16:20	ABB	3060A 7196A
Arsenic	<b>8.48</b>	mg/Kg	0.500	1	06/24/23 01:55	JTR	6010D
Cadmium	<b>0.461</b>	mg/Kg	0.100	1	06/24/23 01:55	JTR	6010D
Copper	<b>10.9</b>	mg/Kg	0.500	1	06/24/23 01:55	JTR	6010D
Lead	<b>10.3</b>	mg/Kg	0.300	1	06/24/23 01:55	JTR	6010D
Mercury	<0.190	mg/Kg	0.190	1	06/23/23 14:55	FDS	7471A
Nickel	<b>12.9</b>	mg/Kg	0.250	1	06/24/23 01:55	JTR	6010D
Selenium	<0.500	mg/Kg	0.500	1	06/24/23 01:55	JTR	6010D
Zinc	<b>37.3</b>	mg/Kg	1.25	1	06/24/23 01:55	JTR	6010D

### Qualifiers/ Definitions

DF Dilution Factor  
MQL Method Quantitation Limit

L Limit Exceeded



20513

Denali Water Solutions  
Ms. Vanya Colburn  
P.O. Box 3036  
Russellville , AR 72811

Project Tennessee Soil Samples  
Information :

Report Number : **23-172-0109**

**REPORT OF ANALYSIS**

Report Date : 07/07/2023

Received : 06/21/2023

Lab No : **89526**

Sample ID : **CC-2**

Matrix: **Solids**

Sampled:

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Calcium (saturated paste)	<b>8.43</b>	meq/L	0.005	1	07/07/23 14:22	SWL	Saturate Paste
Magnesium (saturated paste)	<b>1.53</b>	meq/L	0.008	1	07/07/23 14:22	SWL	Saturate Paste
Sodium (saturated paste)	<b>0.342</b>	meq/L	0.004	1	07/07/23 14:22	SWL	Saturate Paste
Sodium Absorption Ratio	<b>0.153</b>			1	07/07/23 14:22	SWL	Saturate Paste
Chromium, Hexavalent	<0.517	mg/Kg	0.517	1	06/30/23 16:20	ABB	3060A 7196A
Arsenic	<b>7.97</b>	mg/Kg	0.500	1	06/24/23 02:01	JTR	6010D
Cadmium	<b>0.408</b>	mg/Kg	0.100	1	06/24/23 02:01	JTR	6010D
Copper	<b>10.1</b>	mg/Kg	0.500	1	06/24/23 02:01	JTR	6010D
Lead	<b>9.59</b>	mg/Kg	0.300	1	06/24/23 02:01	JTR	6010D
Mercury	<0.177	mg/Kg	0.177	1	06/23/23 14:57	FDS	7471A
Nickel	<b>11.5</b>	mg/Kg	0.250	1	06/24/23 02:01	JTR	6010D
Selenium	<0.500	mg/Kg	0.500	1	06/24/23 02:01	JTR	6010D
Zinc	<b>34.4</b>	mg/Kg	1.25	1	06/24/23 02:01	JTR	6010D

**Qualifiers/  
Definitions**

DF Dilution Factor  
MQL Method Quantitation Limit

L Limit Exceeded



20513

Denali Water Solutions  
Ms. Vanya Colburn  
P.O. Box 3036  
Russellville , AR 72811

Project Tennessee Soil Samples  
Information :

Report Number : **23-172-0109**

## REPORT OF ANALYSIS

Report Date : 07/07/2023

Received : 06/21/2023

Lab No : **89527**

Sample ID : **CC-3**

Matrix: **Solids**

Sampled:

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Calcium (saturated paste)	<b>7.66</b>	meq/L	0.005	1	07/07/23 14:22	SWL	Saturate Paste
Magnesium (saturated paste)	<b>1.51</b>	meq/L	0.008	1	07/07/23 14:22	SWL	Saturate Paste
Sodium (saturated paste)	<b>0.366</b>	meq/L	0.004	1	07/07/23 14:22	SWL	Saturate Paste
Sodium Absorption Ratio	<b>0.171</b>			1	07/07/23 14:22	SWL	Saturate Paste
Chromium, Hexavalent	<0.506	mg/Kg	0.506	1	06/30/23 16:20	ABB	3060A 7196A
Arsenic	<b>9.27</b>	mg/Kg	0.500	1	06/24/23 02:06	JTR	6010D
Cadmium	<b>0.445</b>	mg/Kg	0.100	1	06/24/23 02:06	JTR	6010D
Copper	<b>11.3</b>	mg/Kg	0.500	1	06/24/23 02:06	JTR	6010D
Lead	<b>10.2</b>	mg/Kg	0.300	1	06/24/23 02:06	JTR	6010D
Mercury	<0.170	mg/Kg	0.170	1	06/23/23 14:58	FDS	7471A
Nickel	<b>13.4</b>	mg/Kg	0.250	1	06/24/23 02:06	JTR	6010D
Selenium	<0.500	mg/Kg	0.500	1	06/24/23 02:06	JTR	6010D
Zinc	<b>39.3</b>	mg/Kg	1.25	1	06/24/23 02:06	JTR	6010D

### Qualifiers/ Definitions

DF Dilution Factor  
MQL Method Quantitation Limit

L Limit Exceeded



**Appendix E**  
**Sampling Plan**



# DENALI

**Denali Sampling Plan**  
**Permit Application**  
**Haywood County**



## Material Sampling Plan:

Food processing residuals will be sampled annually for the parameters listed below.

- A. Total Solids
- B. pH
- C. Calcium Carbonate Equivalent
- D. Nutrients
  - a. Ammonia Nitrogen
  - b. Nitrate/Nitrite
  - c. Total Kjeldahl Nitrogen
  - d. Phosphorus
  - e. Potassium
  - f. Boron
  - g. Sulfur
  - h. Manganese
  - i. Molybdenum
- E. Soluble Salts
  - a. Total Soluble Salts
  - b. Calcium
  - c. Magnesium
  - d. Sodium
- F. Designated Groundwater Parameters (Rule 1200-1-7)
  - a. Arsenic
  - b. Cadmium
  - c. Chromium
  - d. Cobalt
  - e. Copper
  - f. Lead
  - g. Mercury
  - h. Nickel
  - i. Selenium
  - j. Zinc

\*All other listed parameters are not known to be in food processing residuals. Food processing facilities have strict guidelines on food safety and cannot come in contact with the majority of chemicals listed in Rule 1200-1-7.

- H. Additional parameters
  - a. Oil and Grease
  - b. Sodium Absorption Ratio
  - c. Total Carbon (C:N can be calculated with TC and TKN)

\*As agreed upon by TDEC, only kill plants will be tested annually for fecal using the 7 geometric mean method.



**Soil Sampling Plan:**

Annually each field will be analyzed for the following parameters:

- A. pH
- B. Cation Exchange Capacity
- C. Nutrients
  - a. Nitrate-N
  - b. Phosphorus
  - c. Potassium
  - d. Estimated Nitrogen Release
- D. Salts
  - a. Soluble Salts
  - b. Calcium
  - c. Sodium
  - d. Magnesium
  - e. Sodium Absorption Ratio
- E. Other Parameters
  - a. Organic Matter

Lime and fertilizer recommendations will be given based on soil results and crop grown.

Every three years, each field will be analyzed for the additional parameters:

- A. Metals
  - a. Arsenic
  - b. Cadmium
  - c. Chromium
  - d. Cobalt
  - e. Copper
  - f. Lead
  - g. Mercury
  - h. Nickel
  - i. Selenium
  - j. Zinc

Representative sample(s) will be taken for each field listed in this permit to adequately characterize the soil and determine the appropriate application rate of materials.

**Soil Sampling Procedure:**

The top 4 inches of soil will be sampled as to best represent any effects from the addition of fertilizer material.



**Surface Water Sampling Plan:**

Denali will maintain the required 100 ft. land application buffer from streams and water ways. Surface water sampling will occur twice a year, spring and fall, during years that land application takes place. Surface waters will be sampled at upstream and downstream of release to determine impact of pollutants. Sample locations are noted in following map.

In the event surface water sampling is needed the following parameters will be sampled:

- A. Biological Oxygen Demand
- B. Dissolved Oxygen (DO)
- C. Chemical Oxygen Demand (COD)
- D. E-coli
- E. Temperature
- F. Dissolved Solids
- G. Total Suspended Solids
- H. Conductivity
- I. pH
- J. Turbidity
- K. Nutrients
  - Ammonia Nitrogen
  - Nitrate/Nitrite
  - Total Kjeldahl Nitrogen
  - Phosphorus

All results will be submitted with the annual report to TDEC and will be available to landowners and generators.





**TN3**

0 1,050 2,100 4,200 6,300 8,400 Feet

Becky Haynes & Chris Cooper  
Haywood County, Tennessee