TENNESSEE Wastewater
an Adenus Utility

851 Aviation Parkway
Smyrna, TN 37167

June 15, 2015

Mr. David Foster, Chief
Utilities Division
Tennessee Regulatory Authority
502 Deaderick Street, 4th Floor
Nashville, TN 37243

RE: Docket # 15-00025 – Petition of Tennessee Wastewater Systems, Inc. to Amend its Certificate of Convenience and Necessity

Dear Mr. Foster:

Tennessee Wastewater Systems, Inc. provides the following information per your request dated May 15, 2015.

1. Please provide financial statements for year-end December 31, 2014 inclusive of balance sheet, income statement and statement of cash flow for Tennessee Wastewater Systems, Inc.

   Response: See attached (Confidential)

2. Provide information from Williamson County showing that the Map and Parcels listed for transfer of the treatment system to TWSI are now deeded/registered to the Sanfords or Nolensville 162, LLC.

   Response: See attached

3. Provide a breakdown of the operation costs provided in the build-out schedule of the Petition and explain how the costs are determined. Please explain the basis and underlying assumptions for the cost estimates.

   Response: See attached

4. Provide the date the SOP application was submitted to TDEC for the Nolensville-Dove Lake Treatment Facility.

   Response: The Engineer (SEC, Inc.) has not submitted the application yet.

5. Provide a copy of the *Notice of Complete Application* for the Nolensville-Dove Lake Treatment Facility and assigned SOP number as reported by TDEC.

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Response: TDEC has not issued a Notice of Complete Application for this project.

6. Please provide a copy of the Detailed Soils Investigation Report ("DSIR") and the Design Development Report ("DDR") that will be submitted to Williamson County for approval of the wastewater system engineering and design.

   Response: See attached.

7. Please explain the roles of Alan Kent, Pete Ferrari and Himanshu Amin to Nolensville 162, LLC. (Developer).

   Response: Alan Kent is the equity provider and the sponsor of the debt.
   Pete Ferrari is the Developer and Manager
   Himanshu Amin is Alan Kent's Controller

8. Provide a map of the exact area being requested showing street names, etc. Provide an actual blueprint to scale showing as-built drawings of the location of all components of the wastewater system and the "proposed phases" of the phased in collection system.

   Response: See DDR/DSIR. As-Built drawings cannot be provided. The system has not been designed, or constructed.

9. TWSI provided in the Petition that the subdivision is inclusive of 222 acres. Will The Enclave of Dove Lake Subdivision encompass all of the 222 acres or will there be other subdivisions built within the 222 acres?

   Response: The Enclave of Dave Lake is the only development proposed to encompass the 222 acres.

10. Provide detailed construction cost estimates for all of the facilities and improvements to the 222 acres of land in order to construct the treatment, disposal and collection system. Provide a comparison of the actual construction costs for similar systems. Submit a copy of the same cost estimates signed by the Design Engineer that includes the STEP System the treatment and collection facilities and drip dispersal, as will be submitted to Williamson County.

    Response: This project is in very preliminary stage and only assumed construction cost estimates have been prepared. The Developer's engineer has

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prepared a detailed construction cost estimate in the DDR/DSIR. No recent similar systems are available for comparison.

11. Provide details of what is involved in the installations of phased collection systems installations.

Response: The following would be considered typical in Williamson County.

a. **Collection system phase would be designed and approved by TDEC**
b. **Preliminary plat would be presented to the County**
c. **Planning Commission would approve Preliminary plat with conditions**
d. **Developer would request bids to have the collection system installed**
e. **Developer would select an installation Contractor**
f. **Contractor would conduct a Pre-con meeting with TWSI inspectors**
g. **TWSI would inspect installation**
h. **TWSI and installer would perform pressure testing of installed lines**
i. **Deficiencies would be corrected, if necessary.**
j. **TWSI would accept and certify the system installations**
k. **Planning Commission would approve final plat**
l. **Developer would post a bond for installed system with the County**
m. **TWSI would sign the final plat as Utility provider**
n. **Developer would record the final plat**

- **This should not be considered Typical for every County in TN.**

12. Will the Enclave of Dove Lake subdivision be built in phases? If so, describe each phase and the estimated time of completion for each phase.

Response: There will be 3 phases to the development. Estimated timeline of the phases will be approximately 4 years. Each phase can't be projected as it is dependent on the purchase of the lots/homes for each phase.

13. Will all of the 165 houses referred to in the Petition be built in the first phase?

Response: No. There will be 3 phases.

14. Will the "phased collection system installations" be complete when TWSI takes over the system from the Developer? If not, provide timeline of phases.

Response: Each phase collection lines will be completed for that phase prior to recording of the plat. The Developer must post a bond with Williamson County. That bond is held on TWSI's behalf according to Williamson County regulations.

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TWSI does not sign the plat or provide service until the collections lines have passed TWSI's requirements.

15. Provide cost estimates for each phase (section) of the "phased in collection system installations."

Response: Phase I – 66 lots * 100ft./lot * $10.00/LF = $66,000.00
Phase II – 65 lots * 100ft/lot * $10.00/LF = $65,000.00
Phase III – 33 lots * 100ft/lot * $10.00/LF = $33,000.00

16. In a previous Docket (Docket No. 14-00062), TWSI stated that a recent reorganization caused certain maintenance personnel previously employed by Adenus Operations to now become full time employees of TWSI. Will an employee of TWSI be performing the operation and maintenance duties at Enclave of Dove Lake? Name all of the operation and maintenance personnel on TWSI's payroll that hold certificates to operate a wastewater system and name the certified operator specifically assigned to the Enclave of Dove Lake.

Response: An employee of TWSI will be assigned to that facility to perform the operation and maintenance for the treatment and collection system. The following personnel are employees of TWSI along with a list of employees of TWSI's affiliated companies who are available to assist TWSI employees:

TWSI Personnel

John Czahoroski, BNS Certification, #15064
Tony Smith, BNS Certification, #15279
Steve Hanson, BNS & Collections I Certification, #14079
Jeremy Stewart, Not yet eligible to take exams for certification
Tracy Nichols, BNS & Collections I & II Certification, #15046
Jesse Hutcherson, BNS & Collections I& II Certification, #15047
Thomas Smithson, BNS Certification, #15507

Adenus Operations LLC Personnel

Larry Barnes, BNS &Collections I Certification, #3542
Brian Carter, BNS & Collections I Certification, #3541
Roy Denney, Grade 4 Operator, #14847
Jennifer Young, Grade 4 Operator, #9166
Charles Hyatt, BNS & Collections I Certification, #3540, Licensed General Contractor, #00058778

Jesse Hutcherson will be assigned as the certified operator for Enclave of Dove Lake.

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17. Provide a copy of the operator certification for the person that will be operating and providing inspection reports for the wastewater system at The Enclave of Dove Lake Subdivision.

    Response: See attached

18. Provide a copy of the same *preliminary plat* as will be submitted to Williamson County for the Enclave at Dove Lake.

    Response: Only a concept plan has been prepared for this project. It is included in the DDR/DSIR. A preliminary plat will be presented to Williamson County once the SOP has been issued by TDEC and the TRA has granted a CCN to the Utility provider.

19. Please explain how customer service needs will be met by providing the following:
    a. Phone number for repair and maintenance (customer service).
    b. Address for written communication for repair and maintenance
    c. Name, address and phone number of area certified operator responsible for and knowledgeable about provider operations
    d. Provide a copy of an actual Tennessee Wastewater Services, Inc. bill, showing all specifics of a bill pursuant to TRA Rules and Regulations that the Enclave of Dove Lake customers will receive. (Include a copy of both monthly bill and annual bill.)

    Response: TWSI information: phone number, address, maintenance hotline is on the monthly bill. In addition to monthly bill, this information can also be found on TWSI website. At each treatment plant location or drip field, a 2x2 foot sign is posted with TWSI information and also TDEC's information. All maintenance calls are dispatched from the Smyrna office. Item (d) information is attached.

20. Identify all complaints filed with state and federal agencies involving your company or affiliated entities. Identify the nature of the complaint, which governmental agency or office received the complaint and how the complaint was resolved. Provide a separate list with any unresolved complaints.

    Response: TWSI is not aware of any outstanding complaints filed outside of the TRA complaints. TRA complaints would be on file along with TWSI's responses to those complaints. TDEC and local health department complaints are not sent to TWSI. Personnel from those agencies along with TWSI personnel visit the site of the complaint to review the claim. Any issues or further actions by TWSI are

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resolved at that point. All customer complaints / maintenance issues are logged into a work order database maintained by Adenus and dispatched to the respective maintenance personnel. That maintenance ticket is then "closed out" by the maintenance personnel once the issue is resolved.

21. Provide a copy of the "Subscription Service Contract" and/or any other contract the customers at the Enclave of Dove Lake will be required to sign to tap on and/or to be serviced by the wastewater system.

    Response: See attached.

If you have any further questions, or need any additional information, please feel free to contact me.

Sincerely,

Charles Hyatt, President
Tennessee Wastewater Systems, Inc.

Serial No. 9349

#17

State of Tennessee

Department of Environment and Conservation

Water and Wastewater Operator Certification Board

Issues This

Certificate of Competency

as Testimony That

Jesse J. Hutcherson

has satisfactorily fulfilled the requirements set forth by the

Water and Wastewater Operator Certification Board

and is therefore, by these presents, entitled to recognition as a

Biological/Natural Systems

In Witness Whereof, we have subscribed our names and affixed our Seal

Certificate No. 15047 *Dated* 11/7/2013

Recommended Alan C. Cranford
Board Chairman

Attest _____
Board Secretary

Approved _____ *Commissioner.*

DH-0756

Serial No. 09858

State of Tennessee

Department of Environment and Conservation

Water and Wastewater Operator Certification Board

Issues This

Certificate of Competency

as Testimony That

Jesse J. Hutcherson

has satisfactorily fulfilled the requirements set forth by the

Water and Wastewater Operator Certification Board

and is therefore, by these presents, entitled to recognition as a

Grade I Wastewater Collection System Operator

In Witness Whereof, we have subscribed our names and affixed our Seal

Certificate No. 15047 *Dated* 11/7/2014

Recommended Alan A. Cosgrove
Board Chairman

Attest Jeff Dill
Board Secretary

Approved Robert Martineau *Commissioner.*

19d

Tennessee Wastewater Systems, Inc.

851 Aviation Parkway
Smyrna, TN 37167
888-3-ADENUS
Maintenance Hotline: 877-669-0786

Account No.	Location No.
000000001257	0000001NBWB0058

From Date	Through Date	
04/30/2015	05/31/2015	

Service	Usage	Amount
Previous Balance		45.63
Payment Received		(45.63)
SEWER		44.15
Bonding		1.48
Total Charges Due		45.63

Past Due Amount	Current Charges	Net Amount
		$ 45.63
Due Date	**After Due Date**	
[illegible]	$ 47.91	$ 45.63

Account No.	Location No.
000000001257	000000TNBWB0058

Due Date	After Due Date	Net Amount
06/15/2015	47.91	45.63

Service Address: 245 HOPE COVE

View account history. Update your account info. Even pay your bill, all online. Visit adenus.com to learn how

RETURN STUB WITH PAYMENT TO:
Tennessee Wastewater Systems, Inc.
851 Aviation Parkway
Smyrna, TN 37167

PRESORTED
FIRST CLASS MAIL
U.S. POSTAGE PAID
SMYRNA TN
Permit No. 28

ADDRESS SERVICE REQUESTED

[redacted]

19d

Tennessee Wastewater Systems, Inc.
Office: (615) 220-7200
Fax: (615) 220-7207

851 Aviation Parkway
Smyrna, TN 37167

Bill To

[redacted]

Empty Lot Fee Statement

Date	Account #
12/15/2014	000000000138
Total Due	Total Due After 1/15/2015
$120.00	$126.00

Description	Previous Balance	Payments	Adjustments	Current Charges	Total Due	Total Due After 1/15/2015
OAK POINTE 000000TNOPO0005	120.00	-120.00	0.00	120.00	120.00	126.00
				Total Due	$120.00	$126.00

Please remit payment with stub

#2

Williamson County Real Estate Assessment Data

New Search

County Number: 094 **Current Tax Year:** 2015

Property Owner and Mailing Address

SANFORD GARY
7620 NOLENSVILLE ROAD
NOLENSVILLE , TN 37135

Property Location

Address: NOLENSVILLE RD
Di: 17 **Map:** 083 **Group:**
Ctrl Map: 083 **Parcel:** 01300 **PI:** **SI:** 000

Value Information

Valuation Year:	2015		
Land Market Value:	$315,700	**Land Use Value:**	$47,200
Improvement Value:	$44,500	**Improvement Value:**	$44,500
Total Market Appraisal:	$360,200	**Total Use Appraisal:**	$91,700
		Assessment %:	Green Belt 25%
		Assessment:	$22,925

General Information

Lot Dimensions: 0.00 x 0.00 **Legal Acreage:** 0.0000
Class: 111 Agricultural
City: 000 Unincorporated

Building Information

Building: 1 (R01) **Year built:** 1992 **Effective Year Built:** 1992

Floor	Base Area	Finished Area
1.0	1014	1014
2.0	1173	1173

Features

Feature Type	Description
ATTGAR	840
DETGAR	943 SF

Sales information

There is no sales information on record for this property.

Recorded Sales

There are no recorded sales available.

Williamson County Real Estate Assessment Data

New Search

County Number: 094 **Current Tax Year:** 2015

Property Owner and Mailing Address

SANFORD PHILLIP T
7612 NOLENSVILLE RD
NOLENSVILLE , TN 37135

Property Location

Address: 7612 NOLENSVILLE RD
Di: 17 **Map:** 083 **Group:**
Ctrl Map: 083 **Parcel:** 01302 **PI:** **SI:** 000

Value Information

Valuation Year:	2015		
Land Market Value:	$283,400	**Land Use Value:**	$42,700
Improvement Value:	$37,600	**Improvement Value:**	$37,600
Total Market Appraisal:	$321,000	**Total Use Appraisal:**	$80,300
		Assessment %:	Green Belt 25%
		Assessment:	$20,075

General Information

Lot Dimensions: 0.00 x 0.00 **Legal Acreage:** 27.5100
Class: 111 Agricultural
City: 000 Unincorporated

Building Information

Building: 1 (R01) **Year built:** 1962 **Effective Year Built:** 1972

Floor	Base Area	Finished Area
1.0	1170	1170

Features

Feature Type	Description
ICP	190
DETGAR	1050 SF
CONCP	200 SF

DETGAR	960 SF

Sales information

There is no sales information on record for this property.

Recorded Sales

There are no recorded sales available.

Williamson County Real Estate Assessment Data

New Search

County Number: 094 **Current Tax Year:** 2015

Property Owner and Mailing Address

SANFORD G T JR LE
SANFORD JANICE P LE
7616 NOLENSVILLE RD
NOLENSVILLE , TN 37135

Property Location

Address: 7624 NOLENSVILLE RD
Di: 18 **Map:** 085 **Group:**
Ctrl Map: 085 **Parcel:** 00101 **PI:** **SI:** 000

Value Information

Valuation Year: 2015

Land Market Value:	$903,600	**Land Use Value:**	$145,900
Improvement Value:	$105,000	**Improvement Value:**	$105,000
Total Market Appraisal:	$1,008,600	**Total Use Appraisal:**	$250,900
		Assessment %:	Green Belt 25%
		Assessment:	$62,725

General Information

Lot Dimensions: 0.00 x 0.00 **Legal Acreage:** 0.0000
Class: 111 Agricultural
City: 000 Unincorporated

Building Information

Building: 1 (R01) **Year built:** 1894 **Effective Year Built:** 1974

Floor	Base Area	Finished Area
1.0	2622	2622

Features

Feature Type	Description
EPF	220

Sales information

Sale date	Price	Deed book	Deed Page
1996-04-02	$0	1385	241

Recorded Sales

There are no recorded sales available.

Williamson County Real Estate Assessment Data

New Search

County Number: 094 **Current Tax Year:** 2015

Property Owner and Mailing Address

SANFORD G T III
SANFORD LESSIA J
7616 NOLENSVILLE RD
NOLENSVILLE , TN 37135

Property Location

Address: 7616 NOLENSVILLE RD
Di: 18 **Map:** 086 **Group:**
Ctrl Map: 086 **Parcel:** 01100 **PI:** **SI:** 000

Value Information

Valuation Year:	2015		
Land Market Value:	$213,200	**Land Use Value:**	$46,500
Improvement Value:	$208,400	**Improvement Value:**	$208,400
Total Market Appraisal:	$421,600	**Total Use Appraisal:**	$254,900
		Assessment %:	Green Belt 25%
		Assessment:	$63,725

General Information

Lot Dimensions: 0.00 x 0.00 **Legal Acreage:** 20.0100
Class: 111 Agricultural
City: 000 Unincorporated

Building Information

Building: 1 (R01) **Year built:** 1962 **Effective Year Built:** 1982

Floor	Base Area	Finished Area
1.0	900	900

Building: 2 (R02) **Year built:** 1984 **Effective Year Built:** 1991

Floor	Base Area	Finished Area
1.0	2744	2744

B 400 0

Features

Feature Type	Description
ATTGAR	744
WDDK	540 SF

Sales information

Sale date	Price	Deed book	Deed Page
2009-03-13	$0	4764	711
2009-02-17	$0	4736	353
1993-09-29	$0	1124	600
1990-11-14	$0	876	101

Recorded Sales

There are no recorded sales available.

TENNESSEE Wastewater
an Aqua Utility

21

SEWER SUBSCRIPTION CONTRACT

DATE:_____

_____
PRINTED NAME

_____ _____
ADDRESS OF PROPERTY **LOT #**

_____
MAILING ADDRESS

_____ _____ ☐ **VACANT LOT**
TELEPHONE NUMBER **EMAIL ADDRESS** ☐ **HOME**

I hereby make application to Tennessee Wastewater Systems, Inc. ("TWS") for sewer service at the address of property stated above. In consideration of the undertaking on the part of TWS to furnish sewer service, I understand, covenant and agree as follows:

1. (If VACANT LOT checked above): I agree to pay an annual Sewer Access Fee for the vacant lot I own until such time as a home is built on the lot and payment for sewer service begins.
2. I understand that the components of a sewer system have been installed on the property referred to above, which is owned or occupied by me, and which is to be connected with a wastewater disposal system owned and/or maintained by TWS. I warrant that any connection to and/or subsequent use to this system by the components on my property shall be in accordance with the Rules, Regulations and Plans of TWS. Regarding my usage of the system components on my property, which are owned by me, I covenant to follow the guidelines set forth in the USER MANUAL **(Do's and Don'ts for an Effluent Collection System). Should I violate these Rules** and/or abuse or damage my components, I understand that I must bear the expense to repair or replace the same in accordance with the Plans of TWS.
3. I acknowledge TWS, its successors and assigns have a perpetual easement in, over, under and upon the above specified land as shown on the property plat, with the right to operate and repair all components of the sewer system on my property, including but not limited to the interceptor tank and the Interceptor Pump or Interceptor Gravity Tank systems. I further grant TWS permission to enter upon my property for any reason connected with the provision or removal of sewer service or collection therefore.
4. For all other plumbing and structures on the property, including the outfall line to the interceptor tank, I agree that I am responsible for all operation and repair thereof.
5. I hereby authorize TWS to purchase and install a cutoff valve on my side of my water meter and grant TWS exclusive right to use such valve in accordance with its Rules and Regulations. However, the use of this valve does not in any way relieve me of my obligation to pay for water service to the service provider.
6. I understand and agree to promptly pay for service at the then current schedule of rates and fees **and agree to abide by and be subject to TWS's billing and cutoff procedures. Should I not pay in accordance with TWS's Rules, I agree to pay all costs of collection, including attorney fees.**
7. I accept the current Rules and Regulations and the Rates and Fees Schedule established with the TRA and agree to abide by any amendments to such Schedules. These rates are subject to change.
8. I agree that this Agreement shall remain in effect for as long as I own, reside upon or rent the above-described property. When such circumstances no longer exist, I agree to provide notice to TWS at least thirty (30) days in advance of my vacating the property.

_____
SUBSCRIBER'S SIGNATURE

3

TNWW Estimated Operating Cost

		2015 (5 Customers)	2016 (35 Customers)	2017 (75 Customers)	2018 (120 Customers)	2019 (165 Customers)
Salaries & Benefits	$208.67	$1,043	$7,303	$15,650	$25,040	$34,431
Electricity	$48.72	$244	$1,705	$3,654	$5,846	$8,039
Telemetry	$38.89	$194	$1,361	$2,917	$4,667	$6,417
License and Permits	$15.50	$78	$543	$1,163	$1,860	$2,558
Transportation	$19.77	$99	$692	$1,483	$2,372	$3,262
Taxes	$46.12	$231	$1,614	$3,459	$5,534	$7,610
Contractual Services	$57.48	$287	$2,012	$4,311	$6,898	$9,484
Materials and Supplies	$56.08	$280	$1,963	$4,206	$6,730	$9,253
All other expenses	$23.48	$117	$822	$1,761	$2,818	$3,874
Total	**$514.71**	**$1,287**	**$18,015**	**$38,603**	**$61,765**	**$84,927**

#6

Nolensville-Dove Lake Treatment Facility

Williamson County, TN

DESIGN DEVELOPMENT REPORT
&
DETAILED SOILS INVESTIGATION REPORT

for

Tennessee Wastewater Systems, Inc.
Charles Hyatt, President
851 Aviation Parkway
Smyrna, TN 37167

Decentralized Wastewater Collection & Treatment Facility
with
Slow Rate Land Treatment Disposal by Drip Irrigation

SEC, Inc.
SITE ENGINEERING CONSULTANTS
ENGINEERING • SURVEYING • LAND PLANNING
850 MIDDLE TENNESSEE BLVD • MURFREESBORO, TENNESSEE 37129
PHONE (615) 890-7901
WWW.SEC-CIVIL.COM

MARK P. LEE
REGISTERED ENGINEER
AGRICULTURE
4/20/2015
COMMERCE
No. 19,186
STATE OF TENNESSEE

SEC Project No. 14204

Index

1. Site Description:

1.1 Location Map Exhibit 1.1

1

Street Address: 7624 Nolensville Road, Nolensville, TN 37135

1.2 Climate

The site is located in the North Temperate Zone of Middle Tennessee, which generally has mild climate year around, but still has four distinct seasons. The average temperature in winter is 39.2 degrees F. In the summer, the average temperature is 76.2 degrees F. The average annual temperature is 58.1 degrees F. The average annual precipitation is 51.8 inches. This information is from the National Oceanic and Atmospheric Administration's National Climate Data Center.

1.3 Geology (including subsurface hydrology)

The attached USGS map (Exhibit 1.3a) indicates that the surface drainage flow path from the Nolensville-Dove Lake Treatment Facility is to the southeast, discharging into Arrington Creek watershed. The subdivision development is comprised of approximately 220 acres. The topography is mainly rolling slopes of 5 - 15 % with moderately steep slopes at the northern portion of the property. This moderately steep portion makes up approximately 35-40% of the property.

The property is bordered on the west by US 31 / US 41A / SR 11, on the east by Arrington Creek, on the north by undeveloped, forested property, and on the south by agricultural property. Roughly 40-45% of the site is wooded and the 11.4 acres required for drip dispersal is mostly cleared and farmed with row crops.

The property has mainly been used for row crops and woodlands. Groundwater was used historically to provide potable water. At this time the area is served by Nolensville College Grove Utility District with potable water.

It is assumed that the groundwater movement and surface flows are to the southwest with Arrington Creek and ultimately into the Harpeth River.

Most of the soils used for drip dispersal are underlain and formed from the Hermitage formation (Oh). In Williamson County, the Hermitage formation consists of flaggy beds of blue-grey sandy and earthy limestone separated by calcareous seams of shale, and calcareous sandstone associated with thin-bedded limestone. These beds are usually devoid of fossils, are locally phosphatic, and at many places simulate thin-bedded earthy yellowish sandstone on weathered surfaces.

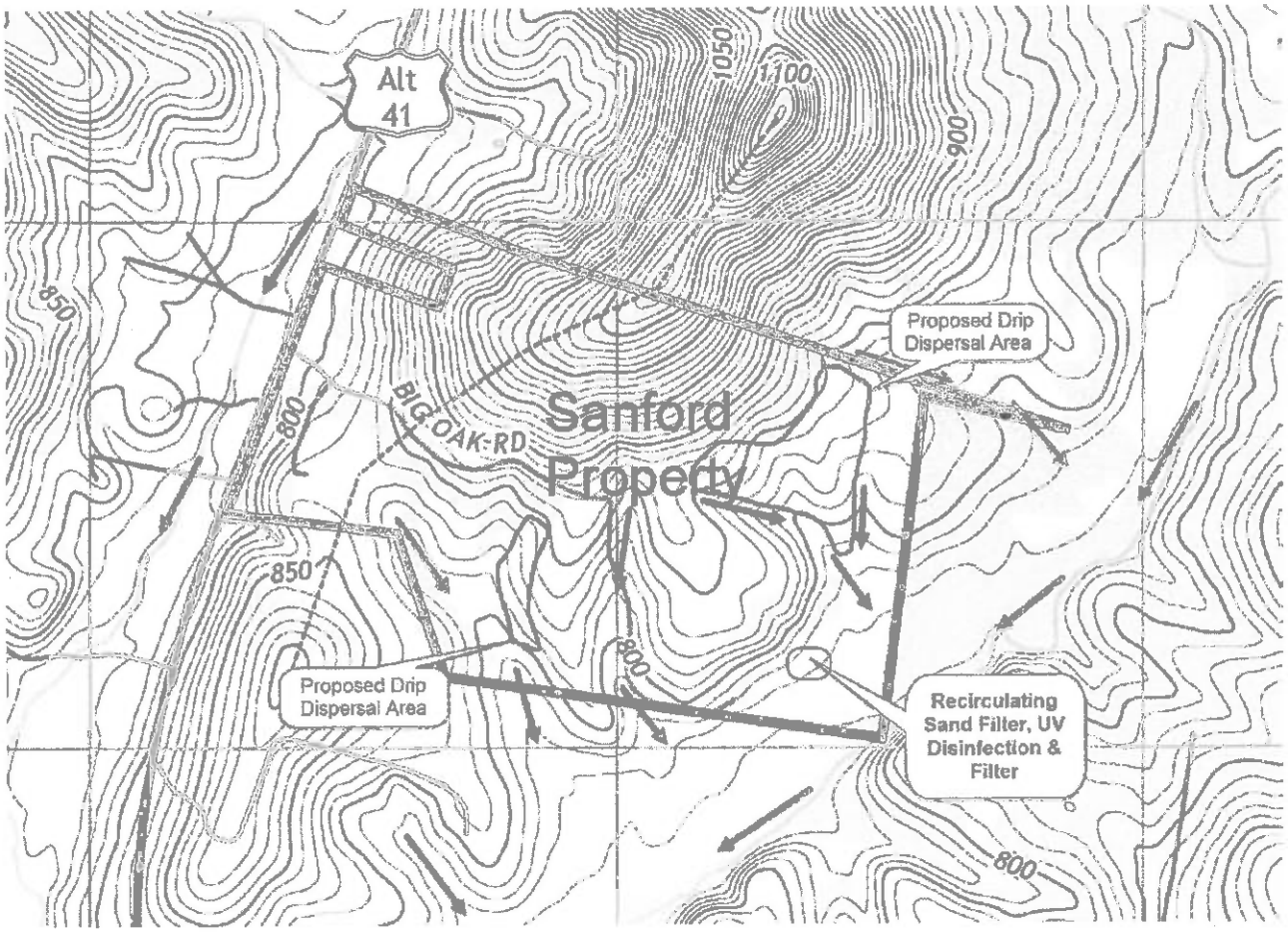
The Hermitage formation ranges in thickness between 60 to 100 feet in the Nashville Basin and crops out at proper horizons throughout the basin. Water movement into the rock formations will be through weathered upper layers into cracks and fissures in the underlying limestone formations. These cracks and fissures are ground water

conduits with vast transmission capacity. These cracks occur usually by solution along preexisting bedding planes or joints. The network of joints and solution openings, both large and small, are filled with water up to a certain level, which is the water table. These underground passages are by no means fortuitous but tend to develop a definite drainage system which is tributary to the surface streams and is an integral part of the regional drainage mechanism. No water table was found in any of the soil auger borings or in pit excavations.

See the following exhibits below:

USGS Quad Map (showing surface flow)	Exhibit 1.3a
USDA soils information	Exhibit 1.3b
Geologic Map	Exhibit 1.3c

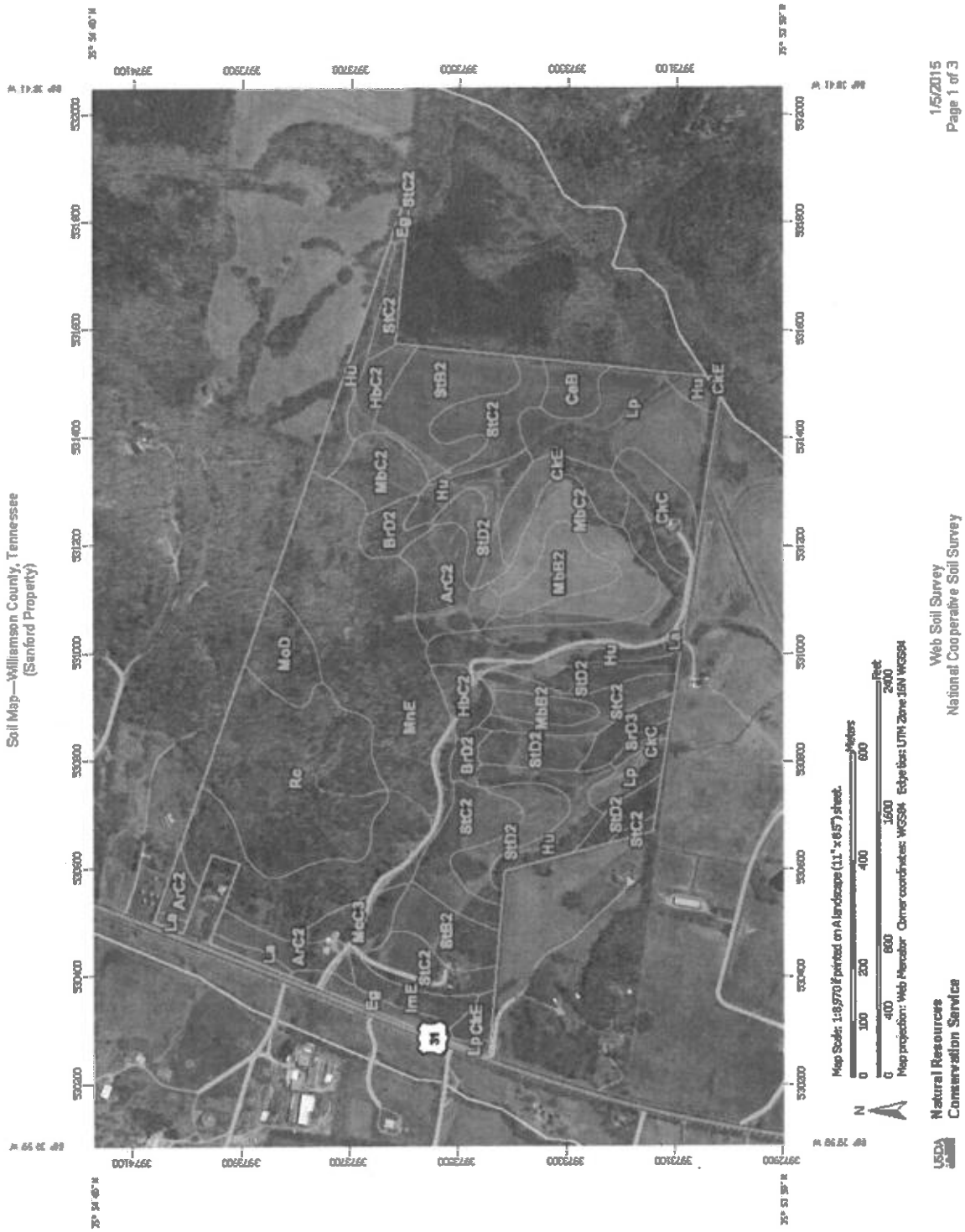
Exhibit 1.3a



USGS Quad Map

Watershed Drainage

Exhibit 1.3b



NRCS Soils Map

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 1:15,800.

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: http://websoilsurvey.nrcs.usda.gov
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: Williamson County, Tennessee
Survey Area Data: Version 10, Aug 28, 2014

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

Date(s) aerial images were photographed: Mar 17, 2011—Jul 2, 2011

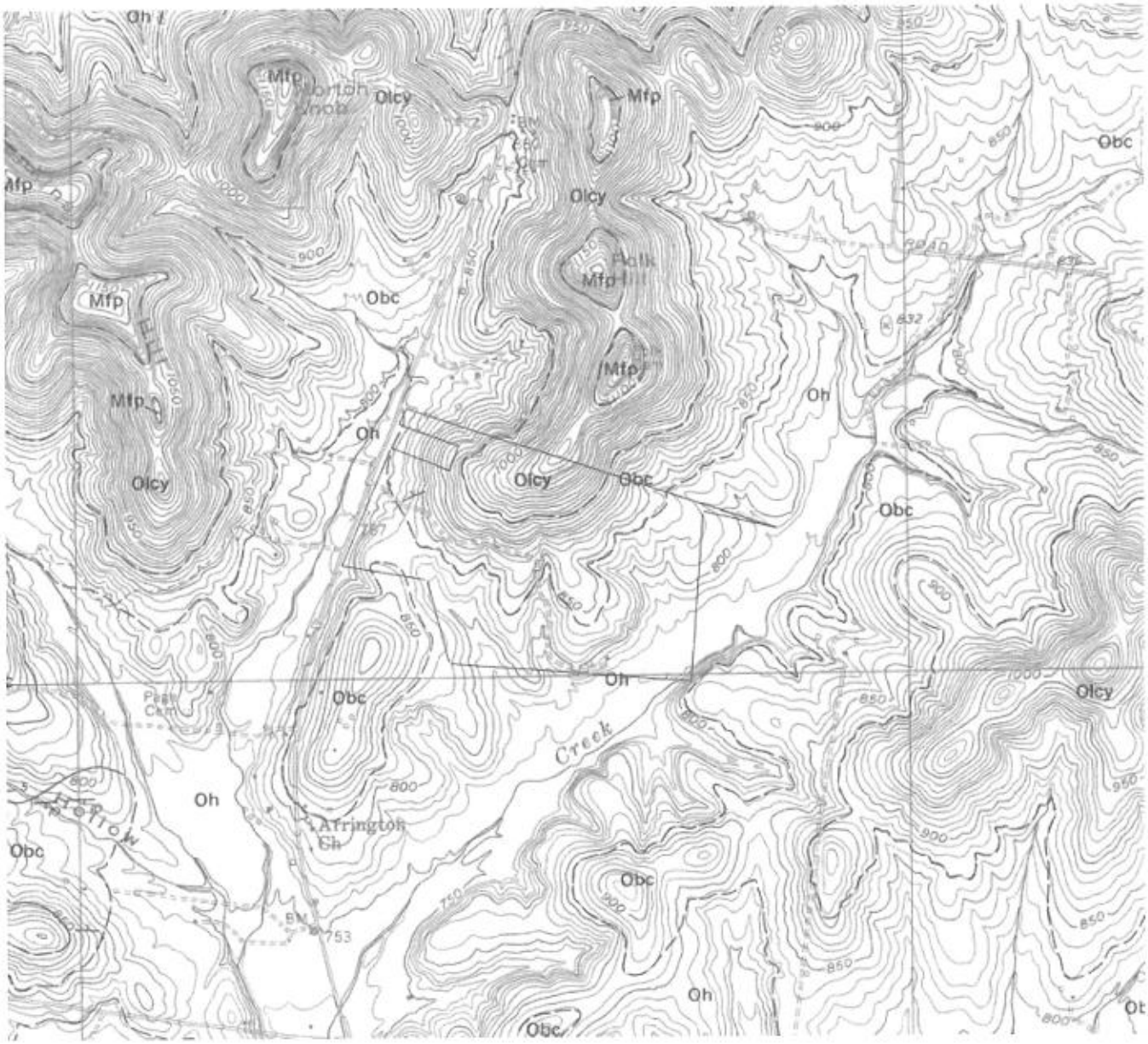
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Exhibit 1.3b Cont.

Map Unit Legend

Williamson County, Tennessee (TN187)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ArC2	Armour silt loam, 5 to 12 percent slopes, eroded	10.3	4.7%
BrD2	Braxton cherty silt loam, 12 to 20 percent slopes, eroded	3.4	1.6%
CaB	Captina silt loam, phosphatic, 2 to 5 percent slopes	2.6	1.2%
CkC	Culleoka silt loam, 5 to 12 percent slopes	5.3	2.4%
CkE	Culleoka silt loam, 20 to 35 percent slopes	5.8	2.8%
Eg	Egam silt loam, phosphatic	2.5	1.2%
HbC2	Hampshire silt loam, 5 to 12 percent slopes, eroded	4.9	2.2%
Hu	Huntington silt loam, phosphatic	14.1	6.5%
ImE	Inman flaggy silty clay loam, 20 to 30 percent slopes, eroded	2.6	1.2%
La	Lanton silt loam, phosphatic	1.4	0.6%
Lp	Lindell silt loam, 0 to 2 percent slopes, occasionally flooded	14.2	6.5%
MbB2	Maury silt loam, 2 to 5 percent slopes, eroded	6.8	3.1%
MbC2	Maury silt loam, 5 to 12 percent slopes, eroded	13.5	6.2%
McC3	Maury silty clay loam, 5 to 12 percent slopes, severely eroded	3.2	1.5%
MnE	Mimosa-Rock outcrop complex, 20 to 40 percent slopes	39.9	18.3%
MoD	Mimosa and Ashwood very rocky soils, 5 to 20 percent slopes	4.6	2.1%
Rc	Rockland	21.9	10.0%
SrD3	Stiversville clay loam, 12 to 20 percent slopes, severely eroded	2.2	1.0%
StB2	Stiversville silt loam, 2 to 5 percent slopes, eroded	12.7	5.8%
StC2	Stiversville silt loam, 5 to 12 percent slopes, eroded	21.8	10.0%
StD2	Stiversville silt loam, 12 to 20 percent slopes, eroded	24.7	11.3%
Totals for Area of Interest		218.1	100.0%

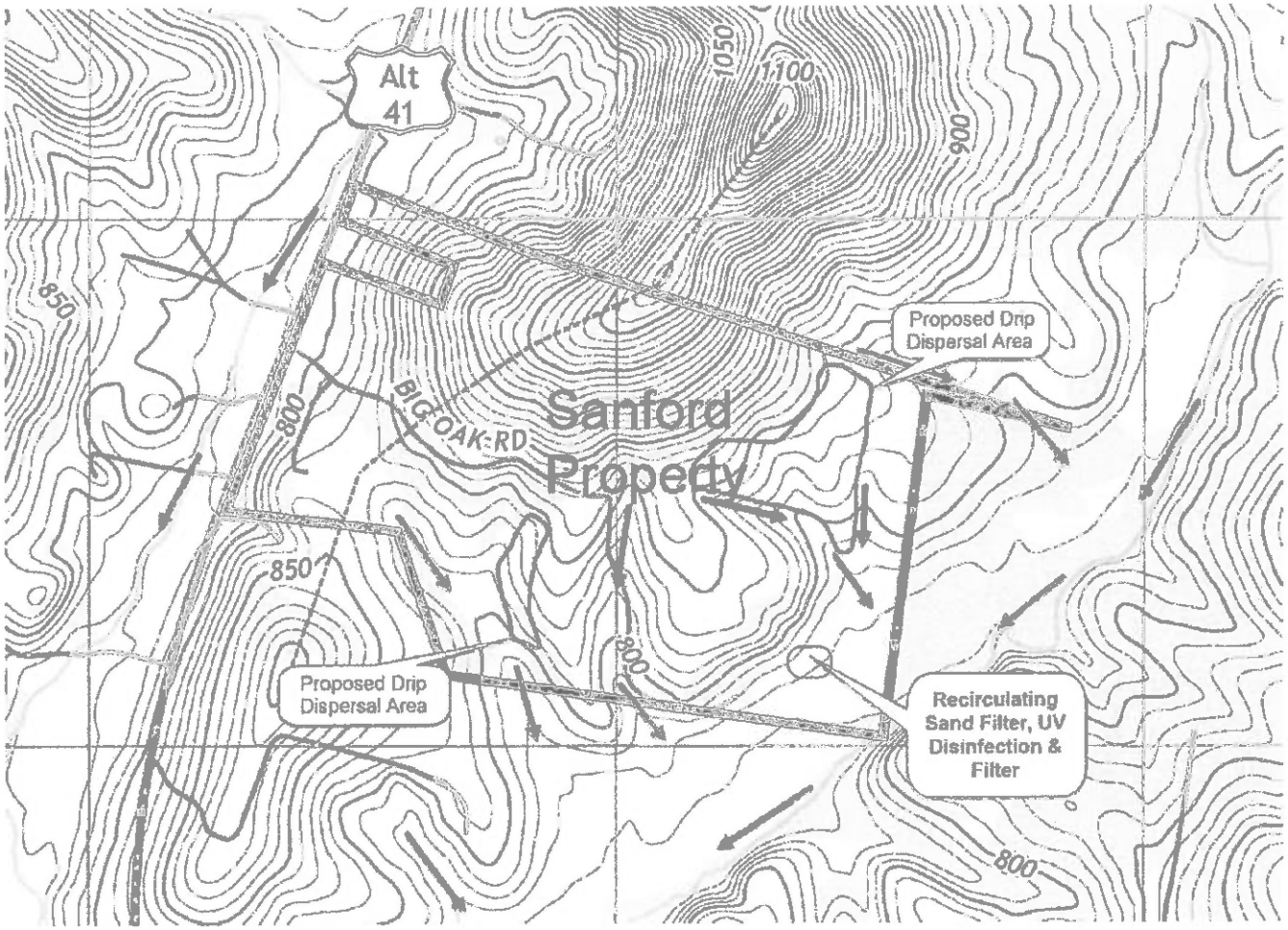
Exhibit 1.3c



Geologic Map

1.4 Topography

Exhibit 1.4a



USGS MAP of the Area

Exhibit 1.4b

Williamson County

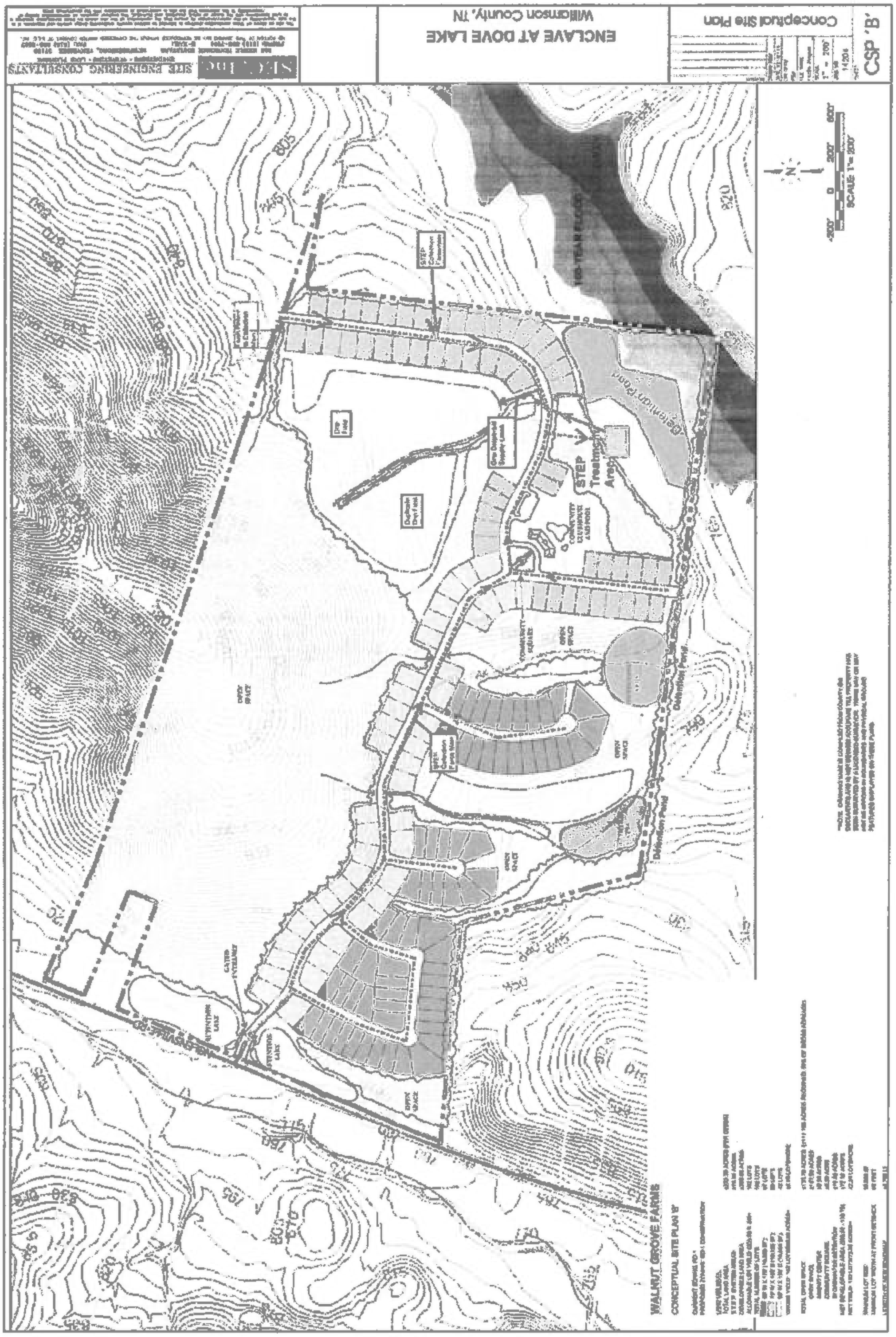
Topographic Map

(5-ft. Contour Interval)

1.5 Access

Access to the proposed Nolensville-Dove Lake TF and drip dispersal areas will be from County subdivision roads off Big Oak Road. Existing Big Oak Road will be reconstructed to County standards and will be the entrance drive from Nolensville Road that meanders through the site. The treatment area and the drip dispersal areas will be fenced. See attached site plan for locations.

Exhibit 1.5

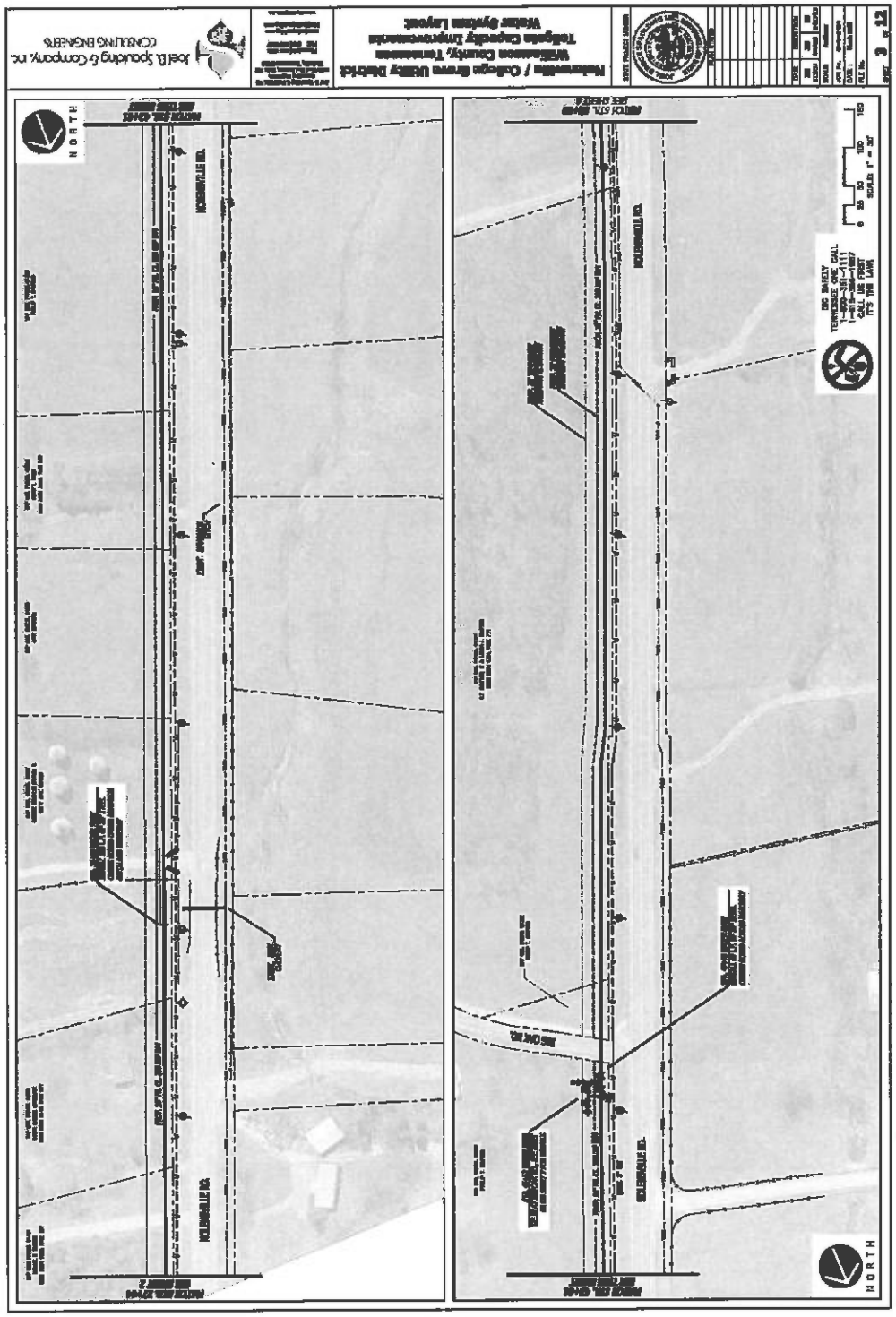


Conceptual Site Plan

1.6 Water supply wells within 1,500 LF of facility

Nolensville/College Grove Utility District currently supplies water to this area, and they are planning an upgrade to their system in this area. See attached drawing from their engineer, Joel B. Spaulding & Company, Inc.

Exhibit 1.6a



Tennessee Wastewater Systems, Inc. (Nolensville-Dove Lake Treatment Facility) currently has a UIC / SOP permit at TDEC for approval. Also attached are the current well locations provided by TDEC. (See Map of Wells in the Area, Exhibit 1.6b, and Record of Water Wells, Exhibit 1.6c).

Exhibit 1.6b

Map of Wells in the Area

Note: Only Wells 4 and 8 are **within 1,500** feet of the property.

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION - DIVISION OF WATER SUPPLY

RECORDS OF WATER WELLS ON THE NOLENSVILLE QUADRANGLE 0070NW TN

QUAD / NTH COUNTY	WELL NUM REG NUM	OWNER'S NAME LOCATION ROAD	COMP DATE INSP DATE	TOT DEPTH AQ DEPTH	TOT YIELD STAT LEVEL	CSE DEPTH CSE TYPE	WELL FINISH INTERVAL	WAT QUAL INSP NUMBER	LATITUDE LONGITUDE	A / C LOG	DRILLER USE
0070NW DAVIDSON	03709101	G.T.WHEELER	09/14/1964	851 850	2 80		-	Good		No	219
0070NW DAVIDSON	03709139	BRIGHAM, A DON		300			-			No	755
0070NW DAVIDSON	03709444	JAMES ROBINSON #-1		150			-			No	740
0070NW DAVIDSON	03709445	JAMES ROBINSON #-2		240			-			No	740
0070NW WAYNE	18109129	WILLIAM EDMONDSON	06/14/1972	829 800	3		-			No	227
0070NW WILLIAMSON	18709062	WILLIAM EDMONDS		829 800	2 20		-	Good		No	740
0070NW WILLIAMSON	18709063	H.L.CYREE	02/01/1972	1009 1000	1 482		-	Bad.		No	15
0070NW WILLIAMSON	18709064	A.J.BURKE	07/24/1969	755 740	8 65		-			No	219
0070NW WILLIAMSON	18709111	ROBERT ADCOCK	08/05/1970	729 708	1 50		-	Bad		No	755
0070NW WILLIAMSON	18709120	A.J.BURKE	07/24/1969	755 740	8 65		-			No	313
0070NW WILLIAMSON	18709126	H.L.CYREE	02/01/1972	1009 1000	1 482		-	Bad		No	15
0070NW WILLIAMSON	18709157	LES POLK	03/13/1970	1028 975	1 305		-	Good		No	313
0070NW WILLIAMSON	18709165	RANDOLPH SHERLING	10/20/1971	1096 1020	1		-			No	313

Exhibit 1.6c

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION - DIVISION OF WATER SUPPLY

RECORDS OF WATER WELLS ON THE NOLENSVILLE QUADRANGLE 0070NW TN

QUAD / NTH COUNTY	WELL NUM REG NUM	OWNER'S NAME LOCATION ROAD	COMP DATE INSP DATE	TOT DEPTH AQ DEPTH	TOT YIELD STAT LEVEL	CSE DEPTH CSE TYPE	WELL FINISH INTERVAL	WAT QUAL INSP NUMBER	LATITUDE LONGITUDE	A / C LOG	DRILLER USE
0070NW WILLIAMSON	18709178	LARRY GIBBS	06/20/1972	953 925	5 133		-	Good		No	227
0070NW WILLIAMSON	18709180	LES POLK	03/13/1970	1028 975	1 305		-	Good		No	313
0070NW WILLIAMSON	18709313	B.O.JONES	05/14/1963	85 50	15 23		-	Good		No	740
0070NW WILLIAMSON	18709341	ALLAN CLAXTON		100 100			-	Bad		No	740
0070NW 1 WILLIAMSON	18700144	BEELER H	08/03/1964	65 65	3 38	18 Steel	-	Bad	355918 864430	S No	94 Residential
0070NW 1 WILLIAMSON	18700181	KOEN J	11/25/1964	305	0		-		355758 864257	S No	219 Other
0070NW 1 WILLIAMSON	18700496	FERRIS, CLARENCE EDMONSON PIKE	08/11/1967	927 923	1 170	31 Steel	31 - 927	Good		No	219 Residential
0070NW 1 WILLIAMSON	18700743	MOONEYHAM A	06/18/1969	172 150	20 102	21 Steel	-	Good	355940 864241	S No	55 Residential
0070NW 1 WILLIAMSON	18700858	LITTLE, VANCE LIBERTY CHURCH	03/31/1970	928 905	5 80	32 Steel	32 - 928	Good		No	227 Residential
0070NW 1 WILLIAMSON	18701054	BENNETT, SCOTT CROCKETT	10/09/1972	928 891	6 107	20 Steel	20 - 928	Good		No	227 Residential
0070NW 1 WILLIAMSON	18701070	GIBBS, LARRY CROCKETT	06/20/1972	953 900	5 133	22 Steel	22 - 953	Good		No	227 Residential
0070NW 1 WILLIAMSON	18701193	KOEN, JOHN SUNSET	08/04/1973	949 921	1 190	28 Steel	28 - 949	Good		No	219 Residential
0070NW 1 WILLIAMSON	18701279	JOHNSON W.	04/28/1971	365	1	21 Steel	-	Good		No	227 Farm

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION - DIVISION OF WATER SUPPLY

RECORDS OF WATER WELLS ON THE NOLENSVILLE QUADRANGLE 0070NW TN

QUAD / NTH COUNTY	WELL NUM REG NUM	OWNER'S NAME LOCATION ROAD	COMP DATE INSP DATE	TOT DEPTH AQ DEPTH	TOT YIELD STAT LEVEL	CSE DEPTH CSE TYPE	WELL FINISH INTERVAL	WAT QUAL INSP NUMBER	LATITUDE LONGITUDE	A / C LOG	DRILLER USE
0070NW 1 WILLIAMSON	18701724	ROLAND B	03/25/1977	248 240	25	35 Steel	-	Bad	355800 864248	S No	15 Residential
0070NW 1 WILLIAMSON	18702108	SOUTH D.C.	05/28/1980	150 140	12 100	21 Steel	-	Good	355854 864246	S No	227 Residential
0070NW 1 WILLIAMSON	18702542	BRIDGES, CURT OLD SMYRNA	06/28/1984	120 22	55 22	21	Open Hole 21 - 120		355730 864230	No	227 Residential
0070NW 1 WILLIAMSON	18702543	BRIDGES, CURT OLD SMYRNA	06/29/1984	280	0				355730 864230	No	227 Residential
0070NW 1 WILLIAMSON	18702561	EGGERT, ARTHUR CLOVERMEADE DR	07/16/1984	200 110	0		-		355730 864230	No	227 Residential
0070NW 1 WILLIAMSON	18702779	GATLIN, W.W. OLD SMYRNA	08/06/1985	200			-		355730 864230	No	227 Residential
0070NW 1 WILLIAMSON	18702811	CLINTON, JOHNNY MAXWELL LANE	04/18/1986	152 120	8 60	20	Open Hole 20 - 152		355730 864230	No	227 Residential
0070NW 1 WILLIAMSON	18702813	MAXWELL, ALTON MAXWELL	04/23/1986	352	0 50	20	Open Hole - 20		355730 864230	No	227 Heat Pump
0070NW 1 WILLIAMSON	18702814	MAXWELL, ALTON MAXWELL	04/24/1986	100 45	4	33	Open Hole 33 - 100		355730 864230	No	227 Residential
0070NW 1 WILLIAMSON	18702820	LAMB, JOHN CONCORD	05/02/1986	88 77	8 20	20	Open Hole - 20		355730 864230	No	227 Residential
0070NW 1 WILLIAMSON	18702822	HALL, RUSSEL BUTTS	05/28/1986	650 200	25	20	Open Hole 20 - 650		355730 864230	No	227 Residential
0070NW 1 WILLIAMSON	18702823	POWELL, JAMES EDMENSON	05/22/1986	325 90	1 70	54	Open Hole 55 - 325		355730 864230	No	227 Irrigation
0070NW 1 WILLIAMSON	18702993	RAINTREE SPLIT LOG	07/08/1987	300 18			-		355730 864230	No	227 Irrigation

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION - DIVISION OF WATER SUPPLY

RECORDS OF WATER WELLS ON THE NOLENSVILLE QUADRANGLE 0070NW TN

QUAD / NTH COUNTY	WELL NUM REG NUM	OWNER'S NAME LOCATION ROAD	COMP DATE INSP DATE	TOT DEPTH AQ DEPTH	TOT YIELD STAT LEVEL	CSE DEPTH CSE TYPE	WELL FINISH INTERVAL	WAT QUAL INSP NUMBER	LATITUDE LONGITUDE	A / C LOC	DRILLER USE
0070NW 1	20031881	PATTON, JEFF	07/03/2003	105	50	43	Open Hole		355900	F	647
WILLIAMSON	D0059263	8 CROOKED STICK LN	05/05/2004	70	10	Galvanized	43 - 105	029841	864335	Yes	Irrigation
0070NW 1	20032539	POPE PROPERTIES INC	08/17/2003	360	1			Clear	355840		227
WILLIAMSON		COL WINSTEAD DR LOT 71		250			-		864342	Yes	Irrigation
0070NW 1	20032542	FLOOD, THOMAS	08/17/2003	360	25	46	Open Hole	Clear	355835	F	227
WILLIAMSON	D0060240	7 WINSTEAD DR	05/05/2004	230		Galvanized	46 - 360	029840	864348	Yes	Irrigation
0070NW 1	20032543	JOHN WEILAND HOMES	05/21/2003	460	4.5	20	Open Hole	Clear	355909	F	227
WILLIAMSON	D0060241	CONCORD RD BONBROOKE I	06/25/2004	70	50	Galvanized	20 - 460	029946	864248	Yes	Irrigation
0070NW 1	20032684	CASTLE CONTRACTORS	09/06/2003	360	9	41	Open Hole		355945	F	227
WILLIAMSON	D0060248	1010 MORGAN'S LANDING C	05/05/2004	258	160	Galvanized	41 - 360	029838	864316	Yes	Irrigation
0070NW 1	20032729	SULLIVAN, PATRICK A	09/21/2003	300	7.5	41	Open Hole	Clear	355945	F	227
WILLIAMSON	D0060254	9609 MITCHELL PL	05/05/2004	245		Galvanized	41 - 300	029837	864317	Yes	Irrigation
0070NW 1	20033467	BELL, KEN	10/30/2003	340	9	31	Open Hole	Clear	355947	F	227
WILLIAMSON	D0060269	MAGNOLIA VALE, LOT 11	05/05/2004	40	30	Galvanized	31 - 340	029839	864305	Yes	Irrigation
0070NW 1	20041739	LEONE, BILL	06/20/2004	265	65	20	Open Hole		355941	F	647
WILLIAMSON	D0064410	9652 STANFIELD RD.	06/25/2004	80	7	Galvanized	20 - 265	029945	864311	Yes	Irrigation
0070NW 1	20043085	KLARITCH, TOM	08/29/2004	400	0	62	Open Hole	Clear	355907	F	227
WILLIAMSON	D0066041	1255 MORNING GLORY COUI	08/02/2005	84		Galvanized	62 - 400	045896	864442	Yes	Other
0070NW 1	20043905	CARPENTER, BRIAN	12/09/2004	240	30	20	Open Hole	Clear	355847	F	227
WILLIAMSON	D0066071	GOVERNORS CLUB, LOT 35	09/15/2005	25	20	Galvanized	20 - 240	046420	864345	Yes	Irrigation
0070NW 1	20051200	PARK TRUST DEVELOPMENT	05/05/2005	340					355922		227
WILLIAMSON	D0069975	ENTRANCE OF ROLLING CRE					-		864446	Yes	Irrigation
0070NW 1	20052774	DRENNAN, LEON	05/14/2005	300	15	20	Slotted	Clear	355930	F	227
WILLIAMSON	D0066077	9608 STANFIELD RD	09/15/2005	17		Galvanized	17 - 18	046419	864351	Yes	Irrigation
0070NW 1	20052973	POPE PROPERTIES	08/28/2005	340	3			Clear	355833		227
WILLIAMSON	D0070003	GOVERNOR'S CLUB, LOT 123		77			-		864336	Yes	Irrigation

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION - DIVISION OF WATER SUPPLY

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0070NW 1 WILLIAMSON	20060103 D0070043	SMIDT, ADAM GOVERNOR'S WAY, LOT 303	09/23/2005	300 90	3 70	20 Galvanized	Open Hole 20 - 300	Clear	355830 864409	Yes	227 Irrigation
0070NW 1 WILLIAMSON	20060180 D0070038	SCHMIDT, ADAM 55 GOVERNOR'S WAY, LOT 3	09/19/2005	360 70	2 50	20 Galvanized	Open Hole 20 - 360	Clear	355829 864409	Yes	227 Other
0070NW 1 WILLIAMSON	20060181 D0070039	BROWN, ROGER 55 GOVERNOR'S WAY	09/16/2005 01/27/2006	300 70	3 50	20 Galvanized	Open Hole 20 - 300	Clear 047125	355824 864421	F Yes	227 Irrigation
0070NW 1 WILLIAMSON	20060348 D0074032	GEORGE, STEVE GOVENORS CLUB LOT 177	12/16/2005 01/27/2006	360 170	1.75 100	20 Galvanized	--	Clear 047124	355833 864418	F Yes	227 Irrigation
0070NW 1 WILLIAMSON	20063101 D0077101	MCSURLEY, DON 9652 CONCORD RD.	07/11/2006	280 115	50 70	20 Galvanized	Open Hole 20 - 280	Clear	355911 864326	Yes	227 Irrigation
0070NW 1 WILLIAMSON	20063105 D0077102	SNUD; PAIGE HIGH POINT ESTATES, LOT 5	07/14/2006	260 130	40	20 Galvanized	Open Hole 20 - 260	Clear	355913 864335	Yes	227 Irrigation
0070NW 1 WILLIAMSON	20063106 D0077121	SNEED, PAIGE HIGH POINT ESTATES, LOT 5	07/14/2006	80			--			Yes	227 Irrigation
0070NW 1 WILLIAMSON	20063128 D0077103	SNEED, PAIGE HIGH POINT ESTATES, LOT 5	07/14/2006	260 140	30	20 Galvanized	Open Hole 20 - 260	Clear		Yes	227 Irrigation
0070NW 1 WILLIAMSON	20064329 D0077149	LUPER, STEVE 9551 LIBERTY CHURCH	09/28/2006	340			--		355945 864402	Yes	227
0070NW 1 WILLIAMSON	91003813	MERCER, JOE SPLIT LOG	10/07/1991	200 85	2	20	Open Hole 20 - 200			No	227 Farm
0070NW 1 WILLIAMSON	93001983	FOSTER, CHET 1512 PINKERTON	07/22/1991	495		21 Steel	Open Hole 21 - 495			No	55 Residential
0070NW 1 WILLIAMSON	94002501 D0002015	ROGERS, OWEN LIBERTY CHURCH	07/20/1994	200 135	15	20	Open Hole 20 - 200			No	227 Residential
0070NW 1 WILLIAMSON	94004874 D0005594	NORTHCUTT, ANN 233 ENDOVER WAY	11/12/1994	445 160	7 80	25 Steel	Open Hole 25 - 445	Sulphur		No	647 Irrigation

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION - DIVISION OF WATER SUPPLY

RECORDS OF WATER WELLS ON THE NOLENSVILLE QUADRANGLE 0070NW TN

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0070NW 1 WILLIAMSON	96003368	BRANNON, TODD WESTON DR	05/24/1996	300			-			No	227 Irrigation
0070NW 1 WILLIAMSON	96004130	FRITCH, HERB EDMONDSON PIKE	08/08/1996	280 28	2		-			No	227 Irrigation
0070NW 1 WILLIAMSON	96004131	FRITCH, HERB EDMONDSON PIKE	08/08/1996	300			-			No	227 Irrigation
0070NW 1 WILLIAMSON	97003272	THE GOVERNORS CLUB CONCORD RD	08/05/1997 06/26/1998	260 180	3		Open Hole -	021640	355826 864410	S No	227 Irrigation
0070NW 1 WILLIAMSON	97003273	THE GOVERNORS CLUB CONCORD RD	08/06/1997 06/26/1998	240			-	021639	355832 864339	S No	227 Irrigation
0070NW 1 WILLIAMSON	97003279 D0021560	THE GOVERNORS CLUB CONCORD RD	07/28/1997 06/26/1998	300 210	25	52	Open Hole 52 - 300	021636	355847 864354	S No	227 Irrigation
0070NW 1 WILLIAMSON	97003280 D0021561	THE GOVERNORS CLUB CONCORD RD	08/04/1997 06/26/1998	300 220	20	66	Open Hole 66 - 300	021637	355851 864402	S No	227 Irrigation
0070NW 1 WILLIAMSON	97003281 D0021562	THE GOVERNORS CLUB CONCORD RD	08/07/1997 06/26/1998	300 270	40	20	Open Hole 20 - 300	021638	355824 864401	S No	227 Irrigation
0070NW 1 WILLIAMSON	97003836	WILSON, PACKER CONCORD RD	09/05/1997	260			-			No	227 Irrigation
0070NW 1 WILLIAMSON	97004709	JAMES, CAROLYN WILSHIRE WAY	10/20/1997 01/02/1998	170	0		-	011916	355951 864612	F No	227 Irrigation
0070NW 1 WILLIAMSON	98003702	THE GOVERNORS CLUB CONCORD RD	09/04/1998 10/13/1998	260 60	2		-	024302	355837 864420	S No	227 Irrigation
0070NW 1 WILLIAMSON	98003705	THE GOVERNORS CLUB CONCORD RD	08/27/1998 10/13/1998	300			-	024301	355829 864423	S No	227 Irrigation
0070NW 1 WILLIAMSON	98003720 D0028777	THE GOVERNORS CLUB CONCORD RD	08/28/1998 10/13/1998	300 70	5	20	Open Hole 20 - 300	019879	355838 864420	S No	227 Irrigation

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION - DIVISION OF WATER SUPPLY

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0070NW 1	98003721	THE GOVERNORS CLUB	08/31/1998	300	30	59	Open Hole		355853	S	227
WILLIAMSON	D0028778	CONCORD RD	10/13/1998	230			59 - 300	019899	864349	No	Irrigation
0070NW 1	98003722	THE GOVERNORS CLUB	09/01/1998	220	30	20	Open Hole		355909	S	227
WILLIAMSON	D0028779	CONCORD RD	10/13/1998	160			20 - 220	019877	864354	No	Irrigation
0070NW 1	98003723	THE GOVERNORS CLUB	09/02/1998	300	30	20	Open Hole		355855	S	227
WILLIAMSON	D0028780	CONCORD RD	10/13/1998	190			20 - 300	019878	864404	No	Irrigation
0070NW 1	98003724	THE GOVERNORS CLUB	09/03/1998	300	8	20	Open Hole		355858	S	227
WILLIAMSON	D0028781	CONCORD RD	10/13/1998	100	0		20 - 300	019883	864402	No	Irrigation
0070NW 1	98003728	LEE, KEVIN	09/11/1998	220	10	20	Open Hole				227
WILLIAMSON	D0028786	HERITAGE DR		110			20 - 220			No	Residential
0070NW 1	99000160	THE GOVERNORS CLUB	11/23/1998	260	15	20	Open Hole				227
WILLIAMSON	D0037341	CONCORD RD		137	80		20 - 260			No	Irrigation
0070NW 1	99002245	SANDERS, DAVID	06/23/1999	242	28	20	Open Hole				227
WILLIAMSON	D0037416	RAGSDALE 1626		140	80		20 - 242			No	Irrigation
0070NW 1	99002700	MADDUX, JERRY	07/18/1999	360							227
WILLIAMSON		HAMMER CT								No	Irrigation
0070NW 1	99002702	CUTLER, CATHERINE	07/08/1999	220	40	37	Open Hole				227
WILLIAMSON	D0037422	CONCORD RD		135	25		37 - 220			No	Irrigation
0070NW 1	99003893	THE GOVERNORS CLUB	08/03/1999	300	75	20	Open Hole	Good	355908	S	647
WILLIAMSON	D0039299	9681 CONCORD RD	04/10/2001	130	30		20 - 300	028610	864414	No	Irrigation
0070NW 1	99003894	THE GOVERNORS CLUB	08/04/1999	240	125	20	Open Hole	Good	355901	S	647
WILLIAMSON	D0039300	9681 CONCORD RD	04/10/2001	75	20		20 - 240	028609	864339	No	Irrigation
0070NW 1	99003895	THE GOVERNORS CLUB	08/05/1999	240	150	20	Open Hole	Good	355901	S	647
WILLIAMSON	D0042301	9681 CONCORD RD	04/10/2001	30	20		- 20	025136	864337	No	Irrigation
0070NW 1	99004084	THE GOVERNORS CLUB	07/29/1999	300	50	20	Open Hole	Good	355905	S	647
WILLIAMSON	D0039296	9681 CONCORD RD	04/10/2001	125	30		20 - 300	028612	864410	No	Irrigation

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION - DIVISION OF WATER SUPPLY

RECORDS OF WATER WELLS ON THE NOLENSVILLE QUADRANGLE 0070NW TN

QUAD / NTH COUNTY	WELL NUM REG NUM	OWNER'S NAME LOCATION ROAD	COMP DATE INSP DATE	TOT DEPTH AQ DEPTH	TOT YIELD STAT LEVEL	CSE DEPTH CSE TYPE	WELL FINISH INTERVAL	WAT QUAL INSP NUMBER	LATITUDE LONGITUDE	A / C LOG	DRILLER USE
0070NW 1 WILLIAMSON	99004085 D0039297	THE GOVERNORS CLUB 9681 CONCORD RD	07/29/1999 04/10/2001	300 135	50 30	20	Open Hole 20 - 300	Good 028613	355904 864406	S No	647 Irrigation
0070NW 1 WILLIAMSON	99004086 D0039298	THE GOVERNORS CLUB 9681 CONCORD RD	07/30/1999 04/10/2001	300 125	50 30	20	Open Hole 20 - 300	Good 028611	355906 864411	S No	647 Irrigation
0070NW 1 WILLIAMSON	99004087 D0042302	THE GOVERNORS CLUB 9681 CONCORD RD	08/05/1999 04/10/2001	240 70	125 20	20	Open Hole 20 - 240	Good 028608	355901 864334	S No	647 Irrigation
0070NW 1 WILLIAMSON	99004088 D0042303	THE GOVERNORS CLUB 9681 CONCORD RD	08/06/1999 04/10/2001	220 70	125 25	20	Open Hole 20 - 220	Good 025150	355900 864331	S No	647 Irrigation
0070NW 1 WILLIAMSON	99004089 D0042304	GOVERNORS CLUB 9681 CONCORD RD	08/09/1999 04/10/2001	260 80	40	20	Open Hole 20 - 260	Good 025151	355820 864338	S No	647 Irrigation
0070NW 1 WILLIAMSON	99004091 D0042306	THE GOVERNORS CLUB 9681 CONCORD RD	08/11/1999 04/10/2001	240 75	5	20	Open Hole 20 - 240	Good 025135	355817 864336	S No	647 Irrigation
0070NW 1 WILLIAMSON	99005932 D0041067	LOONEY, JOHN RAGSDALE 1620	12/02/1999	262 50	6 35	20	Open Hole 20 - 262				227 No Irrigation
0070NW 2 DAVIDSON	03701301	RUCKER B.F #-2 BATTLE	11/16/1982	120		21 Steel	-	Bad	355730 864000	No	227
0070NW 2 DAVIDSON	03701320	B F RUCKER BATTLE	01/12/1983	120 50	1 30	21 Steel	-	Good	355730 864000	No	227 Residential
0070NW 2 DAVIDSON	03709059	DODSON BATSON PETTUS RD	10/01/1962	916 885	1 240	425	-		355730 864000	No	740
0070NW 2 RUTHERFORD	14903262	TOLLISON, HAROLD LASSITER	10/31/1987	105 90	10 80	20 Steel	Open Hole 20 - 105	Good	355730 864000	No	559 Residential
0070NW 2 WILLIAMSON	18700041	PURDONA K	12/10/1963	125 65	25 55	14 Steel	-	Good	355842 864020	S No	219 Residential
0070NW 2 WILLIAMSON	18700120	MOONEYHAM B	05/04/1964	64 60	15 30	19 Steel	-	Good	355902 864152	S No	755 Residential

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0070NW 2 WILLIAMSON	18700127	HYDE J	07/09/1964	105 105	25	25	-		355837 864008	S No	219 Residential
0070NW 2 WILLIAMSON	18700129	NICHOLS H	07/16/1964	120 17	0 103	12 Steel	- -	Good	355841 864010	S No	219 Residential
0070NW 2 WILLIAMSON	18701845	HAMLETT J P	11/28/1978	300 295	70	22 Steel	-	Good	355853 864227	S No	15 Residential
0070NW 2 WILLIAMSON	18701961	HALL J	08/15/1978	348	0	21 Steel	-		355854 864219	S No	227 Other
0070NW 2 WILLIAMSON	18701962	HALL J	09/21/1979	600 514	1 180	21 Steel	- -	Bad	355855 864220	S No	227 Residential
0070NW 2 WILLIAMSON	18702090	FIRST LADY BEAUTY S	09/11/1980	310 80	1 10	21 Steel	-		355824 864008	S No	15 Commercial
0070NW 2 WILLIAMSON	18702109	HOBBS J	05/28/1980	140 110	30 75	21 Steel	-	Good	355856 864136	S No	227 Residential
0070NW 2 WILLIAMSON	18702216	RANDOLPH B	05/05/1981	180 160	20 72	21 Steel	- -	Good	355850 864140	S No	227 Residential
0070NW 2 WILLIAMSON	18702551	HUGHES, MAE NOLENSVILLE	06/21/1984	340		21	Open Hole 21 - 340		355730 864000	 No	227 Heat Pump
0070NW 2 WILLIAMSON	18702574	POTEETE, DANNY LEE BURKE HOLLOW	08/22/1984	140 35	1	21	Open Hole 21 - 140		355730 864000	 No	227 Residential
0070NW 2 WILLIAMSON	18702583	ZULAUF, GARY MAXWELL	08/19/1984 05/07/1985	145 130	15 805	20 Steel	Open Hole 20 - 145	Good	355824 864135	S No	15 Residential
0070NW 2 WILLIAMSON	18702653	CHASTAIN, WILBUR SUTTON	05/07/1985	182 95	40	20	Open Hole 20 - 182		355730 864000	 No	227 Residential
0070NW 2 WILLIAMSON	18702688	BRUCE, BILL BLACK WELL	08/05/1985	145 130	25	20 Steel	Open Hole 20 - 145	Good	355730 864000	 No	15 Residential

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0070NW 2 WILLIAMSON	18702955	TACKITT, HOLLIS MAXWELL LANE	02/13/1987	140 110	30 25	20	Open Hole 20 - 140		355730 864000	No	227 Residential
0070NW 2 WILLIAMSON	18703278	PACHAN, TOM NOLENSVILLE	03/16/1989	400 85	1	20	Open Hole 20 - 400	Good	355730 864000	No	227 Residential
0070NW 2 WILLIAMSON	18703284	FREEMAN, PORTER NOLENSVILLE RD	10/15/1988	300 285	10	20 Steel	Open Hole 20 - 300	Fair	355730 864000	No	15 Residential
0070NW 2 WILLIAMSON	18709015	GAIL CLARK			1				355824 864006	S No	15
0070NW 2 WILLIAMSON	20002660 D0044856	MITCHELL, JR, CHARLIE SUNSET CREEK	06/14/2000	240 210	75 80	41 Galvanized	Open Hole 41 - 240			Yes	227 Irrigation
0070NW 2 WILLIAMSON	20003535 D0044842	WALKER, LARRY 7216 NOLENSVILLE RD	07/19/2000	260 25	2 20	20 Galvanized	Open Hole 20 - 260	Clear		Yes	227 Irrigation
0070NW 2 WILLIAMSON	20004801 D0044573	MURRAY, CONNIE 9412 ASHFORD PL	09/08/2000	300	0	20 Galvanized	Open Hole 20 - 300	Unknown		Yes	647 Residential
0070NW 2 WILLIAMSON	20022289 D0057152	BUSH, BYRON 1652 SUNSET RD	07/20/2002 12/21/2004	320 120	4 80	20 Galvanized	Open Hole 20 - 320	045136	355746 864123	F Yes	227 Residential
0070NW 2 WILLIAMSON	20023402 D0057176	PACHAN, TOM 7115 NOLENSVILLE RD	10/19/2002	142 90	60	20 Galvanized	Open Hole 20 - 142	Clear	355833 864053	Yes	227 Irrigation
0070NW 2 WILLIAMSON	20023403 D0057177	JONES, JERRY 9775 CONCORD RD	10/23/2002	300 170	20 50	20 Galvanized	Open Hole 20 - 300	Clear	355927 864159	Yes	227 Irrigation
0070NW 2 WILLIAMSON	20023404	JONES, JERRY 9775 CONCORD RD	10/20/2002	300					355923 864200	Yes	227 Irrigation
0070NW 2 WILLIAMSON	20042969 D0066044	SUAVE, ROGER 7049 NOLENSVILLE RD.	09/05/2004 08/02/2005	260 83	6 60	20 Galvanized	Open Hole 20 - 260	Clear 045891	355857 864051	F Yes	227 Irrigation
0070NW 2 WILLIAMSON	20042972	PULTE HOMES OWL LANDING / CONCORD F	08/22/2004	320					35596 86429	Yes	227 Irrigation

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0070NW 2 WILLIAMSON	20061460 D0074061	PATTERSON, TED 1000 BLAKEFIELD DR	03/24/2006	300					355956 864255	Yes	227 Irrigation
0070NW 2 WILLIAMSON	20061461 D0074069	LIPPE, DAVID 1013 BLAKEFIELD DR	04/14/2006	300 65	5 40	20 Galvanized	Open Hole 20 - 300	Clear	355949 864252	Yes	227 Irrigation
0070NW 2 WILLIAMSON	90000625	ALLEN, TOMMY BUTTS RD	06/07/1989	220 90	7 4	25	Open Hole 25 - 220	Good		No	647 Residential
0070NW 2 WILLIAMSON	90000871	SHAVER, DALE NOLENSVILLE RD	03/07/1990	140 105	8	20	Open Hole 20 - 140			No	227 Residential
0070NW 2 WILLIAMSON	91003655	FOWLER, GERALD NOLENSVILLE	10/22/1991	80 50	10	20	Open Hole 20 - 80			No	227 Residential
0070NW 2 WILLIAMSON	97004832 D0026315	TAYLOR, JAMES MAUDIN RD	10/02/1997	330 305	2	20 Steel	Open Hole 20 - 330	Good		No	15 Residential
0070NW 2 DAVIDSON	98004857 D0030047	HENSON, AL GLORYLAND LN	10/06/1998	1004 940	5 100	41 Steel	Open Hole 41 - 1004	Good		No	15 Irrigation
0070NW 2 WILLIAMSON	99000162 D0037346	ARLEDGE, BUZZ QUIET LN	12/07/1998	200 62	1 40	20	Open Hole 20 - 200			No	227 Other
0070NW 2 DAVIDSON	99000722 D0030809	DELOUCH, DAVID GLORY LAND LN	01/29/1999	1004 890	10 90	41 Steel	Open Hole 41 - 1004	Good		No	15 Irrigation
0070NW 2 WILLIAMSON	TN009081	DOWELL, RAYMOND MAXWELL	05/07/1985		50		-	009081	355826 864139	S No	740
0070NW 2 WILLIAMSON	TN009086	ESTES, TOM MAXWELL	05/07/1985		100		-	009086	355829 864126	S No	740
0070NW 3 DAVIDSON	03701173	BOMBS C	08/30/1977	985 975	3	21 Steel	-	Good	355857 863722	S No	15 Residential
0070NW 3 DAVIDSON	03701275	RUCKER III B. F. BATTLE	06/23/1982	210	30		-	Bad	355953 863734	S No	227 Other

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0070NW 3 DAVIDSON	03701306	PHILLIPS JOHN KIDD	10/25/1982	400 280	160	32 Steel	-	Good	355840 863756	S No	227 Residential
0070NW 3 DAVIDSON	03701307	OVERBACK WILMA KIDD	10/12/1982	400 83	70	77 Steel	-	Good	355850 863818	S No	227 Residential
0070NW 3 DAVIDSON	03701470	HENSON, ERNEST DAL TWIN OAKS DR	05/16/1985	125 80	4	20 Steel	Open Hole 20 - 125	Good	355730 863730	 No	15 Residential
0070NW 3 WILLIAMSON	18700187	ALLEN W		135 10	20 125	12 Steel	-	Good	355837 863956	S No	219 Residential
0070NW 3 WILLIAMSON	18701599	YATES R	07/19/1976	145 130	10	21 Steel	-	Good	355825 863916	S No	15 Residential
0070NW 3 WILLIAMSON	18701707	HENRY J	05/27/1977	310 290	1	21 Steel	-	Bad	355828 863900	S No	15 Residential
0070NW 3 WILLIAMSON	18702159	PIERCEY J H	03/26/1981	350 220	1	42 Steel	-	Good	355840 863740	S No	15 Residential
0070NW 3 WILLIAMSON	18702587	WILLIAMS, C H YORK	06/20/1984	227 115	20 30	20 Steel	Open Hole 20 - 227	Good	355730 863730	 No	15 Irrigation
0070NW 3 WILLIAMSON	18702743	TURNER-MCFARLIN KIDD	09/12/1985	75 35	20 25	20	Open Hole 20 - 75		355730 863730	 No	227 Farm
0070NW 3 WILLIAMSON	20011108 D0052395	GRAY, ALLEN MCFARLIN RD	03/19/2001 09/21/2001	245 170	3 40	21 Galvanized	Open Hole 21 - 0	Clear 029381	355809 863745	F Yes	647 Residential
0070NW 3 DAVIDSON	20031611 D0061776	NELSON, RICHARD 13405 OLD HICKORY BLVD	06/18/2003 10/03/2005	942 850	50 100	20 Steel	Open Hole 20 - 942	Clear 046385	355958 863759	F Yes	15 Irrigation
0070NW 3 WILLIAMSON	20050460 D0069955	SULLIVAN, RICHARD 1515 SHAMROCK MEADOWS	02/20/2005	150 142	60 15	29 Galvanized	Open Hole 29 - 150	Clear	3558 3 863743	 Yes	227 Residential
0070NW 3 WILLIAMSON	91001407	COLEWELL, DALE G KIDD RD	03/26/1991	300 140	2	20 Steel	Open Hole 20 - 300	Sulphur		 No	15 Residential

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0070NW 3 WILLIAMSON	98002848 D0027634	GUESS, KELLY KIDD RD	06/24/1998 02/23/1999	175 125	7	20 Steel	Open Hole 20 - 175	Unknown 026979	355849 863930	S No	191 Residential
0070NW 3 WILLIAMSON	98004403 D0028761	GRIFFIN, ALICIA ACORN CT	09/18/1998 01/28/1999	200 15	1	20	Slotted 15 - 16	024405	355754 863940	F No	227 Other
0070NW 4 WILLIAMSON	18700004	TIPPENS J	08/21/1963	808 804	3	17 Steel	-	Good	355615 864350	S No	755
0070NW 4 WILLIAMSON	18700514	WARPOOL, HENRY OWL CREEK	11/08/1967	845 1	0 129	25 Steel	25 - 845	Good		No	219 Residential
0070NW 4 WILLIAMSON	18701809	ALLBRIGHT J	04/14/1978	175 52	26	20 Steel	-	Good	355716 864308	S No	227 Residential
0070NW 4 WILLIAMSON	18701810	ALLBRIGHT	04/13/1978	285	0	20 Steel	-		355718 864309	S No	227 Other
0070NW 4 WILLIAMSON	18701966	MABRY V L	10/11/1979	240 173	1 65	21 Steel	-	Good	355501 864440	S No	227 Residential
0070NW 4 WILLIAMSON	18702526	TURNER, JOHN SPLIT LOG RD	06/21/1984	345 112	1	21	Open Hole 21 - 345		355230 870236	No	577 Residential
0070NW 4 WILLIAMSON	18702554	FOSTER, ROBERT SPLIT LOG	05/22/1984	260 230	1 160	21	Open Hole 21 - 260		355500 864230	No	227 Residential
0070NW 4 WILLIAMSON	18702575	JEFFRIES, FRED M OWL CREEK ROAD	08/23/1984	102 60	30	26	Open Hole 26 - 102		355500 864230	No	227 Residential
0070NW 4 WILLIAMSON	18702599	M C I CLOVERCROFT	09/28/1984	1243 1218	6	73	Open Hole 73 - 1243		355500 864230	No	227 Residential
0070NW 4 WILLIAMSON	18702770	FOSTER, ROBERT SPLIT LOG	08/08/1985	450 146	1 52	20	Open Hole 20 - 450		355500 864230	No	227 Heat Pump
0070NW 4 WILLIAMSON	18703006	CAWTHON, JAMES SPLIT LOG	04/16/1987	1100 940	6	20	Open Hole 20 - 1100		355500 864230	No	227 Residential

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0070NW 4 WILLIAMSON	18703008	WOODRING, TUCK SPLIT LOG	04/22/1987	950 950	3	20	Open Hole 20 - 950		355500 864230	No	227 Residential
0070NW 4 WILLIAMSON	18703045	WARPOOL, HUGH BURK HOLLOW	04/30/1987	290		20 Steel	Open Hole 20 - 290	Iron	355500 864230	No	15 Residential
0070NW 4 WILLIAMSON	20000520 D0041089	BIENVENU, GARY 1605 RAGSDALE RD.	01/07/2000	260 130	4 80	20 Galvanized	Open Hole 20 - 260			Yes	227 Irrigation
0070NW 4 WILLIAMSON	20004067	GILMER, RON 9439 CLOVERCROFT RD	09/01/2000	260	0					Yes	227 Irrigation
0070NW 4 WILLIAMSON	20004069	GILMER, RON 9439 CLOVERCROFT RD	09/06/2000	140						Yes	227 Irrigation
0070NW 4 WILLIAMSON	20014971 D0053961	DERR, RON 9478 WINSTON DR	11/05/2001	162 25	20 15	20	Open Hole 20 - 162	Clear		Yes	227 Irrigation
0070NW 4 WILLIAMSON	20014985	BROWN, MICHAEL 9475 WINSTON DR	11/04/2001	200						Yes	227 Irrigation
0070NW 4 WILLIAMSON	20033463 D0060265	WOLF, JOHN SPLIT LOG RD	10/23/2003 05/05/2004	100 28	15	20 Galvanized	Open Hole 20 - 100	Clear 029843	355703 864249	F Yes	227 Residential
0070NW 4 WILLIAMSON	20033466 D0060268	GILBERT, BRENT 9775 SPLIT LOG RD	10/26/2003 05/05/2004	100 25	20 20	20 Galvanized	Open Hole 20 - 100	Muddy 029842	355710 864306	F Yes	227 Residential
0070NW 4 WILLIAMSON	91003450	TALLEY, J M TULLOSS RD	08/09/1991	225						No	647 Residential
0070NW 4 WILLIAMSON	92000375	LEE, ROBERT H SPLIT LOG	01/06/1992	160 145	30	20	Open Hole 20 - 160			No	227 Residential
0070NW 4 WILLIAMSON	93002088	AVERWATER, JIM CLOVERCROFT RD	11/09/1992	263 215	15	41	Open Hole 41 - 263			No	227 Residential
0070NW 4 WILLIAMSON	94003475	WARREN, GARY BUTTER HOLLOW	08/16/1994	350	0	20 Steel	Open Hole 21 - 350			No	15 Residential

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0070NW 4 WILLIAMSON	94003780 D0010276	WARREN, GARY BUTLER HOLLOW	08/16/1994	85 70	15	20 Steel	Open Hole 21 - 85	Good		No	15 Residential
0070NW 4 WILLIAMSON	96003520 D0017305	HEENY, MICHAEL SAM DONALD 9813	07/23/1996 01/28/1999	840 700	2	20	Open Hole 20 - 840	024404	355705 864230	F No	227 Residential
0070NW 4 WILLIAMSON	99004424 D0041018	WEST, ROGER SPLIT LOG 9014	09/02/1999	300 115	4	20	Open Hole 20 - 300			No	227 Irrigation
0070NW 4 WILLIAMSON	99004425 D0041019	WEST, ROGER SPLIT LOG 9014	09/03/1999	240 60	2 40	20	Open Hole 20 - 240			No	227 Irrigation
0070NW 5 WILLIAMSON	18700068	SEALES P	01/27/1964	170 165	20	10 Steel	-	Good	355620 864115	S No	15
0070NW 5 WILLIAMSON	18700744	NOLENSVILLE UTILITYD 41A @ 31A			0	0 Steel	-	Bad		No	740 Municipal
0070NW 5 WILLIAMSON	18700745	NOLENSVILLE UTILITYD	07/10/1969	187 160	132	100 Steel	-	Bad	000000 000000	No	212 Municipal
0070NW 5 WILLIAMSON	18701304	HOSSE, GENE SAM DONALD	11/18/1971	913 862	1 140	21 Steel	21 - 913	Good		No	227 Residential
0070NW 5 WILLIAMSON	18701305	HOSSE G.	10/06/1971	298		21 Steel	-			No	227 Residential
0070NW 5 WILLIAMSON	18701448	SMITH	05/02/1975	185 145	8	22 Steel	-	Good	355548 864057	S No	15 Farm
0070NW 5 WILLIAMSON	18701737	SANFORD K.	07/14/1977	125 115	10	21 Steel	-	Good	355524 864015	S No	15 Residential
0070NW 5 WILLIAMSON	18702260	VERNON R.	06/17/1981	220 125	2 80	21 Steel	-	Good	355610 864056	S No	227 Residential
0070NW 5 WILLIAMSON	18703089	WARREN, MIKE BURKE HOLLOW RD	09/21/1987	200 26	0	20	Open Hole 20 - 200	Good	355500 864000	No	227 Residential

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0070NW 5 WILLIAMSON	18703091	TANT'S PLANTS NOLENSVILLE RD	09/17/1987	350	6		Open Hole 25 - 350	Good	355500 864000	 No	15 Irrigation
0070NW 5 WILLIAMSON	20011500 D0048563	KLIEN, JEFF 9816 SAM DONALD ROAD	05/26/2001 09/21/2001	1200 830	2.5 300	20 Galvanized	Open Hole 20 - 1200	Clear 029295	355711 864221	F Yes	227 Irrigation
0070NW 5 WILLIAMSON	20023765 D0057181	FRIZSELL, DAN 2610 CLOVER SPRINGS LN	11/07/2002	200 28	12 23	25 Galvanized	Open Hole 25 - 200	Cloudy	355456 864753	 Yes	227 Residential
0070NW 5 WILLIAMSON	20061459 D0074067	BRADLEY, BETH 9817 SAM DONALD RD	04/06/2006	302 140	30	27 Galvanized	Open Hole 27 - 302	Clear	355703 864226	 Yes	227 Irrigation
0070NW 5 WILLIAMSON	92002853	MCCARTNEY, JOHN SAM DONALD R	07/20/1992	330 60	3	20 Steel	Open Hole 20 - 330	Good		 No	15 Residential
0070NW 5 WILLIAMSON	94000209 D0000390	MCGEACHY, PAT 31A	01/26/1994	1250 1230	5	20 Steel	Open Hole 21 - 1250	Good		 No	15 Residential
0070NW 5 WILLIAMSON	96002770	WARREN, AMY BURKE HOLLOW RD	06/11/1996 02/23/1999	100			-	026869	355532 864109	S No	227 Residential
0070NW 5 WILLIAMSON	96002771 D0017283	WARREN, AMY BURKE HOLLOW RD	06/11/1996 06/18/1996	300 13	1	2	Open Hole 12 - 300	011305	355524 864115	S No	227 Residential
0070NW 5 WILLIAMSON	96002772 D0017284	NEAL, DOUG CLOVERCROFT RD	06/13/1996 01/28/1999	240 217	17	33	Open Hole 33 - 240	024399	355629 864117	F No	227 Residential
0070NW 5 WILLIAMSON	99002640 D0036956	TENNESSEASONS 7216 NOLENSVILL	05/30/1999	298 150	1 76	20	Open Hole 20 - 298	Good		 No	727 Irrigation
0070NW 5 WILLIAMSON	99004301 D0041035	KLIEN, JEFF 9816 SAM DONALD RD	09/15/1999 09/21/2001	562 150	1 15	20	Open Hole 20 - 562	029294	355711 864218	F No	227 Irrigation
0070NW 6 RUTHERFORD	14903077	JUSTICE, PAT JUSTICE	05/30/1986	165 60	20	41 Steel	Open Hole 41 - 165	Fair	355500 863730	 No	15 Residential
0070NW 6 WILLIAMSON	18700102	SHELTON J	05/16/1964	146 146	30 76	24 Steel	-	Good	355706 863910	S No	219 Residential

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RECORDS OF WATER WELLS ON THE NOLENSVILLE QUADRANGLE 0070NW TN

QUAD / NTH COUNTY	WELL NUM REG NUM	OWNER'S NAME LOCATION ROAD	COMP DATE INSP DATE	TOT DEPTH AQ DEPTH	TOT YIELD STAT LEVEL	CSE DEPTH CSE TYPE	WELL FINISH INTERVAL	WAT QUAL INSP NUMBER	LATITUDE LONGITUDE	A / C LOG	DRILLER USE
0070NW 6 WILLIAMSON	18700179	BATTLE L	10/20/1964	125	0		-		355509 863926	S No	219 Other
0070NW 6 WILLIAMSON	18700180	MCCLAIN	11/09/1964	170 155	20 50	10 Steel	-	Good	355613 863839	S No	219 Residential
0070NW 6 WILLIAMSON	18700196	RIDLEY C	12/16/1964	186 168	7 70	16 Steel	-	Good	355613 863831	S No	147 Residential
0070NW 6 WILLIAMSON	18701184	RAY E	07/30/1973	180	0	21	-		355504 863832	S No	227 Other
0070NW 6 WILLIAMSON	18701185	RAY E	06/23/1973	425	0	21 Steel	-		355505 863832	S No	227 Other
0070NW 6 WILLIAMSON	18701232	RAYAET J	11/09/1973	1151 1132	3 240	21 Steel	-	Good	355505 863832	S No	227 Residential
0070NW 6 WILLIAMSON	18701511	CREECH H.A.	04/12/1976	145 127	25	21 Steel	-	Good	355620 864004	S No	15 Residential
0070NW 6 WILLIAMSON	18701512	CREECH H.A.	04/12/1976	145 135	25	22 Steel	-	Good	355621 864003	S No	15 Residential
0070NW 6 WILLIAMSON	18701514	PETTUS, TOM, HWY 31A	01/28/1976	145 120	15	22 Steel	-	Good	355625 863930	S No	15
0070NW 6 WILLIAMSON	18701600	LEROD R	06/11/1976	125 115	20	22 Steel	-	Good	355616 863838	S No	15 Residential
0070NW 6 WILLIAMSON	18701703	WILBURN A.	03/08/1977	85 60	5	21 Steel	-	Good	355650 864001	S No	15 Residential
0070NW 6 WILLIAMSON	18701706	MCLEMORE R.W.	05/18/1977	105 90	15	21 Steel	-	Good	355639 863948	S No	15 Residential
0070NW 6 WILLIAMSON	18701735	ROBERTSON GREENHOUSE	06/10/1977	280 270	50	21 Steel	-	Good	355515 863919	S No	15 Residential

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0070NW 6 WILLIAMSON	18702839	DEAN JR, ROBERT YORK	06/28/1986	207 70	15	20 Steel	Open Hole 20 - 207	Good	355500 863730	No	15 Residential
0070NW 6 WILLIAMSON	18703070	LAMPLEY, HOMER NOLENSVILLE PK	07/13/1987	310	0 310	41 Steel	Open Hole 41 - 310		355500 863730	No	15 Residential
0070NW 6 WILLIAMSON	20003677 D0045507	JOHNSON, KEVIN YORK RD	07/20/2000	265 100	250 30	41 Steel	Open Hole 41 - 265	Clear		Yes	15 Residential
0070NW 6 WILLIAMSON	20004070	BELL, WILLIAM 7524 NOLENSVILLE RD	08/25/2000	240						Yes	227
0070NW 6 WILLIAMSON	20005086 D0048466	BELL, L D 2600 YORK RD	10/26/2000 12/21/2004	280 80	1 60	22 Galvanized	Open Hole 22 - 280	Clear 045133	355610 863823	S Yes	227 Irrigation
0070NW 6 WILLIAMSON	20013545 D0054979	BERR, WILLIAM 7524 NOLENSVILLE RD	08/18/2001	270 255	65 30	20 Steel	Open Hole 20 - 270	Clear		Yes	15 Farm
0070NW 6 WILLIAMSON	20031176 D0060222	WILLIAMSON CO PARKS & RE 2310 ROCKY FORK RD	05/29/2003 07/16/2003	180 70	60 30	20 Galvanized	Open Hole 20 - 180	Clear 042601	355715 864022	F Yes	227 Irrigation
0070NW 6 WILLIAMSON	20063156 NOTAG356	TVA ROCKY FORK & NEWSOME LI	06/30/2006	300 150						Yes	840
0070NW 6 WILLIAMSON	92000387	ARNOLD, LYNN NOLENSVILLE	03/15/1991	400 60	1	20	Open Hole 20 - 400			No	227 Heat Pump
0070NW 6 WILLIAMSON	96005344 D0015738	COBB, JIM YORK RD	11/14/1996	85	0	54	Open Hole 54 - 85			Yes	647 Residential
0070NW 6 WILLIAMSON	96005345 D0015739	COBB, JIM YORK RD	11/15/1996	145 115	15 45	41	Open Hole 41 - 145	Fair		No	647 Residential
0070NW 6 WILLIAMSON	99004179 D0039739	WILLIAMS, GRADY YORK	08/31/1999	248 140	16 40	20 Steel	Screen 0 - 248	Sulphur		No	15 Irrigation
0070NW 7 WILLIAMSON	18700082	SKINNER W	02/13/1964	140 136	9 35	21 Steel	-	Bad	355252 864328	S No	147 Residential

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0070NW 7 WILLIAMSON	18700132	WHITSEY E	07/16/1964	150 58	0 55	5 Steel	-		355237 864437	S No	147 Residential
0070NW 7 WILLIAMSON	18700161	STEPHENS R	08/12/1964	45 32	12 10	20 Steel	-	Good	355435 864238	S No	17
0070NW 7 WILLIAMSON	18700165	STEPHENS R	08/10/1964	100	0				355434 864236	S No	17 Other
0070NW 7 WILLIAMSON	18700167	STREET M	08/12/1964	190	0	12 Steel	-		355425 864334	S No	15
0070NW 7 WILLIAMSON	18700168	LAMB T	08/10/1964	100 55	2	34 Steel	-		355359 864353	S No	15
0070NW 7 WILLIAMSON	18700176	HUGHES D	10/21/1964	85	0		-		355403 864303	S No	15 Other
0070NW 7 WILLIAMSON	18700793	ENGLISH A	09/14/1969	247 94	0 60	30 Steel	-	Good	355256 864328	S No	227 Residential
0070NW 7 WILLIAMSON	18700858	JENNETTE J	05/19/1970	225 212	6 40	20 Steel	-	Bad	355251 864330	S No	227 Residential
0070NW 7 WILLIAMSON	18700865	DUNN W	04/21/1970	250 205	15 28	21 Steel	-	Bad	355247 864416	S No	227 Residential
0070NW 7 WILLIAMSON	18700924	SWEENEY, KENNETH MOLLY HOLLOW	09/30/1970	925 905	5 220	21 Steel	21 - 925	Good		No	227 Residential
0070NW 7 WILLIAMSON	18701124	ANDERSONRW.	09/29/1973	330 325	10 56	23 Steel	-	Good	355252 864329	S No	15 Residential
0070NW 7 WILLIAMSON	18701172	CHRISTMAN, GARY. WARREN HOLLOW	03/27/1973	1129 1105	2 240	21 Steel	21 - 1129	Bad		No	227 Residential
0070NW 7 WILLIAMSON	18701310	BAILEY; HOWARD BURKE HOLLOW	10/14/1971	1255 1100	1 486	21 Steel	-	Good	355415 864314	F No	227 Residential

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0070NW 7 WILLIAMSON	18701965	MABRY V L	10/09/1979		0				365458 864442	S No	227 Other
0070NW 7 WILLIAMSON	18701970	SIMMS J	05/30/1979	200 160	4 130	21 Steel		Bad	355452 864447	S No	227 Residential
0070NW 7 WILLIAMSON	18702125	SMITH S.	09/22/1980	160	0				355427 864455	S No	227 Residential
0070NW 7 WILLIAMSON	18702180	MONTGOMERY C	11/04/1980	100 15	7 10	21 Steel		Good	354241 355433	S No	227 Residential
0070NW 7 WILLIAMSON	18702517	DUFF, DARYL WARREN HOLLOW	05/01/1984	40 26	14 11	24	Open Hole 24 - 40	Good	355230 864230	 No	227 Residential
0070NW 7 WILLIAMSON	18702562	WAGGONER, L J WAGGONER	07/18/1984	220 190	10 100	21	Open Hole 38 - 220		355230 864230	 No	227 Residential
0070NW 7 WILLIAMSON	18702994	JENKINS, RANDY BURKE HOLLOW	03/23/1987	160	0	20	Open Hole 20 - 160		355230 864230	 No	227 Residential
0070NW 7 WILLIAMSON	18703115	POWELL, DAVID BURKE HOLLOW	02/26/1988	500 128	0	46	Open Hole 46 - 500		355230 864230	 No	227 Residential
0070NW 7 WILLIAMSON	20030887 D0060206	HERZBERG, DAVID 3086 WILSON PK	03/20/2003 07/16/2003	135 32	10 10	37 Galvanized	Slotted 32 - 33	Clear 042603	355349 864353	F Yes	227 Farm
0070NW 7 WILLIAMSON	20043901 D0066067	CORNERSTONE CONST. 1765 WARREN HOLLOW RD.	12/02/2004	240 30	40 25	20 Galvanized	Open Hole 20 - 240	Clear	355444 864229	 Yes	227 Irrigation
0070NW 7 WILLIAMSON	20043902 D0066068	CORNERSTONE CONSTRUCT 1675 WARREN HOLLOW RD.	12/01/2004	300 105	1.5 80	20 Galvanized	Open Hole 20 - 300	Clear	355445 864235	 Yes	227 Irrigation
0070NW 7 WILLIAMSON	20060361 D0074028	MARYMONT FARMS LADD RD	12/01/2005	200 75	3 60	20 Galvanized	Open Hole 20 - 200	Clear	355211 864425	 Yes	227 Farm
0070NW 7 WILLIAMSON	20062548 D0074089	HATCHER, GEORGE 6450 NATHAN SMITH RD	06/13/2006	120 100	0	24 Galvanized	Open Hole 24 - 120		354931 864500	 Yes	227 Residential

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0070NW 7 WILLIAMSON	20052549 D0074098	HATCHER, GEORGE 6450 NATHAN SMITH RD	07/06/2006	320	0					Yes	227 Residential
0070NW 7 WILLIAMSON	93000735	LOSEE, TERRELL HICKORY HILLS D	02/08/1993	520	0 0	41 Steel	Open Hole 41 - 520			No	647 Residential
0070NW 7 WILLIAMSON	93000736	LOSEE, TERRELL HICKORY HILLS R	02/10/1993	155	0 0	20 Steel	Open Hole 20 - 155			No	647 Residential
0070NW 7 WILLIAMSON	95003878 D0002055	RYANS, GLENN SHAKE RAG RD	06/21/1995	180 140	12	20	Open Hole 20 - 180			No	227 Residential
0070NW 7 WILLIAMSON	98002787 D0028724	TURNER, RICK TULLOSS RD	07/13/1998 02/23/1999	160 30	50 5	20	Open Hole 20 - 160	026978	355437 864450	S No	227 Other
0070NW 7 WILLIAMSON	98003530 D0028746	SWANSON, REGG BURKE HOLLOW	08/14/1998 01/28/1999	202 160	30 80	20	Open Hole 20 - 202	024402	355354 864331	S No	227 Irrigation
0070NW 7 WILLIAMSON	98005116 D0037353	SWANSON, REGG BURKE HOLLOW	10/26/1998 01/28/1999	180 165			-	024401	355354 864327	S No	227 Other
0070NW 7 WILLIAMSON	98005117	SWANSON, REGG BURKE HOLLOW	10/26/1998 01/28/1999	162 162			-	026917	355354 864330	S No	227 Other
0070NW 7 WILLIAMSON	98005118	SWANSON, REGG BURKE HOLLOW	10/27/1998 01/28/1999	40 30			-	026918	355358 864328	S No	227 Other
0070NW 7 WILLIAMSON	98005128 D0037354	SWANSON, REGG BURKE HOLLOW	10/27/1998 01/28/1999	80 20	10	23 23	Open Hole - 80	024400	355357 864330	F No	227 Other
0070NW 8 WILLIAMSON	18700221	PASCHALLS INC	05/14/1965	125 80	4 85	10 Steel	-	Good	355232 864219	S No	22 Residential
0070NW 8 WILLIAMSON	18700224	PASCHALLS INC	06/02/1965	190 175	1 120	22 Steel	-	Good	355243 864206	S No	22 Residential
0070NW 8 WILLIAMSON	18700231	WILLIAMS M	06/15/1965	173	20	12 Steel	-	Good	355312 864137	S No	324

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0070NW 8 WILLIAMSON	18700706	WITT, FRANK BURKE HOLLOW	09/10/1968	1153 1140	1 381	22 Steel	- -	Good		No	227 Residential
0070NW 8 WILLIAMSON	18701932	HUSKY G	04/17/1979	220	0	52 Steel	- -		355425 864328	S No	227 Residential
0070NW 8 WILLIAMSON	18701944	HUSKEY G	03/29/1979	365	0	39 Steel	- -		355425 864327	S No	227 Other
0070NW 8 WILLIAMSON	18702266	WOODSIDE D.	11/23/1981	350 80	1	29 Steel	- -	Bad	355433 864153	S No	15 Residential
0070NW 8 WILLIAMSON	18702683	PARKER JR, SAM BURK HOLLOW	06/28/1985	350 280	3	20 Steel	Open Hole 20 - 350	Good	355230 864000	No	15 Residential
0070NW 8 WILLIAMSON	18702735	LITTLE, GLENN SKINNER	11/07/1985	200 30	6 20	20	Open Hole 20 - 200		355230 864000	No	227 Residential
0070NW 8 WILLIAMSON	18703202	BENDER, CRIS BURKE HOLLOW	06/07/1988	360 280	7	28	Open Hole 28 - 360	Good	355230 864000	No	227 Residential
0070NW 8 WILLIAMSON	18703358	WILLIAMS, JOHN OSBORN	06/28/1989	300 295	5	20 Steel	Open Hole 20 - 300	Bad	355230 864000	No	15 Residential
0070NW 8 WILLIAMSON	20005693 D0048464	GREENLINKS CONST HWY 96 EAST	11/23/2000	280 165	30 60	20 Galvanized	Open Hole 20 - 280	Clear		Yes	227 Irrigation
0070NW 8 WILLIAMSON	20005694 D0048465	GREENLINKS CONST HWY 96 EAST	11/24/2000	260 170	40 70	20 Galvanized	Open Hole 20 - 260	Clear		Yes	227 Irrigation
0070NW 8 WILLIAMSON	20005695	GREENLINKS CONST HWY 96 EAST	11/25/2000	180			-			Yes	227 Irrigation
0070NW 8 WILLIAMSON	20005696	GREENLINKS CONST HWY 96 EAST	11/25/2000	160			-			Yes	227 Irrigation
0070NW 8 WILLIAMSON	20005697	GREENLINKS CONS HWY 96 EAST	11/26/2000	240	0		-			Yes	227 Irrigation

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0070NW 8 WILLIAMSON	20005698 D0048485	GREENLINKS CONST HWY 96 EAST	11/26/2000	180 60	100 40	20 Galvanized	Open Hole 20 - 180	Clear		Yes	227 Irrigation
0070NW 8 WILLIAMSON	20005699	GREENLINKS CONST HWY 96 EAST	11/30/2000	120 40	10					Yes	227 Irrigation
0070NW 8 WILLIAMSON	20005700 D0048486	GREENLINKS CONST HWY 96 EAST	12/01/2000	180 55	50 40	24 Galvanized	Open Hole 24 - 180	Clear		Yes	227 Irrigation
0070NW 8 WILLIAMSON	20005731	GREENLINKS CONST HWY 96 EAST	11/22/2000	300 22	0.5					Yes	227 Irrigation
0070NW 8 WILLIAMSON	20021595 D0057112	HAILEY, JAMES 2275 OSBORNE RD	06/06/2002	140 50	6 30	20 Galvanized	Open Hole 20 - 140	Clear		Yes	227 Irrigation
0070NW 8 WILLIAMSON	90001268	SCRUGGS III JAMES WARREN HOLLOW	04/17/1990	160 30	1	20	Open Hole 20 - 160	Sulphur		No	227 Residential
0070NW 8 WILLIAMSON	91003656	MASON, BRENT&KIRS SKINNER	09/18/1991							No	227 Residential
0070NW 8 WILLIAMSON	94003341 D0000423	MCGEE, PARKER BUNKER HILL DR	08/08/1994 03/14/1995	207 160	5	20 Steel	Open Hole 21 - 207	Good 011167	355243 864231	F No	15 Residential
0070NW 8 WILLIAMSON	95004443 D0015635	SHADY CK EMU FARM NOLENSVILLE RD7683	09/19/1995 08/16/1995	105 30	9 10	20	Open Hole 20 - 105	Good 015752	355346 864003	F No	647 Farm
0070NW 8 WILLIAMSON	97005301 D0026325	CAMPBELL, KEVIN SKINNER	10/27/1997	1127 1086	12	20 Steel	Open Hole 20 - 1127	Good		No	15 Residential
0070NW 8 WILLIAMSON	99000572 D0030802	WILLIAMS, DON ROBERTS RD	01/11/1999	207 180	35 40	20 Steel	Open Hole 20 - 207	Fair		No	15 Residential
0070NW 8 WILLIAMSON	99003470 D0041006	OWENS, THOMAS OSBORN RD	08/11/1999	120 60	10	20	Open Hole 20 - 120			No	227 Other
0070NW 8 WILLIAMSON	99005927 D0041061	BLANKENSHIP, FRANK VALLEY FORGE	11/18/1999	282 50	5 20	20	Open Hole 20 - 282			No	227 Other

Well 1

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0070NW 9 RUTHERFORD	14902146	HARVEY C. D.	07/18/1978	178 60	2	42 Steel	-		355419 863746	S No	15. Residential	Well 2
0070NW 9 RUTHERFORD	14903447	HILL, CHARLES MT	03/17/1989	330 125	1 80	41 Steel	Open Hole 41 - 330		355230 863700	 No	437 Residential	
0070NW 9 WILLIAMSON	18700350	PARKER, JAMES, MCCANLESS	05/11/1965	978 50	1 258	50	50 - 978			 No	755 Residential	
0070NW 9 WILLIAMSON	18701233	MARTIN, ED MCCANLESS	11/20/1973	1151 1080	2 190	20 Steel	20 - 1151	Good		 No	227 Residential	
0070NW 9 WILLIAMSON	18701605	BROWN R	11/30/1977	370		 Steel	-	Good	355457 863835	S No	15 Residential	Well 3
0070NW 9 WILLIAMSON	18701726	TARPLEY T	04/26/1977	 80	4	21 Steel	-	Good	355452 863941	S No	15 Residential	Well 4
0070NW 9 WILLIAMSON	18701837	PERRY	09/25/1978	1210 1190	2		-	Good	355424 863738	S No	15 Residential	
0070NW 9 WILLIAMSON	18702831	TATE, JOE MCCLANLES RD	03/11/1986	400	1	20 Steel	Open Hole 20 - 400	Fair	355230 863730	 No	15 Residential	
0070NW 9 WILLIAMSON	18702853	HORNER, JOHN SPANN TOWN	06/04/1986	400 50	2 30	20	Open Hole -		355230 863730	 No	227 Residential	
0070NW 9 WILLIAMSON	18702888	MAYFIELD, BUD 31A-41A	03/10/1986	460 177	15 80	96	Open Hole 96 - 460		355230 863730	 No	227 Heat Pump	
0070NW 9 WILLIAMSON	20002134 D0045477	CLAWSON, STEVE 2935 BOSTICK RD	04/27/2000 12/21/2004	410 200	12 30	41 Steel	Open Hole 41 - 410	Cloudy 045137	355248 863924	F Yes	15 Residential	
0070NW 9 WILLIAMSON	95001535 D0010972	COULSON, CARL PUCKETT	04/04/1995 02/23/1999	1140 1060	2	20	Open Hole 20 - 1140	 026957	355349 863829	S No	227 Residential	Well 5
0070NW 9 WILLIAMSON	96003897	ALLEN, DAVID HENRY ALLEN LN	08/22/1996 02/23/1999	370			-	 026988	355302 863746	F No	15 Residential	Well 6

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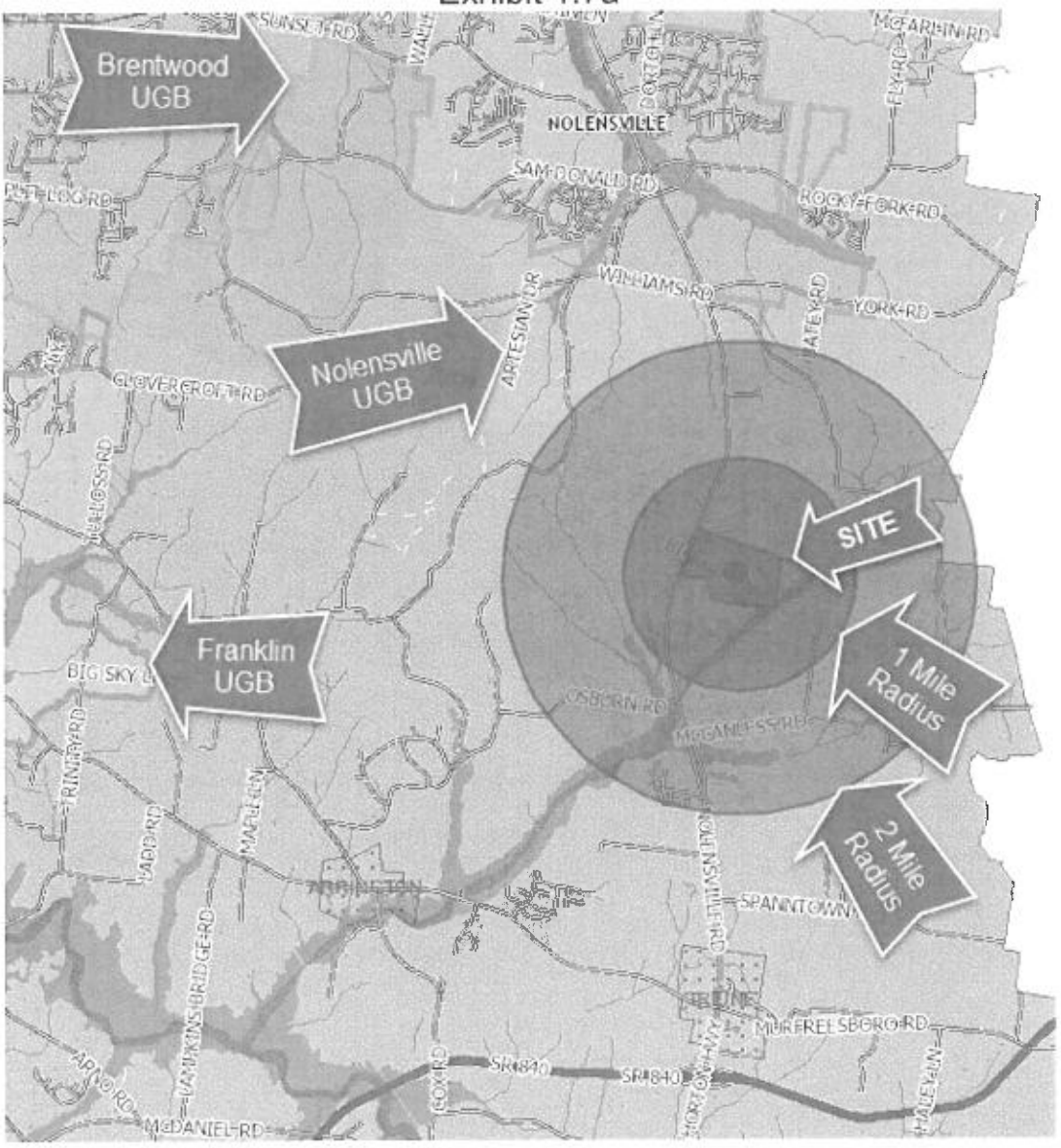
0070NW 9 WILLIAMSON	97003145 D0026268	ROBBINS, JOHN OLD HORTON HWY	07/10/1997 02/23/1999	207 160	25 30	20 Steel	Open Hole 20 - 207	Good 026982	355250 863936	S No	15 Residential	**Well 7**
0070NW 9 WILLIAMSON	99004857 D0039750	GRAHAM, SCOTT NOLENSVILLE RD	09/17/1999 02/14/2000	1209 1189	5	20 Steel	Open Hole 20 - 1209	Good 026437	355436 863904	F No	15 Residential	**Well 8**

1.7 Centralized Wastewater Treatment / Disposal (CWTD) Evaluation

a. Identify potential CWTD service area (topographic maps of area adjacent to the proposed project.):

The area surrounding the proposed project consists of mostly larger tract properties that would tend to lend themselves to the development of residential subdivisions, if wastewater service were available. Some of these properties have one or more existing residences that consume large portions of those properties. It can be assumed that all of these existing residences are on septic systems. The drainage basin for this area flows to the southwest, to the Harpeth River. The property does not lie in any Urban Growth Boundary (UGB). Existing sewer collection lines for centralized treatment are not within 1 mile of the proposed Treatment Facility.

Exhibit 1.7a



b. *Evaluation of the Facility for providing a CWTD system in the service area. (Nature and extent of the area to be served, including immediate and probable future development).*

The Nolensville-Dove Lake Treatment Facility currently is a farm that is in the jurisdiction of Williamson County Department of Sewage Disposal Management. The developer's plan of development is to build on approximately 20 to 30 lots per year until built out. The developer is anticipating 5 – 8 years completing the proposed subdivision, depending on the market demands. The developer's long range plans are to provide approximately 162 residential lots / homes at this location. The proposed Treatment Facility is designed to treat the domestic effluent from approximately 165 residential lots.

The proposed project site basically has no additional capacity to provide sewer services to adjacent properties, without additional expansion. The capacity of the Nolensville-Dove Lake Treatment Facility will be designed to accommodate approximately 165 residential units at 300 gallons per day per unit (49,500 gpd). Typically, design flows do not represent actual flows for a treatment facility, and additional capacity should be expected to accommodate nearby potential subsurface sewage disposal system failures. The suitable soils available at Nolensville-Dove Lake Treatment Facility are dedicated to serve this proposed development, leaving no additional treatment capacity at the current design load requirements.

It does not appear that this particular site would be suitable for a Centralized Wastewater Treatment/Disposal facility, using the current proposed treatment technology (RSF with drip dispersal), as there is no additional land area available.

c. *Summary, conclusion and plan of service regarding the potential CWTD systems within the identified service area.*

The area adjacent to and in the vicinity of the proposed Nolensville-Dove Lake Treatment Facility has the potential to experience further residential growth. The planned use of the proposed project does not lend itself to the expansion of the system under current regulations to accommodate such growth. It does not appear that a larger CWTD would be suitable for this property. However, some additional service could be accommodated after build-out, and a determination of

remaining available capacity is determined based on usage history. (See attached Engineering Report for additional information.)

The proposed wastewater treatment facility will consist of a recirculating sand filter that will treat approximately 49,500 gpd. In addition, there will be recirculating and final dose tanks, and a disk filter. Once treated, the effluent will be dispersed by drip dispersal. 100% reserve area will be provided for the drip dispersal.

The Treatment Facility UIC / SOP permit has been applied for with TDEC. This SOP will be used for treating effluent from Enclave at Dove Lake. A letter of service from Tennessee Wastewater is inserted below.

2. Scaled drawing with 2 foot elevation contours showing the preliminary site layout including:

2.1 *Pre-application treatment facilities* See site and grading plans

2.2 *Storage Facilities* See site and grading plans

2.3 *Disposal Fields* See site and grading plans

2.4 *Buffer Zones* See site and grading plans

2.5 *Hand auger, test pit and soil boring locations* See site and grading plans

2.6 *Access roads and utilities* See site and grading plans

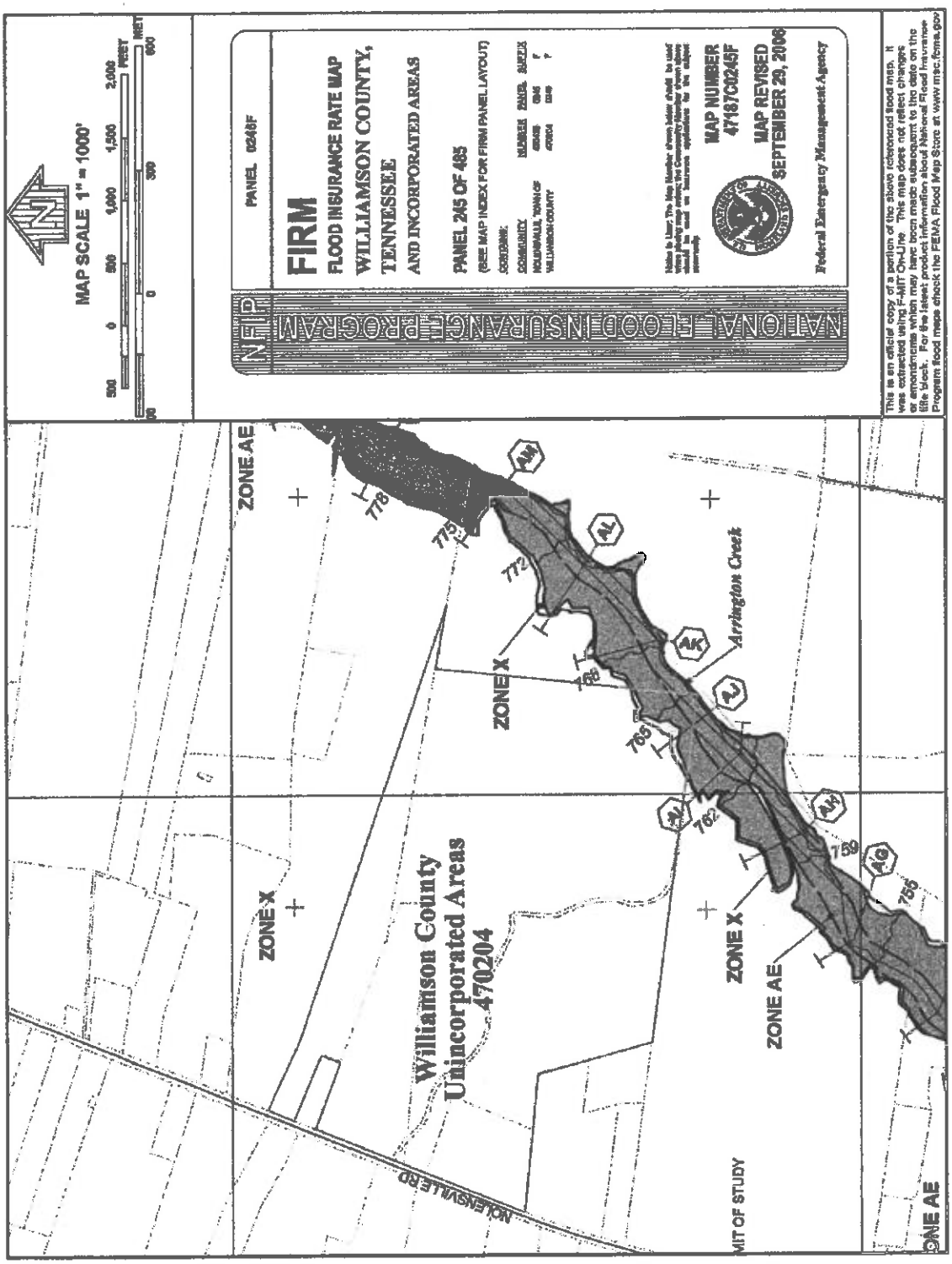
2.7 *Watercourses* See site and grading plans

2.8 *Drainage structures* See site and grading plans

2.9 *Flood elevations with 10 year, 50 year, and 100 year flood plain elevation noted*

See site and grading plans

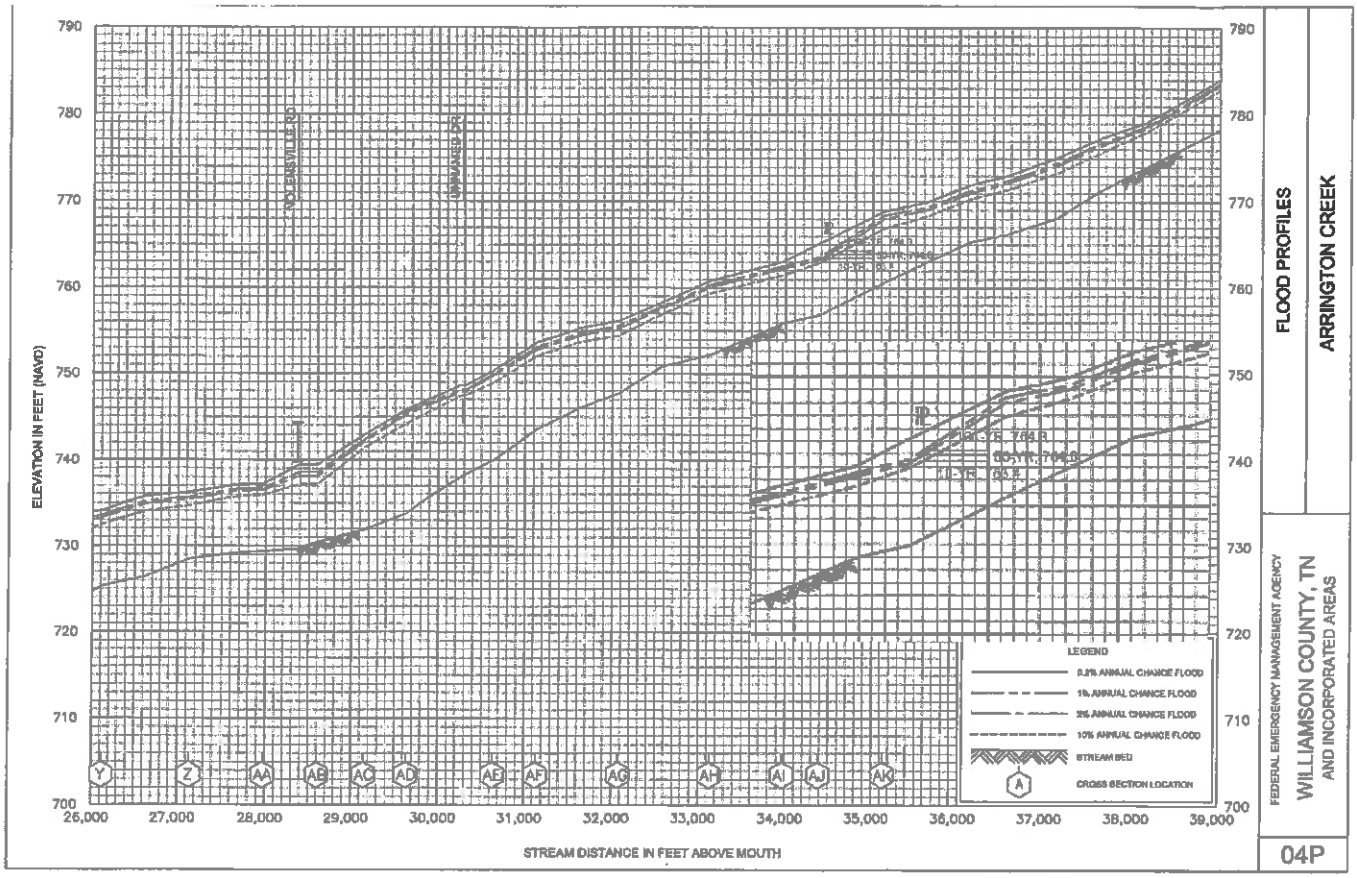
Exhibit 2.9a



FEMA FIRMETTE

Discharges for Arrington Creek for the 10 year (10-Percent Annual Chance), 50 year (2-Percent Annual Chance), and 100 year (1-Percent Annual Chance) floods are published by FEMA. The approximate water surface elevation for each of those recurrence intervals are shown below at the downstream property line.

Exhibit 2.9b



The approximate water surface elevations for the given storm frequencies are as follows at the downstream property line:

10-Yr.	763.4+/-
50-Yr.	764.0 +/-
100-Yr.	764.3 +/-

2.10 Residences and habitable structures within or adjacent to site

See site and grading plans

2.11 Wells within 500' of the site

See site and grading plans. Also, see 1.6 Water supply wells within 1,500 LF of facility for TDEC well location map. No wells are known to be within 500 feet of the proposed Treatment Facility.

3. Design wastewater characteristics (influent to pre-application treatment and treated effluent to disposal fields). If the project involves an existing facility, then actual, recent data should be used:

WASTEWATER TREATMENT SYSTEM
DESIGN SPECIFICATIONS

SITE: Nolensville-Dove Lake Treatment Facility – Nolensville, TN 37135

A recirculating sand filter is proposed to treat the effluent from the development's residences. The system shall consist of the following components: A watertight septic tank and pump at each lot, a collection forcemain delivering septic tank effluent from all lots to a recirculating sand filter, a final storage tank, disk filters, and finally to a subsurface drip irrigation system by means of a forcemain.

The system shall be capable of treating the daily design wastewater flow with the following maximum influent characteristics.

	Raw Influent	**Effluent**
3.1 Average and peak daily flows		
Design flow (gpd)	49,500	49,500
Min. WW Temp. (C)	13	-
pH	3-4	6.5-8.5

(Note: Average flow from existing watertight collection systems is approximately 160 to 180 gpd per house. Average flow is approximately 29,700 GPD.)
Design peak flow for the collection: 165 houses X 0.50 gpm/house = 82.5 GPM

3.2 Biochemical Oxygen Demand		
BOD5 (mg/L) (Septic Tank)	200-300	120-150
BOD5 (mg/L) (RSF)	120-150	< 5
BOD5 (mg/L) (Drip Field)	<5	-
3.3 Total Suspended Solids		
TSS (mg/L) (RSF)	80-120	< 5
TSS (mg/L) (Drip Field)	<5	BDL
3.4 *Ammonia Nitrogen, Total Kjeldahl Nitrogen, Nitrate plus Nitrite*		
TKN (mg/L)(RSF)Ammonia Nitrogen as N	30-5	-
Total Nitrogen as N (mg/L)	40-60	-
Effluent to Drip Dispersal		
Ammonia (mg/l)	<2	
Nitrate (mg/l)	<15	
Nitrite (mg/l)	<1	
TKN (mg/l)	<20	
Alkalinity	A supplemental alkalinity/pH feed system shall be provided	

3.5 Total Phosphorus

Normal waste streams are between 4 mg/l TP in the influent.

Effluent <2 mg/l

3.6 Chloride

Chloride concentrations influent to the recirculating sand filter are approximately 30 mg/l. Effluent to drip dispersal would be approximately <10 mg/l

3.7 Sodium Absorption Ratio

(Na+1)/(sqr((Ca+2+Mg+2)/2))

Range 5-9(a)

3.8 Electrical Conductivity

Permeability Range <0.5 mho/cm

Salinity Range < 0.75-3.0 mmho/cm

3.9 Metals / Priority Pollutants

Chloride and heavy metal concentrations are important to a treatment plant and process but it is uncommon for them to be outside of the generally accepted ranges unless the waste water is from a unique industrial operation. These values should be within the typical range specified in **Table 16-2 Suggested Values for Inorganic Constituents in Wastewater Applied to Land in Article XII Regulations for Wastewater Treatment and Land Disposal Systems, Williamson County, Tennessee.**

4. Water Balance / determination of design wastewater loading rates for each disposal field:

1. The Armour series consists of very deep well drained soils on stream terraces, foot slopes, and valley floors. These soils formed in old alluvium, valley fill, or in alluvium and the underlying residuum of limestone. Slopes range 0 to 20 percent. TAXONOMIC CLASS: Fine-silty, mixed, active, thermic Ultic Hapludalfs.

2. The Captina series consists of very deep, moderately well drained soils on nearly level to moderately sloping uplands and old stream terraces of the Ozark Highlands. They formed in a thin mantle of silty material and the underlying colluvium and residuum weathered from limestone, cherty limestone and dolomite, or siltstone. Slopes range from 1 to 15 percent. Mean annual temperature is 56 degrees F., and mean annual precipitation is 45 inches. TAXONOMIC CLASS: Fine-silty, siliceous, active, mesic Typic Fragiudults.

3. The Culleoka series consists of moderately deep, well drained, soils formed in colluvium or residuum from siltstone or interbedded shale, limestone, siltstone, and fine grained sandstone. Slope ranges from 2 to 70 percent. Near the type location the mean annual precipitation is about 47.5 inches and mean annual air temperature is about 54.7 degrees F. TAXONOMIC CLASS: Fine-loamy, mixed, active, mesic Ultic Hapludalfs.

4. The Hampshire series consists consists of deep, well drained, soils on uplands. These soils formed in clayey residuum of interbedded limestone and shale and the underlying residuum of interbedded siltstone, fine grained sandstone, shale and limestone. Slopes range from 2 to 30 percent. TAXONOMIC CLASS: Fine, mixed, active, thermic Ultic Hapludalfs.

5. The Maury series consists of very deep, well drained, moderately permeable soils that formed in silty material over residuum weathered from phosphatic limestone. These soils are on uplands. TAXONOMIC CLASS: Fine, mixed, active, mesic Typic Paleudalfs.

6. The Stiversville series consists of deep, well drained permeable soils on uplands. They formed mostly in residuum of siltstone and fine grained sandstone that is interbedded with shale and limestone. On steep slopes, some pedons formed partly in colluvium from the same material. Slopes range from 2 to 30 percent. TAXONOMIC CLASS: Fine-loamy, mixed, active, thermic Ultic Hapludalfs.

7. See DSIR, page 12, Item 6.0, Determination of Design Percolation for Each Soil Type. The average "perc" for the soils used was found to be 0.45 in/hr.

8. Nitrogen Balance/selection of cover crop and management scheme

The Enclave at Dove Lake Subdivision
Williamson County

NITROGEN LOADING

USING MASS BALANCE EQUATION

Lwn	=		Allowable Loading rate based on Nitrogen Limits
C_p	=	**10**	maximum nitrogen concentration (mg/l)
Pr	=	table(Chap. 16)	5-year return monthly precipitation, in./mon.
PET	=	table(Chap. 16)	potential evapotranspiration, in./mon. (From Chap. 16)
U	=	100	nitrogen uptake by vegetation (lbs N/acre/year)
C_n	=	23	nitrogen concentration in applied wastewater
f	=	Varies	fraction of applied nitrogen rem. by denitrif. and volatiliz.
constant	=	**4.424**	combined conversion factor

Nutrient Loading Rate = Lwn = $(C_p((PR)-PET))+U(4.424)/(((1-f)*C_n)-C_p)$

	Pr	PET	U(%/mo)	U/mo	% Denitr.	Lwn in/mo	Lwn in/wk	Lwn gal/sf/day
January	7.62	0.10	1	1.0	25	11.09	2.59	0.23
Feb	6.72	0.27	2	2.0	25	10.12	2.36	0.21
Mar	8.85	0.97	4	4.0	27	14.39	3.36	0.29
Apr	6.59	2.30	8	8.0	29	12.27	2.86	0.25
May	6.13	3.59	12	12.0	31	13.24	3.09	0.27
Jun	5.52	4.90	15	15.0	33	13.39	3.12	0.27
July	6.85	5.44	17	17.0	35	17.72	4.13	0.36
August	4.73	5.00	15	15.0	35	12.86	3.00	0.26
Sept	5.54	3.79	12	12.0	34	13.81	3.22	0.28
Oct	4.47	1.98	8	8.0	32	10.56	2.46	0.21
Nov.	6.11	0.82	4	4.0	29	11.06	2.58	0.23
Dec.	7.55	0.27	2	2.0	26	11.46	2.67	0.23

6. Background Groundwater Samples

No wells are located on the project site, but based on the past sampling, expected values would be:
Fecal Coliform: 0/100 ml
Nitrate as N: 0.06 mg/l

7. Phosphorus and Other Constituent Loading Rates

Not a parameter requirement for the SOP.

Normal waste streams are between 8 and 12 mg/l TP in the influent and we would normally use about 25% of that for cell growth in the biofilm.

Effluent 5-6 mg/l
Constituent loading rates will be typical for residential domestic waste.

8. Determination of Wetted Field Area(s) and Required Storage Volume

Area for Drip Irrigation

The total area required for drip irrigation at the design flow of 49,500 gpd will be as follows:

LA16:F33and Reserve Area
Total Soils Area Required (Land Application + Reserve)

	Maximum Application Rate gal/sf/day	Drip Dispersal Backup Soils Area
Tennessee Wastewater	0.2	50%
Williamson County	0.25	100%
TDEC	0.25	0%

		Allowed Application Rates		
Land Application Area	**Units**	**TENNESSEE WASTEWATER SYSTEMS, INC. (All Soils with 50% Backup)**	**Williamson County (Stiversville Soils, 100% backup)**	**TDEC (Stivessville Soils, No Backup Required)**
Land Application Area	gal/sf/day	0.2	0.25	0.25
Primary Area Required	s.f.	247500	198000	198000
Backup Area Required	s.f.	123750	198000	0
Total Area Required	s.f.	371250	396000	198000
or	acres	**8.52**	**9.09**	**4.55**

Therefore, using the largest area, at least 9.09 acres will be provided for land application and reserve area.

Storage Pond Volume

Tennessee Department of Environment and Conservation does not require redundant storage, however, Williamson County requires 40 days of storage.

. The total storage calculations are simply the ability to store water that would have been applied during these days. **Storage Volume = 40 days effluent**

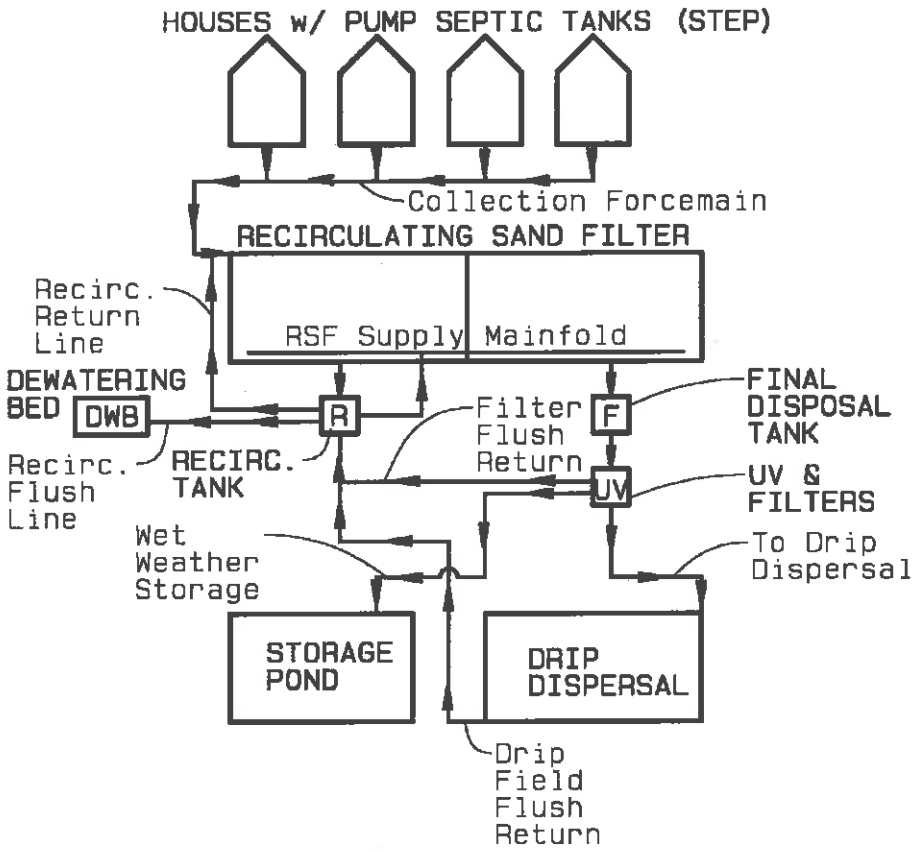
Effluent volume generated for those 40 days = 300 gpd/res. X 165 res. X 40 days / 7.48 gal/CF / 43,560 SF/Ac= **6.08 ac-ft.**

Pond Depth = 15 ft.,
Surface Area = 0.4 Ac. average
Volume = 6.08 Ac-ft.

9. Process design for pre-application treatment facility.

9.1 *Schematic of pump stations and unit processes*

Exhibit 9



WASTEWATER PROCESS SCHEMATIC

9.2 *Basin volumes, loading rates, hydraulic detention times, etc. (aerobic or anaerobic).*

Collection system will be septic tank effluent with pump vault and filter at each residence to pressure collection mains to deliver effluent through force mains to a recirculating sand filter system. A final dose pump system will pressurize the drip system and/or deliver water to the storage pond. Pump curves and calculations are attached.

9.3 *Capacity of all pumps, blowers and other mechanical equipment. Pump curves and hydraulic calculations for the distribution system must accompany the DDR.*

Drip Irrigation Field Sizing:

5.68 acres = 247,500 SF
TDEC requires Laterals to be placed on 2 ft. centers
247,500 SF/2' centers = 123,750 LF of drip line
Divide drip system into 28 zones of 4,420 LF each

Typical zones will have a maximum of 16 distal ends.

Design dose flow (See Engineering Report)
= 4,420 ft / 2' c.c. emitters x 0.61 GPH/emitter/60 min./Hr =
22.47 gpm, use **23 gpm**

Design Flush Flow (See Engineering Report)
Flush Flow Required = **25 gpm**

The system will use two (2) pumps to dose and flush the drip fields. One 4,420 LF zone will be dosed at a time (10 cycles). Both pumps will run at the same time to does and flush the drip line.

Design calculations for the sand filter and drip irrigation are subject to final layout and design. Sand filter pumps are based on typical sand filters of similar size.

9.4 *Design life of treatment and disposal system*

The design life of treatment and disposal system is expected to be 50 years.

10. Detailed Soils Investigation Report

LONNIE NORROD SOIL CONSULTING

ENCLAVE AT DOVE LAKE DSIR

Big Oak Rd. (Williamson County TN tax map #85, parcel #1.01

4-8-2015

Section 20.07

DETAILED SOILS INVESTIGATION REPORT

1.0 Site Description

- 1.1 Location Map
- 1.2 Topographic map
- 1.3 Soil Survey map
- 1.4 Hand auger, test pit and soil boring locations

2.0 Soil series descriptions (each soil series present)

- 2.1 Texture
- 2.2 Permeability
- 2.3 Slope
- 2.4 Drainage
- 2.5 Depth to seasonal high water table
- 2.6 Depth to bedrock
- 2.7 Erodibility

3.0 Soil characteristics (each soil series present)

- 3.1 Hand auger, test pit and soil boring logs:
  - 3.1.1 Soil horizons
  - 3.1.2 Depth to groundwater
  - 3.1.3 Depth to rock
- 3.2 Unified Soil Classification
- 3.3 Results from saturated hydraulic conductivity testing
- 3.4 Results from soil chemistry testing
  - 3.4.1 pH
  - 3.4.2 Cation Exchange Capacity
  - 3.4.3 Percent Base Saturation
  - 3.4.4 Sodium Exchange Potential
  - 3.4.5 Phosphorus Adsorption
  - 3.4.6 Nutrients (N, P, K)
  - 3.4.7 Agronomic trace elements (for cover crop proposed)
  - 3.4.8 Mineralogy (clay)
- 3.5 Engineering properties of soils proposed for any potential pond construction

4.0 Identification of subsurface conditions adversely affecting vertical or lateral drainage of the and treatment site.

5.0 Delineation of soils and areas suitable and not suitable for wastewater drip or spray irrigation.

6.0 Determination of design percolation for each soil type.

APPENDICES

APPENDIX 1.2 – TOPOGRAPHIC MAP AND EXTRA-HIGH INTENSITY SOIL MAP GSM

APPENDIX 1.3 – NRCS SOIL SURVEY MAP

APPENDIX 2.0 – SOIL SERIES DESCRIPTIONS (OSD)

APPENDIX 2.7 – ERODIBILITY CHART

APPENDIX 3.1 – SOIL PEDON DESCRIPTIONS

APPENDIX 3.3 – RESULTS FROM Ksat TESTING

APPENDIX 3.4 – RESULTS FROM SOIL CHEMISTRY TESTING

GLOSSARY OF ABBREVIATIONS:

LNSC- Lonnie Norrod Soil Consulting (Mr. Lonnie Norrod)

GSM – Gibi Soil Mapping (Mr. John Gibi)

NRCS – Natural Resource Conservation Service

Ksat- Saturated Hydraulic Conductivity

TDEC – Tennessee Dept of Enviornment and Conservation

DSIR – Detailed Soils Investigation Report

WCTZO- Williamson County Tennessee Zoning Ordinance

OSD – U.S.D.A. Natural Resources and Conservation Service Official Soil Descriptions

SEC Inc. – Site Engineering Consultant's

Detailed Soil Investigation Report

INTRODUCTION:

The Following is a Detailed Soil Investigation Report (DSIR) prepared by Lonnie Norrod Soil Consulting (LNSC) for Enclave at Dove Lake Subdivision located on Big Oak Rd. Nolensville, TN. The DSIR data was collected and compiled in accordance with the requirements set forth in Section 20.07 of Article 20: "Nontraditional Wastewater Treatment and Disposal Systems" of the Williamson County, Tennessee Zoning Ordinance (WCTZO) adopted May 14, 2012. The data in this report was collected and is presented in a form that will best reflect its application to a wastewater treatment system that utilizes drip dispersal technology as its means of application into the ground. The state of Tennessee Department of Environment and Conservation (TDEC) has the authority to permit the system and has specific guidelines and requirements concerning drip dispersal in "Chapter 17 : Design Guidelines for Wastewater Dispersal Using Drip Irrigation". Any reference to soils being favorable or unfavorable for drip dispersal in this report is based on the guidelines set forth in TDEC's "Chapter 17". "Chapter 17" assigns the hydraulic loading rate of soils for drip dispersal on the most restrictive soil characteristics in the upper 20" of the soil profile. For this reason, much of the field data in this report is focused on that zone of the soil profile.

The soil mapping and soil pedon descriptions were performed by Mr. John Gibi of Gibi Soil Mapping (GSM). Mr. Gibi was accompanied by Mr. Terry Henry of TDEC for most of the pedon descriptions. Hydraulic conductivity testing, research data collection, and soil sample collection was performed by LNSC. The soil samples were collected and sent to Waters Agricultural Laboratories, Inc. 2101 Calhoun Rd. Hwy 81 Owensboro, KY. 42301 for soil chemistry testing and particle size determinations. The hydraulic conductivity testing was done by utilizing a Compact Constant Head Permeameter called the Amoozemeter developed by Dr. Aziz Amoozegar.

Please contact Lonnie Norrod of Lonnie Norrod Soil Consulting at 615-969-4443 with any questions concerning the contents of this DSIR.

DETAILED SOIL INVESTIGATION REPORT

General Geology of the site:

The area that this DSIR was performed on is located near the boundary of the outer portion and the inner portion of the Nashville Basin Physiographic Region. The residuum of these soils in the higher elevations is weathered from the phosphatic limestones, siltstones, and shale of the Bigby-Cannon and Hermitage formations. These geologic formations are made up of hills and ridges that have moderately steep to steep slopes and gently rolling or sloping ridgetops. In the lower elevations, the Carter's Formation is present. The Carter's underlies the Hermitage Formation and consists of non-phosphatic limestone. The Carter's landscape is mostly hilly and undulating. The contact between the inner and outer portions of the Nashville Basin is widely accepted as the boundary between the Hermitage Formation and the Carter's Formation. The entire geology of this site is of the Ordovician Period.

1.0 Site Description:

1.1 Location Map:

1.2 Topographic Map:

-The Topographic Map was provided by SEC Inc. See Appendix 1.2 for a "to scale" version of the topo map and the soil map produced by GSM.

1.3 Soil Survey Map:

See Appendix 1.3 for the NRCS Soil Survey Map

1.4 Hand Auger, test pit and soil boring locations:

-Hand auger holes and/or tractor auger holes were bored by GSM at appropriate intervals in order to create soil map. These locations are marked on the field copy of the map and are not included on the final map.

-Sixteen test pits were excavated and Soil Pedon descriptions were performed at these locations by GSM and Terry Henry of TDEC which are numbered and marked on the soil map displayed in Appendix 1.2.

2.0 Soil series descriptions (each soil series present)

-The Soil Pedon Descriptions in Appendix 3.1 make a note of all of the following physical characteristics noted below in this section. Only the soils considered favorable for drip dispersal were described in the Pedon Descriptions

-The NRCS Official Soil Series Descriptions (OSD)s of all the soil series present are displayed in Appendix 2.0.

2.1 Texture
2.2 Permeability
2.3 Slope
2.4 Drainage
2.5 Depth to seasonal high water table
2.6 Depth to bedrock
2.7 Erodibility

-Appendix 2.7 displays a table with estimated Erodibility

3.0 Soil Characteristics (each soil series present)

3.1 Hand auger, test pits and soil boring logs:

--Hand auger holes and/or tractor auger holes were bored by GSM at appropriate intervals to complete the soil map. The soil series and any special notes about the physical characteristics of the soil at these locations were noted in short hand on the field copy of the soil map. The field copy is not included in this report but was utilized in compiling the final soil map that is included in this report in Appendix 1.2. The soil map and soil pedon descriptions provided by GSM show no water table present in any of the soil areas being utilized for drip irrigation with the exception of the Lindell unit. GSM encountered a layer with low chroma mottles and depletions at a depth of 24" according to the soil pedon descriptions.

It is likely that a water table exists in these areas during the wettest periods of the year at the depth in which the low chroma mottles and depletions are present. Soil pedon description #7 reflecst this phenomenon.

-Sixteen test pits were excavated and Soil Pedon descriptions were performed at these locations which are numbered and marked on the soil map displayed in Appendix 1.2.

3.2 Unified Soil Classification (USC): This data is compiled from NRCS Web Soil Surveys

Soil Series:	Depth in Inches:	Unified Soil Classification
Armour	0-7 7-65	CL, CL-ML, ML CL
Egam	0-11 11-72	CL, CL-ML, ML CH, CL
Hampshire	0-10 10-30 30-49	CL-ML, CL, ML CL, CH, MH CL, GC, SC, GM
Harpeth	0-9 9-65	CL, CL-ML, ML CH, CL, MH, ML
Lindell	0-6 6-60	CL, CL-ML, ML CL, CL-ML
Marsh	0-3 3-19 19-23	CL, CL-ML, ML CL, CL-ML, ML CL, GC, GM, ML
Mimosa	0-6 6-11 11-55	CL, ML ML, CL, MH, CH CH, MN
Pruitton	0-6 6-34 34-29	CL CL SC
Stiversville	0-6 6-50 50-55	CL, CL-ML, ML CL, CL-ML, ML CL, GC, SC, SM

Reference: Web Soil Survey. Soil Survey Staff, National Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/

The following is a chart that describes the Abbreviations of the USC system from Wikipedia:

First and/or second letters

Letter	Definition
G	gravel
S	sand
M	silt
C	clay
O	organic

Second letter

Letter	Definition
P	poorly graded (uniform particle sizes)
W	well-graded (diversified particle sizes)
H	high plasticity
L	low plasticity

3.3 Results from saturated hydraulic conductivity (Ksat) testing:

-The results from the saturated hydraulic conductivity testing are displayed in Appendix 3.3. These tests were conducted utilizing an Amoozemeter. The tests were ran at approximately 20" deep because TDEC assigns a hydraulic loading rate to a soil based on its most limiting characteristics in the upper 20" of the soil profile. There is at least two hydraulic conductivity test for each soil series present that is considered favorable for drip dispersal with the exception of the Lindell soil which only has one. All of the Ksat averages for the soil series present that are mapped in the areas that are considered favorable for drip dispersal fall in the "moderately slow" and "moderate" hydraulic conductivity classes as designated by the following chart from the NRCS Web Soil Survey:

Saturated Hydraulic Conductivity

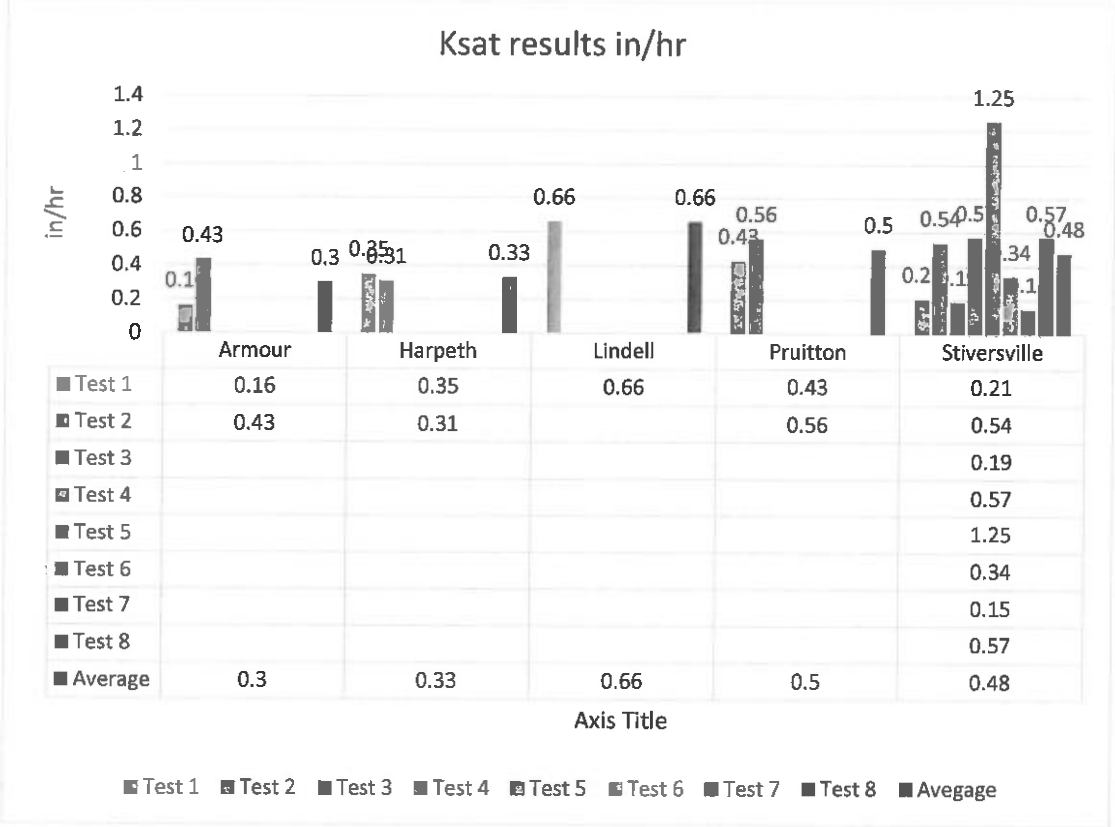
Saturated Hydraulic Conductivity in Relation to Soil Texture

Saturated hydraulic conductivity rates shown are in relation to texture and are only a general guide. Differences in bulk density may alter the rates shown below.

Soil Textural Classes & Related Saturated Hydraulic Conductivity Classes

Texture	Textural Class	General	Ksat Class	in/hr
Coarse sand	Coarse	Sandy	V. rapid	>20
Sands Loamy sands	Coarse	Sandy	Rapid	6 to 20
Sandy loam Fi.san.loam	Mod. coarse	Loamy	Mod. Rapid	2 to 6
v. fi. sa. loam loam silt loam silt	Medium	Loamy	Moderate	0.6 to 2
clay loam sa. cl. loam si. cl.	Mod. fine	Loamy	Mod. slow	0.2 to 0.6
sandy clay silty clay clay	Fine and very fine	Clayey	Slow	0.06 to 0.2
Cd horizon Natric horizon, fragipan, ortstein			V. slow or impermeable	0 to 0.06

Reference: Web Soil Survey. Soil Survey Staff, National Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/



-The Ksats for the soils series in the preceding chart are and average of the readings from the Amoozemeter once the water flow from the auger hole had reached a "steady state".

3.4 Results from soil chemistry testing

-The soil samples were taken from the field by LNSC and sent to Waters Laboratories for testing. The results of this testing is displayed in Appendix 3.4.

3.5 Engineering properties of soils proposed for any potential pond construction

-The engineering criteria for the clay liner of a stabilization pond are as follows:

Clay Content: 40 to 70%

Permeability : 1*10(-7) to 1* 10(-6) cm/sec

Plasticity: 21 Plasticity Index

Consistency: medium stiff to stiff

-As indicated by the soil map prepared by GSM and the Williamson County Soil Survey, there are significant amounts of clayey soils on the property. Potential areas of clay will be benchmarked as they are encountered during the construction process and will be unearthed and utilized for the pond liner. If there is an insufficient amount of clay on the property that meets the design criteria, clay will be hauled in to the site or a PVC liner will be purchased for the lining of the pond.

4.0 Identification of subsurface conditions adversely affecting vertical or lateral drainage of the land treatment site:

- A subsurface condition contacted that would adversely affect the vertical or lateral drainage of the land treatment site would be the seasonable high water table which is indicated by the low chroma depletions that were encountered by GSM at a depth of 24". This is recorded in Soil Pedon Descripton #7 which is located near grid point NN-50. The seasonable high water table appears to be limited to the Lindell soil series unit based on the soil map and the soil pedon descriptions. The seasonable high water table in the Lindell soil does slow down the drainage of water but it is not likely that it would significantly slow down the drainage in the zone of the drip dispersal lines. The drip lines will be installed around 8" deep and the water table is over a foot below that depth. TDEC currently is not requiring a soil improvement practice such as a sub-surface drain to lower the water table or intercept water prior to it entering the treatment area for soils that do not have a water table less than 20". No clay textures or bedrock were observed less than 39" in any of the soil pedon descriptions by GSM. Nor are there any notes on the soil map that indicate any problems of shallow rock or clay textures that would significantly adversely affect vertical or lateral drainage in the boundaries within the designated area of the land treatment site.

5.0 Delineation of soils and areas suitable and not suitable for wastewater drip or spray irrigation:

-All soils mapped Armour, Harpeth, Lindell, Pruitton or Stiversville with 15% or less slopes are areas that are considered suitable for wastewater drip according to the guidelines set forth in TDEC's "Chapter 17" and Williamson County's criteria for advanced wastewater treatment. Any of the soils mapped Egam, Marsh or Mimosa are considered not suitable for wastewater drip at this time. The Marsh soil is normally considered suitable for drip dispersal, but it exceeds the maximum slope limit of 15% for drip dispersal in Williamson County in this case. The Stiversville units that are mapped in excess of 15% are also considered unsuitable for drip dispersal according to Williamson Counties criteria for advanced wastewater treatment systems.

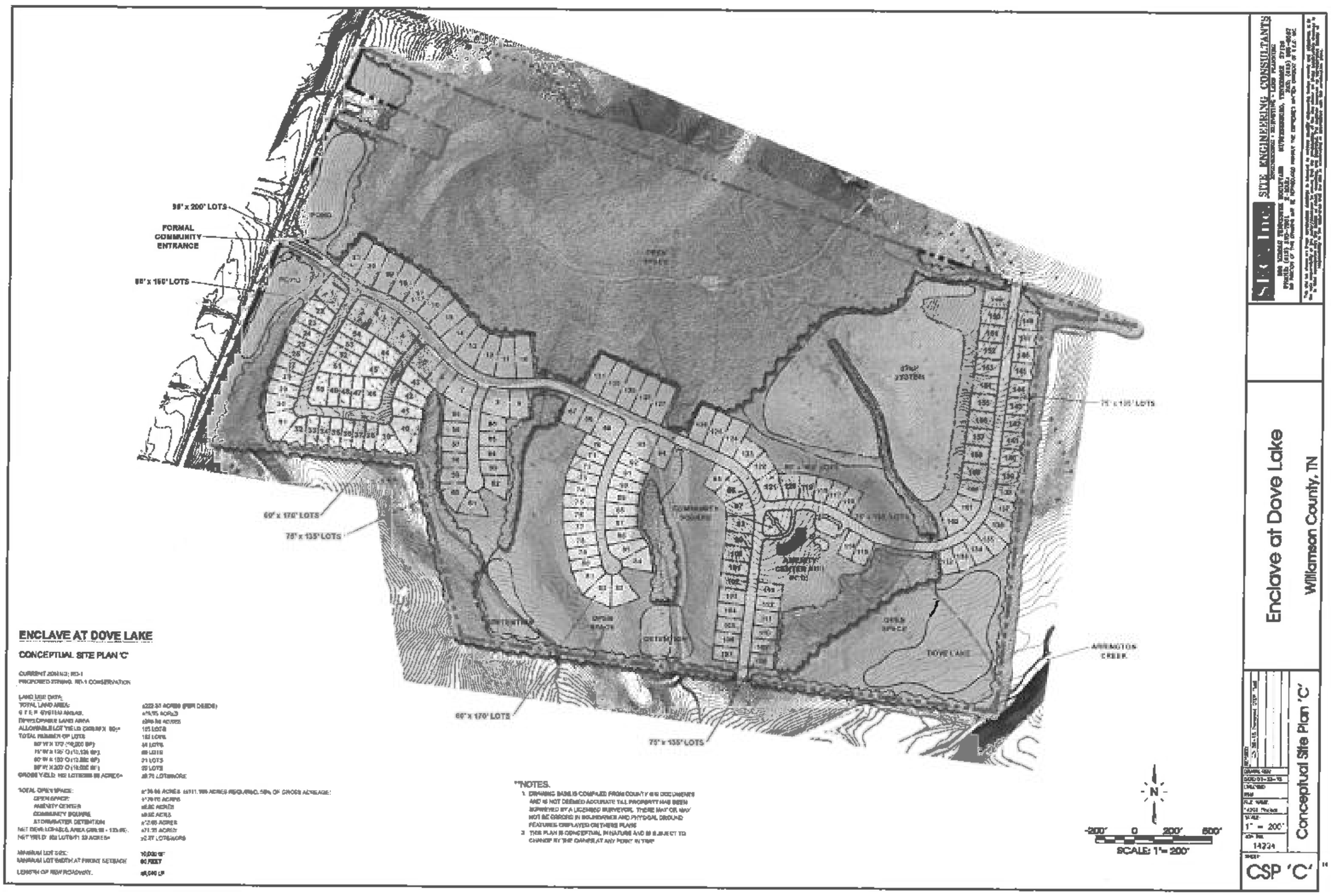
6.0 Determination of design percolation for each soil type:

-According to the Ksat data collected, the following chart reflects the percolation rate for each soil series considered suitable for drip dispersal

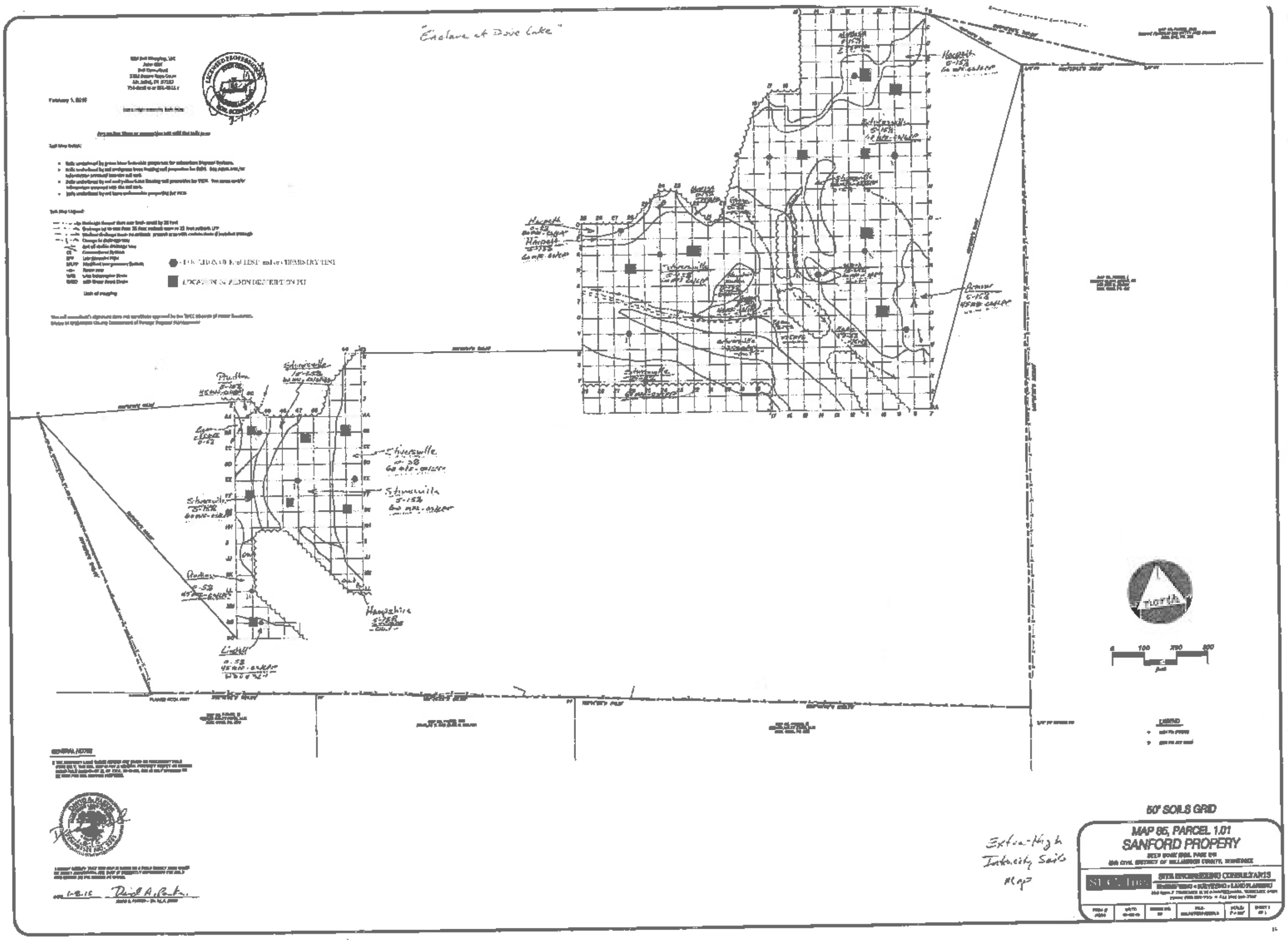
Soil Series	Percolation Rate (in/hr) (average of at least two tests in each series)
Armour	0.30
Harpeth	0.33
Lindell	0.66
Pruitton	0.50
Stiversville	0.48
Average of all soil series:	0.45

APPENDIX 1.2

TOPOGRAPHIC MAP AND EXTRA HIGH INTENSITY SOIL MAP BY GSM



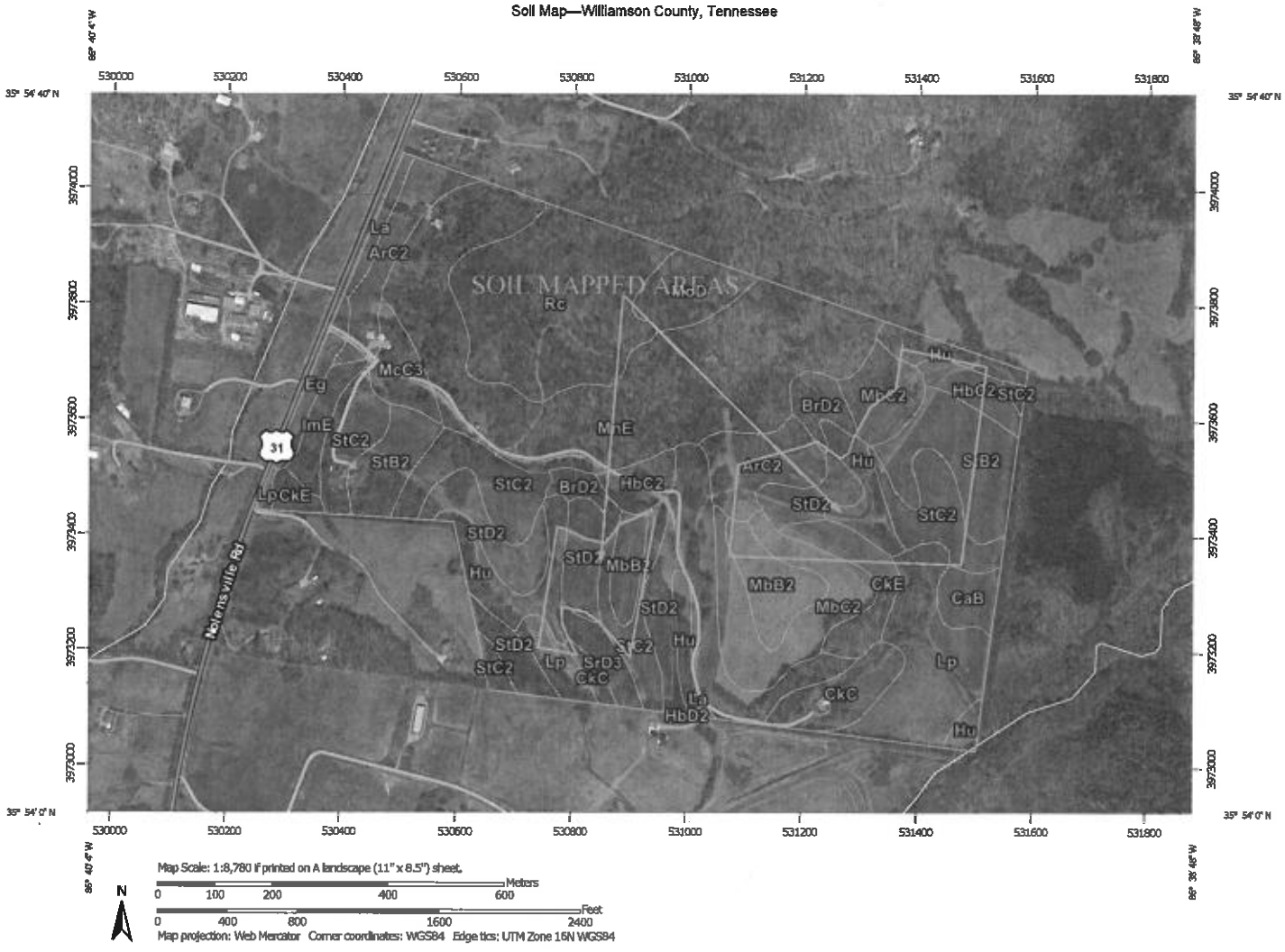
SITE ENGINEERING CONSULTANTS
95' x 200' LOTS
FORMAL COMMUNITY ENTRANCE
80' x 150' LOTS
OPEN SPACE
75' x 135' LOTS
60' x 170' LOTS
COMMUNITY SQUARE
AMENITY CENTER
DETENTION
OPEN SPACE
DOVE LAKE
ARRINGTON CREEK
ENCLAVE AT DOVE LAKE
CONCEPTUAL SITE PLAN 'C'
**NOTES.
SCALE: 1"= 200'
Enclave at Dove Lake
Williamson County, TN
Conceptual Site Plan 'C'
1" = 200'
CSP 'C'


"Enclave at Dove Lake"
NORTH
LEGEND
50' SOILS GRID
MAP 85, PARCEL 1.01
SANFORD PROPERY
SITE ENGINEERING CONSULTANTS
Extra-High Intensity Soils Map

APPENDIX 1.3

NRCS SOIL SURVEY MAP

Soil Map—Williamson County, Tennessee



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 1:15,800.

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: http://websoilsurvey.nrcs.usda.gov
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: Williamson County, Tennessee
Survey Area Data: Version 10, Aug 28, 2014

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

Date(s) aerial images were photographed: Mar 17, 2011—Jul 2, 2011

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

Williamson County, Tennessee (TN187)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ArC2	Armour silt loam, 5 to 12 percent slopes, eroded	10.9	5.0%
BrD2	Braxton cherty silt loam, 12 to 20 percent slopes, eroded	3.4	1.6%
CaB	Captina silt loam, phosphatic, 2 to 5 percent slopes	2.5	1.1%
CkC	Culleoka silt loam, 5 to 12 percent slopes	5.4	2.5%
CkE	Culleoka silt loam, 20 to 35 percent slopes	5.5	2.5%
Eg	Egam silt loam, phosphatic	2.1	1.0%
HbC2	Hampshire silt loam, 5 to 12 percent slopes, eroded	4.9	2.3%
HbD2	Hampshire silt loam, 12 to 20 percent slopes, eroded	0.0	0.0%
Hu	Huntington silt loam, phosphatic	12.9	6.0%
ImE	Inman flaggy silty clay loam, 20 to 30 percent slopes, eroded	2.6	1.2%
La	Lanton silt loam, phosphatic	1.6	0.7%
Lp	Lindell silt loam, 0 to 2 percent slopes, occasionally flooded	13.8	6.4%
MbB2	Maury silt loam, 2 to 5 percent slopes, eroded	6.8	3.1%
MbC2	Maury silt loam, 5 to 12 percent slopes, eroded	13.5	6.2%
McC3	Maury silty clay loam, 5 to 12 percent slopes, severely eroded	3.2	1.5%
MnE	Mimosa-Rock outcrop complex, 20 to 40 percent slopes	40.9	18.8%
MoD	Mimosa and Ashwood very rocky soils, 5 to 20 percent slopes	4.5	2.1%
Rc	Rockland	21.8	10.1%
SrD3	Stiversville clay loam, 12 to 20 percent slopes, severely eroded	2.3	1.0%
StB2	Stiversville silt loam, 2 to 5 percent slopes, eroded	12.8	5.9%
StC2	Stiversville silt loam, 5 to 12 percent slopes, eroded	20.7	9.5%

Williamson County, Tennessee (TN187)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
StD2	Stiversville silt loam, 12 to 20 percent slopes, eroded	25.0	11.5%
Totals for Area of Interest		217.0	100.0%

APPENDIX 2.0

OFFICIAL SOIL DESCRIPTIONS

LOCATION ARMOUR TN+AL KY

Established Series
Rev. RPS/DLN/JLN
04/2011

ARMOUR SERIES

The Armour series consists of very deep well drained soils on stream terraces, foot slopes, and valley floors. These soils formed in old alluvium, valley fill, or in alluvium and the underlying residuum of limestone. Slopes range 0 to 20 percent.

TAXONOMIC CLASS: Fine-silty, mixed, active, thermic Ultic Hapludalfs

TYPICAL PEDON: Armour silt loam - cultivated. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 8 inches, dark brown (7.5YR 3/2) silt loam; weak fine granular structure; very friable; many fine roots; moderately acid; clear smooth boundary. (5 to 10 inches thick)

A--8 to 17 inches, brown (10YR 4/3) silt loam; weak medium granular structure; friable; many fine roots; few angular fragments of chert; few fine black concretions; moderately acid; gradual smooth boundary. (0 to 8 inches thick)

Bt1--17 to 23 inches, brown (7.5YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; friable; common fine roots; few faint clay films on faces of peds; few angular fragments of chert; few fine black concretions; moderately acid; gradual smooth boundary.

Bt2--23 to 48 inches, brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; few to common fine roots; common distinct clay films on faces of peds; few angular fragments of chert; common fine black concretions; strongly acid; clear smooth boundary.

Bt3--48 to 58 inches, reddish brown (5YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; few fine distinct black stains on faces of peds and in pores ; common distinct clay films on faces of peds; few angular fragments of chert; common fine black concretions; strongly acid; gradual smooth boundary. (Combined thickness of the Bt horizon is 30 to 55 inches)

BC--58 to 75 inches, mottled reddish brown (5YR 4/4), strong brown (7.5YR 5/6), and light yellowish brown (10YR 6/4) silty clay loam; weak medium angular blocky structure; friable; few angular fragments of chert; strongly acid.

TYPE LOCATION: Williamson County, Tennessee; about 1 mile north of Franklin, Tennessee, on U.S. Highway 31; 1/4 mile south of Harpeth River Bridge on U.S. Highway 31; 300 feet east of U.S. Highway 31.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 40 to more than 80 inches. Depth to limestone bedrock is greater than 5 feet. Reaction is moderately acid or strongly acid except the surface layer is less acid where limed. Fragments of gravel or chert range from 0 to 10 percent in the upper 40

inches. The fragments range up to about 3 inches in diameter. Below 40 inches the fragment content is dominantly 0 to 35 percent, but ranges to 60 percent.

The A or Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 4. Texture is silt loam except a few severely eroded areas are silty clay loam.

Some pedons have a transitional horizon between the A and Bt horizons.

The Bt horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 or 5, and chroma of 4 or 6. Some pedons have few to common mottles in shades of brown, yellow or red. Texture of the fine earth is dominantly silt loam or silty clay loam but includes loam below 40 inches.

The BC and C horizons, where present, have the same colors and textures as the Bt horizon. Some pedons developed in limestone residuum below 48 inches and have 2Bt, 2BC or 2C horizons. These horizons have a hue of 5YR to 2.5Y, value of 4 or 5 and chroma of 4 to 8. Mottles are in shades of brown, yellow, red, or gray. Texture of the fine earth is silty clay loam, clay loam, silty clay, or clay.

COMPETING SERIES: These are the Barnsdale, Dexter, Dossman, Goodwill and Hicks series in the same family and the closely related Ashton, Elk, Sandhill and Stiversville series. Barnsdall and Dexter soils are free of fragments and have less clay and more sand in the lower part of the solum and C horizon. Dossman soils formed in thick deposits of loess on dissected uplands and have a lower sand content in the control section. Goodwill soils have more sand in the lower B horizon. Hicks soils developed in a loess mantle and residuum of interbedded sandstone, siltstone and shale on upland ridgetops. Rippable bedrock is at 40 to 60 inches from the surface. Ashton soils are moderately acid to neutral and are mesic. Elk soils have a lighter colored surface layer and are mesic. Sandhill and Stiversville soils are fine-loamy and have bedrock at 40 to 60 inches from the surface.

GEOGRAPHIC SETTING: Armour soils are on stream terraces, foot slopes, and valley floors. Slopes range from 0 to 20 percent. These soils formed in old alluvium, valley fill, or in alluvium and the underlying clayey residuum of limestone. Near the type location, mean annual temperature is 59 degrees F. and average annual precipitation is 47 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Hicks and Stiversville series, and the Braxton, Hampshire, Inman, Maury, Sengtown, Byler, Tarklin, Humphreys, Hawthorne, and Mimosa series. The Braxton, Hampshire, Inman, Maury, and Sengtown soils are on uplands and are clayey. The Byler and Tarklin soils are on stream terraces and have a fragipan. Humphreys soils are on foot slopes and stream terraces and are fine-loamy. Hawthorne soils are on uplands and are loamy-skeletal.

DRAINAGE AND PERMEABILITY: Well drained; medium runoff; moderate permeability.

USE AND VEGETATION: Most of the areas are cleared and used for pasture, hay, small grain, tobacco, and corn. The native vegetation was mixed hardwoods including oaks, hickory, elm, hackberry, maple, beech, black walnut, ash, locust, yellow-poplar, and red cedar.

DISTRIBUTION AND EXTENT: The Nashville Basin and Highland Rim in Tennessee and the inner bluegrass region of Kentucky. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Maury County, Tennessee; 1955.

REMARKS: Diagnostic horizons recognized in this pedon are:

Ochric epipedon - 0 to 17 inches (Ap, A horizons)

Argillic horizon - 17 to 58 inches (Bt horizon)

National Cooperative Soil Survey
U.S.A.

LOCATION EGAM TN+AL AR KY VA

Established Series
Rev. RPS:JCJ
04/2001

EGAM SERIES

The Egam series consists of very deep, well drained or moderately well drained soils that formed in clayey alluvium on flood plains and in depressions. Slopes are dominantly less than 2 percent but range from 0 to 5 percent.

TAXONOMIC CLASS: Fine, mixed, active, thermic Cumulic Hapludolls

TYPICAL PEDON: Egam silty clay loam--pasture. (Colors are for moist soil.)

Ap--0 to 7 inches; dark brown (10YR 3/3) silty clay loam; moderate medium granular structure; friable; many fine roots; moderately acid; clear smooth boundary. (6 to 10 inches thick)

A--7 to 22 inches; very dark grayish brown (10YR 3/2) silty clay loam; strong medium angular blocky structure, some medium prismatic structure that parts to angular blocky; firm; many fine roots; moderately acid; gradual smooth boundary. (6 to 30 inches thick)

Bw1--22 to 39 inches; very dark grayish brown (10YR 3/2) silty clay, few fine faint grayish brown mottles; weak medium prismatic structure parting to strong medium angular blocky; very firm; common fine roots largely between peds, few fine roots within peds; pressure faces on some peds; slightly acid; gradual smooth boundary. (0 to 30 inches thick)

Bw2--39 to 56 inches; dark brown (10YR 4/3) silty clay;strong medium angular blocky structure; firm; common fine roots; pressure faces on some peds; common fine and medium faint dark grayish brown (10YR 4/2) redox depletions; slightly acid; gradual smooth boundary.

Bw3--56 to 75 inches; brown (10YR 4/3) silty clay loam;moderate medium angular blocky structure; firm; few fine roots;common medium and fine faint dark grayish brown (10YR 4/2) redox depletions; slightly acid. (Combined thickness of the Bw horizon below the mollic epipedon ranges from 20 to 55 inches)

TYPE LOCATION: Davidson County, Tennessee; Tennessee State University farm; northwest corner of farm, 200 feet south of Cumberland River and 150 feet west of rock fence.USGS topo Quad: (unknown), latitude: (unknown); longitude (unknown).

RANGE IN CHARACTERISTICS: Depth to bedrock is greater than 60 inches. Thickness of the mollic epipedon ranges from 24 to 55 inches. Reaction is neutral to moderately acid in the A and B horizon, below about 50 inches it ranges from moderately alkaline to moderately acid.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. Some pedons have a few faint gray and brown mottles in the lower part. Texture is dominantly silty clay loam or silt loam but a few pedons are loam or silty clay.

The upper part of the Bw horizon is part of the mollic epipedon and in some pedons has colors like the A horizon. Below this, the Bw horizon has hue of 7.5YR to 2.5Y, value of 4 or 5 and chroma of 3 to 6. Redox features is shades of brown or gray are few to common and those with chroma 1 or 2 range from none to common.

Below about 50 inches, the Bw horizon or C horizon, where present, has hue of 7.5YR to 2.5Y, value of 4 to 6 and chroma of 1 to 6. Redox features are in shades of brown and gray and some pedons are mottled without a dominant matrix color. Texture is dominantly silty clay loam, silty clay or clay, but some pedons range to clay loam or coarser.

COMPETING SERIES: These are the Frioton series in the same family. Similar soils are the Agee, Arrington, Bowdre, Cannon, Catalpa, Godwin, Lanton, and Staser series in closely related families. Frioton soils have free carbonates in the solum. Arrington soils are fine-silty and Cannon and Staser soils are fine-loamy. Bowdre and Catalpa soils have mollic epipedons less than 20 inches thick. Agee, Godwin, and Lanton soils are more poorly drained. They have distinct or prominent gray mottles in the mollic epipedon or dominantly gray colors just below the mollic epipedon.

GEOGRAPHIC SETTING: Egam soils are on flood plains and in depressions. Slopes are most commonly 0 to 2 percent and range from 0 to about 5 percent. The soil formed in fine-textured alluvium. Near the type location average annual air temperature is about 59 degrees F., and average annual precipitation is about 47.3 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the similar Arrington, Agee, Godwin, Lanton, and Staser series and the Lynnville series which is fine-silty.

DRAINAGE AND PERMEABILITY: Well drained or moderately well drained; slow runoff; moderately slow permeability. Most areas are flooded for very brief periods. The flooding is rare to frequent.

USE AND VEGETATION: Nearly all areas are cleared and used chiefly for growing corn, soybeans, cotton, hay, and pasture. The original vegetation was hardwood forest, chiefly of oaks, maple, elm, gums, ash, sycamore, beech, and hickory.

DISTRIBUTION AND EXTENT: Nashville Basin and Great Valley regions of Tennessee, northwestern Georgia, northern Alabama, Arkansas, and Kentucky. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Lincoln County, Tennessee; 1938.

REMARKS: Diagnostic horizons recognized in this pedon are: Mollic epipedon - 0 to 39 inches (Ap, A, Bw1 horizons) Cambic horizon - 39 to 75 inches (Bw1, Bw2, Bw3 horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION HAMPSHIRE TN+KY

Established Series
Rev. RPS
04/2001

HAMPSHIRE SERIES

The Hampshire series consists of deep, well drained, soils on uplands. These soils formed in clayey residuum of interbedded limestone and shale and the underlying residuum of interbedded siltstone, fine grained sandstone, shale and limestone. Slopes range from 2 to 30 percent.

TAXONOMIC CLASS: Fine, mixed, active, thermic Ultic Hapludalfs

TYPICAL PEDON: Hampshire silt loam--pasture. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 7 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable; many grass roots; strongly acid; clear wavy boundary. (5 to 9 inches thick)

Bt1--7 to 12 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; firm; common faint clay films on faces of peds; many fine roots; few soft fragments of shale; strongly acid; clear wavy boundary. (3 to 7 inches thick)

Bt2--12 to 24 inches; strong brown (7.5YR 5/6) clay; moderate medium and fine subangular blocky structure; firm; many distinct clay films on faces of peds; few small soft and hard fragments of shale and limestone most of which are coated with clay films; few roots; strongly acid; gradual wavy boundary. (8 to 15 inches thick)

Bt3--24 to 30 inches; strong brown (7.5YR 5/6) clay; moderate medium and fine subangular blocky structure; firm; many distinct clay films on faces of peds; few soft and hard fragments of shale and limestone; few fine roots; strongly acid; clear wavy boundary. (Combined thickness of the Bt horizon ranges from 25 to 45 inches)

2Bt4--30 to 40 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; few faint clay films on faces of peds; 15 percent by volume of soft fragments of sandstone and siltstone and a few hard fragments of limestone; few roots; strongly acid; clear wavy boundary. (0 to 10 inches thick)

2C--40 to 47 inches; strong brown (7.5YR 5/6) very channery loam; massive; friable; 60 percent soft and hard, flat fragments of sandstone, siltstone and limestone up to 10 inches across strongly acid; clear smooth boundary. (0 to 12 inches thick)

2Cr--47 to 60 inches; interbedded sandstone, siltstone and limestone. Weathered bedrock that is rippable and can be dug with a spade except for some hard strata.

TYPE LOCATION: Dekalb County, Tennessee; 1 mile southeast of Alexandria, in northwest corner of Lawrence farm.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 30 to 50 inches and depth to bedrock

ranges from 40 to 60 inches. Fragments of rock range from 0 to 15 percent in the A and Bt horizons, 10 to 50 percent in the BC and C horizons where present, 5 to 20 percent in the 2Bt horizon, and 25 to 75 percent in the 2C horizon. Reaction ranges from medium acid to very strongly acid. Phosphate content is medium or high.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. The chroma of 6 is in severely eroded areas. It is dominantly silt loam, but ranges to silty clay loam in severely eroded areas.

Some pedons have a transitional horizon between the A and Bt horizons.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. Some pedons are mottled with shades of brown and yellow in the middle and lower parts. It is clay, silty clay, silty clay loam or clay loam. Clay content of the control section is dominantly 40 to 45 percent, but ranges from 35 to 55 percent.

A lithologic discontinuity is not a requirement of the series. Where present, the BC and C horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. The fine earth texture ranges from loam to clay.

The 2Bt horizon has the same colors as the Bt horizon. The fine texture is clay loam, silty clay loam or clay.

The 2C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. Mottles are in shades of brown, yellow, and gray. The fine earth fraction is loam, silt loam, clay loam, or silty clay loam.

The 2Cr horizon is interbedded siltstone sandstone, shale and limestone. The weathered bedrock is rippable and in most places can be dug with a spade, but it includes some thin strata that is hard. Most of the rock was calcareous prior to weathering and some strata contains phosphate nodules.

COMPETING SERIES: These are the Brantley, Canton Bend, Capshaw, Cowton, Enon, Gundy, Maben, Magnet, Mecklenburg, Meth, Spray, and Zion series in the same family and Mimosa, Needmore and Talbott series in similar families. Brantley and Enon soils are deeper than 60 inches to bedrock. Canton Bend, Gundy, Maben, Magnet and Mecklenburg soils have hues of 5YR or redder in the B horizon. Capshaw soils have gray mottles in the B horizon. Cowton and Needmore soils have rippable bedrock at a depth of 40 to 60 inches. Meth soils have a solum greater than 60 inches thick. Mimosa soils have a solum less than 20 inches thick. Talbott soils have hue of 5YR or redder in the major part of the B horizon. Zion soils have hard bedrock at a depth of 20 to 40 inches.

GEOGRAPHIC SETTING: Gently sloping to steep uplands. Slopes range from 2 to 30 percent. These soils formed in clayey residuum of interbedded limestone and shale the underlying residuum of interbedded siltstone, fine grained sandstone and limestone. Near the type location, the average annual air temperature is 60 degrees F. and the average annual precipitation is about 52 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Mimosa soils and the Hicks, Inman, Dowellton and Sandhill and Stiversville series. Hicks soils formed partly in a loess mantle and are fine-silty. Inman soils are 20 to 40 inches to bedrock and are flaggy. Dowellton soils have gentle slopes and are poorly drained. Sandhill soils are fine-loamy and are flaggy. Stiversville soils are fine-loamy.

DRAINAGE AND PERMEABILITY: Well drained; moderately slow permeability; medium to rapid runoff.

USE AND VEGETATION: Most areas are cleared. Much of the soil is in pasture and hay, but some is used for growing corn, small grains, and tobacco. The native vegetation is forests of oaks, walnut, locust, ash, hickory, beech, elm, and maple.

DISTRIBUTION AND EXTENT: The Central Basin in Tennessee. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Maury County, Tennessee; 1954.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - The zone from 0 to 7 inches (Ap horizon)

Argillic horizon - The zone from 7 to 40 inches (Bt horizon)

Paralithic contact - at 47 inches (top of Cr horizon)

National Cooperative Soil Survey
U.S.A.

LOCATION HARPETH TN

Established Series
Rev. DEL:JLP
04/2001

HARPETH SERIES

The Harpeth series consists of very deep, well drained, moderately permeable soils on high terraces and uplands. They formed in loess and alluvium over residuum from limestone. Slopes range from 2 to 12 percent.

TAXONOMIC CLASS: Fine-silty, mixed, active, thermic Typic Paleudalfs

TYPICAL PEDON: Harpeth silt loam - pasture. (Colors are for moist soil)

Ap--0 to 7 inches; brown (l0YR 4/3) silt loam; weak fine granular structure; friable, many fine roots; many fine tubular pores; strongly acid; abrupt smooth boundary. (6 to 16 inches thick)

BA--7 to 15 inches; strong brown (7.5YR 4/6) and brown (10YR 4/3) silt loam; weak fine granular structure parting to weak fine subangular blocky; friable; many fine roots; many fine tubular pores; few fine iron-manganese concretions; medium acid; clear smooth boundary.

Bt1--l5 to 25 inches; strong brown (7.5YR 4/6) silt loam; weak fine and medium subangular blocky structure; friable; common fine roots; many fine tubular pores; few faint clay films on faces of peds; few fine iron-manganese concretions; slightly acid; clear smooth boundary.

Bt2--25 to 35 inches; strong brown (7.5YR 4/6) silt loam; moderate fine and medium subangular blocky structure; friable; few fine roots; many fine tubular pores; common distinct clay films on faces of peds; common fine iron-manganese concretions; slightly acid; clear smooth boundary. (Combined thickness of the Bt ranges from 20 to 60 inches or more.)

2Bt3--35 to 49 inches; strong brown (7.5YR 4/6) clay loam; moderate fine and medium subangular blocky structure; friable; few fine roots; many fine tubular pores; common distinct clay films on faces of peds; common fine iron-manganese concretions; about 1 percent by weight pebbles of mixed sedimentary rocks 2 to 5 mm in diameter; slightly acid; gradual smooth boundary.

2Bt4--49 to 65 inches; strong brown (7.5YR 4/6) clay loam; many medium faint strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common fine tubular pores; common distinct clay films on faces of peds; common fine iron-manganese concretions; about 1 percent by weight pebbles of mixed sedimentary rocks 2 to 5 mm in diameter; slightly acid.

TYPE LOCATION: Sumner County, Tennessee; west of Gallatin, 2.0 miles west along Long Hollow Pike from intersection of State Highway 25 and Long Hollow Pike, 200 feet north of road and 150 feet east of private drive.

RANGE IN CHARACTERISTICS:

Solum thickness and depth to limestone bedrock are more than 60 inches. Most pedons have a lithologic 30

discontinuity however, this is not a requirement for the series. Content of fragments of gravel range from 0 to 10 percent in the A and Bt horizons and from 0 to 15 percent in the 2Bt horizons. This soil is slightly acid to strongly acid except the surface layer is less acid where limed. Most pedons have transition horizons with colors and textures similar to adjacent horizons.

The Ap horizon has hue of l0YR or 7.5YR, value of 3 or 4 and chroma of 4. Some pedons have surfaces layers less than 7 inches thick with hue of l0YR or 7.5YR, value of 3 and chroma of 2 or 3.

The Bt horizons have hue of 7.5YR or 5YR, value of 4 or 5 and chroma of 4 or 6. They are silt loam or silty clay loam. Some pedons contain few to common brownish mottles.

The 2Bt horizon has hue of l0YR, 7.5YR, or 5YR, value of 4 or 5 and chroma of 4 or 6. They are clay loam or silty clay loam except in some pedons, below about 48 inches, texture includes silty clay or clay. Most pedons contain few to common brownish mottles.

COMPETING SERIES: These are the Atwood, Lexington and Sykes series in the same family and the Armour, Crider, Kamie, Macon, Peridge and Ryker series. Atwood soils formed in marine or fluvitile sediments in the Southern Coastal Plains. Armour and Lexington soils have argillic horizons that decrease in clay content by 20 percent or more of the maximum within 60 inches of the soil surface. Crider, Peridge and Ryker soils are mesic. Kame and Macon soils are fine-loamy. Sykes soils have clayey discontinuities with moderately slow permeability within 48 inches of the surface.

GEOGRAPHIC SETTING: Harpeth soils are on nearly level to rolling high stream terraces and uplands. The soil formed in a silty mantle (presumably loess) 2 to 3 feet and underlying old loamy alluvial deposits. In many places this is underlain by clayey limestone residuum. Commonly slopes are complex and convex and range from 0 to 12 percent. Near the type location the average annual air temperature is about 58 degrees F and the average annual precipitation is about 48 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Armour and Sykes series and the Barfield, Byler, Inman, and Mimosa soils. Barfield and Inman soils, at similar elevations on nearby uplands, are clayey and are less than 40 inches deep to rock. Byler soils, on stream terraces at lower elevations, have a fragipan and are moderately well drained. Mimosa soils, on adjacent and nearby uplands, are clayey.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability; medium runoff.

USE AND VEGETATION: Nearly all areas are cleared and used for growing row crops, pasture and hay. Crops commonly grown are corn, soybeans, tobacco, small grains and alfalfa. The native vegetation was mixed hardwoods such as oaks, hickories, beech, sweetgum and popular.

DISTRIBUTION AND EXTENT: The Nashville Basin in Tennessee. The series is of small extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Rutherford County, Tennessee, January 1974.

REMARKS: In the past, the Harpeth soils were included with the Pembroke, Maury and Armour series in Tennessee. The site of the original Official Series Description is on the University of Tennessee Middle Tennessee Experiment Station
in Maury County, Tennessee. The area is mapped in the Maury series in the 1952 published soil survey of Maury County.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - from the surface of the soil to about 7 inches (Ap horizon).

Argillic horizon - from about 7 inches to about 65 inches (BA, Bt1, Bt2, 2Bt3, 2Bt4 horizon

ADDITIONAL DATA: Particle size and chemical data on this pedon was provided by the National Soil Survey Laboratory in Lincoln, Nebraska in 1986. (S85TN-165-001).

National Cooperative Soil Survey
U.S.A.

LOCATION LINDELL TN+KY

Established Series
Rev. JCJ
04/2001

LINDELL SERIES

The Lindell series consists of very deep, moderately well drained soils on floodplains. The soil formed in loamy alluvium. Slopes range from 0 to 3 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, active, thermic Fluvaquentic Eutrudepts

TYPICAL PEDON: Lindell silt loam, on level first bottom, in hay. (Colors are for moist soil).

Ap--0 to 7 inches; brown (10YR 4/3) silt loam; weak medium granular structure; friable; common fine roots; few fine black (10YR 2/1) manganese concretions; slightly acid; clear smooth boundary. (5 to 10 inches thick)

Bw1--7 to 11 inches; brown (10YR 4/3) silt loam; moderate medium granular and subangular blocky structure; friable; common fine roots; few fine black (10YR 2/1) manganese concretions; slightly acid; clear smooth boundary.

Bw2--11 to 15 inches; brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; friable; few fine roots; few fine black (10YR 2/1) manganese concretions; few medium faint yellowish brown (10YR 5/4) masses as iron accumulation; few medium faint brown (10YR 5/3) iron depletions; slightly acid; clear smooth boundary.

Bw3--15 to 26 inches; brown (10YR 5/3) silt loam; moderate medium subangular blocky structure; friable; few fine roots; few fine black (10YR 2/1) manganese concretions; common fine and medium faint dark yellowish brown (10YR 4/4) masses as iron accumulations; common fine and medium dark grayish brown (10YR 4/1) iron depletions; slightly acid; clear smooth boundary.

Bg1--26 to 34 inches; dark grayish brown (10YR 4/2) silt loam; weak medium subangular blocky structure; friable; few fine roots; few fine black (10YR 2/1) manganese concretions; common medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) masses as iron accumulations; slightly acid; clear smooth boundary. (Combined thickness of the Bw horizon ranges from 15 to 45 inches)

Bg2--34 to 52 inches; grayish brown (10YR 5/2) silty clay loam; weak medium and coarse subangular blocky structure; friable; common fine black (10YR 2/1) black manganese concretions; common fine and medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) masses as iron accumulations; common medium faint gray (10YR 6/1) iron depletions; moderately acid; gradual smooth boundary. (0 to 22 inches thick)

Cg--52 to 62 inches; grayish brown (10YR 5/2) silty clay loam; massive; friable; common fine black (10YR 2/1) manganese concretions; common fine and medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) masses as iron accumulations; common fine and medium faint gray (10YR 6/1) iron depletions; moderately acid.

TYPE LOCATION: Davidson County, Tennessee; 0.1 mile north of Cleeces Ferry; 50 feet east of Old Hickory Boulevard.

RANGE IN CHARACTERISTICS: Depth to bedrock is greater than 5 feet. Reaction ranges from moderately acid through neutral in each horizon. Fragments range from 0 to 20 percent by volume in the A horizon, 0 to 15 percent in the B horizon, and 0 to 30 percent in the C horizon. Fragments are dominantly chert. The soil ranges from medium to high in phosphorous in each horizon.

The A and Ap horizon have hue of 10YR or 7.5YR, value of 4 or 5 and chroma of 2 to 4. Some pedons have an A horizon with hue of 10YR, value of 3 and chroma of 2 or 3 that is less than 7 inches thick. Texture of the fine earth fraction is commonly silt loam, but includes loam and silty clay loam.

The Bw horizon has hue of 10YR, value of 4 or 5 and chroma of 3 or 4. Few to common redoximorphic features with chroma 2 or less are within 24 inches of the soil surface. Texture is silt loam, silty clay loam, loam, or clay loam

The Bg horizon has hue of 10YR, value of 4 to 6 and chroma of 1 or 2. Common to many redoximorphic features are in shades of gray and brown. Some pedons are an evenly mottled pattern in these colors without a dominant color. Texture is silt loam, silty clay loam, loam or clay loam. Some pedons have buried A and B horizons.

The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6 and chroma of 1 or 2. Common to many redoximorphic features are in shades of gray, black, and brown. Texture of the fine earth fraction is loam, silt loam, silty clay loam or clay loam.

COMPETING SERIES: Monacan is the only series in the same family. Monacan soils have less than 5 percent coarse fragments in the control section and typically have a higher sand content. Soils in closely related families are the Egam, Hamblen, Lindside, and Lynnville series. Egam soils have mollic epipedons and fine-textured control sections. Hamblen soils have siliceous mineralogy. Lindside soils have a mesic soil temperature and fine-silty control sections. Lynnville soils have mollic epipedons.

GEOGRAPHIC SETTING: Lindell soils are on the flood plains of rivers, creeks, and smaller streams. Slopes are mainly less than 1 percent but range up to about 3 percent along narrow drainageways. Near the type location, mean annual temperature is 59.0 degrees F., and mean annual precipitation is 47.3 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Egam, Arrington, Sullivan, and Nolin soils on flood plains. Arrington soils are well drained and have a thick mollic epipedon. Egam soils have a mollic epipedon and have fine texture. Sullivan soils are in similar positions on floodplains and are well drained. Nolin soils are fine-silty. The Armour soils, on adjacent or nearby terraces and footslopes, and the Mimosa, Stiversville, Hampshire, and Inman series are all on the uplands. Armour, Mimosa, Stiversville, Hampshire and Inman soils have argillic horizons.

DRAINAGE AND PERMEABILITY: Moderately well drained. Slow runoff. Moderate permeability.

USE AND VEGETATION: These soils are used for growing corn, soybeans, hay, and pasture. The native vegetation was mixed hardwoods.

DISTRIBUTION AND EXTENT: The Nashville Basin of Tennessee and adjacent areas of the Highland Rim in Tennessee and Kentucky. It is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Davidson County, Tennessee; 1977.

REMARKS: Diagnostic horizons recognized in this pedon are:

Ochric epipedon - from 0 to 7 inches (Ap horizon)

Cambic horizon - from 7 to about 34 inches (Bw and Bg horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION MARSH TN+KY

Established Series
REV - CLD,JCJ
04/2001

MARSH SERIES

The Marsh series consists of moderately deep, well drained soils on uplands. The soil formed in colluvium or residuum from interbedded sandy limestone, siltstone, and shale. These soils are on gently sloping to steep, highly dissected back slopes, shoulders, and narrow on ridgecrests. Slopes range from 2 to 45 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, semiactive, thermic Ultic Hapludalfs

TYPICAL PEDON: Marsh silt loam on a south facing, convex, 20 percent slope under hardwoods at an elevation of 740 feet. (Colors are for moist soil unless otherwise noted.)

Oi-- 1 to 0 inches; fibric material; slightly decomposed leaves, twigs, and woody materials. (0 to 2 inches thick)

A-- 0 to 3 inches; dark brown (10YR 3/3) loam; weak fine and medium granular structure; very friable; common fine roots; approximately 2 percent channers of sandy limestone; slightly acid; clear wavy boundary (2 to 7 inches thick).

BE-- 3 to 11 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable; common fine and medium roots; approximately 10 percent channers of sandy limestone; strongly acid; clear wavy boundary.

Bt-- 11 to 19 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; friable; common fine and few medium and coarse roots; few faint yellowish brown (10YR 5/4) clay films on faces of peds; approximately 10 percent channers of sandy limestone and siltstone; very strongly acid; clear wavy boundary. (8 to 30 inches thick)

CB-- 19 to 23 inches; yellowish brown (10YR 5/6) very channery loam; weak medium subangular blocky structure; friable; few fine roots; approximately 55 percent channers of sandy limestone and siltstone; strongly acid; abrupt wavy boundary. (5 to 9 inches thick)

Cr-- 23 to 35 inches; highly weathered, interbedded siltstone and sandy limestone with thin strata of clayey soil material.

TYPE LOCATION: Marshall County, Tennessee; 0.8 miles north of the community of Mooresville on Fitzpatrick Road; 1000 feet northwest on a hillside.

RANGE IN CHARACTERISTICS: Depth to a paralithic contact is 20 to 40 inches. Content of fragments, dominantly channers of sandy limestone or siltstone, range from 0 to 20 percent in the A horizon, 0 to 35 percent in the B horizon, and 10 to 59 percent in the C horizon. Reaction ranges from slightly acid to very strongly acid, except where limed.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 4, and chroma of 3 or 4. Texture is loam or silt loam, or their channery or gravelly analogs.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. Some pedons have variegations of parent material in shades of red or brown. Texture of the fine-earth fraction is loam, silt loam, or silty clay loam. In some pedons, the lower part of the B horizon has texture ranging to clay loam or silty clay.

The C horizon variegated colors from parent material in shades of red, brown, olive, or gray. Texture is loam, silt loam, silty clay loam, clay loam, or silty clay, or their channery or flaggy analogues.

The Cr horizon consists of interbedded sandy limestone, shale, and siltstone. Some pedons include a few thin strata of hard limestone. Typically, this horizon can be dug with a spade, except for the hard strata.

COMPETING SERIES: These are the Bolivar, Deanburg, Liddieville, Pamunkey, Sandhill, Stiversville, and Toine series in the same family. Bolivar soils have hues redder than 7.5YR in the Bt horizon. Deanburg, Liddieville, Pamunkey, and Toine soils are greater than 60 inches to bedrock. Sandhill and Stiversville soils have a paralithic contact between 40 and 60 inches.

GEOGRAPHIC SETTING: Steep upland hillsides and narrow rolling ridgecrests in the Nashville Basin. Slopes range from 2 to 45 percent. Marsh soils developed in colluvium or residuum from thinly bedded sandy limestone interbedded with siltstone and shale. Near the type location the mean annual air temperature is 57 degrees F and the mean annual precipitation is about 54 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: The Hampshire, Mimosa, Talbott, Hicks, Armour, and Stiversville soils. The Hampshire, Mimosa, and Talbott soils have a fine family particle size control section. In addition, the Mimosa and Talbott soils are underlain by hard limestone bedrock. The Hicks and Armour soils are in a fine-silty family particle size control section and are greater than 60 inches to bedrock. The Stiversville soils are 40 to 60 inches to a paralithic contact.

DRAINAGE AND PERMEABILITY: Marsh soils are well drained with medium to rapid runoff. Permeability is moderate or moderately rapid.

USE AND VEGETATION: Chiefly pasture and hay, with some areas cropped in tobacco and small grains. Native forest has oak, maple, hickory, black walnut, beech, hackberry, poplar, ash, and elm as the dominant species.

DISTRIBUTION AND EXTENT: Nashville Basin of Tennessee. The series is of small extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Marshall County, Tennessee, 1996.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Argillic horizon - 11 to 19 inches (Bt horizon)

Ochric epipedon - 0 to 11 inches (A and BE horizons)

Paralithic contact - at 23 inches (top of Cr horizon)

This soil was previously mapped as the Culleoka series, which is now mesic.

National Cooperative Soil Survey
U.S.A.

LOCATION MIMOSA TN+AL

Established Series
Rev. RPS
04/2001

MIMOSA SERIES

The Mimosa series consists of deep, well drained, slowly permeable soils that formed in clayey residuum from phosphatic limestone. These soils are on gently sloping to steep uplands with medium to rapid runoff. Near the type location, average annual precipitation is 49 inches and average annual air temperature is 60 degrees F. Slopes range from 2 to 45 percent.

TAXONOMIC CLASS: Fine, mixed, semiactive, thermic Typic Hapludalfs

TYPICAL PEDON: Mimosa silt loam--cultivated. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 6 inches; dark brown (10YR 3/3) silt loam; moderate fine granular structure; friable; common fine roots; about 10 to 15 percent by volume fragments of chert 1 to 3 inches across; few fine black concretions; medium acid; clear smooth boundary. (4 to 8 inches thick)

Bt1--6 to 12 inches; brown (7.5YR 4/4) silty clay; moderate medium angular and subangular blocky structure; firm; common fine roots; thin continuous clay films; few fine black and dark brown concretions; few 1 to 3 inch angular fragments of chert; strongly acid; gradual wavy boundary.

Bt2--12 to 22 inches; strong brown (7.5YR 5/6) clay; few fine and medium faint yellowish brown (10YR 5/4) and brown (7.5YR 4/4) mottles; moderate angular blocky structure; very firm; few fine roots; thin continuous clay films; few fine black and dark brown concretions; strongly acid; gradual wavy boundary.

Bt3--22 to 30 inches; yellowish brown (10YR 5/6) clay; common fine and medium distinct brown (7.5YR 4/4), yellowish red (5YR 5/6), and pale brown (10YR 6/3) mottles; strong medium angular blocky structure; very firm; few fine roots; thin continuous clay films; few fine dark brown and black concretions; strongly acid; gradual wavy boundary.

Bt4--30 to 40 inches; yellowish brown (10YR 5/6) clay; common fine and medium distinct pale brown (10YR 6/3) and strong brown (7.5YR 5/6) mottles; weak medium and coarse angular blocky structure; very firm; few fine roots; few thin patchy clay films; common fine dark brown and black concretions; strongly acid; gradual wavy boundary. (Combined thickness of the Bt horizon ranges from 25 to 45 inches)

BC--40 to 50 inches; yellowish brown (10YR 5/6) clay; common fine to coarse distinct light yellowish brown (10YR 6/4) and light brownish gray (10YR 6/2) mottles; weak medium and coarse angular blocky structure; very firm, common medium and coarse black concretions; some thick stains along cracks and on faces of peds; strongly acid; gradual wavy boundary. (0 to 20 inches thick)

C--50 to 55 inches; light olive brown (2.5Y 5/4) clay; many fine to coarse prominent light brownish gray (10YR 6/2), yellowish brown (10YR 5/4), and gray (N 6/0) mottles; massive; very firm; common fine and medium black concretions, medium acid. (0 to 15 inches thick)

R--55 inches; phosphatic limestone bedrock.

TYPE LOCATION: Rutherford County, Tennessee, 1 mile southwest of Eagleville; 200 feet northeast of Eagle benchmark; 1,000 feet southeast of barn on Gordon Lamb Farm.

RANGE IN CHARACTERISTICS: Solum thickness and depth to rock ranges from 40 to 60 inches. Rock fragments range from 0 to 25 percent in the surface layer and 5 percent or less below. The fragments are mostly chert and most areas have less than 15 percent in the surface layer. The soil is medium acid to very strongly acid except the layer just above bedrock is medium acid to mildly alkaline. Phosphorous content of each horizon is medium to high.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5 and chroma of 3 to 6. Value of 5 and chroma of 6 are for pedons in severely eroded areas. Horizons with value of 3 are less than 7 inches thick. The texture is mostly silt loam or silty clay loam, but includes silty clay and clay in severely eroded areas.

Some pedons have a transitional between the Ap and Bt horizons. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5 and chroma of 4 to 8. The texture is silty clay or clay except the upper few inches is also silty clay loam. Mottles are in shades of brown and red.

The BC and C horizons have hue of 10YR or 2.5Y, value of 5 and chroma of 4 or 6. Mottles are in shades of brown, red and gray. The texture is silty clay or clay.

COMPETING SERIES: These are the Archer, Bradyville, Conasauga, Talbott, and Winnsville series in the same family and the Braxton, Capshaw, Colbert, Conasauga, Hampshire, and Needmore series. Archer soils have sandy loam to sand surface horizons and a noticeable amount of sand in the upper part of the B horizon. Bradyville soils have Bt horizons redder than 7.5YR hue. Braxton soils have sola more than 60 inches tkick and base saturation is less than 60 percent. Capshaw soils have gray mottles in the middle and lower parts of the Bt horizon and base saturation of 35 to 60 percent. Colbert soils have montmorillonitic mineralogy and gray mottles in the B horizon. Conasauga soils have a paralithic contact at depths of 20 to 40 inches. Hampshire soils have a paralithic contact at depths of 40 to 60 inches and base saturation of less than 60 percent. Needmore soils are mesic. Talbott soils have bedrock at depths of 20 to 40 inches and have redder hues in the Bt horizon.

GEOGRAPHIC SETTING: Gently sloping to steep upland extending from the edge of the Highland Rim down into the outer Central Basin, and on outlying knobs and hills within the inner Central Basin. Slopes range from about 2 to 45 percent. The soils formed chiefly in clayey residuum weathered from phosphatic limestone. Near the type location, average annual precipitation is 49 inches and average annual air temperature is 60 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Braxton series, and the Armour, Ashwood, Dellrose, and Maury series. Armour and Dellrose soils are less clayey. Ashwood soils are 20 to 40 inches thick over bedrock and have a mollic epipedon. Maury soils have reddish B horizons and depth to rock is more than 60 inches

DRAINAGE AND PERMEABILITY: Well drained; medium to rapid runoff; slow permeability.

USE AND VEGETATION: Most of the acreage of these soils have been cleared, but some areas reverted back to trees. Most cleared areas are used for growing pasture and hay. Wooded areas are in oak, hickory, black walnut, elm, maple, hackberry, black and honey locust, and redcedar.

DISTRIBUTION AND EXTENT: The Central Basin of Tennessee and possibly in northern Alabama. The soil is extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Lincoln County, Tennessee; 1938.

REMARKS: Diagnostic horizons recognized in this pedon are: Ochric epipedon - 0 to 6 inches (Ap horizon) Argillic horizon - 6 to 40 inches (Bt1-Bt4 horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION PRUITTON AL+TN

Established Series
Rev. GWH/JCJ/JLN
04/2011

PRUITTON SERIES

The Pruitton series consists of very deep, well drained, moderately permeable soils that formed in loamy and gravelly alluvium. The soils are on flood plains. Slopes range from 0 to 3 percent.

TAXONOMIC CLASS: Fine-loamy, siliceous, semiactive, thermic Fluventic Dystrudepts

TYPICAL PEDON: Pruitton silt loam in a nearly level cultivated field. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 9 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; 5 percent by volume chert fragments 1/4 to 1 inch across; moderately acid; clear smooth boundary. (5 to 10 inches thick)

Bw1--9 to 26 inches; brown (10YR 4/3) silt loam; weak fine and medium subangular blocky structure; friable; common fine roots; 2 percent by volume chert fragments 1/4 to 1 inch across; strongly acid; gradual smooth boundary.

Bw2--26 to 38 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine and medium subangular blocky structure; friable; few fine roots; 5 percent by volume chert fragments 1/4 to 1 inch across; strongly acid; gradual smooth boundary. (Combined thickness of the Bw horizon is 16 to 45 inches)

2C1--38 to 45 inches; brown (10YR 4/3) gravelly fine sandy loam; weak fine granular structure; very friable; 15 percent by volume chert fragments 1/8 to 1 inch across; very strongly acid; gradual smooth boundary. (6 to 30 inches thick)

2C2--45 to 52 inches; yellowish brown (10YR 5/4) very gravelly sandy loam; common fine distinct dark brown (10YR 3/3) mottles; massive; very friable; 35 percent by volume chert fragments 1/8 to 1 inch across; very strongly acid.

TYPE LOCATION: Lauderdale County, Alabama; 3/4 mile northwest of Pruitton in SW1/4NE1/4 sec. 6, T1 S., R. 10 W. in crop field west of Butler Creek. USGS Pruitton Quad; (Latitude: 34 degrees 59 minutes 55 seconds N; Longitude: 87 degrees 37 minutes 24 seconds W)

RANGE IN CHARACTERISTICS: Solum thickness ranges from 25 to 50 inches. Depth to bedrock is greater than 60 inches. Reaction is very strongly acid to moderately acid, except for the surface layer, where limed. Coarse chert fragment ranges from none to 15 percent by volume in the A and Bw horizons and from 15 to 75 percent by volume in the C horizon. The thickness of the surface epipedon with value of 3 and chroma of 3 is less than 10 inches.

The Ap and A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 through 4. Texture is 42

silt loam or loam.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 through 8. Texture is dominantly silt loam or loam, but the range can include clay loam or silty clay loam.

The 2C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. Mottles in shades of yellow, brown, and gray range from none to many. Texture of the fine earth fraction is dominantly silt loam, fine sandy loam, or loam, but the range can include sandy loam and silty clay loam.

COMPETING SERIES: These include Ennis series in the same family. Ennis soils have 15 to 35 percent coarse fragments throughout the 10 to 40 inch control section.

GEOGRAPHIC SETTING: Pruitton soils are on flood plains primarily in narrow strips along drainageways. Slopes range from 0 to 3 percent. The soil formed in alluvium washed from soils derived from limestone, shale, sandstone, and loess. Near the type location the mean annual temperature is 59.9 degrees F., and average annual precipitation is 55.6 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Ennis series and Lobelville, Bodine, Dickson, Sengtown, Humphreys, Minvale, and Mountview series. Bodine, Sengtown, Humphreys, Minvale, and Mountview soils have argillic horizons. Dickson soils have a fragipan. Lobelville soils have redox depletions of chroma two or less within 24 inches of the surface.

DRAINAGE AND PERMEABILITY: Well drained; very low to negligible runoff; moderate permeability.

USE AND VEGETATION: Most areas are cleared and used for growing corn, cotton, soybeans, small grain, grain sorghum, and pasture. The native vegetation was mixed bottomland hardwoods.

DISTRIBUTION AND EXTENT: The Limestone Valley and Highland Rim of Alabama, Georgia, and Tennessee. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Lauderdale County, Alabama; 1973.

REMARKS: This soil was formerly mapped in the Ennis series. Ennis series has been reclassified and the range in characteristics requires a weighted average of 15 to 35 percent fragments in the 10 to 40 inch control section. When the OSD was updated in 2001 the lithological discontinuity was inadvertently left off of the C1 and C2 in the OSD description and range of characteristics.
Diagnostic horizons recognized in this pedon are:

Ochric epipedon - from 0 to 9 inches (Ap horizon)

Cambic horizon - from 9 to about 38 inches (Bw horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION STIVERSVILLE TN

Established Series
Rev. JFC-RPS
04/2001

STIVERSVILLE SERIES

The Stiversville series consists of deep, well drained permeable soils on uplands. They formed mostly in residuum of siltstone and fine grained sandstone that is interbedded with shale and limestone. On steep slopes, some pedons formed partly in colluvium from the same material. Slopes range from 2 to 30 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, active, thermic Ultic Hapludalfs

TYPICAL PEDON: Stiversville loam--pasture.
(Colors are for moist soil unless otherwise stated.)

Ap--0 to 8 inches; dark brown (10YR 3/3) loam; weak fine granular structure; very friable; few thin flat weathered fragments of siltstone; many fine roots; medium acid; clear smooth boundary. (5 to 10 inches thick)

BA--8 to 14 inches; brown (7.5YR 4/4) loam; weak fine and medium subangular blocky structure; friable; many fine roots; few thin flat weathered fragments of siltstone; few fine black concretions; medium acid; clear smooth boundary. (0 to 8 inches thick)

Bt1--14 to 23 inches; brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; common fine roots; few faint clay films; few fine black concretions; 5 percent thin fragments of siltstone; medium acid; gradual smooth boundary. (7 to 18 inches thick)

Bt2--23 to 34 inches; brown (7.5YR 4/4) clay loam, common medium distinct yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular and angular blocky structure; friable; few fine roots; many distinct clay films; common fine black concretions; 8 percent thin fragments of siltstone and sandstone; strongly acid; clear smooth boundary. (7 to 18 inches thick)

Bt3--34 to 45 inches; brown (7.5YR 4/4) clay loam, common fine and medium prominent pale brown (10YR 6/3) and yellowish red (5YR 4/8) mottles; weak medium angular blocky structure; firm; few faint clay films; common fine black concretions; 15 percent soft and hard, flat fragments of sandstone and siltstone; strongly acid; clear smooth boundary. (0 to 18 inches thick)

Cr--45 to 60 inches; brown and yellowish brown interbedded sandstone and siltstone. The bedrock is rippable and can mostly be dug with a spade, but has some hard strata.

TYPE LOCATION: Williamson County, Tennessee; 1/2 mile south of Bethesda and 500 feet southwest of junction of paved roads.

RANGE IN CHARACTERISTICS: Thickness of the solum and depth to weathered rippable bedrock ranges from 40 to 60 inches. This soil is medium acid or strongly acid and medium or high in phosphate. Each horizon of the solum contains from 0 to about 15 percent soft and hard rock fragments except the

lower part of the horizon contain 5 to 25 percent. Some pedons have a thin CB or C horizon with up to 50 percent fragments.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 and chroma of 2 to 4. It is loam or silt loam, except severely eroded areas range to clay loam or silty clay loam.

The BA horizon, where present, has hue of 10YR or 7.5YR, value of 4 and chroma of 4 to 6. It is loam or silt loam.

The Bt horizon mostly has hue of 7.5YR, value of 4 or 5 and chroma of 4 to 6. Some pedons have subhorizons with hue of 10YR or 5YR with the same value and chroma. Mottles in shades of brown and red are none to common. It is loam or clay loam, except some pedons have thin subhorizons of silt loam, silty clay loam or clay. Fine and coarse sand exceeds 15 percent in most pedons and sand plus coarse fragments exceeds 15 percent in all pedons.

The Cr horizon is dominantly weathered siltstone and fine grained sandstone that is interbedded with shale and limestone. It is rippable and in most places can be dug with a spade. Most of the rock is relatively soft, but includes some thin strata that is hard. Some of the strata was calcareous prior to weathering and some strata contains phosphate nodules.

COMPETING SERIES: These are the Bolivar, Liddieville, Pamunkey, Sandhill and Toine series in the same family and the Armour, Culleoka and Hicks series in similar families. Bolivar soils have a paralithic contact between 20 and 40 inches. Liddieville, Pamunkey and Toine soils formed in alluvium on stream terraces and are greater than 60 inches to bedrock. Sandhill soils have 15 to 35 percent rock fragments in the solum. Armour soils formed in silty alluvium in the upper 2 to 4 feet, are fine-silty and are greater than 60 inches to bedrock. Hicks soils formed in loess in the upper 1.5 to 3 feet and are fine-silty.

GEOGRAPHIC SETTING: Stiversville soils are on upland ridgetops and side slopes. Slopes range from about 2 to 30 percent. They formed mostly in residuum of siltstone and fine grained sandstone that is interbedded with limestone and shale. On steep slopes, some pedons formed partly in colluvium from the same material. Near the type location, mean annual temperature is 59 degrees F., and mean annual precipitation is 48 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Hicks and Sandhill series and the Hampshire and Inman series. Hampshire and Inman soils have a fine control section and Inman soils are less than 40 inches to a paralithic contact.

DRAINAGE AND PERMEABILITY: Well drained; medium runoff; moderately rapid permeability.

USE AND VEGETATION: Most areas are used for growing pasture, hay, small grains, tobacco, and corn. The native vegetation was oak, hickory, elm, hackberry, maple, beech, black walnut, ash, locust, and yellow poplar.

DISTRIBUTION AND EXTENT: The Central Basin of Tennessee. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Morgantown, West Virginia

SERIES ESTABLISHED: Williamson County, Tennessee; 1961.
REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - the zone from 0 to 8 inches (Ap horizons)

Argillic horizon - the zone from 14 to 42 inches (Bt1, Bt2, Bt3 horizons)

Paralithic contact - at 42 inches (top of Cr horizon.)

National Cooperative Soil Survey
U.S.A.

APPENDIX 2.7

ERODIBILITY TABLE

ESTIMATED ERODIBILITY BASED ON DATA FROM THE WEB SOIL SURVEY AND ERODIBILITY CLASS TABLE

Soil Series	Erodibility Index for surface horizon as designated by Web Soil Survey (Kf)	Erodibility Class Based on Erodibility Table Below		
		low	mod	high
Armour	0.43		x	
Hampshire	0.32-0.43		X	
Harpeth	0.43		X	
Egam	0.32-0.43		X	
Lindell	0.32		X	
Mimosa	0.37		X	
Marsh	0.37		X	
Pruitton	0.32		X	
Stiversville	0.32		x	

Soil Erodibility (K) Factor

The K factor represents both susceptibility of soil to erosion and the amount and rate of runoff. Soil texture, organic matter, structure, and permeability determine the erodibility of a particular soil. K values for various soil types are presented in Table 1.

Table 1. Soil Characteristics Associated with K Values.

SOIL TYPE	ERODIBILITY	K VALUE RANGE
fine-textured; high in clay	low	0.05 - 0.15
course-textured; sandy	low	0.05 - 0.20
medium-textured; loams	moderate	0.25 - 0.45
high silt content	high	0.45 - 0.65

Soil organic matter reduces erodibility. However, extrapolation of the K factor nomograph beyond an organic matter of 4% is neither recommended by the NRCS nor allowed by RUSLE software. The USLE also uses this organic matter limit. Addition or accumulation of increased organic matter through management is represented within the C value. Soil structure affects both susceptibility to detachment and infiltration. Permeability of the soil profile affects K because it affects runoff. Where published K values are not available, a value can be estimated using the published soil erodibility nomograph (Wischmeier and Smith 1978, Renard et al. 1996). Erodibility index (EI) zones have been developed for some geographic areas which allow the use of t calculations.
The annual distribution of rainfall erosivity directly influences seasonal values of K. (1)

(1) Jones, David S., Kowalski, David G., and Shaw, Robert B. Calculating Revised Universal Soil Loss Equation Estimates on Dept. of Defense Lands: A Review of RUSLE Factors and U.S. Army Land Condition Trend Analysis (LCTA) Data Gaps. Center for Ecological Management of Military Lands Dept. of Forest Service, Colorodo State University

APPENDIX 3.1

SOIL PEDON DESCRIPTIONS

DWR Soil Pedon Description

Described By: Terry Henry and John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolinsvile Rd. "Enclave at Dove Lake"

Stop or Pit #: #1 BB-44 File # (office use only):

Soil Series: Stiversville Drainage Class: well drained

Soil Classification: fine-sitly Ground Water: none

Parent Material: residuum

Climate: Thermic Land Cover: sorghum stubble

Slope of Map Unit: 0-5% Slope of Pit: 3% Erosion:

Geomorphic Description: upland ridge

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap1	0-2			sil	1	f	gr		
Ap2	2-7			sil	1	m	sbk		
B/A	7-17			sil	2	m	sbk		
Bt1	17-24			sil	2	m	sbk		
Bt2	24-36			sicl	2	m	sbk		
Bt3	36-43								

DWR Soil Pedon Description

Described By: Terry Henry and John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolinsvile Rd. "Enclave at Dove Lake"

Stop or Pit #: #2 GG-44 File # (office use only):

Soil Series: Stiversville Drainage Class: well drained

Soil Classification: fine-loamy Ground Water: none

Parent Material: residuum

Climate: Thermic Land Cover: sorghum stubble

Slope of Map Unit: 0-5% Slope of Pit: 4% Erosion:

Geomorphic Description: upland

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap1	0-2			sil	1	f	gr		
Ap2	2-6			sil	1	m	sbk		
B/A	6-11			sicl	2	m	sbk		
Bt1	11-17			sicl	2	m	sbk		
Bt2	17-27			cl	2	m	sbk		
Bt3	27-35			cl	2	m	sbk		
Bt4	35-41			cl	2	m	sbk		
C	41-50								

DWR Soil Pedon Description

Described By: Terry Henry and John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolinsvile Rd. "Enclave at Dove Lake"

Stop or Pit #: #3 Center of BB-CC 46 and 47 File # (office use only):

Soil Series: Stiversville Drainage Class: well drained

Soil Classification: fine-loamy Ground Water: none

Parent Material: residuum weathered from sandstone

Climate: Thermic Land Cover: sorghum stubble

Slope of Map Unit: 5-15% Slope of Pit: 9% Erosion: none to slight

Geomorphic Description: upland sideslope

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap1	0-4			L	1	f	gr		
Ap2	4-8			L	1	f	gr		
BA	8-16			gr-L	2	m	sbk		
Bt1	16-27			cl	2	m	sbk		
Bt2	27-55			cl	2	m	sbk		

DWR Soil Pedon Description

Described By: Terry Henry and John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolinsvile Rd. "Enclave at Dove Lake"

Stop or Pit #: #4 FF-GG47 and 48 center File # (office use only):

Soil Series: Stiversville Drainage Class: well drained

Soil Classification: fine-loamy Ground Water: none

Parent Material: residuum weathered from sandstone

Climate: Thermic Land Cover: sorghum stubble

Slope of Map Unit: 5-15% Slope of Pit: 6% Erosion:

Geomorphic Description: upland sideslope

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap	0-5			L	1	f	gr		
BA	5-12			L	1	m	sbk		
Bt1	12-24			cl	2	m	sbk		
Bt2	24-44			cl	2	m	sbk		
Cr	44								

DWR Soil Pedon Description

Described By: Terry Henry and John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolinsvile Rd. "Enclave at Dove Lake"

Stop or Pit #: #5 BB-50 File # (office use only):

Soil Series: Pruitton Drainage Class: well drained

Soil Classification: fine-loamy Ground Water: none

Parent Material: alluvium

Climate: Thermic Land Cover: sorghum stubble

Slope of Map Unit: 5-15% Slope of Pit: 10% Erosion:

Geomorphic Description: floodplain

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap				sil	1	f&m	gr&sbk		
A/B				sil	2	m	sbk		
B1				L	2	m	sbk		
B2				L	2	m	sbk		
Bw1				L	1	m	sbk		
Bw2				L	1	m	sbk		
Bw3				L	1	m	sbk		
Bw4				L	1	m	sbk		
Bw5				sil	1	m	sbk		

DWR Soil Pedon Description

Described By: Terry Henry and John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolinsvile Rd. "Enclave at Dove Lake"

Stop or Pit #: #6 FF-50 File # (office use only):

Soil Series: Stiversville Drainage Class: well drained

Soil Classification: fine-loamy Ground Water: none

Parent Material: residuum

Climate: Thermic Land Cover: sorghum stubble

Slope of Map Unit: 5-15% Slope of Pit: 13% Erosion:

Geomorphic Description: upland

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap1	0-4			L	1	f	gr		
Ap2	4-8			gr-L	1	f	sbk		
BA	8-16			L	2	m	sbk		
Bt2	16-40			cl	2	m	sbk		
Bt3	40-50			cl	2	m	sbk		

DWR Soil Pedon Description

Described By: Terry Henry and John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolinsvile Rd. "Enclave at Dove Lake"

Stop or Pit #: #7 NN-50 File # (office use only):

Soil Series: Lindell Drainage Class: well drained

Soil Classification: fine-loamy Ground Water: none

Parent Material: alluvium

Climate: Thermic Land Cover: sorghum stubble

Slope of Map Unit: 0-5% Slope of Pit: 2% Erosion:

Geomorphic Description: floodplain

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap	0-4			L	1	f&m	gr&sbk		
B	4-10	10YR 4/3	few 10YR 5/4	L	1	m	sbk		
Bw1	10-15	10YR 4/4	common 10YR 6/4	L	1	m	sbk		
Bw2	15-24	10YR 4/4		L	1	m	sbk		
Ab	24-39	10YR 5/3	common 10 YR 6/2	sil	1	m	sbk		
Btb	39-52	7.5 YR 5/4	common 10 YR 4/2	sicl	2	m	sbk		

DWR Soil Pedon Description

Described By: Terry Henry and John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolinsvile Rd. "Enclave at Dove Lake"

Stop or Pit #: #8 N-24 File # (office use only):

Soil Series: Harpeth Drainage Class: well drained

Soil Classification: fine-silty Ground Water: none

Parent Material: alluvium/colluvium over residuum

Climate: Thermic Land Cover: sorghum stubble

Slope of Map Unit: 5-15% Slope of Pit: 12% Erosion:

Geomorphic Description: upland

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap1				sil	1	f	gr		
Ap2				sil	2	m	sbk		
A/B				sil	2	m	sbk		
Bt1				sicl	2	m	sbk		
Bt2				sicl	2	m	sbk		
Bt3				sicl	1	m	sbk		

DWR Soil Pedon Description

Described By: Terry Henry and John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolinsvile Rd. "Enclave at Dove Lake"

Stop or Pit #: #9 U-10 File # (office use only):

Soil Series: Stiversville Drainage Class: well drained

Soil Classification: fine-loamy Ground Water: none

Parent Material: residuum

Climate: Thermic Land Cover: sorghum stubble

Slope of Map Unit: 5-15% Slope of Pit: 10% Erosion:

Geomorphic Description: upland sideslope

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap1				sil	1	f	gr		
Ap2				sil	1	m	sbk		
B/A				sicl	2	m	sbk		
Bt1				sicl	2	m	sbk		
Bt2				vgr sicl	2	m	sbk		
Bt3				sic	2	m	sbk		
Bt4				sic	2	m	sbk		

DWR Soil Pedon Description

Described By: John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolinsvile Rd. "Enclave at Dove Lake"

Stop or Pit #: #10 P-11 File # (office use only):

Soil Series: Stiversville Drainage Class: well drained

Soil Classification: fine-loamy Ground Water: none

Parent Material: residuum weathered from limestone

Climate: Thermic Land Cover: sorghum stubble

Slope of Map Unit: 5-15% Slope of Pit: 10% Erosion: none

Geomorphic Description: upland sideslope

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap1	0-4			sil	1	f	gr		
Ap2	4-8			sil	1	f	gr		
BA	8-19			sicl	1	m	sbk		
Bt1	19-27			sicl	2	m	sbk		
Bt2	27-33			cl	2	m	sbk		
Bt3	33-50			cl	2	m	sbk		

DWR Soil Pedon Description

Described By: John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolinsvile Rd. "Enclave at Dove Lake"

Stop or Pit #: #11 K-11 File # (office use only):

Soil Series: Stiversville Drainage Class: well drained

Soil Classification: fine-loamy Ground Water: none

Parent Material: residuum weathered from sandstone

Climate: Thermic Land Cover: sorghum stubble

Slope of Map Unit: 5-15% Slope of Pit: 10% Erosion:

Geomorphic Description: upland

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap	0-6			sil	1	f	gr		
B/A	6-12			sicl	1	m	sbk		
Bt1	12-26			sicl	2	m	sbk		
Bt2	26-38			cl	2	m	sbk		
Bt3	38-50			gr cl	2	m	sbk		

DWR Soil Pedon Description

Described By: John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolinsvile Rd. "Enclave at Dove Lake"

Stop or Pit #: #12 G-9 File # (office use only):

Soil Series: Armour Drainage Class: well drained

Soil Classification: fine-sitly Ground Water: none

Parent Material: alluvium

Climate: Thermic Land Cover: sorghum stubble

Slope of Map Unit: 5-15% Slope of Pit: 6% Erosion:

Geomorphic Description: high terrace

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap				sil	1	f	gr		
B/A				sil	1	m	sbk		
Bt1				sicl	2	m	sbk		
Bt2				sicl	2	m	sbk		
Bt3				sicl	2	m	sbk		

DWR Soil Pedon Description

Described By: John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolensville Rd. Williamson County "Enclave at Dove Lake"

Stop or Pit #: #13 F-11 File # (office use only):

Soil Series: Harpeth Drainage Class: well drained

Soil Classification: fine-silty Ground Water: none

Parent Material: alluvium over residuum

Climate: thermic Land Cover:

Slope of Map Unit: 5-15% Slope of Pit: 6% Erosion:

Geomorphic Description: upland ridge

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap1	0-5			sil	1	f	gr		
Ap2	5-12			sil	1	m	sbk		
B/A	12-21			sicl	2	m	sbk		
Bt1	21-39			sicl	2	m	sbk		
2Bt	39-50			sicl	2	m	sbk		

DWR Soil Pedon Description

Described By: John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolensville Rd. Williamson County "Enclave at Dove Lake"

Stop or Pit #: #14 K- 15 File # (office use only):

Soil Series: Harpeth Drainage Class: well drained

Soil Classification: fine-silty Ground Water: none

Parent Material: alluvium over residuum

Climate: thermic Land Cover:

Slope of Map Unit: 5-15% Slope of Pit: 6% Erosion:

Geomorphic Description: upland ridge

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap1	0-4			sil	1	f	gr		
Ap2	4-7			sil	1	f	gr		
B/A	7-18			sicl	2	m	sbk		
Bt1	18-26			sicl	2	m	sbk		
2Bt	26-33			sicl	2	m	sbk		
Bt3	33-50								

DWR Soil Pedon Description

Described By: John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolensville Rd. Williamson County "Enclave at Dove Lake"

Stop or Pit #: #15 O-22 File # (office use only):

Soil Series: Stiversville Drainage Class: well drained

Soil Classification: fine-loamy Ground Water: none

Parent Material: residuum from weathered sandstone

Climate: thermic Land Cover:

Slope of Map Unit: 5-15% Slope of Pit: 10% Erosion:

Geomorphic Description: upland sideslope

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap1	0-4			sil	1	f	gr		
B/A	4-12			L	1	m	sbk		
Bt1	12-18			gr L	2	m	sbk		
Bt2	18-29			gr sicl	2	m	sbk		
Bt3	29-40			gr cl	2	m	sbk		
R	40	soft bedrock							

DWR Soil Pedon Description

Described By: John Gibi Date: 1-22-15

Site Location: Big Oak Ln. off Nolensville Rd. Williamson County "Enclave at Dove Lake"

Stop or Pit #: #16 R-26 File # (office use only):

Soil Series: Stiversville Drainage Class: well drained

Soil Classification: fine-loamy Ground Water: none

Parent Material: residuum from weathered sandstone

Climate: thermic Land Cover:

Slope of Map Unit: 5-15% Slope of Pit: 14% Erosion:

Geomorphic Description: upland sideslope

Physiographic Location: Nashville Basin

Soil Pedon Description

Horizon	Depth	Color(s)	Depletions/Concentrations Redox/Mottles	Texture	Grade	Size	Type	State Design Criteria	
								Texture & Structure (Grade & Type)	Maximum Hydraulic Loading Rate GPD/SF (Table 17-2 or 16-1)
Ap1	0-4			sil	1	f	gr		
B/A	4-12			sil	1	m	sbk		
Bt1	12-18			sicl	2	m	sbk		
Bt2	18-29			gr cl	2	m	sbk		
Bt3	29-40			gr cl	2	m	sbk		

SOIL TEXTURE LEGEND OF ABBREVIATIONS:

l	Loam
sil	Silt Loam
sicl	Silty Clay Loam
c	clay
GR	Gravelly modifier > or = to 15% but less than 35%
VGR	Very Gravelly > or = to 35% but less than 60%
XGR	Extremely Gravelly > or = to 60% but < than 90%

SOIL STRUCTURE LEGEND OF ABBREVIATIONS:

GADE	
0	STURCTURELESS
1	WEEK
2	MODERATE
3	STRONG
SIZE	
f	FINE
m	MEDIUM
TYPE	
gr	GRANULAR
sbk	SUBANGULAR BLOCKY
m	MASSIVE

APPENDIX 3.3

RESULTS FROM Ksat TESTS

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	3/30/2017	Permeameter #:	
Location:	Enclave A	Air Temperature (F) initial:	
Soil Survey Area/Special Project:		Air Temperature (F) final:	60
Series or Map Unit Component:	Lindell	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bw2		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		17.1
[2] *You want this value to be very close to 15 cm. (Record to nearest millimeter.)*		Initial:	17.1
		Final:	17.1
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		4.1

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min) :	(min/60)	(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
1.90	105.0		5	0.083	2394.0	1.75483	0.69088
3.60	105.0		10	0.167	2268.0	1.66247	0.65451
6.50	105.0		19	0.317	2155.3	1.57983	0.62198
				*5	Mean K:	1.66571	0.65579
					St. Dev:	0.0875	0.0345
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	########	##########
Low	.01-.1	0.00142	0.0036	0.0864	########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	4/1/2015	Permeameter #:	
Location:	Enclave B	Air Temperature (F) initial:	
Soil Survey Area/Special Project:		Air Temperature (F) final:	66
Series or Map Unit Component:	Pruitton	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bw1		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		16.5
[2] *You want this value to be very close to 15 cm. (Record to nearest millimeter.)*		Initial:	16.5
		Final:	16.5
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		3

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min) :	(min/60)	(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
1.90	105.0		10	0.167	1197.0	1.09965	0.43293
1.50	105.0		8	0.133	1181.3	1.08518	0.42724
3.00	105.0		16	0.267	1181.3	1.08518	0.42724
				*5	Mean K:	1.09001	0.42914
					St. Dev:	0.0084	0.0033
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	########	##########
Low	.01-.1	0.00142	0.0036	0.0864	########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	3/30/2015	Permeameter #:	
Location:	Enclave C	Air Temperature (F) initial:	
Soil Survey Area/Special Project:		Air Temperature (F) final:	60
Series or Map Unit Component:	Pruitton	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bw1		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	45.8

H =	[2] Actual water level in hole (cm):		16.5
[2] *You want this value to be very close to 15 cm. (Record to nearest millimeter.)*		Initial:	16.5
		Final:	16.5
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		4.1

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min) :	(min/60)	(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
3.40	105.0		12	0.200	1785.0	1.37604	0.54175
6.40	105.0		22	0.367	1832.7	1.41284	0.55623
4.60	105.0		15	0.250	1932.0	1.48936	0.58636
				*5	Mean K:	1.42608	0.56145
					St. Dev:	0.0578	0.0228
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	########	##########
Low	.01-.1	0.00142	0.0036	0.0864	########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	3/30/2015	Permeameter #:	
Location:	Enclave D	Air Temperature (F) initial:	
Soil Survey Area/Special Project:		Air Temperature (F) final:	65
Series or Map Unit Component:	Stiversville	[1]Soil Moisture Content (%):	moist
Pedon Number:		*[1] If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bt1		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		15.0
[2] You want this value to be very close to 15 cm. (Record to nearest millimeter.)		Initial:	15.0
		Final:	15.0
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		3

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min) : (min/60)		(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
2.30	105.0		30	0.500	483.0	0.50996	0.20077
1.50	105.0		19	0.317	497.4	0.52513	0.20675
2.10	105.0		26	0.433	508.8	0.53725	0.21152
				*5	Mean K:	0.52412	0.20634
					St. Dev:	0.0137	0.0054
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	#########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	#########	##########
Low	.01-.1	0.00142	0.0036	0.0864	#########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	3/30/2015	Permeameter #:	
Location:	Enclave E	Air Temperature (F) initial:	
Soil Survey Area/Special Project:		Air Temperature (F) final:	65
Series or Map Unit Component:	Stiversville	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bt2		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		17.1
[2] *You want this value to be very close to 15 cm. (Record to nearest millimeter.)*		Initial:	17.1
		Final:	17.1
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		3

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min)	: (min/60)	(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
7.50	105.0		30	0.500	1575.0	1.37279	0.54047
4.60	105.0		19	0.317	1525.3	1.32944	0.52340
5.10	105.0		20	0.333	1606.5	1.40025	0.55128
				*5	Mean K:	1.36749	0.53838
					St. Dev:	0.0357	0.0141
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	########	##########
Low	.01-.1	0.00142	0.0036	0.0864	########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	3/31/2015	Permeameter #:	
Location:	Enclave F	Air Temperature (F) initial:	
Soil Survey Area/Special Project:		Air Temperature (F) final:	75
Series or Map Unit Component:	Harpeth	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bt1		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		14.6
[2] *You want this value to be very close to 15 cm. (Record to nearest millimeter.)*		Initial:	14.6
		Final:	14.6
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		3

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min)	: (min/60)	(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
2.60	105.0		20	0.333	819.0	0.89924	0.35403
2.60	105.0		20	0.333	819.0	0.89924	0.35403
2.60	105.0		20	0.333	819.0	0.89924	0.35403
				*5	Mean K:	0.89924	0.35403
					St. Dev:	0.0000	0.0000
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	#########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	#########	##########
Low	.01-.1	0.00142	0.0036	0.0864	#########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	3/31/2015	Permeameter #:	
Location:	Enclave G	Air Temperature (F) initial:	
Soil Survey Area/Special Project:		Air Temperature (F) final:	75
Series or Map Unit Component:	Stiversville	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bt2		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		15.2
[2] *You want this value to be very close to 15 cm. (Record to nearest millimeter.)*		Initial:	15.2
		Final:	15.2
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		3

Outflow Chamber (s) used: [Associated **C**onversion **F**actor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min)	: (min/60)	(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
1.10	105.0		15	0.250	462.0	0.47850	0.18839
1.10	105.0		15	0.250	462.0	0.47850	0.18839
0.70	105.0		9	0.150	490.0	0.50750	0.19980
				*5	Mean K:	0.48816	0.19219
					St. Dev:	0.0167	0.0066
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately **High**	1.0-10	0.142	0.36	8.64	#########	##########
Moderately **Low**	.1-1.0	0.0142	0.036	0.864	#########	##########
Low	.01-.1	0.00142	0.0036	0.0864	#########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	3/31/2015	Permeameter #:	
Location:	Enclave H	Air Temperature (F) initial:	
Soil Survey Area/Special Project:		Air Temperature (F) final:	80
Series or Map Unit Component:	Stiversville	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bt1		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		15.2
[2] *You want this value to be very close to 15 cm. (Record to nearest millimeter.)*		Initial:	15.2
		Final:	15.2
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		3

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min) :	(min/60)	(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
1.10	105.0		5	0.083	1386.0	1.43549	0.56516
1.10	105.0		5	0.083	1386.0	1.43549	0.56516
1.10	105.0		5	0.083	1386.0	1.43549	0.56516
				*5	Mean K:	1.43549	0.56516
					St. Dev:	0.0000	0.0000
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	########	##########
Low	.01-.1	0.00142	0.0036	0.0864	########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	3/31/2015	Permeameter #:	
Location:	Enclave I	Air Temperature (F) initial:	
Soil Survey Area/Special Project:		Air Temperature (F) final:	80
Series or Map Unit Component:	Stiversville	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bt1		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	45.8

H =	[2] Actual water level in hole (cm):		16.8
[2] *You want this value to be very close to 15 cm. (Record to nearest millimeter.)*		Initial:	16.8
		Final:	16.8
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		3

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min) : (min/60)		(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
5.70	105.0		10	0.167	3591.0	3.21269	1.26484
11.00	105.0		20	0.333	3465.0	3.09997	1.22046
5.70	105.0		10	0.167	3591.0	3.21269	1.26484
				*5	Mean K:	3.17512	1.25005
					St. Dev:	0.0651	0.0256
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	########	##########
Low	.01-.1	0.00142	0.0036	0.0864	########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	3/31/2015	Permeameter #:	
Location:	Enclave J	Air Temperature (F) initial:	
Soil Survey Area/Special Project:		Air Temperature (F) final:	75
Series or Map Unit Component:	Armour	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bt2		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		14.9
[2] *You want this value to be very close to 15 cm. (Record to nearest millimeter.)*		Initial:	14.9
		Final:	14.9
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		3

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min) : (min/60)		(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
0.60	105.0		10	0.167	378.0	0.40299	0.15866
0.60	105.0		10	0.167	378.0	0.40299	0.15866
0.60	105.0		10	0.167	378.0	0.40299	0.15866
				*5	Mean K:	0.40299	0.15866
					St. Dev:	0.0000	0.0000
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	#########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	#########	##########
Low	.01-.1	0.00142	0.0036	0.0864	#########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	4/1/2015	Permeameter #:	
Location:	Enclave K		
Soil Survey Area/Special Project:		Air Temperature (F) final:	68
Series or Map Unit Component:	Stiversville	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bt1		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		14.6
[2] *You want this value to be very close to 15 cm. (Record to nearest millimeter.)*		Initial:	14.6
		Final:	14.6
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		4.1

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min) : (min/60)		(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
1.70	105.0		11	0.183	973.6	0.89015	0.35045
1.70	105.0		12	0.200	892.5	0.81597	0.32125
1.80	105.0		12	0.200	945.0	0.86397	0.34014
				*5	Mean K:	0.85669	0.33728
					St. Dev:	0.0376	0.0148
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	########	##########
Low	.01-.1	0.00142	0.0036	0.0864	########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	4/1/2015	Permeameter #:	
Location:	Enclave L		
Soil Survey Area/Special Project:		Air Temperature (F) final:	68
Series or Map Unit Component:	Harpeth	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	B/A		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		16.2
[2] *You want this value to be very close to 15 cm. (Record to nearest millimeter.)*		Initial:	16.2
		Final:	16.2
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		4.1

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min)	: (min/60)	(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
3.20	105.0		20	0.333	1008.0	0.79735	0.31392
1.60	105.0		10	0.167	1008.0	0.79735	0.31392
1.60	105.0		10	0.167	1008.0	0.79735	0.31392
					Mean K:	0.79735	0.31392
				*5	St. Dev:	0.0000	0.0000
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	########	##########
Low	.01-.1	0.00142	0.0036	0.0864	########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	4/1/2015	Permeameter #:	
Location:	Enclave M		
Soil Survey Area/Special Project:		Air Temperature (F) final:	66
Series or Map Unit Component:	Stiversville	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bt1		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		15.0
[2] You want this value to be very close to 15 cm. (Record to nearest millimeter.)		Initial:	15.0
		Final:	15.0
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		3

Outflow Chamber (s) used: [Associated **C**onversion **F**actor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min) :	(min/60)	(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
0.30	105.0		5	0.083	378.0	0.39910	0.15713
0.80	105.0		14	0.233	360.0	0.38010	0.14964
0.80	105.0		14	0.233	360.0	0.38010	0.14964
					Mean K:	0.38643	0.15214
					*5 St. Dev:	0.0110	0.0043
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	########	##########
Low	.01-.1	0.00142	0.0036	0.0864	########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	3/31/2015	Permeameter #:	
Location:	Enclave N		
Soil Survey Area/Special Project:		Air Temperature (F) final:	72
Series or Map Unit Component:	Stiversville	[1]Soil Moisture Content (%):	moist
Pedon Number:		[1] *If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bt1		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		16.5
[2] *You want this value to be very close to 15 cm. (Record to nearest millimeter.)*		Initial:	16.5
		Final:	16.5
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		3

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min) :	(min/60)	(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17					
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
1	105.0		4	0.067	1575.0	1.44691	0.56965
1	105.0		4	0.067	1575.0	1.44691	0.56965
1	105.0		4	0.067	1575.0	1.44691	0.56965
				*5	Mean K:	1.44691	0.56965
					St. Dev:	0	0
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	#########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	#########	##########
Low	.01-.1	0.00142	0.0036	0.0864	#########	##########
Very Low	<.01					

Amoozemeter Data Sheet

User(s):	Lonnie Norrod Soil Consulting		
Date:	3/31/2015	Permeameter #:	
Location:	Enclave O		
Soil Survey Area/Special Project:		Air Temperature (F) final:	66
Series or Map Unit Component:	Armour	[1]Soil Moisture Content (%):	moist
Pedon Number:		*[1] If not known, give a relative soil moisture content. i.e. dry, moist, or wet.*	
Horizon Tested:	Bt2		

Set-up Calculation	
Hole Depth (cm):	50.8
Distance from Bottom of Bubble Tube to soil surface (cm) = D:	10
Desired Water Depth in Hole (cm):	-15
CHT Tube setting (cm) = d:	**45.8**

H =	[2] Actual water level in hole (cm):		16.5
[2] You want this value to be very close to 15 cm. (Record to nearest millimeter.)		Initial:	16.5
		Final:	16.5
r =	[3]Auger Hole Radius (cm) Standard kit (6 cm) diam. auger		3

Outflow Chamber (s) used: [Associated Conversion Factor:]	105.0	(=20.0 cm^2) Set on 1 (Large Tank only) (=105.0 cm^2) Set on 2 (Both Tanks)

[4]Drop in Water	Outflow Chamber	Clock Time	Elapsed Time (between readings)		Outflow (Q)	Hydraulic Conductivity (Ksat)	
(cm)	(C.F.)	(hr:min)	(min)	: (min/60)	(cm^3/hr)	(cm/hr)	(in/hr)
Ex 4.9	20	10:17			392	0.4139	0.1629
Start			xxx	xxxx	xxxx	xxxxx	xxxxxx
1.90	105.0		10	0.167	1197.0	1.09965	0.43293
1.50	105.0		8	0.133	1181.3	1.08518	0.42724
3.00	105.0		16	0.267	1181.3	1.08518	0.42724
				*5	Mean K:	1.09001	0.42914
					St. Dev:	0.0084	0.0033
					Hydraulic Conductivity		Mod. High

Saturated Hydraulic Conductivity Class Limits						
Ksat Class	Class Limits (Range)	Alternative Equivalent Units				
(µm/s)		in/hr	cm/hr	cm/day	m/s	m^3s/kg
Very High	≥ 100	14.2	36	864	0.000102	##########
High	10-100	1.42	3.6	86.4	0.0000102	##########
Moderately High	1.0-10	0.142	0.36	8.64	#########	##########
Moderately Low	.1-1.0	0.0142	0.036	0.864	#########	##########
Low	.01-.1	0.00142	0.0036	0.0864	#########	##########
Very Low	<.01					

APPENDIX 3.4

RESULTS OF CHEMISTRY TESTING

Waters Agricultural Laboratories, Inc.
2101 Calhoun Rd. Hwy 81 Owensboro, KY 42301
(270) 685-4039 FAX (270) 685-3989

"Improving Growth... With Science"

Soil Analysis

LONNIE NORROD SOIL CONSULTING	**Grower:** LONNIE NORROD	**Received:**	04/01/2015
	Farm ID:	**Processed:**	04/03/2015
277 RED WILLIAMS ROAD	**Sample ID:** LOCATION A 0-4"	**Account #:**	66277
CROSSVILLE, TN 38571			

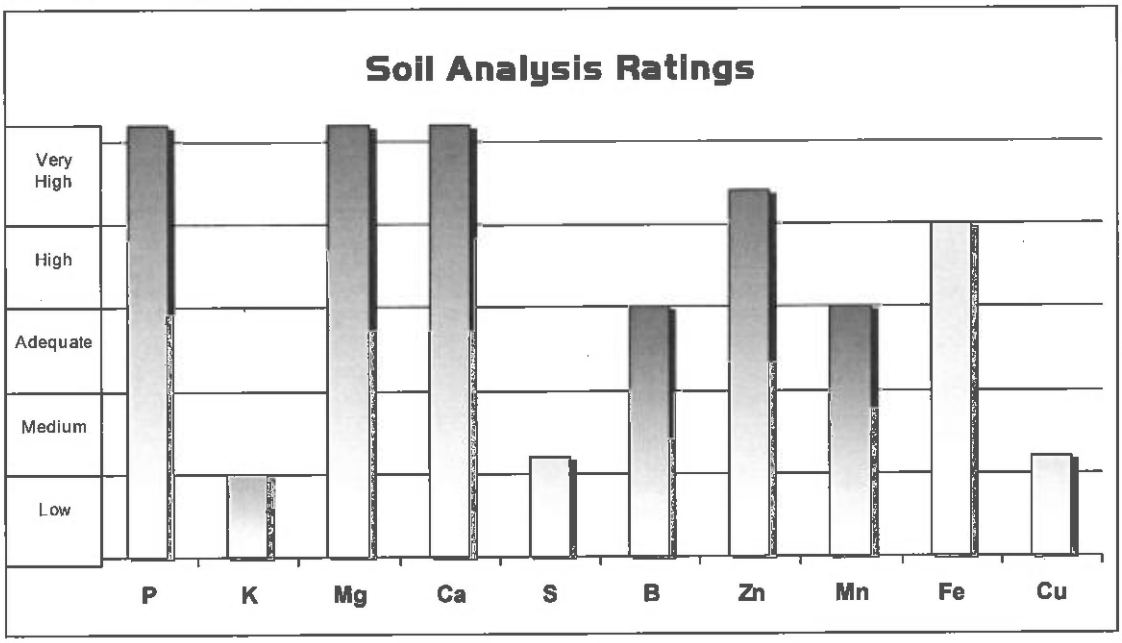
Lab Results

Lab Number: 181439WO — **lbs. per Acre** — **Target pH:** 6.5 — **Test Method:** Mehlich III

P Phosphorus	K Potassium	Mg Magnesium	Ca Calcium	Soil pH	Buffer pH	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
348 VH	107 L	395 VH	2522 VH	6.5	7.70	26 M	2.0 A	15.8 VH	179 A	375 H	1.7 M

Aluminum	Sodium	Nitrate N	Soluble Salts	Organic Matter	ENR	Molybdenum	NH4	Nickel	BiCarbs
			mmhos/cm	2.46 %	49.2	ppm		ppm	meq/l

Soil Analysis Ratings

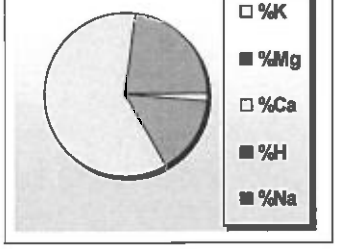


Cation Exchange Capacity 10.5 meq/100g

Base Saturation

K:	1.3 %
Mg:	15.7 %
Ca:	60.1 %
H:	22.9 %
Na:	%

Base Saturation



Fertility Recommendations

Crop: NO CROP — **lbs. per Acre** — **Yield:**

Lime Tons/Acre	Gypsum Tons/Acre	N Nitrogen	P2O5 Phosphate	K2O Potash	Mg Magnesium	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
				*							

* = Maintenance Recommendation

Comments:

Waters Agricultural Laboratories, Inc.
2101 Calhoun Rd. Hwy 81 Owensboro, KY 42301
(270) 685-4039 FAX (270) 685-3989

"Improving Growth... With Science"

Soil Analysis

LONNIE NORROD SOIL CONSULTING

277 RED WILLIAMS ROAD
CROSSVILLE, TN 38571

Grower: LONNIE NORROD
Farm ID:
Sample ID: LOCATION C 0-4"

Received: 04/01/2015
Processed: 04/03/2015
Account #: 66277

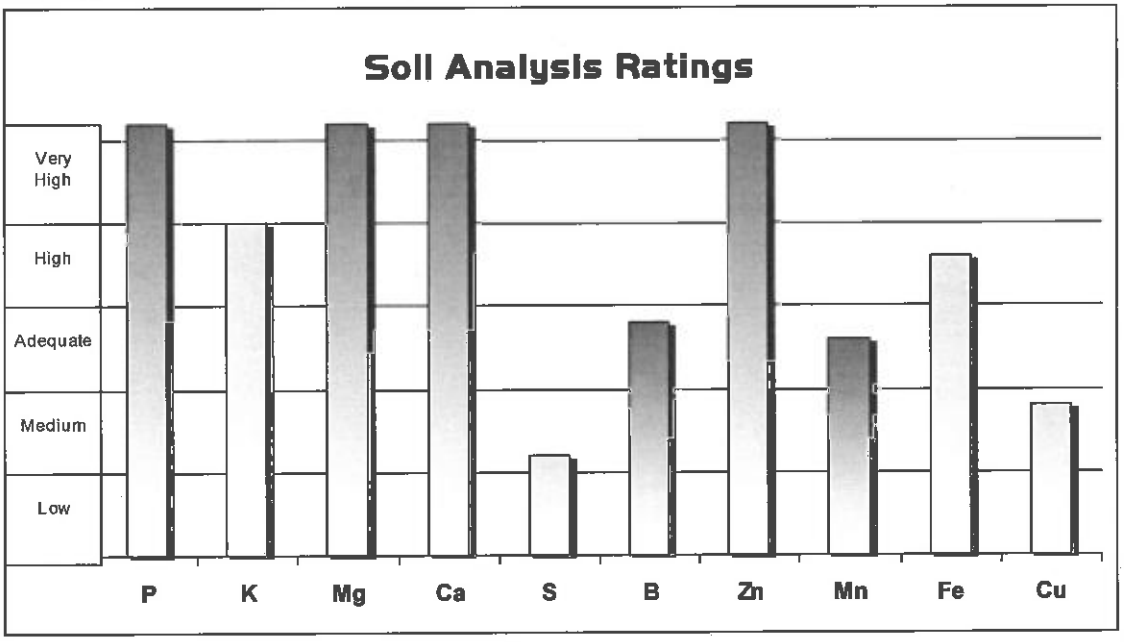
Lab Results
lbs. per Acre

Lab Number: 181438WO

Target pH: 6.5
Test Method: Mehlich III

P Phosphorus	K Potassium	Mg Magnesium	Ca Calcium	Soil pH	Buffer pH	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
494 VH	412 H	556 VH	2892 VH	6.6	7.70	28 M	1.9 A	26.4 VH	131 A	309 H	2.6 M

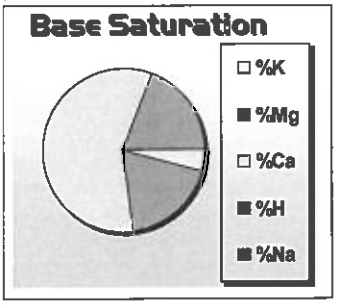
Aluminum	Sodium	Nitrate N	Soluble Salts	Organic Matter	ENR	Molybdenum	NH4	Nickel	BiCarbs		
			mmhos/cm	3.23 %	64.6	ppm		ppm	meq/l		



Cation Exchange Capacity: 12.5 meq/100g

Base Saturation

K:	4.2 %
Mg:	18.6 %
Ca:	58.0 %
H:	19.2 %
Na:	%



Fertility Recommendations
lbs. per Acre

Crop: NO CROP

Yield:

Lime Tons/Acre	Gypsum Tons/Acre	N Nitrogen	P2O5 Phosphate	K2O Potash	Mg Magnesium	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
				*							

* = Maintenance Recommendation

Comments:

Waters Agricultural Laboratories, Inc.
2101 Calhoun Rd. Hwy 81 Owensboro, KY 42301
(270) 685-4039 FAX (270) 685-3989

"Improving Growth... With Science"

Soil Analysis

LONNIE NORROD SOIL CONSULTING

277 RED WILLIAMS ROAD
CROSSVILLE, TN 38571

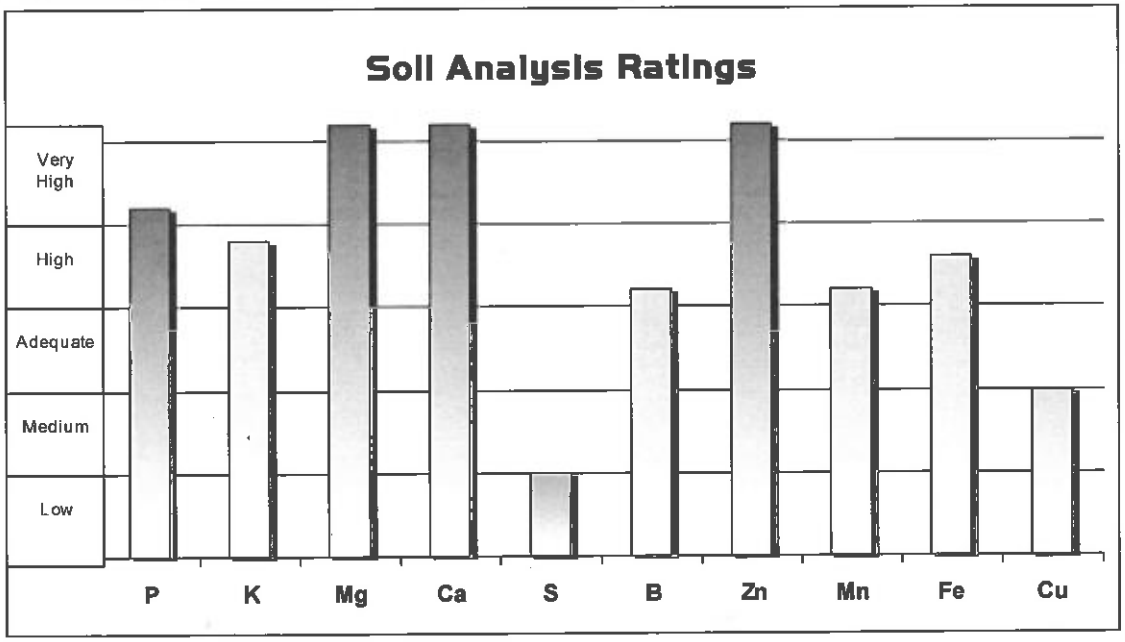
Grower: LONNIE NORROD
Farm ID:
Sample ID: LOCATION D 0-4"

Received: 04/01/2015
Processed: 04/03/2015
Account #: 66277

Lab Results
lbs. per Acre

Lab Number: 181437WO
Target pH: 6.5
Test Method: Mehlich III

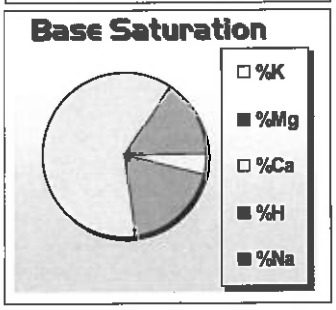
P Phosphorus	K Potassium	Mg Magnesium	Ca Calcium	Soil pH	Buffer pH	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
211 VH	400 H	590 VH	3206 VH	6.8	7.75	23 L	2.1 H	21.2 VH	227 H	292 H	2.8 M
Aluminum	**Sodium**	**Nitrate N**	**Soluble Salts**	**Organic Matter**	**ENR**	**Molybdenum**	**NH4**	**Nickel**	**BiCarbs**		
			mmhos/cm	2.83 %	56.6	ppm		ppm	meq/l		



Cation Exchange Capacity 13.0 meq/100g

Base Saturation

K:	3.9 %
Mg:	18.9 %
Ca:	61.7 %
H:	15.4 %
Na:	%



Fertility Recommendations
lbs. per Acre

Crop: NO CROP
Yield:

Lime Tons/Acre	Gypsum Tons/Acre	N Nitrogen	P2O5 Phosphate	K2O Potash	Mg Magnesium	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
				*							

* = Maintenance Recommendation

Comments:

Waters Agricultural Laboratories, Inc.
2101 Calhoun Rd. Hwy 81 Owensboro, KY 42301
(270) 685-4039 FAX (270) 685-3989

"Improving Growth... With Science"

Soil Analysis

LONNIE NORROD SOIL CONSULTING

277 RED WILLIAMS ROAD
CROSSVILLE, TN 38571

Grower: LONNIE NORROD
Farm ID:
Sample ID: LOCATION F 0-4"

Received: 04/01/2015
Processed: 04/03/2015
Account #: 66277

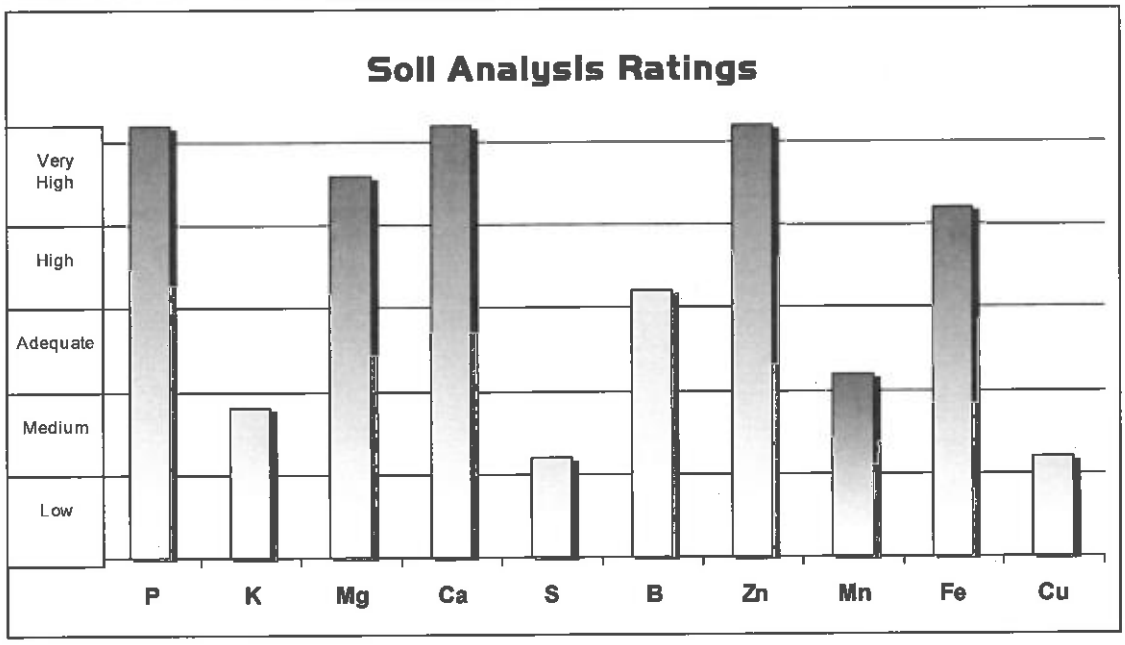
Lab Number: 181445WO

Lab Results
lbs. per Acre

Target pH: 6.5
Test Method: Mehlich III

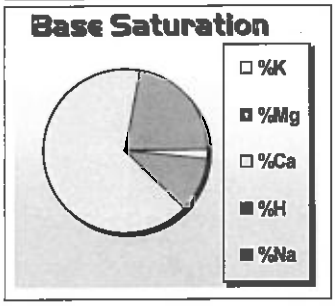
P Phosphorus	K Potassium	Mg Magnesium	Ca Calcium	Soil pH	Buffer pH	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
621 VH	198 M	375 VH	3824 VH	6.5	7.60	28 M	2.1 H	18.8 VH	61 A	415 VH	1.7 M

Aluminum	Sodium	Nitrate N	Soluble Salts	Organic Matter	ENR	Molybdenum	NH4	Nickel	BiCarbs		
			mmhos/cm	2.91 %	58.2	ppm		ppm	meq/l		



Cation Exchange Capacity: 14.6 meq/100g

Base Saturation
K: 1.7 %
Mg: 10.7 %
Ca: 65.6 %
H: 22.0 %
Na: %



Fertility Recommendations
lbs. per Acre

Crop: NO CROP

Yield:

Lime Tons/Acre	Gypsum Tons/Acre	N Nitrogen	P2O5 Phosphate	K2O Potash	Mg Magnesium	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
				*							

* = Maintenance Recommendation

Comments:

Waters Agricultural Laboratories, Inc.
2101 Calhoun Rd. Hwy 81 Owensboro, KY 42301
(270) 685-4039 FAX (270) 685-3989

"Improving Growth... With Science"

Soil Analysis

LONNIE NORROD SOIL CONSULTING	Grower:	LONNIE NORROD	Received: 04/01/2015
	Farm ID:		Processed: 04/03/2015
277 RED WILLIAMS ROAD	Sample ID:	LOCATION G 0-4"	Account #: 66277
CROSSVILLE, TN 38571			

Lab Results
lbs. per Acre

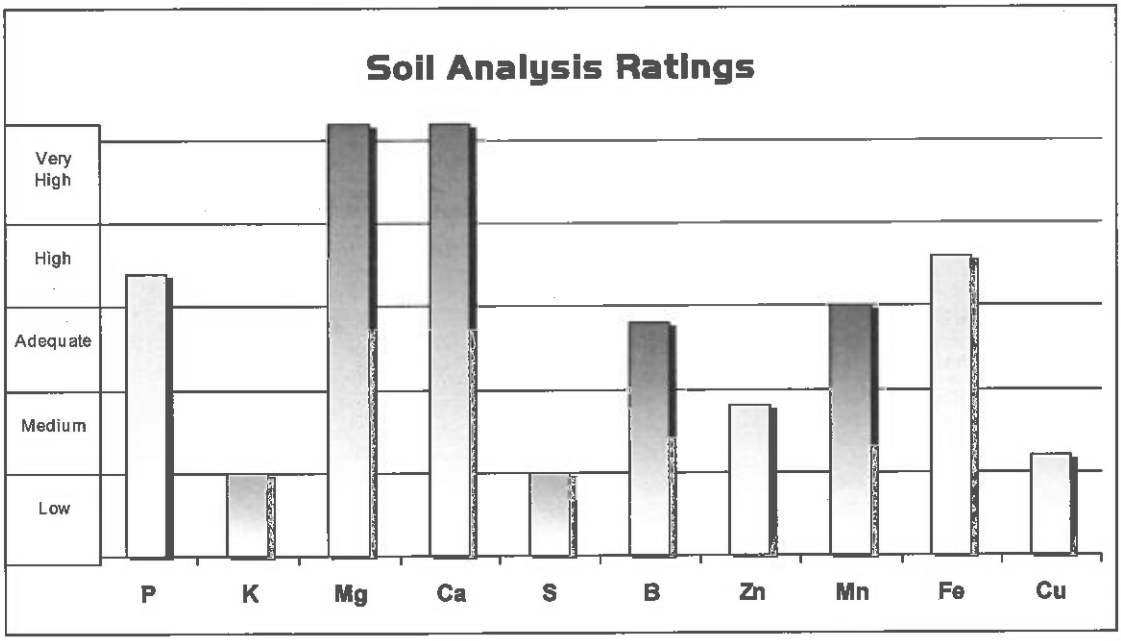
Lab Number: 181441WO

Target pH: 6.5

Test Method: Mehlich III

P Phosphorus	K Potassium	Mg Magnesium	Ca Calcium	Soil pH	Buffer pH	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
162 H	115 L	419 VH	2839 VH	6.5	7.70	23 L	1.8 A	5.6 M	198 A	285 H	1.8 M

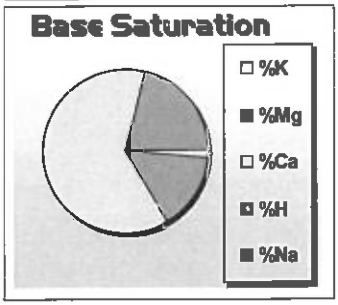
Aluminum	Sodium	Nitrate N	Soluble Salts	Organic Matter	ENR	Molybdenum	NH4	Nickel	BiCarbs		
			mmhos/cm	2.4 %	48	ppm		ppm	meq/l		



Cation Exchange Capacity: 11.4 meq/100g

Base Saturation

K:	1.3 %
Mg:	15.3 %
Ca:	62.3 %
H:	21.1 %
Na:	%



Fertility Recommendations
lbs. per Acre

Crop: NO CROP

Yield:

Lime Tons/Acre	Gypsum Tons/Acre	N Nitrogen	P2O5 Phosphate	K2O Potash	Mg Magnesium	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
			*	*							

* = Maintenance Recommendation

Comments:

Waters Agricultural Laboratories, Inc.
2101 Calhoun Rd. Hwy 81 Owensboro, KY 42301
(270) 685-4039 FAX (270) 685-3989

"Improving Growth... With Science"

Soil Analysis

LONNIE NORROD SOIL CONSULTING	**Grower:** LONNIE NORROD	**Received:**	04/01/2015
	Farm ID:	**Processed:**	04/03/2015
277 RED WILLIAMS ROAD	**Sample ID:** LOCATION I 0-4"	**Account #:**	66277
CROSSVILLE, TN 38571			

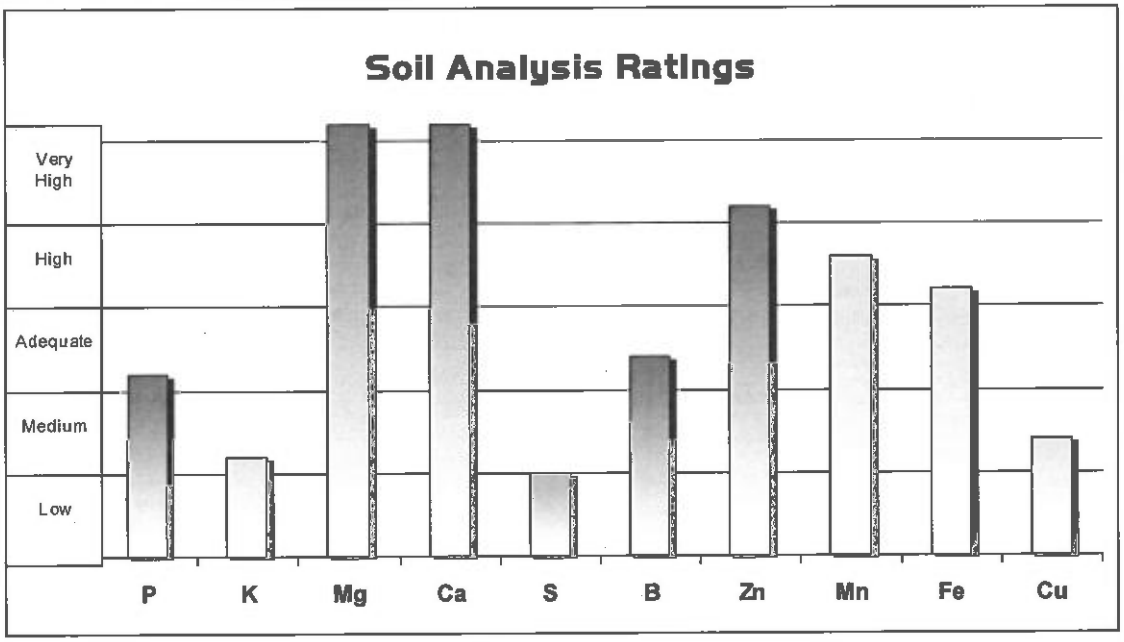
Lab Results
lbs. per Acre

Lab Number: 181440WO

Target pH: 6.5
Test Method: Mehlich III

P Phosphorus	K Potassium	Mg Magnesium	Ca Calcium	Soil pH	Buffer pH	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
106 A	145 M	464 VH	2796 VH	7.0	7.70	25 L	1.6 A	14.2 VH	317 H	202 H	2.0 M

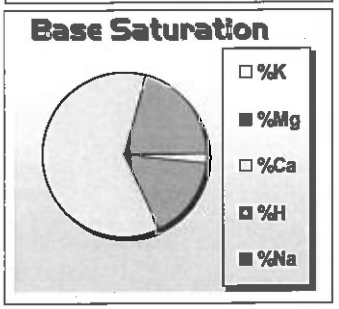
Aluminum	Sodium	Nitrate N	Soluble Salts	Organic Matter	ENR	Molybdenum	NH4	Nickel	BiCarbs		
			mmhos/cm	2.33 %	46.6	ppm		ppm	meq/l		



Cation Exchange Capacity	11.5 meq/100g

Base Saturation

K:	1.6 %
Mg:	16.8 %
Ca:	60.7 %
H:	20.9 %
Na:	%



Fertility Recommendations
lbs. per Acre

Crop: NO CROP

Yield:

Lime Tons/Acre	Gypsum Tons/Acre	N Nitrogen	P2O5 Phosphate	K2O Potash	Mg Magnesium	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
			*	*							

* = Maintenance Recommendation

Comments:

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Soil Analysis

LONNIE NORROD SOIL CONSULTING	**Grower:** LONNIE NORROD	**Received:**	04/01/2015
	Farm ID:	**Processed:**	04/03/2015
277 RED WILLIAMS ROAD	**Sample ID:** LOCATION J 0-4"	**Account #:**	66277
CROSSVILLE, TN 38571			

Lab Number: 181442WO

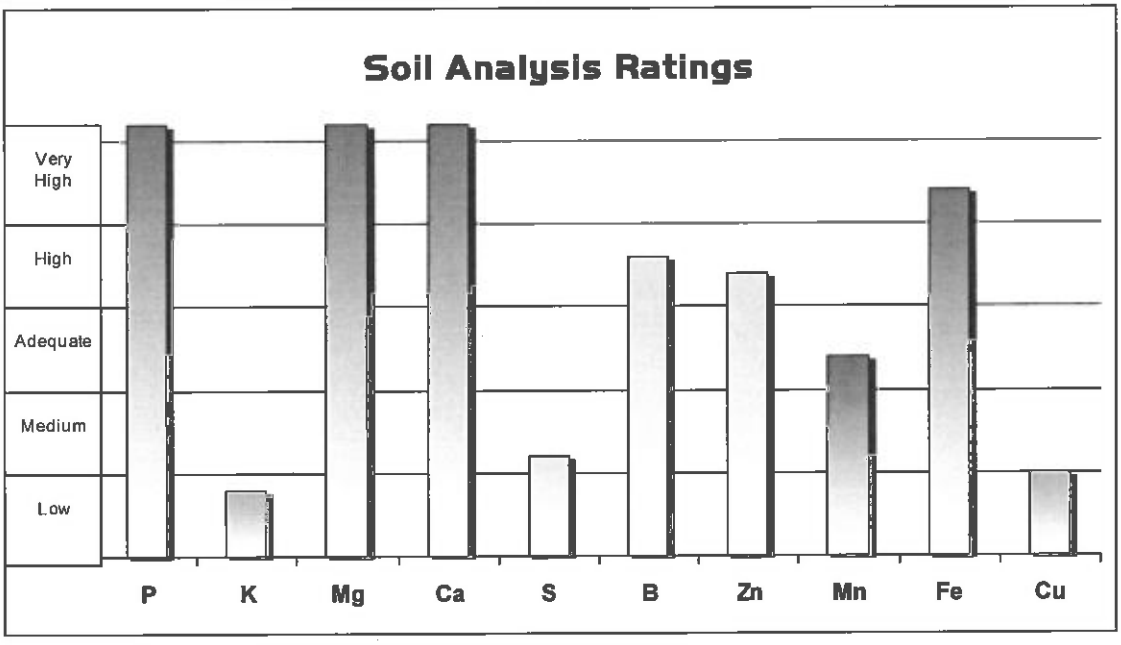
Lab Results
lbs. per Acre

Target pH: 6.5
Test Method: Mehlich III

P Phosphorus	K Potassium	Mg Magnesium	Ca Calcium	Soil pH	Buffer pH	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
393 VH	92 L	458 VH	2912 VH	6.4	7.55	26 M	2.3 H	11.3 H	116 A	474 VH	1.3 L

Aluminum	Sodium	Nitrate N	Soluble Salts	Organic Matter	ENR	Molybdenum	NH4	Nickel	BiCarbs		
			mmhos/cm	2.61 %	52.2	ppm		ppm	meq/l		

Soil Analysis Ratings

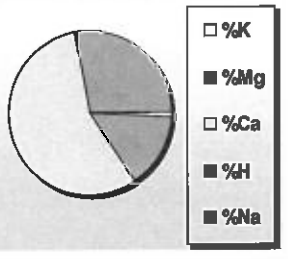


Cation Exchange Capacity	12.9 meq/100g

Base Saturation

K:	0.9 %
Mg:	14.8 %
Ca:	56.4 %
H:	27.9 %
Na:	%

Base Saturation



Fertility Recommendations
lbs. per Acre

Crop: NO CROP
Yield:

Lime Tons/Acre	Gypsum Tons/Acre	N Nitrogen	P2O5 Phosphate	K2O Potash	Mg Magnesium	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
0.0				*							

* = Maintenance Recommendation

Comments:

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2101 Calhoun Rd. Hwy 81 Owensboro, KY 42301
(270) 685-4039 FAX (270) 685-3989

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Soil Analysis

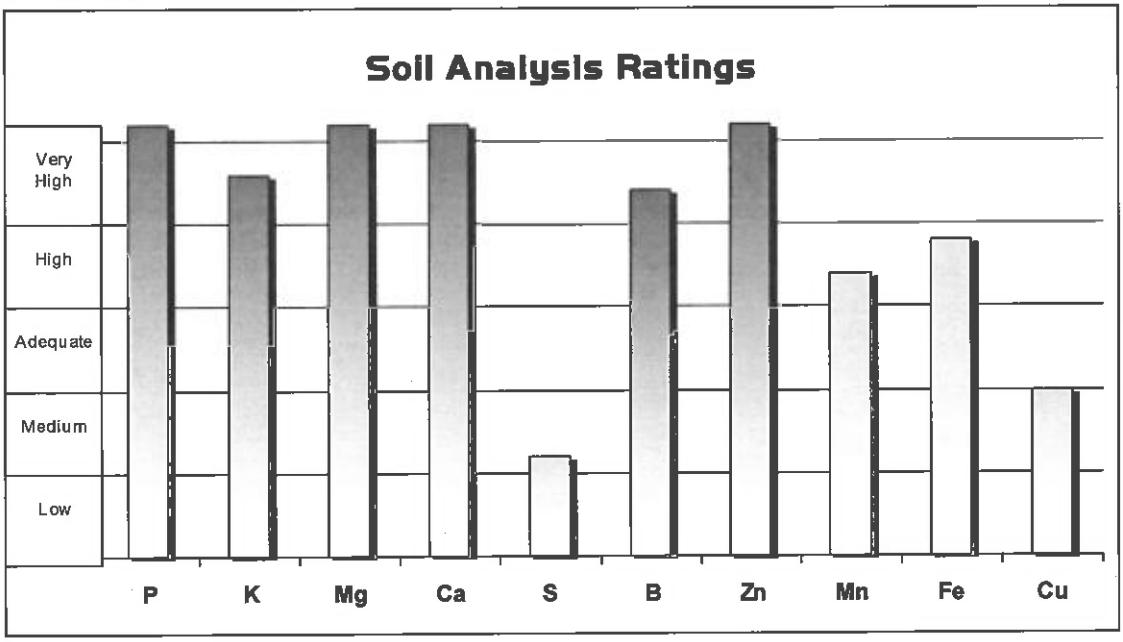
LONNIE NORROD SOIL CONSULTING	**Grower:**	LONNIE NORROD	**Received:** 04/01/2015
	Farm ID:		**Processed:** 04/03/2015
277 RED WILLIAMS ROAD	**Sample ID:**	LOCATION K 0-4"	**Account #:** 66277
CROSSVILLE, TN 38571			

Lab Results
lbs. per Acre

Lab Number: 181444WO

Target pH: 6.5
Test Method: Mehlich III

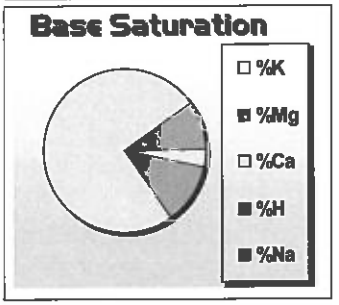
P Phosphorus	K Potassium	Mg Magnesium	Ca Calcium	Soil pH	Buffer pH	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
424 VH	547 VH	582 VH	6200 VH	7.3	7.75	30 M	2.9 VH	26.1 VH	272 H	346 H	2.9 M
Aluminum	**Sodium**	**Nitrate N**	**Soluble Salts**	**Organic Matter**	**ENR**	**Molybdenum**	**NH4**	**Nickel**	**BiCarbs**		
			mmhos/cm	3.86 %	77.2	ppm		ppm	meq/l		



Cation Exchange Capacity 20.6 meq/100g

Base Saturation

K:	3.4 %
Mg:	11.8 %
Ca:	75.1 %
H:	9.7 %
Na:	%



Fertility Recommendations
lbs. per Acre

Crop: NO CROP

Yield:

Lime Tons/Acre	Gypsum Tons/Acre	N Nitrogen	P2O5 Phosphate	K2O Potash	Mg Magnesium	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper

* = Maintenance Recommendation

Comments:

Waters Agricultural Laboratories, Inc.
2101 Calhoun Rd. Hwy 81 Owensboro, KY 42301
(270) 685-4039 FAX (270) 685-3989

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Soil Analysis

LONNIE NORROD SOIL CONSULTING

277 RED WILLIAMS ROAD
CROSSVILLE, TN 38571

Grower: LONNIE NORROD
Farm ID:
Sample ID: LOCATION L 0-4"

Received: 04/01/2015
Processed: 04/03/2015
Account #: 66277

Lab Results
lbs. per Acre

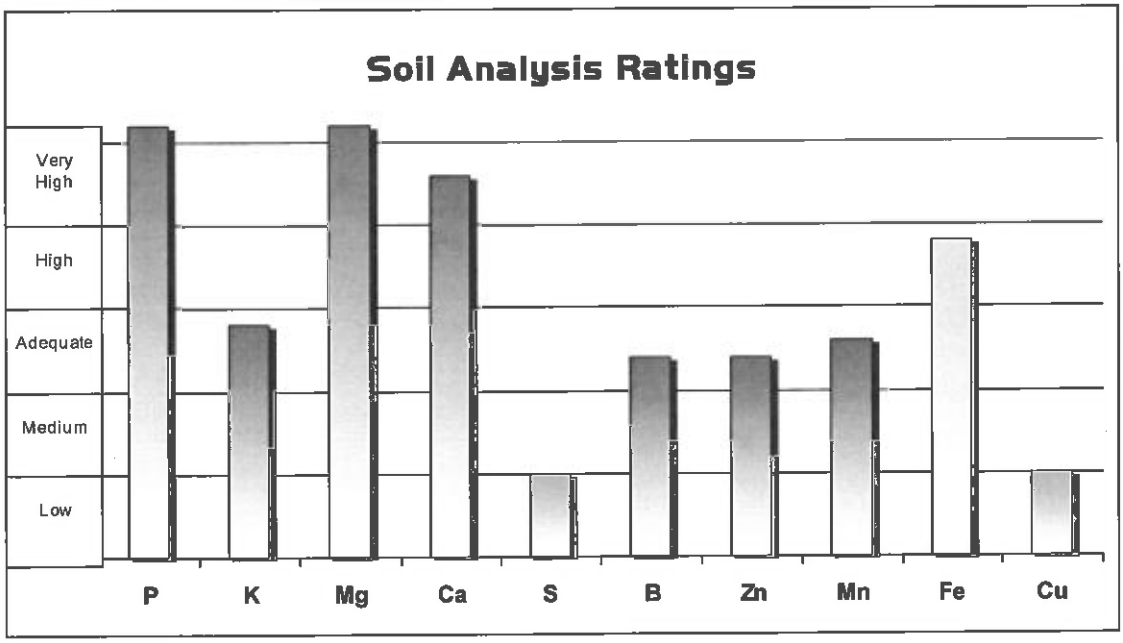
Lab Number: 181443WO

Target pH: 6.5
Test Method: Mehlich III

P Phosphorus	K Potassium	Mg Magnesium	Ca Calcium	Soil pH	Buffer pH	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
335 VH	304 A	454 VH	2272 VH	6.2	7.60	25 L	1.7 A	7.5 A	135 A	359 H	1.3 L

Aluminum	Sodium	Nitrate N	Soluble Salts	Organic Matter	ENR	Molybdenum	NH4	Nickel	BiCarbs		
			mmhos/cm	2.32 %	46.4	ppm		ppm	meq/l		

Soil Analysis Ratings

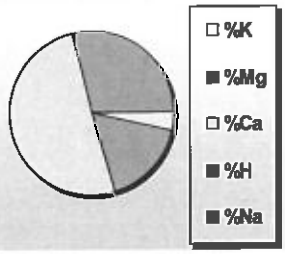


Cation Exchange Capacity: 11.2 meq/100g

Base Saturation

K:	3.5 %
Mg:	16.9 %
Ca:	50.9 %
H:	28.7 %
Na:	%

Base Saturation



Fertility Recommendations
lbs. per Acre

Crop: NO CROP

Yield:

Lime Tons/Acre	Gypsum Tons/Acre	N Nitrogen	P2O5 Phosphate	K2O Potash	Mg Magnesium	S Sulfur	B Boron	Zn Zinc	Mn Manganese	Fe Iron	Cu Copper
1.0				*							

* = Maintenance Recommendation

Comments:

Waters Agricultural Laboratories, Inc.

2101 Calhoun Road – Owensboro, KY 42301
phone: (270) 685-4039 – fax: (270) 685-3989 – email: kyinfo@watersag.com

Nitrate-N Analyses

Ship To:	Report Date:
Lonnie Norrod Soil Consulting **277 Red Williams Rd** **Crossville, TN 38571**	**April 2, 2015**

Grower/Client:	Lonnie Norrod Soil Consulting		
Farm/Field:			
Sampling Date:		Test Method:	**Proprietary**
Extraction Date:	04/01/2015	Lab Number(s):	**1362XX, 1364XX, 1366XX, 1368XX, 1370XX, 1372XX, 1374XX, 1376XX, 1378XX**
Sample Description:	Soil Samples		

Sample ID	Lab #	Sample Depth	NO3 (ppm)	NH4 (ppm)
Location 1 Nitrate	1362XX	6" – 12"	5.06	Not Requested
Location 2 Nitrate	1364XX	6" – 12"	4.68	Not Requested
Location 3 Nitrate	1366XX	6" – 12"	3.56	Not Requested
Location 4 Nitrate	1368XX	6" – 12"	3.22	Not Requested
Location 5 Nitrate	1370XX	6" – 12"	4.54	Not Requested
Location 6 Nitrate	1372XX	6" – 12"	3.55	Not Requested
Location 7 Nitrate	1374XX	6" – 12"	5.45	Not Requested
Location 8 Nitrate	1376XX	6" – 12"	6.63	Not Requested
Location 9 Nitrate	1378XX	6" – 12"	5.78	Not Requested

Comments:

Waters Agricultural Laboratories, Inc.

2101 Calhoun Road - Hwy. 81
Owensboro, Kentucky 42301
270-685-4039 phone / 270-685-3989 fax

Company: LONNIE NORROD SOIL CONSULTING
Address: 277 RED WILLIAMS RD
CROSSVILLE, TN 38571

Grower: LONNIE NORROD SOIL CONSULTING

Date Received: April 1, 2015 **Date of Report:** April 6, 2015

	Sample Number	Lab Number	Soil Type	% Silt + % Clay	% Sand	% Clay	% Silt
1	Location 1	1363x	Clay Loam	67.8	32.2	29.8	38
2	Location 2	1365x	Loam	60.6	39.4	27.8	32.8
3	Location 3	1367x	Clay Loam	66.2	33.8	28.6	37.6
4	Location 4	1369x	Loam	72.2	27.8	26.6	45.6
5	Location 5	1371x	Silty Clay Loam	81	19	33.4	47.6
6	Location 6	1373x	Clay Loam	57	43	29.4	27.6
7	Location 7	1375x	Clay Loam	77	23	36.6	40.4
8	Location 8	1377x	Silty Clay Loam	86.6	13.4	33.8	52.8
9	Location 9	1379x	Sandy Clay Loam	53	47	27	26
10							
11							
12							
13							
14							
15							
16							
17							
18							

11. The back-up wastewater disposal sites shall be identified and shown in the DDR. All proposed uses for the back-up sites shall be described in the DDR.

See plan for soil reserve areas.

12. Cost Estimate

12.1 *Engineered opinion of construction cost attached below*

Nolensville-Dove Wastewater Collection, Treatment and Dispersal
OPINION OF PROBABLE CONSTRUCTION COST

ITEM NO.	DESCRIPTION	UNIT	Estimated Quantity	unit price	amount
1	Mobilization	LS	1	$5,000.00	$5,000.00
2	Construction Surveying	LS	1	$2,500.00	$2,500.00
3	185'x55' Recirculating Sand Filter and all pertinent apparatuses	EA	1	$250,000.00	$250,000.00
4	Drip Dispersal Emitter Tubing + installation	LF	123,750	$0.72	$89,100.00
5	2" Zone Supply Header + Installation	LF	1545	$17.28	$26,697.60
6	2" Zone Return Header + installation	LF	1470	$17.28	$25,401.60
7	2" Zone Supply Line + installation	LF	670	$9.50	$6,365.00
8	2" Zone Return Line + installation	LF	1090	$9.50	$10,355.00
9	2" Solenoid Valves, boxes, wiring,& labor (Drip Field)	EA	28	$864.00	$24,192.00
10	Flushing Zone Valves, boxes, wiring,& labor (Drip Field)	EA	28	$486.00	$13,608.00
11	Stone for Meter Boxes	LS	1	$3,435.00	$3,435.00
12	48" Drip Zone Line Markers w/ Labels + installation	EA	28	$81.00	$2,268.00
13	Ultra Violet Disinfection Building with all pertinent apparatuses	EA	1	$45,000.00	$45,000.00
14	5,000 Gallon Recirculating Tank with all pertinent apparatuses	EA	1	$15,000.00	$15,000.00
15	3,000 Gallon Final Dose Tank with all pertinent apparatuses	EA	1	$10,000.00	$10,000.00
16	Embankment / Final Grading (RSF)	LS	1	$3,435.00	$3,435.00
17	Asphalt Pavement Access Drive	SY	350	$19.40	$6,790.00
18	Galvanized 6' Chain link fence with angled barbed wire	LF	3540	$19.44	$68,817.60
19	Wood Fence 3-rail	LF	800.00	$16.00	$12,800.00
19	7' gate access (72 inch chain link fence)	EA	3	$540.00	$1,620.00
20	Silt Fence	LF	600	$5.00	$3,000.00
21	Seed and Straw Disturbed Areas	acre	2	$35.00	$70.00
22	Flush Chambers	each	50	$125.00	$6,250.00
23	Storage Pond	CY	5,500	$4.00	$22,000.00
			Total		$653,704.60

Note:
SEC, Inc. has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor(s)' method of determining prices, or over competitive bidding or market conditions. SEC, Inc.'s opininons of Probable Cost are made on the basis of our experience and qualifications and represent our best judgement as an experienced and qualified professional engineering firm, familiar with the construction industry. SEC, Inc. cannot and does not guarantee that proposals, bids or actual project costs will not vary from Opinions of Probable Cost prepared by SEC, Inc. If prior to the Bidding or Negotiating Phase the owner wishes greater assurance as to Project Costs, the owner shall employ an Independent cost estimator.

12.2 *Not applicable*

12.3 *Not applicable*

13. If auxiliary sites are anticipated beyond the primary dedicated disposal site, these sites or disposal options must be presented for review. Beneficial reuse opportunities with treated wastewater will be considered on a case by case basis

Not applicable

14. Staging or Phasing of Construction

Not applicable

Appendix

Attachment 1: Confidential