May 20, 2022

David Hastings, Water and Wastewater Superintendent
City of Lawton
103 SW 4th Street,
Lawton, OK 73501

Re: General Permit No. OKLAS2200005 – Approved
One-time Land Application of Biosolids
City of Lawton Wastewater Treatment Facility
Facility No. S-11303
OPDES Permit No. OK0035246

Dear Mr. Hastings:

The Oklahoma Department of Environmental Quality (DEQ), Water Quality Division (WQD) is enclosing the authorization, No. OKLAS2200005, to operate in compliance with General Permit OK65S, for a one-time application of biosolids from the City of Lawton's (City) Wastewater Treatment Facility (WWTF). The City's application for this authorization was submitted to DEQ on May 6, 2022. On May 17, 2022, DEQ made a request for more information, and DEQ received the requested information the same day.

This authorization is approved in accordance with requirements of Oklahoma Administrative Code (OAC) 252:606, as adopted and promulgated pursuant to the Environmental Code, 27A Oklahoma Statute (O.S.) Supp. 2011.

The authorization is for a one-time application of biosolids from City's Wet Weather Flow Equalization Basin located at 8104 SE 15th Street, Lawton, OK to the following sites:

Site 1: 160 acres in the NW¼ of Section 28, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Site 2: 159.34 acres in the SE¼ of Section 29, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Site 3: 47 and 64 acres in the NE¼ of Section 32, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Sites 4 & 5: 480 acres in the NW¼, SW¼, and SE¼ of Section 33, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Site 6: 160 acres in the NE¼ of Section 33, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Site 7: 160 acres in the NW¼ of Section 34, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Sites 8 & 9: 120 acres in the SW¼ of Section 27, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

The sludge operation authorized by this permit should be maintained in accordance with the plan approved by WQD, DEQ on September 27, 2021. DEQ must approve any deviation from the approved plan in writing before changes can be made. I am returning a copy of the signed Permit for your records. If you have any questions, feel free to contact me at (405) 702-8108 or write to me at the letterhead address.

Sincerely,

Shane Hacker

Shane Hacker, P.E., District Engineer
Municipal Wastewater Enforcement Section
Water Quality Division

SH/MM/hb

Enclosure

cc: Aaron Gruenewald, Hodges Farms and Dredging, LLC.
Jeff Lawler, ECLS, Lawton DEQ Office
Bill Kropf, Regional Manager, ECLS, DEQ

**OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
AUTHORIZATION FOR ONE TIME LAND APPLICATION OF SEWAGE SLUDGE
UNDER GENERAL PERMIT NO. GP. OK65S**

AUTHORIZATION NO. OKLAS2200005

In compliance with Oklahoma Statute, Title 27A O.S. § 2-14-305 (2011) as amended, and the Rules of the Department of Environmental Quality promulgated thereunder, and in reliance on the certified statement and representation heretofore made in its application,

City of Lawton Wastewater Treatment Facility
103 SW 4th Street
Lawton, OK 73501

is hereby authorized for a one-time land application of biosolids from the City of Lawton Wastewater Treatment Facility to the following sites:

Site 1: 160 acres in the NW¼ of Section 28, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Site 2: 159.34 acres in the SE¼ of Section 29, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Site 3: 47 and 64 acres in the NE¼ of Section 32, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Sites 4 & 5: 480 acres in the NW¼, SW¼, and SE¼ of Section 33, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Site 6: 160 acres in the NE¼ of Section 33, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Site 7: 160 acres in the NW¼ of Section 34, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Sites 8 & 9: 120 acres in the SW¼ of Section 27, Township 1 North, Range 11 West of the Indian Meridian, Comanche County, Oklahoma;

Whose site-specific and land application site conditions conform to/with requirements established under 40 Code of Federal Regulations (C.F.R.) Part 503, and in accordance with sewage sludge characteristics, monitoring requirements, and other conditions set forth in General Permit No. OK65S, and in Parts I and II, hereof.

Issuance of this Authorization in no way or in any respect affects the Permittee's civil or criminal responsibilities regarding beneficial reuse by land application of sewage sludge, except with respect to the Permittee's legal responsibility under the Environmental Code and Rules promulgated by the Board of Environmental Quality to obtain this permit.

This Authorization is non-transferable and is granted summarily by and at the discretion of the Executive Director in accordance with applicable DEQ Rules and provisions of the above-referenced Permit.

This is to certify that the proposed beneficial reuse by land application of biosolids set forth in this Authorization meets the requirements of DEQ Rules, provided the Permittee does not exceed the loading rates and/or metal concentrations set forth in this Authorization.

Issued this 20th day of May, 2022.

____
Myles Mungle, P.E., Engineer Manager
Municipal Wastewater Enforcement Section
Water Quality Division

NOTE: Expiration date is upon completion of existing biosolids removal from the Wet Weather Basin at the City of Lawton Wastewater Treatment Facility.

PART I: MONITORING, LOADING RATES, METAL CONCENTRATIONS AND OTHER REQUIREMENTS.

SECTION A - MONITORING REQUIREMENTS,

During the period beginning on the effective date and lasting through the expiration date of this Authorization, the Permittee shall monitor all land application of sewage sludge in accordance with the following schedule.

Pollutants shall be monitored at the frequency schedule(s) shown below:

Amount of Sewage Sludge* (Metric tons/365 day period)	**Frequency**
0 ≥ Sludge ≤ 290	Once/Year
290 ≥ Sludge ≤ 1,500	Once/Quarter
1,500 ≥ Sludge ≤ 15,000	Once/Two Months
15,000 ≥ Sludge	Once/Month

*The amount of bulk sewage sludge applied to the land (dry weight basis).

Representative samples of sewage sludge shall be collected and analyzed in accordance with the methods referenced in 40 C.F.R. § 503.8 (b) (2011).

The required monitoring results shall be retained for the period of the Authorization. The results shall be submitted to the Department as follows:

Sampling Frequency	**Reporting deadline(s)**
Yearly	
January	February 28
Quarterly	
January, February and March	April 28
April, May and June	July 28
July, August and September	October 28
October, November and December	January 28
Bi-monthly	
January - February	March 28
March - April	May 28
May - June	July 28
July - August	September 28
September - October	November 28
November - December	January 28
Monthly Sampling	Due the 28th of the following month

SECTION B - LOADING RATES AND METAL CONCENTRATIONS

In addition to all other requirements and conditions of this General Permit, the Permittee is authorized to land apply sewage sludge only upon the condition that the pollutant ceiling concentration and cumulative pollutant loading rate shall not exceed the listed numerical limits. Metal concentrations of sewage sludge - Sewage sludge shall not be applied to the land if the concentration of any of the pollutants exceeds the following pollutant concentrations:

TABLE 1

Pollutant	**Ceiling Concentrations (milligrams per kilogram) ***
Arsenic	75
Cadmium	85
Copper	4300
Lead	840
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7500

*Dry Weight Basis

Cumulative Pollutant Loading Rate Limits:

TABLE 2

Pollutant	**Cumulative Pollutant Loading Rate (kilograms per hectare)**
Arsenic	41
Cadmium	39
Copper	1500
Lead	300
Mercury	17
Molybdenum	Monitor
Nickel	420
Selenium	100
Zinc	2800

All bulk sewage sludge which is applied to agricultural land, forest, or a reclamation site shall be treated by either Class A or Class B pathogen reduction requirements as defined in Part I Section 1.B.5 of the General Permit. The Permittee may land apply sewage sludge only during the effective date of this Authorization and shall immediately cease and desist any and all land application of sewage sludge made pursuant to such Authorization upon its expiration or at any time the required monitoring indicates that the cumulative loading rate is greater than the allowable rate set forth in this Authorization.

PART II: SPECIAL AND STANDARD CONDITIONS

SECTION A - SPECIAL CONDITIONS

1. There shall be no runoff or discharge from the land application site.
2. The commingling of sewage sludge with any other type of sludge or wastewater intended for land application is not allowed under this Authorization. Sludge which results from the commingling of sewage and any other additive shall not be land applied under this Authorization.
3. Special conditions and/or modification for specific land application sites will be included in the Authorization as necessary to protect the waters of the State.
4. When storage of sewage sludge is necessary, prior to land application, the sludge must be stored in a manner to prevent pollution to the waters of the State.
5. The Permittee is hereby given notice that this Authorization is in all respects subject to compliance with any and all applicable and relevant terms, conditions, provisions and requirements and any and all amendments of the laws of the State of Oklahoma and the Board of Environmental Quality's Rules. The absence of any express reference within this Authorization to any particular statutory requirement, rule(s) or standard(s) shall in no respect be deemed or construed to exempt or preclude the application of such requirement, rule(s) and standard(s) to this Authorization or the Permittee. By approval, grant and issuance of this Authorization, Permittee acknowledges receipt of true, correct and current copies of the Board of Environmental Quality's rules (as amended) provided, however, that Permittee further acknowledges that any and all amendments thereto shall become part of this Authorization.

SECTION B - STANDARD CONDITIONS

1. Duty to reapply: If the Permittee wishes to continue an activity regulated by this Authorization after the expiration date of said Authorization, the Permittee must reapply for and obtain a new Authorization. Application for renewal shall be submitted at least ninety (90) days before the expiration date of the original Authorization. The Department may grant permission to submit a renewal application out of time but not later than the original Authorization expiration date.
2. Duty to provide information: The Permittee shall furnish to the Department, within reasonable time, any information which the Department may request to determine whether cause exists for modifying or revoking the Authorization, or to determine compliance with the Authorization.
3. Facilities operation: All facilities and equipment used by the Permittee shall be operated as efficiently as possible and be maintained in good working order so as to achieve compliance with the terms and conditions of this Authorization.
4. Right to entry: The Permittee shall allow any representative of the Department, upon presentation of credentials to a responsible person to:
   a. Enter upon the Permittee's premises where sewage sludge is being land applied or where any records are required to be kept under the terms and conditions of the permit.

b. At reasonable times have access to and copy any records required to be kept under the terms and conditions of this Authorization; to inspect any equipment utilized in the land application of the sewage sludge; to take photographs; and to sample the sewage sludge being land applied or the soil at the land application site.

c. Enter upon the Permittee's premises to examine and inspect any facilities and equipment covered under the terms of the permit.

5. Monitoring and reporting: All monitoring and reporting shall be in accordance with Part I, Section A of the Authorization.

6. Noncompliance notification: If, for any reason, the Permittee does not comply with or is unable to comply with any term(s) or condition(s) of the permit, the Permittee shall within five (5) days of becoming aware of such condition, provide the Department with the following information in writing:

   a. Description of the noncompliance and the cause; and

   b. the period of noncompliance, including exact dates and times; or, if not corrected the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncompliance.

7. Sludge application limitations: Sewage sludge shall not be applied to any site which is flooded, frozen, snow covered or within 10 meters of any water of the U.S.

RECEIVED
MAY 06 2022
WATER QUALITY DIVISION

Hodges Farms & Dredging, LLC

Request for One Time Application of Biosolids – West Wet Weather Cell
Lawton WWTP - City of Lawton, OK
OPDES No. OK0035246 Facility ID #S-11303

Oklahoma Department of Environmental Quality
Water Quality Division

May 1, 2022

TABLE OF CONTENTS

SECTION A – BIOSOLIDS MANAGEMENT OPERATIONS PLAN

The City of Lawton, OK operates an 18 MGD treatment facility. Biological treatment of the waste stream into this Publicly Owned Treatment Works (POTW) Facility is comprised of primarily of domestic sewage is by tricking filter and activated sludge system. This project entales removal and one time application of accumulated solids from the west onsite wet weather cell. This Biosolids Management Plan and operations plan is for the removal and disposal of approximately 2,000 dry tons of biosolids from the west wet weather cell as part of ongoing and planned plant upgrades.

Biosolids will be loaded at the City of Lawton's Wastewater Treatment Facility wet weather cell and trucked to the fields when field cropping schedules and weather permit prior to planting or directly pumped via hose to adjacent farm ground. Trucks will be loaded at the facility and then transport the biosolids to a land application site.

Biosolids that are trucked offsite will field-loaded into liquid application equipment (pull tanks) for land application. The pull tanks will be equipped with toolbars used to subsurface inject or surface apply the biosolids. Biosolids directly land applied will be pumped to a tractor with a toolbar used to subsurface inject or surface apply the biosolids.

The following conditions will be meet for land application:

- Soil type and texture are suitable for the type of waste that will be land-applied.
- Areas of application meet topography requirements as stated in 252:606-8-6 for having minimal slope to prevent ponding and soil erosion.
- Target land application rates are based upon soil crop need for nitrogen and phosphorus.
- Water drainage characteristics for the site are suitable to avoid migration and runoff of biosolids from the site. For example the following will be implemented:

  - ✓ Avoid seasonal high groundwater periods on poorly and somewhat poorly drained soil.
  - ✓ Avoid sites not intended to be vegetated.
  - ✓ Maintain at least a 100-foot setback for incorporated/injected material from drainage pathways or unsuitable soil and steep slopes when water is present (252:606-8-3 c 17).
  - ✓ Maintain at least a 33-foot setback for incorporated/injected applied material from drainage pathways or unsuitable soil and steep slopes when water is NOT present
  - ✓ Avoid areas subject to frequent flooding or ponding.
  - ✓ Maintain at least a 250-foot setback from private domestic water supply wells (252:606-8-3 c 18).

Fields will not be land-applied when runoff may result, during periods of high groundwater conditions or during periods of flooding.

Recommendations for crop nitrogen and phosphorus will guide application rates. We are requesting a max hydraulic application rate of 27,000 gallons per acre. Rate is limited by percent solids. 1 dry tons per acre should provide ~10 lbs of nitrogen, 8.7 lbs of phosphorus, and 9.3 lbs of potassium based on testing.

The following site conditions will be observed:

- Food, feed, and fiber crops will not be harvested for 30 days after application of biosolids.
- Livestock will not be allowed to graze on the land for 30 days after application.
- Public access to the land with a low potential for public exposure will be restricted for 30 days after application.

SECTION B – APPLICANT / FACILITY INFORMATION

Legal Name of Applicant: City of Lawton WWTP

Mailing Address of Applicant: 103 SW 4th Street, Lawton, OK 73501

Applicant Contact: David Hastings

Applicant Phone: 580.512.7884 Email: david.hastings@lawtonok.gov

Facility Name: City of Lawton Wastewater Treatment Planty

Facility Address: 8104 SE 15th Street, Lawton, OK 73501
,
Facility Phone Number:

Facility Latitude: 34˚ 31' 37" N Longitude: 98˚ 22' 06" W

Facility Contact Name: David Hastings

Facility Contact Phone: 580.512.7884 Email: david.hastings@lawtonok.gov

The facility's Oklahoma Pollution Discharge Elimination System permit is included in Exhibit A.

SECTION C – CONTRACTOR INFORMATION

Hodges Farms and Dredging
501 N West Street
Lebo, KS 66856

Jeff Hodges Owner: 620.343.0513 Managing Director: Aaron Gruenewald 920.373.8715

SECTION D – DISPOSAL SITES OWNER AND OPEARATOR INFORMATION

Site 1: Deeded Acres – 160 Ac (Parcel ID 01N11W-28-2-99974-000-0000)

Site Owner:

Owner Address:

Operator:

Address:

Phone:

Site 2: Deeded Acres – 159.34 Ac (Parcel ID 01N11W-29-4-99974-000-0000)

Site Owner:

Owner Address:

Operator:

Address:

Phone:

Site 3: Deeded Acres – 47 Ac (Parcel ID 01N11W-32-1-99974-000-0000 and
64 Ac (Parcel ID 01N11W-32-1-99974-000-0000)

Site Owner:

Owner Address:

Operator:

Address:

Phone:

Site 4: Deeded Acres – 47 Ac

Site Owner:

Owner Address:

Operator:

Address:

Phone:

Site 5: Deeded Acres – 480 Ac (Parcel ID 01N11W-33-2-99974-000-0000)

Site Owner: Indian Land

Owner Address: Lawton, OK 73501

Operator:

Address:

Phone:

Site 6: Deeded Acres – 160 Ac (Parcel ID 01N11W-33-1-99974-000-0000

Site Owner:

Owner Address:

Operator:

Address:

Phone:

Site 7: Deeded Acres – 160 Ac (Parcel ID 01N11W-34-2-99974-000-0000

Site Owner:

Owner Address:

Operator:

Address:

Phone:

Site 8 and 9: Deeded Acres – 120 Ac (Parcel ID 01N11W-27-3-99974-000-0000

Site Owner: Geo Group

Owner Address: 4955 Technology Way, Boca Raton, FL 33431

Operator:

Address: – 4305 SE Flower Mound Rd, Lawon, OK 73501

Phone:

SECTION E – DOCUMENATION OF SITE OWNER

Operator Agreements are included in Exhibit C.

SECTION F – ANALTICAL INFORMATION

A Residuals Sampling Summary Form and Residuals Field Loading Report are included as part of Exhibit D. All analytical results (Pace Analytical, Inc. and Environmental Resource Technologies, LLC) are also included in Exhibit E. All analytical results are below Table 1 Ceiling Metal Concentrations and 40 CFR 503 Low Metal Ceiling Concentrations as indicated on the Field Loading Report (Exhibit E).

SECTION G - ANALTICAL INFORMATION – PATHOGEN DESTRUCTION CRITERIA FOR CLASS B

Pathogen Reduction (40 CFR 503.32) for Class B Biosolids was met by Alternative 1 (Fecal Coliform Geometric Mean of 7 samples is < 2,000,000 MPN or CFU/gram dry weight basis) as shown in the following table. Exhibit E includes Pace Analytical results from May 26, 2021.

Sample ID	Results (cfu/g)
1-Fecal	6,763
2-Fecal	81,508
3-Fecal	89,291
4-Fecal	80,765

- Pace Analytical, Inc. and Environmental Resource Technologies, LLC

SECTION H - ANALTICAL INFORMATION – VECTOR ATTRACTION REDUCTION CRITERIA

City of Lawton biosolids will be incorporated per Title 252 Chapter 606 and to meet Vector Attraction Reduction (VAR) criteria.

SECTION I – SITE(S) LEGAL DESCRIPTION (Includes the following 4 sites)

Site 1: NW ¼ of Section 28, Town 1N, Range 11W, Comanche County
Location: 34° 31' 58"N, 98° 21' 55"W – Deeded Acres: 160

Site 2: SE ¼ of Section 29, Town 1N, Range 11W, Comanche County
Location: 34° 31' 32"N, 98° 22' 49"W – Deeded Acres: 159.34

Site 3: Part of NE ¼ of Section 32, Town 1N, Range 11W, Comanche County
Location: 34° 31' 05"N, 98° 22' 13"W – Deeded Acres: 47 and 64

Site 4 and 5: NW ¼, SW ¼, and SE ¼, of Section 33, Town 1N, Range 11W, Comanche County
Location: 34° 30' 57"N, 98° 21' 55"W – Deeded Acres: 480

Site 6: NE ¼ of Section 33, Town 1N, Range 11W, Comanche County
Location: 34° 31' 05"N, 98° 21' 23"W – Deeded Acres: 160

Site 7: NW ¼ of Section 34, Town 1N, Range 11W, Comanche County
Location: 34° 31' 05"N, 98° 20' 52"W – Deeded Acres: 160

Site 8 and 9: Part SW ¼ of Section 27, Town 1N, Range 11W, Comanche County
Location: 34° 31' 33"N, 98° 20' 59"W – Deeded Acres: 120

SECTION J - SITE(S) USGS TOPOGRAPHIC MAP

Plat maps/aerial photographs of the proposed sites indicating soil type, setbacks, and areas of no application are included in Exhibit F. The maps for each site show:

- ✓ Homes and buildings adjacent or near the proposed land application sites
- ✓ Lakes, ponds, wetlands, dry runs, and streams
- ✓ Section lines or other legal boundaries, generally as shown on a plat map
- ✓ Setbacks as it relates to injection application

SECTION K - SITE(S) SOIL TESTING

Soil samples and associated 252:606-8-3 required results are included in Exhibit G.

SECTION L - SITE(S) WEB SOIL SURVEY MAP

Web Soil Survey maps are included in Exhibit F. A complete Site Soil Report all sites is included in Exhibit H. Borings/field investigation will be completed to ensure saturated soil conditions do not exist at the time of application. Portions of the fields that have the presence of seasonal high groundwater (saturated soil conditions) at the time of application will NOT be applied.

SECTION M – SITE SOIL REPORTS

Depth to groundwater was analyzed by a review of the site soils. Parts of the sites require setbacks from surface water. The fields have a depth to groundwater greater than 200 cm (>6.5'). A complete Site Soil Report for all sites is included in Exhibit H which further describe the soil types found within each site.

SECTION N – SPILL PREVENTION, CONTROL PLAN, AND EMERGENCY RESPONSE

In the unlikely event of a spill, the following actions will be taken immediately.

<u>Halt Source of Spill.</u> Use of any leaking or damaged unit which is causing the spill will cease immediately. The unit will be repaired before resuming its use.

<u>Contain Spill.</u> In the event large quantities of biosolids have been spilled, appropriate barriers will be used to contain the spill and prevent motorists from driving through it.

<u>Clean-Up.</u> Depending on the type and amount of biosolids spilled, a variety of equipment may be used to remove the biosolids: front-end loader, shovels and brooms and vacuum equipment of a liquid biosolids applicator. Any biosolids removed from the spill site will be spread on an approved application site, returned to the lagoon, or disposed of in an approved landfill.

<u>Final Clean-Up.</u> Flush roadways with water or sweep as necessary to clean. Allow to dry and incorporate if spill occurs on non-paved and tillable area. In the event a spill occurs on private property, final clean-up should be completed immediately to the satisfaction of the owner.

<u>Management of Clean-Up Efforts.</u> The Project Manager will take immediate charge and initiate clean-up activities. Hodges Farms and Dredging labor will be used, with additional labor secured as needed. The Project Manager will also communicate with the public on the scene, answering questions and advising of clean-up activities.

<u>Reporting.</u> All spills will be reported <u>immediately</u>. State and local agencies will be notified in accordance with their notification requirements.

Within 72 hours of the spill, the Project Manager will send a written report detailing how the spill occurred and remedial action taken.

<u>Spill Prevention.</u> The Project Manager will implement the following spill prevention measures:
1) Ensure loader operators do not overload trucks/trailers/tanks;
2) Ensure trailer hatches are closed and latched while transporting;
3) Ensure trailer seals are inspected on a daily basis and replaced as necessary; and
4) Ensure unloading operations in the field are conducted to minimize any potential runoff or tracking.

Environmental Protection, Dust Control, Mud, and Noise Control

Hodges Farms and Dredging will provide adequate methods to minimize dust from the plant site. Such methods include, but are not limited to:

- Water.
- Selecting work and staging areas, based upon existing current conditions, which will not cause excessive dust generation.

Hodges Farms and Dredging will have tools and equipment for sludge and mud removal from trucks and pavement.

Hodges Farms and Dredging will adjust procedures and hours of operation, as necessary, to mitigate excessive noise emanating from the site.

Washing of equipment or trucks with biosolids will take place in a designated & contained area near the lagoon and directed by City of Lawton plant staff.

SECTION O – OTHER INFORMATION

All pertinent and applicable information is included in attached Exhibits A through M.

Anticipated 10.185 lbs per dry ton. Bermudagrass at 6 tons per acre yield goal has application rate of 200-240 lbs of nitrogen per acre. Application rates will vary from 19.6 dry tons per acre to 23.6 dry tons per acre based on Nitrogen loading rates. Based on application limited by gallons per acre an application rate of 127 lbs of N per acre at 10% solids will apply 12.5 dry tons per acre equals 30,000 gallons per acre.

At an application rate of 10% solids and 12.5 dry tons per acre (127 lbs of N per acre) 160-200 acres will be needed for 2,000 dry tons. (2,000 total dry tons / 12.5 dry tons per acre = 160 acres).

Percent solids will be tested and tracked on a daily basis. Application rates will be adjusted accordingly to ensure the proper number of dry tons are applied per site. The above calculations assume an average percent solids result of 10%.

Soil sample results for Site 1 can be found in Section K. An average application rate will target 200 lbs of nitrogen per acre.

EXHIBIT A

OKLAHOMA POLLUTION DISCHARGE ELIMINATION SYSTEM PERMIT - #OK0035246

O K L A H O M A
DEPARTMENT OF ENVIRONMENTAL QUALITY

SCOTT A. THOMPSON
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT
Governor

March 10, 2020

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Rusty Whisenhunt, Director of Public Utilities
City of Lawton
103 SW 4th Street
Lawton, OK 73501

RE: DEQ Application for Renewal, OPDES Permit No. OK0035246
City of Lawton Wastewater Treatment Facility
Facility ID. No.: S-11303

Dear Mr. Whisenhunt:

Your new OPDES permit is enclosed. All public notice requirements have been met and public comment periods have expired. The draft permit received no comments. However, due to recent failure of the whole effluent toxicity testing for the fathead minnow species, the final permit has been revised to extend the trial period of quarterly testing, from one (1) year to two (2) years, before a biomonitoring frequency reduction may be requested if eligible (pass all 8 quarterly tests). The effective and expiration dates of this final permit appear on the cover page.

Should you have any questions regarding the final permit, please contact the Municipal Permits Section at the letterhead address or telephone (405) 702-8100. Should you have any questions regarding compliance with the conditions of this permit, please contact the Municipal Wastewater Enforcement Section at the same address and phone number.

Sincerely,

Michael B. Moe, P.E., Manager
Municipal Discharge and Stormwater Permit Section
Water Quality Division

MBM/VD/cp CG/WM/ST/PP/BB/BC/DM

Enclosures

c: Evelyn Rosborough, EPA Region 6 (6WQ-CA) w/permit

AUTHORIZATION TO DISCHARGE UNDER THE
OKLAHOMA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT NUMBER: OK0035246
ID NUMBER: S-11303

PART I

In compliance with the Oklahoma Pollutant Discharge Elimination System Act (OPDES Act), Title 27A O.S. § 2-6-201 *et seq.*, and the rules of the State of Oklahoma Department of Environmental Quality (DEQ) adopted thereunder {See OAC 252:606}; the Federal Clean Water Act, Public Law 95-217 (33 U.S.C. 1251 *et seq.*), Section 402; and NPDES Regulations (40 CFR Parts 122, 124, and 403),

City of Lawton
103 SW 4th Street
Lawton, OK 73501

is hereby authorized to discharge treated wastewater from a facility located at approximately

SE¼, SE¼, SW¼, Section 28,
Township 1 North, Range 11 West, Indian Meridian,
Comanche County, Oklahoma
or at 8104 SE 15th Street, Lawton, OK 73501

to receiving waters: Nine Mile Creek, a tributary to East Cache Creek at the point located at approximately:

Outfalls	Receiving Stream	Latitude [a]	Longitude [a]
001	Nine Mile Creek, East Cache Creek, Red River	34° 31' 27.748" N	98° 21' 53.717" W
002	Nine Mile Creek, East Cache Creek, Red River	34° 31' 22.638" N	98° 21' 44.072" W
003	Lake Comanche, unnamed tributary to Nine Mile Creek	34° 31' 23.804" N	98° 21' 45.358" W

[a] GPS: NAD83

Planning Segment No. 311300 of the Red River Basin

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, III, and IV hereof.

This permit replaces and supersedes the previous permit issued on November 30, 2011.

The issuance date of this permit is March 10, 2020.

This permit shall become effective April 1, 2020.

This permit and authorization to discharge shall expire at midnight March 31, 2025.

For the Oklahoma Department of Environmental Quality:

Michael B. Moe, P.E., Manager
Municipal Discharge and Stormwater Permit Section
Water Quality Division

Shellie R. Chard, Director
Water Quality Division

A. Effluent Limitations and Monitoring Requirements

During the period beginning the effective date and lasting through date of expiration the permittee is authorized to discharge treated wastewater in accordance with the following limitations:

1. Outfalls 001 and 002 (See explanation for total mass loading below)

Effluent Characteristics		**Discharge Limitations**			**Monitoring Requirements**	
		Mass Loading [a] (lb/d)	Concentrations (mg/l unless otherwise specified)		Frequency	Sample Type
		Monthly Avg.	Monthly Avg.	Weekly Avg.		
Flow (mgd) [b] [50050]	Year round	Report Monthly Average and Daily Maximum			Daily	Totalized
Carbonaceous Biochemical Oxygen Demand - 5 Day ($CBOD_5$) [80082]	Year round	1501.2	10.0	15.0	Daily	12-hr Comp
Total Suspended Solids (TSS) [00530]	Year round	2251.8	15.0	22.5	Daily	12-hr Comp
Ammonia as N (NH_3-N) [00610]	Apr – Oct	300.2	2.0	3.0	Daily	12-hr Comp
	Nov – Mar	450.4	3.0	4.5		
Dichlorobromomethane (µg/l) [32101]	Year round	1.55	10.34	15.09 Daily max.	1/2 Months	12-hr Comp
Selenium, total (µg/l) [c] [01147]	Year round	0.71	4.74 [d]	8.21 Daily Max.	2/Month	12-hr Comp
E. Coli (MPN/100 ml) [51040]	May – Sep	---	126 Geo. Mean	406 Daily Max.	2/Week	Grab
Total Residual Chlorine (TRC) [50060] [e]	Year round	---	Maximum: No Measurable [f]		Daily	Grab
Dissolved Oxygen (DO) [00300]	Apr – Oct	---	Minimum: 6.5		Daily	Grab
	Nov – Mar	---	Minimum: 6.0			
pH (standard unit) [00400]	Year round	---	6.5 – 9.0		Daily	Grab

[a] Total mass loading for discharges through Outfalls 001 and 002.

[b] Flow at Outfall 001shall be totalized measurement. Flow at Outfall 002 (overflow of the holding pond), if/when discharged, can be estimated.

[c] Compliance with permit limit is deferred for three (3) years from the effective date of the permit. During this deferment period, the permittee is required to monitor and report.

[d] If any individual test result reported by the lab is less than the minimum quantification level (for Selenium) of 5 µg/l, a value of zero (0) may be used for the discharge monitoring report (DMR) requirements.

[e] If no chlorine is used for an entire reporting period, the permittee shall report a value of "zero" for the daily maximum and enter "No chlorine used this reporting period" in the comments section on the DMR for that reporting period in lieu of the indicated testing. For any week in which chlorine is used, the indicated testing shall be done until chlorine is no longer in use and at least one subsequent test verifies that the effluent meets the total residual chlorine limit.

[f] No measurable is defined as less than 0.1 mg/l.

2. Outfall 003

The permittee may use test results (concentration limits) purportedly reported for Outfall 001 to fulfill the reporting requirements for Outfall 003.

Effluent Characteristics		Discharge Limitations			Monitoring Requirements	
		Mass Loading (lb/d)	Concentrations (mg/l unless otherwise specified)		Frequency	Sample Type
		Monthly Avg.	Monthly Avg.	Weekly Avg.		
Flow (mgd) [a] [50050]	Year round	Report Monthly Average and Daily Maximum			Daily	Totalized
Carbonaceous Biochemical Oxygen Demand - 5 Day ($CBOD_5$) [80082]	Year round	500.4	10.0	15.0	5/Week	12-hr Comp
Total Suspended Solids (TSS) [00530]	Year round	750.6	15.0	22.5	5/Week	12-hr Comp
Ammonia as N (NH_3-N) [00610]	Apr – Oct	100.1	2.0	3.0	5/Week	12-hr Comp
	Nov – Mar	150.1	3.0	4.5		
Dichlorobromomethane (µg/l) [32101]	Year round	0.52	10.34	15.09 Daily max.	1/2 Months	12-hr Comp
Selenium, total (µg/l) [b] [01147]	Year round	0.24	4.74 [c]	8.21 Daily Max.	2/Month	12-hr Comp
E. Coli (MPN/100 ml) [51040]	May – Sep	---	126 Geo. Mean	406 Daily Max.	2/Week	Grab
Total Residual Chlorine (TRC) [50060] [d]	Year round	---	Maximum: No Measurable [e]		Daily	Grab
Dissolved Oxygen (DO) [00300]	Apr – Oct	---	Minimum: 6.5		Daily	Grab
	Nov – Mar	---	Minimum: 6.0			
pH (standard unit) [00400]	Year round	---	6.5 – 9.0		Daily	Grab

[a] Flow at Outfall 003 shall be read/calculated from flow meter installed at the pump station at the effluent splitter basin.

[b] Compliance with permit limit is deferred for three (3) years from the effective date of the permit. During this deferment period, the permittee is required to monitor and report.

[c] If any individual test result reported by the lab is less than the minimum quantification level (for Selenium) of 5 µg/l, a value of zero (0) may be used for the discharge monitoring report (DMR) requirements.

[d] If no chlorine is used for an entire reporting period, the permittee shall report a value of "zero" for the daily maximum and enter "No chlorine used this reporting period" in the comments section on the DMR for that reporting period in lieu of the indicated testing. For any week in which chlorine is used, the indicated testing shall be done until chlorine is no longer in use and at least one subsequent test verifies that the effluent meets the total residual chlorine limit.

[e] No measurable is defined as less than 0.1 mg/l.

Other Year Round Requirements (Outfalls 001, 002, and 003)

- There shall be no discharge of floating solids or visible foam except in trace amounts.
- There shall be no discharge of a visible sheen of oil or globules of oil or grease on or in the water. Oil and grease shall not be present in quantities that adhere to stream banks, coat bottoms of water courses, or cause deleterious effects to the biota.
- All monitoring and reporting requirements shall also be in compliance with Part III of this permit.

Sampling Point: Samples taken in compliance with permit limits and monitoring requirements for all outfalls (Outfall 001, 002, and 003) shall be taken at the end of the final treatment unit located in the SE¼, SE¼, SW¼ Section 28, Township 1N, Range 11WIM, Comanche County, Oklahoma.

B. Whole Effluent Toxicity Reporting and Monitoring Requirements

During the period beginning with the effective date and lasting through the expiration date of the permit, the permittee is authorized to discharge from Outfalls TX1, TX2, and TX3 (functionally identical to Outfalls 001, 002, and 003). Such discharge shall be limited and monitored by the permittee as specified below.

The permittee is encouraged to perform required biomonitoring activities as early in the reporting period as is practical so as to ensure sufficient time remains in the reporting period should retests/repeat tests be necessary.

All laboratory analyses for the parameters specified in the biomonitoring section must be performed by a laboratory certified by the Oklahoma Department of Environmental Quality for those parameters.

Whole Effluent Toxicity Limit and Reporting Requirements for *Ceriodaphnia dubia*
(Outfalls TX1, TX2, and TX3)

Effluent Characteristic			Reporting/Monitoring Requirements [a]		
Test	Critical Dilution [c]	Parameter	7-day Min	Testing Frequency [b]	Sample Type
Ceriodaphnia dubia, 7-day chronic NOEC static renewal, freshwater	100%	Pass/Fail Survival [TLP3B]	Report	1/Quarter	24-hr Comp
		$NOEC_L$ Survival [TOP3B]	Report		
		% Mortality at Critical Dilution [TJP3B]	Report		
		Pass/Fail Reproduction [TGP3B]	Report		
		$NOEC_S$ Reproduction [TPP3B]	Report		
		% Coeff of Variation [TQP3B]	Report		
Whole Effluent Toxicity Limit (lowest chronic $NOEC_L$ and/or sublethal NOECs for *C. dubia*) [STORET 51710]			100%	1/Quarter [d]	24-hr Comp

[a] See Part II, Section E, Whole Effluent Toxicity Limit, for additional monitoring and reporting conditions.
[b] Quarterly reporting periods commence with the effective date of the permit. A valid WET test shall be reported for *C. dubia* for each reporting period. Results of retests conducted pursuant to prior test failure shall not be submitted on DMRs in lieu of routine test results.
[c] All chronic WET testing shall use the dilution series specified in Part II, Section E, Item 1.
[d] Results of retests conducted pursuant to prior test failure shall not be submitted on DMRs in lieu of routine test results.

C. dubia whole effluent toxicity limit and monitoring requirements apply beginning the effective date of the permit, and the first reporting period is April 1, 2020 to June 30, 2020 .

Whole Effluent Toxicity Monitoring and Reporting Requirements for Fathead minnow (Outfalls TX1, TX2, and TX3)

Effluent Characteristic				Rerpoting/Monitoring Requirements [a]		
Test		Critical Dilution [c]	Parameter	7-day Min	Testing Frequency [b]	Sample Type
	Pimephales promelas (Fathead minnow), 7-day chronic NOEC static renewal, freshwater	100%	Pass/Fail Survival [TLP6C]	Report	1/Quarter [d]	24-hr Comp
			NOEC$_L$ Survival [TOP6C]	Report		
			% Mortality at Critical Dilution [TJP6C]	Report		
			Pass/Fail Growth [TGP6C]	Report		
			NOEC$_S$ Growth [TPP6C]	Report		
			% Coeff of Variation [TQP6C]	Report		
Retesting	Retest #1 [22415] [e]			Report	As Required [f]	24-hr Comp
	Retest #2 [22416] [e]			Report		

a See Part II, Section F, Whole Effluent Toxicity Testing, for additional monitoring and reporting conditions.
b See provision for monitoring frequency reduction after the second year (Part II, Section F, Item 5).
c All chronic WET testing shall use the dilution series specified in Part II, Section F, Item 1
d Results of retests conducted pursuant to prior test failure shall not be submitted on DMRs in lieu of routine test results (see Part II, Section F, Item 2.a).
e Applies according to results of test failure triggering monthly retests.
f Monthly retesting required only if routine test for reporting period fails. Fill out ONLY these two retest parameters on the retest DMRs, do not change the original results, and put the correct submission date in the lower right hand corner of the DMR.

P. promelas (Fathead minnow) whole effluent toxicity reporting and monitoring requirements apply beginning the effective date, and the first reporting period is April 1, 2020 to June 30, 2020 .

Dilution Water and WET Test Acceptability

For Outfall TX1 and Outfall TX2 where the receiving stream (Nine Mile Creek)'s flow is intermittent, OAC 252:690-3-36 states that "...where there is no receiving water available when the sample is collected, permittees must use synthetic dilution water having a pH, hardness, and alkalinity similar to that of the closet downstream perennial water."

For Outfall TX3 where the receiving stream is Comanche Lake, OAC 252:690-3-37 states that "...permittees must use receiving water collected as close to the point of discharge as possible but unaffected by the discharge. Receiving water must be collected outside the regulatory mixing zone for discharges to lakes. If the receiving water control fails to fulfill the test acceptability criteria in OAC 252:690-3-38, the permittee must substitute synthetic dilution water for the receiving water in all subsequent tests, provided:

(1) a synthetic dilution water control which fulfills the test acceptability requirements in OAC 252:690-3-38 was run concurrently with the receiving water control.

(2) the test indicating receiving water toxicity was carried out to completion.

(3) the synthetic dilution water had a pH, hardness and alkalinity similar to that of the receiving water, provided the magnitude of these three parameters did not cause toxicity in the synthetic dilution water.

(4) the receiving water test must be conducted at the start of each permitting cycle."

Three (3) separate WET tests must be conducted, one (1) for each outfall using different receiving stream water, as indicated above (two WET tests if Outfall TX2 remain inactive). The permittee may use the same effluent sample for those WET tests. In accordance with OAC 252:690-3-38, if a WET test does not meet all of the acceptability requirements of the test method plus those specified above, the permittee must conduct a repeat test for the affected test species within the required reporting period.

WET Testing Summary Reports

The permittee must submit reports of all WET testing initiated, regardless of whether such tests are carried to completion, in accordance with the terms of Item 3 of Sections E and F in Part II of the permit.

Whole Effluent Toxicity Concurrent Testing Requirements

In accordance with OAC 252:690-3-30, if there is reason to believe certain substances may cause or contribute to whole effluent toxicity, the permit may require testing of those substances concurrently with WET testing. Specific concurrent testing requirements for ammonia are described at OAC 252:690-3-25.

Concurrent analyses of ammonia and pH are required for each individual effluent sample collected for chronic WET testing or retesting of the Fathead minnow specie. Reporting of concurrent testing results shall be in accordance with the following requirements. Results shall also be submitted in or concurrently with each WET test report.

Concurrent Effluent Testing for Chronic WET Tests – Reporting Requirements
(Outfalls TX1, TX2, and TX3)

Effluent Characteristic	**Concentration**			**Monitoring Requirements**	
	Daily Min	Monthly Avg	Daily Max	Monitoring Frequency [a]	Sample Type
Ammonia, (NH_3-N) (mg/l) [a, b] [STORET 00610]	Report	Report	Report	1/Quarter	24-hr Comp [b]
pH (std units) [a, b] [STORET 00400]	Report	N/A	Report	1/Quarter	Measured in each composite effluent sample, including static renewals, just prior to first use [b]

[a] Report only those effluent samples collected for WET testing of the Fathead minnow species.

[b] Samples collected for WET testing purposes, including static renewals, shall be of sufficient volume to allow for the required concurrent analyses in addition to the WET testing itself.

Two sets of samples for **concurrent analyses** are required for ammonia and pH:

Samples sent directly to a WET testing laboratory shall NOT undergo any preservation other than refrigeration to maintain a temperature at or below 6° C but not frozen prior to arrival and processing at the WET testing laboratory. These results may be used in the table above.

A second concurrent analysis is required for the sample that is sent to the WET testing laboratory and for the table above.

Just prior to the first use of each composite sample for WET testing purposes, the biomonitoring laboratory shall take an adequately-sized portion of each composite sample, acidify it in accordance with preservation requirements in 40 CFR 136, and have it analyzed for ammonia (NH_3-N) at a state certified analytical laboratory. The pH measurement required for the above table must be taken just prior to the acidification step. These pH and ammonia readings should NOT be included in the results for Outfalls 001, 002, and 003.

Samples sent directly to a state certified analytical laboratory must be composite samples that are properly preserved. These results may be included in the results for Outfalls 001, 002, and 003.

Sampling Location: Samples taken in compliance with the monitoring requirements specified above for Outfalls TX1, TX2, and TX3 shall be taken at the same location as for Outfalls 001, 002, and 003.

C. Compliance Schedule

Effluent limits for total selenium are now established in the permit. Data submitted with the application indicates that the permittee may not be able to comply with permit limits; therefore, compliance with permit limits is deferred for three (3) years. During this deferment period the permittee is required to monitor and report for selenium. The permittee should evaluate data from the monitoring requirement, and may need to revise the plant's operation and maintenance routine, or propose revisions to its pretreatment program in order to comply with the newly established limits. Such evaluation or revision of the plant's operation and maintenance routine, pretreatment program, or additional plant improvements, if any, should begin as soon as possible so that compliance with newly established limits can be attained. The permittee is required to complete the following tasks and submit to the DEQ in accordance with the following schedule:

Task	Due date
A. Submit a report with results and evaluation of the monitoring requirement for total selenium	15 months from the effective date of the permit
B. Submit Plan of Actions to reduce selenium from entering the treatment system and to attain compliance with permit limits	18 months from the effective date of the permit
C. Submit engineering report for plant improvements (if needed)	21 months from the effective date of the permit
D. Submit Plans and Specifications for plant improvements (if needed)	24 months from the effective date of the permit
E. Complete plant improvements (if needed)	33 months from the effective date of the permit
F. Attain final compliance with permit limits	36 months from the effective date of the permit

D. Reporting of Monitoring Results

Monitoring results shall be reported in accordance with the provisions of Part III.B.5 of the permit. Monitoring results obtained during the previous month shall be summarized and electronically reported on an electronic Discharge Monitoring Report (eDMR) form due to the Oklahoma Department of Environmental Quality, Water Quality Division, Wastewater Compliance Tracking Section no later than the 15th day of the month following the completed monthly test. If no discharge occurs during the reporting period, an eDMR form stating "No Discharge" shall be electronically submitted according to the above schedule. Instructions on how to register as a Preparer or Signatory for eDMRs, as well as how to prepare and submit eDMRs, can be found on DEQ's website at http://www.deq.state.ok.us/wqdnew/ereporting/index.html. Assistance is also available by contacting DEQ at (405) 702-8100 or deqreporting@deq.ok.gov.

The first report is due on the 15th of May, 2020 .

E. Sanitary Sewer Overflows

Any bypass in the collection system [sanitary sewer overflow (SSO)] shall be reported in accordance with Permit Part III.B.6.

PERMIT PART II - OTHER PERMIT REQUIREMENTS

A. CONTRIBUTING INDUSTRIES AND PRETREATMENT REQUIREMENTS

1. The permittee shall operate an industrial pretreatment program in accordance with Section 402(b)(8) of the Clean Water Act, the General Pretreatment Regulations (40 CFR Part 403) and the provisions of the subsequently approved industrial pretreatment program submitted by the permittee. A Publicly Owned Treatment Works (POTW) facility is defined in 40 CFR 403.3(o) as any devices and systems used in storage, treatment, recycling and reclamation of municipal sewage and industrial wastes of a liquid nature. It includes sewers, pipes and other conveyances if they convey wastewater to a POTW. The term also means a municipality as defined in the Act, which has jurisdiction over the Indirect Discharges to and from such treatment works. The POTW pretreatment program was approved on March 14, 1983 and modified on June 30, 1992, June 20, 2000, and August 12, 2002 to include program revisions with the incorporation of the latest 40 CFR Part 403 regulations adopted by DEQ effective June 15, 2007, approved on October 23, 2011, and a minor modification approved on August 2, 2013. Any non-substantial modifications [as defined under 40 CFR 403.18(b)] to the POTW pretreatment program received and implemented in accordance with 40 CFR 403.18(d) shall be considered incorporated as of the date of approval by DEQ. The current POTW pretreatment program is hereby incorporated by reference and shall be implemented in a manner consistent with the following requirements:

    a. Industrial user information shall be updated at a frequency adequate to ensure that all IUs are properly characterized at all times;

    b. The frequency and nature of industrial user compliance monitoring activities by the permittee shall be commensurate with the character, consistency and volume of waste. However, in keeping with the requirements of 40 CFR 403.8 (f)(2)(v), the permittee must inspect and sample the effluent from each Significant Industrial User at least once a year. This is in addition to any industrial self-monitoring activities;

    c. The permittee shall enforce and obtain remedies for noncompliance by any industrial users with applicable pretreatment standards and requirements;

    d. The permittee shall control through permit, order, or similar means, the contribution to the POTW by each Industrial User to ensure compliance with applicable Pretreatment Standards and requirements. In the case of Industrial Users identified as significant under 40 CFR 403.3(t), this control shall be achieved through permits or equivalent individual control mechanisms issued to each such user. Such control mechanisms must be enforceable and contain, at a minimum, the following conditions:

        (1) Statement of duration (in no case more than five years);

        (2) Statement of non-transferability without, at a minimum, prior notification to the POTW and provision of a copy of the existing control mechanism to the new owner or operator;

        (3) Effluent limits based on applicable general pretreatment standards, categorical pretreatment standards, local limits, and State and local law;

        (4) Self-monitoring, sampling, reporting, notification, and record keeping requirements, including an identification of the pollutants to be monitored, sampling location, sampling frequency, and sample type, based on the applicable general pretreatment standards in 40 CFR 403, categorical pretreatment standards, local limits, and State and local law; and

(5) Statement of applicable civil and criminal penalties for violation of pretreatment standards and requirements and any applicable compliance schedule. Such schedules may not extend the compliance date beyond federal deadlines.

e. The permittee shall evaluate, at least once every two years, whether each Significant Industrial User needs a plan to control slug discharges. If the POTW decides that a slug control plan is needed, the plan shall contain at least the minimum elements required in 40 CFR 403.8 (f)(2)(v);

f. The permittee shall provide adequate staff, equipment, and support capabilities to carry out all elements of the pretreatment program; and,

g. The approved program shall not be modified by the permittee without the prior approval of DEQ.

2. The permittee shall establish and enforce specific limits to implement the provisions of 40 CFR Parts 403.5(a) and (b), as required by 40 CFR Part 403.5(c). Each POTW with an approved pretreatment program shall continue to develop these limits as necessary and effectively enforce such limits.

   The permittee shall within sixty (60) days of the effective date of this permit: (1) submit a **WRITTEN CERTIFICATION** that a technical evaluation has demonstrated that the existing technically based local limits (TBLL) are based on current state water quality standards and are adequate to prevent pass through of pollutants, inhibition of or interference with the treatment facility, worker health and safety problems, and sludge contamination, **OR** (2) submit a **WRITTEN NOTIFICATION** that a technical evaluation revising the current TBLL and a draft sewer use ordinance which incorporates such revisions will be submitted within 12 months of the effective date of this permit.

   All specific prohibitions or limits developed under this requirement are deemed to be conditions of this permit. The specific prohibitions set out in 40 CFR Part 403.5(b) shall be enforced by the permittee unless modified under this provision.

3. The permittee shall analyze the treatment facility influent and effluent for the presence of the toxic pollutants listed in 40 CFR 122 Appendix D (NPDES Application Testing Requirements) Table II at least 1/6 months and the toxic pollutants in Table III at least 1/6 months. If, based upon information available to the permittee, there is reason to suspect the presence of any toxic or hazardous pollutant listed in Table V, or any other pollutant, known or suspected to adversely affect treatment plant operation, receiving water quality, or solids disposal procedures, analysis for those pollutants shall be performed at least 1/6 months on both the influent and the effluent.

   The influent and effluent samples collected shall be composite samples consisting of at least 12 aliquots collected at approximately equal intervals over a representative 24 hour period and composited according to flow. Sampling and analytical procedures shall be in accordance with guidelines established in 40 CFR 136. The effluent samples shall be analyzed to a level as required in item 6 below. Where composite samples are inappropriate, due to sampling, holding time, or analytical constraints, at least 4 grab samples, taken at equal intervals over a representative 24 hour period, shall be taken.

4. The permittee shall prepare annually a list of Industrial Users which during the preceding twelve months were in significant noncompliance with applicable pretreatment requirements. For the purposes of this Part, significant noncompliance shall be determined based upon the more stringent of either criteria established at 40 CFR Part 403.8(f)(2)(vii) [rev. 7/24/90] or criteria established in the approved POTW pretreatment program. This list is to be published annually in the largest daily newspaper in the municipality during the month of March.

In addition, during the **month of March** the permittee shall submit an updated status report to DEQ containing the following information:

a. An updated list of all significant industrial users. For each industrial user listed the following information shall be included:

(1) Standard Industrial Classification (SIC) code and categorical determination;

(2) Control document status. Whether the user has an effective control document, and the date such document was last issued, reissued, or modified, (indicate which industrial users were added to the system (or newly identified) within the previous 12 months);

(3) A summary of all monitoring activities performed within the previous 12 months. The following information shall be reported:

(a) total number of inspections performed;
(b) total number of sampling visits made;

(4) Status of compliance with both effluent limitations and reporting requirements. Compliance status shall be defined as follows:

(5) Compliant (C) - no violations during the previous 12 month period;

(6) Non-compliant (NC) - one or more violations during the previous 12 months but does not meet the criteria for significantly non-compliant industrial users;

(7) Significant Noncompliance (SNC) - in accordance with requirements described in d. above; and

(8) For significantly non-compliant industrial users, indicate the nature of the violations, the type and number of actions taken (notice of violation, administrative order, criminal or civil suit, fines or penalties collected, etc.) and current compliance status. If ANY industrial user was on a schedule to attain compliance with effluent limits, indicate the date the schedule was issued and the date compliance is to be attained;

(a) A list of all significant industrial users whose authorization to discharge was terminated or revoked during the preceding 12 month period and the reason for termination;

(b) A report on any interference, pass through, upset or POTW permit violations known or suspected to be caused by industrial contributors and actions taken by the permittee in response;

(c) The results of all influent and effluent analyses performed pursuant to permit Part II D.3 above;

(d) A copy of the newspaper publication of the significantly non-compliant industrial users giving the name of the newspaper and the date published; and

(e) The monthly average water quality based effluent concentration necessary to meet the state water quality standards as developed in the approved technically based local limits.

5. The permittee shall provide adequate notice of the following:

   a. Any new introduction of pollutants into the treatment works from an indirect discharger which would be subject to Sections 301 and 306 of the CWA and/or Sections 40 CFR 405-499 if it were directly discharging those pollutants;

   b. Any substantial change in the volume or character of pollutants being introduced into the treatment works by a source introducing pollutants into the treatment works at the time of issuance of the permit; and

   c. Adequate notice shall include information on (i) the quality and quantity of effluent to be introduced into the treatment works, and (ii) any anticipated impact of the change on the quality or quantity of effluent to be discharged from the POTW.

6. All effluent monitoring conducted in accordance with permit Part II A.3 above; shall meet the Minimum Quantification Levels (MQLs) shown in the attached tables (on Page 21).

B. REOPENER CLAUSE

This permit may be reopened for modification or revocation and reissuance to require additional monitoring and/or effluent limitations where actual or potential exceedances of State water quality criteria are determined to be the result of the permittee's discharge to the receiving water(s), or a revised Total Maximum Daily Load is established for the receiving water(s), or when required as technology. Modification or revocation and reissuance of the permit shall follow regulations listed at 40 CFR 124.5.

C. BIOSOLIDS/SEWAGE SLUDGE REQUIREMENTS

Biosolids/sewage sludge disposal practices shall comply with the Federal regulations for landfills, biosolids/sewage sludge, and solid waste disposal established at 40 CFR Part 257, 503, and the DEQ rules governing Sludge Management (OAC 252:515 and OAC 252:606) as applicable.

The biosolids/sewage sludge disposal practices shall also comply with the requirements of the Sludge Disposition Plan, which was approved by the DEQ on June 1, 2009, that allows the permittee to landfill biosolids/sewage sludge at the City of Lawton Municipal Landfill, which is located in Section 30, Township 1 North, Range 11 West, Comanche County, Oklahoma.

The permittee is required to maintain all records relevant to sewage sludge disposal for the life of the permit. These records shall be made available to the DEQ upon request.

The permittee shall give 120 days prior notice to DEQ of any change planned in the sewage sludge disposal practice.

D. POLLUTION PREVENTION REQUIREMENTS

1. The permittee shall institute a program within 12 months of the effective date of the permit (or continue an existing program) directed towards optimizing the efficiency and extending the useful life of the facility. The permittee shall consider the following items in the program:

   a. The influent loadings, flow, and design capacity;
   b. The effluent quality and plant performance;
   c. The age and expected life of the wastewater treatment facility's equipment;

d. Bypasses and overflows of the tributary sewerage system and treatment works;

e. New developments at the facility;
f. Operator certification and training plans and status;
g. The financial status of the facility;
h. Preventative maintenance programs and equipment conditions; and
i. An overall evaluation of conditions at the facility.

2. The permittee shall prepare the following information on the biosolids/sewage sludge generated by the facility:

a. An annual quantitative tabulation of the ultimate disposition of all biosolids/sewage sludge (including, but not limited to, the amount beneficially reused, landfilled, and incinerated).

b. An assessment of technological processes and an economic analysis evaluating the potential for beneficial reuse of all biosolids/sewage sludge not currently beneficially reused, including a listing of any steps which would be required to achieve the biosolids/sewage sludge quality necessary to beneficially reuse the biosolids/sewage sludge.

c. A description of, including the expected results and the anticipated timing for, all projects in process, in planning, and/or being considered which are directed towards additional beneficial reuse of biosolids/sewage sludge.

d. An analysis of one composite sample of the biosolids/sewage sludge collected prior to ultimate re-use or disposal shall be performed for the pollutants listed in Part IV, Element 1, Section III, Table 3.

e. A listing of the specific steps (controls/changes) which would be necessary to achieve and sustain the quality of the biosolids/sewage sludge so that the pollutant concentrations in the biosolids/sewage sludge fall below the pollutant concentration criteria listed in Part IV, Element 1, Section III, Table 3.

f. A listing of, and the anticipated timing for, all projects in process, in planning, and/or being considered which are directed towards meeting the biosolids/sewage sludge quality referenced in (e) above.

The permittee shall certify in writing, within three years of the effective date of the permit, that all pertinent information is available. This certification shall be submitted to:

Oklahoma Department of Environmental Quality
Water Quality Division
Municipal Permits Section
P. O. Box 1677
707 North Robinson Street
Oklahoma City, Oklahoma 73101-1677

E. WHOLE EFFLUENT TOXICITY TESTING – *Ceriodaphnia dubia*

1. Scope and Methodology

a. The permittee shall test the effluent for toxicity in accordance with the provisions in this section, which apply individually and separately to the outfalls listed below. No samples or portions of samples from one outfall may be composited with samples or portions of samples from another outfall. The permittee shall biomonitor for *Ceriodaphnia dubia* in accordance with the WET testing frequencies prescribed in Part I. Intervals between test initiation dates shall be a function of the required testing frequency, as follows:

The permittee is encouraged to perform required biomonitoring activities as early in the reporting period as is practical to ensure sufficient time remains in the reporting period should retests/repeat tests be necessary.

All laboratory analyses for the biomonitoring parameters specified in this permit must be performed by a laboratory certified by the Oklahoma Department of Environmental Quality for those parameters.

Intervals between test initiation dates shall be a function of the required testing frequency, as follows:

- Monthly: No less than 20 days and no more than 40 days.
- Quarterly: No less than 2 months and no more than 4 months.
- Semi-annually: No less than 4 months and no more than 8 months.

APPLICABLE TO OUTFALL(S):	001, 002, and 003
REPORTED ON DMR AS OUTFALL(S):	TX1, TX2, and TX3
CRITICAL DILUTION:	100%
EFFLUENT DILUTION SERIES (ALL TESTS):	32%, 42%, 56%, 75%, **100%**
SAMPLE TYPE:	Defined at Part I
TEST SPECIES/METHODS:	40 CFR 136, except for changes required by EPA, Region 6.

Ceriodaphnia dubia chronic static renewal 7-day survival and reproduction test, Method 1002.0, EPA-821-R-02-013 (October 2002), or most recent update thereof. A minimum of ten (10) replicates of a single (1) organism per test chamber, must be used in the control and in each effluent dilution of this test. This test should be terminated when 60% of the surviving females in the control produce three broods or at the end of eight days, whichever comes first. If this criterion is not met at the end of 8 days, the test must be repeated.

b. Chronic lethal effect test failure – The $NOEC_L$ (No Observed Lethal Effect Concentration) is defined as the greatest effluent dilution at and below which lethality (toxicity) that is statistically different from the control (0% effluent) at the 95% confidence level does not occur. Chronic lethal test failure (chronic $NOEC_L$ test) is defined as a demonstration of a statistically significant lethal (toxic) effect at test completion to a test species at or below the critical dilution.

c. Chronic sublethal effect test failure – The $NOEC_S$ (No Observed Sublethal Effect Concentration) is defined as the greatest effluent dilution at and below which sublethality (toxicity: inhibited reproduction in the *Ceriodaphnia dubia* test) that is statistically different from the control (0% effluent) at the 95% confidence level does not occur. Chronic sublethal test failure (chronic $NOEC_S$ test) is defined as a demonstration of a statistically significant sublethal effect at test completion to a test species at or below the critical dilution.

d. The conditions of this item are effective beginning with the effective date of the WET limit as established in Part 1 of this permit. When the testing frequency stated above is less than monthly and the effluent fails the lethal and/or sublethal endpoint at or below the critical dilution, the permittee shall be considered in violation of this permit limit and the frequency for the affected species will increase to monthly until such time as compliance with the No Observed Effect Concentration (NOEC: lethal and sublethal) effluent limitation is demonstrated for a period of three consecutive months, at which time the permittee may return to the testing frequency stated in Part I of this permit.

If the permittee cannot pass three tests in a row within the next six months, DEQ will review the test results and may require a Toxicity Identification Evaluation (TIE) be done to determine the cause of the toxicity. If the TIE cannot detect the problem, another Toxicity Reduction Evaluation (TRE) may be required.

A full laboratory report for the failed routine test and all additional tests shall be provided and submitted to DEQ in accordance with procedure outlined in Item 4.

e. Reopener clause – This permit may be reopened to require chemical specific effluent limits, additional testing, and/or other appropriate actions to address toxicity. Accelerated or intensified testing may be required in accordance with Section 308 of the Clean Water Act.

f. Upon becoming aware of the failure of any test, the permittee shall notify a DEQ Water Quality Division biomonitoring coordinator immediately, and in writing within 5 working days of the test failure with a summary of the results of and any other pertinent circumstances associated with the failed test.

2. Testing Requirements due to Chronic Lethal and/or Sublethal Test Failure

Upon becoming aware of the failure of any test, the permittee shall notify DEQ Water Quality Division biomonitoring coordinator immediately, and in writing within 5 working days of the test failure with a summary of the results of and any other pertinent circumstances associated with the failed test.

Beginning with the effective date of the WET limit, as established in Part I of this permit, the following testing requirements due to chronic test failure apply:

a. When there is a lethal and/or sublethal effect test failure for either species during routine testing, at least three additional monthly tests (retests) for the affected species are required. (Part II, Section D.1.d above). The additional tests shall be conducted monthly during subsequent consecutive months until there are three consecutive months of passing tests at which time the frequency of testing shall return to that stated in Part 1 of the permit. The permittee shall <u>not</u> substitute any of the retests for routine toxicity testing.

b. A full laboratory report for the failed routine test and all additional tests shall be provided and submitted to DEQ in accordance with procedure outlined in Item 4.

c. If the permittee cannot pass three tests in a row within the next six months, DEQ will review the test results and may require a Toxicity Identification Evaluation (TIE) be done to determine the cause of the toxicity. If the TIE cannot detect the problem, another Toxicity Reduction Evaluation (TRE) may be required.

3. Required Toxicity Testing Conditions

a. Test acceptance – The permittee shall repeat a test, including the control and all effluent dilutions, if the procedures and quality assurance requirements defined in the test methods or in this permit are not satisfied, including the following additional criteria:

(1) The toxicity test control (0% effluent) must have survival equal to or greater than 80%.

(2) The mean number of *Ceriodaphnia dubia* neonates produced per surviving female in the control (0% effluent) must be 15 or more.

(3) Sixty (60) percent of the surviving *Ceriodaphnia dubia* females in the control must produce three broods.

(4) The percent coefficient of variation between replicates shall be 40% or less in the control (0% effluent) for the young of surviving females in the *Ceriodaphnia dubia* reproduction test.

(5) The percent coefficient of variation between replicates shall be 40% or less in the critical dilution, unless significant lethal or sublethal effects are exhibited for the young of surviving females in the *Ceriodaphnia dubia* reproduction test.

(6) As documented at test termination, no more than forty (40) percent of the daphnid test organisms in any replicate of any effluent dilution or in any replicate of the control (0% effluent) shall be male.

(7) The Percent Minimum Significant Difference (PMSD) shall be in the range of 13-47 for *Ceriodaphnia dubia* reproduction. If the test PMSD is less than 13, 13 may be substituted for the PMSD.

If the above criteria or criteria listed in Item 1.a is not met, the test will be considered invalid. Test failure may not be construed or reported as invalid due to a coefficient of variation value of greater than 40% for replicates tested at the critical dilution. A repeat test shall be conducted and the biomonitoring enforcement coordinator notified, within the reporting period of any test determined to be invalid.

b. The permittee shall follow the requirements listed below in determining success or failure of a WET test:

(1) The statistical analyses in the *Ceriodaphnia dubia* survival test, used to determine if there is a significant difference between the control and the critical dilution shall be Fisher's Exact Test as described in EPA-821-R-02-013, or the most recent update thereof.

(2) The statistical analyses in the *Ceriodaphnia dubia* reproduction test, used to determine if there is a significant difference between the control and the critical dilution shall be in accordance with the methods for determining the No Observed Effect Concentration (NOEC) as described in EPA-821-R-03-013, or the most recent update thereof.

(3) If the conditions of test acceptability are met in Item 3.a above and the percent survival of the test organism is equal to or greater than 80% in the critical dilution concentration and all lower dilution concentrations, the test shall be considered to be a passing test, and the permittee shall report an $NOEC_L$ of not less than the critical dilution for the DMR reporting requirements found in Item 4 below.

c. The permittee shall use dilution water that meets the following standards:

(1) Dilution water used in the toxicity tests will be receiving water collected as close to the point of discharge as possible but unaffected by the discharge. The permittee shall substitute synthetic dilution water of similar pH, hardness and alkalinity to the closest downstream perennial water where the toxicity test is conducted on an effluent discharge to a receiving stream classified as intermittent or to a receiving stream with no flow due to zero flow conditions.

(2) If the receiving water is unsatisfactory as a result of instream toxicity (fails to meet the test acceptance criteria in Item 3.a), the permittee must submit the test results exhibiting receiving water toxicity with the full test report required in Item 4 below and may thereafter substitute synthetic dilution water for the receiving water in all subsequent tests, provided the unacceptable receiving water test met the following stipulations:

(a) a synthetic dilution water control which fulfills the test acceptance requirements of Item 3.a was run concurrently with the receiving water control;

(b) the test indicating receiving water toxicity was carried out to completion (i.e., 48 hours); and

(c) the synthetic dilution water had a pH, hardness and alkalinity similar to that of the receiving water or closest downstream perennial water not adversely affected by the discharge, provided the magnitude of these parameters will not cause toxicity in the synthetic dilution water.

d. The permittee shall collect samples that are representative of their effluent by following the criteria listed below:

(1) <u>Unless grab sampling is specifically authorized in Part I of the permit</u>, the permittee shall collect three flow-weighted 24-hour composite samples representative of the flows during normal operation from the outfall(s) listed at Item 1.a above. If grab sampling is authorized, all requirements specified below for composite sampling also pertain to grab sampling. In such cases, collection of the grab sample is considered equivalent to collection of the last portion of a composite sample. Unless otherwise specified in Part I of the permit, a 24-hour composite sample consists of a minimum of 12 effluent portions collected at equal time intervals representative of a 24-hour operating day and combined proportional to flow or a sample continuously collected proportional to flow over a 24-hour operating day.

(2) The first composite sample shall be used to initiate each test. The permittee must initiate the toxicity test within 36 hours after the collection of the last portion of the first composite sample. Collection of the second and third composite samples must be timed so as to permit an approximately equal use distribution of the three composite samples for daily static renewals. The permittee must collect the composite samples so that the maximum holding time for any effluent sample shall not exceed 72 hours. Samples shall be chilled to maintain a temperature at or below 6° C but not frozen during collection, shipping, and/or storage.

(3) The permittee must collect the composite samples such that the effluent samples are representative of any periodic episode of chlorination, biocide usage or other potentially toxic substance discharged on an intermittent basis.

(4) If it is anticipated that flow from the outfall being tested may cease prior to collection of the third composite sample, the permittee must ensure that the second composite sample is of sufficient volume to complete the required testing with daily renewal of effluent. The abbreviated composite sample collection duration, the static renewal protocol associated with an abbreviated sample collection, and a summary of the circumstances justifying collection of an abbreviated sample must be adequately documented in the full test report required in Item 4 below. The DEQ reserves the right to require a retest and/or consider the permittee in violation of this permit if the basis offered for justification of an abbreviated sample is insufficient, flawed, or in any way reflects an effort on the part of the permittee to avoid test failure by use of an abbreviated sample.

4. Reporting

a. The permittee shall retain each full report pursuant to the records retention provisions of Part III of this permit. The permittee shall also submit to the DEQ biomonitoring enforcement coordinator a copy of the full laboratory test reports at TX1, TX2, and TX3 in accordance with the Report Preparation Section of EPA-821-R-02-013 for every valid or invalid toxicity test initiated, whether carried to completion or not, including any test which is considered invalid, is terminated early for any reason, or which indicates receiving water toxicity. The reports shall be received no later than the 15th day of the month following the end of the testing period.

As of October 22, 2015, the EPA published the "National Pollutant Discharge Eliminations System (NPDES) Electronic Reporting" final rule, with an effective date of December 21, 2015, which requires the electronic reporting and sharing of Clean Water Act National Pollutant Discharge Elimination System (NPDES) program information. DEQ has developed electronic systems so that NPDES-regulated entities can submit the required electronic DMRs and other reports to DEQ as the initial recipient. Instructions on how to access and use the appropriate electronic reporting tool can be found on DEQ's website at https://www.deq.ok.gov/water-quality-division/electronic-reporting/. Assistance is also available by contacting DEQ at (405) 702-8100 or deqreporting@deq.ok.gov.

b. A valid test for *Ceriodaphnia dubia* (excluding retests) at TX1, TX2, and TX3 must be reported on the DMR for each reporting period specified in Part I of this permit. DMRs must be received by the 15th day of the month following the end of the testing period. The full report for the test (see Item 4.a above) shall be submitted along with the DMR. If a test is determined to be invalid, the repeat test must be conducted in the coinciding testing period; if the first sample of the repeat test is taken after the last day of the final month in a testing period, the facility will be out of compliance with the reporting period. If monthly retesting is required as a result of a WET limit permit violation, the monthly DMR will be reported to TX1A, TX2A, and TX3A. Quarterly testing at TX1Q, TX2Q, and TX3Q shall continue; the facility may substitute a monthly test from TX1A, TX2A, and TX3A for the quarterly report if the test falls within the testing period. If more than one valid test (excluding retests) is performed on a species during a reporting period, the permittee shall report the lowest lethal and/or sublethal test result as the 7-day minimum and the *C. dubia* [51710] result.

c. If any test results in anomalous $NOEC_L$ or $NOEC_S$ findings (i.e., it indicates an interrupted dose response across the dilution series), DEQ recommends that the permittee contact a DEQ biomonitoring coordinator for a technical review of the test results prior to submitting the full laboratory test report and DMR. A summary of all tests initiated during the reporting period, including invalid tests, repeat tests and retests, shall be attached to the reporting period DMR for DEQ review.

A test is a <u>REPEAT</u> test if it is performed as the result of a previously invalid test. A test is a <u>RETEST</u> if it is performed as the result of a previously failed test, the exception being where the test is the first (valid) test of a reporting period, in which case it is reported as such on the DMR for that period.

(1) The reporting period test summary attached to the DMR shall be organized as follows:

(a) Invalid tests (basis for test invalidity must be described)

(b) Valid tests (other than retests) initiated during current reporting period

(c) Valid retests for tests failed during previous reporting period (if not submitted in the previous reporting-period test summary)

(d) Valid retests for tests failed during current reporting period.

(2) The following information shall be listed in the reporting period test summary for each valid test in categories (b) through (d) in Item 4.b(1) above:

(a) Test species

(b) Date of test initiation at laboratory

(c) Results of all concurrent effluent analyses specified in Part I of this permit

(d) All test result parameters for the test species specified in Item 4.c below.

d. The permittee shall report the following results for all VALID toxicity tests (excluding retests) on the DMR(s) for that reporting period in accordance with Item 4.b above and Part III of this permit.

(1) Parameter TLP3B: If the *Ceriodaphnia dubia* $NOEC_L$ for survival is less than the critical dilution, report a "1"; otherwise, report a "0".

(2) Parameter TOP3B: Report the *Ceriodaphnia dubia* $NOEC_L$ value for survival.

(3) Parameter TJP3B: Report the *Ceriodaphnia dubia* percent mortality in the critical dilution at test completion.

(4) Parameter TGP3B: If the *Ceriodaphnia dubia* $NOEC_S$ for reproduction is less than the critical dilution, report a "1"; otherwise, report a "0".

(5) Parameter TPP3B: Report the *Ceriodaphnia dubia* $NOEC_S$ value for reproduction.

(6) Parameter TQP3B: Report the highest coefficient of variation (critical dilution or control) for *Ceriodaphnia dubia* reproduction.

e. The permittee shall report the results for all toxicity monthly testing on the DMR(s) for the reporting period in which monthly testing is required, which shall be received no later than the 15th day of the month following the end of the monthly period. Results of all required monthly tests shall be reported under TX1A, TX2A, and TX3A of the DMR for the reporting period (see Item 4.b above). If the permittee passes three consecutive tests in the six months after the initial failure, the permittee will return to quarterly testing. If the permittee takes the first sample of the monthly test after the last day of the final month in the monthly period, the facility will be out of compliance with the reporting period. The full laboratory report for the WET tests (see Item 4.a above) shall be submitted along with the retest DMR. Should test failures necessitate the continuation of monthly testing into subsequent reporting periods, the results of the first test in any reporting period will be reported using the parameter STORET codes listed in Items 4.c above. If monthly testing is not required during a given reporting period, the permittee shall leave these DMR fields blank and DMR TX1A, TX2A, and TX3A will not be activated.

f. Whole effluent toxicity limit – The permittee shall report the lowest of either the $NOEC_L$ or $NOEC_S$ value across these species for the 7-day minimum under STORET No. *C. dubia* [51710] on the DMR for the reporting period in accordance with Part III of this permit.

F. WHOLE EFFLUENT TOXICITY TESTING - *Pimephales promelas* (Fathead minnow)

1. Scope and Methodology

a. The permittee shall test the effluent for toxicity in accordance with the provisions in this section, which apply individually and separately to the outfalls listed below. No samples or portions of samples from one outfall may be composited with samples or portions of samples from another outfall. The permittee shall biomonitor for *Pimephales promelas* in accordance with the WET testing frequencies prescribed in Part I. Intervals between test initiation dates shall be a function of the required testing frequency, as follows:

The permittee is encouraged to perform required biomonitoring activities as early in the reporting period as is practical to ensure sufficient time remains in the reporting period should retests/repeat tests be necessary.

All laboratory analyses for the biomonitoring parameters specified in this permit must be performed by a laboratory certified by the Oklahoma Department of Environmental Quality for those parameters.

Provisions for performance-based monitoring frequency reductions are contained in Item 5 of this section.
Intervals between test initiation dates shall be a function of the required testing frequency, as follows:

- Monthly: No less than 20 days and no more than 40 days.
- Quarterly: No less than 2 months and no more than 4 months.
- Semi-annually: No less than 4 months and no more than 8 months.

APPLICABLE TO OUTFALL(S):	001, 002, and 003
REPORTED ON DMR AS OUTFALL(S):	TX1, TX2, and TX3
CRITICAL DILUTION:	100%
EFFLUENT DILUTION SERIES (ALL TESTS):	32%, 42%, 56%, 75%, **100%**
SAMPLE TYPE:	Defined at Part I
TEST SPECIES/METHODS:	40 CFR 136, except for changes required by EPA, Region 6.

Pimephales promelas (Fathead minnow) chronic static renewal 7-day larval survival and growth test, Method 1000.0, EPA-821-R-02-013 (October 2002), or most recent update thereof. A minimum of five (5) replicates with eight (8) organisms per replicate must be used in the control and in each effluent dilution of this test.

b. Chronic lethal effect test failure – The $NOEC_L$ (No Observed Lethal Effect Concentration) is defined as the greatest effluent dilution at and below which lethality (toxicity) that is statistically different from the control (0% effluent) at the 95% confidence level does not occur. Chronic lethal test failure (chronic $NOEC_L$ test) is defined as a demonstration of a statistically significant lethal effect at test completion to a test species at or below the critical dilution.

c. Chronic sublethal effect test failure – The $NOEC_S$ (No Observed Sublethal Effect Concentration) is defined as the greatest effluent dilution at and below which sublethality (toxicity: inhibited growth in the Fathead minnow test) that is statistically different from the control (0% effluent) at the 95% confidence level does not occur. Chronic sublethal test failure (chronic $NOEC_S$ test) is defined as a demonstration of a statistically significant sublethal effect at test completion to a test species at or below the critical dilution.

d. Reopener clause – This permit may be reopened to require whole effluent toxicity limits, chemical specific effluent limits, additional testing, and/or other appropriate actions to address toxicity.

2. Testing Requirements due to Test Failure

Upon becoming aware of the failure of any test, the permittee shall notify DEQ Water Quality Division biomonitoring coordinator immediately, and in writing within 5 working days, of the test failure with a summary of the results of, and any other pertinent circumstances associated with, the failed test.

a. Whenever there is a test failure for *Pimephales promelas* during routine testing, the frequency of testing for *Pimephales promelas* shall automatically increase to, or continue at, as appropriate, the WET testing frequency prescribed in Part I for the remaining life of the permit. In addition, two (2) additional monthly tests (retests) of *Pimephales promelas* are required. The two additional tests shall be conducted monthly during the next two consecutive months. The permittee shall not substitute either of the two additional tests for routine toxicity testing. A full laboratory report for the failed routine test and both additional tests, if required, shall be prepared and submitted to DEQ in accordance with procedures outlined in Item 4 of this section.

b. Persistent toxicity – If either of the two additional tests result in an $NOEC_L$ and/or NOECs value less than the critical dilution, persistent lethality and/or sublethality is exhibited. Then the permittee shall initiate a Toxicity Reduction Evaluation (TRE) as specified in Item 6 below. The TRE initiation date will be the test completion date of the first failed retest. The permittee may request a temporary exemption to this TRE-triggering criterion only if the permittee is under a compliance schedule defined in an OPDES permit or an enforcement order to effect aquatic toxicity reduction measures.

c. Intermittent toxicity – If both additional tests result in an $NOEC_L$ and/or NOECs value greater than or equal to the critical dilution, persistent lethality and/or sublethality is <u>not</u> exhibited. However, if any routine lethal and/or sublethal effect test failure occurs within 18 months of a prior lethal and/or sublethal effect test failure, intermittent lethality and/or sublethality is exhibited, and the permittee may be required by DEQ to initiate a TRE, as described in Item 6 below, based on the severity and pattern of such lethal and/or sublethal effect over time.

d. Suspension of retesting requirements during a TRE – Retesting requirements in Item 2.a are temporarily suspended upon submittal of a TRE Action Plan. Such suspension of retesting requirements applies only to the species under evaluation by a TRE and only to the period during which a TRE is being performed.

3. Required Toxicity Testing Conditions

a. Test acceptance – The permittee shall repeat a test, including the control and all effluent dilutions, if the procedures and quality assurance requirements defined in the test methods or in this permit are not satisfied, including the following additional criteria:

(1) The toxicity test control (0% effluent) must have survival equal to or greater than 80%.

(2) The mean dry weight of surviving Fathead minnow larvae at the end of the 7 days in the control (0% effluent) must be 0.25 mg per larva or greater.

(3) The percent coefficient of variation between replicates shall be 40% or less in the control (0% effluent) for the growth and survival endpoints of the Fathead minnow test.

(4) The percent coefficient of variation between replicates shall be 40% or less in the critical dilution, unless significant lethal or sublethal effects are exhibited for the growth and survival endpoints of the Fathead minnow test.

(5) The PMSD shall be in the range of 12-30 for Fathead minnow growth. If the test PMSD is less than 12, 12 may be substituted for the the PMSD.

If the above criteria or criteria listed in Item 1.a is not met the test will be considered invalid. Test failure may not be construed or reported as invalid due to a coefficient of variation value of greater than 40% for replicates tested at the critical dilution. A repeat test shall be conducted and the biomonitoring enforcement coordinator notified, within the reporting period of any test determined to be invalid.

b. The permittee shall follow the requirements listed below in determining success or failure of a WET test:

(1) The statistical analyses in the Fathead minnow larval survival and growth test, used to determine if there is a significant difference between the control and the critical dilution shall be in accordance with the methods for determining the No Observed Effect Concentration (NOEC) as described in EPA-821-R-02-013 or most recent update thereof.

(2) If the conditions of test acceptability are met in Item 3.a above and the percent survival of the test organism is equal to or greater than 80% in the critical dilution concentration and all lower dilution concentrations, the test shall be considered to be a passing test, and the permittee shall report an $NOEC_L$ of not less than the critical dilution for the DMR reporting requirements found in Item 4 below.

c. The permittee shall use dilution water that meets the following standards:

(1) Dilution water used in the toxicity tests will be receiving water collected as close to the point of discharge as possible but unaffected by the discharge. The permittee shall substitute synthetic dilution water of similar pH, hardness and alkalinity to the closest downstream perennial water where the toxicity test is conducted on an effluent discharge to a receiving stream classified as intermittent or to a receiving stream with no flow due to zero flow conditions.

(2) If the receiving water is unsatisfactory as a result of instream toxicity (fails to meet the test acceptance criteria in Item 3.a), the permittee must submit the test results exhibiting receiving water toxicity with the full test report required in Item 4 below and may thereafter substitute synthetic dilution water for the receiving water in all subsequent tests, provided the unacceptable receiving water test met the following stipulations:

(a) a synthetic dilution water control which fulfills the test acceptance requirements of Item 3.a was run concurrently with the receiving water control;

(b) the test indicating receiving water toxicity was carried out to completion (i.e., 48 hours); and

(c) the synthetic dilution water had a pH, hardness and alkalinity similar to that of the receiving water or closest downstream perennial water not adversely affected by the discharge, provided the magnitude of these parameters will not cause toxicity in the synthetic dilution water.

d. The permittee shall collect samples that are representative of their effluent by following the criteria listed below:

(1) Unless grab sampling is specifically authorized in Part I of the permit, the permittee shall collect three flow-weighted 24-hour composite samples representative of the flows during normal operation from the outfall(s) listed at Item 1.a above. If grab sampling is authorized, all requirements specified below for composite sampling also pertain to grab sampling. In such cases, collection of the grab sample is considered equivalent to collection of the last portion of a composite sample. Unless otherwise specified in Part I of the permit, a 24-hour composite sample consists of a minimum of 12 effluent portions collected at equal time intervals representative of a 24-hour operating day and combined proportional to flow or a sample continuously collected proportional to flow over a 24-hour operating day.

(2) The first composite sample shall be used to initiate each test. The permittee must initiate the toxicity test within 36 hours after the collection of the last portion of the first composite sample. Collection of the second and third composite samples must be timed so as to permit an approximately equal use distribution of the three composite samples for daily static renewals. The permittee must collect the composite samples so that the maximum holding time for any effluent sample shall not exceed 72 hours. Samples shall be chilled to maintain a temperature at or below 6° C but not frozen during collection, shipping, and/or storage.

(3) The permittee must collect the composite samples such that the effluent samples are representative of any periodic episode of chlorination, biocide usage or other potentially toxic substance discharged on an intermittent basis.

(4) If it is anticipated that flow from the outfall being tested may cease prior to collection of the third composite sample, the permittee must ensure that the second composite sample is of sufficient volume to complete the required testing with daily renewal of effluent. The abbreviated composite sample collection duration, the static renewal protocol associated with an abbreviated sample collection, and a summary of the circumstances justifying collection of an abbreviated sample must be adequately documented in the full test report required in Item 4 below. The DEQ reserves the right to require a retest and/or consider the permittee in violation of this permit if the basis offered for justification of an abbreviated sample is insufficient, flawed, or in any way reflects an effort on the part of the permittee to avoid test failure by use of an abbreviated sample.

4. Reporting

a. The permittee shall retain each full report pursuant to the records retention provisions of Part III of this permit. The permittee shall also submit to the DEQ biomonitoring enforcement coordinator a copy of the full laboratory test reports at TX1, TX2, and TX3 in accordance with the Report Preparation Section of EPA-821-R-02-013 for every valid or invalid toxicity test initiated, whether carried to completion or not, including any test which is considered invalid, is terminated early for any reason, or which indicates receiving water toxicity. The reports shall be received no later than the 15th day of the month following the end of the testing period.

As of October 22, 2015, the EPA published the "National Pollutant Discharge Eliminations System (NPDES) Electronic Reporting" final rule, with an effective date of December 21, 2015, which requires the electronic reporting and sharing of Clean Water Act National Pollutant Discharge Elimination

System (NPDES) program information. DEQ has developed electronic systems so that NPDES-regulated entities can submit the required electronic DMRs and other reports to DEQ as the initial recipient. Instructions on how to access and use the appropriate electronic reporting tool can be found on DEQ's website at https://www.deq.ok.gov/water-quality-division/electronic-reporting/. Assistance is also available by contacting DEQ at (405) 702-8100 or deqreporting@deq.ok.gov.

b. A valid test for *Pimephales promelas* (excluding retests) at TX1, TX2, and TX3 must be reported on the DMR for each reporting period specified in Part I of this permit unless the permittee is performing a TRE, which may increase the frequency of testing and reporting. An electronic DMR and a copy of the lab report must be received by the 15th day of the month following the end of the testing period.

If a test is determined to be invalid, the repeat test must be conducted in the coinciding quarter; if the first sample of the repeat test is taken after the last day of the final month in a testing period, the facility will be out of compliance with the reporting period. If a lethal and/or sublethal test failure is experienced for *Pimephales promelas*, two (2) monthly WET retests are required during the two-month period following the month in which the test failure is experienced.

If more than one valid test (excluding retests) is performed on a species during a reporting period, the permittee shall report the lowest lethality and sublethality NOEC effluent concentrations for all such tests as the 7-day minimum on the DMR for the reporting period in question, specifying the dates of each test in the comments section of the DMR. Under no circumstance shall the monitoring/reporting period dates at the top of the DMR form be altered.

c. If any test results in anomalous $NOEC_L$ or $NOEC_S$ findings (i.e., it indicates an interrupted dose response across the dilution series), DEQ recommends that the permittee contact a DEQ biomonitoring coordinator for a technical review of the test results prior to submitting the full test report and DMR. A summary of all tests initiated during the reporting period, including invalid tests, repeat tests and retests, shall be attached to the reporting period DMR for DEQ review.

A test is a REPEAT test if it is performed as the result of a previously invalid test. A test is a RETEST if it is performed as the result of a previously failed test, the exception being where the test is the first (valid) test of a reporting period, in which case it is reported as such on the DMR for that period.

(1) The reporting period test summary attached to the DMR shall be organized as follows:

(a) Invalid tests (basis for test invalidity must be described)

(b) Valid tests (other than retests) initiated during current reporting period

(c) Valid retests for tests failed during previous reporting period (if not submitted in the previous reporting period test summary)

(d) Valid retests for tests failed during current reporting period.

(2) The following information shall be listed in the reporting period test summary for each valid test in categories (b) through (d) in Item 4.b(1) above:

(a) Test species

(b) Date of test initiation at laboratory

(c) Results of all concurrent effluent analyses specified in Part I of this permit

(d) All test result parameters for the test species specified in Item 4.c below.

d. The permittee shall report the following results for all VALID toxicity tests (excluding retests) on the DMR(s) for that reporting period in accordance with Item 4.b above and Part III of this permit.

   (1) Parameter TLP6C: If the Fathead minnow $NOEC_L$ for survival is less than the critical dilution, report a "1"; otherwise, report a "0".

   (2) Parameter TOP6C: Report the Fathead minnow $NOEC_L$ value for survival.

   (3) Parameter TJP6C: Report the Fathead minnow percent mortality in the critical dilution at test completion.

   (4) Parameter TGP6C: If the Fathead minnow $NOEC_S$ for growth is less than the critical dilution, report a "1"; otherwise, report a "0".

   (5) Parameter TPP6C: Report the Fathead minnow $NOEC_S$ value for growth.

   (6) Parameter TQP6C: Report the highest coefficient of variation (critical dilution or control) for Fathead minnow survival and growth.

e. The permittee shall report the following results for all VALID toxicity retests on the DMR(s) for that reporting period.

   (1) Retest #1 (STORET 22415): If the first monthly retest following failure of a routine test results in an $NOEC_L$ and/or $NOEC_S$ less than the critical dilution, report a "1"; otherwise, report a "0".

   (2) Retest #2 (STORET 22416): If the second monthly retest following failure of a routine test results in an $NOEC_L$ and/or $NOEC_S$ less than the critical dilution, report a "1"; otherwise, report a "0".

   Results of all retests shall be reported on a copy of the DMR for the reporting period (see Item 4.b above) in which the triggering routine test failure is experienced. Such retest results (using STORET codes 22415 and 22416 only) shall be postmarked or received no later than the 15th day of the month following completion of the retest. The full report for the retest (see Item 4.a above) shall be submitted along with the retest DMR. Even if a retest cannot be conducted before the end of the reporting period for which it is required (due to test initiation interval requirements), the retest results shall still be reported for the reporting period in which the triggering test failure is experienced. Under no circumstance shall the monitoring/reporting period dates for a supplemental retest DMR ever be modified. The permittee shall indicate the retest date in the comments section of the supplemental DMR and insert the date the DMR is submitted in the lower right hand corner. In this manner, both retests are reported for the same reporting period as the failed routine test triggering the retests. If retesting is not required during a given reporting period, the permittee shall leave the DMR retest fields blank.

5. Monitoring Frequency Reduction

a. The permittee may apply for a testing frequency reduction upon the successful completion of the second year of testing for *Pimephales promelas* with no lethal or sublethal effects demonstrated at or below the critical dilution. Certification in accordance with Item 5.b of this section shall be submitted with the application for monitoring frequency reduction. If granted, the monitoring frequency may be reduced to a minimum of 6 months (once each during the periods June 1 through September 30 and December 1 through March 31) for either test species.

b. Certification – The permittee must certify in writing that no lethal or sublethal test failures have occurred for the species for which the monitoring frequency reduction is being requested and that all tests meet all test acceptability criteria in Item 3.a above. In addition, the permittee must provide a summary of all tests initiated during the period of certification including test initiation dates, species, test acceptability parameters, $NOEC_L$ values, percent mortality at the critical dilution, $NOEC_S$ values, and coefficients of variation for the controls and critical dilutions. If the certification is approvable, DEQ will issue a letter of confirmation of the monitoring frequency reduction. A copy of the confirmation letter will be forwarded to DEQ's Permit Compliance System unit to update the permit reporting requirements. DEQ may refuse to approve the certification if it determines that, during the period for which the certification is submitted, there were errors in meeting test acceptability requirements, errors in statistical interpretation affecting test results reported on DMRs, late submissions of test reports or submissions of substantively incomplete test reports. If the certification is not approved, the permittee shall continue biomonitoring of the affected test species at a frequency of once per quarter until the permit is reissued.

c. Lethal and/or sublethal failures after a monitoring frequency reduction – If any lethal or sublethal endpoint test is failed at any time after the granting of a monitoring frequency reduction, two monthly retests are required for that species in accordance with Item 2 above and the monitoring frequency for the affected test species shall be increased to the WET testing frequency prescribed in Part I until the permit is reissued. If the permittee is performing a TRE this section does not apply.

6. Toxicity Reduction Evaluation (TRE)

a. Within ninety (90) days of confirming toxicity in the retests for a test species, the permittee shall submit to DEQ a TRE Action Plan and Schedule for conducting a Toxicity Reduction Evaluation (TRE). The TRE Action Plan shall specify the approach and methodology to be used in performing the TRE. A Toxicity Reduction Evaluation is an investigation intended to determine those actions necessary to achieve compliance with water quality-based effluent limits by reducing an effluent's toxicity to an acceptable level. A TRE is defined as a step-wise process which combines toxicity testing and analyses of the physical and chemical characteristics of a toxic effluent to identify the constituents causing effluent toxicity and/or treatment methods which will reduce the effluent toxicity. The TRE Action Plan shall lead to the successful elimination of effluent toxicity and include the following:

(1) Specific Activities. DEQ requires that a thorough audit of the design, operation and maintenance of the entire plant be done at the **outset** of the Toxicity Identification Evaluation (TIE) and/or TRE, rather than later in the process.

The plan shall detail the specific approach the permittee intends to utilize in conducting the TRE. The approach may include toxicity characterizations, identifications and confirmation activities, source evaluation, treatability studies, or alternative approaches. When the permittee conducts Toxicity Characterization Procedures, the permittee shall perform multiple characterizations and follow the procedures specified in the documents "Methods for Aquatic Toxicity Identification Evaluations: Phase I Toxicity Characterization Procedures" (EPA-600/6-91/003) and "Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I" (EPA-600/6-91/005F), or alternate procedures. When the permittee conducts Toxicity Identification Evaluations and Confirmations, the permittee shall perform multiple identifications and follow the methods specified in the documents "Methods for Aquatic Toxicity Identification Evaluations, Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity"

(EPA/600/R-92/080) and "Methods for Aquatic Toxicity Identification Evaluations, Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/081), as appropriate.

The documents referenced above may be available through the

National Technical Information Service (NTIS)

U.S. Department of Commerce
National Technical Information Service
5301 Shawnee Rd., Alexandria, VA 22312
orders@ntis.gov
(800) 553-NTIS (6847), or at the

National Service Center for Environmental Publications (NSCEP)

U.S. EPA/NSCEP
P.O. Box 42419
Cincinnati, Ohio 45242-0419
1-(800) 490-9198

E-mail: nscep@bps-lmit.com

(2) Sampling Plan (e.g., locations, methods, holding times, chain of custody, preservation, etc.). The effluent sample volume collected for all tests shall be adequate to perform the toxicity test, toxicity characterization, identification and confirmation procedures, and conduct chemical specific analyses when a probable toxicant has been identified. Where the permittee has identified or suspects specific pollutant(s) and/or source(s) of effluent toxicity, the permittee shall conduct, concurrent with toxicity testing, chemical specific analyses for the identified and/or suspected pollutant(s) and/or source(s) of effluent toxicity. Where toxicity was demonstrated within 48 hours of test initiation, each composite sample shall be analyzed independently. Otherwise, the permittee may substitute a composite sample, comprised of equal portions of the individual composite samples, for the chemical specific analysis.

(3) Quality Assurance Plan (e.g., QA/QC implementation, corrective actions, etc.).

(4) Project Organization (e.g., project staff, project manager, consulting services, etc.).

b. The permittee shall initiate the TRE Action Plan within thirty (30) days of submitting the plan and schedule. The permittee shall assume all risks for failure to achieve the required toxicity reduction.

c. The permittee shall submit to DEQ a quarterly TRE Activities Report with the Discharge Monitoring Report in months to be specified in their TRE plan, containing the following information:

(1) all data and/or substantiating documentation which identifies the pollutant(s) and/or source(s) of effluent toxicity;

(2) all studies/evaluations and results on the treatability of the facility's effluent toxicity; and

(3) all data which identifies effluent toxicity control mechanisms that will reduce effluent toxicity to the level necessary to meet no significant toxicity at any dilution.

d. The permittee shall submit to DEQ a Final Report on Toxicity Reduction Evaluation Activities no later than twenty-eight (28) months after confirming toxicity in the retests. The final report shall provide information pertaining to the specific control mechanism selected that will, when implemented, result in reduction of effluent toxicity to a 48-hour LC_{50} effluent value of greater than 100%. The final report will also provide a schedule for implementing the selected control mechanism.

e. Quarterly testing during the TRE is the minimum monitoring requirement. DEQ recommends that permittees performing a TRE not rely on quarterly testing alone. Failure to identify the specific chemical compound causing toxicity test failure will normally result in a permit limit for whole effluent toxicity per federal regulations at 40 CFR 122.44(d)(1)(v).

MINIMUM QUANTIFICATION LEVELS (MQLs)

METALS AND CYANIDE	(ug/L)	EPA METHOD
Antimony (Total)[1]	60	200.7
Arsenic (Total)[1]	0.5	206.5 200.7 revision 4.4 (1994) 200.8 revision 5.4 (1994) 200.9 revision 2.2 (1994)
Beryllium (Total)[1]	5	200.7
Cadmium (Total)	1	200.7 revision 4.4 (1994) 200.8 revision 5.4 (1994) 200.9 revision 2.2 (1994)
Chromium (Total)[1]	10	200.7
Chromium (3+)[1]	10	200.7
Chromium (6+)[1]	10	200.7
Copper (Total)	1	200.7 revision 4.4 (1994) 200.8 revision 5.4 (1994) 200.9 revision 2.2 (1994)
Lead (Total)	0.5	200.7 revision 4.4 (1994) 200.8 revision 5.4 (1994) 200.9 revision 2.2 (1994)
Mercury (Total)[1]	0.05	245.1 revision 3.0 (1994)
Molybdenum (Total)	30	200.7
Nickel (Total)[1] [Freshwater]	10	200.7
Nickel (Total) [Marine]	5	200.8 revision 5.4 (1994) 200.9 revision 2.2 (1994)
Selenium (Total)[1]	5	200.7 revision 4.4 (1994) 200.8 revision 5.4 (1994) 200.9 revision 2.2 (1994)
Silver (Total)	0.5	200.7 revision 4.4 (1994) 200.8 revision 5.4 (1994) 200.9 revision 2.2 (1994)
Thallium (Total)[1]	0.5	279.2 revision
Zinc (Total)[1]	20	200.7
Cyanide (Total)[1]	10	335.4
Phenols, (Total)[1]	10	604
DIOXIN		
2,3,7,8-Tetrachlorodibenzo-P-Dioxin (TCDD)[2,4]	0.00001	1613
VOLATILE COMPOUNDS		
Acrolein[3]	50	624
Acrylonitrile[3]	50	624
Benzene[3]	10	624
Bromoform[4]	10	624
Carbon Tetrachloride[4]	10	624
Chlorobenzene[4]	10	624

MINIMUM QUANTIFICATION LEVELS (MQLs)

Chlorodibromomethane[4]	10	624
Chloroethane	50	624
2-Chloroethylvinyl Ether[3]	10	624
Chloroform[4]	10	624
Dichlorobromomethane[4]	10	624
1,1-Dichloroethane[4]	10	624
1,2-Dichloroethane[4]	10	624
1,1-Dichloroethylene[4]	10	624
1,2-Dichloropropane[4]	10	624
1,3-Dichloropropylene[4]	10	624
Ethylbenzene[4]	10	624
Methyl Bromide [Bromomethane]	50	624
Methyl Chloride [Chloromethane]	50	624
Methylene Chloride[4]	20	624
1,1,2,2-Tetrachloroethane[4]	10	624
Tetrachloroethylene[4]	10	624
Toluene[4]	10	624
1,2-Trans-Dichloroethylene[4]	10	624
1,1,1-Trichloroethane[4]	10	624
1,1,2-Trichloroethane[4]	10	624
Trichloroethylene[4]	10	624
Vinyl Chloride[4]	10	624
ACID COMPOUNDS		
2-Chlorophenol[4]	20	625
2,4-Dichlorophenol[4]	20	625
2,4-Dimethylphenol[1]	20	625
4,6-Dinitro-o-Cresol [12 methyl 4,6-dinitrophenol][4]	50	625
2,4-Dinitrophenol[4]	50	625
2-Nitrophenol[4]	20	625
4-Nitrophenol[4]	50	625
p-Chloro-m-cresol [4 chloro-3-methylphenol][1]	20	625
Pentachlorophenol[4]	50	625
Phenol[4]	20	625
2,4,6-Trichlorophenol[4]	20	625
BASE/NEUTRAL COMPOUNDS		
Acenaphthene[4]	20	625
Acenaphthylene[4]	20	625
Anthracene[4]	20	625
Benzidine[3]	50	625
Benzo(a)Anthracene[4]	20	625
Benzo(a)Pyrene[4]	20	625
3,4-Benzofluoranthene[4]	20	625

MINIMUM QUANTIFICATION LEVELS (MQLs)

Benzo(ghi)Perylene	20	625
Benzo(k)Fluoranthene[4]	20	625
Bis(2-Chloroethoxy) Methane[4]	20	625
Bis(2-Chloroethyl) Ether[4]	20	625
Bis(2-Chloroisopropyl) Ether[4]	20	625
Bis(2-Ethylhexyl) Phthalate[4]	20	625
4-Bromophenyl Phenyl Ether[4]	20	625
Butylbenzyl Phthalate[4]	20	625
2-Chloronapthalene[4]	20	625
4-Chlorophenyl Phenyl Ether[4]	20	625
Chrysene[4]	20	625
Dibenzo (a,h) Anthracene	20	625
1,2-Dichlorobenzene[4]	20	625
1,3-Dichlorobenzene[4]	20	625
1,4-Dichlorobenzene[4]	20	625
3,3'-Dichlorobenzidine	20	625
Diethyl Phthalate[4]	20	625
Dimethyl Phthalate[4]	20	625
Di-n-butyl Phthalate[4]	20	625
2,4-Dinitrotoluene[4]	20	625
2,6-Dinitrotoluene[4]	20	625
Di-n-octyl Phthalate[4]	20	625
1,2-Diphenylhydrazine[3]	20	625
Fluoranthene[4]	20	625
Fluorene[4]	20	625
Hexachlorobenzene[4]	10	625
Hexachlorobutadiene[4]	20	625
Hexachlorocyclopentadiene[4]	20	625
Hexachloroethane	20	625
Indeno (1,2,3-cd) Pyrene (2.3-o-phenylene pyrene)	20	625
Isophorone[4]	20	625
Naphthalene[4]	10	625
Nitrobenzene[4]	20	625
N-nitrosodimethylamine	50	625
N-nitrosodi-n-propylamine	20	625
N-nitrosodiphenylamine	20	625
Phenanthrene[4]	20	625
Pyrene[4]	20	625
1,2,4-Trichlorobenzene[4]	20	625

PESTICIDES

Aldrin[1]	0.05	608
Alpha-BHC[1]	0.05	608

MINIMUM QUANTIFICATION LEVELS (MQLs)

Beta-BHC[1]	0.05	609
Gamma-BHC (Lindane)[1]	0.05	608
Delta-BHC[1]	0.05	608
Chlordane[1]	0.2	608
4,4'-DDT[1]	0.05	608
4,4'-DDE (p,p-DDX)[1]	0.05	608
4,4'-DDD (p,p-TDE)[1]	0.05	608
Dieldrin[1]	0.05	608
Alpha-endosulfan[1]	0.05	608
Beta-endosulfan[1]	0.05	608
Endosulfan sulfate[1]	0.05	608
Endrin[1]	0.05	608
Endrin aldehyde[1]	0.05	608
Heptachlor[1]	0.05	608
Heptachlor epoxide[1] (BHC-hexachlorocyclohexane)	0.05	608
PCB-1242[1]	0.25	608
PCB-1254	0.25	608
PCB-1221	0.25	608
PCB-1232	0.25	608
PCB-1248	0.25	608
PCB-1260	0.25	609
PCB-1016	0.25	608
PCB, total	0.25	608
Toxaphene[1]	0.3	608

[1] Based on Contract Required Quantitation Level (CRQL) developed pursuant to 40 CFR Part 122
[2] Dioxin National Strategy
[3] No CRQL(Contract Required Quantification Level developed pursuant to 40 CFR Part 122) established
[4] CRQL basis, equivalent to MQL

MQL based on 3.3 times LOD published in 40 CFR 136, Appendix B

Methods/MQL List modified 6/20/08

FACT SHEET

(Draft of April 4, 2019)

FOR THE DRAFT AUTHORIZATION TO DISCHARGE TO WATERS OF THE UNITED STATES UNDER THE OKLAHOMA POLLUTANT DISCHARGE ELIMINATION SYSTEM (OPDES).

Permit Number:	OK0035246
Facility I.D. Number:	S-11303
Applicant:	City of Lawton 103 SW 4th St Lawton, OK, OK 73501
Issuing Office:	Oklahoma Department of Environmental Quality (DEQ) Water Quality Division 707 North Robinson P.O. Box 1677 Oklahoma City, Oklahoma 73101-1677
Prepared By:	Vance Doan Municipal Permits Section Water Quality Division
Date Prepared:	April 4, 2019
Reviewed By:	Karen Steele, P.E., Manager Municipal Discharge and Stormwater Permit Section Water Quality Division Michael B. Moe, P.E., Engineering Manager Wastewater Group Water Quality Division

In accordance with 40 CFR 124.8 and 124.56, this fact sheet describes the applicant's facility operation and sets forth the principal facts and the significant factual, legal, methodological, and policy questions considered in preparing the draft permit. Also set forth are any calculations or other necessary explanations of the derivation of specific effluent limitations and conditions or standards for sewage sludge use or disposal, including a citation to the applicable performance standard, or standard for sewage sludge use or disposal as required by 40 CFR 122.44. In accordance with 40 CFR 122.44(l), proposed permit limits for reissued permits are based on the more stringent of applicable technology-based limitations, applicable water quality-based limitations, or limitations in the previous permit.

Citations to 40 CFR refer to promulgated regulations listed at Title 40, Code of Federal Regulations. Citations to OAC 252 and OAC 785 refer to promulgated regulations listed at Titles 252 and 785, Oklahoma Administrative Code.

I. PERMITTING BACKGROUND

A. CHRONOLOGY OF PERMITTING ACTIVITIES

The following is a chronology of permitting activities since issuance of the previous OPDES permit:

January 8, 2020:	Draft permit package sent to applicant for public notice.
December 5, 2019:	Response to comment and draft permit sent to applicant for courtesy review.
January 26, 2017:	EPA no objection letter received.
January 23, 2017:	Comments on draft permit and fact sheet from applicant received.
December 15, 2016:	Draft permit package sent to EPA for review.
December 13, 2016:	Draft permit package sent to applicant for courtesy review.
July 8, 2016:	Administrative review of permit application completed.
July 7, 2016:	Certification of public notice of filing of application received.
June 17, 2016:	Notice of incomplete application sent to applicant.
May 16, 2016:	OPDES permit application (Form 2M1) received.
November 30, 2011:	Previous OPDES permit issued.

B. PROPOSED PERMITTING ACTION

It is proposed that Permit No.OK0035246, which was effective January 1, 2012, and expired December 31, 2016, and for which application for renewal was timely submitted prior to permit expiration, be reissued for a five year term in accordance with regulations promulgated at 40 CFR 122.46(a) and OAC 252:606-1-3(b).

II. APPLICANT ACTIVITY

A. DESCRIPTION AND LOCATION OF FACILITY

The City of Lawton Wastewater Treatment Plant is located at 8104 SE 15th Street, Lawton, in the SE ¼, SE ¼, SW ¼, Section 28, Township 1 North, Range 11 West, Indian Meridian, Comanche County. Under SIC code 4952, this facility provides biological treatment of domestic sewage for the City of Lawton.

B. WASTEWATER GENERATION AND TREATMENT

1. Treatment Plant

a. Wastewater

The facility's design average daily flow, as stated in the application, is 18.0 million gallons per day (mgd), which is the same as the design flow specified in the facility's State Water Quality Management Plan (208 Plan). Biological treatment of the waste stream into this Publicly Owned Treatment Works (POTW) facility, which is comprised primarily of domestic sewage, is by a trickling filter and activated sludge system. Prior to January 2014, after exiting the final treatment unit, all or portion of the treated wastewater (effluent) was discharged into Nine Mile Creek via Outfall 001, or was diverted into an on-site effluent holding pond. From this on-site effluent holding pond, the effluent was pumped, via Outfall 003, to Lake Comanche for use as cooling water at the Public Service of Oklahoma (PSO) power plant, or was discharged through an overflow structure into Nine Mile Creek via Outfall 002. In January 2014, the City of Lawton and the PSO completed construction of a new pump station and an effluent splitter basin. All effluent from the facility's final treatment unit is diverted into this basin, where it is discharged into Nine Mile Creek via Outfall 001 or is pumped and discharged into Lake Comanche, via Outfall 003, for use as cooling water at the PSO. The City of Lawton is considering converting and incorporating the on-site holding pond into its plan of a possible water reuse in the future. For the time being, the on-site holding pond is utilized as an effluent equalization basin with possible discharges into Nine Mile Creek via Outfall 002.

b. Biosolids/Sludge

Biosolids/sewage sludge generated from the wastewater treatment process is thickened with polymer, followed by anaerobic digestion, and then dewatered by pressing. The biosolids/sewage sludge is disposed of in the City of Lawton Municipal Landfill in accordance with the Sludge Disposition Plan approved by the DEQ on June 1, 2009.

2. Industrial Contributions

The facility receives significant industrial wastewaters, and has been required to develop and implement an industrial wastewater pretreatment program in accordance with Section 402(b)(8) of the Clean Water Act and the General Pretreatment Regulations per 40 CFR Part 403.

III. DISCHARGE INFORMATION

A. DISCHARGE LOCATION

	Location			Receiving Stream
	Legal Description	Latitude	Longitude	
Outfall 001 [a]	SE¼, SE¼, SW¼, Section 28, T1N, R11WIM, Comanche Co., Oklahoma	N 34° 31' 27.748" (GPS: NAD83)	W 98° 21' 53.717" (GPS: NAD83)	Nine Mile Creek
Outfall 002 [b]	(same)	N 34° 31' 22.638" (GPS: NAD83)	W 98° 21' 44.072" (GPS: NAD83)	Nine Mile Creek
Outfall 003 [a]	(same)	N 34° 31' 23.804" (GPS: NAD83)	W 98° 21' 45.358" (GPS: NAD83)	Lake Comanche

[a] Treated wastewater from the treatment plant is diverted into an effluent splitter basin where it is discharged via Outfall 001 into Nine Mile Creek and/or is pumped/discharged via Outfall 003 into Lake Comanche, a tributary to Nine Mile Creek, for use as cooling water at the Public Service of Oklahoma (PSO) power plant.

[b] Outfall 002 is an overflow structure of the on-site effluent (treated wastewater) storage pond.

B. DISCHARGE DESCRIPTION AND CHARACTERISTICS

A summary of biomonitoring (Whole Effluent Toxicity) testing data is provided in Section V.D.1.f(2).

The previous permit had effluent limits for dichlorobromomethane. Discharge monitoring reports show that the pollutant was not detected at DEQ's minimum quantification level; therefore, re-evaluation of permit limits is not needed. The limits for dichlorobromomethane remain the same in the renewed permit.

The previous permit also had effluent monitoring requirements for total dissolved solids and chloride. Effluent data for total dissolved solids and chloride, and any other pollutants detected in the effluent are summarized in the following table:

City of Lawton Wastewater Treatment Facility

Effluent Characteristic	Number of Samples	MQL (µg/l unless otherwise specified)	Concentration (µg/l unless otherwise specified)	
			Average [a]	Maximum
Copper, total	6	10	6.17 [b]	12.00
Selenium, total	6	5	4.83 [b]	9.20
Zinc, total	6	20	32.58	54.40
Phenols	6	10	43.41 [b]	110.00
Chloride (mg/l)	15	---	117.23	152.0
Total Dissolved Solids (mg/l)	15	---	785.84	956.0

[a] Where the number of samples is sufficient, the average is calculated as a geometric mean.

[b] Data set includes both measurable and unmeasurable data. Unmeasurable data is estimated to be one-half (1/2) the MQL or detection limit.

IV. TECHNOLOGY-BASED EFFLUENT LIMITATIONS AND CONDITIONS

POTWs treating domestic sewage are required by 40 CFR 133 to provide secondary or secondary-equivalent treatment. The Oklahoma definition of secondary treatment, which sets minimum requirements for developing wasteload allocations for municipalities in the State's Water Quality Management Plan (WQMP), is defined at OAC 252:606-5-2(2). The definitions are dependent on the type of treatment system and whether the receiving stream flow is perennial or intermittent. Since the facility is a mechanical plant discharging to an intermittent stream, secondary treatment is defined according to OAC 252:606-5-2(2)(C) as indicated below:

- 5-day Biochemical Oxygen Demand (BOD_5)
  A monthly average effluent concentration of 20 mg/l BOD_5
  A weekly average effluent concentration of 30 mg/l BOD_5

- Total Suspended Solids (TSS)
  A monthly average effluent concentration of 30 mg/l TSS
  A weekly average effluent concentration of 45 mg/l TSS

- pH
  A pH range between 6.5 and 9.0 standard units, inclusive.

For an influent waste stream composed primarily of domestic sewage, compliance with the 85% minimum monthly average percent removal criteria for BOD_5/$CBOD_5$ and TSS is implied if the effluent is in compliance with the concentration standards for secondary treatment.

V. WATER QUALITY-BASED EFFLUENT LIMITATIONS AND CONDITIONS

A. GENERAL

Section 101 of the Clean Water Act (CWA) states that "... it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited..." A permit containing technology-based permit limitations alone may not adequately protect the quality of a specific receiving stream. Thus, additional water quality-based effluent limitations and/or conditions are considered in the draft permit using narrative and numerical standards contained in the Oklahoma Water Quality Standards (OWQS), as amended (OAC 785:45), and implementation criteria contained in OAC 785:46 and 252:690, promulgated by the Oklahoma Water Resources Board (OWRB) and Department of Environmental Quality (DEQ), respectively. This is to ensure that no point-source discharge results in instream aquatic toxicity, a violation of applicable narrative or numerical State water quality standards, or aquatic bioaccumulation which threatens human health.

B. RECEIVING STREAM DESIGNATED USES AND ANTIDEGRADATION PROVISIONS

The facility discharges through Outfalls 001 and 002 to Nine Mile Creek (WBID: 311300020030_00) in Segment 311300 of the Red River Basin. The facility also discharges through Outfall 003 to Lake Comanche for use as cooling water at the PSO power plant. Because Lake Comanche is a tributary to Nine Mile Creek, and is approximately just two (2) miles upstream of Outfalls 001 and 002, any discharge to and from Lake Comanche is eventually a discharge to Nine Mile Creek. Thus, reasonable potential to exceed Nine Mile Creek's water quality standards is evaluated, and is applied to all three outfalls. As designated in Appendix A of the OWQS, the designated beneficial uses of Nine Mile Creek in this stream segment are:

- Fish and Wildlife Propagation (OAC 785:45-5-12)/Warm Water Aquatic Community
- Agriculture (OAC 785:45-5-13)
- Primary Body Contact Recreation (OAC 785:45-5-17)
- Aesthetics (OAC 785:45-5-19)
- Fish Consumption (OAC 785:45-5-20)

Nine Mile Creek is not designated as an Outstanding Resource Water (ORW), High Quality Water (HQW), or Sensitive Water Supply (SWS) in Appendix A of the OWQS. Neither is it designated in Table 1 of Appendix B of the OWQS as an area of ecological and/or recreational significance or in Table 2 of Appendix B as an area containing federally-listed endangered species.

C. WATER QUALITY STANDARDS IMPLEMENTATION

1. Water Quality Standards Implementation Process

To achieve the objectives stated in Section V.A above, each pollutant present at measurable levels in the facility's effluent, for which there are one or more applicable numerical water quality criteria, is screened against the applicable criteria to determine whether the pollutant has reasonable potential (RP) to exceed any of the criteria. The screens are performed in accordance with the OWQS, OWQS implementation criteria in OAC 785:46 and OAC 252:690, and the Continuing Planning Process (CPP) document. In the RP screening process, the 95th percentile effluent concentration, or estimate thereof if the effluent data set is not sufficiently large to determine it directly, is used to compute an instream concentration according to the regulatory mixing zone equations defined in OAC 785:46. The computed instream concentrations are then compared with the applicable criteria to determine whether RP is exhibited. If RP is exhibited, in accordance with 40 CFR 122.44(d)(1)(vi) and OAC 252:690, a wasteload allocation and criterion long term average is computed for each applicable criterion. Water quality-based permit limitations are calculated for each pollutant exhibiting RP for all applicable criteria. The most stringent of the resulting monthly average permit limitations is established in the draft permit for each pollutant requiring such limitations.

2. Summary of Regulatory Parameters

Regulatory receiving water flows are established in OAC 785:46. Effluent regulatory flows, as well as regulatory effluent and background pollutant concentrations are established in OAC 252:690, Subchapter 3. Definitions and values for these terms are as follows:

a. Effluent and Upstream Receiving Water Regulatory Flows

$Q_{e(D)}$ POTW design flow rate. The flow rate used must be consistent with that in the WQMP. The design flow rate specified in the permit application and the approved design flow for this facility in the State Water Quality Management Plan (WQMP) is 18.0 mgd.

$Q_{u(7Q2)}$ Upstream 7Q2 flow rate. This is the annual 7-day, 2-year low flow of the receiving stream. Where flow data published in the USGS publication, Statistical Summaries of Streamflow in and near Oklahoma Through 2007 by John M. Lewis and Rachel A. Esralew (http://pubs.usgs.gov/sir/2009/5135/), is available, minor adjustments for known upstream or downstream perennial flows, as appropriate, may be utilized to estimate the 7Q2 for a specific location upstream or downstream of the USGS gauging station. If streamflow is intermittent, if USGS 7Q2 data is not available, or if the applicant has not developed a site-specific 7Q2, a default value of 1 cfs (0.6463 mgd) is assumed.

$Q_{u(LTA)}$ Upstream long-term average flow rate. This is the mean annual flow of the receiving stream. Where flow data published in the USGS publication, Statistical Summaries of Streamflow in and near Oklahoma Through 2007 by John M. Lewis and Rachel A. Esralew (http://pubs.usgs.gov/sir/2009/5135/), is available, minor adjustments for known upstream or downstream perennial flows, as appropriate, may be utilized to estimate the mean annual flow for a specific location upstream or downstream of the USGS gauging station. If published mean annual flow data is not available, it may be approximated by multiplying the receiving water's drainage area at the point of discharge by the mean annual runoff per unit area published in the CPP.

$Q_{u(STA)}$ Upstream short-term average flow rate. This flow rate, used only in the sample standard (SS) agriculture screen, is a function of $Q_{u(LTA)}$. The equation is $Q_{u(STA)} = 0.68 \times Q_{u(LTA)}$.

The facility discharges to Nine Mile Creek, a tributary to the East Cache Creek in the Red River Basin. Because Nine Mile Creek's flow is intermittent, the upstream $Q_{u(7Q2)}$ is assumed to be 0.6463 mgd. For determination of $Q_{u(LTA)}$, the CPP method is used. The drainage area of Nine Mile Creek upstream from the facility's POD, is estimated to be 22 square miles (mi^2). Thus, the $Q_{u(LTA)}$ at the facility's POD is estimated by multiplying the mean annual runoff per unit area (0.21 cfs/mi^2 or 0.14 mgd/mi^2) by the stream's drainage area of approximately 22 square miles. This yields a $Q_{u(LTA)}$ value of 2.92 mgd.

	$Q_{u(7Q2)}$	$Q_{u(LTA)}$	$Q_{u(STA)}$ [a]
Upstream flow at POD (mgd)	0.6463	2.92	1.99

[a] $Q_{u(STA)} = 0.68 \times Q_{u(LTA)}$

b. Dilution Ratios (Q*)

Q* Ratio of effluent flow to stream flow, also known as dilution capacity. The Q* ratios for municipal discharges, as well as their values, are defined in the following table:

Q* Values (Outfall 001)

Q* Ratio	Corresponding Water Quality Screens	Implementation Reference	Value
$Q_{e(D)} / Q_{u(7Q2)}$	Acute/Chronic Toxicity	OAC 252:690-3-53(1)(B)	27.8508
$Q_{e(D)} / Q_{u(LTA)}$	Human Health/Fish Flesh	OAC 252:690-3-66(2)	6.1644
	Human Health/Fish Flesh and Water	OAC 252:690-3-73(2)	
	Raw Water Column		
	Agriculture/Yearly Mean Standard	OAC 252:690-3-81(1)(B)	
$Q_{e(D)} / Q_{u(STA)}$	Agriculture/Sample Standard	OAC 252:690-3-81(2)(B)	9.0653

c. Characterization of Pollutant Effluent Concentrations

For purposes of determining whether water quality-based effluent limitations are required, one of two methods for determining C_{95} is employed, depending on the size of the effluent data set (i.e., number of data points).

C_{95} 95th percentile maximum likelihood effluent concentration for purposes of determining whether effluent limitations are required.

Method 1:

In accordance with OAC 252:690-3-4, at least 10 data points are required to calculate the standard deviation, and in accordance with OAC 252:690-3-8(a), if at least 10 data points are available, C_{95} is calculated directly from the effluent data set, assuming a log-normal distribution, according to the following equation:

$$C_{95} = \mathrm{EXP}\left(\ln(x)_{avg} + 1.645 \times s_{\ln(x)}\right)$$

$$\text{where } \ln(x)_{avg} = \frac{\left(\sum_{i=1}^{N} \ln(x_i)\right)}{N} \text{ and } s_{\ln(x)} = \sqrt{\frac{N \sum_{i=1}^{N}\left(\ln(x_i)^2\right) - \left(\sum_{i=1}^{N}\ln(x_i)\right)^2}{N(N-1)}}.$$

In the above equations, $\ln(x)_{avg}$ represents the arithmetic average of the set of log-transformed data points, and $s_{\ln(x)}$ represents the standard deviation of the set of log-transformed data points.

In accordance with OAC 252:690-3-2(1), Robust Regression on Order Statistics (ROS) will be used to estimate the unmeasurable quantities if the data set has at least three measurable data points. However, if the data set has fewer than three measurable data points, Robust ROS will not be used and the DEQ will use ½ of the MQL to estimate the unmeasurable quantities.

Method 2:

In accordance with OAC 252:690-3-8(a), if less than 10 effluent data points are available; C_{95} must be estimated from the mean effluent concentration, as follows:

$C_{95} = C_{mean} \times 2.135$, where C_{mean} is calculated as the geometric mean.

In accordance with OAC 252:690-3-2(1), the DEQ will use ½ of the MQL to estimate the unmeasurable quantities for the calculation of C_{mean}.

In accordance with OAC 252:690-3-5, if the geometric mean is not available or cannot be determined, the arithmetic mean may be used in the above equation.

$C_{95(M)}$ 95th percentile maximum likelihood effluent concentration for purposes of determining whether additional effluent monitoring is required.

In accordance with OAC 252:690-3-90, where the effluent data set is comprised of fewer than 10 data points, a determination of whether further effluent monitoring of a pollutant is warranted in the absence of a requirement for effluent limitations by using the "TSD method." The TSD method is based on the methodology in Section 3.3.2 of Technical Support Document for Water Quality-Based Toxics Control, EPA/505/2-90-001. The 95th percentile effluent concentration calculated using the TSD method is referred to as $C_{95(M)}$.

$C_{95(M)}$ is calculated according to the following equation:

$$C_{95(M)} = C_{max} \times RPF_{95(M)}$$

$RPF_{95(M)}$ is calculated, assuming a log-normal distribution, according to the following equation:

$$RPF_{95(M)} = \frac{EXP\left(1.645\sqrt{\ln\left(1+CV^2\right)} - 0.5\ln\left(1+CV^2\right)\right)}{EXP\left(z_N\sqrt{\ln\left(1+CV^2\right)} - 0.5\ln\left(1+CV^2\right)\right)}$$

where z_N is the upper k^{th} percentile of the normal distribution, $k = 0.05^{1/N}$ (for the 95% confidence level), and CV is assumed to equal 0.6.

The values of z_N and the resulting value of $RPF_{95(M)}$ for values of N from 1 to 9 are shown in the following table:

N	1	2	3	4	5	6	7	8	9
z_N	-1.645	-0.760	-0.336	-0.068	0.124	0.272	0.390	0.489	0.574
$RPF_{95(M)}$	6.199	3.795	3.000	2.585	2.324	2.141	2.006	1.898	1.811

CV Relative variability of a data set. In accordance with OAC 252:690-3-7, CV is defined as the standard deviation of a data set divided by its arithmetic average. Where at least 10 effluent data points are available, CV may be determined according to the following equation.

$$CV = \frac{s_x}{C_{avg}}$$

Where fewer than 10 data points are available, a default CV value of 0.6 is assumed.

Values of C_{95}, $C_{95(M)}$, and CV are summarized for quantifiable pollutants with applicable water quality criteria in the following table:

C_{mean}, C_{max}, C_{95}, $C_{95(M)}$, and CV Values for Quantifiable Pollutants (Outfall 001)

Effluent Characteristic	No. of Data Points (N)	Concentration (µg/l unless otherwise specified)				CV [a]
		C_{mean}	C_{95}	C_{max}	$C_{95(M)}$	
Copper, total	6	6.17	13.17	12.00	25.69	---
Selenium, total	6	4.83	10.31	9.20	19.70	---
Zinc, total	6	32.58	69.56	54.40	116.47	---
Phenols	6	43.41	92.68	110.00	235.51	---
Chloride (mg/l)	12	117.23	135.25	--- [b]	--- [b]	0.097
TDS (mg/l)	12	785.84	890.71	--- [b]	--- [b]	0.071

[a] A coefficent of variation (CV) is calculated only where an effluent data set consists of at least ten data points, of which at least three must be measurable. A CV value of 0.6 is assumed where a data set is of insufficient size to calculate a CV directly (see OAC 252:690-3-7).

[b] Sufficient data points are available with which to calculate summary statistics directly from effluent data set. Thus, determination of C_{max} and $C_{95(M)}$ values is unnecessary.

d. Pollutant Background Concentrations

C_b Upstream or background concentration of a pollutant. Site specific data is used where available. Where such data is not available, and in streams where the 7Q2 = 0 in the absence of known upstream toxicants, background concentrations are assumed to be zero. For the agriculture screens, C_b is computed using the segment average YMS and SS values for the receiving stream segment published in Appendix F to OAC 785:45 according to the following equation: $C_b = 2 \times YMS - SS$. Background levels are described in the following table:

Background Concentrations of Pollutants Present in Effluent (Outfall 001)

Pollutant	No. of Data Points (N)	Background Concentration (C_b) (µg/l unless otherwise specified)	Data Source
Copper, total	---	Assumed zero [a]	---
Selenium, total	---	Assumed zero [a]	---
Zinc, total	---	Assumed zero [a]	---
Phenols	---	Assumed zero [a]	---
Chlorides (mg/l)	---	185 [b]	OAC 785:45
TDS (mg/l)	---	781 [b]	OAC 785:45

[a] No background data available. Background level is assumed to be zero in accordance with OAC 252:690-3-11(c).

[b] Background concentration is calculated from segment-averaged YMS and SS criteria in accordance with OAC 252:690-3-16(a). For chlorides, $C_b = 2 \times 232 - 279 = 185$ mg/l. For TDS, $C_b = 2 \times 830 - 879 = 781$ mg/l.

e. Other Applicable Terminology

$C_{criterion}$ Numerical water quality criterion for a specific pollutant. For some pollutants, aquatic toxicity criteria are pH- or hardness-dependent. In such cases, in accordance with OAC 785:46-5-8, site-specific pH or hardness data, if available, may be used. If site-specific pH or hardness data is not available, the segment averaged pH or hardness from OAC 785:46, Appendix B, is used. Where a specific pollutant screen exhibits reasonable potential,

$C_{criterion}$ is used to calculate the wasteload allocation (WLA). Criteria applicable to Outfall 001 are as follows:

Fish and wildlife propagation (F&WP/WWAC) use
C_A: Acute toxicity criterion
C_C: Chronic toxicity criterion

Fish consumption use
C_{FF}: Human health criterion for the consumption of fish flesh

Agriculture use
C_{YMS}: Yearly mean standard
C_{SS}: Sample standard

C_d Instream concentration of a specific pollutant, according to the appropriate mixing equation.

D. WATER QUALITY-BASED REQUIREMENTS

1. Criteria for Protection of the Fish and Wildlife Propagation Use

a. DO and DO-Demanding Substances (Outfalls 001, 002, and 003)

OAC 785:45-5-12(f)(1) requires that where DO-demanding substances are present in an effluent at significant levels, a Wasteload Allocation (WLA) must be established according to certain seasonal criteria dependent on the receiving water's aquatic community subcategory. In determining the WLA for DO-demanding substances, the prescribed level of secondary treatment for the facility (see Section IV) is modeled to determine if it meets the aforementioned seasonal criteria. If the model indicates that a more stringent WLA than secondary is required to meet these criteria, the more stringent WLA (often referred to as a "tertiary" level of treatment) will be used once it is granted technical approval by EPA Region 6. It is then promulgated as an amendment to the State WQMP. The approved WLA for DO-demanding substances for this facility at a design average flow of 18.0 mgd is shown in the following table:

DO-Based WLA (Outfall 001)

Season	Level of Treatment	WLA Parameters (in mg/l)			
		$CBOD_5$	TSS	NH_3-N	DO
April – October	Tertiary	10	15	2	6.5
November – March	Tertiary	10	15	3	6

For purposes of establishing permit limitations for DO-demanding substances, the seasonal monthly average limit (MAL) in the draft permit for each effluent characteristic is set equal to the corresponding WLA concentration shown in the table. The corresponding weekly average limit (WAL) is set equal to 1.5 times the seasonal WLA concentration in accordance with 40 CFR 122.45(d)(2).

b. pH (Outfalls 001, 002, and 003)

OAC 785:45-5-12(f)(3) states "pH values shall be between 6.5 and 9.0 in waters designated for fish and wildlife propagation; unless pH values outside that range are due to natural conditions." This pH range is established in the draft permit.

c. Oil and Grease (Outfalls 001, 002, and 003)

In accordance with OAC 758:45-5-12(f)(4), a narrative condition prohibiting the discharge of any visible sheen or globules of oil or grease or in quantities that adhere to stream banks and coat bottoms of water courses or which cause deleterious effects to the biota will be included in the draft permit.

d. Toxicity from Halogenated Oxidants (Outfalls 001, 002, and 003)

The facility utilizes an ultraviolet (UV) system for disinfection of the discharge; however, sodium hypochlorite is also used as a back up to the UV system. OAC 785:46-3-1(c) states "Toxicity from halogens (e.g., chlorine, bromine, and bromo-chloro compounds) will be controlled by dehalogenation rather than WET testing. However, use of dehalogenation shall not exempt an effluent from the WET testing requirements of this Subchapter." Chapter 2, Part III of the CPP implements this narrative criterion as follows: The requirement of OAC 785:46-3-1(c) for dehalogenation is typically implemented as "no measurable amount" in the effluent. For chlorine, "No measurable amount" is defined by the DEQ to be less than 0.1 mg/l.

e. Ammonia Toxicity (Outfalls 001, 002, and 003)

(1) Criterion and Implementation

Interim implementation for controlling ammonia toxicity is described in OAC 785:46 and OAC 252:690. OAC 785:46-5-3(b)(3) states "For regulatory purposes, there is a reasonable potential for chronic toxicity if concentrations of ammonia outside the chronic regulatory mixing zone exceed 6 mg/l." For POTWs, OAC 252:690-3-20 through 3-23 requires that where seasonal DO-based monthly average ammonia limits are established, those limits must be compared with toxicity-based monthly average ammonia limits determined using the interim 6 mg/l chronic toxicity criterion, the conservative substance mixing zone equations for chronic toxicity, and a monitoring frequency of 3 per week.

(2) Determination of Toxicity-Based Limits

Toxicity-based ammonia limits are determined in accordance with OAC 252:690-3-22.

(a) Wasteload Allocation and Criterion Long Term Average Concentration

C_C for ammonia is 6 mg/l and C_b is assumed to be zero. The chronic toxicity wasteload allocation equations for ammonia are as follows:

$$WLA_{NH3} = 6\left(\frac{1+Q^*}{1.94\,Q^*}\right), \text{ for } Q^* \leq 0.1823.$$

$$WLA_{NH3} = 6\left(6.17 - 15.51Q^*\right), \text{ for } 0.1823 < Q^* < 0.3333.$$

$WLA_{NH3} = 6$ mg/l, for $Q^* \geq 0.3333$.

Q^* for this application is 27.8508, so the third equation is used. Thus, $WLA_{NH3} = 6$ mg/l. WLA_{NH3} is a short term value and must be converted to a long term average for development of permit limits. LTA_{NH3} is calculated on a 99% probability basis, and the equation is as follows:

$$LTA_{NH3} = WLA_{NH3} \times EXP\left(0.5\ln\left(1+\frac{CV^2}{4}\right) - 2.326\left(\ln\left(1+\frac{CV^2}{4}\right)\right)^{0.5}\right),$$

where a CV value of 0.6 is assumed. Thus, $LTA_{NH3} = 3.16$ mg/l.

(b) Permit Limits (Outfalls 001, 002, and 003)

The toxicity-based monthly average limit (MAL_{NH3}) is calculated on a 95% probability basis, and the daily maximum limit (DML_{NH3}) is calculated on a 99% probability basis. The monitoring frequency basis is 3/week (or 12/month). The limits equations are as follows:

$$MAL_{NH3} = LTA_{NH3} \times EXP\left(1.645\left(\ln\left(1+\frac{CV^2}{N_m}\right)\right)^{0.5} - 0.5\ln\left(1+\frac{CV^2}{N_m}\right)\right),$$

where N_m is the per month monitoring frequency.

Thus, based on $N_m = 12$, $MAL_{NH3} = 4.1$ mg/l.

$$DML_{NH3} = LTA_{NH3} \times EXP\left(2.326\left(\ln\left(1+CV^2\right)\right)^{0.5} - 0.5\ln\left(1+CV^2\right)\right)$$

Thus, $DML_{NH3} = 9.9$ mg/l.

(3) Comparison of Toxicity-Based Ammonia Limits with DO-Based Ammonia Limits

In accordance with OAC 252:690-3-23, the most stringent monthly average limit for each season and its associated weekly average or daily maximum limit, as appropriate, is established in the permit.

Comparison of Ammonia Limits (mg/l)

Type of Limit	Apr – Oct			Nov – Mar		
	Monthly Average	Weekly Average	Daily Maximum	Monthly Average	Weekly Average	Daily Maximum
DO-Based	2.0	3.0	---	3.0	4.5	---
Toxicity-Based	4.1	---	9.9	4.1	---	9.9
Draft Permit	**2.0**	**3.0**	**---**	**3.0**	**4.5**	**---**

(4) **Performance-Based Ammonia Monitoring Frequency Reduction**

Not applicable.

f. **Whole Effluent Toxicity (Outfalls 001, 002, and 003)**

(1) **Criterion and Implementation**

Whole effluent toxicity (WET) testing is the most direct measure of potential aquatic toxicity, since it incorporates the effects of synergism of effluent components and receiving stream water quality characteristics. OAC 785:45-5-12(f)(6)(A) states "Surface waters of the state shall not exhibit acute toxicity and shall not exhibit chronic toxicity outside the chronic regulatory mixing zone. Acute test failure and chronic test failure shall be used to determine discharger compliance with these narrative aquatic life toxics criteria." This narrative toxicity criterion is implemented according to procedures described at OAC 785:46, Subchapter 3, OAC. 252:690-3-17 through 3-43, and Chapter 3 of the CPP.

Two types of WET tests are used to implement the narrative toxicity criterion. The 48-hour acute test is used to protect against acute toxicity, and the 7-day chronic test is used to protect against chronic toxicity outside the chronic regulatory mixing zone. Two test species are used. The vertebrate species is *Pimephales promelas* (Fathead minnow), and the invertebrate species is *Daphnia pulex* (for acute testing) or *Ceriodaphnia dubia* (for chronic testing).

(2) **WET Testing Historical Summary**

The previous permit required chronic WET limit for the *Ceriodaphnia dubia* specie, and WET testing requirement for the Fathead minnow specie. The WET limits and WET testing requirements applied to all outfalls (TX1, TX2, and TX3). During the previous permit cycle, WET tests were only conducted and reported for Outfall TX1 and TX3, as no discharges occurred at Outfall TX2. Prior to January 2014, two (2) separate WET tests were conducted for Outfall TX1 and TX3 at each testing event due to different effluent's and dilution water's chemical characteristics at and for the two outfalls. Since 2014, due to the fact that the effluent's chemical characteristics are the same at both Outfall TX1 and TX3 (effluent entering the splitter basin), it appears that only one (1) test was conducted and reported for both outfalls at each testing event, or the same dilution (synthetic) water was used for both tests conducted for Outfall TX1 and TX3.

In the following summary table, where a test failed, or would have failed under current test failure criteria, the No Observed Effect (NOEC) concentrations ($NOEC_L$ for lethal effects and $NOEC_S$ for sublethal effects) are shown **underlined in bold face**. (OAC 252:690-3-40 requires that significant sublethal effects at or below the critical dilution also be considered as test failures).

(a) Outfall TX2 (function identical to Outfall 002)

The facility did not discharge from Outfall TX2 during the last permit cycle.

(b) Outfall TX1 (function identical to Outfall 001)

Summary of Chronic WET Test Results by Species
(January 2012 through June 2016)

Ceriodaphnia dubia				*Pimephales promelas* (Fathead minnow)		
Reporting period	**$NOEC_L$ [a]**	**$NOEC_S$ [a]**	**22414**	**Reporting period**	**$NOEC_L$ [a]**	**$NOEC_S$ [a]**
01/12 – 03/12	100	100	100	01/12 – 03/12	100	100
04/12 – 06/12	100	100	100	04/12 – 06/12	100	100
07/12 – 09/12	100	**56**	100	07/12 – 09/12	100	100
Retest 1	100	100	100	10/12 – 12/12	100	100
Retest 2	100	100	100	01/13 – 03/13	100	100
Retest 3	100	100	100	03/13 – 08/13 [b]	100	100
10/12 – 12/12	100	100	100	09/13 – 02/14	100	100
01/13 – 03/13	100	100	100	03/14 – 08/14	100	100
04/13 – 06/13	100	100	100	09/14 – 02/15	100	100
07/13 – 09/13	100	100	100	03/15 – 08/15	100	100
10/13 – 12/13	100	100	100	09/15 – 02/16	100	100
01/14 – 03/14	100	**56**	100	03/16 – 08/16	100	100
Retest 1	100	100	100			
Retest 2	100	100	100			
Retest 3	100	100	100			
04/14 – 06/14	100	100	100			
07/14 – 09/14	100	100	100			
10/14 – 12/14	100	100	100			
01/15 – 03/15	100	100	100			
04/15 – 06/15	100	100	100			
07/15 – 09/15	100	100	100			
10/15 – 12/15	100	100	100			
01/16– 03/16	100	100	100			
04/16 – 06/16	100	100	100			

a NOECs reported in percent effluent.
b Monitoring frequency was reduced to 2/year as of March 1, 2013.

(c) Outfall TX3 (function identical to Outfall 003)

Summary of Chronic WET Test Results by Species
(January 2012 through June 2016)

Ceriodaphnia dubia				*Pimephales promelas* **(Fathead minnow)**		
Reporting period	**NOEC$_L$ [a]**	**NOEC$_S$ [a]**	**22414**	**Reporting period**	**NOEC$_L$ [a]**	**NOEC$_S$ [a]**
01/12 – 03/12	100	100	100	01/12 – 03/12	100	100
04/12 – 06/12	100	**0**	100	04/12 – 06/12	100	100
May 2012	100	100	100	07/12 – 09/12	100	100
June 2012	100	100	100	10/12 – 12/12	100	100
July 2012	100	**32**	100	01/13 – 03/13	100	100
August 2012	100	100	100	04/13 – 06/13 [b]	100	100
September 2012	100	**0**	100	07/13 – 08/13	100	100
October 2012	100	**32**	100	09/13 – 02/14	100	100
November 2012	100	100	100	03/14 – 08/14	100	100
December 2012	100	100	100	09/14 – 02/15	100	100
January 2013	100	**56**	100	03/15 – 08/15	100	100
February 2013	100	**75**	100	09/15 – 02/16	100	100
March 2013	100	100	100	03/16 – 08/16	100	100
April 2013	100	**32**	100			
May 2013	100	**42**	100			
June 2013	100	100	100			
July 2013	100	**56**	100			
August 2013	100	**56**	100			
September 2013	100	**0**	100			
October 2013	100	**32**	100			
November 2013	100	100	100			
December 2013	No test	No test	No test			
January 2014	100	**32**	100			
February 2014	100	100	100			
March 2014	100	100	100			
April 2014	100	100	100			
04/14 – 06/14	100	100	100			
07/14 – 09/14	100	100	100			
10/14 – 12/14	100	100	100			
01/15 – 03/15	100	100	100			
04/15 – 06/15	100	100	100			
07/15 – 09/15	100	100	100			
10/15 – 12/15	100	100	100			
01/16– 03/16	100	100	100			
04/16 – 06/16	100	100	100			

[a] NOECs reported in percent effluent.
[b] Monitoring frequency was reduced to 2/year as of March 1, 2013.

(3) Reasonable Potential

(a) Criteria for Reasonable Potential

According to 40 CFR 122.44(d)(1)(v), when the permitting authority determines that a discharge causes, has the reasonable potential (RP) to cause, or contributes to an in-stream excursion above a narrative criterion within an applicable State water quality standard for whole effluent toxicity, the permit must contain effluent limits for whole effluent toxicity.

In accordance with the narrative criteria established in OAC 785:46-3-5 and cited by reference in OAC 252:690-3-18, RP exists whenever persistent lethality is demonstrated. In addition, the OAC 785:46-3-5 states that the permitting authority may deem RP to be demonstrated whenever intermittent toxicity or persistent toxicity occurs. Persistent toxicity (lethality and/or sublethality) is defined in OAC 252:690-1-2 as repeat failure (failure of the routine test plus one of the two monthly retests) of an acute or chronic WET test and intermittent toxicity is defined as two or more lethal or sublethal effect test failures of a routine acute or chronic WET test within any 18-month period. OAC 252:690-3-19(a) requires a toxicity reduction evaluation (TRE) when persistent toxicity is demonstrated. In accordance with OAC 252:690-3-19(b) the effective date of a WET limit for the affected species may be deferred up to three years from the effective date of the permit.

(b) Application of Criteria to the Draft Permit and Permitting Actions

The above summaries of WET testing since the effective date of the previous permit shows two (2) sublethal effects for *C. dubia* at Outfall TX1 and several sublethal effects for *C. dubia* at Outfall TX3. For Outfall TX1, all required retests passed; thus no persistent lethality for *C. dubia* was exhibited. For Outfall TX3, the sublethal failures occurred during the period when blue green algae presented in the effluent holding pond (to supply to the PSO via Outfall 003) and copper sulfate was used for algae control. The facility conducted several toxic identification evaluations (TIE) during this period. While baseline (samples) toxic were inconclusive, the TIEs suspected blue green algae related toxin (microcystin) and copper were the causes of those sublethal failures to *C. dubia*. In January 2014, the facility constructed a new pump station and a splitter basin to replace the broken pump station and effluent holding pond. Effluent from the facility's final treatment unit enters this basin, and is discharged into Nine Mile Creek via Outfall 001, or is immediately pumped to the PSO via Outfall 003. The effluent being supplied to the PSO is no longer impounded. Neither lethal nor sublethal failures occurred after January 2014. WET limits for *C. dubia* were already established in the previous permit. These WET limits shall remain in the renewed permit and are applied to all three (3) outfalls (TX1, TX2, and TX3). For the fathead minnow specie, the above summaries show neither lethal nor sublethal failures during the previous permit cycle. Therefore, no RP to the fatheads is demonstrated. The facility is required to continue biomonitoring (WET testing) for the life of the renewed permit.

Under the previous permit, only lethal effects were considered in terms of test failure. OAC 252:690-3-40 now requires that significant sublethal effects at or below the critical dilution also be considered as test failures.

(4) Whole Effluent Toxicity Testing Requirements

(a) Type of WET Testing Required

In accordance with OAC 252:690-3-31, the type of WET test(s) required is based on the value of Q*, as follows:

Where $Q^* < 0.054$, acute testing only is required.

Where $Q^* > 0.3333$, chronic testing only is required.

Where $0.054 \le Q^* \le 0.3333$, both acute and chronic testing are required.

Since Q* is 27.8508, only chronic testing is required.

(b) Critical Dilutions

The chronic critical dilution (CCD), expressed as percent effluent, is based on the value of Q* using the following set of equations:

$$CCD = 100 \times \frac{1.94\,Q^*}{(1+Q^*)}, \text{ where } Q^* \le 0.1823.$$

$$CCD = 100 \times \frac{1}{(6.17 - 15.51\,Q^*)}, \text{ where } 0.1823 < Q^* < 0.3333.$$

$$CCD = 100, \text{ where } Q^* \ge 0.3333.$$

Since Q* for this application is 27.8508, the third equation is used, and the CCD is 100%.

(c) Dilution Series

A 0.75 dilution series is used for all WET testing. Where it is practical to do so, the critical dilution is bracketed. The purpose of doing so is to evaluate dose response both above and below the critical dilution. For critical dilutions between 76% and 95%, OAC 252:690, Appendix D, Table D-2, requires that a 100% effluent dilution be added to the dilution series to bracket the critical dilution. In accordance with OAC 252:690-3-33, the dilution series for each type test are as follows (critical dilutions are shown **<u>underlined in bold face</u>**):

Chronic test: **<u>100%</u>**, 75%, 56%, 42%, 32%, plus a dilution water control.

(d) Frequency of WET Testing

In accordance with OAC 252:690-3-41, the facility will be required to perform quarterly testing of both test species.

For *C. dubia* specie with a WET limit, in accordance with OAC 252:690-3-42(4) quarterly monitoring is required for the life of the permit. For the Fathead minnow specie, in accordance with OAC 252:690-3-42(1) a monitoring frequency reduction to twice a year may be requested after two (2) years from the effective date of the permit (see Permit Part II, Section F.5).

(e) Concurrent Testing Requirements

In accordance with OAC 252:690-3-25, the draft permit will include a provision for concurrent testing of ammonia and pH on all composite samples collected for WET testing of the Fathead minnow specie. The draft permit will not specify any concurrent testing requirements for daphnid testing.

2. **Aquatic Toxicity, Human Health and Raw Water Column Criteria for Toxic Substances for Protection of the Fish and Wildlife Propagation, Fish Consumption and Public and Private Water Supply Uses**

a. **Criteria and Implementation**

(1) **Aquatic Toxicity – Fish and Wildlife Propagation Use (Outfalls 001, 002, and 003)**

Acute and chronic aquatic toxicity numerical criteria are specified at OAC 785:45-5-12(f)(6)(G) and are implemented according to procedures in OAC 785:46, Subchapter 5, OAC. 252:690-3-51 through 3-57, and Chapter 3 of the CPP.

Aquatic toxicity numerical criteria are hardness-dependent for certain metals. The equations for calculating hardness-dependent criteria (for those metals present at quantifiable levels in the combined discharge) and the resulting acute and chronic criteria are as follows:

Hardness-dependent Aquatic Toxicity Criteria (µg/l) for Nine Mile Creek

Effluent Characteristic	Acute Toxicity Criteria		Chronic Toxicity Criteria	
	Equation	Value [a]	Equation	Value [a]
Copper, total	$C_{acute} = e^{(0.9422(\ln(\text{hardness})) - 1.3844)}$	48.64	$C_{chronic} = e^{(0.8545(\ln(\text{hardness})) - 1.386)}$	29.74
Zinc, total	$C_{acute} = e^{(0.8473(\ln(\text{hardness})) + 0.8604)}$	270.05	$C_{chronic} = e^{(0.8473(\ln(\text{hardness})) + 0.7614)}$	244.59

[a] Based on a segment-averaged receiving water hardness of 268.3 mg/l.

(2) **Protection of Human Health – Fish Consumption Use (Outfalls 001, 002, and 003)**

Criteria for the protection of human health for the consumption of fish flesh apply only to receiving waters not designated as habitat-limited aquatic communities. Additional human health/fish flesh criteria are recommended by EPA in the National Recommended Water Quality Criteria (NRWQC). NRWQC criteria are not binding upon individual states, however.

OWQS and NRWQC criteria for the protection of human health for the consumption of fish flesh are specified at OAC 785:45-5-20(b) and Publication No. EPA 822-Z-99-001, respectively, and are implemented according to the procedures in OAC 785:46, Subchapter 7, OAC 252:690-3-64 through 3-70, and Chapter 3 of the CPP.

b. **Determination of Reasonable Potential and Wasteload Allocation**

(1) **Reasonable Potential and WLA Equations**

(a) **Aquatic Toxicity – Fish and Wildlife Propagation Use (Outfalls 001, 002, and 003)**

For determining whether there is reasonable potential to exceed acute toxicity numerical criteria for discharges to streams, OAC 785:46-5-3(b)(2) defines a pollutant's concentration at the edge of the acute regulatory mixing zone (C_d) as:

$$C_d = C_b + \frac{Q_{e(D)}}{64.63}(C_{95} - C_b)\text{, where } Q_{e(D)} \text{ is expressed in mgd.}$$

In order for C_d to fall in the range between C_u and C_{95}, the value for $Q_{e(D)}$ used in the equation must be less than or equal to 64.63 mgd. If the actual $Q_{e(D)} > 64.63$ mgd, a value of 64.63 mgd is used in the reasonable potential equation.

Should a pollutant's acute toxicity screen exhibit reasonable potential, a water quality-based limit is required for that pollutant and a wasteload allocation is calculated for each applicable criterion. For discharges to streams, the acute toxicity wasteload allocation is calculated in accordance with OAC 252:690-3-55(a)(1), as follows:

$$WLA_A = C_b + \frac{64.63}{Q_{e(D)}}(C_A - C_b)\text{, where } Q_{e(D)} \text{ is expressed in mgd.}$$

As with the reasonable potential equation, if the actual $Q_{e(D)} > 64.63$ mgd, a value of 64.63 mgd is used in the WLA equation.

For determining whether there is reasonable potential to exceed <u>chronic</u> toxicity numerical criteria, OAC 785:46-5-3(b)(2) defines a pollutant's maximum concentration at the boundary of the chronic regulatory mixing zone (C_d) as:

$$C_d = C_b + 1.94\,Q^* \frac{(C_{95} - C_b)}{(1+Q^*)}\text{, for } Q^* \le 0.1823$$

$$C_d = C_b + \frac{(C_{95} - C_b)}{(6.17 - 15.51\,Q^*)}\text{, for } 0.1823 < Q^* < 0.3333$$

$$C_d = C_{95}\text{, for } Q^* \ge 0.3333$$

Should a pollutant's chronic toxicity screen exhibit reasonable potential, a water quality-based limit is required for that pollutant and a wasteload allocation is calculated for each applicable criterion. For discharges to streams, the chronic toxicity wasteload allocation is calculated in accordance with OAC 252:690-3-55(a)(1), as follows:

$$WLA_C = C_b + \left(\frac{1+Q^*}{1.94Q^*}\right)(C_C - C_b)\text{, for } Q^* \le 0.1823$$

$$WLA_C = C_b + (6.17 - 15.51\,Q^*)(C_C - C_b)\text{, for } 0.1823 < Q^* < 0.3333$$

$$WLA_C = C_C\text{, for } Q^* \ge 0.3333$$

(b) Protection of Human Health – Fish Consumption Use (Outfalls 001, 002, and 003)

OAC 785:46-7-3(b)(2) defines the reasonable potential equation for a pollutant's instream concentration C_d after complete mixing as follows:

$$C_d = \frac{(C_{95}\,Q^* + C_b)}{(1+Q^*)}$$

The human health/fish flesh wasteload allocation is calculated in accordance with OAC 252:690-3-68, as follows:

$$WLA_{FF} = C_{FF} + \frac{(C_{FF} - C_b)}{Q^*}$$

Should a pollutant's OWQS human health/fish flesh screen exhibit reasonable potential, a water quality-based limit is required for that pollutant and a wasteload allocation is calculated for each applicable criterion. Where a discharge is located less than five miles upstream of a PWS intake (see Section III.A), OAC 252:690-3-68 requires that a human health/fish flesh wasteload allocation equal to the criterion be established for any pollutant detected in the discharge to which a human health/fish flesh criterion applies. Since there is no PWS intake within five miles of this discharge the WLA uses the above equation.

In accordance with EPA Region 6 policy, pollutants are screened for reasonable potential to exceed NRWQC human health/fish flesh consumption criteria and, if reasonable potential is exhibited, effluent monitoring of those pollutants is required as a permit condition in lieu of establishing effluent limitations.

(2) Results of Reasonable Potential Screening

(a) Aquatic Toxicity – Fish and Wildlife Propagation Use (Outfalls 001, 002, and 003)

Results of the acute and chronic toxicity screens for Outfalls 001, 002, and 003, using $Q_{e(D)}$ = 18.0 mgd, C_{95} values reflected in Section V.C.2.c, pollutant background levels reflected in Section V.C.2.d, and any hardness-dependent metals criteria reflected in Section V.D.2.a(1), are shown in the table below. Any required WLAs are also shown.

Results of Acute and Chronic Toxicity Screens (Outfall 001)
(concentrations in µg/l unless otherwise specified)

Effluent Characteristic	Acute Toxicity				Chronic Toxicity			
	C_d	C_A	$C_d > C_A$?	WLA_A	C_d	C_C	$C_d > C_C$?	WLA_C
Copper, total	3.67	48.64	No	---	13.17	29.74	No	---
Selenium, total	2.87	20.00	No	71.81 [a]	10.31	5.00	**Yes**	5.00
Zinc, total	19.37	270.05	No	---	69.60	244.59	No	---

[a] Even though reasonable potential for selenium to exceed acute toxicity criterion was not demonstrated, a wasteload allocation is required because another applicable criterion (chronic) demonstrated reasonable potential.

(b) Protection of Human Health – Fish Consumption Use (Outfalls 001, 002, and 003)

Results of the OWQS and NRWQC human health/fish flesh screens for Outfalls 001, 002, and 003, using $Q^* = 6.1644$, C_{95} values reflected in Section V.C.2.c, and background levels reflected in Section V.C.2.d, are shown in the table below. Any required OWQS WLAs are also shown.

Results of OWQS and NRWQC Human Health/Fish Flesh Screens (Outfall 001)
(concentrations in µg/l unless otherwise specified)

Effluent Characteristic	State Human Health/ Fish Flesh Criteria				NRWQC Criteria		
	C_d	C_{FF}	$C_d > C_{FF}$?	WLA_{FF}	C_d	C_{NRWQC}	$C_d > C_{NRWQC}$?
Phenols	79.74	860,000	No	---	Not Applicable		

c. Criterion Long Term Average (LTA) Concentration

(1) Aquatic Toxicity – Fish and Wildlife Propagation Use (Outfalls 001, 002, and 003)

Acute and chronic toxicity criteria LTAs (LTA_A and LTA_C) are calculated for the pollutants requiring water quality-based limits assuming a log-normal distribution and using a 99% probability basis according to the following equations. A CV of 0.6 is assumed when the effluent data set is not sufficiently large to determine a CV directly.

$$LTA_A = WLA_A \times EXP\left(0.5\ln\left(1+CV^2\right)-2.326\sqrt{\ln\left(1+CV^2\right)}\right)$$

$$LTA_C = WLA_C \times EXP\left(0.5\ln\left(1+\frac{CV^2}{4}\right)-2.326\sqrt{\ln\left(1+\frac{CV^2}{4}\right)}\right)$$

Acute and chronic criterion LTAs are compared in the following table to determine the more stringent LTA (referred to as LTA_{TOX}) for the purpose of developing toxicity-based permit limitations.

Comparison of Acute and Chronic Toxicity Criteria LTAs (Outfall 001)
(concentrations in µg/l unless otherwise specified)

Effluent Characteristic	LTA_A	LTA_C	Controlling Toxicity LTA (LTA_{TOX})
Selenium, total	23.06	2.64	2.64 (Chronic)

(2) Protection of Human Health – Fish Consumption Use (Outfalls 001, 002, and 003)

For the human health/fish flesh criterion, $LTA_{FF} = WLA_{FF}$. Because reasonable potential to exceed water quality standard was not demonstrated and no WLA_{FF} was calculated, determination of LTA_{FF} is not needed.

d. Permit Limitations

(1) Aquatic Toxicity – Fish and Wildlife Propagation Use (Outfalls 001, 002, and 003)

Aquatic toxicity-based monthly average limits (MAL_{TOX}) are calculated on a 95% probability basis, and aquatic toxicity-based daily maximum limits (DML_{TOX}) are calculated on a 99% probability basis. In accordance with OAC 252:690-3-89, a monitoring frequency (N_m) of 2/month is utilized, and a CV of 0.6 is assumed. The permit limit equations are:

$$MAL_{TOX} = LTA_{TOX} \times EXP\left(1.645\sqrt{\ln\left(1+\frac{CV^2}{N_m}\right)} - 0.5\ln\left(1+\frac{CV^2}{N_m}\right)\right)$$

$$DML_{TOX} = LTA_{TOX} \times EXP\left(2.326\sqrt{\ln\left(1+CV^2\right)} - 0.5\ln\left(1+CV^2\right)\right)$$

The resulting toxicity-based permit limitations for Outfall 001 are shown the following table:

Aquatic Toxicity-Based Permit Limitations (Outfalls 001, 002, and 003)

Effluent Characteristic	No. of samples per month (N_m)	Effluent Limitations (µg/l unless otherwise specified)	
		Monthly Average (MAL_{TOX})	Daily Maximum (DML_{TOX})
Selenium, total	2	4.74	8.21

Based on the effluent analytical data provided with the permit application, the facility may not be able to comply with newly established limits for selenium without addition improvement or othere strategies to reduce/eliminate selenium in the discharge. Therefore, compliance with effluent limits for selenium shall be delayed for three (3) years from the effective date of the permit. During this period, the facility is required to monitor and report.

(2) Protection of Human Health – Fish Consumption Use (Outfalls 001, 002, and 003)

Human health/fish flesh-based monthly average limits (MAL_{FF}) are equal to the respective criterion long term averages, and daily maximum limits (DML_{FF}) are calculated on a 99% probability basis. The permit limit equations are as follows:

$$MAL_{FF} = LTA_{FF}$$

$$DML_{FF} = LTA_{FF} \times EXP\left(\frac{2.326\sqrt{\ln(1+CV^2)} - 0.5\ln(1+CV^2)}{1.645\sqrt{\ln\left(1+\frac{CV^2}{N_m}\right)} - 0.5\ln\left(1+\frac{CV^2}{N_m}\right)}\right)$$

Because reasonable potential to exceed water quality standard was not demonstrated and no LTA_{FF} was calculated, determination of permit limits is not needed.

3. Mineral Constituent Criteria for Protection of the Agriculture Use (Outfalls 001, 002, and 003)

a. General

Yearly mean standard (YMS) and sample standard (SS) criteria for surface waters designated for the Agriculture use are described in OAC 785:45-5-13 and Appendix F thereto. Both sets of numerical criteria are implemented according to the screening procedures in OAC 785:46, Subchapter 9. OAC 785:46-9-3 specifies that for POTW discharges, the regulatory flows for implementing YMS criteria are $Q_{e(D)}$ and $Q_{u(LTA)}$. For implementing SS criteria, the regulatory flows are $Q_{e(D)}$ and $Q_{u(STA)}$.

For this permit, mineral constituent's background concentrations (C_u) are derived from the site-specific YMS and SS criteria for Nine Mile Creek as specified in OAC 785:45, as follows:

$$C_b = \text{YMS} - (\text{SS} - \text{YMS}) = 2\ \text{YMS} - \text{SS}$$

For chlorides, $C_b = 2 \times 499 - 624 = 374$ mg/l.

For TDS, $C_b = 2 \times 1680 - 2100 = 1260$ mg/l.

b. Reasonable Potential

(1) Yearly Mean Standard

OAC 785:46-9-5(b) and (c) define a POTW discharge's instream pollutant concentration $C_{d(YMS)}$, after complete mixing, as follows:

$$C_{d(YMS)} = \frac{(C_{95}\,Q^* + C_b)}{(1+Q^*)}\text{, where } Q^* = Q_{e(D)} / Q_{u(LTA)}$$

In accordance with OAC 785:46-9-4 for chlorides, $C_{d(YMS)}$ is compared against the higher of the YMS criterion or 250 mg/l. For TDS, $C_{d(YMS)}$ is compared against the higher of the YMS criterion or 700 mg/l. The results of the YMS reasonable potential screen are shown in the following table:

Results of Yearly Mean Standard Screen for Effluent Limits (Outfalls 001, 002, and 003)
(concentrations in mg/l)

Effluent Characteristic	C_{mean}	C_{95}	C_b	$C_{d(YMS)}$	Criterion			$C_{d(YMS)} > C_{YMS}$
					C_{YMS}	Default	Maximum (C_{YMS}, Default)	
Chlorides	117	135	374	167	499	250	499	No
TDS	786	891	1260	942	1680	700	1680	No

(2) Sample Standard

OAC 785:46-9-5(b) and (d) define a POTW discharge's instream pollutant concentration $C_{d(SS)}$, after complete mixing, as follows:

$$C_{d(SS)} = \frac{(C_{95}\,Q^* + C_b)}{(1+Q^*)}\text{, where } Q^* = Q_{e(D)} / Q_{u(STA)}$$

For chlorides, $C_{d(SS)}$ is compared against the higher of the SS criterion or 250 mg/l. For TDS, $C_{d(SS)}$ is compared against the higher of the SS criterion or 700 mg/l. The results of the SS reasonable potential screen are shown in the following table:

Results of Sample Standard Screen for Effluent Limits (Outfalls 001, 002, and 003)
(concentrations in mg/l)

Effluent Characteristic	C_{mean}	C_{95}	C_b	$C_{d(SS)}$	Criterion			$C_{d(SS)}$ > C_{SS}
					C_{SS}	Default	Max (C_{SS}, Default)	
Chlorides	117	135	374	159	624	250	624	No
TDS	786	891	1260	927	2100	700	2100	No

c. Wasteload Allocation (WLA) and Criterion Long Term Average (LTA) Concentrations

The results of the screening indicate that reasonable potentials at Outfalls 001, 002, and 003 for TDS to exceed either YMS or SS criteria are not demonstrated. Thus, determination of wasteload allocations is not needed.

d. Permit Limitations

None. Monthly monitoring and report requirements in the previous are hereby discontinued.

4. Bacterial Criteria for Protection of the Primary Body Contact Recreation and Public and Private Water Supply Uses

The previous permit contained effluent limits for fecal coliform. However, fecal coliform is no longer used as an indicator for bacterial criteria and has been deleted from Oklahoma's Water Quality Standards as of September 12, 2014. In accordance with the revised OAC 252:690-3-86, either E. coli or enterococci are now the only valid bacteriological indicators. The draft permit will contain effluent limitations for E. coli (in place of fecal coliform), unless the facility requests the DEQ in writing to specify enterococci, instead.

a. Bacteria Limitation – Primary Body Contact Recreation Use (Outfalls 001, 002, and 003)

- In accordance with OAC 252:690-3-86(a)(2), the draft permit shall have a E. Coli monthly average limit (MAL) of 126/100 ml, expressed as a geometric mean, and a daily maximum limit (DML) of 406/100 ml for the "recreational period" from May 1 through September 30.
- In accordance with OAC 252:690-3-89(a)(3)(A), the draft permit shall have a bacteria monitoring frequency of two per week.

b. Total Coliform – Public and Private Water Supply Use (Outfalls 001, 002, and 003)

In accordance with OAC 252:690-3-78, total coliform criteria are applied where a discharge is within five miles upstream of a public water supply intake or within five miles of such an intake in a lake. Since there is no intake within five miles downstream of the discharge, total coliform limit is not required.

5. Criteria for Protection of the Aesthetics Use (Outfalls 001, 002, and 003)

a. General

Nutrient loading in Oklahoma's surface waters, particularly of phosphorus, has become an area of concern. OAC 785:45-5-9(d) states "Nutrients from point source discharges or other sources shall not cause excessive growth of periphyton, phytoplankton, or aquatic macrophyte communities which impairs any existing or designated beneficial use." This narrative criteria is echoed in the State of Oklahoma's general antidegradation policy as applied to beneficial uses (OAC 785:45-3-2(d)) as "No water quality degradation which will interfere with the attainment or maintenance of an existing or designated beneficial use shall be allowed."

b. Nutrient Limitations and Monitoring Requirements

The previous permit for the facility contained no nitrate or phosphorus limits or reporting requirements. According to data published by the OWRB in its Beneficial Use Monitoring Program (BUMP) 2013 Final Report, the trophic condition of the Red River downstream of the facility is stable. Thus, in the judgment of the permit writer, monitoring of effluent nutrient levels is not warranted at this time. The permit will, however, contain a narrative condition for control of solids to protect the Aesthetics use.

c. Floatable Solids and Foam

In accordance with OAC 785:45-5-9(b), a narrative condition prohibiting the discharge of floating solids or visible foam in other than trace amounts will be included in the permit.

E. MONITORING REQUIREMENTS

1. Effluent Monitoring Requirements (Outfalls 001, 002, and 003)

a. General

In accordance with OAC 252:690-3-90, where reasonable potential to exceed an applicable criterion is not exhibited, the background is unknown and there are fewer than 10 effluent data points to characterize the effluent, further effluent monitoring may be warranted based on use of the TSD method for computing $C_{95(M)}$ (see Section V.C.2.c). The TSD procedure accounts for the inherent uncertainty in characterizing an effluent distribution from a small data set.

b. Applicability

Water quality-based limitations are required for selenium. All other pollutants detectable in the discharge which have State of Oklahoma water quality criteria are screened for reasonable potential using $C_{95(M)}$ in place of C_{95} to determine which of them may require effluent monitoring (see Section V.C.2.c).

c. Results of Reasonable Potential Screening Using $C_{95(M)}$

Where C_d, calculated using $C_{95(M)}$ in place of C_{95}, exceeds an applicable criterion for a pollutant, a short term effluent monitoring requirement (sufficient to collect a minimum of ten data points) is established in the permit for that pollutant in accordance with OAC 252:690-3-90(a). Reasonable potential may then be reassessed with the larger effluent data set and the permit reopened, if necessary, to add appropriate effluent limitations. Results of the reasonable potential screens using $C_{95(M)}$ are shown in the following tables:

City of Lawton Wastewater Treatment Facility

(1) **Aquatic Toxicity Criteria**

Results of Acute and Chronic Toxicity RP Screens using $C_{95(M)}$ (Outfalls 001, 002, and 003)
(concentrations in μg/l unless otherwise specified)

Effluent Characteristic	Acute Toxicity			Chronic Toxicity		
	C_d	C_{acute}	$C_d > C_{acute}$?	C_d	$C_{chronic}$	$C_d > C_{chronic}$?
Copper, total	7.16	48.64	No	25.69	29.74	No
Zinc, total	32.44	270.05	No	116.47	244.59	No

(2) **Human Health/Fish Flesh Criteria**

Results of Human Health/Fish Flesh RP Screen Using $C_{95(M)}$ (Outfalls 001, 002, and 003)
(concentrations in μg/l unless otherwise specified)

Effluent Characteristic	C_d	C_{FF}	$C_d > C_{FF}$?
Phenols	202.64	860,000	No

(3) **YMS and SS Agriculture Criteria**

None.

2. **Background Monitoring Requirements (Monitoring Point 999)**

OAC 252:690-3-10 requires that, where available, background levels be included in reasonable potential assessments and in calculating wasteload allocations.

a. **Assessment for Aquatic Toxicity, Human Health, and Raw Water Column Criteria**

In general, if water quality-based limits derived from aquatic toxicity, human health, or raw water column criteria are established in a permit for a pollutant based on an assumed zero background (or a partial background data set consisting of less than 10 data points), background monitoring for that pollutant will be required. There are two exceptions to this requirement, both of which exclude background concentration as a component in the wasteload allocation equation. These exceptions are as follows:

- where permit limits are based on a chronic toxicity criterion in an effluent-dominated discharge situation, and
- where permit limits are based on a raw water column or human health/fish flesh and water criterion and the associated wasteload allocation was set equal to that criterion because the discharge is in close proximity to a PWS intake.

Where permit limits for a pollutant are not required and the background is unknown (assumed zero), background monitoring may be justified for the purpose of reassessing whether there is reasonable potential to exceed an applicable criterion. In such cases, OAC 252:690-3-12 requires that the background trigger to criterion (BT/C) ratio be used to determine whether background monitoring is warranted for a pollutant. The trigger background concentration for a criterion is defined in OAC 252:690-1-2 as "the background concentration necessary to trigger reasonable potential for a substance to exceed an applicable criterion given a specified mean effluent concentration." As described in

Appendix J of OAC 252:690, the procedure involves calculating a BT/C ratio for each applicable criterion and comparing each such ratio with an associated threshold value, $(BT/C)_{max}$, which is a function of the magnitude of each criterion. Where the BT/C ratio > 1.0, the C_{95} concentration is less than the criterion and there is no possibility of exhibiting reasonable potential to exceed that criterion at any background level which is less than or equal to the criterion. Where the BT/C ratio ≤ 1.0, the C_{95} concentration is at least as high as the criterion and, depending on the magnitude of the criterion, background monitoring may be justified. If the BT/C ratio ≤ $(BT/C)_{max}$ for any of the applicable criteria for a pollutant, then background monitoring for that pollutant is required. In order for $(BT/C)_{max}$ to be appropriately more sensitive to criteria of smaller magnitude, at which a measurable background level of a pollutant may have a relatively greater impact in the determination of reasonable potential, the value of the $(BT/C)_{max}$ threshold value function increases as the magnitude of a criterion decreases within the range of 1 to 1000 µg/l.

(1) Calculation of $(BT/C)_{max}$

The value of $(BT/C)_{max}$ for each applicable criterion is an inverse function of the criterion's magnitude with two break points (or "hinges"), one at 1.0 µg/l and the other at 1,000.0 µg/l. It is calculated as follows:

$$(BT/C)_{max} = 1.0, \text{ where the criterion} \le 1.0\ \mu g/l.$$

$$(BT/C)_{max} = \frac{1}{2^{\log(\text{criterion})}}, \text{ where the criterion} > 1.0\ \mu g/l \text{ and} \le 1{,}000.0\ \mu g/l.$$

$$(BT/C)_{max} = 0.125, \text{ where the criterion} > 1{,}000.0\ \mu g/l.$$

(2) Calculation of BT/C Ratios

Background trigger concentrations are first calculated for all applicable criteria and the BT/C concentration is then calculated by dividing the criterion-specific background trigger concentration by the applicable criterion. Values of $Q_{e(D)}$, Q^*, C_{95}, C_A, C_C, C_{FF}, C_{FFW}, and C_{Raw} are as previously defined.

(a) Acute Toxicity Criteria

$$BT/C_{Acute} = \frac{\left(\dfrac{64.63\ C_A - Q_{e(D)} C_{95}}{64.63 - Q_{e(D)}}\right)}{C_A}, \text{ where } Q_{e(D)} < 64.63 \text{ mgd.}$$

BT/C_{Acute} is not defined for values of $Q_{e(D)} \ge 64.63$ mgd.

(b) Chronic Toxicity Criteria

For discharges to streams, the following equations are used:

$$BT/C_{Chronic} = \frac{\left(\dfrac{(1+Q^*)C_C - 1.94\ Q^* C_{95}}{1 - 0.94\ Q^*}\right)}{C_C}, \text{ where } Q^* \le 0.1823$$

$$\mathrm{BT/C}_{\text{Chronic}} = \frac{\left(\frac{(6.17 - 15.51\,Q^*)C_C - C_{95}}{5.17 - 15.51\,Q^*}\right)}{C_C}, \text{ where } 0.1823 < Q^* < 0.3333$$

$\mathrm{BT/C}_{\mathrm{Chronic}}$ is not defined for $Q^* \geq 0.3333$ (effluent-dominated discharge situations), since the background level is not a component of the chronic toxicity reasonable potential equation.

(c) Human Health/Fish Flesh Criteria

$$\mathrm{BT/C}_{FF} = \frac{(1 + Q^*)C_{FF} - Q^* C_{95}}{C_{FF}}$$

(3) Summary of Background Monitoring Requirements

Summary of Background Monitoring Requirements (Outfall 999)

Effluent Characteristic	Effluent limit required?	Background assumed zero?	BT/C ratio procedure applicable ?	BT/C Ratio Assessment				Background monitoring required?
				Type Criterion	BT/C Ratio	$(BT/C)_{max}$	BT/C ratio ≤ $(BT/C)_{max}$?	
Copper, total	No	Yes	Yes	Acute	>1	0.311	No	No
				Chronic	N/A	0.360	N/A	
Silver, total	Yes (Chronic toxicity)	Yes	No	---	---	---	---	No
Zinc, total	No	Yes	Yes	Acute	>1	0.185	No	No
				Chronic	N/A	0.191	N/A	
Phenols	No	Yes	Yes	FF	>1	0.125	No	No

F. BIOSOLIDS/SEWAGE SLUDGE REQUIREMENTS

Biosolids/sewage sludge disposal practices shall comply with the Federal regulations for landfills, biosolids/sewage sludge, and solid waste disposal established at 40 CFR Part 257, 503, and the DEQ rules governing Sludge Management (OAC 252:515 and OAC 252:606) as applicable.

The biosolids/sewage sludge disposal practices shall also comply with the requirements of the Sludge Disposition Plan, which was approved by the DEQ on June 1, 2009, that allows the permittee to landfill biosolids/sewage sludge at the City of Lawton Municipal Landfill, which is located in Section 30, Township 1 North, Range 11 West, Comanche County, Oklahoma.

The permittee is required to maintain all records relevant to biosolids/sewage sludge disposal for the life of the permit. These records shall be made available to the ODEQ upon request.

The permittee shall give 120 days prior notice to DEQ of any change planned in the biosolids/sewage sludge disposal practice.

G. 303(d) LIST

The facility discharges into Nine Mile Creek (WBID: 311300020030_00) in Segment 311300 of the Red River Basin. Nine Mile Creek is not listed in the 303(d) List in the Appendix C of the 2014 Integrated Report as an impaired waterbody. Therefore, additional monitoring requirements are not established in the permit. A reopener clause is provided in the permit for the purpose of incorporating provisions of the Total Maximum Daily Load (TMDL) after it is completed and approved.

H. ANTIDEGRADATION REQUIREMENTS

Because no antidegradation restrictions are listed in Appendix A of the OWQS for the stream segment of Nine Mile Creek, to which the facility discharges (see Section V.B), implementation of the State's antidegradation policy, as described at OAC 785:46, Subchapter 13, indicates that no special requirements beyond Tier 1 protection (maintenance and protection of designated uses, as herein described) are necessary.

I. PROTECTION OF ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT

The stream segment of Nine Mile Creek, to which the facility discharges, is considered by the U.S. Fish and Wildlife Service (USFWS) to be a sensitive area for endangered or threatened species. Since there is no proposed increase in the facility's design average daily flow nor a change in location of the point of discharge (POD), no adverse impact on endangered or threatened species or their critical habitat is expected.

VI. GROUNDWATER PROTECTION

For municipal facilities, permits issued through the Water Quality Division's Construction Permit Section for plant design and construction (pursuant to the requirements of OAC 252:656) and land application of non-industrial wastewater and/or biosolids (pursuant to the requirements of OAC 252:621 and OAC 252:606, respectively) are considered sufficient to protect groundwater quality.

VII. DRAFT PERMIT EFFLUENT LIMITATIONS

A. GENERAL

In accordance with 40 CFR 122.44(a), (d) and (l), pollutant limitations and monitoring requirements are established in the draft permit based on the more stringent of technology-based, water quality-based, or previous permit requirements. Both concentration and mass (loading) limits are established unless it is impractical to specify loading limits because of the units in which concentration limits are expressed (e.g., standard units for pH). Such loading limitations are calculated using the facility's design average daily flow according to the following equation:

Mass loading limit *(in lbs/day)* = Concentration limit *(in mg/l)* $\times$ $Q_{e(D)}$ *(in mgd)* $\times$ 8.34

The facility's approved design average daily flow of 18.0 mgd is used to calculate all loading limits for discharges into Nine Mile Creek (Outfalls 001 and 002 combined). For Outfall 003, which discharges into Comanche Lake, a historically recorded flow of 6.0 mgd is used.

B. EFFLUENT LIMITATIONS

The following limitations and monitoring requirements apply for the periods indicated.

City of Lawton Wastewater Treatment Facility

1. Concentration Limitations and Reporting Requirements (Outfalls 001, 002, and 003)

Due to the fact that effluent's characteristics are now expected to be the same at Outfall 001 and Outfall 003, limits as stated in the facility's approved 208 Plan, and from any water quality-based reasonable potential evaluations, are applied to both outfalls. The permittee may use test results purportedly reported for Outfall 001 to fulfill the reporting requirements for Outfall 003. For Outfall 002, historical discharge monitoring reports show that this outfall has been inactive and could be eliminated once the permittee decide to utilize the holding pond for water reuse purposes in the future. For the time being, these same concentration limits (shown in table below) are also applied to Outfall 002.

Effluent Characteristics [a]		**WQS**		**Previous Permit**		**Draft Permit**	
		Monthly Average	Weekly Average	Monthly Average	Weekly Average	Monthly Average	Weekly Average
Carbonaceous Biochemical Oxygen Demand – 5 Days ($CBOD_5$)	Year round	10.0	15.0	10.0	15.0	10.0	15.0
Total Suspended Solids (TSS)	Year round	15.0	22.5	15.0	22.5	15.0	22.5
Ammonia as N (NH_3-N) [b]	Apr – Oct	2.0	3.0	2.0	3.0	2.0	3.0
	Nov – Mar	3.0	4.5	3.0	4.5	3.0	4.5
Dichlorobromomethane (µg/l)	Year round	10.34	15.09 Daily Max.	10.34	15.09 Daily Max.	10.34	15.09 Daily Max.
Selenium, total (µg/l) [c]	Year round	4.74 [d]	8.21 Daily Max.	---		4.74 [d]	8.21 Daily Max.
E. Coli (MPN/100 ml) [e]	May – Sep	126 Geo. Mean	406 Daily Max.	Fecal Coliform Limits		126 Geo. Mean	406 Daily Max.
Total Residual Chlorine (TRC) [f]	Year round	Maximum: No Measurable [g]		Maximum: No Measurable [g]		Maximum: No Measurable [g]	
Dissolved Oxygen	Apr – Oct	Minimum: 6.5		Minimum: 6.5		Minimum: 6.5	
	Nov – Mar	Minimum: 6.0		Minimum: 6.0		Minimum: 6.0	
pH (standard unit)	Year round	6.5 – 9.0		6.5 – 9.0		6.5 – 9.0	
Chloride	Year round	---		Report		---	
Total Dissolved Solids	Year round	---		Report		---	

a Units are mg/l, unless otherwise specified.

b A typographical error was identified in the previous permit. In accordance with the approved WLA (208 Plan) for the facility ammonia as N (NH_3-N) is required, instead of total ammonia.

c Compliance with permit limit is deferred for three (3) years from the effective date of the permit. During this deferment period, the permittee is required to monitor and report.

d If any individual test result reported by the lab is less than the minimum quantification level (for Selenium) of 5 µg/l, a value of zero (0) may be used for the discharge monitoring report (DMR) requirements.

e Reporting unit, as Most Probable Number (MPN)/100 ml, was selected by the permittee on December 30, 2019.

f If no chlorine is used for an entire reporting period, the permittee shall report a value of "zero" for the daily maximum and enter "No chlorine used this reporting period" in the comments section on the DMR for that reporting period in lieu of the indicated testing. For any week in which chlorine is used, the indicated testing shall be done until chlorine is no longer in use and at least one subsequent test verifies that the effluent meets the total residual chlorine limit.

g No measurable is defined as less than 0.1 mg/l.

2. Monthly Average Mass Loadings (lbs/d) and Reporting Requirements

a. Outfalls 001 and 002 Combined

Effluent Characteristics		WQS Monthly Average	Previous Permit Monthly Average	Draft Permit Monthly Average
Flow (mgd) [a]	Year round	Report Monthly Average and Daily Maximum	Report 30-Day Average and Daily Maximum [b]	Report Monthly Average and Daily Maximum [b]
$CBOD^5$	Year round	1501.2	1501.2	1501.2
TSS	Year round	2251.8	2251.8	2251.8
Ammonia as N (NH_3-N)	Apr – Oct	300.2	300.2	300.2
	Nov – Mar	450.4	450.4	450.4
Dichlorobromomethane	Year round	1.55	1.55	1.55
Selenium, total	Year round	0.71	---	0.71

[a] Flow shall be measured daily by totalized measurement at Outfall 001. Flow at Outfall 002 (overflow of the holding pond), if/when discharged, can be estimated.

[b] Monitoring and reporting for flow is revised as Monthly Average and Daily Maximum, instead of 30-Day Average and Daily Maximum, to be consistent with monitoring and reporting requirements for other parameters.

b. Outfall 003

Effluent Characteristics		WQS Monthly Average	Previous Permit Monthly Average	Draft Permit Monthly Average
Flow (mgd) [a]	Year round	Report Monthly Average and Daily Maximum	Report 30-Day Average and Daily Maximum [b]	Report Monthly Average and Daily Maximum [b]
$CBOD_5$	Year round	500.4	500.4	500.4
TSS	Year round	750.6	1501.2 [c]	750.6
Ammonia as N (NH_3-N)	Apr – Oct	100.1	100.1	100.1
	Nov – Mar	150.1	150.1	150.1
Dichlorobromomethane	Year round	0.52	0.52	0.52
Selenium, total	Year round	0.24	---	0.24

[a] Flow at Outfall 003 shall be read/calculated daily from flow meter installed at the pump station at the effluent splitter basin.

[b] Monitoring and reporting for flow is revised as Monthly Average and Daily Maximum, instead of 30-Day Average and Daily Maximum, to be consistent with monitoring and reporting requirements for other parameters.

[c] Mass loading in the previous permit was calculated based on modified TSS concentration limit of 30 mg/l, which became effective on August 12, 2002. As of January 2014, the effluent being supplied to the PSO is pumped from the same newly constructed splitter basin where the effluent is also discharged to Nine Mile Creek via Outfall 001. The same chemical characteristics are expected for both Outfall 001 and Outfall 003. Thus, mass loading limit for Outfall 003 is now based on the concentration of 15 mg/l stated in the facility's approved wasteload allocation (208 Plan).

3. Monitoring Frequencies and Sample Types

a. Evaluation for Performance-Based Monitoring Frequency Reductions

Not applicable for this permit cycle.

b. Monitoring Requirements and Sample Types

(1) Outfall 001 and Outfall 002

Effluent Characteristic		Previous Permit		Draft Permit	
		Measurement Frequency	Sample Type	Measurement Frequency	Sample Type
Flow	Year round	Daily	Totalized	Daily	Totalized
$CBOD_5$	Year round	Daily	12-hr Composite	Daily	12-hr Composite
TSS	Year round	Daily	12-hr Composite	Daily	12-hr Composite
Ammonia as N (NH_3-N) [a]	Year round	Daily	12-hr Composite	Daily	12-hr Composite
Dichlorobromomethane	Year round	1/2 Months	12-hr Composite	1/2 Months	12-hr Composite
Selenium, total	Year round	---		2/Month	12-hr Composite
E. Coli	May - Sep	2/Week	Grab	2/Week	Grab
Total Residual Chlorine (TRC)	Year round	Daily	Grab	Daily	Grab
Dissolved Oxygen (DO)	Year round	Daily	Grab	Daily	Grab
pH	Year round	Daily	Grab	Daily	Grab

[a] Ammonia analysis shall also be performed concurrently with and on all samples collected for WET testing at Outfall 001 and Outfall 002 (see WET testing requirements for Outfall TX1 and Outfall TX2 in Section VII.C below). Results from concurrent ammonia analyses for Outfall TX1 and Outfall TX2 may be used in partial fulfillment of ammonia monitoring requirements at Outfall 001 and Outfall 002.

(2) Outfall 003

Effluent Characteristic		Previous Permit		Draft Permit	
		Measurement Frequency	Sample Type	Measurement Frequency	Sample Type
Flow	Year round	Daily	Totalized	Daily	Totalized
$CBOD_5$	Year round	5/Week	12-hr Composite	5/Week	12-hr Composite
TSS	Year round	5/Week	12-hr Composite	5/Week	12-hr Composite
Ammonia as N (NH_3-N) [a]	Year round	5/Week	12-hr Composite	5/Week	12-hr Composite
Dichlorobromomethane	Year round	1/2 Months	12-hr Composite	1/2 Months	12-hr Composite
Selenium, total	Year round	---		2/Month	12-hr Composite
E. Coli	May - Sep	2/Week	Grab	2/Week	Grab
Total Residual Chlorine (TRC)	Year round	Daily	Grab	Daily	Grab
Dissolved Oxygen (DO)	Year round	Daily	Grab	Daily	Grab
pH	Year round	Daily	Grab	Daily	Grab

[a] Ammonia analysis shall also be performed concurrently with and on all samples collected for WET testing at Outfall 003 (see WET testing requirements for Outfall TX3 in Section VII.C below). Results from concurrent ammonia analyses for Outfall TX3 may be used in partial fulfillment of ammonia monitoring requirements at Outfall 003.

C. BIOMONITORING OUTFALL (OUTFALLS TX1, TX2, and TX3)

Outfall TX1, TX2, and TX3 are designated for biomonitoring reporting purposes. They are functionally identical to Outfalls 001, 002, and 003.

1. Previous Permit

The previous permit required chronic WET Limit for the *C. dubia* specie and chronic WET testing for the Fathead minnow specie. The WET limit and WET testing requirements are re-stated/summarized in the following table:

Previous Permit's WET Limit, Reporting, and Monitoring Requirements (Outfalls TX1, TX 2, and TX3)

Effluent Characteristic			Reporting/ Monitoring Requirements		
Test	Critical Dilution	Parameter	7-day Min	Testing Frequency	Sample Type
Ceriodaphnia dubia, 7-day chronic NOEC static renewal, freshwater	100%	Pass/Fail Survival [TLP3B]	Report	1/Quarter	24-hr Comp
		NOEC$_L$ Survival [TOP3B]	Report		
		% Mortality at Critical Dilution [TJP3B]	Report		
		Pass/Fail Reproduction [TGP3B]	Report		
		NOEC$_S$ Reproduction [TPP3B]	Report		
		% Coeff of Variation [TQP3B]	Report		
Pimephales promelas (Fathead minnow), 7-day chronic NOEC static renewal, freshwater	100%	Pass/Fail Survival [TLP6C]	Report	1/Quarter	24-hr Comp
		NOEC$_L$ Survival [TOP6C]	Report		
		% Mortality at Critical Dilution [TJP6C]	Report		
		Pass/Fail Growth [TGP6C]	Report		
		NOEC$_S$ Growth [TPP6C]	Report		
		% Coeff of Variation [TQP6C]	Report		
Whole Effluent Toxicity (lowest chronic NOEC$_L$ and/or sublethal NOECs for *C. dubia*) [22414]			100%	1/Quarter	24-hr Comp

2. Draft Permit

During the period beginning with the effective date and lasting through the expiration date of the permit, the permittee is authorized to discharge from Outfalls TX1, TX2, and TX3 (functionally identical to Outfalls 001, 002, and 003). Such discharge shall be limited and monitored by the permittee as specified below.

The permittee is encouraged to perform required biomonitoring activities as early in the reporting period as is practical so as to ensure sufficient time remains in the reporting period should retests/repeat tests be necessary.

All laboratory analyses for the parameters specified in the biomonitoring section must be performed by a laboratory certified by the Oklahoma Department of Environmental Quality for those parameters.

Whole Effluent Toxicity Limit, Reporting, and Monitoring Requirements for *Ceriodaphnia dubia* (Outfalls TX1, TX2, and TX3)

Effluent Characteristic			Reporting/Monitoring Requirements		
Test	Critical Dilution	Parameter	7-day Min	Testing Frequency [a]	Sample Type
Ceriodaphnia dubia, 7-day chronic NOEC static renewal, freshwater	100%	Pass/Fail Survival [TLP3B]	Report	1/Quarter	24-hr Comp
		$NOEC_L$ Survival [TOP3B]	Report		
		% Mortality at Critical Dilution [TJP3B]	Report		
		Pass/Fail Reproduction [TGP3B]	Report		
		$NOEC_S$ Reproduction [TPP3B]	Report		
		% Coeff of Variation [TQP3B]	Report		
Whole Effluent Toxicity Limit (lowest chronic $NOEC_L$ and/or sublethal $NOEC_S$ for *C. dubia*) [STORET 22414]			100%	1/Quarter	24-hr Comp

[a] Quarterly reporting periods commence with the effective date of the permit. A valid WET test shall be reported for *C. dubia* for each reporting period.

C. dubia whole effluent toxicity limit and monitoring requirements apply beginning the effective date of the permit, and the first reporting period is April 1, 2020 to June 30, 2020 .

Whole Effluent Toxicity Reporting and Monitoring Requirements for Fathead minnow (Outfalls TX1, TX2, and TX3)

Effluent Characteristic				Rerpoting/Monitoring Requirements		
Test		Critical Dilution	Parameter	7-day Min	Testing Frequency	Sample Type
	Pimephales promelas (Fathead minnow), 7-day chronic NOEC static renewal, freshwater	100%	Pass/Fail Survival [TLP6C]	Report	1/Quarter	24-hr Comp
			$NOEC_L$ Survival [TOP6C]	Report		
			% Mortality at Critical Dilution [TJP6C]	Report		
			Pass/Fail Growth [TGP6C]	Report		
			$NOEC_S$ Growth [TPP6C]	Report		
			% Coeff of Variation [TQP6C]	Report		
Retesting	Retest #1 [22415] [a]			Report	As Required [b]	24-hr Comp
	Retest #2 [22416] [a]			Report		

[a] Applies according to results of test failure triggering monthly retests.
[b] Monthly retesting required only if routine test for reporting period fails. Fill out ONLY these two retest parameters on the retest DMRs, do not change the original results, and put the correct submission date in the lower right hand corner of the DMR.

P. promelas (Fathead minnow) whole effluent toxicity reporting and monitoring requirements apply beginning the effective date, and the first reporting period is April 1, 2020 to June 30, 2020 .

Dilution Water and WET Test Acceptability

For Outfall TX1 and Outfall TX2 where the receiving stream (Nine Mile Creek)'s flow is intermittent, OAC 252:690-3-36 states that "...where there is no receiving water available when the sample is collected, permittees must use synthetic dilution water having a pH, hardness, and alkalinity similar to that of the closet downstream perennial water."

For Outfall TX3 where the receiving stream is Comanche Lake, OAC 252:690-3-37 states that "...permittees must use receiving water collected as close to the point of discharge as possible but unaffected by the discharge. Receiving water must be collected outside the regulatory mixing zone for discharges to lakes. If the receiving water control fails to fulfill the test acceptability criteria in OAC 252:690-3-38, the permittee must substitute synthetic dilution water for the receiving water in all subsequent tests, provided:

(1) a synthetic dilution water control which fulfills the test acceptability requirements in OAC 252:690-3-38 was run concurrently with the receiving water control.
(2) the test indicating receiving water toxicity was carried out to completion.
(3) the synthetic dilution water had a pH, hardness and alkalinity similar to that of the receiving water, provided the magnitude of these three parameters did not cause toxicity in the synthetic dilution water.
(4) the receiving water test must be conducted at the start of each permitting cycle."

Three (3) separate WET tests must be conducted, one (1) for each outfall using different receiving stream water, as indicated above, for each outfall (two WET tests if Outfall TX2 remain inactive). The permittee may use the same effluent sample for those WET tests. In accordance with OAC 252:690-3-38, if a WET test does not meet all of the acceptability requirements of the test method plus those specified above, the permittee must conduct a repeat test for the affected test species within the required reporting period.

WET Testing Summary Reports

The permittee must submit reports of all WET testing initiated, regardless of whether such tests are carried to completion, in accordance with the terms of Item 3 of Sections E and F in Part II of the permit.

Whole Effluent Toxicity Concurrent Testing Requirements

In accordance with OAC 252:690-3-30, where there is reason to believe certain substances may cause or contribute to whole effluent toxicity, the permit may require testing of those substances concurrently with WET testing. Specific concurrent testing requirements for ammonia are described at OAC 252:690-3-25.

Concurrent analyses of ammonia and pH are required for each individual effluent sample collected for chronic WET testing or retesting of the Fathead minnow specie. Reporting of concurrent testing results shall be in accordance with the following requirements. Results shall also be submitted in or concurrently with each WET test report.

Concurrent Effluent Testing for Chronic WET Tests – Reporting Requirements (Outfalls TX1, TX2, and TX3)

Effluent Characteristic	Concentration			Monitoring Requirements	
	Daily Min	Monthly Avg	Daily Max	Monitoring Frequency [a]	Sample Type
Ammonia, (NH_3-N) (mg/l) [a, b] [STORET 00610]	Report	Report	Report	1/Quarter	24-hr Comp [b]
pH (std units) [a, b] [STORET 00400]	Report	N/A	Report	1/Quarter	Measured in each composite effluent sample, including static renewals, just prior to first use [b]

a Report only those effluent samples collected for WET testing of the Fathead minnow species.

b Samples collected for WET testing purposes, including static renewals, shall be of sufficient volume to allow for the required concurrent analyses in addition to the WET testing itself.

Two sets of samples for **concurrent analyses** are required for ammonia and pH:

Samples sent directly to a WET testing laboratory shall NOT undergo any preservation other than refrigeration to maintain a temperature at or below 6° C but not frozen prior to arrival and processing at the WET testing laboratory. These results may be used in the table above.

A second concurrent analysis is required for the sample that is sent to the WET testing laboratory and for the table above.

Just prior to the first use of each composite sample for WET testing purposes, the biomonitoring laboratory shall take an adequately-sized portion of each composite sample, acidify it in accordance with preservation requirements in 40 CFR 136, and have it analyzed for ammonia (NH_3-N) at a state certified analytical laboratory. The pH measurement required for the above table must be taken just prior to the acidification step. These pH and ammonia readings should NOT be included in the results for Outfalls 001, 002, and 003.

Samples sent directly to a state certified analytical laboratory must be composite samples that are properly preserved. These results may be included in the results for Outfalls 001, 002, and 003.

D. COMPLIANCE SCHEDULE

Effluent limits for total selenium are now established in the permit. Data submitted with the application indicates that the permittee may not be able to comply with permit limits; therefore, compliance with permit limits is deferred for three (3) years. During this deferment period the permittee is required to monitor and report. The permittee should evaluate data from the monitoring requirement, and may need to revise the plant's operation and maintenance routine, or propose revisions to its pretreatment program in order to comply with the newly established limits. Such evaluation or revision of the plant's operation and maintenance routine, pretreatment program, or additional plant improvements, if any, should begin as soon as possible so that compliance with newly established limits can be attained. The permittee is required to complete the following tasks and submit to the DEQ in accordance with the following schedule:

Task	Due Date
A. Submit a report with results and evaluation of the monitoring requirement for total selenium	15 months from the effective date of the permit
B. Submit Plan of Actions to reduce selenium from entering the treatment system and to attain compliance with permit limits	18 months from the effective date of the permit
C. Submit engineering report for plant improvements (if needed)	21 months from the effective date of the permit
D. Submit Plans and Specifications for plant improvements (if needed)	24 months from the effective date of the permit
E. Complete plant improvements (if needed)	33 months from the effective date of the permit
F. Attain final compliance with permit limits	36 months from the effective date of the permit

VIII. SUMMARY OF CHANGES FROM PREVIOUS PERMIT

The following changes were made in the draft permit relative to the previous OPDES permit:

- Water quality-based limits for selenium have been added.
- Fecal coliform limits have been replaced by *E.* coli limits due to change in State's regulations.
- Monitoring requirements for chloride and total dissolved solids have been discontinued.
- Minimum Quantification Levels (MQL) for priority pollutants have been updated.

IX. ADMINISTRATIVE RECORD

The following sources were used to prepare the draft permit and constitute a part of its administrative record:

A. APPLICATIONS

OPDES Permit Application No. OK0035246 (Form 2M1), received May 16, 2016.

B. CLEAN WATER ACT CITATIONS

Sections 301, 303(d), 305(b), 402(a), and 402(o).

C. 40 CFR CITATIONS

40 CFR Parts 122, 124, and 136.

D. STATE LAW, STANDARDS, AND RULES AND REGULATIONS

Oklahoma Pollutant Discharge Elimination System (OPDES) Act, 27A O.S. §2-6-201 *et seq.*

OAC 252:606, Discharge Standards (DEQ).
OAC 252:690, Water Quality Standards Implementation (DEQ).
OAC 785:45, Oklahoma Water Quality Standards (OWRB).
OAC 785:46, OWQS Implementation (OWRB).
Oklahoma Continuing Planning Process (CPP) Document (DEQ).

E. MISCELLANEOUS

- Category 5 303(d) list, in Appendix C of the 2014 Integrated Report.
- 2013 Beneficial Use Monitoring Program (BUMP) Report (OWRB).
- WQMP amendment dated January 2, 1997, incorporating approved WLA for DO-demanding substances.
- Permit file, OPDES Permit No. OK0035246, including selected biomonitoring laboratory reports.
- Integrated Compliance Information System (ICIS-OPDES), January 2012 through June 2016.
- EPA Region 6 revision to Post Third Round Biomonitoring Policy, dated June 30, 2000.
- USGS publication, Statistical Summaries of Streamflow in and near Oklahoma Through 2007 by John M. Lewis and Rachel A. Esralew **(http://pubs.usgs.gov/sir/2009/5135/)**.
- Part III and IV of OPDES Permit No. OK0035246.

X. REVIEW BY OTHER AGENCIES AND FINAL DETERMINATION

A draft permit and draft public notice will be sent to the District Engineer, Corps of Engineers, State Historical Preservation Office and to the Field Supervisor of the U.S. Fish and Wildlife Service upon the publication of the notice. If comments are received from these agencies or other State or Federal agencies with jurisdiction over fish, wildlife, or public health, the permit may be denied or additional conditions may be included in accordance with regulations promulgated at 40 CFR 124.59.

The public notice describes the procedures for the formulation of final determinations.

EXHIBIT B

PROOF OF OWNERSHIP AND SUPORTING DOCUMENTATION

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Site 1

The Comanche County Assessor's Office has made every effort to insure the accuracy of the data contained on this web site; however, this material may be slightly dated which could have an impact on its accuracy.

The information must be accepted and used by the recipient with the understanding that the data was developed and collected only for the purpose of establishing fair market value for ad valorem taxation. Although changes may be made periodically to the tax laws, administrative rules and similar directives, these changes may not always be incorporated in the material on this web site.

The Comanche County Assessor's Office assumes no liability for any damages incurred, whether directly or indirectly, incidental, punitive or consequential, as a result of any errors, omissions or discrepancies in any information published on this web site or by any use of this web site.

Assessment Data

Account	160010122
Parcel ID	01N11W-28-2-99974-000-0000
Cadastral ID	099974-2820001-00000
Property Type	REAL - Real Property
Property Class	RAUP
Tax Area	8 - LAWTON RURAL92.03
Lot Size	160.00 - Acres
Owners Name	

Primary Image

House

Image Date 8/16/2018

Parcel Location

Situs	01701 SE GOODIN RD
Subdivision	FARM 1N-11W
Lot/Block	/
Sec/Twn/Rng	28 - 1N - 11W - 2
Neighborhood	199974 - FARM AG 1N-11W

Legal Description

28-1N-11W NW/4 SEC 28

Valuation	Current	2021
Land Value	25,646	25,646
Improvements	26,319	26,191
Mobile Home	0	0
Fair Market Value	51,965	51,837
Taxable Value - Capped	49,270	47,835
Assement Ratio	11.25%	11.25%
Gross Assessed	5,543	5,381
Exemptions	0	0
Net Assessed	5,543	5,381
Tax Rate	92.0300	92.0300
Estimated Taxes	510.00	495.00

Tax Detail (Millages)		%	Mills	Dollars
C001	COMANCHE COUNTY			
	GENERAL FUND	11.1	10.23	56.69
	HEALTH FUND	2.8	2.56	14.19
	SCHOOL FOUR MILL	4.4	4.09	22.67
SI08	LAWTON I-8			
	GENERAL FUND	38.8	35.67	197.67
	BUILDING FUND	5.5	5.10	28.26
	SINKING FUND	20.8	19.13	106.01
T099	OUTSIDE AND FARM			
V009	VO-TECH DISTRICT 9 I-8			
	GENERAL FUND	11.1	10.23	56.69
	BUILDING FUND	5.5	5.02	27.82

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Sale History

Instrument	Book	Page	Grantor	Date	Price	Code
2491-331	2491	331		12/1994	0	N

Billed History

Tax Year	Billed Owner	Tax Area	Total Value	Exemptions	Taxable Value	Billed Tax
2021		8	51,837	0	5,381	495.00
2020		8	46,442	0	5,225	481.00
2019		8	54,723	0	6,156	564.00
2018		8	55,550	0	6,249	539.00
2017		8	65,037	0	7,317	580.00
2016		8	67,901	0	7,639	618.00
2015		8	67,901	0	7,639	612.00
2014		8	67,856	0	7,634	596.00
2013		8	67,856	0	7,634	594.00
2012		8	67,856	0	7,634	607.00
2011		8	67,856	0	7,634	582.00
2010		8	67,856	0	7,634	609.00
2009		8	67,856	0	7,634	615.00

Residential Improvements

Card	Improvement Type	Condition	Quality	Year	Exterior Wall	HVAC	Bed/Bath	Base Area	Total Area
1	Single-Family Residence	Average	Fair	1933	100%	100%	3 / 2.0	1,176	1,176
		Average	Fair	1933				0	0
	ROOF/PORCH W/STEP			1933				6x6	36
	SCREEN ENCLOSED PORC			1933				21x8	168
	STORAGE SHED			1933				8x7	56

Outbuildings

Bldg	Improvement Type	Condition	Quality	Year	Exterior Wall	Roof	Dimensions	Total Area
1	STORAGE SHED	Worn Out	Fair	1933		GABL ROLL	18x48x10	864
2	LOAFING SHED(POL	Worn Out	Fair	1953		SHED METAL	70x64x10	4,480

Attached Images

Comanche

Data provided by Grant Edwards County Assessor

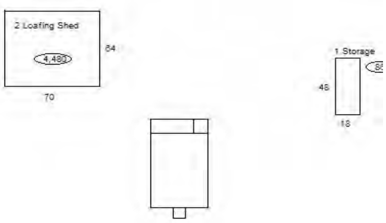
Property Information - Date 05/06/2022

Attached Images

Image ID 33029
Image Date 6/4/2004

D:\Convert\Photos\160\010\122Sp.jpg

Image ID 482591
Image Date 8/16/2018



Site-Plan Image. Saved : 08/16/2018 03:18:35P

Image ID 482592
Image Date 8/16/2018

Image ID 482593
Image Date 8/16/2018

Barn

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Attached Images

Image ID 482594
Image Date 8/16/2018

Image ID 482595
Image Date 8/16/2018

Image ID 398373
Image Date 8/8/2014

Image ID 33026
Image Date 9/26/2006

D:\Convert\Photos\160\010\122-01.jpg

Comanche

Data provided by Grant Edwards County Assessor

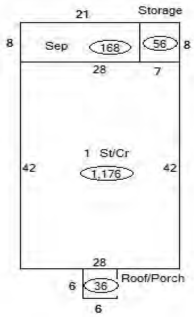
Property Information - Date 05/06/2022

Attached Images

Image ID 33027
Image Date 9/26/2006

D:\Convert\Photos\160\010\122-02.jpg

Image ID 33028
Image Date 6/4/2004



Sketch Image. Saved : 08/02/2020 11:59:04A

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Site 2

The Comanche County Assessor's Office has made every effort to insure the accuracy of the data contained on this web site; however, this material may be slightly dated which could have an impact on its accuracy.

The information must be accepted and used by the recipient with the understanding that the data was developed and collected only for the purpose of establishing fair market value for ad valorem taxation. Although changes may be made periodically to the tax laws, administrative rules and similar directives, these changes may not always be incorporated in the material on this web site.

The Comanche County Assessor's Office assumes no liability for any damages incurred, whether directly or indirectly, incidental, punitive or consequential, as a result of any errors, omissions or discrepancies in any information published on this web site or by any use of this web site.

Assessment Data

Account	160042153
Parcel ID	01N11W-29-4-99974-000-0000
Cadastral ID	099974-2940001-00000
Property Type	REAL - Real Property
Property Class	RAUP
Tax Area	8 - LAWTON RURAL92.03
Lot Size	159.34 - Acres
Owners Name	

Primary Image

CAND

Image Date 8/20/2018

Parcel Location

Situs	
Subdivision	FARM 1N-11W
Lot/Block	/
Sec/Twn/Rng	29 - 1N - 11W - 4
Neighborhood	199974 - FARM AG 1N-11W

Legal Description

29-1N-11W SE/4 LESS: BEG AT A PT 380.63' E AND 33.00' N OF SW/C SE /4 THN (N08*00'00W) 78.22' TO A PT THN (N82*00'00E) 290.00' TO A PT THN (S08*00'00E) 118.97' TO A PT THEN W 292.85' TO POB

Valuation	Current	2021
Land Value	59,994	59,994
Improvements	16,471	16,967
Mobile Home	0	0
Fair Market Value	76,465	76,961
Taxable Value - Capped	62,391	60,574
Assement Ratio	11.25%	11.25%
Gross Assessed	7,019	6,815
Exemptions	0	0
Net Assessed	7,019	6,815
Tax Rate	92.0300	92.0300
Estimated Taxes	645.00	627.00

Tax Detail (Millages)		%	Mills	Dollars
C001	COMANCHE COUNTY			
	GENERAL FUND	11.1	10.23	71.70
	HEALTH FUND	2.8	2.56	17.94
	SCHOOL FOUR MILL	4.4	4.09	28.67
SI08	LAWTON I-8			
	GENERAL FUND	38.8	35.67	250.00
	BUILDING FUND	5.5	5.10	35.74
	SINKING FUND	20.8	19.13	134.07
T099	OUTSIDE AND FARM			
V009	VO-TECH DISTRICT 9 I-8			
	GENERAL FUND	11.1	10.23	71.70
	BUILDING FUND	5.5	5.02	35.18

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Billed History

Tax Year	Billed Owner	Tax Area	Total Value	Exemptions	Taxable Value	Billed Tax
2021		8	76,961	0	6,815	627.00
2020		8	65,992	0	6,616	609.00
2019		8	67,468	0	6,423	589.00
2018		8	62,992	0	6,237	538.00
2017		8	62,992	0	6,055	480.00
2016		8	62,542	0	5,879	476.00
2015		8	62,542	0	5,708	457.00
2014		8	62,542	0	5,541	433.00
2013		8	62,542	0	5,541	431.00
2012		8	62,542	0	5,541	441.00
2011		8	62,542	0	5,541	423.00
2010		8	62,542	0	5,277	421.00
2009		8	62,542	0	5,026	405.00

Residential Improvements

Card	Improvement Type	Condition	Quality	Year	Exterior Wall	HVAC	Bed/Bath	Base Area	Total Area
1	None						/ .0		

Outbuildings

Bldg	Improvement Type	Condition	Quality	Year	Exterior Wall	Roof	Dimensions	Total Area
1	1 Grain Bin	Badly Worn	Fair	1969			14x14x13	1,607
2	2 Grain Bin	Badly Worn	Fair	1969			14x14x13	1,607
3	CANOPY ROOF/DIRT	Badly Worn	Fair	1995		Gable Metal	100x40x15	4,000
4	CANOPY ROOF/DIRT	Badly Worn	Fair	1969		Flat Asphalt Shingles	70x15x10	1,050
5	Farm Utility Building	Badly Worn	Fair	1969	Single -Metal on Steel Frame	Flat Asphalt Shingles	70x30x8	2,100

Attached Images

Comanche

Data provided by Grant Edwards County Assessor

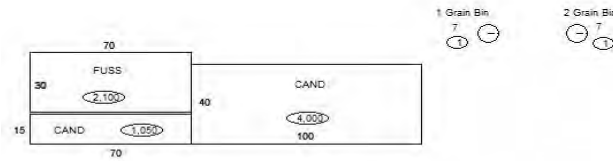
Property Information - Date 05/06/2022

Attached Images

Image ID 111307
Image Date 6/4/2004

D:\Convert\Photos\160\042\153Sp.jpg

Image ID 483015
Image Date 8/20/2018



Sketch Image. Saved : 08/20/2018 04:23:07P

Image ID 483017
Image Date 8/20/2018

XBIN

Image ID 483018
Image Date 8/20/2018

CAND/ FUBL

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Attached Images

Image ID 398375
Image Date 8/8/2014

Image ID 111306
Image Date 9/26/2006

D:\Convert\Photos\160\042\153-01.jpg

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Site 3

The Comanche County Assessor's Office has made every effort to insure the accuracy of the data contained on this web site; however, this material may be slightly dated which could have an impact on its accuracy.

The information must be accepted and used by the recipient with the understanding that the data was developed and collected only for the purpose of establishing fair market value for ad valorem taxation. Although changes may be made periodically to the tax laws, administrative rules and similar directives, these changes may not always be incorporated in the material on this web site.

The Comanche County Assessor's Office assumes no liability for any damages incurred, whether directly or indirectly, incidental, punitive or consequential, as a result of any errors, omissions or discrepancies in any information published on this web site or by any use of this web site.

Assessment Data

Account	160101310
Parcel ID	01N11W-32-1-99974-000-0000
Cadastral ID	099974-3210002-00001
Property Type	REAL - Real Property
Property Class	RAUP
Tax Area	16 - GERONIMO RUR101.42
Lot Size	47.00 - Acres
Owners Name	

Primary Image

Pasture

Image Date 8/21/2018

Parcel Location

Situs	
Subdivision	FARM 1N-11W
Lot/Block	/
Sec/Twn/Rng	32 - 1N - 11W - 1
Neighborhood	199974 - FARM AG 1N-11W

Legal Description

32-1N-11W ALL THAT LAND LYING EAST OF THE CENTERLINE OF CACHE CREEK CONSIST OF 47 AC IN THE NE/4

Valuation

Valuation	Current	2021
Land Value	9,899	9,899
Improvements	0	0
Mobile Home	0	0
Fair Market Value	9,899	9,899
Taxable Value - Capped	9,899	9,899
Assement Ratio	11.25%	11.25%
Gross Assessed	1,114	1,114
Exemptions	0	0
Net Assessed	1,114	1,114
Tax Rate	101.4200	101.4200
Estimated Taxes	112.00	113.00

Tax Detail (Millages)

	Tax Detail (Millages)	%	Mills	Dollars
C001	COMANCHE COUNTY			
	GENERAL FUND	10.1	10.23	11.30
	HEALTH FUND	2.5	2.56	2.83
	SCHOOL FOUR MILL	4.0	4.09	4.52
SI04	GERONIMO I-4			
	GENERAL FUND	36.3	36.80	40.64
	BUILDING FUND	5.2	5.26	5.81
	SINKING FUND	26.8	27.23	30.07
T099	OUTSIDE AND FARM			
V009	VO-TECH DISTRICT 9 I-8			
	GENERAL FUND	10.1	10.23	11.30
	BUILDING FUND	4.9	5.02	5.54

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Sale History

Instrument	Book	Page	Grantor	Date	Price	Code
I-2015-008310	7415	188		06/2015	92,000	YES

Billed History

Tax Year	Billed Owner	Tax Area	Total Value	Exemptions	Taxable Value	Billed Tax
2021		16	9,899	0	1,114	113.00
2020		16	9,899	0	1,114	117.00
2019		16	9,899	0	1,114	117.00
2018		16	9,903	0	1,114	114.00
2017		16	9,903	0	1,114	118.00
2016		16	9,903	0	1,114	112.00
2015		16	9,903		1,114	113.00

Residential Improvements

Card	Improvement Type	Condition	Quality	Year	Exterior Wall	HVAC	Bed/Bath	Base Area	Total Area
1	None						/ .0		

Attached Images

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Site 3

The Comanche County Assessor's Office has made every effort to insure the accuracy of the data contained on this web site; however, this material may be slightly dated which could have an impact on its accuracy.

The information must be accepted and used by the recipient with the understanding that the data was developed and collected only for the purpose of establishing fair market value for ad valorem taxation. Although changes may be made periodically to the tax laws, administrative rules and similar directives, these changes may not always be incorporated in the material on this web site.

The Comanche County Assessor's Office assumes no liability for any damages incurred, whether directly or indirectly, incidental, punitive or consequential, as a result of any errors, omissions or discrepancies in any information published on this web site or by any use of this web site.

Assessment Data

Account	160030150
Parcel ID	01N11W-32-1-99974-000-0000
Cadastral ID	099974-3210001-00000
Property Type	REAL - Real Property
Property Class	RAUP
Tax Area	16 - GERONIMO RUR101.42
Lot Size	64.00 - Acres
Owners Name	

Primary Image

Pasture

Image Date 8/21/2018

Parcel Location

Situs	
Subdivision	FARM 1N-11W
Lot/Block	/
Sec/Twn/Rng	32 - 1N - 11W - 1
Neighborhood	199974 - FARM AG 1N-11W

Legal Description

32-1N-11W E 64 AC OF NE/4 SEC 32

Valuation	Current	2021
Land Value	23,967	23,967
Improvements	0	0
Mobile Home	0	0
Fair Market Value	23,967	23,967
Taxable Value - Capped	20,558	19,960
Assement Ratio	11.25%	11.25%
Gross Assessed	2,313	2,246
Exemptions	0	0
Net Assessed	2,313	2,246
Tax Rate	101.4200	101.4200
Estimated Taxes	234.00	228.00

Tax Detail (Millages)		%	Mills	Dollars
C001	COMANCHE COUNTY			
	GENERAL FUND	10.1	10.23	23.60
	HEALTH FUND	2.5	2.56	5.91
	SCHOOL FOUR MILL	4.0	4.09	9.44
SI04	GERONIMO I-4			
	GENERAL FUND	36.3	36.80	84.91
	BUILDING FUND	5.2	5.26	12.14
	SINKING FUND	26.8	27.23	62.83
T099	OUTSIDE AND FARM			
V009	VO-TECH DISTRICT 9 I-8			
	GENERAL FUND	10.1	10.23	23.60
	BUILDING FUND	4.9	5.02	11.58

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Billed History

Tax Year	Billed Owner	Tax Area	Total Value	Exemptions	Taxable Value	Billed Tax
2021		16	23,967	0	2,246	228.00
2020		16	23,967	0	2,180	229.00
2019		16	23,967	0	2,117	222.00
2018		16	23,975	0	2,055	210.00
2017		16	23,975	0	1,995	211.00
2016		16	23,975	0	1,937	194.00
2015		16	23,975	0	1,881	191.00
2014		16	23,975	0	1,826	184.00
2013		16	23,975	0	1,826	181.00
2012		16	23,975	0	1,826	179.00
2011		16	23,975	0	1,826	179.00
2010		16	23,975	0	1,739	170.00
2009		16	23,975	0	1,656	164.00

Residential Improvements

Card	Improvement Type	Condition	Quality	Year	Exterior Wall	HVAC	Bed/Bath	Base Area	Total Area
1	None						/ .0		

Attached Images

Image ID 398402
Image Date 8/8/2014

Image ID 82722
Image Date 9/27/2006

D:\Convert\Photos\160\030\150-01.jpg

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Site 4 and 5

The Comanche County Assessor's Office has made every effort to insure the accuracy of the data contained on this web site; however, this material may be slightly dated which could have an impact on its accuracy.

The information must be accepted and used by the recipient with the understanding that the data was developed and collected only for the purpose of establishing fair market value for ad valorem taxation. Although changes may be made periodically to the tax laws, administrative rules and similar directives, these changes may not always be incorporated in the material on this web site.

The Comanche County Assessor's Office assumes no liability for any damages incurred, whether directly or indirectly, incidental, punitive or consequential, as a result of any errors, omissions or discrepancies in any information published on this web site or by any use of this web site.

Assessment Data

Account 160038900
Parcel ID 01N11W-33-2-99974-000-0000
Cadastral ID 099974-3320001-00000
Property Type REAL - Real Property
Property Class 6RAUP
Tax Area 16 - GERONIMO RUR101.42
Lot Size 480.00 - Acres
Owners Name
INDIAN LAND

Primary Image

Exempt House
Image Date 8/21/2018

Parcel Location

Situs
Subdivision FARM 1N-11W
Lot/Block /
Sec/Twn/Rng 33 - 1N - 11W - 2
Neighborhood 199974 - FARM AG 1N-11W

Legal Description

33-1N-11W NW/4 SW/4 & SE/4 SEC 33

Valuation	Current	2021
Land Value	120,359	120,359
Improvements	0	0
Mobile Home	0	0
Fair Market Value	120,359	120,359
Taxable Value - Capped	0	0
Assement Ratio	11.25%	11.25%
Gross Assessed	0	0
Exemptions	0	0
Net Assessed	0	0
Tax Rate	101.4200	101.4200
Estimated Taxes	0.00	0.00

Tax Detail (Millages)		%	Mills	Dollars
C001	COMANCHE COUNTY			
	GENERAL FUND	10.1	10.23	.00
	HEALTH FUND	2.5	2.56	.00
	SCHOOL FOUR MILL	4.0	4.09	.00
SI04	GERONIMO I-4			
	GENERAL FUND	36.3	36.80	.00
	BUILDING FUND	5.2	5.26	.00
	SINKING FUND	26.8	27.23	.00
T099	OUTSIDE AND FARM			
V009	VO-TECH DISTRICT 9 I-8			
	GENERAL FUND	10.1	10.23	.00
	BUILDING FUND	4.9	5.02	.00

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Billed History

Tax Year	Billed Owner	Tax Area	Total Value	Exemptions	Taxable Value	Billed Tax
2021	INDIAN LAND	16	120,359	0	0	0.00
2020	INDIAN LAND	16	120,359	0	0	0.00
2019	INDIAN LAND	16	120,359	0	0	0.00
2018	INDIAN LAND	16	120,409	0	0	0.00
2017	INDIAN LAND	16	120,409	0	0	0.00
2016	INDIAN LAND	16	120,409	0	0	0.00
2015	INDIAN LAND	16	120,409	0	0	0.00
2014	INDIAN LAND	16	120,409	0	0	0.00
2013	INDIAN LAND	16	120,409	0	0	0.00
2012	INDIAN LAND	16	120,409	0	0	0.00
2011	INDIAN LAND	16	120,409	0	0	0.00
2010	INDIAN LAND	16	120,409	0	0	0.00
2009	INDIAN LAND	16	120,409	0	0	0.00

Residential Improvements

Card	Improvement Type	Condition	Quality	Year	Exterior Wall	HVAC	Bed/Bath	Base Area	Total Area
1	None						/ .0		

Attached Images

Image ID 102684
Image Date 6/18/2003

[redacted]

D:\Convert\Photos\160\038\900Sk1.jpg

Image ID 398403
Image Date 8/8/2014

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Attached Images

Image ID	102683
Image Date	9/27/2006

D:\Convert\Photos\160\038\900-01.jpg

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Sale History

Instrument	Book	Page	Grantor	Date	Price	Code
5729-29	5729	29		09/2008	769,000	Loca~
5729-27	5729	27		09/2008	102,500	Loca~
5729-31	5729	31		09/2008	51,500	Loca~
5729-32	5729	32		09/2008	102,500	Loca~

Billed History

Tax Year	Billed Owner	Tax Area	Total Value	Exemptions	Taxable Value	Billed Tax
2021	GEO GROUP, INC	8	21,314	0	2,398	221.00
2020	GEO GROUP, INC	8	21,314	0	2,398	221.00
2019	GEO GROUP, INC	8	21,314	0	2,398	220.00
2018	GEO GROUP, INC	8	21,345	0	2,401	207.00
2017	GEO GROUP, INC	8	21,345	0	2,401	190.00
2016	GEO GROUP, INC	8	21,345	0	2,401	194.00
2015	GEO GROUP, INC	8	21,345	0	2,401	192.00
2014	GEO GROUP, INC	8	21,345	0	2,401	187.00
2013	GEO GROUP, INC	8	21,345	0	2,401	187.00
2012	GEO GROUP, INC	8	21,345	0	2,401	191.00
2011	GEO GROUP, INC	8	21,345	0	2,401	183.00
2010	GEO GROUP, INC	8	21,345	0	2,401	191.00
2009	GEO GROUP, INC	8	21,345	0	2,401	193.00

Residential Improvements

Card	Improvement Type	Condition	Quality	Year	Exterior Wall	HVAC	Bed/Bath	Base Area	Total Area
1	None						/ .0		

Attached Images

Image ID 82683

Image Date 9/26/2006

D:\Convert\Photos\160\030\119-01.jpg

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Site 6

The Comanche County Assessor's Office has made every effort to insure the accuracy of the data contained on this web site; however, this material may be slightly dated which could have an impact on its accuracy.

The information must be accepted and used by the recipient with the understanding that the data was developed and collected only for the purpose of establishing fair market value for ad valorem taxation. Although changes may be made periodically to the tax laws, administrative rules and similar directives, these changes may not always be incorporated in the material on this web site.

The Comanche County Assessor's Office assumes no liability for any damages incurred, whether directly or indirectly, incidental, punitive or consequential, as a result of any errors, omissions or discrepancies in any information published on this web site or by any use of this web site.

Assessment Data

Account	160030157
Parcel ID	01N11W-33-1-99974-000-0000
Cadastral ID	099974-3310001-00000
Property Type	REAL - Real Property
Property Class	RAUP
Tax Area	16 - GERONIMO RUR101.42
Lot Size	160.00 - Acres
Owners Name	

Primary Image

Pasture

Image Date 8/21/2018

Parcel Location

Situs	
Subdivision	FARM 1N-11W
Lot/Block	/
Sec/Twn/Rng	33 - 1N - 11W - 1
Neighborhood	199974 - FARM AG 1N-11W

Legal Description

33-1N-11W NE/4

Valuation	Current	2021
Land Value	42,059	42,059
Improvements	0	0
Mobile Home	0	0
Fair Market Value	42,059	42,059
Taxable Value - Capped	42,059	42,059
Assement Ratio	11.25%	11.25%
Gross Assessed	4,732	4,732
Exemptions	0	0
Net Assessed	4,732	4,732
Tax Rate	101.4200	101.4200
Estimated Taxes	479.00	480.00

Tax Detail (Millages)		%	Mills	Dollars
C001	COMANCHE COUNTY			
	GENERAL FUND	10.1	10.23	48.32
	HEALTH FUND	2.5	2.56	12.09
	SCHOOL FOUR MILL	4.0	4.09	19.32
SI04	GERONIMO I-4			
	GENERAL FUND	36.3	36.80	173.80
	BUILDING FUND	5.2	5.26	24.84
	SINKING FUND	26.8	27.23	128.61
T099	OUTSIDE AND FARM			
V009	VO-TECH DISTRICT 9 I-8			
	GENERAL FUND	10.1	10.23	48.32
	BUILDING FUND	4.9	5.02	23.71

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Billed History

Tax Year	Billed Owner	Tax Area	Total Value	Exemptions	Taxable Value	Billed Tax
2021		16	42,059	0	4,732	480.00
2020		16	42,059	0	4,732	498.00
2019		16	42,059	0	4,732	496.00
2018		16	42,067	0	4,733	483.00
2017		16	42,067	0	4,733	501.00
2016		16	42,067	0	4,733	474.00
2015		16	42,067	0	4,733	482.00
2014		16	42,067	0	4,733	476.00
2013		16	42,067	0	4,733	470.00
2012		16	42,067	0	4,733	465.00
2011		16	42,067	0	4,733	464.00
2010		16	42,067	0	4,733	462.00
2009		16	42,067	0	4,627	457.00

Residential Improvements

Card	Improvement Type	Condition	Quality	Year	Exterior Wall	HVAC	Bed/Bath	Base Area	Total Area
1	None						/ .0		

Attached Images

Image ID 398404
Image Date 8/8/2014

Image ID 82733
Image Date 9/27/2006

D:\Convert\Photos\160\030\157-01.jpg

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Site 7

The Comanche County Assessor's Office has made every effort to insure the accuracy of the data contained on this web site; however, this material may be slightly dated which could have an impact on its accuracy.

The information must be accepted and used by the recipient with the understanding that the data was developed and collected only for the purpose of establishing fair market value for ad valorem taxation. Although changes may be made periodically to the tax laws, administrative rules and similar directives, these changes may not always be incorporated in the material on this web site.

The Comanche County Assessor's Office assumes no liability for any damages incurred, whether directly or indirectly, incidental, punitive or consequential, as a result of any errors, omissions or discrepancies in any information published on this web site or by any use of this web site.

Assessment Data

Account	160030159
Parcel ID	01N11W-34-2-99974-000-0000
Cadastral ID	099974-3420001-00000
Property Type	REAL - Real Property
Property Class	RAUP
Tax Area	16 - GERONIMO RUR101.42
Lot Size	160.00 - Acres
Owners Name	

Primary Image

Pasture

Image Date 8/21/2018

Parcel Location

Situs	
Subdivision	FARM 1N-11W
Lot/Block	/
Sec/Twn/Rng	34 - 1N - 11W - 2
Neighborhood	199974 - FARM AG 1N-11W

Legal Description

34-1N-11W NW/4 SEC 34

Valuation

Valuation	Current	2021
Land Value	18,590	18,590
Improvements	0	0
Mobile Home	0	0
Fair Market Value	18,590	18,590
Taxable Value - Capped	18,590	18,590
Assement Ratio	11.25%	11.25%
Gross Assessed	2,091	2,091
Exemptions	0	0
Net Assessed	2,091	2,091
Tax Rate	101.4200	101.4200
Estimated Taxes	212.00	212.00

Tax Detail (Millages)

Tax Detail (Millages)		%	Mills	Dollars
C001	COMANCHE COUNTY			
	GENERAL FUND	10.1	10.23	21.38
	HEALTH FUND	2.5	2.56	5.35
	SCHOOL FOUR MILL	4.0	4.09	8.55
SI04	GERONIMO I-4			
	GENERAL FUND	36.3	36.80	76.92
	BUILDING FUND	5.2	5.26	11.00
	SINKING FUND	26.8	27.23	56.92
T099	OUTSIDE AND FARM			
V009	VO-TECH DISTRICT 9 I-8			
	GENERAL FUND	10.1	10.23	21.38
	BUILDING FUND	4.9	5.02	10.49

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Sale History

Instrument	Book	Page	Grantor	Date	Price	Code
2491-330	2491	330		12/1994	0	N

Billed History

Tax Year	Billed Owner	Tax Area	Total Value	Exemptions	Taxable Value	Billed Tax
2021		16	18,590	0	2,091	212.00
2020		16	18,590	0	2,091	220.00
2019		16	18,590	0	2,091	219.00
2018		16	18,621	0	2,095	214.00
2017		16	18,621	0	2,095	222.00
2016		16	18,621	0	2,095	210.00
2015		16	18,621	0	2,095	213.00
2014		16	18,621	0	2,095	211.00
2013		16	18,621	0	2,095	208.00
2012		16	18,621	0	2,095	206.00
2011		16	18,621	0	2,095	206.00
2010		16	18,621	0	2,095	205.00
2009		16	18,621	0	2,095	207.00

Residential Improvements

Card	Improvement Type	Condition	Quality	Year	Exterior Wall	HVAC	Bed/Bath	Base Area	Total Area
1	None						/ .0		

Attached Images

Image ID 398405
Image Date 8/8/2014

Image ID 82738
Image Date 9/27/2006

D:\Convert\Photos\160\030\159-01.jpg

Comanche

Data provided by Grant Edwards County Assessor

Property Information - Date 05/06/2022

Site 8 and 9

The Comanche County Assessor's Office has made every effort to insure the accuracy of the data contained on this web site; however, this material may be slightly dated which could have an impact on its accuracy.

The information must be accepted and used by the recipient with the understanding that the data was developed and collected only for the purpose of establishing fair market value for ad valorem taxation. Although changes may be made periodically to the tax laws, administrative rules and similar directives, these changes may not always be incorporated in the material on this web site.

The Comanche County Assessor's Office assumes no liability for any damages incurred, whether directly or indirectly, incidental, punitive or consequential, as a result of any errors, omissions or discrepancies in any information published on this web site or by any use of this web site.

Assessment Data

Account	160030119
Parcel ID	01N11W-27-3-99974-000-0000
Cadastral ID	099974-2730001-00000
Property Type	REAL - Real Property
Property Class	RAUP
Tax Area	8 - LAWTON RURAL92.03
Lot Size	120.00 - Acres

Owners Name

GEO GROUP, INC
4955 TECHNOLOGY WAY
BOCA RATON FL 33431-3367

Primary Image

Image Date 8/8/2014

Parcel Location

Situs	
Subdivision	FARM 1N-11W
Lot/Block	/
Sec/Twn/Rng	27 - 1N - 11W - 3
Neighborhood	199974 - FARM AG 1N-11W

Legal Description

27-1N-11W 120 AC OF SW/4 & S/2 NW/4 LESS: 40 AC TR BEG NW/C S/2 NW/4 S 2100'; E 830'; N 2100'; W 830' TO POB

Valuation	Current	2021
Land Value	21,314	21,314
Improvements	0	0
Mobile Home	0	0
Fair Market Value	21,314	21,314
Taxable Value - Capped	21,314	21,314
Assement Ratio	11.25%	11.25%
Gross Assessed	2,398	2,398
Exemptions	0	0
Net Assessed	2,398	2,398
Tax Rate	92.0300	92.0300
Estimated Taxes	220.00	221.00

Tax Detail (Millages)		%	Mills	Dollars
C001	COMANCHE COUNTY			
	GENERAL FUND	11.1	10.23	24.46
	HEALTH FUND	2.8	2.56	6.12
	SCHOOL FOUR MILL	4.4	4.09	9.78
SI08	LAWTON I-8			
	GENERAL FUND	38.8	35.67	85.27
	BUILDING FUND	5.5	5.10	12.19
	SINKING FUND	20.8	19.13	45.73
T099	OUTSIDE AND FARM			
V009	VO-TECH DISTRICT 9 I-8			
	GENERAL FUND	11.1	10.23	24.46
	BUILDING FUND	5.5	5.02	12.00

EXHIBIT C

OPERATOR AGREEMENT

Hodges Farms and Dredging

501 N West Street Lebo, KS 66856 • 620-343-0513 • jeff@hodgesfd.com • www.hodgesfd.com

Landowner Consent Form

Date: 3-20-22

I, ______________________ give Hodges Farms and Dredging, LLC

permission to land apply bio solids on the following land:

Physical Address: ______________________

Legal Address: 04-15-11W Lots 3&4 E½ NW/4

____

Crop Production: Cotton Yield ________

Landowner/Tennant Contact Information

Please Print

Name: ______________________

Address: ______________________

Phone: ____________ Email: ____________

Signature: ______________________

Hodges Farms and Dredging LLC. Signature: ______________________

Hodges Farms and Dredging

501 N West Street Lebo, KS 66856 • 620-343-0513 • jeff@hodgesfd.com • www.hodgesfd.com

Landowner Consent Form

Date: 3-20-22

I, ____________________ give Hodges Farms and Dredging, LLC

permission to land apply bio solids on the following land:

Physical Address: ____________________

Legal Address: 27-5N-11W 120 AC of SW/4 & S/2 NW/4 Less 40 Acres TR Beg NW/c S/2 NW/4 S 2100' E830 N 2100' W830' To POB

Crop Production: Wheat / Grass Yield ____________

Landowner/Tennant Contact Information

Please Print

Name: ____________________

Address: Lawton

Phone: ____________ Email: ____________

Signature: Allison

Hodges Farms and Dredging LLC. Signature: ____________________

Hodges Farms and Dredging

501 N West Street Lebo, KS 66856 • 620-343-0513 • jeff@hodgesfd.com • www.hodgesfd.com

Landowner Consent Form

Date: 3-20-22

I, ________ give Hodges Farms and Dredging, LLC

permission to land apply bio solids on the following land:

Physical Address: ________

Legal Address: 33 IN - 11W NW/4S SW/4 & SE/4

Sec 33

Crop Production: Wheat Yield ________

Landowner/Tennant Contact Information

Please Print

Name: ________

Address: Lawton

Phone: ________ Email: ________

Signature Allison

Hodges Farms and Dredging LLC. Signature: ________

Hodges Farms and Dredging

501 N West Street Lebo, KS 66856 • 620-343-0513 • jeff@hodgesfd.com • www.hodgesfd.com

Landowner Consent Form

Date: 3-20-22

I, ______________________ give Hodges Farms and Dredging, LLC

permission to land apply bio solids on the following land:

Physical Address: ______________________

Legal Address: 33-1N-11W NW/4 SW/4 + SE/4

Sec 33

Crop Production: Cotton   Yield ________

Landowner/Tennant Contact Information

Please Print

Name: ______________________

Address: ______________________

Phone: 9 ______________ Email: ______________________

Signature: ______________________

Hodges Farms and Dredging LLC. Signature: ______________________

Hodges Farms and Dredging

501 N West Street Lebo, KS 66856 • 620-343-0513 • jeff@hodgesfd.com • www.hodgesfd.com

Landowner Consent Form

Date: MAY 5

I, [redacted] give Hodges Farms and Dredging, LLC

permission to land apply biosolids on the following land:

Physical Address: QUARTER SECTION WEST OF SEWER

Legal Address: ______________________

____

Crop Production: ALFALFA Yield ________

Landowner/Tennant Contact Information

Please Print

Name: [redacted]

Address: [redacted]

Phone: [redacted] Email: [redacted]

Signature: ______________________

Hodges Farms and Dredging, LLC. Signature: ______________________

EXHIBIT D

PAN CALCUATIONS
PACE ANALYTICAL, INC RESULTS FROM 5/27/2021

Residuals Sampling Data

Project Name: **Solids Removal and Disposal - City of Lawton, OK WWTP**

Sampling Date: **1/13/22 & 3/24/22** Sampling Date Range Start: **1/13/2022** Sampling Date Range End: **12/31/2022**

Parameters	Sample		1/13/2022	3/24/2022	3/24/2022	3/24/2022		Average
% Solids		---------------	10.5	4.2	4.3	4.8	---------------	6.0
Total Kildahl Nitrogen (TKN)	mg/kg	---------------	7,770	5,490	18,200	22,500	---------------	13,490
Ammomia Nitrogen	mg/kg	---------------	1,720	2,074	3,985	4,077	---------------	2,964
Nitrate Nitrogen	mg/kg	---------------	<9.3	<23.5	<22.9	<20.3	---------------	<23.5
Nitrite Nitrogen	mg/kg	---------------	<9.3	<23.5	<22.9	<20.3	---------------	<23.5
Organic Nitrogen	mg/kg	---------------	6,050	3,416	14,215	18,423	---------------	10,526
Total Phosphorus (P)	mg/kg	---------------	4,970	8,093	8,701	8,501	---------------	7,566
Total Potassium (K)	mg/kg	---------------	3,870	4,285	3,517	3,788	---------------	3,865
Arsenic (As)	mg/kg	---------------	29.1	36.7	24.5	31.2	---------------	30.4
Cadmium (Cd)	mg/kg	---------------	<3.7	1.99	1.78	1.56	---------------	<3.7
Chromium (Cr)	mg/kg	---------------	40.2	27.6	27.6	26.5	---------------	30.5
Copper (Cu)	mg/kg	---------------	212	301	312	302	---------------	282
Lead (Pb)	mg/kg	---------------	19.2	12.2	18.5	15	---------------	16.2
Mercury (Hg)	mg/kg	---------------	<0.13	<0.781	<0.723	<0.903	---------------	<0.903
Molybdenum (Mo)	mg/kg	---------------	<14.7	9.99	16.2	13.9	---------------	13.4
Nickel (Ni)	mg/kg	---------------	24.6	21.4	20.7	21	---------------	21.9
Selenium (Se)	mg/kg	---------------	<11.0	<4.83	<4.62	<4.15	---------------	<11.0
Zinc (Zn)	mg/kg	---------------	420	469	553	528	---------------	493
Aluminum (Al)	mg/kg	---------------	NR	NR	NR	NR	---------------	NR
Calcium (Ca)	mg/kg	---------------	60,000	NR	NR	NR	---------------	60,000
Iron (Fe)	mg/kg	---------------	NR	NR	NR	NR	---------------	NR
Magnesium (Mg)	mg/kg	---------------	7,960	NR	NR	NR	---------------	7,960
Manganese (Mn)	mg/kg	---------------	NR	NR	NR	NR	---------------	NR
Silver (Ag)	mg/kg	---------------	NR	NR	NR	NR	---------------	NR
Sodium (Na)	mg/kg	---------------	NR	NR	NR	NR	---------------	NR
Sulfur (S)	mg/kg	---------------	NR	NR	NR	NR	---------------	NR
Chloride (Cl)	mg/kg	---------------	676	NR	NR	NR	---------------	676
pH		---------------	7.1	NR	NR	NR	---------------	7.1
Volatile Solids	%	---------------	24.1	NR	NR	NR	---------------	24.1
Effective Cal Carbonate Eq (ECCE)	%	---------------	NR	NR	NR	NR	---------------	NR

NR: Not Reported
All reported values are on a "dry weight" basis or noted by *

Field Loading Report - Average Residuals Concentrations

Project Name: **Solids Removal and Disposal - City of Lawton, OK WWTP**

Sample Date: **1/13/22 & 3/24/22** **Report Start: 1/13/2022** **Report End: 12/31/2022**

Parameter		PPM (mg/kg)	Lbs/Dry Ton	40 CFR 503 Table 1 Ceiling Concentrations (mg/kg)	40 CFR 503 Low Metals Ceiling Concentrations (mg/kg)
PAN (Injected)		5,093	10.185		
PAN (Surface with Incorporation)		5,093	10.185		
PAN (Dewatered Surface without Incorporation)		5,093	10.185		
PAN (Liquid Surface without Incorporation)		2,870	5.739		
Total Kildahl Nitrogen (TKN)		13,490			
Ammomia Nitrogen (NH3-N)		2,964			
Nitrate Nitrogen (NO3-N)	<	23.5			
Organic Nitrogen		10,526			
Total Phosphorus (P)		7,566	15.133		
Total Potassium (K)		3,865	7.730		
Arsenic (As)		30.4	0.061	75	41
Cadmium (Cd)	<	3.7	0.007	85	39
Chromium (Cr)		30.5	NR	3,000	1,200
Copper (Cu)		282	0.564	4,300	1,500
Lead (Pb)		16.2	0.032	840	300
Mercury (Hg)	<	0.903	0.0018	57	17
Molybdenum (Mo)		13.4	0.027	75	18
Nickel (Ni)		21.9	0.044	420	420
Selenium (Se)	<	11.0	0.022	100	36
Zinc (Zn)		493	0.985	7,500	2,800
Calcium (Ca)		60,000	120		
Magnesium (Mg)		7,960	15.9		
Aluminum (Al)		NR	NR		
Sodium (Na)		NR	NR		
Chloride (Cl)		676	1.4		
K_2O			9.3		
P_2O_5			8.7		

Percent Solids: 6.0 %

Formula:
PAN (ppm) = [(f1)(ppm Organic Nitrogen)]+[(V1)(ppm Ammonia)+(ppm Nitrate N)
lbs/dry ton = ppm or mg/kg x 0.002

Notes:
PAN = Plant Available Nitrogen
State of Application: Oklahoma

Organic Nitrogen Mineralization Rate (f1): 20 %
Anaerobically Digested: 20%
Aerobically Digested: 30%
Unstablized Primary and Waste: 40%
Lime Stablilized: 25%

Ammonia Nitrogen Non-Volatilized Fraction (V1):

For Injection:	1
For Surface with Incorporation:	1
For Dewatered Surface without Incorporation:	1
Liquid Surface without Incorporation:	0.25

NR = Not Reported

Sample Note: Results are an average of one sample taken from pond on 1/13/2022 and 3 samples on 3/24/2022

EXHIBIT E

ANALYTICAL RESULTS – PACE ANALYITICAL, INC AND EDR, LLC

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

January 26, 2022

Jeff Hodges
Hodges Farms & Dredging LLC
501 N. West Street
Lebo, KS 66856

RE: Project: LAWTON OK
Pace Project No.: 60390689

Dear Jeff Hodges:

Enclosed are the analytical results for sample(s) received by the laboratory on January 14, 2022. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Kansas City
- Pace Analytical Services - SE Kansas

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Nolie Wood
nolie.wood@pacelabs.com
1(913)563-1401
Project Manager

Enclosures

cc: Aaron Gruenwald, Hodges Farms and Dredging, LLC

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project:	LAWTON OK
Pace Project No.:	60390689

Pace Analytical Services Kansas

9608 Loiret Boulevard, Lenexa, KS 66219
Missouri Inorganic Drinking Water Certification #: 10090
Arkansas Drinking Water
Arkansas Certification #: 20-020-0
Arkansas Drinking Water
Illinois Certification #: 2000302021-3
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212020-2
Oklahoma Certification #: 9205/9935
Florida: Cert E871149 SEKS WET
Texas Certification #: T104704407-19-12
Utah Certification #: KS000212019-9
Illinois Certification #: 004592
Kansas Field Laboratory Accreditation: # E-92587
Missouri SEKS Micro Certification: 10070

Pace Analytical Services Southeast Kansas

808 West McKay, Frontenac, KS 66763
Arkansas Certification #: 18-016-0
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10426
Louisiana Certification #: 03055
Oklahoma Certification #: 9935
Texas Certification #: T104704407
Utah Certification #: KS00021

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: LAWTON OK
Pace Project No.: 60390689

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60390689001	**1-1**	Solid	01/13/22 11:00	01/14/22 10:50
60390689002	**1-2**	Solid	01/13/22 11:00	01/14/22 10:50
60390689003	**1-3**	Solid	01/13/22 11:00	01/14/22 10:50
60390689004	**1-4**	Solid	01/13/22 11:00	01/14/22 10:50
60390689005	**1-5**	Solid	01/13/22 11:00	01/14/22 10:50
60390689006	**1-6**	Solid	01/13/22 11:00	01/14/22 10:50
60390689007	**1-7**	Solid	01/13/22 11:00	01/14/22 10:50
60390689008	**COMP**	Solid	01/13/22 11:00	01/14/22 23:05
60390689009	**COMP-LAWTON**	Solid	01/13/22 11:00	01/14/22 23:05
60390689010	**COMP-LAWTON**	Solid	01/13/22 11:00	01/14/22 23:05

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: LAWTON OK
Pace Project No.: 60390689

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60390689001	**1-1**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689002	**1-2**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689003	**1-3**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689004	**1-4**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689005	**1-5**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689006	**1-6**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689007	**1-7**	SM 9222D	MEB	1	PASI-SE
		CALC A	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689008	**COMP**	EPA 6010	MA1	14	PASI-K
		EPA 7471	CJH1	1	PASI-K
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
		EPA 9045	MAP	1	PASI-K
		TKN-NH3 Calculation	LDB	1	PASI-K
		EPA 350.1	BLA	1	PASI-K
		EPA 351.2	SK	1	PASI-K
		EPA 365.4	CRN2	1	PASI-K
		EPA 9056	CRN2	1	PASI-K
		EPA 9056	CRN2	2	PASI-K
60390689009	**COMP-LAWTON**	EPA 8082	AJA1	8	PASI-K
		ASTM D2974	DWC	1	PASI-K
60390689010	**COMP-LAWTON**	EPA 6010	MA1	7	PASI-K

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: LAWTON OK
Pace Project No.: 60390689

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 7470	CJH1	1	PASI-K

PASI-K = Pace Analytical Services - Kansas City
PASI-SE = Pace Analytical Services - SE Kansas

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: 1-1 **Lab ID: 60390689001** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**5825**	CFU/g	9.8	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.8**	%	0.50	1		01/19/22 15:20		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.2**	%	0.10	1		01/19/22 15:20		

Sample: 1-2 **Lab ID: 60390689002** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**7339**	CFU/g	9.2	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.1**	%	0.50	1		01/19/22 15:20		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.9**	%	0.10	1		01/19/22 15:20		

Sample: 1-3 **Lab ID: 60390689003** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**6085**	CFU/g	10.1	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**90.1**	%	0.50	1		01/19/22 15:21		

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: 1-3 **Lab ID: 60390689003** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**9.9**	%	0.10	1		01/19/22 15:21		

Sample: 1-4 **Lab ID: 60390689004** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**7547**	CFU/g	9.4	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.4**	%	0.50	1		01/18/22 15:39		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.6**	%	0.10	1		01/18/22 15:39		

Sample: 1-5 **Lab ID: 60390689005** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**9615**	CFU/g	9.6	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.6**	%	0.50	1		01/19/22 15:21		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.4**	%	0.10	1		01/19/22 15:21		

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: 1-6 **Lab ID: 60390689006** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**8571**	CFU/g	9.5	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.5**	%	0.50	1		01/19/22 15:21		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.5**	%	0.10	1		01/19/22 15:21		

Sample: 1-7 **Lab ID: 60390689007** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**4000**	CFU/g	10	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Geometric Mean	Analytical Method: CALC A Pace Analytical Services - SE Kansas							
Fecal Coliforms	**6763**	CFU/g	10	1		01/15/22 11:15		
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**90.0**	%	0.50	1		01/19/22 15:22		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.0**	%	0.10	1		01/19/22 15:22		

Sample: COMP **Lab ID: 60390689008** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050 Pace Analytical Services - Kansas City							
Arsenic	**29.1**	mg/kg	7.4	1	01/19/22 16:00	01/25/22 19:42	7440-38-2	
Cadmium	ND	mg/kg	3.7	1	01/19/22 16:00	01/25/22 19:42	7440-43-9	
Calcium	**60000**	mg/kg	147	1	01/19/22 16:00	01/25/22 19:42	7440-70-2	M1
Chromium	**40.2**	mg/kg	3.7	1	01/19/22 16:00	01/25/22 19:42	7440-47-3	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: COMP **Lab ID: 60390689008** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050 Pace Analytical Services - Kansas City							
Copper	**212**	mg/kg	14.7	1	01/19/22 16:00	01/25/22 19:42	7440-50-8	
Lead	**19.2**	mg/kg	7.4	1	01/19/22 16:00	01/25/22 19:42	7439-92-1	
Magnesium	**7960**	mg/kg	36.8	1	01/19/22 16:00	01/25/22 19:42	7439-95-4	
Molybdenum	ND	mg/kg	14.7	1	01/19/22 16:00	01/25/22 19:42	7439-98-7	
Nickel	**24.6**	mg/kg	3.7	1	01/19/22 16:00	01/25/22 19:42	7440-02-0	
Potassium	**3870**	mg/kg	368	1	01/19/22 16:00	01/25/22 19:42	7440-09-7	M1
Selenium	ND	mg/kg	11.0	1	01/19/22 16:00	01/26/22 11:07	7782-49-2	
Silver	ND	mg/kg	5.1	1	01/19/22 16:00	01/25/22 19:42	7440-22-4	
Sodium	**1650**	mg/kg	368	1	01/19/22 16:00	01/25/22 19:42	7440-23-5	
Zinc	**420**	mg/kg	73.5	1	01/19/22 16:00	01/25/22 19:42	7440-66-6	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471 Pace Analytical Services - Kansas City							
Mercury	ND	mg/kg	0.13	1	01/19/22 12:30	01/20/22 13:35	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.5**	%	0.50	1		01/19/22 15:22		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.5**	%	0.10	1		01/19/22 15:22		
2540G Total Volatile Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Volatile Solids	**24.1**	% (w/w)	0.10	1		01/18/22 15:39		
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - Kansas City							
pH at 25 Degrees C	**7.1**	Std. Units	0.10	1		01/21/22 13:52		
Total Organic Nitrogen Soil	Analytical Method: TKN-NH3 Calculation Pace Analytical Services - Kansas City							
Total Organic Nitrogen	**6050**	mg/kg	50.0	1		01/26/22 16:43		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1720**	mg/kg	9.5	1	01/25/22 08:16	01/25/22 13:53	7664-41-7	
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Kansas City							
Nitrogen, Kjeldahl, Total	**7770**	mg/kg	590	1	01/19/22 10:34	01/20/22 14:54	7727-37-9	

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: COMP **Lab ID: 60390689008** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
365.4 Total Phosphorus	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Kansas City							
Phosphorus	**4970**	mg/kg	215	5	01/25/22 13:23	01/26/22 11:52	7723-14-0	
9056 IC Anions	Analytical Method: EPA 9056 Preparation Method: EPA 9056 Pace Analytical Services - Kansas City							
Chloride	**676**	mg/kg	93.5	1	01/24/22 10:57	01/24/22 17:31	16887-00-6	
9056 IC Anions	Analytical Method: EPA 9056 Preparation Method: EPA 9056 Pace Analytical Services - Kansas City							
Nitrate as N	ND	mg/kg	9.3	1	01/24/22 08:40	01/24/22 23:34	14797-55-8	
Nitrite as N	ND	mg/kg	9.3	1	01/24/22 08:40	01/24/22 23:34	14797-65-0	

Sample: COMP-LAWTON **Lab ID: 60390689009** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB SW	Analytical Method: EPA 8082 Preparation Method: EPA 3546 Pace Analytical Services - Kansas City							
PCB-1016 (Aroclor 1016)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	12674-11-2	
PCB-1221 (Aroclor 1221)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	11104-28-2	
PCB-1232 (Aroclor 1232)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	11141-16-5	
PCB-1242 (Aroclor 1242)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	53469-21-9	
PCB-1248 (Aroclor 1248)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	12672-29-6	
PCB-1254 (Aroclor 1254)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	11097-69-1	
PCB-1260 (Aroclor 1260)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	11096-82-5	
Surrogates								
Decachlorobiphenyl (S)	67	%	35-120	1	01/17/22 19:36	01/19/22 01:28	2051-24-3	CL
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**88.9**	%	0.50	1		01/24/22 09:49		

Sample: COMP-LAWTON **Lab ID: 60390689010** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, TCLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1311; 01/19/22 14:37 Initial pH: 7.19; Final pH: 5.24 Pace Analytical Services - Kansas City							
Arsenic	ND	mg/L	0.050	1	01/20/22 15:10	01/21/22 10:23	7440-38-2	
Barium	ND	mg/L	0.25	1	01/20/22 15:10	01/21/22 10:23	7440-39-3	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: COMP-LAWTON **Lab ID: 60390689010** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, TCLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1311; 01/19/22 14:37 Initial pH: 7.19; Final pH: 5.24 Pace Analytical Services - Kansas City							
Cadmium	ND	mg/L	0.0050	1	01/20/22 15:10	01/21/22 10:23	7440-43-9	
Chromium	ND	mg/L	0.010	1	01/20/22 15:10	01/21/22 10:23	7440-47-3	
Lead	ND	mg/L	0.050	1	01/20/22 15:10	01/21/22 10:23	7439-92-1	
Selenium	ND	mg/L	0.050	1	01/20/22 15:10	01/21/22 10:23	7782-49-2	
Silver	ND	mg/L	0.010	1	01/20/22 15:10	01/21/22 10:23	7440-22-4	
7470 Mercury, TCLP	Analytical Method: EPA 7470 Preparation Method: EPA 7470 Leachate Method/Date: EPA 1311; 01/19/22 14:37 Initial pH: 7.19; Final pH: 5.24 Pace Analytical Services - Kansas City							
Mercury	ND	mg/L	0.0020	1	01/20/22 12:15	01/21/22 09:59	7439-97-6	

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 768021
QC Batch Method: SM 9222D
Analysis Method: SM 9222D
Analysis Description: 9222DS MBIO Fecal Coliform
Laboratory: Pace Analytical Services - SE Kansas
Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689004, 60390689005, 60390689006, 60390689007

METHOD BLANK: 3068616
Matrix: Water
Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689004, 60390689005, 60390689006, 60390689007

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Fecal Coliforms	CFU/g	<1	1.0	01/15/22 11:15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767496 | Analysis Method: EPA 7470
QC Batch Method: EPA 7470 | Analysis Description: 7470 Mercury TCLP
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689010

METHOD BLANK: 3065848 Matrix: Water
Associated Lab Samples: 60390689010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/L	ND	0.0020	01/21/22 09:43	

LABORATORY CONTROL SAMPLE: 3066810

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/L	0.015	0.015	98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3066811 3066812

Parameter	Units	60390760001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/L	ND	0.015	0.015	0.015	0.014	100	96	75-125	5	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767266	Analysis Method:	EPA 7471
QC Batch Method:	EPA 7471	Analysis Description:	7471 Mercury
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

METHOD BLANK: 3065899 Matrix: Solid

Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/kg	ND	0.050	01/20/22 12:58	

LABORATORY CONTROL SAMPLE: 3065900

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	0.5	0.50	99	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3065901 3065902

Parameter	Units	60390419003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	ND	3.8	3.7	3.4	3.3	81	81	75-125	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 766836
QC Batch Method: EPA 3050
Analysis Method: EPA 6010
Analysis Description: 6010 MET
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

METHOD BLANK: 3064562 Matrix: Solid

Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/kg	ND	1.0	01/25/22 19:38	
Cadmium	mg/kg	ND	0.50	01/25/22 19:38	
Calcium	mg/kg	ND	20.0	01/25/22 19:38	
Chromium	mg/kg	ND	0.50	01/25/22 19:38	
Copper	mg/kg	ND	2.0	01/25/22 19:38	
Lead	mg/kg	ND	1.0	01/25/22 19:38	
Magnesium	mg/kg	ND	5.0	01/25/22 19:38	
Molybdenum	mg/kg	ND	2.0	01/25/22 19:38	
Nickel	mg/kg	ND	0.50	01/25/22 19:38	
Potassium	mg/kg	ND	50.0	01/25/22 19:38	
Selenium	mg/kg	ND	1.5	01/26/22 11:03	
Silver	mg/kg	ND	0.70	01/25/22 19:38	
Sodium	mg/kg	ND	50.0	01/25/22 19:38	
Zinc	mg/kg	ND	10.0	01/25/22 19:38	

LABORATORY CONTROL SAMPLE: 3064563

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	100	98.1	98	80-120	
Cadmium	mg/kg	100	107	107	80-120	
Calcium	mg/kg	1000	1090	109	80-120	
Chromium	mg/kg	100	107	107	80-120	
Copper	mg/kg	100	110	110	80-120	
Lead	mg/kg	100	108	108	80-120	
Magnesium	mg/kg	1000	1120	112	80-120	
Molybdenum	mg/kg	100	112	112	80-120	
Nickel	mg/kg	100	111	111	80-120	
Potassium	mg/kg	1000	1080	108	80-120	
Selenium	mg/kg	100	102	102	80-120	
Silver	mg/kg	50	51.4	103	80-120	
Sodium	mg/kg	1000	1110	111	80-120	
Zinc	mg/kg	100	105	105	80-120	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3064564 3064565

Parameter	Units	60390689008 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	29.1	735	713	695	678	91	91	75-125	2	20	
Cadmium	mg/kg	ND	735	713	721	710	98	99	75-125	2	20	
Calcium	mg/kg	60000	7350	7130	28800	25800	-424	-480	75-125	11	20	M1
Chromium	mg/kg	40.2	735	713	774	750	100	100	75-125	3	20	
Copper	mg/kg	212	735	713	946	903	100	97	75-125	5	20	
Lead	mg/kg	19.2	735	713	768	718	102	98	75-125	7	20	
Magnesium	mg/kg	7960	7350	7130	16400	14500	114	92	75-125	12	20	
Molybdenum	mg/kg	ND	735	713	743	729	100	101	75-125	2	20	
Nickel	mg/kg	24.6	735	713	763	743	100	101	75-125	3	20	
Potassium	mg/kg	3870	7350	7130	14000	12500	138	122	75-125	11	20	M1
Selenium	mg/kg	ND	735	713	697	658	94	92	75-125	6	20	
Silver	mg/kg	ND	368	356	357	348	97	97	75-125	2	20	
Sodium	mg/kg	1650	7350	7130	9080	8860	101	101	75-125	2	20	
Zinc	mg/kg	420	735	713	1100	1040	93	87	75-125	6	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767528 | Analysis Method: EPA 6010
QC Batch Method: EPA 3010 | Analysis Description: 6010 MET TCLP
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689010

METHOD BLANK: 3065848 Matrix: Water

Associated Lab Samples: 60390689010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/L	ND	0.050	01/21/22 09:56	
Barium	mg/L	ND	0.25	01/21/22 09:56	
Cadmium	mg/L	ND	0.0050	01/21/22 09:56	
Chromium	mg/L	ND	0.010	01/21/22 09:56	
Lead	mg/L	ND	0.050	01/21/22 09:56	
Selenium	mg/L	ND	0.050	01/21/22 09:56	
Silver	mg/L	ND	0.010	01/21/22 09:56	

LABORATORY CONTROL SAMPLE: 3066921

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/L	1	0.93	93	80-120	
Barium	mg/L	1	0.97	97	80-120	
Cadmium	mg/L	1	0.98	98	80-120	
Chromium	mg/L	1	0.97	97	80-120	
Lead	mg/L	1	0.95	95	80-120	
Selenium	mg/L	1	0.98	98	80-120	
Silver	mg/L	0.5	0.48	96	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3066922 3066923

Parameter	Units	60390760001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/L	ND	1	1	0.93	0.93	93	93	75-125	1	20	
Barium	mg/L	ND	1	1	0.94	0.95	94	95	75-125	1	20	
Cadmium	mg/L	ND	1	1	0.96	0.96	96	96	75-125	0	20	
Chromium	mg/L	ND	1	1	0.96	0.97	96	97	75-125	1	20	
Lead	mg/L	ND	1	1	0.96	0.96	95	96	75-125	0	20	
Selenium	mg/L	ND	1	1	0.98	0.99	98	99	75-125	1	20	
Silver	mg/L	ND	0.5	0.5	0.47	0.48	94	95	75-125	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 766872 | Analysis Method: EPA 8082
QC Batch Method: EPA 3546 | Analysis Description: 8082 GCS PCB
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689009

METHOD BLANK: 3064676 | Matrix: Solid
Associated Lab Samples: 60390689009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1221 (Aroclor 1221)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1232 (Aroclor 1232)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1242 (Aroclor 1242)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1248 (Aroclor 1248)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1254 (Aroclor 1254)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1260 (Aroclor 1260)	ug/kg	ND	31.3	01/19/22 07:37	
Decachlorobiphenyl (S)	%	75	35-120	01/19/22 07:37	

LABORATORY CONTROL SAMPLE: 3064677

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg	161	153	95	65-120	
PCB-1260 (Aroclor 1260)	ug/kg	161	141	88	65-120	
Decachlorobiphenyl (S)	%			87	35-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3064757 3064758

Parameter	Units	60390771002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
PCB-1016 (Aroclor 1016)	ug/kg	ND	163	160	145	136	89	85	30-130	6	40	
PCB-1260 (Aroclor 1260)	ug/kg	ND	163	160	129	120	79	75	15-155	7	40	
Decachlorobiphenyl (S)	%						68	64	35-120		50	CL

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767158
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689004

SAMPLE DUPLICATE: 3065593

Parameter	Units	60390416001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	96.3	96.3	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767318
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689005, 60390689006, 60390689007, 60390689008

SAMPLE DUPLICATE: 3066096

Parameter	Units	60390835008 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	7.5	7.3	2	20	

SAMPLE DUPLICATE: 3066097

Parameter	Units	60390707001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	54.0	53.9	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767862 | Analysis Method: ASTM D2974
QC Batch Method: ASTM D2974 | Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689009

METHOD BLANK: 3068324 | Matrix: Solid

Associated Lab Samples: 60390689009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Percent Moisture	%	ND	0.50	01/24/22 08:52	

SAMPLE DUPLICATE: 3068325

Parameter	Units	60391168001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	10.9	11.7	7	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767146
QC Batch Method: SM 2540G
Analysis Method: SM 2540G
Analysis Description: 2540G Total Solids
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689004

METHOD BLANK: 3065544 Matrix: Solid
Associated Lab Samples: 60390689004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Solids	%	ND	0.10	01/18/22 15:37	

SAMPLE DUPLICATE: 3065545

Parameter	Units	60390416001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Solids	%	3.7	3.7	0	8	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767311
QC Batch Method: SM 2540G
Analysis Method: SM 2540G
Analysis Description: 2540G Total Solids
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689005, 60390689006, 60390689007, 60390689008

METHOD BLANK: 3066082 Matrix: Solid
Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689005, 60390689006, 60390689007, 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Solids	%	ND	0.10	01/19/22 15:19	

SAMPLE DUPLICATE: 3066083

Parameter	Units	60390835008 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Solids	%	92.5	92.6	0	8	

SAMPLE DUPLICATE: 3066084

Parameter	Units	60390707001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Solids	%	46.0	46.1	0	8	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767145
QC Batch Method: SM 2540G
Analysis Method: SM 2540G
Analysis Description: 2540G Total Volatile Solids
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

METHOD BLANK: 3065542 Matrix: Solid

Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Volatile Solids	% (w/w)	ND	0.10	01/18/22 15:37	

SAMPLE DUPLICATE: 3065543

Parameter	Units	60390416001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Volatile Solids	% (w/w)	67.9	67.8	0	8	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767733	Analysis Method:	EPA 9045
QC Batch Method:	EPA 9045	Analysis Description:	9045 pH
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

SAMPLE DUPLICATE: 3067725

Parameter	Units	60390417001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.1	7.1	0	3	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 768086
QC Batch Method: EPA 350.1
Analysis Method: EPA 350.1
Analysis Description: 350.1 Ammonia
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689008

METHOD BLANK: 3068783 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	1.0	01/25/22 13:33	

LABORATORY CONTROL SAMPLE: 3068784

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	50	51.6	103	90-110	

MATRIX SPIKE SAMPLE: 3068785

Parameter	Units	60390326004 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	1680	290	2260	201	80-120	M1

SAMPLE DUPLICATE: 3068786

Parameter	Units	60390594023 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	ND		20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767232	Analysis Method:	EPA 351.2
QC Batch Method:	EPA 351.2	Analysis Description:	351.2 TKN
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

METHOD BLANK: 3065806 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	ND	62.5	01/20/22 14:36	

LABORATORY CONTROL SAMPLE: 3065807

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	625	585	94	90-110	

MATRIX SPIKE SAMPLE: 3065808

Parameter	Units	60390229003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	8790	7300	18100	128	90-110	M1

SAMPLE DUPLICATE: 3065809

Parameter	Units	60390598002 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	2580	2590	0	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767820
QC Batch Method: EPA 365.4
Analysis Method: EPA 365.4
Analysis Description: 365.4 Total Phosphorus
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689008

METHOD BLANK: 3068126 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Phosphorus	mg/kg	ND	10.0	01/26/22 10:58	

LABORATORY CONTROL SAMPLE: 3068127

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/kg	200	193	96	90-110	

MATRIX SPIKE SAMPLE: 3068128

Parameter	Units	60390429001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/kg	4120	3820	7890	99	90-110	

SAMPLE DUPLICATE: 3068129

Parameter	Units	60390399008 Result	Dup Result	RPD	Max RPD	Qualifiers
Phosphorus	mg/kg	14200	14000	1	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical
www.pacelabs.com

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767824	Analysis Method:	EPA 9056
QC Batch Method:	EPA 9056	Analysis Description:	9056 IC Anions
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

METHOD BLANK: 3068154 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/kg	ND	104	01/24/22 15:44	

LABORATORY CONTROL SAMPLE: 3068155

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	511	498	97	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3068156 3068157

Parameter	Units	60390656012 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/kg	10900	593	583	12900	12600	334	289	80-120	2	15	E,M1

SAMPLE DUPLICATE: 3068158

Parameter	Units	60390656013 Result	Dup Result	RPD	Max RPD	Qualifiers
Chloride	mg/kg	3820	3740	2	15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767823 | Analysis Method: EPA 9056
QC Batch Method: EPA 9056 | Analysis Description: 9056 IC Anions
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689008

METHOD BLANK: 3068149 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrate as N	mg/kg	ND	10.0	01/24/22 20:34	
Nitrite as N	mg/kg	ND	10.0	01/24/22 20:34	

LABORATORY CONTROL SAMPLE: 3068150

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrate as N	mg/kg	200	199	99	80-120	
Nitrite as N	mg/kg	200	202	101	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3068151 3068152

Parameter	Units	60390594019 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrate as N	mg/kg	ND	246	246	263	263	107	107	80-120	0	15	
Nitrite as N	mg/kg	ND	246	246	267	267	108	108	80-120	0	15	

SAMPLE DUPLICATE: 3068153

Parameter	Units	60390594020 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrate as N	mg/kg	ND	ND		15	
Nitrite as N	mg/kg	ND	ND		15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALIFIERS

Project: LAWTON OK
Pace Project No.: 60390689

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

CL	The continuing calibration for this compound is outside of Pace Analytical acceptance limits. The results may be biased low.
E	Analyte concentration exceeded the calibration range. The reported result is estimated.
H3	Sample was received or analysis requested beyond the recognized method holding time.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
u3	Analysis initiated more than 8 hours but less than 24 hours after sample collection.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: LAWTON OK
Pace Project No.: 60390689

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60390689009	**COMP-LAWTON**	EPA 3546	766872	EPA 8082	767101
60390689008	**COMP**	EPA 3050	766836	EPA 6010	767514
60390689010	**COMP-LAWTON**	EPA 3010	767528	EPA 6010	767620
60390689001	**1-1**	SM 9222D	768021	SM 9222D	768022
60390689002	**1-2**	SM 9222D	768021	SM 9222D	768022
60390689003	**1-3**	SM 9222D	768021	SM 9222D	768022
60390689004	**1-4**	SM 9222D	768021	SM 9222D	768022
60390689005	**1-5**	SM 9222D	768021	SM 9222D	768022
60390689006	**1-6**	SM 9222D	768021	SM 9222D	768022
60390689007	**1-7**	SM 9222D	768021	SM 9222D	768022
60390689007	**1-7**	CALC A	768023		
60390689010	**COMP-LAWTON**	EPA 7470	767496	EPA 7470	767566
60390689008	**COMP**	EPA 7471	767266	EPA 7471	767381
60390689001	**1-1**	ASTM D2974	767318		
60390689002	**1-2**	ASTM D2974	767318		
60390689003	**1-3**	ASTM D2974	767318		
60390689004	**1-4**	ASTM D2974	767158		
60390689005	**1-5**	ASTM D2974	767318		
60390689006	**1-6**	ASTM D2974	767318		
60390689007	**1-7**	ASTM D2974	767318		
60390689008	**COMP**	ASTM D2974	767318		
60390689009	**COMP-LAWTON**	ASTM D2974	767862		
60390689001	**1-1**	SM 2540G	767311		
60390689002	**1-2**	SM 2540G	767311		
60390689003	**1-3**	SM 2540G	767311		
60390689004	**1-4**	SM 2540G	767146		
60390689005	**1-5**	SM 2540G	767311		
60390689006	**1-6**	SM 2540G	767311		
60390689007	**1-7**	SM 2540G	767311		
60390689008	**COMP**	SM 2540G	767311		
60390689008	**COMP**	SM 2540G	767145		
60390689008	**COMP**	EPA 9045	767733		
60390689008	**COMP**	TKN-NH3 Calculation	768452		
60390689008	**COMP**	EPA 350.1	768086	EPA 350.1	768249
60390689008	**COMP**	EPA 351.2	767232	EPA 351.2	767274
60390689008	**COMP**	EPA 365.4	767820	EPA 365.4	768416
60390689008	**COMP**	EPA 9056	767824	EPA 9056	767928
60390689008	**COMP**	EPA 9056	767823	EPA 9056	768156

PaceAnalytical

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page : 1 Of 1

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Hodges Farms & Dredging LLC	Report To:	Jeff Hodges	Attention:	
Address:	501 N. West Street	Copy To:		Company Name:	
Lebo, KS 66856				Address:	
Email:	jhodges@ewrllc.com	Purchase Order #:		Pace Quote:	
Phone:	620-343-0513 Fax	Project Name:	Lawton, OK	Pace Project Manager:	alice.spiller@pacelabs.com Nicole Wood
Requested Due Date:		Project #:		Pace Profile #:	2421 line 1

Regulatory Agency
ODEQ
State / Location
OK / Lawton

MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Other OT; Tissue TS

SAMPLE ID — One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	START TIME	END DATE	END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Fecal Coliform	% solids	Geometric Mean	PCB	Metals 6010/7471	SOUR	Phos, Ammonia, TKN	pH	NO2/NO3	Total Organic Nitrogen	TVS, Total % Solids	TCLP *	Residual Chlorine (Y/N)	60390689
1	1-1 → 1-7	WW	C	1-13-22	9:00	1-13-22	11:00		7	X									X	X	X											7SPST-001-007
2	Comp	↓	C	↓	↓	↓	↓		1	X													X		X	X	X	X	X			
3	Comp - Lawton	↓	C	↓	↓	↓	↓		1	X												X										
4	Comp - Lawton	↓	C	↓	↓	↓	↓		1	X																				X		
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
*TCLP → Arsenic	[signature] / HFD	1-13-22	1330	[signature] Pace	1-13-22	1330				
Barium, Cadmium, chromium	[signature] Pace	1-13-22	1700	[signature] Pace	1/14/22	1050	3.2	Y	Y	Y
Lead, Mercury, Selenium	[signature] Pace	1/14/22	1600	[signature]	1-14-22	2305	0.2	Y	Y	Y
Silver										

All Dry Weight

SENT FECAL DIRECT TO FRONTENAC

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Aaron Gruenewald

SIGNATURE of SAMPLER: [signature] DATE Signed: 1-13-22

TEMP in C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

Pace Analytical

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A
Required Client Information:

Company:	Hodges Farms & Dredging LLC
Address:	501 N. West Street
	Lebo, KS 66856
Email:	jhodges@ewrllc.com
Phone:	620-343-0513 Fax:
Requested Due Date:	

Section B
Required Project Information:

Report To:	Jeff Hodges
Copy To:	
Purchase Order #:	
Project Name:	Lawton, OK
Project #:	

Section C
Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote:	
Pace Project Manager:	alice.spiller@pacelabs.com Nicole Wood
Pace Profile #:	2421, line 1

Regulatory Agency	ODEQ
State / Location	OK / Lawton

MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Other OT; Tissue TS

Requested Analysis Filtered (Y/N)

60390689

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE	SAMPLE TYPE (G=GRAB C=COMP)	START DATE	START TIME	END DATE	END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Fecal Coliform	% solids	Geometric Mean	PCB	Metals 6010/7471	SOUR	Phos, Ammonia, TKN	pH	NO2/NO3	Total Organic Nitrogen	TVS, Total % Solids	TCLP *	Residual Chlorine (Y/N)	
1	1-1 → 1-7	NW	C	1-13-22	9:00	1-13-22	11:00		7	X									X	X	X											
2	Comp	↓	C	↓	↓	↓	↓		1	X													X		X	X	X	X	X			
3	Comp - Lawton	↓	C	↓	↓	↓	↓		1	X												X										
4	Comp - Lawton	↓	C	↓	↓	↓	↓		1	X																				X		
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
*TCLP → Arsenic, Barium, Cadmium, chromium, Lead, Mercury, Selenium, Silver	[signature] / HFD	1-13-22	13:30	[signature] Pace	1-13-22	1330				
	[signature] Pace	1-13-22	1700	[signature] / Pace	1-14-22	0935	1.7	Y	Y	Y
							TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

All Dry Weight

SENT FECAL DIRECT TO FRONTENAC

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: Aaron Gruenewald
SIGNATURE of SAMPLER: [signature] DATE Signed: 1-13-22

ENVIRONMENTAL RESOURCE TECHNOLOGIES, LLC

EPA laboratory code: OK00921

Oklahoma DEQ State ID No. 8304

Certificate of Analysis

Client Name: **Hodges Farm & Dredging** | Date Received: 03/24/22

Project: **Lawton WWTP** | Report Date: 04/14/22

ERT Lab Log #	Sample Identification	Date Sampled	Analysis Date	Time	Analyzed By	Parameter	Results	Units	RL	Method
WW2203533	**Law #1 Sludge**	**03/24/22**	03/26/22	19:10	JD	**Solids**	**4.17**	%		SM_2540G
			04/05/22	12:24	CLL	**Mercury**	**BDL**	mg/kg*	0.781	EPA 7471A
			03/31/22	09:35	SN	**Arsenic**	**36.7**	mg/kg*	2.41	EPA 6010B
			03/31/22	14:28	SN	**Cadmium**	**1.99**	mg/kg*	0.241	EPA 6010B
			03/31/22	14:27	SN	**Chromium**	**27.6**	mg/kg*	0.241	EPA 6010B
			03/31/22	16:38	SN	**Copper**	**301**	mg/kg*	2.41	EPA 6010B
			03/31/22	14:27	SN	**Lead**	**12.2**	mg/kg*	2.41	EPA 6010B
			03/31/22	12:08	SN	**Molybdenum**	**9.99**	mg/kg*	1.21	EPA 6010B
			03/31/22	16:39	SN	**Nickel**	**21.4**	mg/kg*	1.21	EPA 6010B
			03/31/22	14:27	SN	**Selenium**	**BDL**	mg/kg*	4.83	EPA 6010B
			03/31/22	14:26	SN	**Zinc**	**469**	mg/kg*	4.83	EPA 6010B
			03/31/22	11:10	SN	**Phosphorus (P)**	**8,093**	mg/kg*	60.3	EPA 6010B
			03/31/22	11:09	SN	**Potassium**	**4,285**	mg/kg*	60.3	EPA 6010B
			04/13/22	10:45	JL	**Ammonia (N)**	**2,074**	mg/kg*	47.9	EPA 350.1
			04/01/22	10:50	AJ	**NO3-NO2 (N)**	**BDL**	mg/kg*	23.5	EPA 353.2
			04/01/22	16:15	LDT	**TKN**	**5,490**	mg/kg*	391	4500NOrg C-2011

Laboratory Authorized Signature

RL = Reporting Limit

BDL = Analyte Detected Below RL

CLL, LDT = Subcontracted to ODEQ State ID 9915

*mg/kg reported on a dry weight basis

201 Arlington St. Ada OK 74820
(580) 332-8808 Phone (580) 421-9110 Fax

ENVIRONMENTAL RESOURCE TECHNOLOGIES, LLC

EPA laboratory code: OK00921

Oklahoma DEQ State ID No. 8304

Quality Control Report

Client Name: **Hodges Farm & Dredging** Date Received: 03/24/22

Project: **Lawton WWTP** Report Date: 04/14/22

Date Sampled	Parameter	Method	RL (ppm)	RPD %	BLANK	Spike % Recovery	Standard % Recovery
03/24/22	% Solids	SM_2540G		0.634	0.00	NA	NA
	Arsenic	EPA 6010B	0.010	2.34	BDL	98.5	95.0
	Cadmium	EPA 6010B	0.001	1.80	BDL	94.4	91.0
	Chromium	EPA 6010B	0.001	1.81	BDL	91.5	86.2
	Copper	EPA 6010B	0.010	1.21	0.001212	99.4	91.2
	Lead	EPA 6010B	0.010	0.956	BDL	92.4	90.5
	Mercury	EPA 7471A	0.0400	4.46	BDL	96.0	103
	Molybdenum	EPA 6010B	0.005	0.566	0.001259	100	94.0
	Nickel	EPA 6010B	0.005	0.0764	0.002249	95.0	89.3
	Selenium	EPA 6010B	0.020	2.01	0.00953	89.0	84.7
	Zinc	EPA 6010B	0.020	2.39	BDL	90.5	86.3
	Phosphorus (P)	EPA 6010B	0.250	0.211	BDL	107	93.8
	Potassium	EPA 6010B	0.250	0.738	BDL	107	93.2
	Ammonia (N)	EPA 350.1	0.100	0.889	BDL	101	101
	NO3-NO2 (N)	EPA 353.2	0.100	1.13	BDL	99.1	98.3
	TKN	4500NOrg C-2011	20.0	29.9*	BDL	29.1*	80.9

Laboratory Authorized Signature

RL = Reporting Limit

BDL = Analyte Detected Below RL

* Outside of Control Limits

201 Arlington St. Ada OK 74820
(580) 332-8808 Phone (580) 421-9110 Fax

ENVIRONMENTAL RESOURCE TECHNOLOGIES, LLC

201 Arlington St.
Ada, OK 74820
(580) 332-8808 Phone (580) 421-9110 Fax
EPA Laboratory Code: OK00921
ODEQ State ID No. 8304

Client Name:	**Hodges Farm & Dredging**	Dates Received:	03/24/22
Project:	**Lawton WWTP**	Report Date:	04/14/22
ERT Lab Log#	WW2203533		

- CERTIFICATE OF ANALYSIS -

Sample Date	Sample ID	Fecal Coliforms cfu/gram	% solids
3/24/2022	**#1**	**62,400**	**4.33**
3/24/2022	**#2**	**81,400**	**4.30**
3/24/2022	**#3**	**73,300**	**4.23**
3/24/2022	**#4**	**57,800**	**4.18**
3/24/2022	**#5**	**148,000**	**4.24**
3/24/2022	**#6**	**82,800**	**4.35**
3/24/2022	**#7**	**87,600**	**4.34**

Geometric Mean **81,508**

Standard Methods		*9222-D*	*2540-G*

Analyst Notes:

Analysis Date	Analysis Time	Analyzed By	Parameter
03/24/22	18:50	CB	Fecal Coliform
03/26/22	19:10	JD	% Solids

Laboratory Authorized Signature

Environmental Resource Technologies

131 Arlington St. Ada, Oklahoma 74820
Phone (580) 332-8808 Fax (580) 421-9110

CHAIN OF CUSTODY

Client Name: Hodges Farm & Dredging

PROJECT NAME : Lawton WWTP

WW2203533

Lab Log #	Date Sample Taken	Time Sample Taken	Matrix Water (W) Soil (S) Sludge (Sl) Other	GRAB	COMP	Client I.D. Sample Location	Temp C, F	No. of Container (p)=plastic (g)=glass	Size of Container 1L, 500mL, 250mL, etc.	Analysis Requested	Sample Presv.
Law 1	3-24-22		Sludge (Sl)	X		Sludge		1(p)	1L	As,Cd,Cr,Cu,Pb, Mg,Ni,Se,Zn, Hg (mg/kg dry weight)	
Law 1	3-24-22		Sludge (Sl)	X		Sludge		1(p)	1L	K, P, TKN, $NH_3(N)$, $NO_3(N)$ (% dry weight)	
Law 1	3-24-22	11:00	Sludge (Sl)	X		Sludge		7(p)	100mL	Fecals	

Comments:

Sampled By: Phillip Fleming	Date/Time:	Received By:	Date/Time:
Relinquished By: [signature]	Date/Time:	Received By:	Date/Time:
Relinquished to Lab By:	Date/Time:	Received at Lab By: [signature]	Date/Time: 3-24-22 15:45

Report To:	Send Invoice To:
Address:	Address:
Phone/Fax Number:	Phone/Fax Number:

ENVIRONMENTAL RESOURCE TECHNOLOGIES, LLC

EPA laboratory code: OK00921

Oklahoma DEQ State ID No. 8304

Certificate of Analysis

Client Name: **Hodges Farm & Dredging** Date Received: 03/24/22

Project: **Lawton WWTP** Report Date: 04/14/22

ERT Lab Log #	Sample Identification	Date Sampled	Analysis Date	Time	Analyzed By	Parameter	Results	Units	RL	Method
WW2203534	**Law #2 Sludge**	**03/24/22**	03/26/22	19:10	JD	**Solids**	**4.34**	%		SM_2540G
			04/05/22	12:26	CLL	**Mercury**	**BDL**	mg/kg*	0.723	EPA 7471A
			03/31/22	09:37	SN	**Arsenic**	**24.5**	mg/kg*	2.31	EPA 6010B
			03/31/22	14:33	SN	**Cadmium**	**1.78**	mg/kg*	0.231	EPA 6010B
			03/31/22	14:32	SN	**Chromium**	**27.6**	mg/kg*	0.231	EPA 6010B
			03/31/22	16:42	SN	**Copper**	**312**	mg/kg*	2.31	EPA 6010B
			03/31/22	14:32	SN	**Lead**	**18.5**	mg/kg*	2.31	EPA 6010B
			03/31/22	12:11	SN	**Molybdenum**	**16.2**	mg/kg*	1.16	EPA 6010B
			03/31/22	16:42	SN	**Nickel**	**20.7**	mg/kg*	1.16	EPA 6010B
			03/31/22	14:33	SN	**Selenium**	**BDL**	mg/kg*	4.62	EPA 6010B
			03/31/22	14:31	SN	**Zinc**	**553**	mg/kg*	4.62	EPA 6010B
			03/31/22	11:13	SN	**Phosphorus (P)**	**8,701**	mg/kg*	57.8	EPA 6010B
			03/31/22	11:13	SN	**Potassium**	**3,517**	mg/kg*	57.8	EPA 6010B
			04/13/22	10:45	JL	**Ammonia (N)**	**3,985**	mg/kg*	46.1	EPA 350.1
			04/01/22	10:50	AJ	**NO3-NO2 (N)**	**BDL**	mg/kg*	22.9	EPA 353.2
			04/01/22	16:32	LDT	**TKN**	**18,200**	mg/kg*	723	4500NOrg C-2011

Laboratory Authorized Signature

RL = Reporting Limit

BDL = Analyte Detected Below RL

CLL, LDT = Subcontracted to ODEQ State ID 9915

*mg/kg reported on a dry weight basis

OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND/OR INSPECTED, AND ARE NOT INDICATIVE OF THE QUANITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS. UNLESS NOTIFIED IN WRITING, SAMPLES ARE DISPOSED OF 15 DAYS AFTER THE SAMPLE IS REPORTED.

201 Arlington St. Ada OK 74820
(580) 332-8808 Phone (580) 421-9110 Fax

ENVIRONMENTAL RESOURCE TECHNOLOGIES, LLC

EPA laboratory code: OK00921

Oklahoma DEQ State ID No. 8304

Quality Control Report

Client Name: **Hodges Farm & Dredging** Date Received: 03/24/22

Project: **Lawton WWTP** Report Date: 04/14/22

Date Sampled	Parameter	Method	RL (ppm)	RPD %	BLANK	Spike % Recovery	Standard % Recovery
03/24/22	% Solids	SM_2540G		0.634	0.00	NA	NA
	Arsenic	EPA 6010B	0.010	2.34	BDL	98.5	95.0
	Cadmium	EPA 6010B	0.001	1.80	BDL	94.4	91.0
	Chromium	EPA 6010B	0.001	1.81	BDL	91.5	86.2
	Copper	EPA 6010B	0.010	1.21	0.001212	99.4	91.2
	Lead	EPA 6010B	0.010	0.956	BDL	92.4	90.5
	Mercury	EPA 7471A	0.0400	4.46	BDL	96.0	103
	Molybdenum	EPA 6010B	0.005	0.566	0.001259	100	94.0
	Nickel	EPA 6010B	0.005	0.0764	0.002249	95.0	89.3
	Selenium	EPA 6010B	0.020	2.01	0.00953	89.0	84.7
	Zinc	EPA 6010B	0.020	2.39	BDL	90.5	86.3
	Phosphorus (P)	EPA 6010B	0.250	0.211	BDL	107	93.8
	Potassium	EPA 6010B	0.250	0.738	BDL	107	93.2
	Ammonia (N)	EPA 350.1	0.100	0.889	BDL	101	101
	NO3-NO2 (N)	EPA 353.2	0.100	1.13	BDL	99.1	98.3
	TKN	4500NOrg C-2011	20.0	29.9*	BDL	29.1*	80.9

Laboratory Authorized Signature

RL = Reporting Limit

BDL = Analyte Detected Below RL

* Outside of Control Limits

201 Arlington St. Ada OK 74820
(580) 332-8808 Phone (580) 421-9110 Fax

ENVIRONMENTAL RESOURCE TECHNOLOGIES, LLC

201 Arlington St.
Ada, OK 74820
(580) 332-8808 Phone (580) 421-9110 Fax
EPA Laboratory Code: OK00921
ODEQ State ID No. 8304

Client Name:	**Hodges Farm & Dredging**	Dates Received:	03/24/22
Project:	**Lawton WWTP**	Report Date:	04/14/22
ERT Lab Log#	WW2203534		

- CERTIFICATE OF ANALYSIS -

Sample Date	Sample ID	Fecal Coliforms cfu/gram	% solids
3/24/2022	**#1**	**98,800**	**4.25**
3/24/2022	**#2**	**100,000**	**4.30**
3/24/2022	**#3**	**64,800**	**4.32**
3/24/2022	**#4**	**85,300**	**4.34**
3/24/2022	**#5**	**89,000**	**4.27**
3/24/2022	**#6**	**82,400**	**4.25**
3/24/2022	**#7**	**113,000**	**4.32**

Geometric Mean **89,291**

Standard Methods		*9222-D*	*2540-G*

Analyst Notes:

Analysis Date	Analysis Time	Analyzed By	Parameter
03/24/22	18:50	JD	Fecal Coliform
03/26/22	19:10	JD	% Solids

Laboratory Authorized Signature

*Analytical Laboratory * Environmental Consulting*

Environmental Resource Technologies

131 Arlington St. Ada, Oklahoma 74820
Phone (580) 332-8808 Fax (580) 421-9110

CHAIN OF CUSTODY

Client Name: Hodges Farm & Dredging

PROJECT NAME : Lawton WWTP

WW2203534

Lab Log #	Date Sample Taken	Time Sample Taken	Matrix Water (W) Soil (S) Sludge (Sl) Other	GRAB	COMP	Client I.D. Sample Location	Temp C, F	No. of Container (p)=plastic (g)=glass	Size of Container 1L, 500mL, 250mL, etc.	Analysis Requested	Sample Presv.
Law 2	3-24-22		Sludge (Sl)	X		Sludge		1(p)	1L	As,Cd,Cr,Cu,Pb, Mg,Ni,Se,Zn, Hg (mg/kg dry weight)	
Law 2	3-24-22		Sludge (Sl)	X		Sludge		1(p)	1L	K, P, TKN, NH_3(N), NO_3(N) (% dry weight)	
Law 2	3-24-22	11:00	Sludge (Sl)	X		Sludge		7(p)	100mL	Fecals	

Comments:

Sampled By: Phillip Fleming	Date/Time:	Received By:	Date/Time:
Relinquished By: [signature]	Date/Time:	Received By:	Date/Time:
Relinquished to Lab By:	Date/Time:	Received at Lab By: [signature]	Date/Time: 3-24-22 15:45

Report To:	Send Invoice To:
Address:	Address:
Phone/Fax Number:	Phone/Fax Number:

ENVIRONMENTAL RESOURCE TECHNOLOGIES, LLC

EPA laboratory code: OK00921

Oklahoma DEQ State ID No. 8304

Certificate of Analysis

Client Name: **Hodges Farm & Dredging** Date Received: 03/24/22

Project: **Lawton WWTP** Report Date: 04/14/22

ERT Lab Log #	Sample Identification	Date Sampled	Analysis Date	Time	Analyzed By	Parameter	Results	Units	RL	Method
WW2203535	**Law #3 Sludge**	**03/24/22**	03/26/22	19:10	JD	**Solids**	**4.80**	%		SM_2540G
			04/05/22	12:29	CLL	**Mercury**	**BDL**	mg/kg*	0.903	EPA 7471A
			03/31/22	09:40	SN	**Arsenic**	**31.2**	mg/kg*	2.07	EPA 6010B
			03/31/22	14:38	SN	**Cadmium**	**1.56**	mg/kg*	0.207	EPA 6010B
			03/31/22	14:37	SN	**Chromium**	**26.5**	mg/kg*	0.207	EPA 6010B
			03/31/22	16:46	SN	**Copper**	**302**	mg/kg*	2.07	EPA 6010B
			03/31/22	14:38	SN	**Lead**	**15.0**	mg/kg*	2.07	EPA 6010B
			03/31/22	12:13	SN	**Molybdenum**	**13.9**	mg/kg*	1.04	EPA 6010B
			03/31/22	16:46	SN	**Nickel**	**21.0**	mg/kg*	1.04	EPA 6010B
			03/31/22	14:38	SN	**Selenium**	**BDL**	mg/kg*	4.15	EPA 6010B
			03/31/22	14:37	SN	**Zinc**	**528**	mg/kg*	4.15	EPA 6010B
			03/31/22	11:17	SN	**Phosphorus (P)**	**8,501**	mg/kg*	51.9	EPA 6010B
			03/31/22	11:16	SN	**Potassium**	**3,788**	mg/kg*	51.9	EPA 6010B
			04/13/22	10:45	JL	**Ammonia (N)**	**4,077**	mg/kg*	41.7	EPA 350.1
			04/01/22	10:50	AJ	**NO3-NO2 (N)**	**BDL**	mg/kg*	20.3	EPA 353.2
			04/01/22	16:33	LDT	**TKN**	**22,500**	mg/kg*	903	4500NOrg C-2011

Laboratory Authorized Signature

RL = Reporting Limit

BDL = Analyte Detected Below RL

CLL, LDT = Subcontracted to ODEQ State ID 9915

*mg/kg reported on a dry weight basis

OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND/OR INSPECTED, AND ARE NOT INDICATIVE OF THE QUANITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS. UNLESS NOTIFIED IN WRITING, SAMPLES ARE DISPOSED OF 15 DAYS AFTER THE SAMPLE IS REPORTED.

201 Arlington St. Ada OK 74820
(580) 332-8808 Phone (580) 421-9110 Fax

ENVIRONMENTAL RESOURCE TECHNOLOGIES, LLC

EPA laboratory code: OK00921

Oklahoma DEQ State ID No. 8304

Quality Control Report

Client Name: **Hodges Farm & Dredging** Date Received: 03/24/22

Project: **Lawton WWTP** Report Date: 04/14/22

Date Sampled	Parameter	Method	RL (ppm)	RPD %	BLANK	Spike % Recovery	Standard % Recovery
03/24/22	% Solids	SM_2540G		0.634	0.00	NA	NA
	Arsenic	EPA 6010B	0.010	2.34	BDL	98.5	95.0
	Cadmium	EPA 6010B	0.001	1.80	BDL	94.4	91.0
	Chromium	EPA 6010B	0.001	1.81	BDL	91.5	86.2
	Copper	EPA 6010B	0.010	1.21	0.001212	99.4	91.2
	Lead	EPA 6010B	0.010	0.956	BDL	92.4	90.5
	Mercury	EPA 7471A	0.0400	4.46	BDL	96.0	103
	Molybdenum	EPA 6010B	0.005	0.566	0.001259	100	94.0
	Nickel	EPA 6010B	0.005	0.0764	0.002249	95.0	89.3
	Selenium	EPA 6010B	0.020	2.01	0.00953	89.0	84.7
	Zinc	EPA 6010B	0.020	2.39	BDL	90.5	86.3
	Phosphorus (P)	EPA 6010B	0.250	0.211	BDL	107	93.8
	Potassium	EPA 6010B	0.250	0.738	BDL	107	93.2
	Ammonia (N)	EPA 350.1	0.100	0.889	BDL	101	101
	NO3-NO2 (N)	EPA 353.2	0.100	1.13	BDL	99.1	98.3
	TKN	4500NOrg C-2011	20.0	29.9	BDL	29.1	80.9

Laboratory Authorized Signature

RL = Reporting Limit

BDL = Analyte Detected Below RL

* Outside of Control Limits

OUR LETTERS AND REPORTS APPLY ONLY TO THE SAMPLE TESTED AND/OR INSPECTED, AND ARE NOT INDICATIVE OF THE QUANITIES OF APPARENTLY IDENTICAL OR SIMILAR PRODUCTS. UNLESS NOTIFIED IN WRITING, SAMPLES ARE DISPOSED OF 15 DAYS AFTER THE SAMPLE IS REPORTED.

201 Arlington St. Ada OK 74820
(580) 332-8808 Phone (580) 421-9110 Fax

ENVIRONMENTAL RESOURCE TECHNOLOGIES, LLC

201 Arlington St.
Ada, OK 74820
(580) 332-8808 Phone (580) 421-9110 Fax
EPA Laboratory Code: OK00921
ODEQ State ID No. 8304

Client Name:	**Hodges Farm & Dredging**	Dates Received:	03/24/22
Project:	**Lawton WWTP**	Report Date:	04/14/22
ERT Lab Log#	WW2203535		

- CERTIFICATE OF ANALYSIS -

Sample Date	Sample ID	Fecal Coliforms cfu/gram	% solids
3/24/2022	**#1**	**74,400**	**4.30**
3/24/2022	**#2**	**53,500**	**4.30**
3/24/2022	**#3**	**73,200**	**4.10**
3/24/2022	**#4**	**84,900**	**4.36**
3/24/2022	**#5**	**69,700**	**4.16**
3/24/2022	**#6**	**78,800**	**4.19**
3/24/2022	**#7**	**165,000**	**4.12**

Geometric Mean **80,765**

Standard Methods		*9222-D*	*2540-G*

Analyst Notes:

Analysis Date	Analysis Time	Analyzed By	Parameter
03/24/22	18:50	JD	Fecal Coliform
03/26/22	19:10	JD	% Solids

Laboratory Authorized Signature

*Analytical Laboratory * Environmental Consulting*

Environmental Resource Technologies

131 Arlington St. Ada, Oklahoma 74820
Phone (580) 332-8808 Fax (580) 421-9110

CHAIN OF CUSTODY

Client Name: Hodges Farm & Dredging

PROJECT NAME : Lawton WWTP

WL2203535

Lab Log #	Date Sample Taken	Time Sample Taken	Matrix Water (W) Soil (S) Sludge (Sl) Other	GRAB	COMP	Client I.D. Sample Location	Temp C, F	No. of Container (p)=plastic (g)=glass	Size of Container 1L, 500mL, 250mL, etc.	Analysis Requested	Sample Presv.
Law 3	3-24-22		Sludge (Sl)	X		Sludge		1(p)	1L	As,Cd,Cr,Cu,Pb, ~~Mg~~,Ni,Se,Zn, Hg (mg/kg dry weight) mo KRC 3.31.22	
Law 3	3-24-22		Sludge (Sl)	X		Sludge		1(p)	1L	K, P, TKN, NH_3(N), NO_3(N) (% dry weight)	
Law 3	3-24-22		Sludge (Sl)	X		Sludge		7(p)	100mL	Fecals	

Comments:

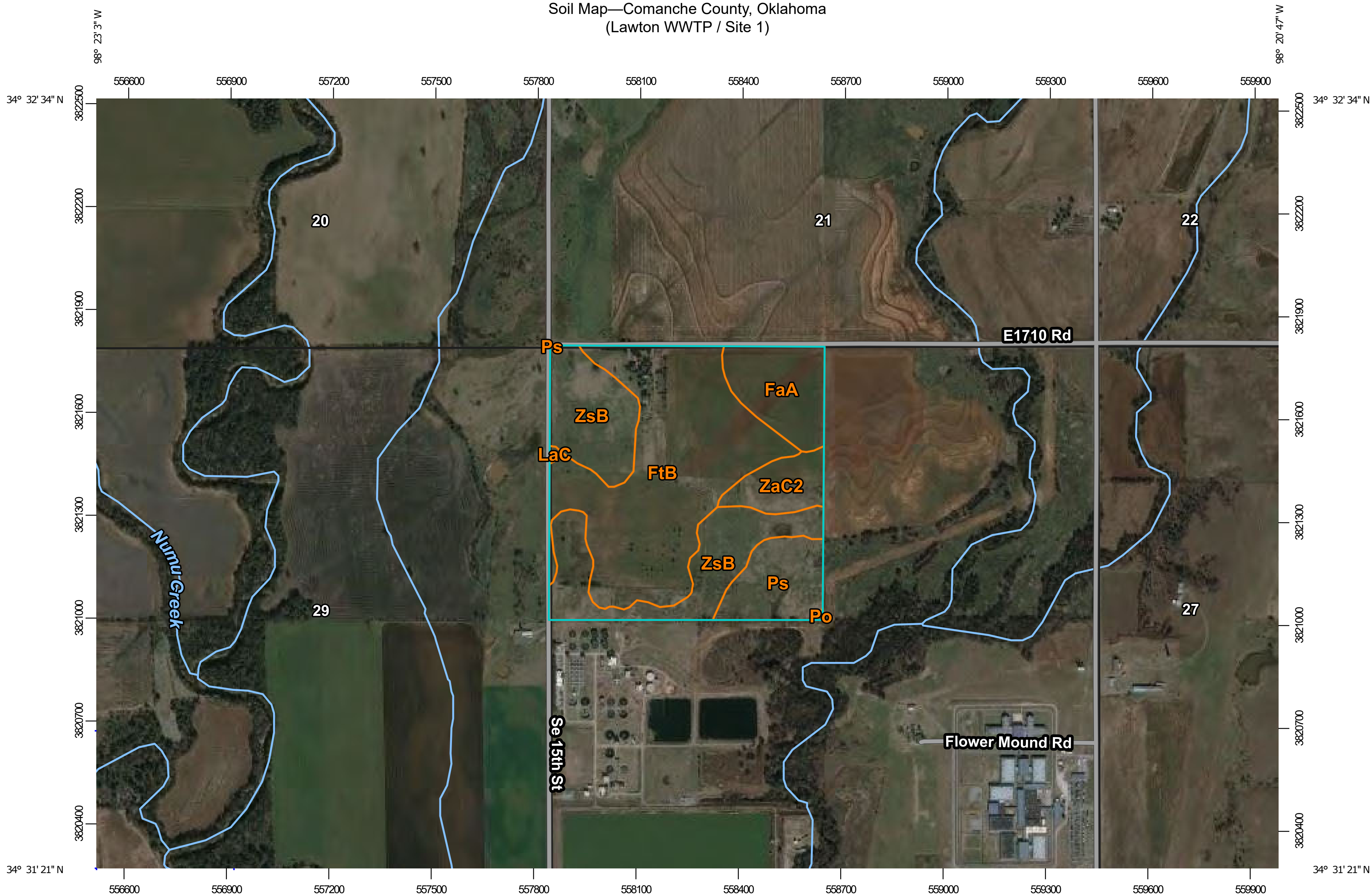
Sampled By: Phillip Fleming	Date/Time:	Received By:	Date/Time:
Relinquished By: [signature]	Date/Time:	Received By:	Date/Time:
Relinquished to Lab By:	Date/Time:	Received at Lab By: [signature]	Date/Time: 3-24-22 15:45

Report To:	Send Invoice To:
Address:	Address:
Phone/Fax Number:	Phone/Fax Number:

EXHIBIT F

SOIL AND APPLICATION MAP

Soil Map—Comanche County, Oklahoma
(Lawton WWTP / Site 1)



Map Scale: 1:15,800 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 200, 400, 800, 1200

N

Feet: 0, 500, 1000, 2000, 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features

- PLSS Township and Range
- PLSS Section

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

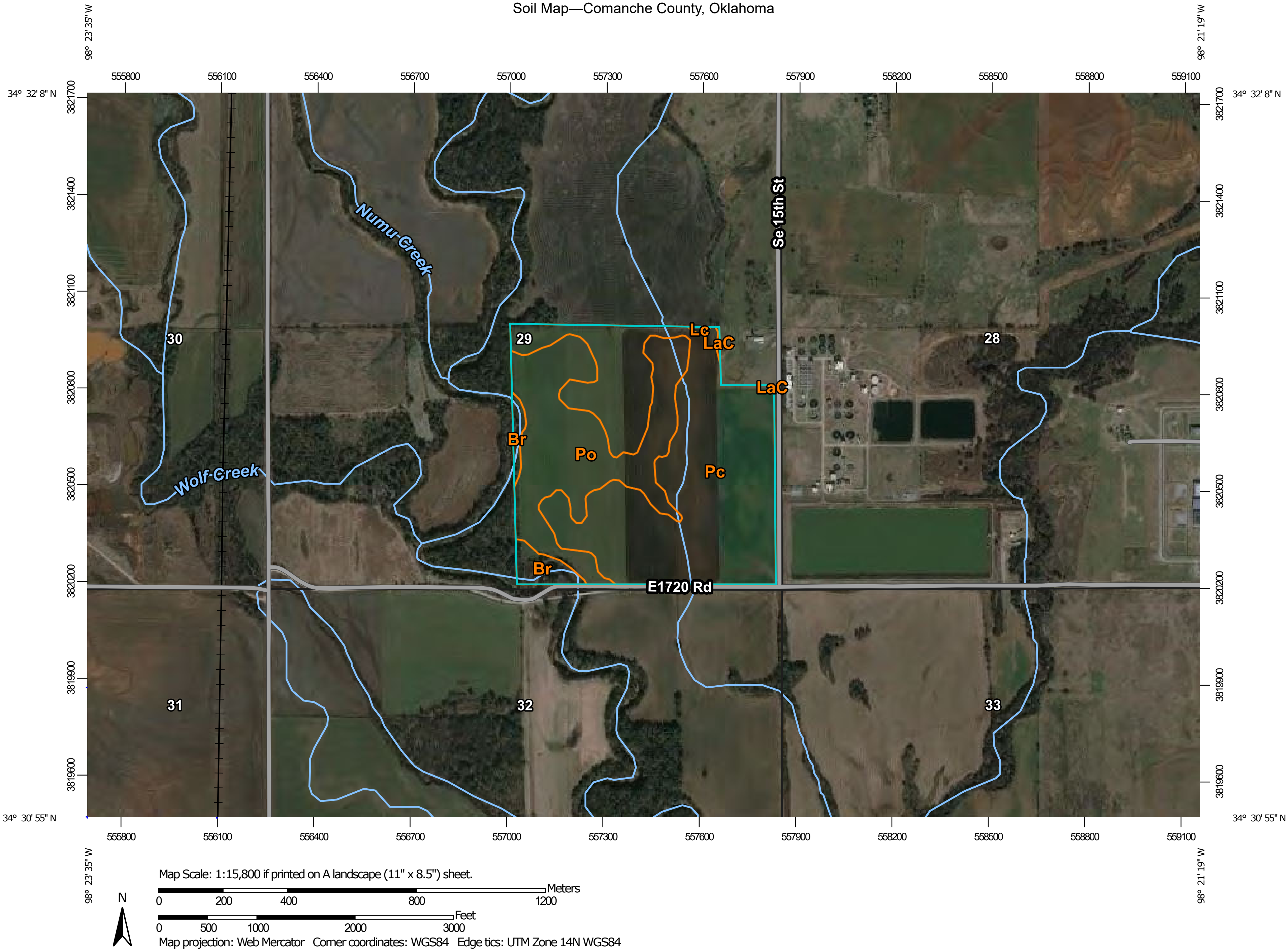
Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FaA	Foard silt loam, 0 to 1 percent slopes	17.1	10.8%
FtB	Foard and Tillman soils, 1 to 3 percent slopes	70.8	44.5%
LaC	Lawton loam, 3 to 5 percent slopes	0.3	0.2%
Po	Ashport loam, 0 to 1 percent slopes, occasionally flooded	0.1	0.0%
Ps	Ashport-Oscar complex, 0 to 1 percent slopes, occasionally flooded	15.1	9.5%
ZaC2	Zaneis loam, 3 to 5 percent slopes, eroded	9.7	6.1%
ZsB	Zaneis-Huska complex, 1 to 3 percent slopes	46.1	28.9%
Totals for Area of Interest		**159.2**	**100.0%**

Soil Map—Comanche County, Oklahoma



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

Political Features
- PLSS Township and Range
- PLSS Section

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

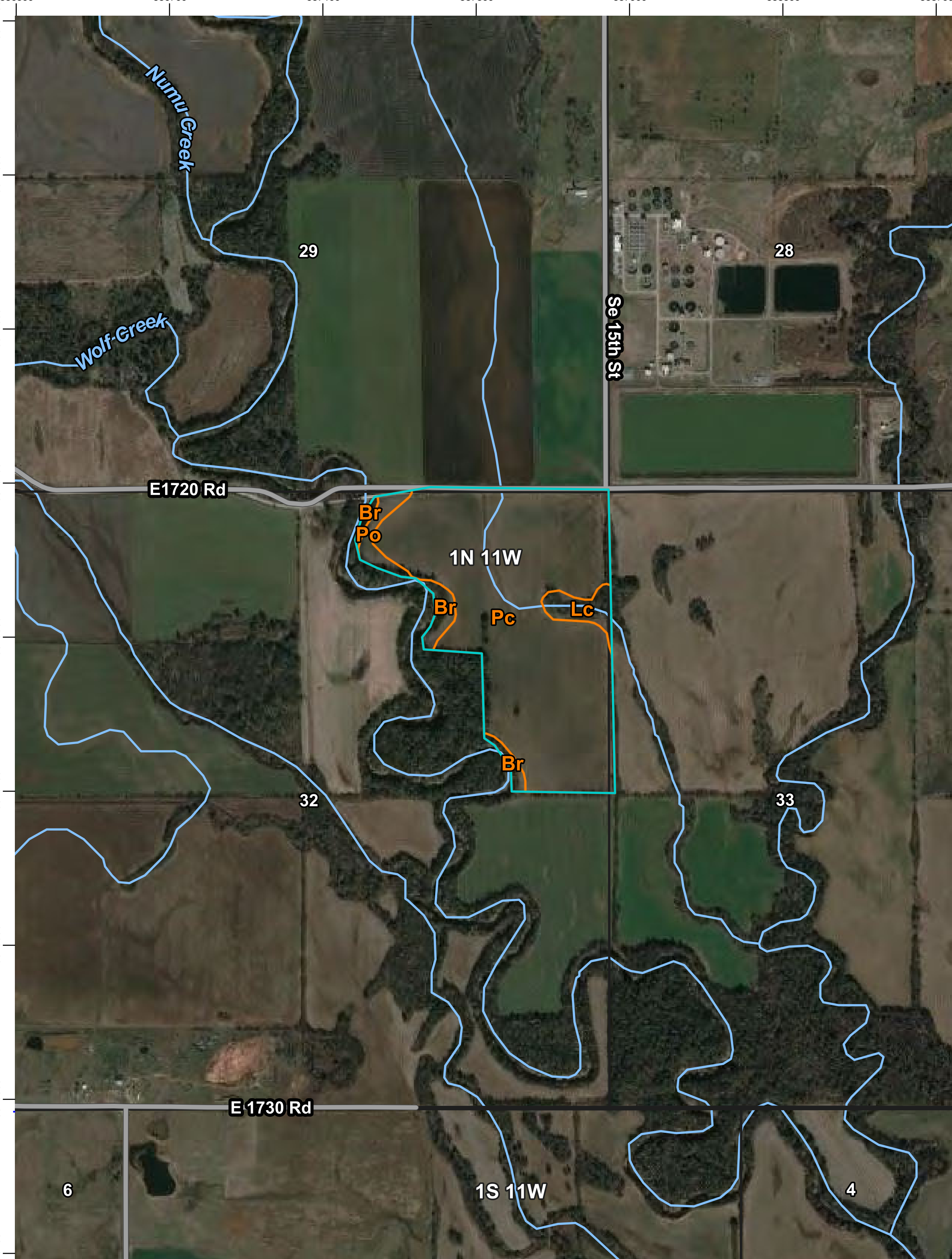
Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded	6.2	4.0%
LaC	Lawton loam, 3 to 5 percent slopes	0.2	0.1%
Lc	Lela clay, 0 to 1 percent slopes, occasionally flooded	0.2	0.2%
Pc	Ashport clay loam, 0 to 1 percent slopes, occasionally flooded	98.5	63.9%
Po	Ashport loam, 0 to 1 percent slopes, occasionally flooded	49.0	31.8%
Totals for Area of Interest		**154.2**	**100.0%**

Soil Map—Comanche County, Oklahoma
(Lawton WWTP / Site 3)



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features

PLSS Township and Range

PLSS Section

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

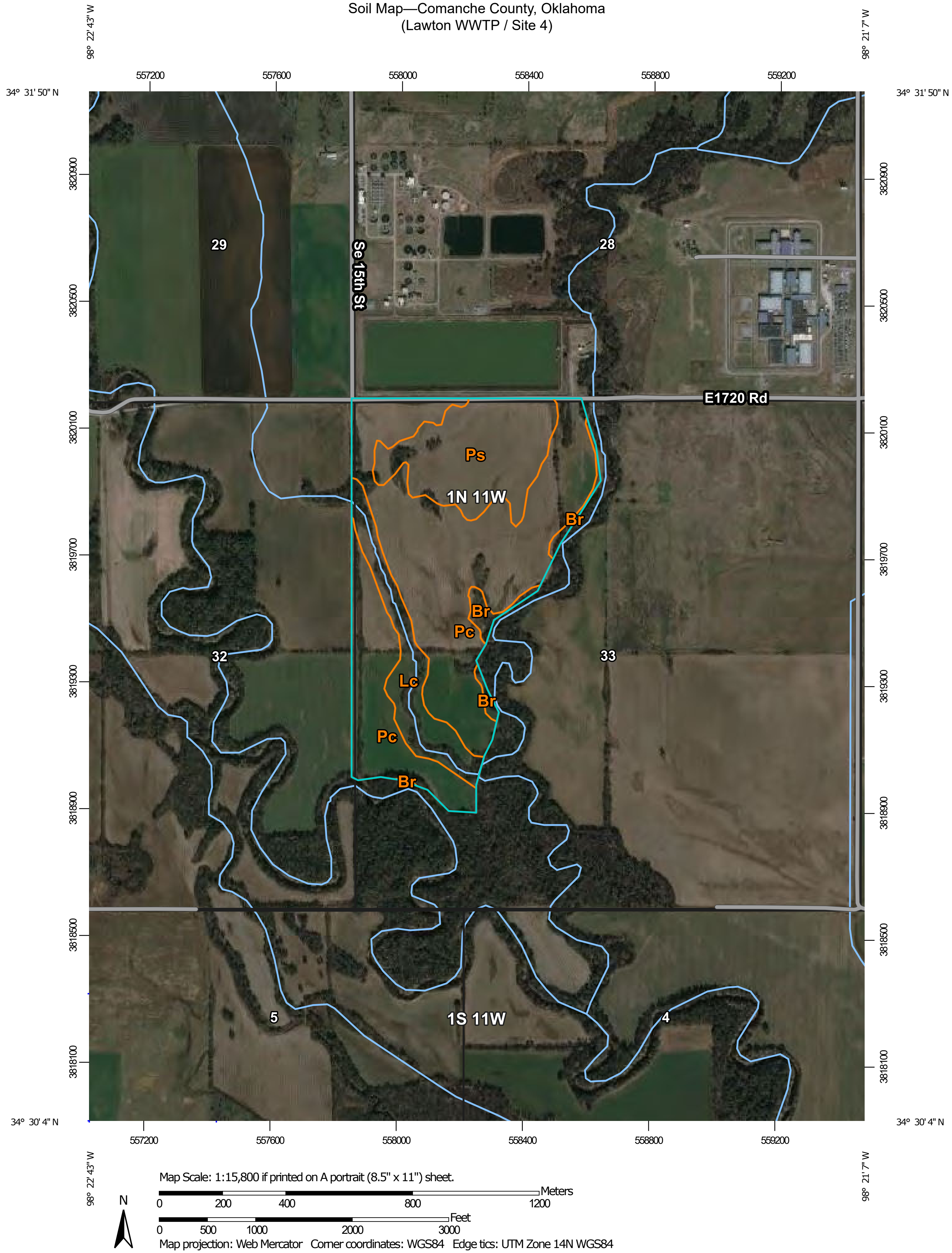
Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded	3.9	4.4%
Lc	Lela clay, 0 to 1 percent slopes, occasionally flooded	3.4	3.9%
Pc	Ashport clay loam, 0 to 1 percent slopes, occasionally flooded	77.7	88.6%
Po	Ashport loam, 0 to 1 percent slopes, occasionally flooded	2.7	3.1%
Totals for Area of Interest		**87.7**	**100.0%**

Soil Map—Comanche County, Oklahoma
(Lawton WWTP / Site 4)



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

Political Features
- PLSS Township and Range
- PLSS Section

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

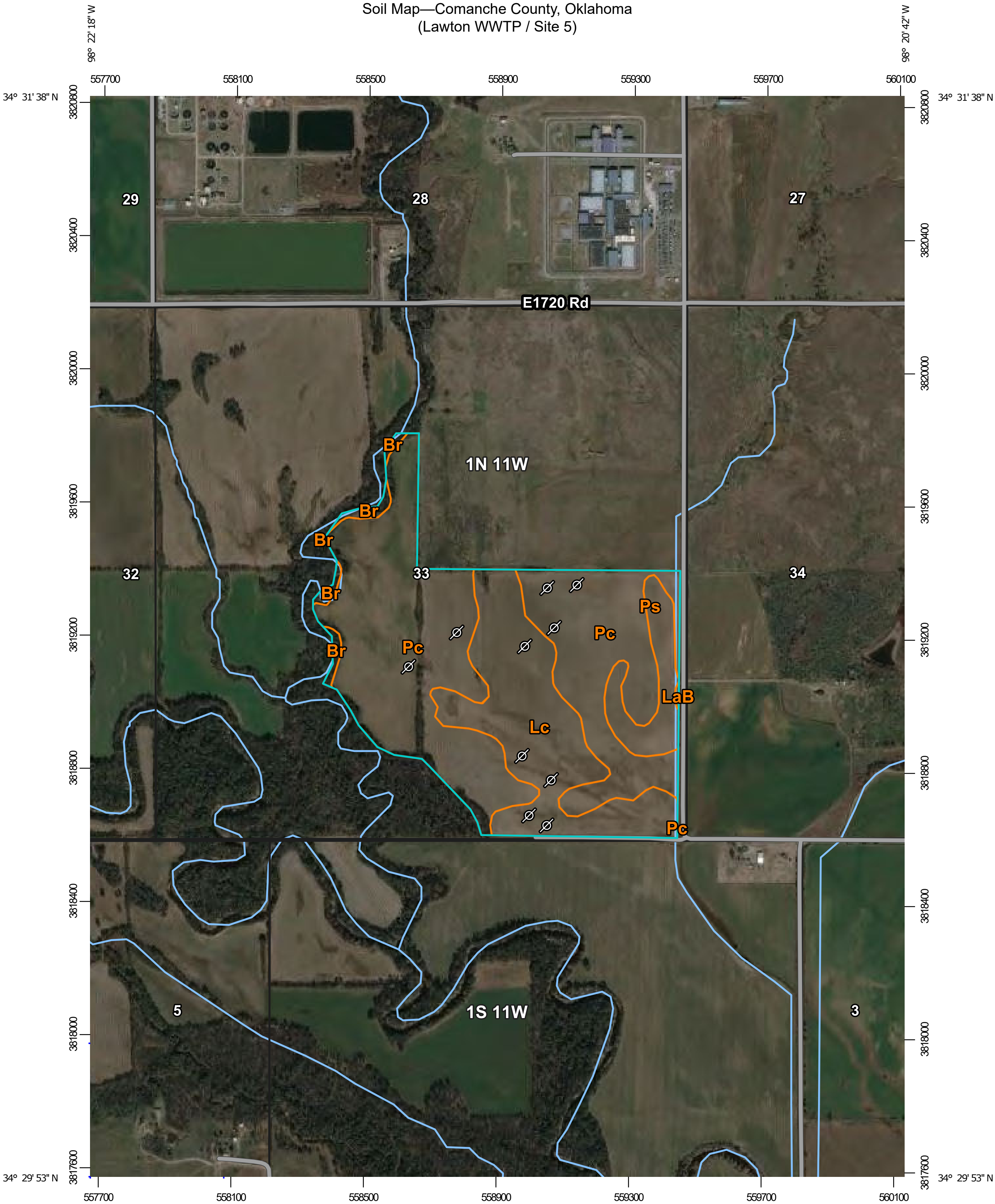
Date(s) aerial images were photographed: Data not available.

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

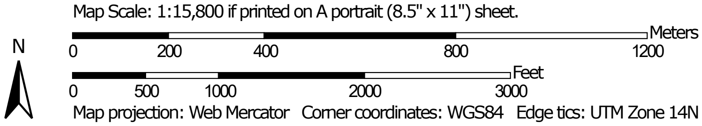
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded	5.2	3.0%
Lc	Lela clay, 0 to 1 percent slopes, occasionally flooded	20.8	11.7%
Pc	Ashport clay loam, 0 to 1 percent slopes, occasionally flooded	114.9	64.8%
Ps	Ashport-Oscar complex, 0 to 1 percent slopes, occasionally flooded	36.4	20.5%
Totals for Area of Interest		**177.3**	**100.0%**

Soil Map—Comanche County, Oklahoma
(Lawton WWTP / Site 5)



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features
- PLSS Township and Range
- PLSS Section

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

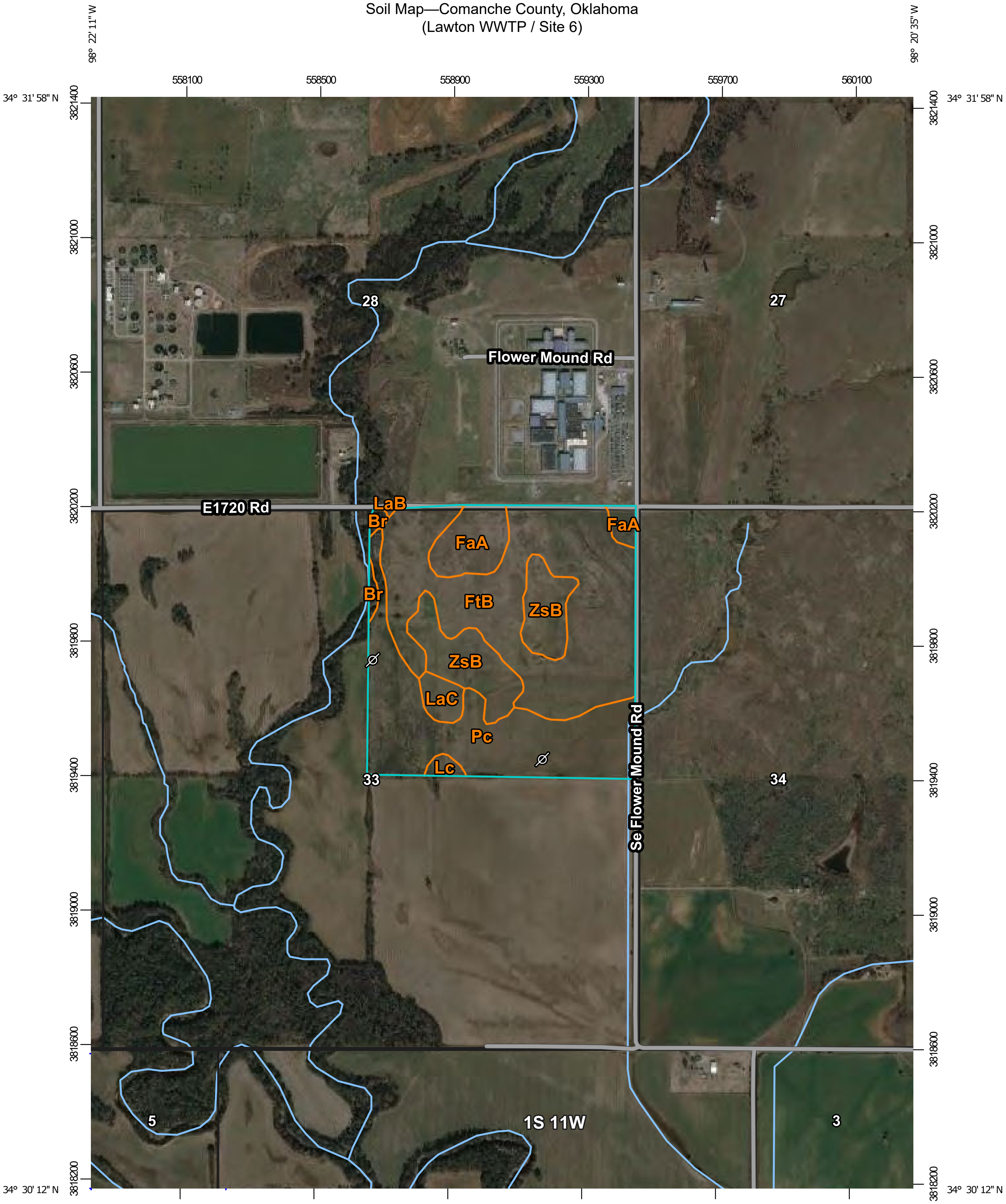
Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded	3.8	1.9%
LaB	Lawton loam, 1 to 3 percent slopes	0.2	0.1%
Lc	Lela clay, 0 to 1 percent slopes, occasionally flooded	55.0	27.5%
Pc	Ashport clay loam, 0 to 1 percent slopes, occasionally flooded	127.4	63.7%
Ps	Ashport-Oscar complex, 0 to 1 percent slopes, occasionally flooded	13.7	6.9%
Totals for Area of Interest		**200.1**	**100.0%**

Soil Map—Comanche County, Oklahoma
(Lawton WWTP / Site 6)



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features
- PLSS Township and Range
- PLSS Section

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

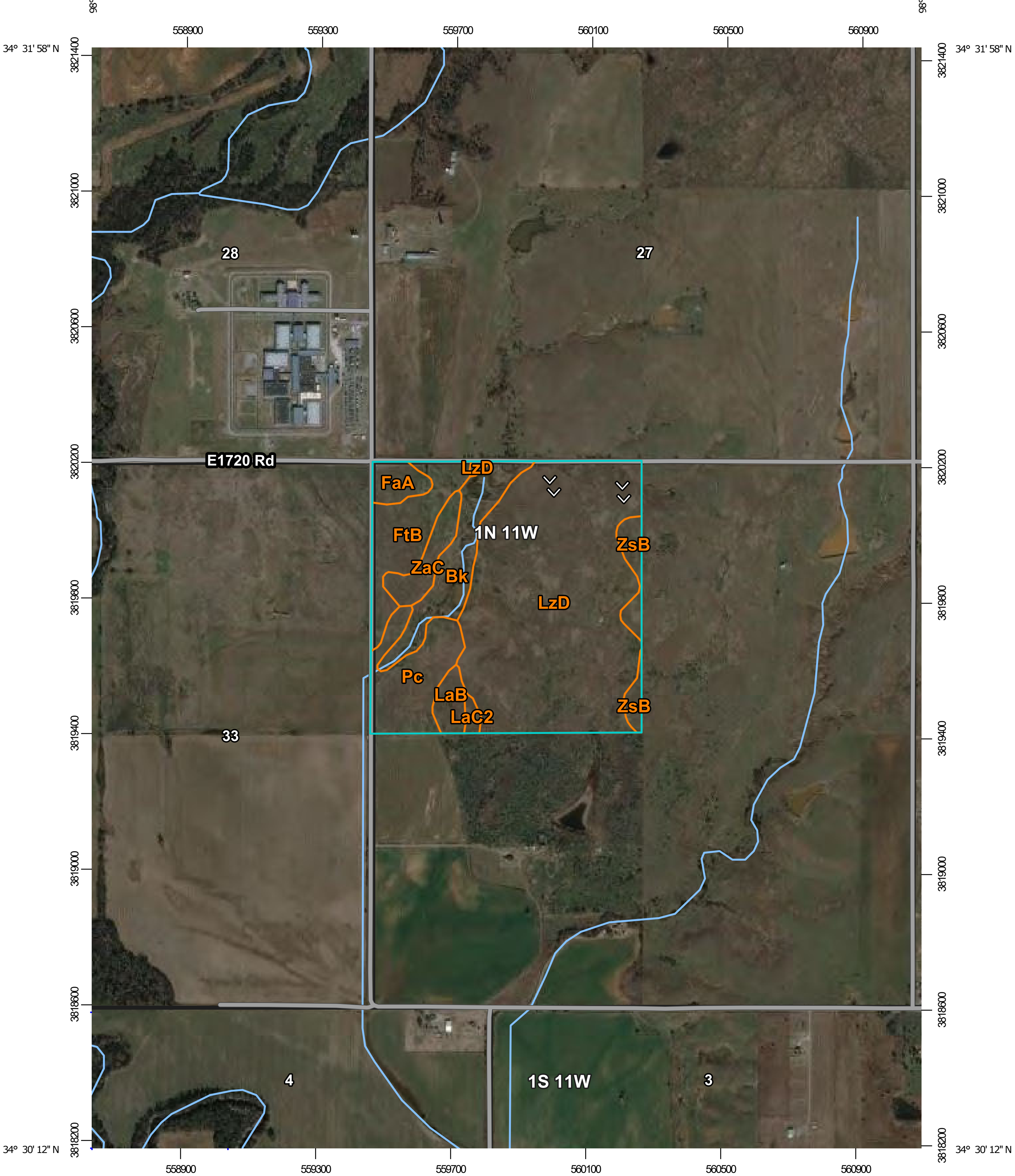
Date(s) aerial images were photographed: Data not available.

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

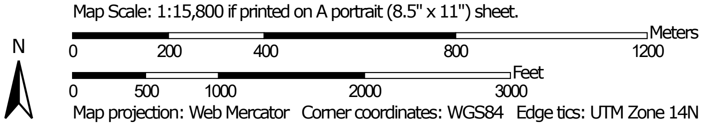
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded	1.6	1.0%
FaA	Foard silt loam, 0 to 1 percent slopes	12.0	7.5%
FtB	Foard and Tillman soils, 1 to 3 percent slopes	71.3	44.8%
LaB	Lawton loam, 1 to 3 percent slopes	0.1	0.1%
LaC	Lawton loam, 3 to 5 percent slopes	3.7	2.3%
Lc	Lela clay, 0 to 1 percent slopes, occasionally flooded	1.4	0.9%
Pc	Ashport clay loam, 0 to 1 percent slopes, occasionally flooded	47.2	29.6%
ZsB	Zaneis-Huska complex, 1 to 3 percent slopes	22.1	13.8%
Totals for Area of Interest		**159.3**	**100.0%**

Soil Map—Comanche County, Oklahoma
(Lawton WWTP / Site 7)



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features

- PLSS Township and Range
- PLSS Section

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

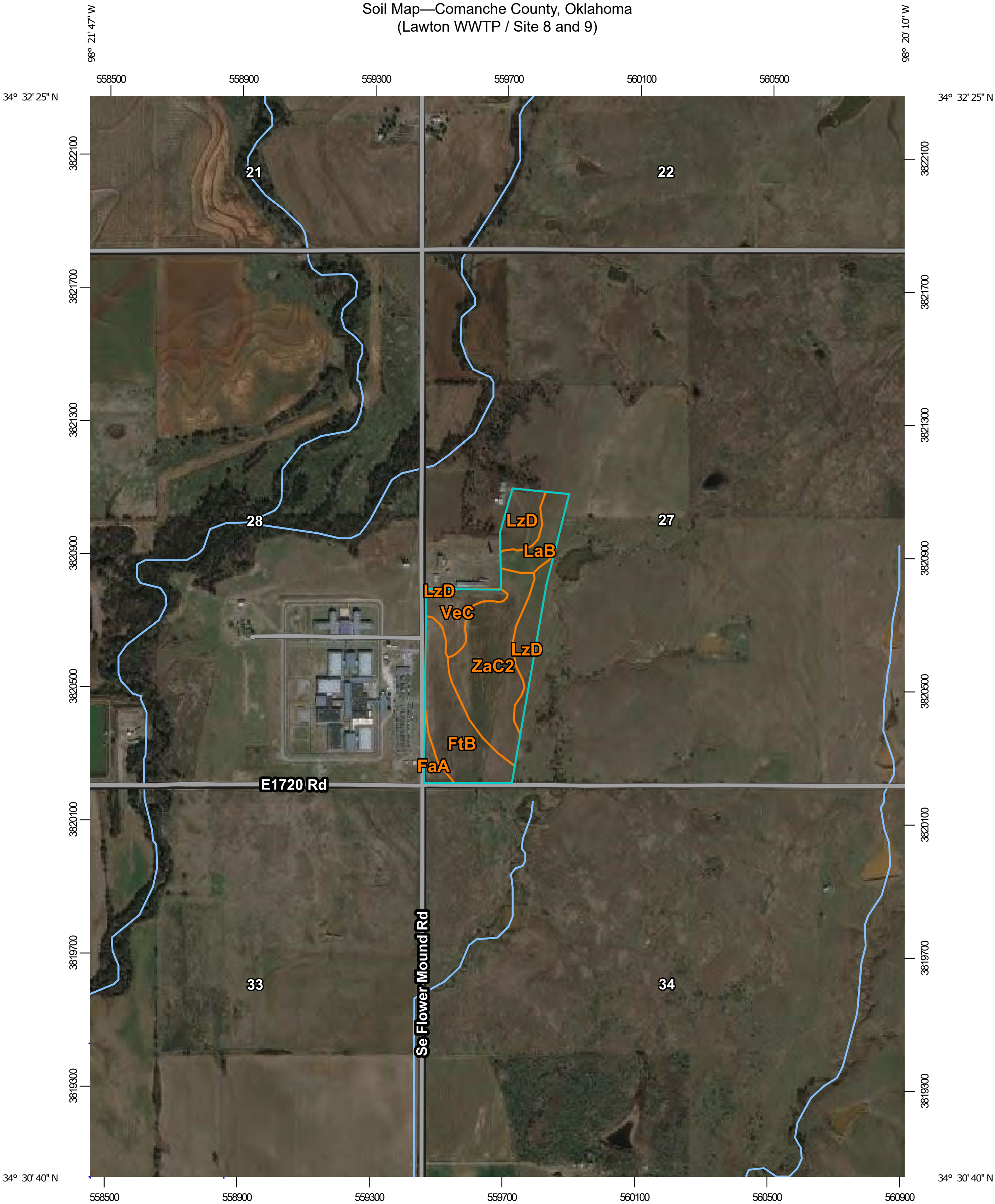
Date(s) aerial images were photographed: Data not available.

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

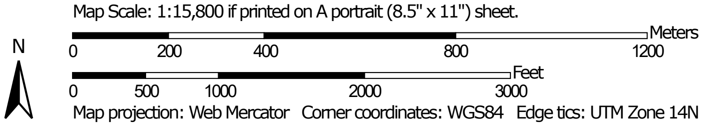
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Bk	Vernon-Clairemont complex, 0 to 12 percent slopes	15.3	9.6%
FaA	Foard silt loam, 0 to 1 percent slopes	4.4	2.7%
FtB	Foard and Tillman soils, 1 to 3 percent slopes	15.1	9.5%
LaB	Lawton loam, 1 to 3 percent slopes	3.7	2.3%
LaC2	Lawton loam, 3 to 5 percent slopes, eroded	1.1	0.7%
LzD	Lucien-Grainola-Zaneis complex, 5 to 12 percent slopes	91.5	57.5%
Pc	Ashport clay loam, 0 to 1 percent slopes, occasionally flooded	16.4	10.3%
ZaC	Zaneis loam, 3 to 5 percent slopes	6.2	3.9%
ZsB	Zaneis-Huska complex, 1 to 3 percent slopes	5.6	3.5%
Totals for Area of Interest		**159.2**	**100.0%**

Soil Map—Comanche County, Oklahoma
(Lawton WWTP / Site 8 and 9)



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features
- PLSS Township and Range
- PLSS Section

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FaA	Foard silt loam, 0 to 1 percent slopes	1.7	3.0%
FtB	Foard and Tillman soils, 1 to 3 percent slopes	14.4	25.1%
LaB	Lawton loam, 1 to 3 percent slopes	5.1	9.0%
LzD	Lucien-Grainola-Zaneis complex, 5 to 12 percent slopes	10.5	18.3%
VeC	Vernon clay, 1 to 5 percent slopes	5.4	9.4%
ZaC2	Zaneis loam, 3 to 5 percent slopes, eroded	20.1	35.2%
Totals for Area of Interest		**57.2**	**100.0%**

EXHIBIT G

SOIL SAMPLE RESULTS – NUTRIENTS

SOIL ANALYSIS REPORT

CLIENT:	
25842	HODGES FARMS & DREDGING 501 NW STREET LEBO, KS 66856

servi tech
www.servitech.com

1816 E. Wyatt Earp
PO Box 1397
Dodge City, KS 67801
800.557.7509
620.227.7123
Fax 620.227.2047

LAB NO:	90629 - 90630
INVOICE NO:	891010
DATE RECEIVED:	03/29/2022
DATE REPORTED:	05/05/2022

SOIL ANALYSIS RESULTS FOR: PHILLIP FLEMING **FIELD IDENTIFICATION:** LAWTON WW TP

METHOD USED:			1:1 (c) Water-Soil			XSL(i)	LOI(r)	Cd Reduction		Mehlich 3	Mehlich 3 ICP										
Lab Number	Sample ID	Sample Depth	Soil pH	Buffer pH		Excess Lime	% Organic Matter	Nitrate-Nitrogen ppm	lb. N/A	Phosphorus ppm P	Potassium ppm K			Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B
90629	SULLIVAN 1	0 - 8	8.0			Hi	1.3	7.9	19	30	187										
90630	SULLIVAN 2	0 - 8	8.0			Hi	1.3	8.1	19	28	179										

FERTILIZER RECOMMENDATIONS: POUNDS ACTUAL NUTRIENT PER ACRE

Lab Number	Sample ID	Crop To Be Grown	Yield Goal	Lime, ECC Tons/A to raise pH to: 6.0	6.5	7.0	N	P_2O_5	K_2O	Zn	S	Mn	Cu	MgO	B	Ca	Cl
90629	SULLIVAN 1	CORN	180 bu				225	20	0								
90630	SULLIVAN 2	CORN	180 bu				220	25	0								

Cation Exchange Capacity

CEC	%H	%K	%Ca	%Mg	%Na

SPECIAL COMMENTS AND SUGGESTIONS:

Lab Number(s): 90629, 90630
CORN: Nitrogen fertilizer recommendations have been adjusted for soil organic matter content.

Analyses are representative of the samples submitted   Samples are retained 30 days after report of analysis   Explanations of soil analysis terms are available upon request

Reviewed and Approved By: Michele Pacheco, Data Review Coordinator   Michele Pacheco

05/05/2022 8:37 am

SOIL ANALYSIS REPORT

CLIENT: 25842	HODGES FARMS & DREDGING 501 NW STREET LEBO, KS 66856

servi tech
www.servitech.com
1816 E. Wyatt Earp
PO Box 1397
Dodge City, KS 67801
800.557.7509
620.227.7123
Fax 620.227.2047

LAB NO:	90631 - 90632
INVOICE NO:	891010
DATE RECEIVED:	03/29/2022
DATE REPORTED:	05/05/2022

SOIL ANALYSIS RESULTS FOR: PHILLIP FLEMING **FIELD IDENTIFICATION:** LAWTON WW TP

METHOD USED:			1:1 (c) Water-Soil	Sikora 2		XSL(i)	LOI(r)	Cd Reduction		Mehlich 3	Mehlich 3 ICP										
Lab Number	Sample ID	Sample Depth	Soil pH	Buffer pH		Excess Lime	% Organic Matter	Nitrate-Nitrogen ppm	lb. N/A	Phosphorus ppm P	Potassium ppm K			Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B
90631	DOYE NORTH 1	0 - 8	6.3			No	1.5	3.2	8	14	240										
90632	DOYE NORTH 2	0 - 8	5.6	7.0		No	1.3	10.5	25	11	189										

FERTILIZER RECOMMENDATIONS: POUNDS ACTUAL NUTRIENT PER ACRE

Lab Number	Sample ID	Crop To Be Grown	Yield Goal	Lime, ECC Tons/A to raise pH to: 6.0	6.5	7.0	N	P_2O_5	K_2O	Zn	S	Mn	Cu	MgO	B	Ca	Cl
90631	DOYE NORTH 1	BERMUDAGRASS HAY	6 tons				230	65	0								
90632	DOYE NORTH 2	BERMUDAGRASS HAY	6 tons	0.6	1.3	2.0	215	65	0								

Cation Exchange Capacity

Lab Number	CEC	%H	%K	%Ca	%Mg	%Na
90631						
90632						

SPECIAL COMMENTS AND SUGGESTIONS:

Lab Number(s): 90631, 90632

IMPROVED BERMUDAGRASS: Split the nitrogen (N) applications through the summer growing season according to hay harvest or grazing schedule. Make the first nitrogen application prior to vigorous growth (April or early May) to help avoid weed competition. Make other applications after each cutting or grazing period. The required phosphate (P2O5) or potash (K2O) may be blended with one of the early nitrogen applications to be topdressed on established stands.

PASTURE: Use fertilizer recommendations that have been developed for hay production. In an improved grazing system, the equivalent of one ton of hay yield should provide about 30 days grazing for a cow-calf pair or about 40 days grazing for a weaned calf or about 25 to 30 days grazing for a yearling calf.

Analyses are representative of the samples submitted   Samples are retained 30 days after report of analysis   Explanations of soil analysis terms are available upon request

Reviewed and Approved By: Michele Pacheco, Data Review Coordinator   Michele Pacheco

05/05/2022 8:37 am

SOIL ANALYSIS REPORT

CLIENT:	
25842	HODGES FARMS & DREDGING 501 NW STREET LEBO, KS 66856

servi tech
www.servitech.com

1816 E. Wyatt Earp
PO Box 1397
Dodge City, KS 67801
800.557.7509
620.227.7123
Fax 620.227.2047

LAB NO:	90633 - 90634
INVOICE NO:	891010
DATE RECEIVED:	03/29/2022
DATE REPORTED:	05/05/2022

SOIL ANALYSIS RESULTS FOR: PHILLIP FLEMING **FIELD IDENTIFICATION:** LAWTON WW TP

METHOD USED:			1:1 (c) Water-Soil			XSL(i)	LOI(r)	Cd Reduction		Mehlich 3	Mehlich 3 ICP										
Lab Number	Sample ID	Sample Depth	Soil pH	Buffer pH		Excess Lime	% Organic Matter	Nitrate-Nitrogen ppm	lb. N/A	Phosphorus ppm P	Potassium ppm K			Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B
90633	DOYE SOUTH 1	0 - 8	6.7			No	3.7	5.0	12	19	320										
90634	DOYE SOUTH 2	0 - 8	6.7			No	2.5	4.1	10	11	299										

FERTILIZER RECOMMENDATIONS: POUNDS ACTUAL NUTRIENT PER ACRE

Lab Number	Sample ID	Crop To Be Grown	Yield Goal	Lime, ECC Tons/A to raise pH to: 6.0	6.5	7.0	N	P_2O_5	K_2O	Zn	S	Mn	Cu	MgO	B	Ca	Cl
90633	DOYE SOUTH 1	BERMUDAGRASS HAY	6 tons				230	60	0								
90634	DOYE SOUTH 2	BERMUDAGRASS HAY	6 tons				230	65	0								

Cation Exchange Capacity

CEC	%H	%K	%Ca	%Mg	%Na

SPECIAL COMMENTS AND SUGGESTIONS:

Lab Number(s): 90633, 90634

IMPROVED BERMUDAGRASS: Split the nitrogen (N) applications through the summer growing season according to hay harvest or grazing schedule. Make the first nitrogen application prior to vigorous growth (April or early May) to help avoid weed competition. Make other applications after each cutting or grazing period. The required phosphate (P2O5) or potash (K2O) may be blended with one of the early nitrogen applications to be topdressed on established stands.

PASTURE: Use fertilizer recommendations that have been developed for hay production. In an improved grazing system, the equivalent of one ton of hay yield should provide about 30 days grazing for a cow-calf pair or about 40 days grazing for a weaned calf or about 25 to 30 days grazing for a yearling calf.

Analyses are representative of the samples submitted Samples are retained 30 days after report of analysis Explanations of soil analysis terms are available upon request

Reviewed and Approved By: Michele Pacheco, Data Review Coordinator Michele Pacheco

SOIL ANALYSIS REPORT

CLIENT:	
25842	HODGES FARMS & DREDGING 501 NW STREET LEBO, KS 66856

servi tech
www.servitech.com
1816 E. Wyatt Earp
PO Box 1397
Dodge City, KS 67801
800.557.7509
620.227.7123
Fax 620.227.2047

LAB NO:	90635 - 90636
INVOICE NO:	891010
DATE RECEIVED:	03/29/2022
DATE REPORTED:	05/05/2022

SOIL ANALYSIS RESULTS FOR: PHILLIP FLEMING **FIELD IDENTIFICATION:** LAWTON WW TP

METHOD USED:			1:1 (c) Water-Soil			XSL(i)	LOI(r)	Cd Reduction		Mehlich 3	Mehlich 3 ICP										
Lab Number	Sample ID	Sample Depth	Soil pH	Buffer pH		Excess Lime	% Organic Matter	Nitrate-Nitrogen ppm	lb. N/A	Phosphorus ppm P	Potassium ppm K			Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B
90635	DOYE SW 1	0 - 8	7.8			Hi	2.0	2.2	5	47	257										
90636	DOYE SW 2	0 - 8	7.8			Hi	2.0	1.6	4	47	230										

FERTILIZER RECOMMENDATIONS: POUNDS ACTUAL NUTRIENT PER ACRE

Lab Number	Sample ID	Crop To Be Grown	Yield Goal	Lime, ECC Tons/A to raise pH to: 6.0	6.5	7.0	N	P_2O_5	K_2O	Zn	S	Mn	Cu	MgO	B	Ca	Cl
90635	DOYE SW 1	CORN	180 bu				220	0	0								
90636	DOYE SW 2	CORN	180 bu				220	0	0								

Cation Exchange Capacity

CEC	%H	%K	%Ca	%Mg	%Na

SPECIAL COMMENTS AND SUGGESTIONS:

Lab Number(s): 90635, 90636
CORN: Nitrogen fertilizer recommendations have been adjusted for soil organic matter content.

Analyses are representative of the samples submitted   Samples are retained 30 days after report of analysis   Explanations of soil analysis terms are available upon request

Reviewed and Approved By: Michele Pacheco, Data Review Coordinator   Michele Pacheco

05/05/2022 8:37 am

SOIL ANALYSIS REPORT

CLIENT:	
25842	HODGES FARMS & DREDGING 501 NW STREET LEBO, KS 66856

servi tech
www.servitech.com

1816 E. Wyatt Earp
PO Box 1397
Dodge City, KS 67801
800.557.7509
620.227.7123
Fax 620.227.2047

LAB NO:	90637 - 90638
INVOICE NO:	891010
DATE RECEIVED:	03/29/2022
DATE REPORTED:	05/05/2022

SOIL ANALYSIS RESULTS FOR: PHILLIP FLEMING **FIELD IDENTIFICATION:** LAWTON WW TP

METHOD USED:			1:1 (c) Water-Soil			XSL(i)	LOI(r)	Cd Reduction		Mehlich 3	Mehlich 3 ICP										
Lab Number	Sample ID	Sample Depth	Soil pH	Buffer pH		Excess Lime	% Organic Matter	Nitrate-Nitrogen ppm	lb. N/A	Phosphorus ppm P	Potassium ppm K			Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B
90637	DOYE SE 1	0 - 8	7.5			Lo	2.8	<1.0	2	11	429										
90638	DOYE SE 2	0 - 8	7.5			Lo	2.5	<1.0	2	9	430										

FERTILIZER RECOMMENDATIONS: POUNDS ACTUAL NUTRIENT PER ACRE

Lab Number	Sample ID	Crop To Be Grown	Yield Goal	Lime, ECC Tons/A to raise pH to: 6.0	6.5	7.0	N	P_2O_5	K_2O	Zn	S	Mn	Cu	MgO	B	Ca	Cl
90637	DOYE SE 1	BERMUDAGRASS HAY	6 tons				240	65	0								
90638	DOYE SE 2	BERMUDAGRASS HAY	6 tons				240	70	0								

Cation Exchange Capacity

CEC	%H	%K	%Ca	%Mg	%Na

SPECIAL COMMENTS AND SUGGESTIONS:

Lab Number(s): 90637, 90638

IMPROVED BERMUDAGRASS: Split the nitrogen (N) applications through the summer growing season according to hay harvest or grazing schedule. Make the first nitrogen application prior to vigorous growth (April or early May) to help avoid weed competition. Make other applications after each cutting or grazing period. The required phosphate (P2O5) or potash (K2O) may be blended with one of the early nitrogen applications to be topdressed on established stands.

PASTURE: Use fertilizer recommendations that have been developed for hay production. In an improved grazing system, the equivalent of one ton of hay yield should provide about 30 days grazing for a cow-calf pair or about 40 days grazing for a weaned calf or about 25 to 30 days grazing for a yearling calf.

Analyses are representative of the samples submitted   Samples are retained 30 days after report of analysis   Explanations of soil analysis terms are available upon request

Reviewed and Approved By: Michele Pacheco, Data Review Coordinator   Michele Pacheco

05/05/2022 8:38 am

SOIL ANALYSIS REPORT

CLIENT:	
25842	HODGES FARMS & DREDGING 501 NW STREET LEBO, KS 66856

servi tech
www.servitech.com
1816 E. Wyatt Earp
PO Box 1397
Dodge City, KS 67801
800.557.7509
620.227.7123
Fax 620.227.2047

LAB NO:	90639 - 90640
INVOICE NO:	891010
DATE RECEIVED:	03/29/2022
DATE REPORTED:	05/05/2022

SOIL ANALYSIS RESULTS FOR: PHILLIP FLEMING **FIELD IDENTIFICATION:** LAWTON WW TP

METHOD USED:			1:1 (c) Water-Soil			XSL(i)	LOI(r)	Cd Reduction		Mehlich 3	Mehlich 3 ICP											
Lab Number	Sample ID	Sample Depth	Soil pH	Buffer pH		Excess Lime	% Organic Matter	Nitrate-Nitrogen ppm	lb. N/A	Phosphorus ppm P	Potassium ppm K			Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B
90639	BENKE A	0 - 8	7.3			Lo	1.7	9.4	23	25	228										
90640	BENKE 2	0 - 8	7.7			Lo	1.7	9.4	23	28	242										

FERTILIZER RECOMMENDATIONS: POUNDS ACTUAL NUTRIENT PER ACRE

Lab Number	Sample ID	Crop To Be Grown	Yield Goal	Lime, ECC Tons/A to raise pH to: 6.0	6.5	7.0	N	P_2O_5	K_2O	Zn	S	Mn	Cu	MgO	B	Ca	Cl
90639	BENKE A	ALFALFA	6 tons					45	0								
90640	BENKE 2	ALFALFA	6 tons					35	0								

Cation Exchange Capacity

CEC	%H	%K	%Ca	%Mg	%Na

Analyses are representative of the samples submitted Samples are retained 30 days after report of analysis Explanations of soil analysis terms are available upon request

Reviewed and Approved By: Michele Pacheco, Data Review Coordinator Michele Pacheco

SOIL ANALYSIS REPORT

CLIENT:	
25842	HODGES FARMS & DREDGING 501 NW STREET LEBO, KS 66856

servi tech
www.servitech.com
1816 E. Wyatt Earp
PO Box 1397
Dodge City, KS 67801
800.557.7509
620.227.7123
Fax 620.227.2047

LAB NO:	90641 - 90642
INVOICE NO:	891010
DATE RECEIVED:	03/29/2022
DATE REPORTED:	05/05/2022

SOIL ANALYSIS RESULTS FOR: PHILLIP FLEMING **FIELD IDENTIFICATION:** LAWTON WW TP

METHOD USED:			1:1 (c) Water-Soil	Sikora 2		XSL(i)	LOI(r)	Cd Reduction		Mehlich 3	Mehlich 3 ICP											
Lab Number	Sample ID	Sample Depth	Soil pH	Buffer pH		Excess Lime	% Organic Matter	Nitrate-Nitrogen ppm	lb. N/A	Phosphorus ppm P	Potassium ppm K			Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B
90641	ALLISON RUNW	0 - 8	6.2	7.0		No	3.6	4.4	11	11	256										
90642	ALLISON WHEA	0 - 8	5.8	7.1		No	1.7	25.7	62	6	185										

FERTILIZER RECOMMENDATIONS: POUNDS ACTUAL NUTRIENT PER ACRE

Lab Number	Sample ID	Crop To Be Grown	Yield Goal	Lime, ECC Tons/A to raise pH to: 6.0	6.5	7.0	N	P_2O_5	K_2O	Zn	S	Mn	Cu	MgO	B	Ca	Cl
90641	ALLISON RUNW	BERMUDAGRASS HAY	6 tons	0.0	0.6	1.6	230	65	0								
90642	ALLISON WHEA	CORN	180 bu	0.2	0.9	1.5	170	105	0								

Cation Exchange Capacity

CEC	%H	%K	%Ca	%Mg	%Na

SPECIAL COMMENTS AND SUGGESTIONS:

Lab Number(s): 90641

IMPROVED BERMUDAGRASS: Split the nitrogen (N) applications through the summer growing season according to hay harvest or grazing schedule. Make the first nitrogen application prior to vigorous growth (April or early May) to help avoid weed competition. Make other applications after each cutting or grazing period. The required phosphate (P2O5) or potash (K2O) may be blended with one of the early nitrogen applications to be topdressed on established stands.

PASTURE: Use fertilizer recommendations that have been developed for hay production. In an improved grazing system, the equivalent of one ton of hay yield should provide about 30 days grazing for a cow-calf pair or about 40 days grazing for a weaned calf or about 25 to 30 days grazing for a yearling calf.

Lab Number(s): 90642

CORN: Nitrogen fertilizer recommendations have been adjusted for soil organic matter content.

Analyses are representative of the samples submitted Samples are retained 30 days after report of analysis Explanations of soil analysis terms are available upon request

Reviewed and Approved By: Michele Pacheco, Data Review Coordinator

Michele Pacheco

SOIL ANALYSIS REPORT

CLIENT:	
25842	HODGES FARMS & DREDGING 501 NW STREET LEBO, KS 66856

1816 E. Wyatt Earp
PO Box 1397
Dodge City, KS 67801
800.557.7509
620.227.7123
Fax 620.227.2047
www.servitech.com

LAB NO:	90643 - 90644
INVOICE NO:	891010
DATE RECEIVED:	03/29/2022
DATE REPORTED:	05/05/2022

SOIL ANALYSIS RESULTS FOR: PHILLIP FLEMING **FIELD IDENTIFICATION:** LAWTON WW TP

METHOD USED:			1:1 (c) Water-Soil			XSL(i)	LOI(r)	Cd Reduction		Mehlich 3	Mehlich 3 ICP										
Lab Number	Sample ID	Sample Depth	Soil pH	Buffer pH		Excess Lime	% Organic Matter	Nitrate-Nitrogen ppm	lb. N/A	Phosphorus ppm P	Potassium ppm K			Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B
90643	ALLISON IN 1	0 - 8	8.0			Hi	2.5	7.5	18	38	204										
90644	ALLISON IN 2	0 - 8	7.9			Hi	1.7	9.8	24	46	237										

FERTILIZER RECOMMENDATIONS: POUNDS ACTUAL NUTRIENT PER ACRE

Lab Number	Sample ID	Crop To Be Grown	Yield Goal	Lime, ECC Tons/A to raise pH to: 6.0	6.5	7.0	N	P_2O_5	K_2O	Zn	S	Mn	Cu	MgO	B	Ca	Cl
90643	ALLISON IN 1	CORN	180 bu				195	0	0								
90644	ALLISON IN 2	CORN	180 bu				210	0	0								

Cation Exchange Capacity

CEC	%H	%K	%Ca	%Mg	%Na

SPECIAL COMMENTS AND SUGGESTIONS:

Lab Number(s): 90643, 90644
CORN: Nitrogen fertilizer recommendations have been adjusted for soil organic matter content.

Analyses are representative of the samples submitted   Samples are retained 30 days after report of analysis   Explanations of soil analysis terms are available upon request

Reviewed and Approved By: Michele Pacheco, Data Review Coordinator   Michele Pacheco

05/05/2022 8:38 am

EXHIBIT H

NRCS SITE SOIL REPORTS

United States Department of Agriculture

NRCS

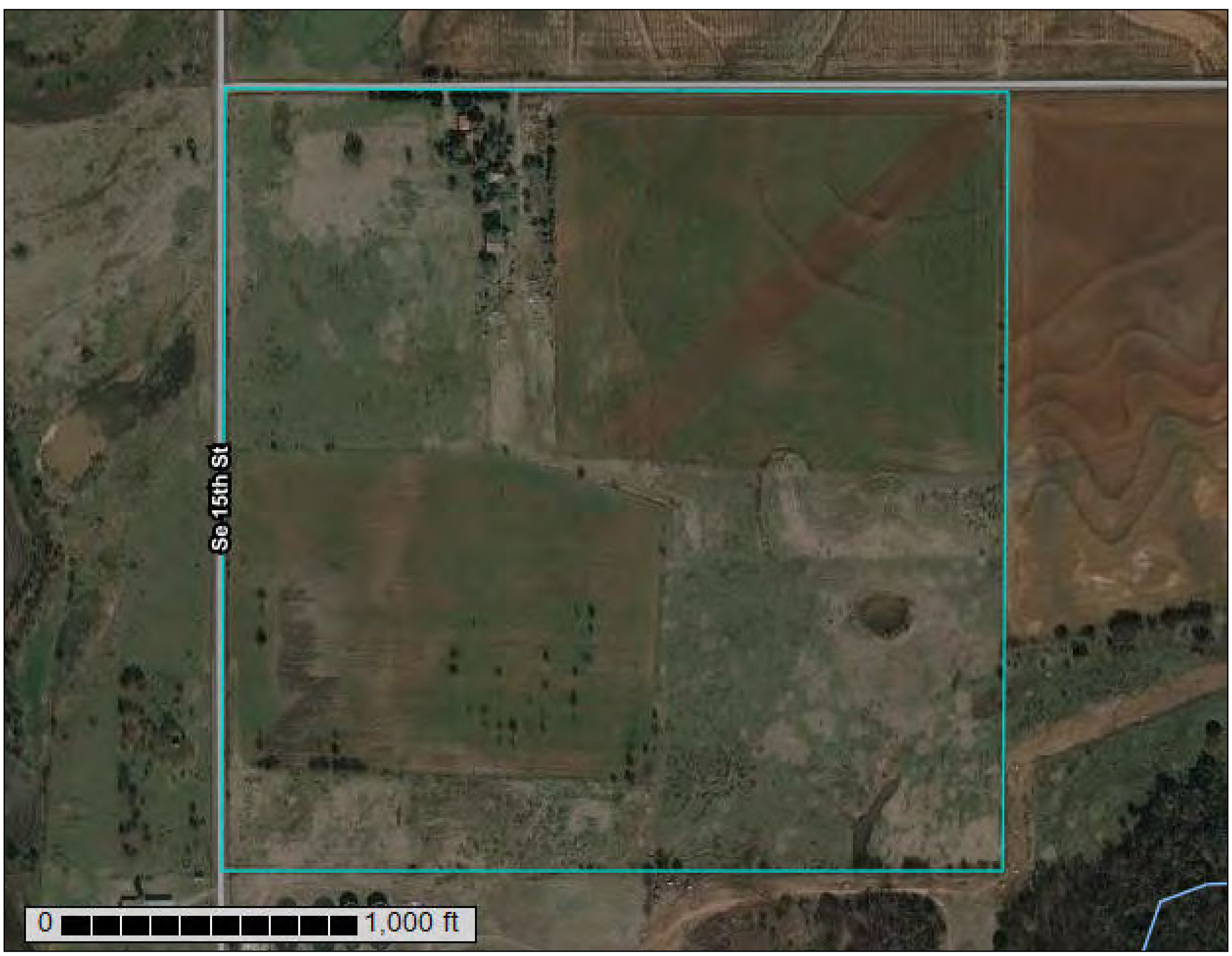
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Comanche County, Oklahoma

Lawton WWTP / Site 1



May 4, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

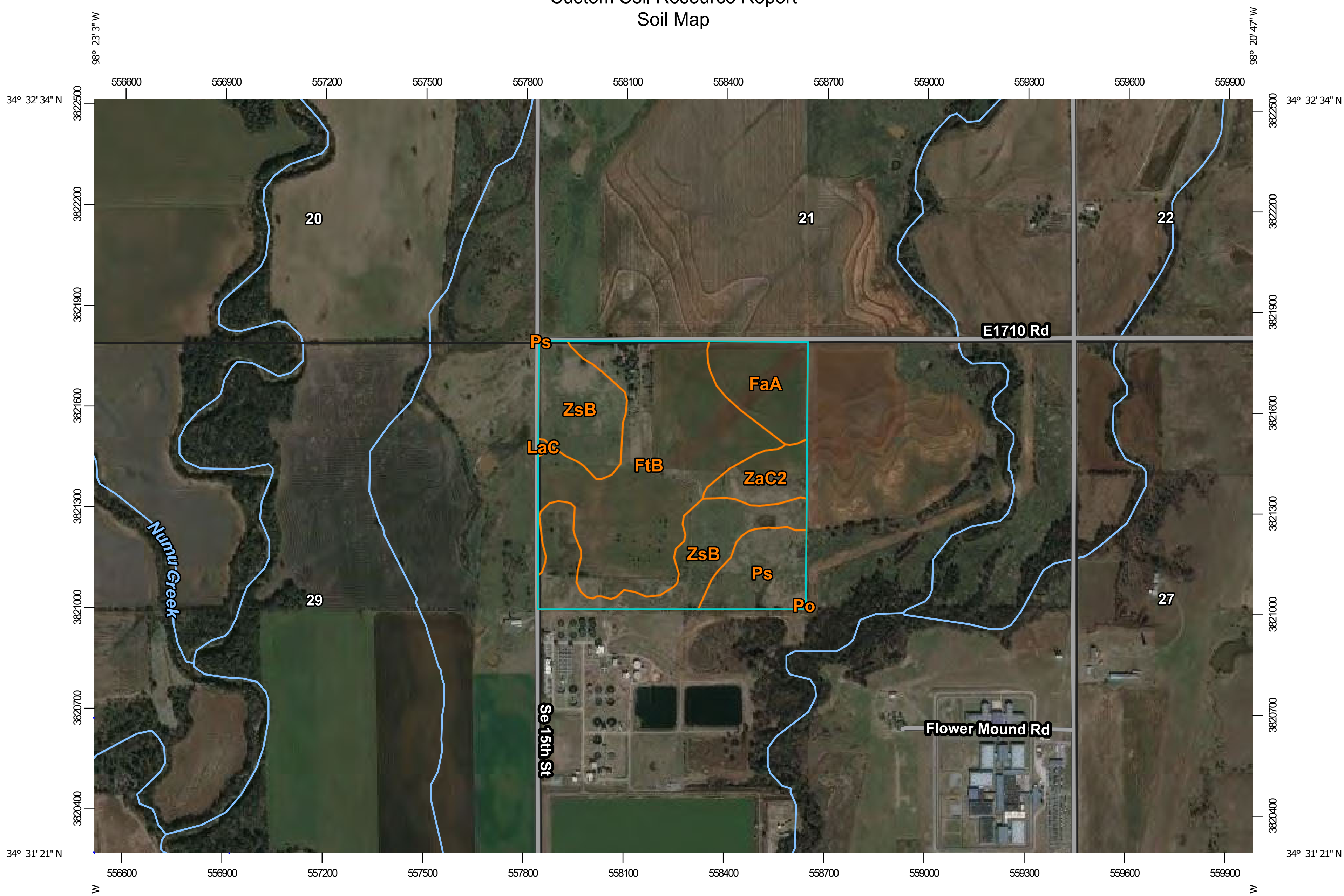
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:15,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features
- PLSS Township and Range
- PLSS Section

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FaA	Foard silt loam, 0 to 1 percent slopes	17.1	10.8%
FtB	Foard and Tillman soils, 1 to 3 percent slopes	70.8	44.5%
LaC	Lawton loam, 3 to 5 percent slopes	0.3	0.2%
Po	Ashport loam, 0 to 1 percent slopes, occasionally flooded	0.1	0.0%
Ps	Ashport-Oscar complex, 0 to 1 percent slopes, occasionally flooded	15.1	9.5%
ZaC2	Zaneis loam, 3 to 5 percent slopes, eroded	9.7	6.1%
ZsB	Zaneis-Huska complex, 1 to 3 percent slopes	46.1	28.9%
Totals for Area of Interest		**159.2**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Comanche County, Oklahoma

FaA—Foard silt loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2w5qg
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 185 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Foard and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Foard

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Granitic clayey alluvium derived from granite over clayey alluvium derived from shale and siltstone

Typical profile

A - 0 to 9 inches: silt loam
Btss - 9 to 22 inches: silty clay
Btknss - 22 to 48 inches: silty clay loam
BCnss - 48 to 56 inches: silty clay loam
Cn - 56 to 66 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 25.0
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: D
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Minor Components

Hollister

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Hinkle

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R078CY091OK - Slickspot
Hydric soil rating: No

Tillman

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Indiahoma

Percent of map unit: 4 percent
Landform: Hillslopes on hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Roscoe

Percent of map unit: 1 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R080AY025OK - Depressional Upland
Hydric soil rating: No

FtB—Foard and Tillman soils, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: dtp9
Elevation: 900 to 3,000 feet
Mean annual precipitation: 17 to 30 inches
Mean annual air temperature: 37 to 68 degrees F
Frost-free period: 185 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Foard and similar soils: 60 percent
Tillman and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Foard

Setting

Landform: Pediments on paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Clayey alluvium derived from granite over residuum weathered from shale and siltstone

Typical profile

A - 0 to 9 inches: silt loam
Bt - 9 to 22 inches: clay
Btk - 22 to 48 inches: clay
BCk - 48 to 56 inches: clay
C - 56 to 80 inches: clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 25.0
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: D
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Description of Tillman

Setting

Landform: Pediments on paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous clayey and loamy alluvium derived from claystone

Typical profile

A - 0 to 6 inches: silty clay loam
BA - 6 to 13 inches: clay loam
Bt - 13 to 24 inches: silty clay
Btk - 24 to 40 inches: silty clay
BCk - 40 to 50 inches: silty clay
C - 50 to 80 inches: clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to moderately saline (0.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 12.0
Available water supply, 0 to 60 inches: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Minor Components

Vernon

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY065OK - Red Clay (North)
Hydric soil rating: No

Hinkle

Percent of map unit: 3 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R078CY091OK - Slickspot
Hydric soil rating: No

Stamford

Percent of map unit: 3 percent
Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

LaC—Lawton loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2w5q8
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 185 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lawton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lawton

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Granitic outwash and loamy alluvium

Typical profile

Ap - 0 to 11 inches: loam
BA - 11 to 18 inches: clay loam
Bt - 18 to 47 inches: clay loam
BC - 47 to 80 inches: gravelly clay loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R082BY056OK - Loamy Prairie PE 38-48
Hydric soil rating: No

Minor Components

Foard

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Tillman

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Vernon

Percent of map unit: 5 percent
Landform: Hillslopes on hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY112TX - Red Clay (South) 23-30" PZ
Hydric soil rating: No

Po—Ashport loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2tq77
Elevation: 700 to 1,500 feet
Mean annual precipitation: 31 to 40 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 185 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ashport, occasionally flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 5 inches: loam
A - 5 to 16 inches: loam
Bw - 16 to 36 inches: silty clay loam
Ab - 36 to 52 inches: loam
Bwb - 52 to 79 inches: loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B

Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Pulaski, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R084AY050OK - Loamy Bottomland
Hydric soil rating: No

Easpur, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Ps—Ashport-Oscar complex, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2yh69
Elevation: 1,070 to 1,290 feet
Mean annual precipitation: 29 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 181 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ashport, occasionally flooded, and similar soils: 60 percent
Oscar, saline, occasionally flooded, and similar soils: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 6 inches: silt loam

Bw - 6 to 31 inches: silty clay loam
C - 31 to 80 inches: silt loam

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Oscar, Saline, Occasionally Flooded

Setting
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Saline loamy alluvium derived from sedimentary rock

Typical profile
A - 0 to 5 inches: loam
Btnz - 5 to 12 inches: silty clay loam
BCkn - 12 to 24 inches: silty clay loam
C - 24 to 63 inches: silty clay loam

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Slightly saline to strongly saline (4.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 80.0
Available water supply, 0 to 60 inches: High (about 11.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: R080AY001OK - Alkali Bottomland
Hydric soil rating: No

Minor Components

Port, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Miller, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Lela, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

ZaC2—Zaneis loam, 3 to 5 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2tq6y
Elevation: 750 to 1,350 feet
Mean annual precipitation: 33 to 39 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 190 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Zaneis, eroded, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zaneis, Eroded

Setting

Landform: Low hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 12 inches: loam
Bt1 - 12 to 47 inches: clay loam
Bt2 - 47 to 55 inches: sandy clay loam
Cr - 55 to 65 inches: bedrock

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: 49 to 57 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 3.0 mmhos/cm)
Sodium adsorption ratio, maximum: 3.0
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R080AY056OK - Loamy Upland
Hydric soil rating: No

Minor Components

Lucien, eroded

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080AY083OK - Shallow Upland
Hydric soil rating: No

Renfrow, eroded

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex

Across-slope shape: Linear
Ecological site: R080AY010OK - Claypan Upland (North)
Hydric soil rating: No

Coyle, eroded

Percent of map unit: 5 percent
Landform: Low hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080AY056OK - Loamy Upland
Hydric soil rating: No

ZsB—Zaneis-Huska complex, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tq65
Elevation: 700 to 1,500 feet
Mean annual precipitation: 29 to 37 inches
Mean annual air temperature: 59 to 61 degrees F
Frost-free period: 190 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Zaneis and similar soils: 65 percent
Huska and similar soils: 30 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zaneis

Setting

Landform: Hillslopes on low hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 12 inches: loam
BA - 12 to 19 inches: loam
Bt1 - 19 to 39 inches: clay loam
Bt2 - 39 to 55 inches: sandy clay loam
BC - 55 to 59 inches: sandy clay loam
Cr - 59 to 69 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 57 to 60 inches to paralithic bedrock

Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: R080AY056OK - Loamy Upland
Hydric soil rating: No

Description of Huska

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Saline clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 6 inches: silt loam
Btn - 6 to 18 inches: silty clay loam
Btknz - 18 to 25 inches: silty clay loam
Btnyz - 25 to 34 inches: clay
B'tn - 34 to 50 inches: clay
2Cr - 50 to 60 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 49 to 60 inches to paralithic bedrock
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Very slightly saline to strongly saline (2.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 45.0
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: R080AY091OK - Slickspot

Hydric soil rating: No

Minor Components

Grainola

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080AY010OK - Claypan Upland (North)
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Comanche County, Oklahoma

Lawton WWTP / Site 2

May 4, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

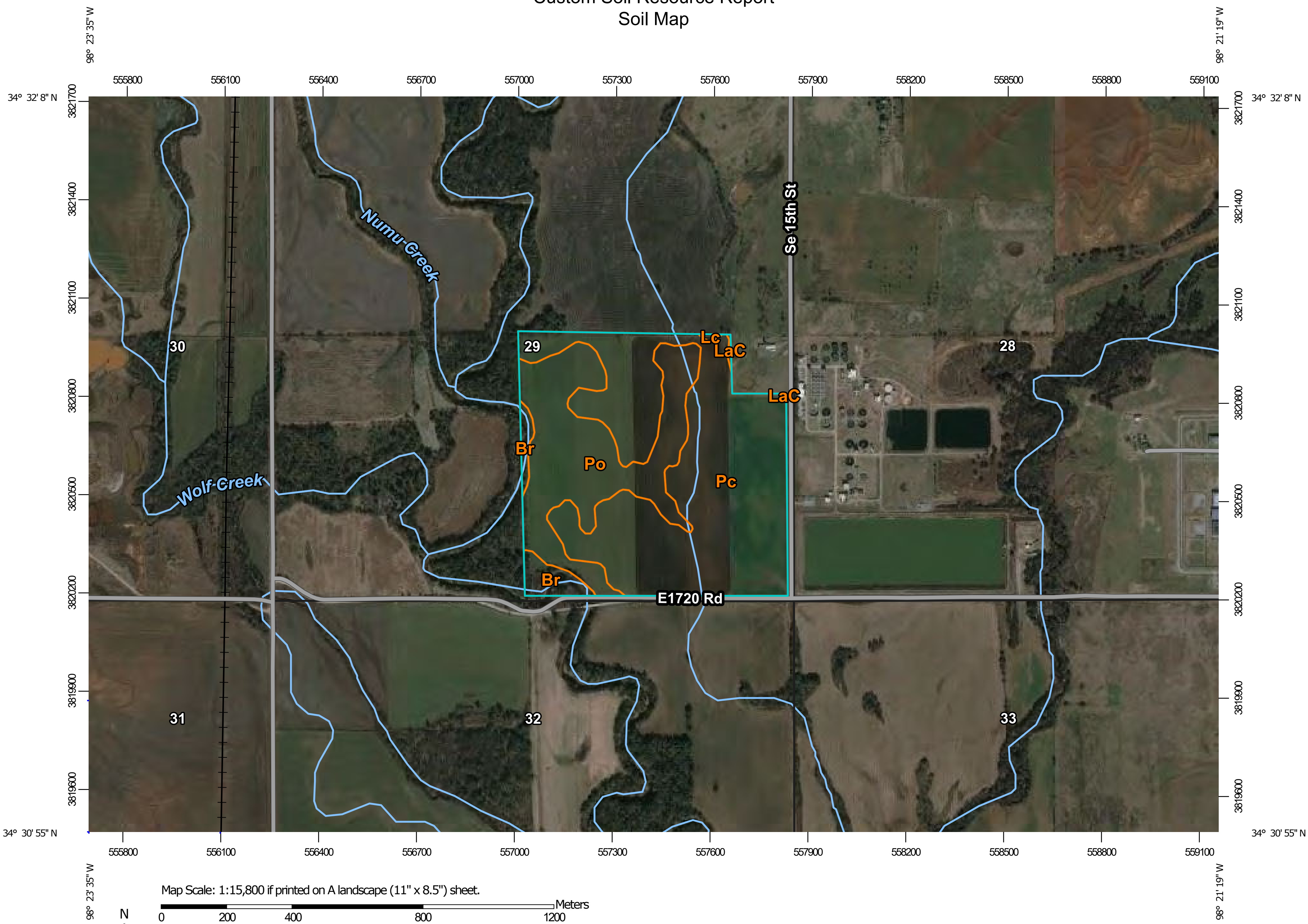
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:15,800 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator   Corner coordinates: WGS84   Edge tics: UTM Zone 14N WGS84

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

Political Features

PLSS Township and Range

PLSS Section

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded	6.2	4.0%
LaC	Lawton loam, 3 to 5 percent slopes	0.2	0.1%
Lc	Lela clay, 0 to 1 percent slopes, occasionally flooded	0.2	0.2%
Pc	Ashport clay loam, 0 to 1 percent slopes, occasionally flooded	98.5	63.9%
Po	Ashport loam, 0 to 1 percent slopes, occasionally flooded	49.0	31.8%
Totals for Area of Interest		**154.2**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Comanche County, Oklahoma

Br—Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2yh68
Elevation: 1,080 to 1,200 feet
Mean annual precipitation: 31 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 180 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ashport, frequently flooded, and similar soils: 40 percent
Port, frequently flooded, and similar soils: 34 percent
Yahola, frequently flooded, and similar soils: 16 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: silty clay loam
Bw1 - 14 to 27 inches: silt loam
Bw2 - 27 to 80 inches: stratified fine sandy loam to silt loam to silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 3.0
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Port, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium derived from sedimentary rock

Typical profile

A1 - 0 to 7 inches: silt loam
A2 - 7 to 27 inches: silt loam
Bw - 27 to 46 inches: silt loam
Ab - 46 to 51 inches: silt loam
Bwb - 51 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Yahola, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 11 inches: fine sandy loam
C1 - 11 to 40 inches: fine sandy loam
C2 - 40 to 56 inches: loam
C3 - 56 to 72 inches: fine sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Retrop, frequently flooded

Percent of map unit: 8 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096OK - Subirrigated (Moderately Saline) PE 32-44 (Obsolete) Refer To 78CY095OK
Hydric soil rating: No

Tribbey, frequently flooded

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R084AY095OK - Subirrigated Bottomland
Hydric soil rating: No

LaC—Lawton loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2w5q8
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 185 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lawton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lawton

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Granitic outwash and loamy alluvium

Typical profile

Ap - 0 to 11 inches: loam
BA - 11 to 18 inches: clay loam
Bt - 18 to 47 inches: clay loam
BC - 47 to 80 inches: gravelly clay loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R082BY056OK - Loamy Prairie PE 38-48
Hydric soil rating: No

Minor Components

Foard

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Tillman

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear

Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Vernon

Percent of map unit: 5 percent
Landform: Hillslopes on hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY112TX - Red Clay (South) 23-30" PZ
Hydric soil rating: No

Lc—Lela clay, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: dtpn
Elevation: 700 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 57 to 65 degrees F
Frost-free period: 185 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lela, occasionally flooded, and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lela, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium derived from sedimentary rock

Typical profile

A - 0 to 16 inches: clay
C - 16 to 80 inches: clay

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone

Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Minor Components

Miller, occasionally flooded

Percent of map unit: 10 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Port, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Ashport, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Mclain, rarely flooded

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Lebron, occasionally flooded

Percent of map unit: 1 percent
Landform: Depressions on flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R080AY090OK - Ponded Bottomland
Hydric soil rating: Yes

Pc—Ashport clay loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2tq71
Elevation: 700 to 1,500 feet
Mean annual precipitation: 31 to 40 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 200 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ashport, occasionally flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 5 inches: clay loam
A - 5 to 16 inches: silty clay loam
Bw - 16 to 36 inches: silty clay loam
Ab - 36 to 52 inches: loam
Bwb - 52 to 79 inches: loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B

Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Miller, occasionally flooded
Percent of map unit: 5 percent
Landform: Backswamps on flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Yahola, occasionally flooded
Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Easpur, occasionally flooded
Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Po—Ashport loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting
National map unit symbol: 2tq77
Elevation: 700 to 1,500 feet
Mean annual precipitation: 31 to 40 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 185 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Ashport, occasionally flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Occasionally Flooded

Setting
Landform: Flood plains

Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 5 inches: loam
A - 5 to 16 inches: loam
Bw - 16 to 36 inches: silty clay loam
Ab - 36 to 52 inches: loam
Bwb - 52 to 79 inches: loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Pulaski, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R084AY050OK - Loamy Bottomland
Hydric soil rating: No

Easpur, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Comanche County, Oklahoma

Lawton WWTP / Site 3

May 4, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

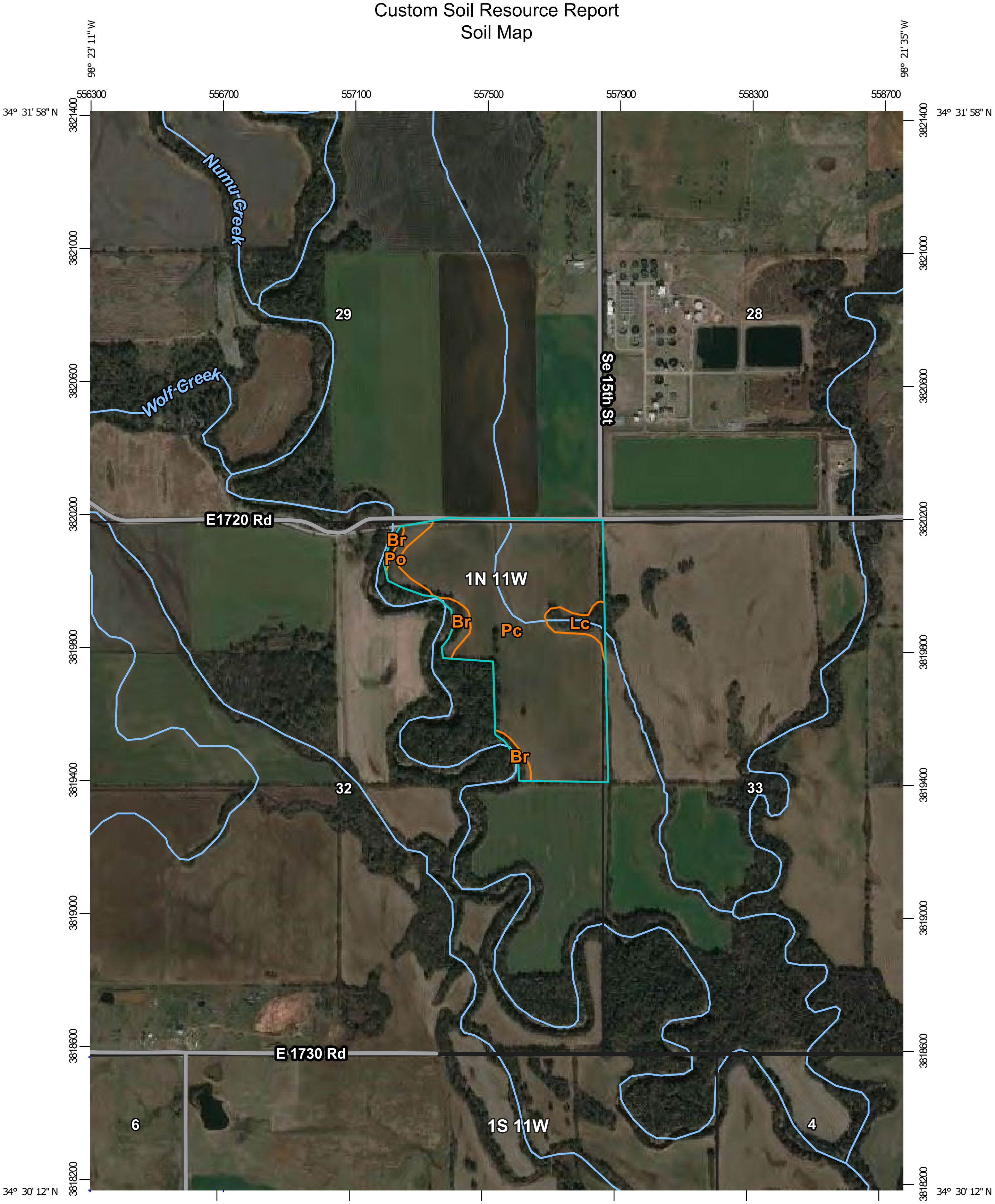
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features
- PLSS Township and Range
- PLSS Section

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded	3.9	4.4%
Lc	Lela clay, 0 to 1 percent slopes, occasionally flooded	3.4	3.9%
Pc	Ashport clay loam, 0 to 1 percent slopes, occasionally flooded	77.7	88.6%
Po	Ashport loam, 0 to 1 percent slopes, occasionally flooded	2.7	3.1%
Totals for Area of Interest		**87.7**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Comanche County, Oklahoma

Br—Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2yh68
Elevation: 1,080 to 1,200 feet
Mean annual precipitation: 31 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 180 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ashport, frequently flooded, and similar soils: 40 percent
Port, frequently flooded, and similar soils: 34 percent
Yahola, frequently flooded, and similar soils: 16 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: silty clay loam
Bw1 - 14 to 27 inches: silt loam
Bw2 - 27 to 80 inches: stratified fine sandy loam to silt loam to silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 3.0
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Port, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium derived from sedimentary rock

Typical profile

A1 - 0 to 7 inches: silt loam
A2 - 7 to 27 inches: silt loam
Bw - 27 to 46 inches: silt loam
Ab - 46 to 51 inches: silt loam
Bwb - 51 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Yahola, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 11 inches: fine sandy loam
C1 - 11 to 40 inches: fine sandy loam
C2 - 40 to 56 inches: loam
C3 - 56 to 72 inches: fine sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Retrop, frequently flooded

Percent of map unit: 8 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096OK - Subirrigated (Moderately Saline) PE 32-44 (Obsolete) Refer To 78CY095OK
Hydric soil rating: No

Tribbey, frequently flooded

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R084AY095OK - Subirrigated Bottomland
Hydric soil rating: No

Lc—Lela clay, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: dtpn
Elevation: 700 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 57 to 65 degrees F
Frost-free period: 185 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lela, occasionally flooded, and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lela, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium derived from sedimentary rock

Typical profile

A - 0 to 16 inches: clay
C - 16 to 80 inches: clay

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Minor Components

Miller, occasionally flooded

Percent of map unit: 10 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Port, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland

Hydric soil rating: No

Ashport, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Mclain, rarely flooded

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Lebron, occasionally flooded

Percent of map unit: 1 percent
Landform: Depressions on flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R080AY090OK - Ponded Bottomland
Hydric soil rating: Yes

Pc—Ashport clay loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2tq71
Elevation: 700 to 1,500 feet
Mean annual precipitation: 31 to 40 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 200 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ashport, occasionally flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 5 inches: clay loam
A - 5 to 16 inches: silty clay loam
Bw - 16 to 36 inches: silty clay loam
Ab - 36 to 52 inches: loam
Bwb - 52 to 79 inches: loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Miller, occasionally flooded

Percent of map unit: 5 percent
Landform: Backswamps on flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Yahola, occasionally flooded

Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Easpur, occasionally flooded

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Po—Ashport loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2tq77
Elevation: 700 to 1,500 feet
Mean annual precipitation: 31 to 40 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 185 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ashport, occasionally flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 5 inches: loam
A - 5 to 16 inches: loam
Bw - 16 to 36 inches: silty clay loam
Ab - 36 to 52 inches: loam
Bwb - 52 to 79 inches: loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Pulaski, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R084AY050OK - Loamy Bottomland
Hydric soil rating: No

Easpur, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

United States Department of Agriculture

NRCS

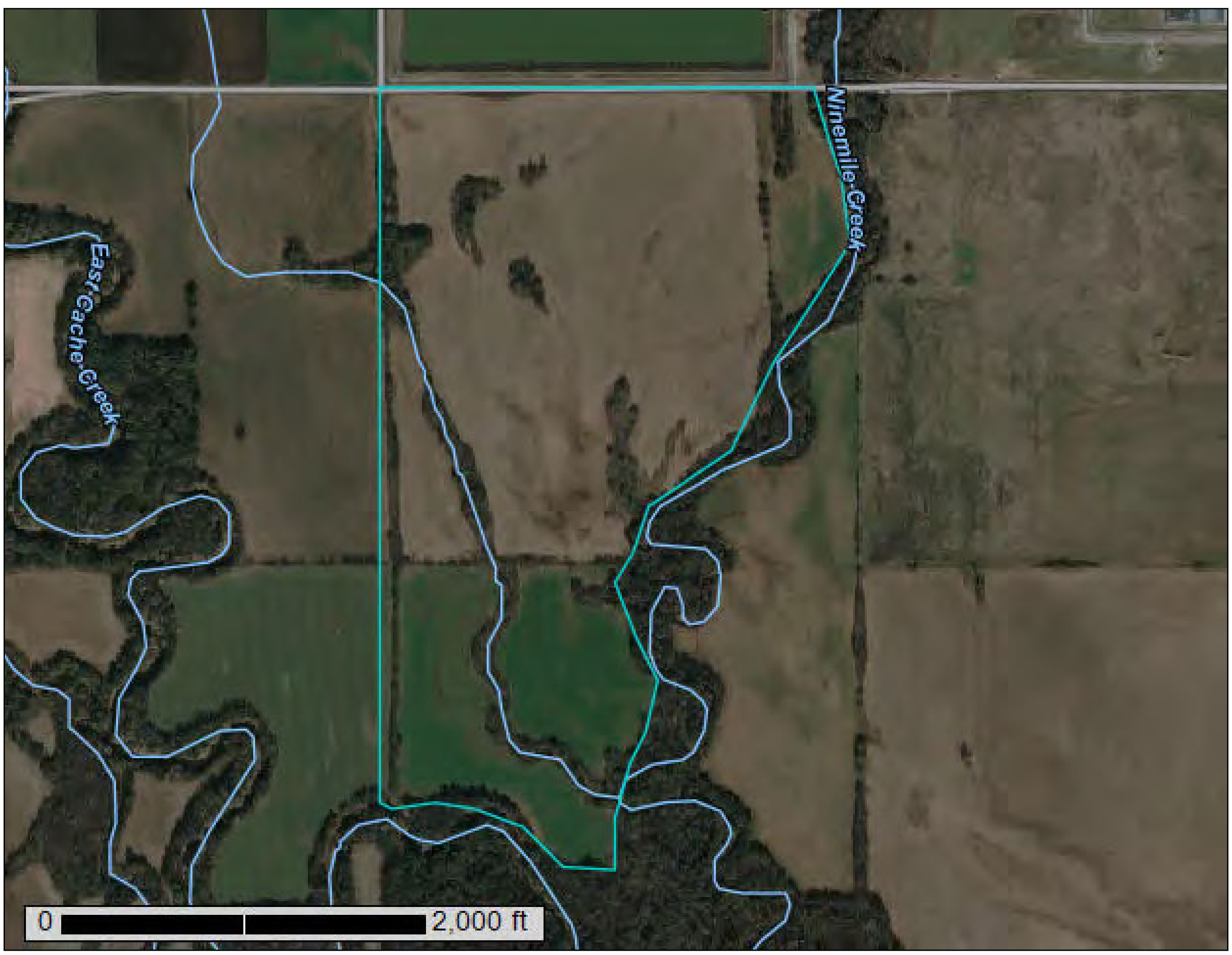
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Comanche County, Oklahoma

Lawton WWTP / Site 4



May 4, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

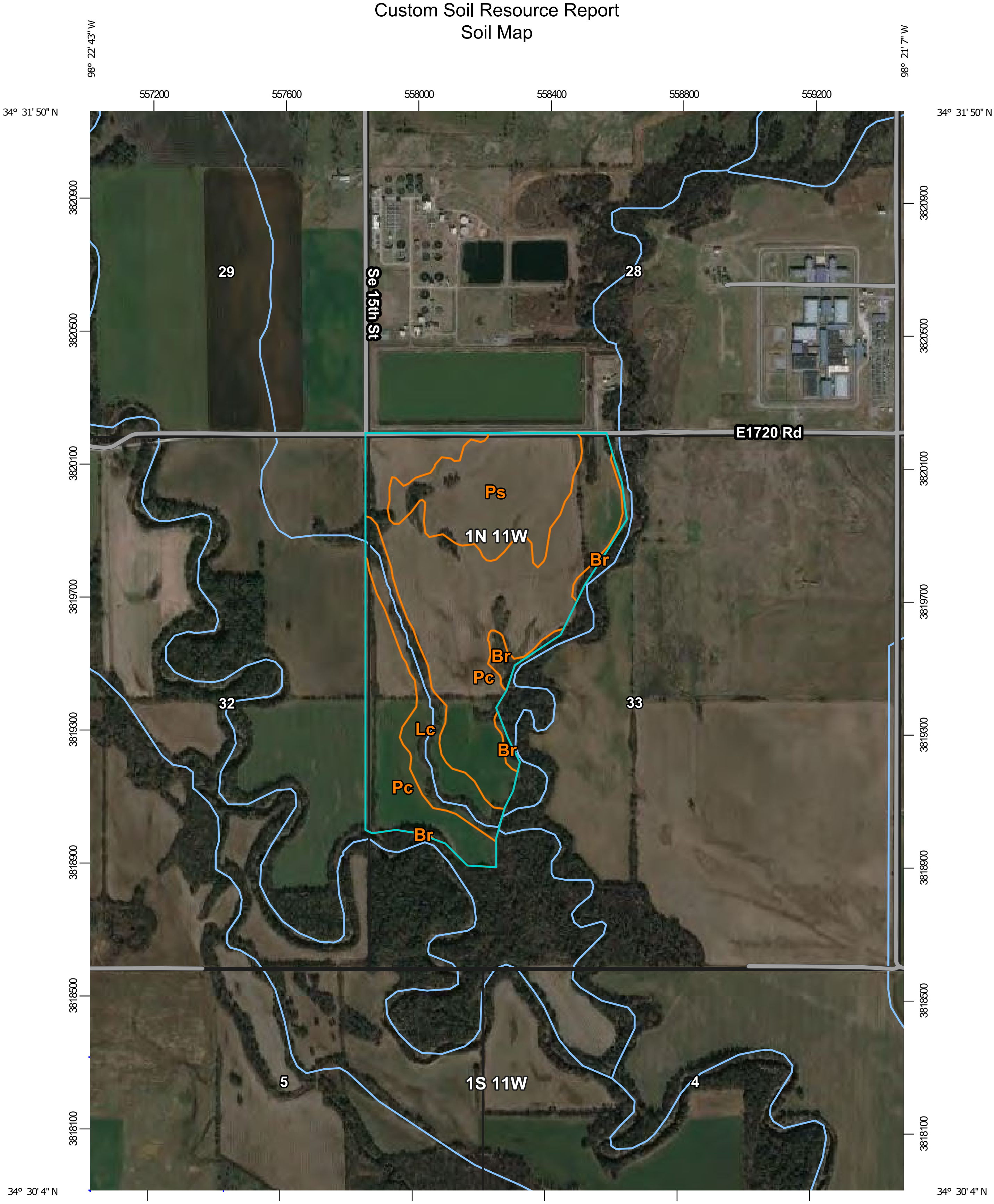
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features
- PLSS Township and Range
- PLSS Section

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded	5.2	3.0%
Lc	Lela clay, 0 to 1 percent slopes, occasionally flooded	20.8	11.7%
Pc	Ashport clay loam, 0 to 1 percent slopes, occasionally flooded	114.9	64.8%
Ps	Ashport-Oscar complex, 0 to 1 percent slopes, occasionally flooded	36.4	20.5%
Totals for Area of Interest		**177.3**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Comanche County, Oklahoma

Br—Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2yh68
Elevation: 1,080 to 1,200 feet
Mean annual precipitation: 31 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 180 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ashport, frequently flooded, and similar soils: 40 percent
Port, frequently flooded, and similar soils: 34 percent
Yahola, frequently flooded, and similar soils: 16 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: silty clay loam
Bw1 - 14 to 27 inches: silt loam
Bw2 - 27 to 80 inches: stratified fine sandy loam to silt loam to silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 3.0
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Port, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium derived from sedimentary rock

Typical profile

A1 - 0 to 7 inches: silt loam
A2 - 7 to 27 inches: silt loam
Bw - 27 to 46 inches: silt loam
Ab - 46 to 51 inches: silt loam
Bwb - 51 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Yahola, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 11 inches: fine sandy loam
C1 - 11 to 40 inches: fine sandy loam
C2 - 40 to 56 inches: loam
C3 - 56 to 72 inches: fine sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Retrop, frequently flooded

Percent of map unit: 8 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096OK - Subirrigated (Moderately Saline) PE 32-44 (Obsolete) Refer To 78CY095OK
Hydric soil rating: No

Tribbey, frequently flooded

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R084AY095OK - Subirrigated Bottomland
Hydric soil rating: No

Lc—Lela clay, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: dtpn
Elevation: 700 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 57 to 65 degrees F
Frost-free period: 185 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lela, occasionally flooded, and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lela, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium derived from sedimentary rock

Typical profile

A - 0 to 16 inches: clay
C - 16 to 80 inches: clay

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Minor Components

Miller, occasionally flooded

Percent of map unit: 10 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Port, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland

Hydric soil rating: No

Ashport, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Mclain, rarely flooded

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Lebron, occasionally flooded

Percent of map unit: 1 percent
Landform: Depressions on flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R080AY090OK - Ponded Bottomland
Hydric soil rating: Yes

Pc—Ashport clay loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2tq71
Elevation: 700 to 1,500 feet
Mean annual precipitation: 31 to 40 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 200 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ashport, occasionally flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 5 inches: clay loam
A - 5 to 16 inches: silty clay loam
Bw - 16 to 36 inches: silty clay loam
Ab - 36 to 52 inches: loam
Bwb - 52 to 79 inches: loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Miller, occasionally flooded

Percent of map unit: 5 percent
Landform: Backswamps on flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Yahola, occasionally flooded

Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Easpur, occasionally flooded

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Ps—Ashport-Oscar complex, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2yh69
Elevation: 1,070 to 1,290 feet
Mean annual precipitation: 29 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 181 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ashport, occasionally flooded, and similar soils: 60 percent
Oscar, saline, occasionally flooded, and similar soils: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 6 inches: silt loam
Bw - 6 to 31 inches: silty clay loam
C - 31 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Oscar, Saline, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Saline loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 5 inches: loam
Btnz - 5 to 12 inches: silty clay loam
BCkn - 12 to 24 inches: silty clay loam
C - 24 to 63 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Slightly saline to strongly saline (4.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 80.0
Available water supply, 0 to 60 inches: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: R080AY001OK - Alkali Bottomland
Hydric soil rating: No

Minor Components

Port, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Miller, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread

Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Lela, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

United States Department of Agriculture

NRCS

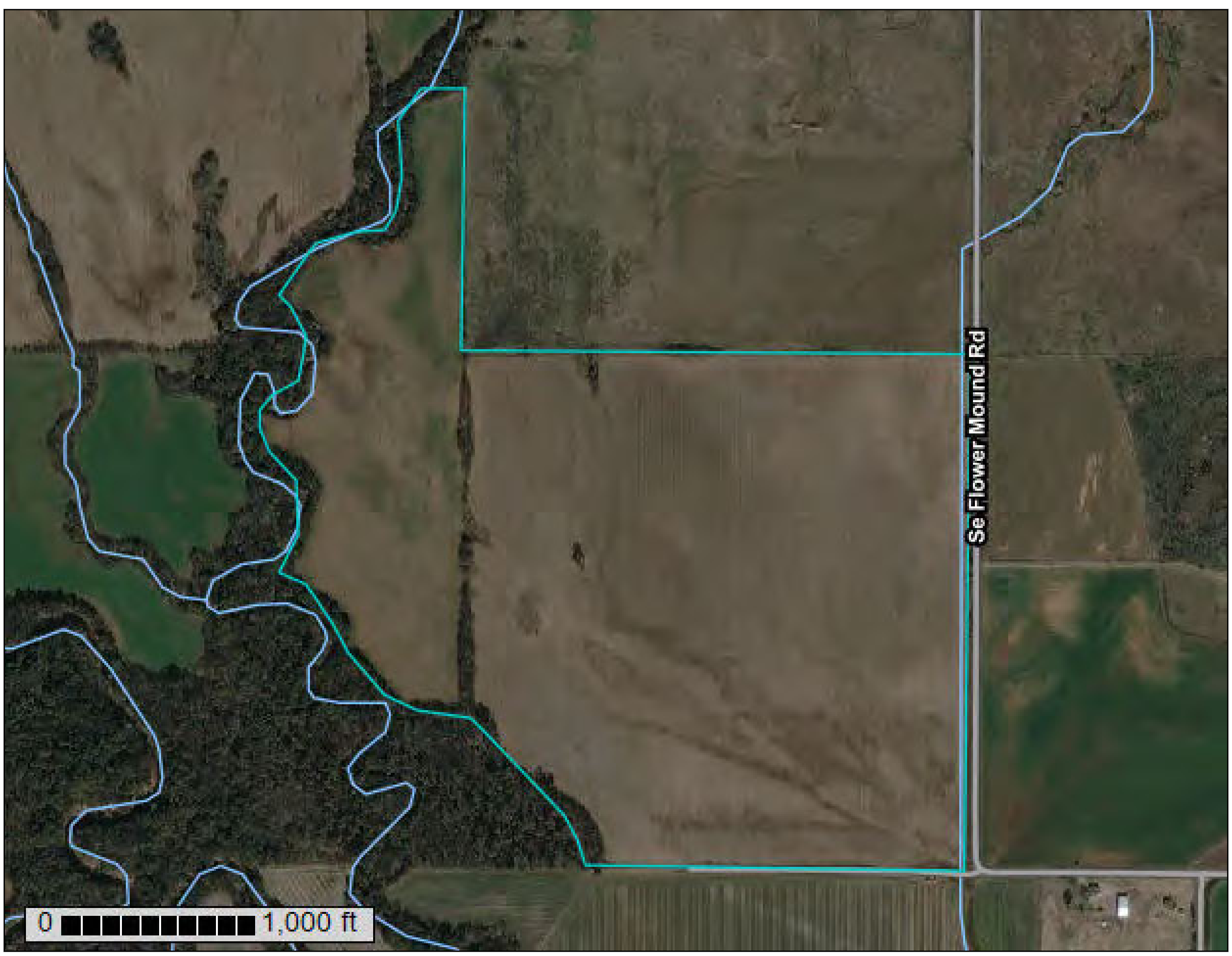
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Comanche County, Oklahoma

Lawton WWTP / Site 5



May 4, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

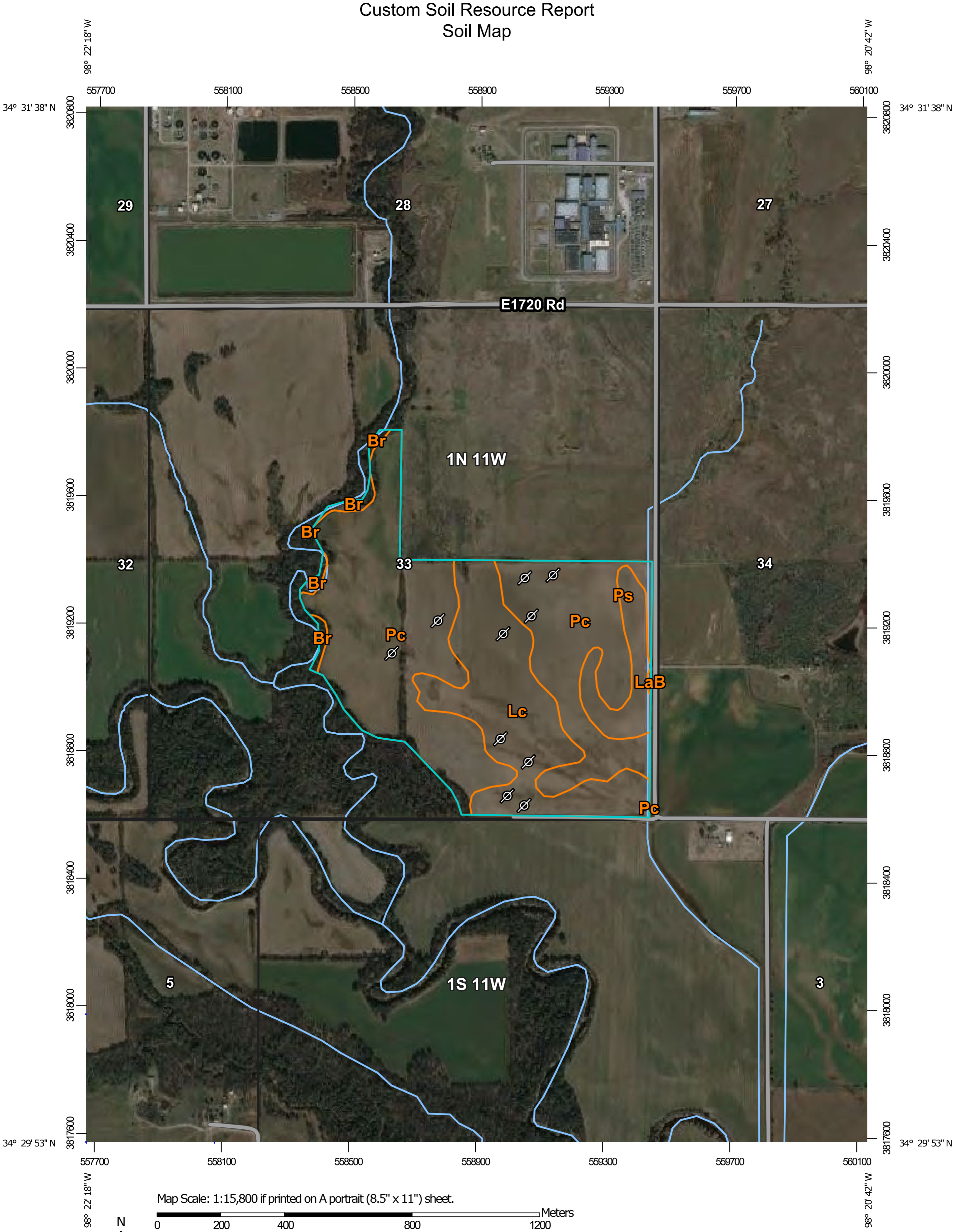
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features

PLSS Township and Range

PLSS Section

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded	3.8	1.9%
LaB	Lawton loam, 1 to 3 percent slopes	0.2	0.1%
Lc	Lela clay, 0 to 1 percent slopes, occasionally flooded	55.0	27.5%
Pc	Ashport clay loam, 0 to 1 percent slopes, occasionally flooded	127.4	63.7%
Ps	Ashport-Oscar complex, 0 to 1 percent slopes, occasionally flooded	13.7	6.9%
Totals for Area of Interest		**200.1**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Comanche County, Oklahoma

Br—Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2yh68
Elevation: 1,080 to 1,200 feet
Mean annual precipitation: 31 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 180 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ashport, frequently flooded, and similar soils: 40 percent
Port, frequently flooded, and similar soils: 34 percent
Yahola, frequently flooded, and similar soils: 16 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: silty clay loam
Bw1 - 14 to 27 inches: silt loam
Bw2 - 27 to 80 inches: stratified fine sandy loam to silt loam to silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 3.0
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Port, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium derived from sedimentary rock

Typical profile

A1 - 0 to 7 inches: silt loam
A2 - 7 to 27 inches: silt loam
Bw - 27 to 46 inches: silt loam
Ab - 46 to 51 inches: silt loam
Bwb - 51 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Yahola, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 11 inches: fine sandy loam
C1 - 11 to 40 inches: fine sandy loam
C2 - 40 to 56 inches: loam
C3 - 56 to 72 inches: fine sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Retrop, frequently flooded

Percent of map unit: 8 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096OK - Subirrigated (Moderately Saline) PE 32-44 (Obsolete) Refer To 78CY095OK
Hydric soil rating: No

Tribbey, frequently flooded

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R084AY095OK - Subirrigated Bottomland
Hydric soil rating: No

LaB—Lawton loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2w5q5
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 180 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lawton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lawton

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Granitic outwash and loamy alluvium

Typical profile

Ap - 0 to 11 inches: loam
BA - 11 to 18 inches: clay loam
Bt - 18 to 47 inches: clay loam
BC - 47 to 80 inches: gravelly clay loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R082BY056OK - Loamy Prairie PE 38-48
Hydric soil rating: No

Minor Components

Farry

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY110TX - Sandy Loam 23-31" PZ
Hydric soil rating: No

Foard

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear

Across-slope shape: Convex
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Tillman

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Lc—Lela clay, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: dtpn
Elevation: 700 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 57 to 65 degrees F
Frost-free period: 185 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lela, occasionally flooded, and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lela, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium derived from sedimentary rock

Typical profile

A - 0 to 16 inches: clay
C - 16 to 80 inches: clay

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None

Calcium carbonate, maximum content: 2 percent
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Minor Components

Miller, occasionally flooded

Percent of map unit: 10 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Port, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Ashport, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Mclain, rarely flooded

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Lebron, occasionally flooded

Percent of map unit: 1 percent
Landform: Depressions on flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R080AY090OK - Ponded Bottomland
Hydric soil rating: Yes

Pc—Ashport clay loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2tq71
Elevation: 700 to 1,500 feet
Mean annual precipitation: 31 to 40 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 200 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ashport, occasionally flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 5 inches: clay loam
A - 5 to 16 inches: silty clay loam
Bw - 16 to 36 inches: silty clay loam
Ab - 36 to 52 inches: loam
Bwb - 52 to 79 inches: loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B

Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Miller, occasionally flooded
Percent of map unit: 5 percent
Landform: Backswamps on flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Yahola, occasionally flooded
Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Easpur, occasionally flooded
Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Ps—Ashport-Oscar complex, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting
National map unit symbol: 2yh69
Elevation: 1,070 to 1,290 feet
Mean annual precipitation: 29 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 181 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Ashport, occasionally flooded, and similar soils: 60 percent
Oscar, saline, occasionally flooded, and similar soils: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 6 inches: silt loam
Bw - 6 to 31 inches: silty clay loam
C - 31 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Oscar, Saline, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Saline loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 5 inches: loam
Btnz - 5 to 12 inches: silty clay loam
BCkn - 12 to 24 inches: silty clay loam
C - 24 to 63 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Slightly saline to strongly saline (4.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 80.0
Available water supply, 0 to 60 inches: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: R080AY001OK - Alkali Bottomland
Hydric soil rating: No

Minor Components

Port, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Miller, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Lela, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

United States
Department of
Agriculture

NRCS

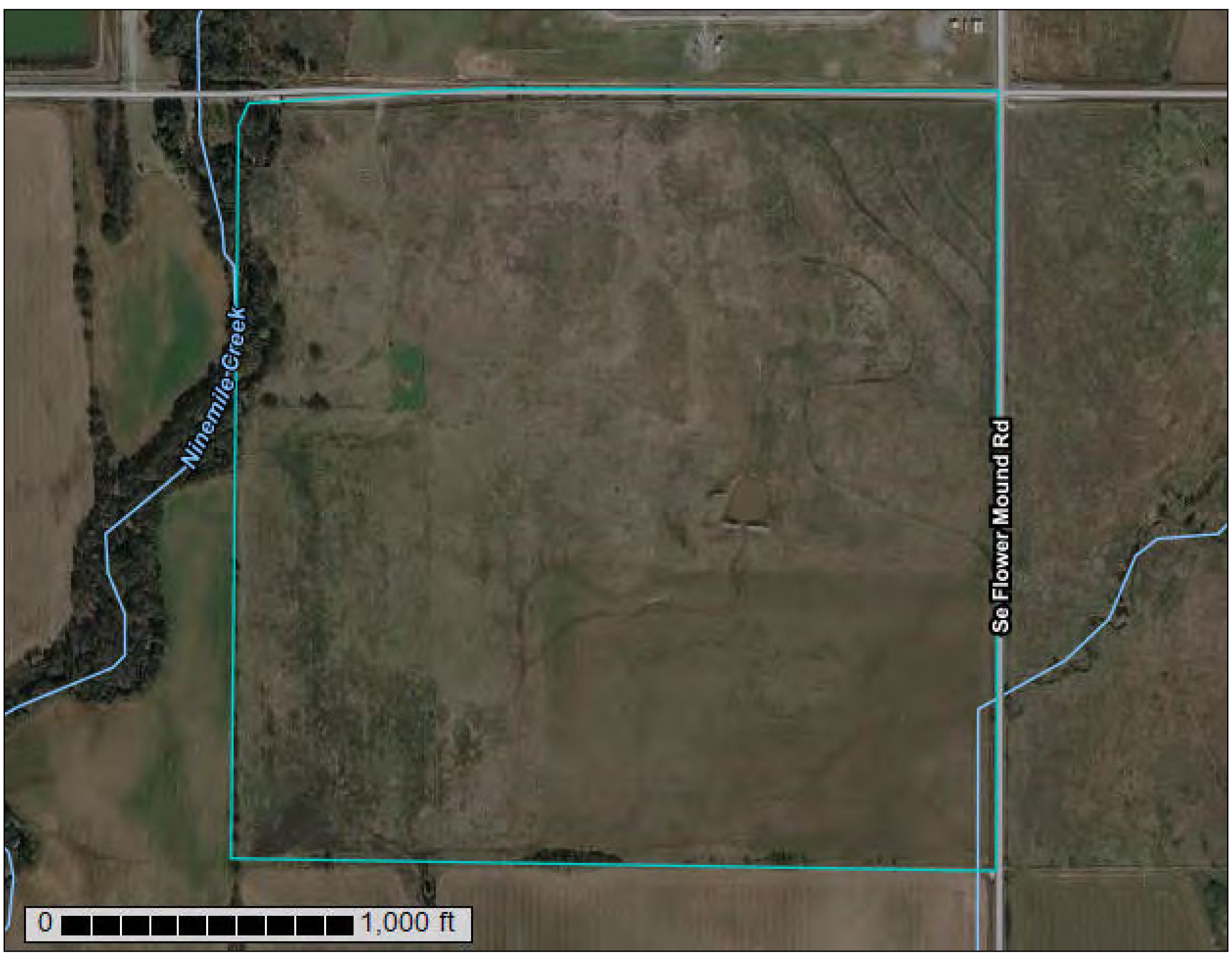
Natural
Resources
Conservation
Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Comanche County, Oklahoma

Lawton WWTP / Site 6



May 4, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

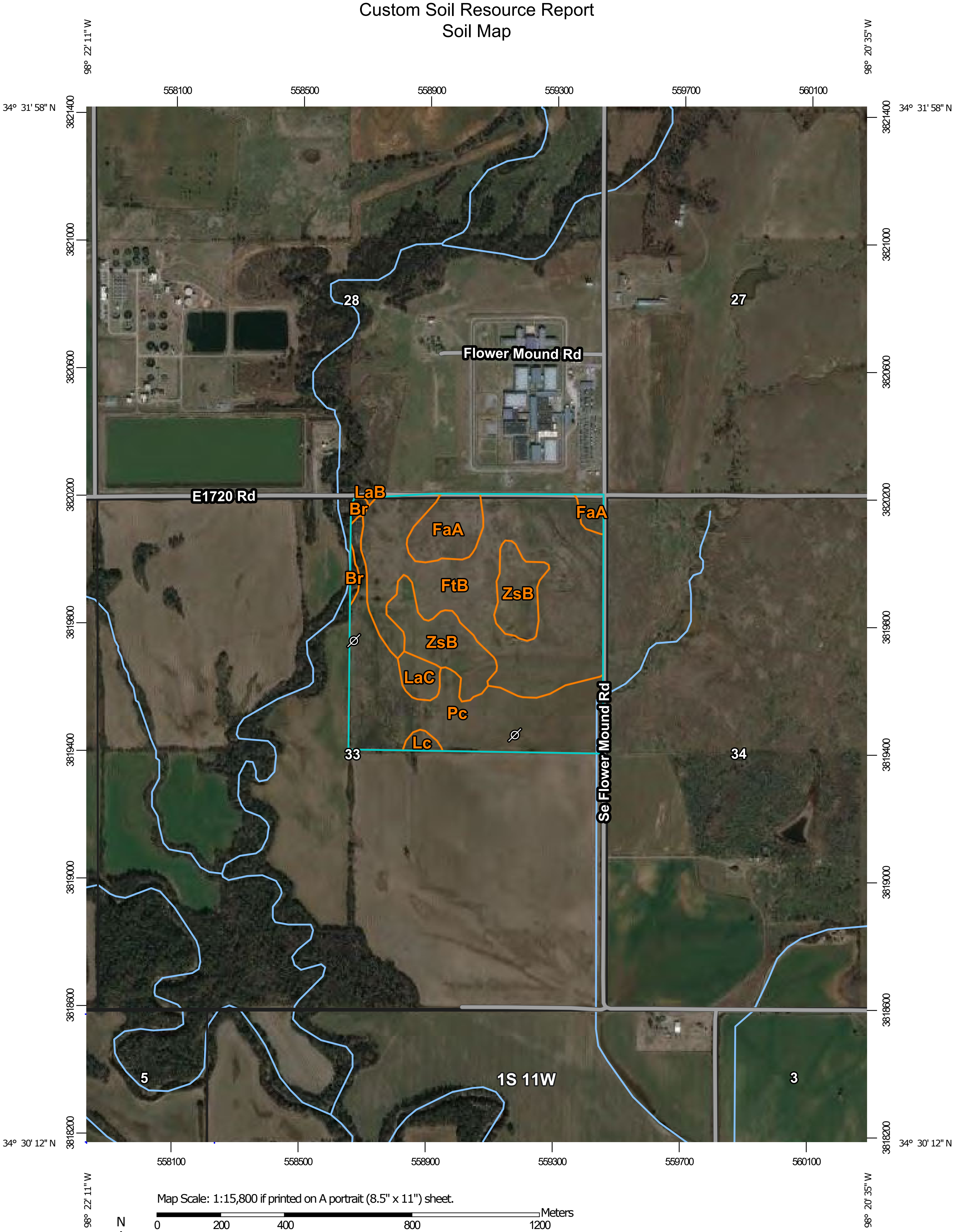
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features
- PLSS Township and Range
- PLSS Section

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded	1.6	1.0%
FaA	Foard silt loam, 0 to 1 percent slopes	12.0	7.5%
FtB	Foard and Tillman soils, 1 to 3 percent slopes	71.3	44.8%
LaB	Lawton loam, 1 to 3 percent slopes	0.1	0.1%
LaC	Lawton loam, 3 to 5 percent slopes	3.7	2.3%
Lc	Lela clay, 0 to 1 percent slopes, occasionally flooded	1.4	0.9%
Pc	Ashport clay loam, 0 to 1 percent slopes, occasionally flooded	47.2	29.6%
ZsB	Zaneis-Huska complex, 1 to 3 percent slopes	22.1	13.8%
Totals for Area of Interest		**159.3**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Comanche County, Oklahoma

Br—Ashport, Port and Yahola soils, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2yh68
Elevation: 1,080 to 1,200 feet
Mean annual precipitation: 31 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 180 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ashport, frequently flooded, and similar soils: 40 percent
Port, frequently flooded, and similar soils: 34 percent
Yahola, frequently flooded, and similar soils: 16 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: silty clay loam
Bw1 - 14 to 27 inches: silt loam
Bw2 - 27 to 80 inches: stratified fine sandy loam to silt loam to silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 3.0
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Port, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium derived from sedimentary rock

Typical profile

A1 - 0 to 7 inches: silt loam
A2 - 7 to 27 inches: silt loam
Bw - 27 to 46 inches: silt loam
Ab - 46 to 51 inches: silt loam
Bwb - 51 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Description of Yahola, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 11 inches: fine sandy loam
C1 - 11 to 40 inches: fine sandy loam
C2 - 40 to 56 inches: loam
C3 - 56 to 72 inches: fine sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Retrop, frequently flooded

Percent of map unit: 8 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096OK - Subirrigated (Moderately Saline) PE 32-44 (Obsolete) Refer To 78CY095OK
Hydric soil rating: No

Tribbey, frequently flooded

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R084AY095OK - Subirrigated Bottomland
Hydric soil rating: No

FaA—Foard silt loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2w5qg
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 185 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Foard and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Foard

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Granitic clayey alluvium derived from granite over clayey alluvium derived from shale and siltstone

Typical profile

A - 0 to 9 inches: silt loam
Btss - 9 to 22 inches: silty clay
Btknss - 22 to 48 inches: silty clay loam
BCnss - 48 to 56 inches: silty clay loam
Cn - 56 to 66 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 25.0
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: D
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Minor Components

Hollister

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Hinkle

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R078CY091OK - Slickspot
Hydric soil rating: No

Tillman

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Indiahoma

Percent of map unit: 4 percent
Landform: Hillslopes on hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Roscoe

Percent of map unit: 1 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R080AY025OK - Depressional Upland
Hydric soil rating: No

FtB—Foard and Tillman soils, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: dtp9
Elevation: 900 to 3,000 feet
Mean annual precipitation: 17 to 30 inches
Mean annual air temperature: 37 to 68 degrees F
Frost-free period: 185 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Foard and similar soils: 60 percent
Tillman and similar soils: 30 percent

Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Foard

Setting

Landform: Pediments on paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Clayey alluvium derived from granite over residuum weathered from shale and siltstone

Typical profile

A - 0 to 9 inches: silt loam
Bt - 9 to 22 inches: clay
Btk - 22 to 48 inches: clay
BCk - 48 to 56 inches: clay
C - 56 to 80 inches: clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 25.0
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: D
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Description of Tillman

Setting

Landform: Pediments on paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous clayey and loamy alluvium derived from claystone

Typical profile

A - 0 to 6 inches: silty clay loam
BA - 6 to 13 inches: clay loam
Bt - 13 to 24 inches: silty clay
Btk - 24 to 40 inches: silty clay
BCk - 40 to 50 inches: silty clay

C - 50 to 80 inches: clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to moderately saline (0.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 12.0
Available water supply, 0 to 60 inches: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Minor Components

Vernon

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY065OK - Red Clay (North)
Hydric soil rating: No

Hinkle

Percent of map unit: 3 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R078CY091OK - Slickspot
Hydric soil rating: No

Stamford

Percent of map unit: 3 percent
Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

LaB—Lawton loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2w5q5
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 180 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lawton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lawton

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Granitic outwash and loamy alluvium

Typical profile

Ap - 0 to 11 inches: loam
BA - 11 to 18 inches: clay loam
Bt - 18 to 47 inches: clay loam
BC - 47 to 80 inches: gravelly clay loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R082BY056OK - Loamy Prairie PE 38-48
Hydric soil rating: No

Minor Components

Farry

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY110TX - Sandy Loam 23-31" PZ
Hydric soil rating: No

Foard

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Tillman

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

LaC—Lawton loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2w5q8
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 185 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lawton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lawton

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Granitic outwash and loamy alluvium

Typical profile
Ap - 0 to 11 inches: loam
BA - 11 to 18 inches: clay loam
Bt - 18 to 47 inches: clay loam
BC - 47 to 80 inches: gravelly clay loam

Properties and qualities
Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R082BY056OK - Loamy Prairie PE 38-48
Hydric soil rating: No

Minor Components

Foard
Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Tillman
Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Vernon
Percent of map unit: 5 percent
Landform: Hillslopes on hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY112TX - Red Clay (South) 23-30" PZ

Hydric soil rating: No

Lc—Lela clay, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: dtpn
Elevation: 700 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 57 to 65 degrees F
Frost-free period: 185 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lela, occasionally flooded, and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lela, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium derived from sedimentary rock

Typical profile

A - 0 to 16 inches: clay
C - 16 to 80 inches: clay

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Minor Components

Miller, occasionally flooded

Percent of map unit: 10 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Port, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Ashport, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Mclain, rarely flooded

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Lebron, occasionally flooded

Percent of map unit: 1 percent
Landform: Depressions on flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R080AY090OK - Ponded Bottomland
Hydric soil rating: Yes

Pc—Ashport clay loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2tq71
Elevation: 700 to 1,500 feet
Mean annual precipitation: 31 to 40 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 200 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ashport, occasionally flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 5 inches: clay loam
A - 5 to 16 inches: silty clay loam
Bw - 16 to 36 inches: silty clay loam
Ab - 36 to 52 inches: loam
Bwb - 52 to 79 inches: loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B

Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Miller, occasionally flooded

Percent of map unit: 5 percent
Landform: Backswamps on flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Yahola, occasionally flooded

Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Easpur, occasionally flooded

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

ZsB—Zaneis-Huska complex, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tq65
Elevation: 700 to 1,500 feet
Mean annual precipitation: 29 to 37 inches
Mean annual air temperature: 59 to 61 degrees F
Frost-free period: 190 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Zaneis and similar soils: 65 percent
Huska and similar soils: 30 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zaneis

Setting

Landform: Hillslopes on low hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 12 inches: loam
BA - 12 to 19 inches: loam
Bt1 - 19 to 39 inches: clay loam
Bt2 - 39 to 55 inches: sandy clay loam
BC - 55 to 59 inches: sandy clay loam
Cr - 59 to 69 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 57 to 60 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: R080AY056OK - Loamy Upland
Hydric soil rating: No

Description of Huska

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Saline clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 6 inches: silt loam
Btn - 6 to 18 inches: silty clay loam
Btknz - 18 to 25 inches: silty clay loam
Btnyz - 25 to 34 inches: clay
B'tn - 34 to 50 inches: clay
2Cr - 50 to 60 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 49 to 60 inches to paralithic bedrock
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Very slightly saline to strongly saline (2.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 45.0
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: R080AY091OK - Slickspot
Hydric soil rating: No

Minor Components

Grainola

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080AY010OK - Claypan Upland (North)
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

United States Department of Agriculture

NRCS

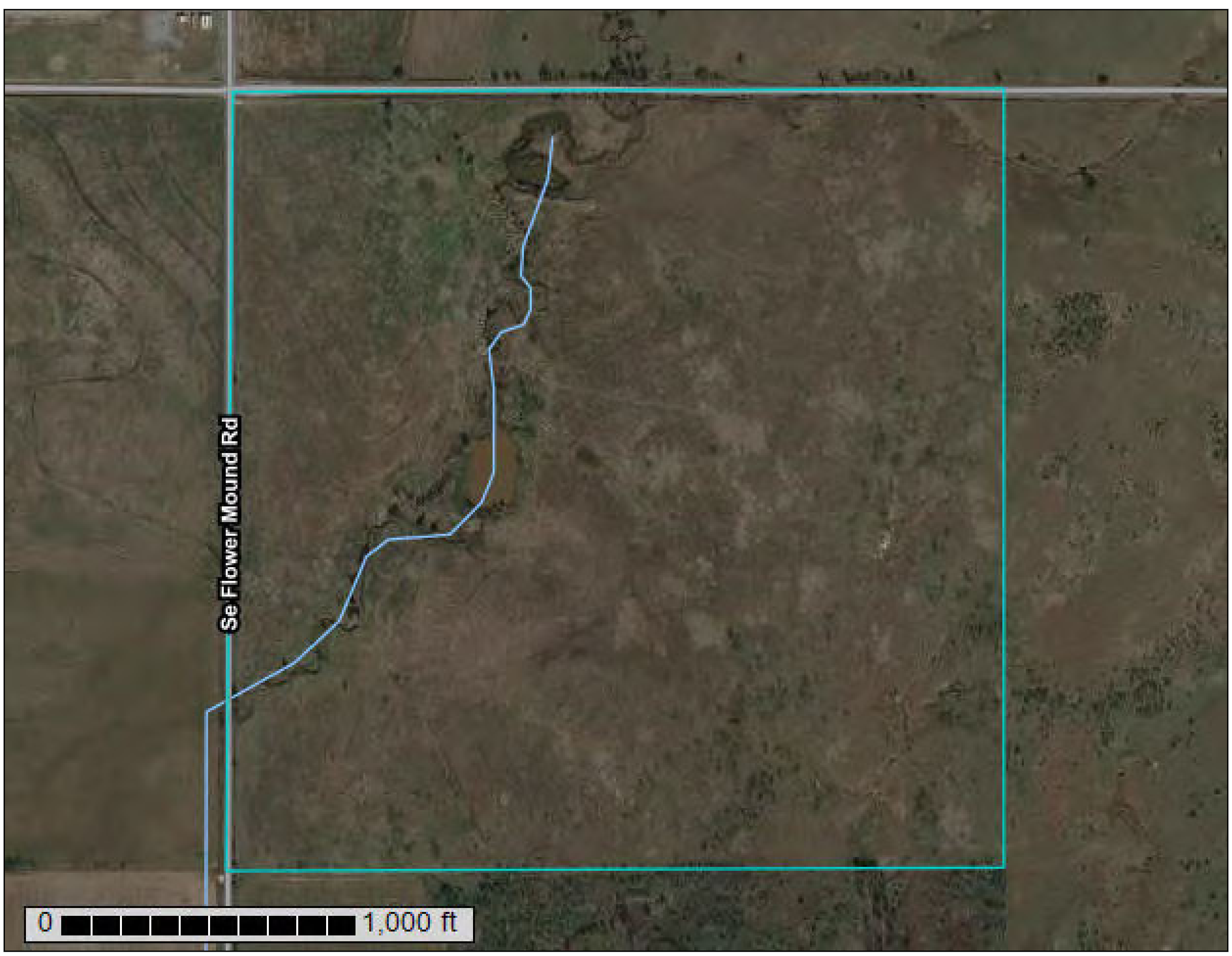
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Comanche County, Oklahoma

Lawton WWTP / Site 7



May 4, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

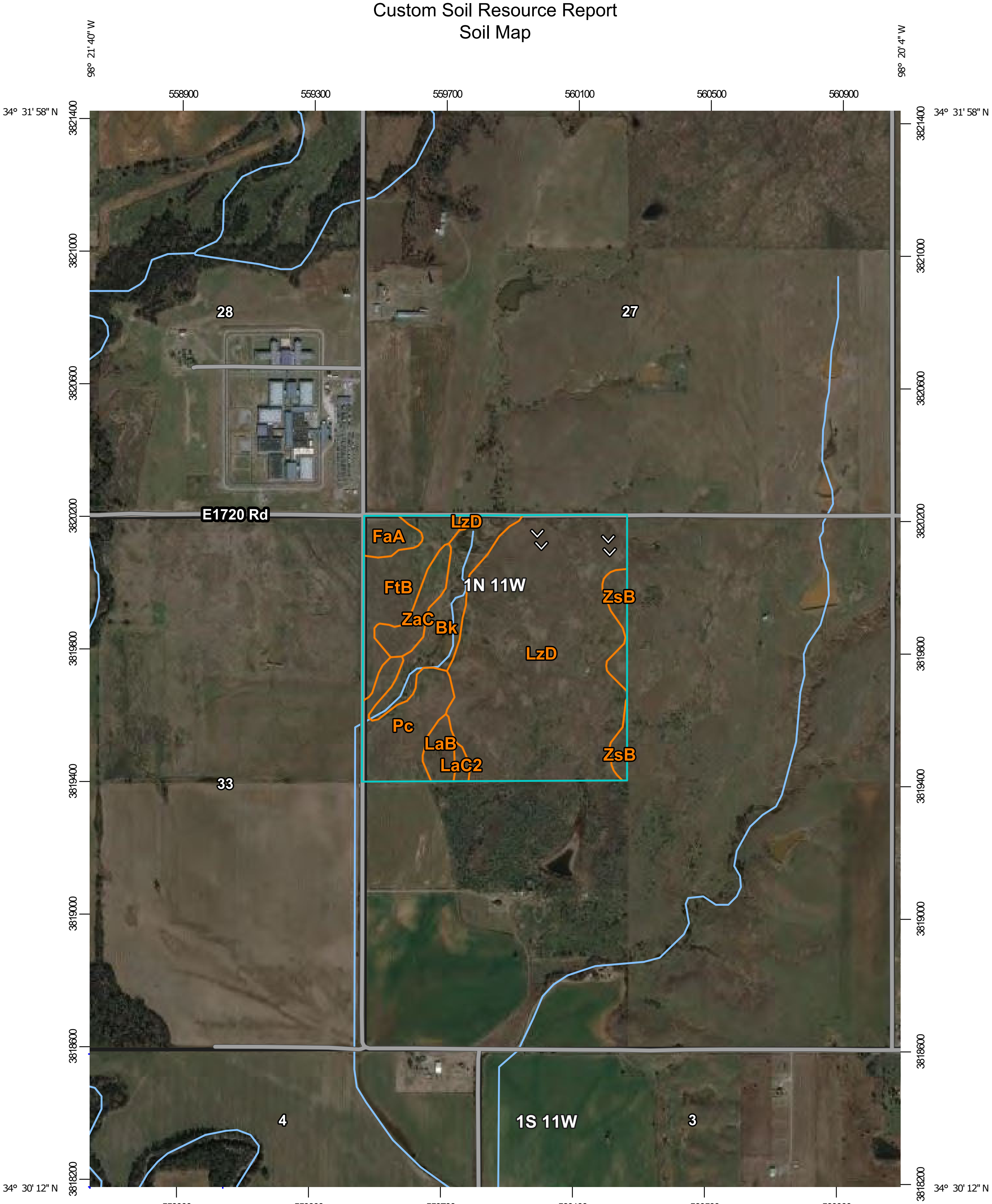
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features

- PLSS Township and Range
- PLSS Section

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Bk	Vernon-Clairemont complex, 0 to 12 percent slopes	15.3	9.6%
FaA	Foard silt loam, 0 to 1 percent slopes	4.4	2.7%
FtB	Foard and Tillman soils, 1 to 3 percent slopes	15.1	9.5%
LaB	Lawton loam, 1 to 3 percent slopes	3.7	2.3%
LaC2	Lawton loam, 3 to 5 percent slopes, eroded	1.1	0.7%
LzD	Lucien-Grainola-Zaneis complex, 5 to 12 percent slopes	91.5	57.5%
Pc	Ashport clay loam, 0 to 1 percent slopes, occasionally flooded	16.4	10.3%
ZaC	Zaneis loam, 3 to 5 percent slopes	6.2	3.9%
ZsB	Zaneis-Huska complex, 1 to 3 percent slopes	5.6	3.5%
Totals for Area of Interest		**159.2**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Comanche County, Oklahoma

Bk—Vernon-Clairemont complex, 0 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2t025
Elevation: 1,000 to 2,050 feet
Mean annual precipitation: 30 to 35 inches
Mean annual air temperature: 60 to 63 degrees F
Frost-free period: 200 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Vernon and similar soils: 55 percent
Clairemont and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vernon

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Clayey residuum weathered from claystone

Typical profile

A - 0 to 5 inches: clay
Bk - 5 to 25 inches: clay
Cd - 25 to 80 inches: clay

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to densic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to moderately saline (1.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 25.0
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R078CY112TX - Red Clay (South) 23-30" PZ
Hydric soil rating: No

Description of Clairemont

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous silty alluvium derived from siltstone

Typical profile

A - 0 to 8 inches: silt loam
C - 8 to 80 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.35 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: High (about 11.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: R078CY103TX - Loamy Bottomland 23-31" PZ
Hydric soil rating: No

Minor Components

Tillman

Percent of map unit: 8 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Ashport

Percent of map unit: 6 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Rock outcrop

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

FaA—Foard silt loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2w5qg
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 185 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Foard and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Foard

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Granitic clayey alluvium derived from granite over clayey alluvium derived from shale and siltstone

Typical profile

A - 0 to 9 inches: silt loam
Btss - 9 to 22 inches: silty clay
Btknss - 22 to 48 inches: silty clay loam
BCnss - 48 to 56 inches: silty clay loam
Cn - 56 to 66 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 25.0
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: D
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Minor Components

Hollister

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Hinkle

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R078CY091OK - Slickspot
Hydric soil rating: No

Tillman

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Indiahoma

Percent of map unit: 4 percent
Landform: Hillslopes on hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Roscoe

Percent of map unit: 1 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread

Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R080AY025OK - Depressional Upland
Hydric soil rating: No

FtB—Foard and Tillman soils, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: dtp9
Elevation: 900 to 3,000 feet
Mean annual precipitation: 17 to 30 inches
Mean annual air temperature: 37 to 68 degrees F
Frost-free period: 185 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Foard and similar soils: 60 percent
Tillman and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Foard

Setting

Landform: Pediments on paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Clayey alluvium derived from granite over residuum weathered from shale and siltstone

Typical profile

A - 0 to 9 inches: silt loam
Bt - 9 to 22 inches: clay
Btk - 22 to 48 inches: clay
BCk - 48 to 56 inches: clay
C - 56 to 80 inches: clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)

Sodium adsorption ratio, maximum: 25.0
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: D
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Description of Tillman

Setting

Landform: Pediments on paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous clayey and loamy alluvium derived from claystone

Typical profile

A - 0 to 6 inches: silty clay loam
BA - 6 to 13 inches: clay loam
Bt - 13 to 24 inches: silty clay
Btk - 24 to 40 inches: silty clay
BCk - 40 to 50 inches: silty clay
C - 50 to 80 inches: clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to moderately saline (0.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 12.0
Available water supply, 0 to 60 inches: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Minor Components

Vernon

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope

Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY065OK - Red Clay (North)
Hydric soil rating: No

Hinkle

Percent of map unit: 3 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R078CY091OK - Slickspot
Hydric soil rating: No

Stamford

Percent of map unit: 3 percent
Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

LaB—Lawton loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2w5q5
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 180 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lawton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lawton

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Granitic outwash and loamy alluvium

Typical profile

Ap - 0 to 11 inches: loam
BA - 11 to 18 inches: clay loam

Bt - 18 to 47 inches: clay loam
BC - 47 to 80 inches: gravelly clay loam

Properties and qualities
Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R082BY056OK - Loamy Prairie PE 38-48
Hydric soil rating: No

Minor Components

Farry
Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY110TX - Sandy Loam 23-31" PZ
Hydric soil rating: No

Foard
Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Tillman
Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

LaC2—Lawton loam, 3 to 5 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2w5q9
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 180 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Lawton, eroded, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lawton, Eroded

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Granitic outwash and loamy alluvium

Typical profile

Ap - 0 to 5 inches: loam
Bt - 5 to 62 inches: clay loam
BC - 62 to 80 inches: gravelly clay loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R082BY056OK - Loamy Prairie PE 38-48
Hydric soil rating: No

Minor Components

Tillman, eroded

Percent of map unit: 10 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Foard, eroded

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Farry, eroded

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY110TX - Sandy Loam 23-31" PZ
Hydric soil rating: No

LzD—Lucien-Grainola-Zaneis complex, 5 to 12 percent slopes

Map Unit Setting

National map unit symbol: dtpr
Elevation: 700 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 190 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Lucien and similar soils: 35 percent
Grainola and similar soils: 30 percent
Zaneis and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lucien

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 10 inches: loam
Cr - 10 to 20 inches: bedrock

Properties and qualities

Slope: 5 to 12 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R080AY083OK - Shallow Upland
Hydric soil rating: No

Description of Grainola

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous clayey residuum weathered from shale

Typical profile

A - 0 to 4 inches: clay loam
BA - 4 to 17 inches: stony clay loam
Btk - 17 to 36 inches: silty clay
Cr - 36 to 50 inches: bedrock

Properties and qualities

Slope: 5 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R080AY011OK - Claypan Upland (South)
Hydric soil rating: No

Description of Zaneis

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 6 inches: loam
BA - 6 to 12 inches: clay loam
Bt - 12 to 50 inches: clay loam
Cr - 50 to 61 inches: bedrock

Properties and qualities

Slope: 5 to 8 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R080AY056OK - Loamy Upland
Hydric soil rating: No

Minor Components

Minco

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080AY056OK - Loamy Upland
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Yahola, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Pc—Ashport clay loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2tq71
Elevation: 700 to 1,500 feet
Mean annual precipitation: 31 to 40 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 200 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ashport, occasionally flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashport, Occasionally Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 5 inches: clay loam
A - 5 to 16 inches: silty clay loam
Bw - 16 to 36 inches: silty clay loam
Ab - 36 to 52 inches: loam
Bwb - 52 to 79 inches: loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Minor Components

Miller, occasionally flooded

Percent of map unit: 5 percent
Landform: Backswamps on flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: R080AY045OK - Clay Bottomland
Hydric soil rating: No

Yahola, occasionally flooded

Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

Easpur, occasionally flooded

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

ZaC—Zaneis loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2tp4l
Elevation: 920 to 1,200 feet
Mean annual precipitation: 33 to 39 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 181 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Zaneis and similar soils: 87 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zaneis

Setting

Landform: Hillslopes on low hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 12 inches: loam
BA - 12 to 19 inches: loam
Bt1 - 19 to 39 inches: clay loam
Bt2 - 39 to 55 inches: sandy clay loam
BC - 55 to 59 inches: sandy clay loam
Cr - 59 to 69 inches: bedrock

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: 57 to 60 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: R080AY056OK - Loamy Upland

Hydric soil rating: No

Minor Components

Renfrow

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Ecological site: R080AY010OK - Claypan Upland (North)
Hydric soil rating: No

Coyle

Percent of map unit: 3 percent
Landform: Low hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080AY056OK - Loamy Upland
Hydric soil rating: No

Grainola

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080AY010OK - Claypan Upland (North)
Hydric soil rating: No

Lucien

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080AY083OK - Shallow Upland
Hydric soil rating: No

ZsB—Zaneis-Huska complex, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tq65
Elevation: 700 to 1,500 feet
Mean annual precipitation: 29 to 37 inches
Mean annual air temperature: 59 to 61 degrees F

Frost-free period: 190 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Zaneis and similar soils: 65 percent
Huska and similar soils: 30 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zaneis

Setting

Landform: Hillslopes on low hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 12 inches: loam
BA - 12 to 19 inches: loam
Bt1 - 19 to 39 inches: clay loam
Bt2 - 39 to 55 inches: sandy clay loam
BC - 55 to 59 inches: sandy clay loam
Cr - 59 to 69 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 57 to 60 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: R080AY056OK - Loamy Upland
Hydric soil rating: No

Description of Huska

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Saline clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 6 inches: silt loam
Btn - 6 to 18 inches: silty clay loam
Btknz - 18 to 25 inches: silty clay loam
Btnyz - 25 to 34 inches: clay
B'tn - 34 to 50 inches: clay
2Cr - 50 to 60 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 49 to 60 inches to paralithic bedrock
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Very slightly saline to strongly saline (2.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 45.0
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: R080AY091OK - Slickspot
Hydric soil rating: No

Minor Components

Grainola

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080AY010OK - Claypan Upland (North)
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

United States Department of Agriculture

NRCS

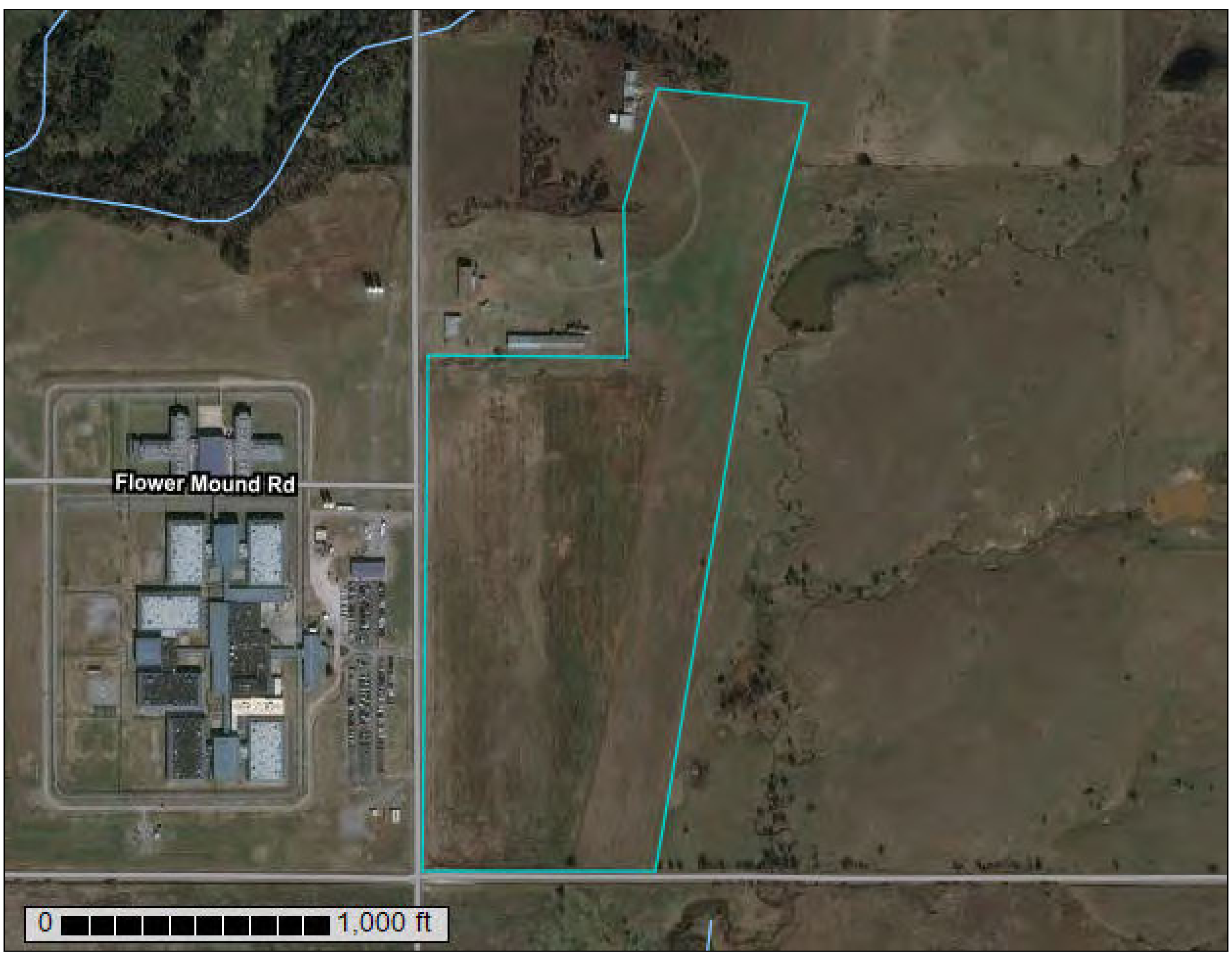
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Comanche County, Oklahoma

Lawton WWTP / Site 8 and 9



May 4, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

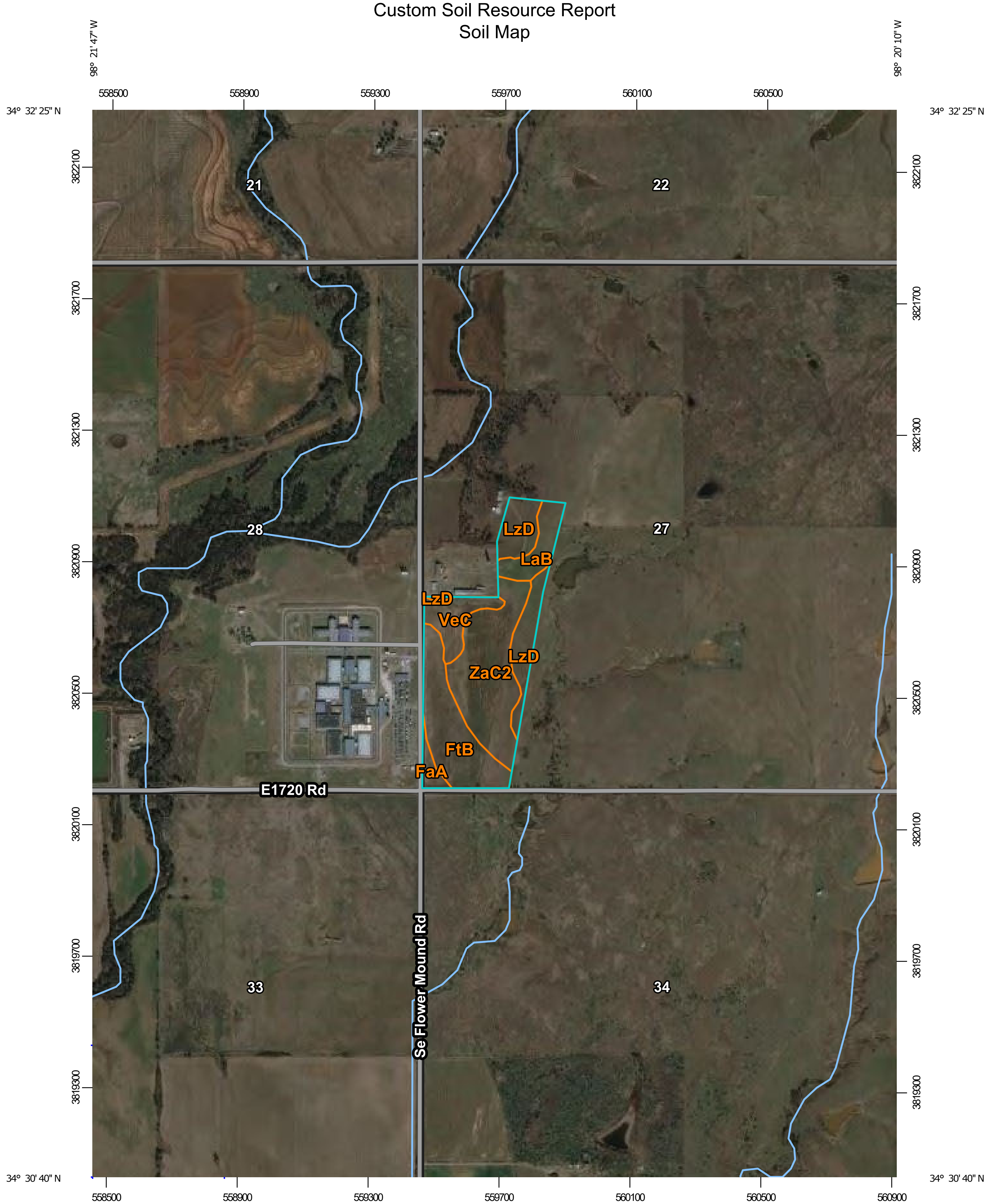
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

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

Political Features

PLSS Township and Range

PLSS Section

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Comanche County, Oklahoma
Survey Area Data: Version 18, Aug 27, 2021

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

Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FaA	Foard silt loam, 0 to 1 percent slopes	1.7	3.0%
FtB	Foard and Tillman soils, 1 to 3 percent slopes	14.4	25.1%
LaB	Lawton loam, 1 to 3 percent slopes	5.1	9.0%
LzD	Lucien-Grainola-Zaneis complex, 5 to 12 percent slopes	10.5	18.3%
VeC	Vernon clay, 1 to 5 percent slopes	5.4	9.4%
ZaC2	Zaneis loam, 3 to 5 percent slopes, eroded	20.1	35.2%
Totals for Area of Interest		**57.2**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Comanche County, Oklahoma

FaA—Foard silt loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2w5qg
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 185 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Foard and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Foard

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Granitic clayey alluvium derived from granite over clayey alluvium derived from shale and siltstone

Typical profile

A - 0 to 9 inches: silt loam
Btss - 9 to 22 inches: silty clay
Btknss - 22 to 48 inches: silty clay loam
BCnss - 48 to 56 inches: silty clay loam
Cn - 56 to 66 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 25.0
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: D
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Minor Components

Hollister

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Hinkle

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R078CY091OK - Slickspot
Hydric soil rating: No

Tillman

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Indiahoma

Percent of map unit: 4 percent
Landform: Hillslopes on hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Roscoe

Percent of map unit: 1 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R080AY025OK - Depressional Upland
Hydric soil rating: No

FtB—Foard and Tillman soils, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: dtp9
Elevation: 900 to 3,000 feet
Mean annual precipitation: 17 to 30 inches
Mean annual air temperature: 37 to 68 degrees F
Frost-free period: 185 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Foard and similar soils: 60 percent
Tillman and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Foard

Setting

Landform: Pediments on paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Clayey alluvium derived from granite over residuum weathered from shale and siltstone

Typical profile

A - 0 to 9 inches: silt loam
Bt - 9 to 22 inches: clay
Btk - 22 to 48 inches: clay
BCk - 48 to 56 inches: clay
C - 56 to 80 inches: clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 25.0
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: D
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Description of Tillman

Setting

Landform: Pediments on paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous clayey and loamy alluvium derived from claystone

Typical profile

A - 0 to 6 inches: silty clay loam
BA - 6 to 13 inches: clay loam
Bt - 13 to 24 inches: silty clay
Btk - 24 to 40 inches: silty clay
BCk - 40 to 50 inches: silty clay
C - 50 to 80 inches: clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to moderately saline (0.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 12.0
Available water supply, 0 to 60 inches: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Minor Components

Vernon

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY065OK - Red Clay (North)
Hydric soil rating: No

Hinkle

Percent of map unit: 3 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R078CY091OK - Slickspot
Hydric soil rating: No

Stamford

Percent of map unit: 3 percent
Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

LaB—Lawton loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2w5q5
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 180 to 230 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lawton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lawton

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Granitic outwash and loamy alluvium

Typical profile

Ap - 0 to 11 inches: loam
BA - 11 to 18 inches: clay loam
Bt - 18 to 47 inches: clay loam
BC - 47 to 80 inches: gravelly clay loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R082BY056OK - Loamy Prairie PE 38-48
Hydric soil rating: No

Minor Components

Farry

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R078CY110TX - Sandy Loam 23-31" PZ
Hydric soil rating: No

Foard

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

Tillman

Percent of map unit: 5 percent
Landform: Paleoterraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

LzD—Lucien-Grainola-Zaneis complex, 5 to 12 percent slopes

Map Unit Setting

National map unit symbol: dtpr
Elevation: 700 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 190 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Lucien and similar soils: 35 percent
Grainola and similar soils: 30 percent
Zaneis and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lucien

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 10 inches: loam
Cr - 10 to 20 inches: bedrock

Properties and qualities

Slope: 5 to 12 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R080AY083OK - Shallow Upland
Hydric soil rating: No

Description of Grainola

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous clayey residuum weathered from shale

Typical profile

A - 0 to 4 inches: clay loam
BA - 4 to 17 inches: stony clay loam
Btk - 17 to 36 inches: silty clay
Cr - 36 to 50 inches: bedrock

Properties and qualities

Slope: 5 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R080AY011OK - Claypan Upland (South)
Hydric soil rating: No

Description of Zaneis

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 6 inches: loam
BA - 6 to 12 inches: clay loam
Bt - 12 to 50 inches: clay loam
Cr - 50 to 61 inches: bedrock

Properties and qualities

Slope: 5 to 8 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R080AY056OK - Loamy Upland
Hydric soil rating: No

Minor Components

Minco

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080AY056OK - Loamy Upland
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Yahola, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R080AY050OK - Loamy Bottomland
Hydric soil rating: No

VeC—Vernon clay, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2t01y
Elevation: 900 to 1,500 feet

Mean annual precipitation: 28 to 32 inches
Mean annual air temperature: 62 to 65 degrees F
Frost-free period: 210 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Vernon

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Clayey residuum weathered from claystone

Typical profile

A - 0 to 6 inches: clay
Bk - 6 to 28 inches: clay
Cd - 28 to 80 inches: clay

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: 20 to 40 inches to densic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to moderately saline (1.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 25.0
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: D
Ecological site: R078CY112TX - Red Clay (South) 23-30" PZ
Hydric soil rating: No

Minor Components

Knoco

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex

Ecological site: R078CY114TX - Shallow Red Clay 23-31" PZ
Hydric soil rating: No

Bluegrove

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080BY164TX - Tight Sandy Loam 26-33" PZ
Hydric soil rating: No

Tillman

Percent of map unit: 2 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R078CY096TX - Clay Loam 23-30" PZ
Hydric soil rating: No

ZaC2—Zaneis loam, 3 to 5 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2tq6y
Elevation: 750 to 1,350 feet
Mean annual precipitation: 33 to 39 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 190 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Zaneis, eroded, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zaneis, Eroded

Setting

Landform: Low hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 12 inches: loam
Bt1 - 12 to 47 inches: clay loam
Bt2 - 47 to 55 inches: sandy clay loam

Cr - 55 to 65 inches: bedrock

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: 49 to 57 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 3.0 mmhos/cm)
Sodium adsorption ratio, maximum: 3.0
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R080AY056OK - Loamy Upland
Hydric soil rating: No

Minor Components

Lucien, eroded

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080AY083OK - Shallow Upland
Hydric soil rating: No

Renfrow, eroded

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R080AY010OK - Claypan Upland (North)
Hydric soil rating: No

Coyle, eroded

Percent of map unit: 5 percent
Landform: Low hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R080AY056OK - Loamy Upland
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

EXHIBIT I

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY FORM 850SMP

OKLAHOMA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Oklahoma Department of Environmental Quality
707 N. Robinson, OKC OK 73102-6010

Application for Municipal Sludge Land Application Permit

As required by the Oklahoma Environmental Quality Code

This application is to be submitted to obtain a Municipal Sludge Land Application Permit.
Application, plans, and specifications submitted in triplicate through the County DEQ personnel.

To the Executive Director of The Department of Environmental Quality
Department of Environmental Quality
Water Quality Division
P.O. Box 1677
Oklahoma City, OK 73101-1677

Date: 4-1-2022

Application

The applicant, City of Lawton WWTF (Name of Applicant (Print or Type)), proposes to land apply sludge

generated at City of Lawton WWTF (Name of Treatment Plant (Print or Type)), facility ID No. S-11303.

located at SE 1/4, SE 1/4, SW 1/4, Sec 28, T1N, R11W, Indian Meridian, Comanche County (Legal Description)

City of Lawton WWTF (Name of Applicant), hereby makes application for a permit to land apply sludge as required by OAC 252:606 of the Oklahoma Environmental Quality Code, 27A O.S. Supp. 2000, Section 2-1-2-101 et seq., the Solid Waste Management Act, 27A:2-10-101 et siq., Article VI of the Code [Water Quality], 27A:2-6-101 et siq., the Oklahoma Pollutant Discharge Elimination System Act, 27A:2-6-201 et sig. And any rules and regulations pursuant thereto.

Applicant Signature

Note: Application must be signed by the authorized chief elective or executive officer of the applicant. Information must be legible.

Stanley Booker
Signature

Stan Booker
Name of Authorized Signature (Print or Type)

Mayor
Title

City of Lawton
Name of Organization (Print or Type)

212 SW 9th St.
Street Address (Print or Type)

Lawton OK 73501
City/State/Zip Code

COUNTY DEQ PERSONNEL ONLY	DO NOT USE THIS SPACE - ODEQ ONLY
I have had the opportunity to review this application and comment on it. Signature: ____ Title: ____ County: ____ Date: ____	

EXHIBIT J

OKLAHOMA DEQ APPLICATION FOR LAND APPLICATION

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
APPLICATION FOR AUTHORIZATION TO BE COVERED UNDER GENERAL PERMIT GP NO ___
FOR LAND APPLICATION OF SEWAGE SLUDGE

FORM______

FOR DEQ USE ONLY	**Application/Permit Number GP** __________ **Date Received** __________ **One Time Land Application** __________**, Minor Facility** __________ **DEQ Biosolids Coordinator** __________

SECTION I

1. **Legal name of applicant:**
   City of Lawton Wastewater Treatment Facility
2. **Mailing address of applicant:**
   Street address or PO Box 103 SW 4th Street
   City Lawton County Comanche State OK Zip 73501
   Telephone (____) 580.512.7884
3. **Name and address of facility:**
   Facility Name City of Lawton Wastewater Facility, 8104 SE 15th Steet
   City Lawton County Comanche State OK Zip 73501
4. **Location of land application site:**
   Legal Description: ___¼, ___W 1/2¼, Sec 28, T 1N, R 11W. (X) IM ( ) CM.
   Entry Point: Longitude 34 31'37"N Latitude 98 22'06"W
5. **Type Ownership** Public ( ) Private (X) Federal ( ) State ( )
6. **Contact Person:**
   Name & Title David Hastings
   Street address or PO Box __________
   City Lawton County Comanche State OK Zip 73501
   Telephone (____) 580.512.7884
7. **Type of Treatment:**
   Minor Facility: Design Capacity 18 MGD Estimated Sludge Production Varies Dry Tons/Year
   Lagoon: Estimated sludge quantity 10,000 Dry Tons
   Other sludge storage facility: Estimated sludge quantity N/A (Dry Tons)
8. **Does Facility Receive Industrial Wastes?** Yes ( ) No (X)
   If "yes", What is the average daily industrial waste flow ________ GPD
   If the facility receives wastewater from a categorical industry, you must submit Section II of this form (attached) for each categorical industrial facility discharging to the sewer system.
9. **Are industrial discharge(s) to the system controlled by ordinance?** Yes ( ) No (X)

10. Sludge generated by the facility:

A. When was the last time sludge was removed from the facility (date) not from overflow

B. Was removal authorized by DEQ? Yes ( ) No ( ) X N/A

C. How was it disposed of (describe the disposal method) N/A

D. Location(s) of the disposal site(s) (legal description to the nearest 10 acres) Adjacent

E. Sludge Management Plan, if any:
Sludge Plan ID Number One Time Cleanout approved by the Department of Environmental Quality

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I also certify that I will provide for the operation of this facility in accordance with the Oklahoma Discharge Permits and Pollution Control Regulations and will provide certified operators as required by the Oklahoma Water and Wastewater Operations Certification Act. I further certify that I shall acquire or possess a right to the use of the property or properties on which the land application activities are located as well as the access route thereto. I understand I shall maintain such right of use and access for the duration of the permit term. I am aware that there are significant penalties for submitting false information, including revocation of the permit and the possibility of fine and imprisonment.

Note: Application must be signed by the authorized chief elective or executive officer of the applicant, or by the applicant, if an individual.

Name (print) Stan Booker

Title Mayor

Date 5/3/2022

Signature [signature]

Subscribed and sworn to before me this 3rd *day of* May, 20 22

[signature] *My commission expires* 3/9/2026

This application shall be filed in duplicate with the original and one copy to be submitted to the DEQ, and one copy to be submitted to the local DEQ office.

Please return completed form with attachments to:

Water Quality Division
Department of Environmental Quality
707 N. Robinson, P>O. Box 1677
Oklahoma City, Oklahoma 73102-1677

NOTARY SEAL PUBLIC
TAMMY L. HUFFMAN
Notary Public in and for the State of Oklahoma
Commission #10002013
My Commission expires 3/09/2026

EXHIBIT K

ANALYTICAL RESULTS - TCLP

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

January 26, 2022

Jeff Hodges
Hodges Farms & Dredging LLC
501 N. West Street
Lebo, KS 66856

RE: Project: LAWTON OK
Pace Project No.: 60390689

Dear Jeff Hodges:

Enclosed are the analytical results for sample(s) received by the laboratory on January 14, 2022. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Kansas City
- Pace Analytical Services - SE Kansas

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Nolie Wood
nolie.wood@pacelabs.com
1(913)563-1401
Project Manager

Enclosures

cc: Aaron Gruenwald, Hodges Farms and Dredging, LLC

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project:	LAWTON OK
Pace Project No.:	60390689

Pace Analytical Services Kansas

9608 Loiret Boulevard, Lenexa, KS 66219
Missouri Inorganic Drinking Water Certification #: 10090
Arkansas Drinking Water
Arkansas Certification #: 20-020-0
Arkansas Drinking Water
Illinois Certification #: 2000302021-3
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212020-2
Oklahoma Certification #: 9205/9935
Florida: Cert E871149 SEKS WET
Texas Certification #: T104704407-19-12
Utah Certification #: KS000212019-9
Illinois Certification #: 004592
Kansas Field Laboratory Accreditation: # E-92587
Missouri SEKS Micro Certification: 10070

Pace Analytical Services Southeast Kansas

808 West McKay, Frontenac, KS 66763
Arkansas Certification #: 18-016-0
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10426
Louisiana Certification #: 03055
Oklahoma Certification #: 9935
Texas Certification #: T104704407
Utah Certification #: KS00021

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: LAWTON OK
Pace Project No.: 60390689

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60390689001	**1-1**	Solid	01/13/22 11:00	01/14/22 10:50
60390689002	**1-2**	Solid	01/13/22 11:00	01/14/22 10:50
60390689003	**1-3**	Solid	01/13/22 11:00	01/14/22 10:50
60390689004	**1-4**	Solid	01/13/22 11:00	01/14/22 10:50
60390689005	**1-5**	Solid	01/13/22 11:00	01/14/22 10:50
60390689006	**1-6**	Solid	01/13/22 11:00	01/14/22 10:50
60390689007	**1-7**	Solid	01/13/22 11:00	01/14/22 10:50
60390689008	**COMP**	Solid	01/13/22 11:00	01/14/22 23:05
60390689009	**COMP-LAWTON**	Solid	01/13/22 11:00	01/14/22 23:05
60390689010	**COMP-LAWTON**	Solid	01/13/22 11:00	01/14/22 23:05

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: LAWTON OK
Pace Project No.: 60390689

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60390689001	**1-1**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689002	**1-2**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689003	**1-3**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689004	**1-4**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689005	**1-5**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689006	**1-6**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689007	**1-7**	SM 9222D	MEB	1	PASI-SE
		CALC A	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689008	**COMP**	EPA 6010	MA1	14	PASI-K
		EPA 7471	CJH1	1	PASI-K
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
		EPA 9045	MAP	1	PASI-K
		TKN-NH3 Calculation	LDB	1	PASI-K
		EPA 350.1	BLA	1	PASI-K
		EPA 351.2	SK	1	PASI-K
		EPA 365.4	CRN2	1	PASI-K
		EPA 9056	CRN2	1	PASI-K
		EPA 9056	CRN2	2	PASI-K
60390689009	**COMP-LAWTON**	EPA 8082	AJA1	8	PASI-K
		ASTM D2974	DWC	1	PASI-K
60390689010	**COMP-LAWTON**	EPA 6010	MA1	7	PASI-K

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: LAWTON OK
Pace Project No.: 60390689

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 7470	CJH1	1	PASI-K

PASI-K = Pace Analytical Services - Kansas City
PASI-SE = Pace Analytical Services - SE Kansas

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: 1-1 **Lab ID: 60390689001** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**5825**	CFU/g	9.8	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.8**	%	0.50	1		01/19/22 15:20		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.2**	%	0.10	1		01/19/22 15:20		

Sample: 1-2 **Lab ID: 60390689002** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**7339**	CFU/g	9.2	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.1**	%	0.50	1		01/19/22 15:20		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.9**	%	0.10	1		01/19/22 15:20		

Sample: 1-3 **Lab ID: 60390689003** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**6085**	CFU/g	10.1	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**90.1**	%	0.50	1		01/19/22 15:21		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: 1-3 **Lab ID: 60390689003** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**9.9**	%	0.10	1		01/19/22 15:21		

Sample: 1-4 **Lab ID: 60390689004** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**7547**	CFU/g	9.4	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.4**	%	0.50	1		01/18/22 15:39		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.6**	%	0.10	1		01/18/22 15:39		

Sample: 1-5 **Lab ID: 60390689005** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**9615**	CFU/g	9.6	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.6**	%	0.50	1		01/19/22 15:21		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.4**	%	0.10	1		01/19/22 15:21		

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: 1-6 **Lab ID: 60390689006** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**8571**	CFU/g	9.5	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.5**	%	0.50	1		01/19/22 15:21		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.5**	%	0.10	1		01/19/22 15:21		

Sample: 1-7 **Lab ID: 60390689007** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**4000**	CFU/g	10	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Geometric Mean	Analytical Method: CALC A Pace Analytical Services - SE Kansas							
Fecal Coliforms	**6763**	CFU/g	10	1		01/15/22 11:15		
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**90.0**	%	0.50	1		01/19/22 15:22		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.0**	%	0.10	1		01/19/22 15:22		

Sample: COMP **Lab ID: 60390689008** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050 Pace Analytical Services - Kansas City							
Arsenic	**29.1**	mg/kg	7.4	1	01/19/22 16:00	01/25/22 19:42	7440-38-2	
Cadmium	ND	mg/kg	3.7	1	01/19/22 16:00	01/25/22 19:42	7440-43-9	
Calcium	**60000**	mg/kg	147	1	01/19/22 16:00	01/25/22 19:42	7440-70-2	M1
Chromium	**40.2**	mg/kg	3.7	1	01/19/22 16:00	01/25/22 19:42	7440-47-3	

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: COMP **Lab ID: 60390689008** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050 Pace Analytical Services - Kansas City							
Copper	**212**	mg/kg	14.7	1	01/19/22 16:00	01/25/22 19:42	7440-50-8	
Lead	**19.2**	mg/kg	7.4	1	01/19/22 16:00	01/25/22 19:42	7439-92-1	
Magnesium	**7960**	mg/kg	36.8	1	01/19/22 16:00	01/25/22 19:42	7439-95-4	
Molybdenum	ND	mg/kg	14.7	1	01/19/22 16:00	01/25/22 19:42	7439-98-7	
Nickel	**24.6**	mg/kg	3.7	1	01/19/22 16:00	01/25/22 19:42	7440-02-0	
Potassium	**3870**	mg/kg	368	1	01/19/22 16:00	01/25/22 19:42	7440-09-7	M1
Selenium	ND	mg/kg	11.0	1	01/19/22 16:00	01/26/22 11:07	7782-49-2	
Silver	ND	mg/kg	5.1	1	01/19/22 16:00	01/25/22 19:42	7440-22-4	
Sodium	**1650**	mg/kg	368	1	01/19/22 16:00	01/25/22 19:42	7440-23-5	
Zinc	**420**	mg/kg	73.5	1	01/19/22 16:00	01/25/22 19:42	7440-66-6	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471 Pace Analytical Services - Kansas City							
Mercury	ND	mg/kg	0.13	1	01/19/22 12:30	01/20/22 13:35	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.5**	%	0.50	1		01/19/22 15:22		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.5**	%	0.10	1		01/19/22 15:22		
2540G Total Volatile Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Volatile Solids	**24.1**	% (w/w)	0.10	1		01/18/22 15:39		
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - Kansas City							
pH at 25 Degrees C	**7.1**	Std. Units	0.10	1		01/21/22 13:52		
Total Organic Nitrogen Soil	Analytical Method: TKN-NH3 Calculation Pace Analytical Services - Kansas City							
Total Organic Nitrogen	**6050**	mg/kg	50.0	1		01/26/22 16:43		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1720**	mg/kg	9.5	1	01/25/22 08:16	01/25/22 13:53	7664-41-7	
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Kansas City							
Nitrogen, Kjeldahl, Total	**7770**	mg/kg	590	1	01/19/22 10:34	01/20/22 14:54	7727-37-9	

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: COMP **Lab ID: 60390689008** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
365.4 Total Phosphorus	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Kansas City							
Phosphorus	**4970**	mg/kg	215	5	01/25/22 13:23	01/26/22 11:52	7723-14-0	
9056 IC Anions	Analytical Method: EPA 9056 Preparation Method: EPA 9056 Pace Analytical Services - Kansas City							
Chloride	**676**	mg/kg	93.5	1	01/24/22 10:57	01/24/22 17:31	16887-00-6	
9056 IC Anions	Analytical Method: EPA 9056 Preparation Method: EPA 9056 Pace Analytical Services - Kansas City							
Nitrate as N	ND	mg/kg	9.3	1	01/24/22 08:40	01/24/22 23:34	14797-55-8	
Nitrite as N	ND	mg/kg	9.3	1	01/24/22 08:40	01/24/22 23:34	14797-65-0	

Sample: COMP-LAWTON **Lab ID: 60390689009** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB SW	Analytical Method: EPA 8082 Preparation Method: EPA 3546 Pace Analytical Services - Kansas City							
PCB-1016 (Aroclor 1016)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	12674-11-2	
PCB-1221 (Aroclor 1221)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	11104-28-2	
PCB-1232 (Aroclor 1232)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	11141-16-5	
PCB-1242 (Aroclor 1242)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	53469-21-9	
PCB-1248 (Aroclor 1248)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	12672-29-6	
PCB-1254 (Aroclor 1254)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	11097-69-1	
PCB-1260 (Aroclor 1260)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	11096-82-5	
Surrogates								
Decachlorobiphenyl (S)	67	%	35-120	1	01/17/22 19:36	01/19/22 01:28	2051-24-3	CL
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**88.9**	%	0.50	1		01/24/22 09:49		

Sample: COMP-LAWTON **Lab ID: 60390689010** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, TCLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1311; 01/19/22 14:37 Initial pH: 7.19; Final pH: 5.24 Pace Analytical Services - Kansas City							
Arsenic	ND	mg/L	0.050	1	01/20/22 15:10	01/21/22 10:23	7440-38-2	
Barium	ND	mg/L	0.25	1	01/20/22 15:10	01/21/22 10:23	7440-39-3	

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: COMP-LAWTON **Lab ID: 60390689010** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, TCLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1311; 01/19/22 14:37 Initial pH: 7.19; Final pH: 5.24 Pace Analytical Services - Kansas City							
Cadmium	ND	mg/L	0.0050	1	01/20/22 15:10	01/21/22 10:23	7440-43-9	
Chromium	ND	mg/L	0.010	1	01/20/22 15:10	01/21/22 10:23	7440-47-3	
Lead	ND	mg/L	0.050	1	01/20/22 15:10	01/21/22 10:23	7439-92-1	
Selenium	ND	mg/L	0.050	1	01/20/22 15:10	01/21/22 10:23	7782-49-2	
Silver	ND	mg/L	0.010	1	01/20/22 15:10	01/21/22 10:23	7440-22-4	
7470 Mercury, TCLP	Analytical Method: EPA 7470 Preparation Method: EPA 7470 Leachate Method/Date: EPA 1311; 01/19/22 14:37 Initial pH: 7.19; Final pH: 5.24 Pace Analytical Services - Kansas City							
Mercury	ND	mg/L	0.0020	1	01/20/22 12:15	01/21/22 09:59	7439-97-6	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 768021
QC Batch Method: SM 9222D
Analysis Method: SM 9222D
Analysis Description: 9222DS MBIO Fecal Coliform
Laboratory: Pace Analytical Services - SE Kansas
Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689004, 60390689005, 60390689006, 60390689007

METHOD BLANK: 3068616 Matrix: Water
Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689004, 60390689005, 60390689006, 60390689007

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Fecal Coliforms	CFU/g	<1	1.0	01/15/22 11:15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767496 | Analysis Method: EPA 7470
QC Batch Method: EPA 7470 | Analysis Description: 7470 Mercury TCLP
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689010

METHOD BLANK: 3065848 | Matrix: Water
Associated Lab Samples: 60390689010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/L	ND	0.0020	01/21/22 09:43	

LABORATORY CONTROL SAMPLE: 3066810

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/L	0.015	0.015	98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3066811 3066812

Parameter	Units	60390760001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/L	ND	0.015	0.015	0.015	0.014	100	96	75-125	5	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767266
QC Batch Method: EPA 7471
Analysis Method: EPA 7471
Analysis Description: 7471 Mercury
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689008

METHOD BLANK: 3065899 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/kg	ND	0.050	01/20/22 12:58	

LABORATORY CONTROL SAMPLE: 3065900

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	0.5	0.50	99	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3065901 3065902

Parameter	Units	60390419003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	ND	3.8	3.7	3.4	3.3	81	81	75-125	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 766836
QC Batch Method: EPA 3050
Analysis Method: EPA 6010
Analysis Description: 6010 MET
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689008

METHOD BLANK: 3064562 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/kg	ND	1.0	01/25/22 19:38	
Cadmium	mg/kg	ND	0.50	01/25/22 19:38	
Calcium	mg/kg	ND	20.0	01/25/22 19:38	
Chromium	mg/kg	ND	0.50	01/25/22 19:38	
Copper	mg/kg	ND	2.0	01/25/22 19:38	
Lead	mg/kg	ND	1.0	01/25/22 19:38	
Magnesium	mg/kg	ND	5.0	01/25/22 19:38	
Molybdenum	mg/kg	ND	2.0	01/25/22 19:38	
Nickel	mg/kg	ND	0.50	01/25/22 19:38	
Potassium	mg/kg	ND	50.0	01/25/22 19:38	
Selenium	mg/kg	ND	1.5	01/26/22 11:03	
Silver	mg/kg	ND	0.70	01/25/22 19:38	
Sodium	mg/kg	ND	50.0	01/25/22 19:38	
Zinc	mg/kg	ND	10.0	01/25/22 19:38	

LABORATORY CONTROL SAMPLE: 3064563

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	100	98.1	98	80-120	
Cadmium	mg/kg	100	107	107	80-120	
Calcium	mg/kg	1000	1090	109	80-120	
Chromium	mg/kg	100	107	107	80-120	
Copper	mg/kg	100	110	110	80-120	
Lead	mg/kg	100	108	108	80-120	
Magnesium	mg/kg	1000	1120	112	80-120	
Molybdenum	mg/kg	100	112	112	80-120	
Nickel	mg/kg	100	111	111	80-120	
Potassium	mg/kg	1000	1080	108	80-120	
Selenium	mg/kg	100	102	102	80-120	
Silver	mg/kg	50	51.4	103	80-120	
Sodium	mg/kg	1000	1110	111	80-120	
Zinc	mg/kg	100	105	105	80-120	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3064564 3064565

Parameter	Units	60390689008 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	29.1	735	713	695	678	91	91	75-125	2	20	
Cadmium	mg/kg	ND	735	713	721	710	98	99	75-125	2	20	
Calcium	mg/kg	60000	7350	7130	28800	25800	-424	-480	75-125	11	20	M1
Chromium	mg/kg	40.2	735	713	774	750	100	100	75-125	3	20	
Copper	mg/kg	212	735	713	946	903	100	97	75-125	5	20	
Lead	mg/kg	19.2	735	713	768	718	102	98	75-125	7	20	
Magnesium	mg/kg	7960	7350	7130	16400	14500	114	92	75-125	12	20	
Molybdenum	mg/kg	ND	735	713	743	729	100	101	75-125	2	20	
Nickel	mg/kg	24.6	735	713	763	743	100	101	75-125	3	20	
Potassium	mg/kg	3870	7350	7130	14000	12500	138	122	75-125	11	20	M1
Selenium	mg/kg	ND	735	713	697	658	94	92	75-125	6	20	
Silver	mg/kg	ND	368	356	357	348	97	97	75-125	2	20	
Sodium	mg/kg	1650	7350	7130	9080	8860	101	101	75-125	2	20	
Zinc	mg/kg	420	735	713	1100	1040	93	87	75-125	6	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767528
QC Batch Method: EPA 3010
Analysis Method: EPA 6010
Analysis Description: 6010 MET TCLP
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689010

METHOD BLANK: 3065848 Matrix: Water
Associated Lab Samples: 60390689010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/L	ND	0.050	01/21/22 09:56	
Barium	mg/L	ND	0.25	01/21/22 09:56	
Cadmium	mg/L	ND	0.0050	01/21/22 09:56	
Chromium	mg/L	ND	0.010	01/21/22 09:56	
Lead	mg/L	ND	0.050	01/21/22 09:56	
Selenium	mg/L	ND	0.050	01/21/22 09:56	
Silver	mg/L	ND	0.010	01/21/22 09:56	

LABORATORY CONTROL SAMPLE: 3066921

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/L	1	0.93	93	80-120	
Barium	mg/L	1	0.97	97	80-120	
Cadmium	mg/L	1	0.98	98	80-120	
Chromium	mg/L	1	0.97	97	80-120	
Lead	mg/L	1	0.95	95	80-120	
Selenium	mg/L	1	0.98	98	80-120	
Silver	mg/L	0.5	0.48	96	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3066922 3066923

Parameter	Units	60390760001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/L	ND	1	1	0.93	0.93	93	93	75-125	1	20	
Barium	mg/L	ND	1	1	0.94	0.95	94	95	75-125	1	20	
Cadmium	mg/L	ND	1	1	0.96	0.96	96	96	75-125	0	20	
Chromium	mg/L	ND	1	1	0.96	0.97	96	97	75-125	1	20	
Lead	mg/L	ND	1	1	0.96	0.96	95	96	75-125	0	20	
Selenium	mg/L	ND	1	1	0.98	0.99	98	99	75-125	1	20	
Silver	mg/L	ND	0.5	0.5	0.47	0.48	94	95	75-125	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 766872 | Analysis Method: EPA 8082
QC Batch Method: EPA 3546 | Analysis Description: 8082 GCS PCB
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689009

METHOD BLANK: 3064676 | Matrix: Solid

Associated Lab Samples: 60390689009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1221 (Aroclor 1221)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1232 (Aroclor 1232)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1242 (Aroclor 1242)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1248 (Aroclor 1248)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1254 (Aroclor 1254)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1260 (Aroclor 1260)	ug/kg	ND	31.3	01/19/22 07:37	
Decachlorobiphenyl (S)	%	75	35-120	01/19/22 07:37	

LABORATORY CONTROL SAMPLE: 3064677

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg	161	153	95	65-120	
PCB-1260 (Aroclor 1260)	ug/kg	161	141	88	65-120	
Decachlorobiphenyl (S)	%			87	35-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3064757 3064758

Parameter	Units	60390771002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
PCB-1016 (Aroclor 1016)	ug/kg	ND	163	160	145	136	89	85	30-130	6	40	
PCB-1260 (Aroclor 1260)	ug/kg	ND	163	160	129	120	79	75	15-155	7	40	
Decachlorobiphenyl (S)	%						68	64	35-120		50	CL

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767158	Analysis Method:	ASTM D2974
QC Batch Method:	ASTM D2974	Analysis Description:	Dry Weight/Percent Moisture
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689004

SAMPLE DUPLICATE: 3065593

Parameter	Units	60390416001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	96.3	96.3	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767318	Analysis Method:	ASTM D2974
QC Batch Method:	ASTM D2974	Analysis Description:	Dry Weight/Percent Moisture
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689005, 60390689006, 60390689007, 60390689008

SAMPLE DUPLICATE: 3066096

Parameter	Units	60390835008 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	7.5	7.3	2	20	

SAMPLE DUPLICATE: 3066097

Parameter	Units	60390707001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	54.0	53.9	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767862
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689009

METHOD BLANK: 3068324 Matrix: Solid
Associated Lab Samples: 60390689009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Percent Moisture	%	ND	0.50	01/24/22 08:52	

SAMPLE DUPLICATE: 3068325

Parameter	Units	60391168001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	10.9	11.7	7	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767146
QC Batch Method: SM 2540G
Analysis Method: SM 2540G
Analysis Description: 2540G Total Solids
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689004

METHOD BLANK: 3065544   Matrix: Solid
Associated Lab Samples: 60390689004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Solids	%	ND	0.10	01/18/22 15:37	

SAMPLE DUPLICATE: 3065545

Parameter	Units	60390416001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Solids	%	3.7	3.7	0	8	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767311	Analysis Method:	SM 2540G
QC Batch Method:	SM 2540G	Analysis Description:	2540G Total Solids
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689005, 60390689006, 60390689007, 60390689008

METHOD BLANK: 3066082 Matrix: Solid

Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689005, 60390689006, 60390689007, 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Solids	%	ND	0.10	01/19/22 15:19	

SAMPLE DUPLICATE: 3066083

Parameter	Units	60390835008 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Solids	%	92.5	92.6	0	8	

SAMPLE DUPLICATE: 3066084

Parameter	Units	60390707001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Solids	%	46.0	46.1	0	8	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767145
QC Batch Method: SM 2540G
Analysis Method: SM 2540G
Analysis Description: 2540G Total Volatile Solids
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

METHOD BLANK: 3065542 Matrix: Solid

Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Volatile Solids	% (w/w)	ND	0.10	01/18/22 15:37	

SAMPLE DUPLICATE: 3065543

Parameter	Units	60390416001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Volatile Solids	% (w/w)	67.9	67.8	0	8	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767733
QC Batch Method: EPA 9045
Analysis Method: EPA 9045
Analysis Description: 9045 pH
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

SAMPLE DUPLICATE: 3067725

Parameter	Units	60390417001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.1	7.1	0	3	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	768086	Analysis Method:	EPA 350.1
QC Batch Method:	EPA 350.1	Analysis Description:	350.1 Ammonia
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

METHOD BLANK: 3068783   Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	1.0	01/25/22 13:33	

LABORATORY CONTROL SAMPLE: 3068784

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	50	51.6	103	90-110	

MATRIX SPIKE SAMPLE: 3068785

Parameter	Units	60390326004 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	1680	290	2260	201	80-120	M1

SAMPLE DUPLICATE: 3068786

Parameter	Units	60390594023 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	ND		20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767232	Analysis Method:	EPA 351.2
QC Batch Method:	EPA 351.2	Analysis Description:	351.2 TKN
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

METHOD BLANK: 3065806 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	ND	62.5	01/20/22 14:36	

LABORATORY CONTROL SAMPLE: 3065807

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	625	585	94	90-110	

MATRIX SPIKE SAMPLE: 3065808

Parameter	Units	60390229003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	8790	7300	18100	128	90-110	M1

SAMPLE DUPLICATE: 3065809

Parameter	Units	60390598002 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	2580	2590	0	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767820	Analysis Method:	EPA 365.4
QC Batch Method:	EPA 365.4	Analysis Description:	365.4 Total Phosphorus
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

METHOD BLANK: 3068126 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Phosphorus	mg/kg	ND	10.0	01/26/22 10:58	

LABORATORY CONTROL SAMPLE: 3068127

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/kg	200	193	96	90-110	

MATRIX SPIKE SAMPLE: 3068128

Parameter	Units	60390429001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/kg	4120	3820	7890	99	90-110	

SAMPLE DUPLICATE: 3068129

Parameter	Units	60390399008 Result	Dup Result	RPD	Max RPD	Qualifiers
Phosphorus	mg/kg	14200	14000	1	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767824	Analysis Method:	EPA 9056
QC Batch Method:	EPA 9056	Analysis Description:	9056 IC Anions
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

METHOD BLANK: 3068154 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/kg	ND	104	01/24/22 15:44	

LABORATORY CONTROL SAMPLE: 3068155

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	511	498	97	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3068156 3068157

Parameter	Units	60390656012 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/kg	10900	593	583	12900	12600	334	289	80-120	2	15	E,M1

SAMPLE DUPLICATE: 3068158

Parameter	Units	60390656013 Result	Dup Result	RPD	Max RPD	Qualifiers
Chloride	mg/kg	3820	3740	2	15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767823
QC Batch Method: EPA 9056
Analysis Method: EPA 9056
Analysis Description: 9056 IC Anions
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689008

METHOD BLANK: 3068149 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrate as N	mg/kg	ND	10.0	01/24/22 20:34	
Nitrite as N	mg/kg	ND	10.0	01/24/22 20:34	

LABORATORY CONTROL SAMPLE: 3068150

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrate as N	mg/kg	200	199	99	80-120	
Nitrite as N	mg/kg	200	202	101	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3068151 3068152

Parameter	Units	60390594019 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrate as N	mg/kg	ND	246	246	263	263	107	107	80-120	0	15	
Nitrite as N	mg/kg	ND	246	246	267	267	108	108	80-120	0	15	

SAMPLE DUPLICATE: 3068153

Parameter	Units	60390594020 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrate as N	mg/kg	ND	ND		15	
Nitrite as N	mg/kg	ND	ND		15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALIFIERS

Project: LAWTON OK
Pace Project No.: 60390689

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

CL	The continuing calibration for this compound is outside of Pace Analytical acceptance limits. The results may be biased low.
E	Analyte concentration exceeded the calibration range. The reported result is estimated.
H3	Sample was received or analysis requested beyond the recognized method holding time.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
u3	Analysis initiated more than 8 hours but less than 24 hours after sample collection.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: LAWTON OK
Pace Project No.: 60390689

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60390689009	**COMP-LAWTON**	EPA 3546	766872	EPA 8082	767101
60390689008	**COMP**	EPA 3050	766836	EPA 6010	767514
60390689010	**COMP-LAWTON**	EPA 3010	767528	EPA 6010	767620
60390689001	**1-1**	SM 9222D	768021	SM 9222D	768022
60390689002	**1-2**	SM 9222D	768021	SM 9222D	768022
60390689003	**1-3**	SM 9222D	768021	SM 9222D	768022
60390689004	**1-4**	SM 9222D	768021	SM 9222D	768022
60390689005	**1-5**	SM 9222D	768021	SM 9222D	768022
60390689006	**1-6**	SM 9222D	768021	SM 9222D	768022
60390689007	**1-7**	SM 9222D	768021	SM 9222D	768022
60390689007	**1-7**	CALC A	768023		
60390689010	**COMP-LAWTON**	EPA 7470	767496	EPA 7470	767566
60390689008	**COMP**	EPA 7471	767266	EPA 7471	767381
60390689001	**1-1**	ASTM D2974	767318		
60390689002	**1-2**	ASTM D2974	767318		
60390689003	**1-3**	ASTM D2974	767318		
60390689004	**1-4**	ASTM D2974	767158		
60390689005	**1-5**	ASTM D2974	767318		
60390689006	**1-6**	ASTM D2974	767318		
60390689007	**1-7**	ASTM D2974	767318		
60390689008	**COMP**	ASTM D2974	767318		
60390689009	**COMP-LAWTON**	ASTM D2974	767862		
60390689001	**1-1**	SM 2540G	767311		
60390689002	**1-2**	SM 2540G	767311		
60390689003	**1-3**	SM 2540G	767311		
60390689004	**1-4**	SM 2540G	767146		
60390689005	**1-5**	SM 2540G	767311		
60390689006	**1-6**	SM 2540G	767311		
60390689007	**1-7**	SM 2540G	767311		
60390689008	**COMP**	SM 2540G	767311		
60390689008	**COMP**	SM 2540G	767145		
60390689008	**COMP**	EPA 9045	767733		
60390689008	**COMP**	TKN-NH3 Calculation	768452		
60390689008	**COMP**	EPA 350.1	768086	EPA 350.1	768249
60390689008	**COMP**	EPA 351.2	767232	EPA 351.2	767274
60390689008	**COMP**	EPA 365.4	767820	EPA 365.4	768416
60390689008	**COMP**	EPA 9056	767824	EPA 9056	767928
60390689008	**COMP**	EPA 9056	767823	EPA 9056	768156

Pace Analytical

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page : 1 Of 1

Section A Required Client Information:

Company:	Hodges Farms & Dredging LLC
Address:	501 N West Street
	Lebo, KS 66856
Email:	jhodges@ewrllc.com
Phone:	620-343-0513 Fax
Requested Due Date:	

Section B Required Project Information:

Report To:	Jeff Hodges
Copy To:	
Purchase Order #:	
Project Name:	Lawton, OK
Project #:	

Section C Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote:	
Pace Project Manager:	alice.spiller@pacelabs.com Nicole Wood
Pace Profile #:	2421 line 1

Regulatory Agency: ODEQ

State / Location: OK / Lawton

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE	SAMPLE TYPE (G=GRAB C=COMP)	START DATE	START TIME	END DATE	END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Fecal Coliform	% solids	Geometric Mean	PCB	Metals 6010/7471	SOUR	Phos, Ammonia, TKN	pH	NO2/NO3	Total Organic Nitrogen	TVS, Total % Solids	TCLP *	Residual Chlorine (Y/N)	60390689
1	1-1 → 1-7	WW	C	1-13-22	9:00	1-13-22	11:00		7	X									X	X	X											7SPST-001-007
2	Comp	↓	C	↓	↓	↓	↓		1	X													X		X	X	X	X	X			
3	Comp - Lawton	↓	C	↓	↓	↓	↓		1	X												X										
4	Comp - Lawton	↓	C	↓	↓	↓	↓		1	X																				X		
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

MATRIX CODE: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Other OT, Tissue TS

SAMPLE ID: One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
*TCLP → Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver	[signature] / HFD	1-13-22	1330	[signature] Pace	1-13-22	1330				
	[signature] Pace	1-13-22	1700	[signature] Pace	1/14/22	1050	3.2	Y	Y	Y
	[signature] Pace	1/14/22	1600	[signature]	1-14-22	2305	0.2	Y	Y	Y

All Dry Weight

SENT FECAL DIRECT TO FRONTENAC

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Aaron Gruenewald

SIGNATURE of SAMPLER: [signature] DATE Signed: 1-13-22

TEMP in C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

Pace Analytical

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page : 1 Of 1

Section A
Required Client Information:

Company:	Hodges Farms & Dredging LLC
Address:	501 N. West Street
	Lebo, KS 66856
Email:	jhodges@ewrllc.com
Phone:	620-343-0513 Fax:
Requested Due Date:	

Section B
Required Project Information:

Report To:	Jeff Hodges
Copy To:	
Purchase Order #:	
Project Name:	Lawton, OK
Project #:	

Section C
Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote:	
Pace Project Manager:	alice.spiller@pacelabs.com Nicole Wood
Pace Profile #:	2421, line 1

Regulatory Agency	ODEQ
State / Location	OK / Lawton

Requested Analysis Filtered (Y/N)

MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Other OT; Tissue TS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	START TIME	END DATE	END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Fecal Coliform	% solids	Geometric Mean	PCB	Metals 6010/7471	SOUR	Phos, Ammonia, TKN	pH	NO2/NO3	Total Organic Nitrogen	TVS, Total % Solids	TCLP*	Residual Chlorine (Y/N)	60390689
1	1-1 → 1-7	WW	C	1-13-22	9⁰⁰	1-13-22	11⁰⁰		7	X									X	X	X											
2	Comp	↓	C	↓	↓	↓	↓		1	X													X		X	X	X	X	X			
3	Comp - Lawton	↓	C	↓	↓	↓	↓		1	X												X										
4	Comp - Lawton	↓	C	↓	↓	↓	↓		1	X																				X		
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
*TCLP → Arsenic, Barium, Cadmium, chromium, Lead, Mercury, Selenium, Silver	[signature] / HFD	1-13-22	13³⁰	[signature]	1-13-22	1330				
	[signature] Pace	1-13-22	1700	[signature] / Pace	1-14-22	0935	1.7	Y	Y	Y

All Dry Weight

SENT FECAL DIRECT TO FRONTENAC

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: Aaron Gruenewald
SIGNATURE of SAMPLER: [signature] DATE Signed: 1-13-22

TEMP in C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

EXHIBIT L

ANALYTICAL RESULTS - PCB

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

January 26, 2022

Jeff Hodges
Hodges Farms & Dredging LLC
501 N. West Street
Lebo, KS 66856

RE: Project: LAWTON OK
Pace Project No.: 60390689

Dear Jeff Hodges:

Enclosed are the analytical results for sample(s) received by the laboratory on January 14, 2022. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Kansas City
- Pace Analytical Services - SE Kansas

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Nolie Wood
nolie.wood@pacelabs.com
1(913)563-1401
Project Manager

Enclosures

cc: Aaron Gruenwald, Hodges Farms and Dredging, LLC

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project:	LAWTON OK
Pace Project No.:	60390689

Pace Analytical Services Kansas

9608 Loiret Boulevard, Lenexa, KS 66219
Missouri Inorganic Drinking Water Certification #: 10090
Arkansas Drinking Water
Arkansas Certification #: 20-020-0
Arkansas Drinking Water
Illinois Certification #: 2000302021-3
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212020-2
Oklahoma Certification #: 9205/9935
Florida: Cert E871149 SEKS WET
Texas Certification #: T104704407-19-12
Utah Certification #: KS000212019-9
Illinois Certification #: 004592
Kansas Field Laboratory Accreditation: # E-92587
Missouri SEKS Micro Certification: 10070

Pace Analytical Services Southeast Kansas

808 West McKay, Frontenac, KS 66763
Arkansas Certification #: 18-016-0
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10426
Louisiana Certification #: 03055
Oklahoma Certification #: 9935
Texas Certification #: T104704407
Utah Certification #: KS00021

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: LAWTON OK
Pace Project No.: 60390689

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60390689001	**1-1**	Solid	01/13/22 11:00	01/14/22 10:50
60390689002	**1-2**	Solid	01/13/22 11:00	01/14/22 10:50
60390689003	**1-3**	Solid	01/13/22 11:00	01/14/22 10:50
60390689004	**1-4**	Solid	01/13/22 11:00	01/14/22 10:50
60390689005	**1-5**	Solid	01/13/22 11:00	01/14/22 10:50
60390689006	**1-6**	Solid	01/13/22 11:00	01/14/22 10:50
60390689007	**1-7**	Solid	01/13/22 11:00	01/14/22 10:50
60390689008	**COMP**	Solid	01/13/22 11:00	01/14/22 23:05
60390689009	**COMP-LAWTON**	Solid	01/13/22 11:00	01/14/22 23:05
60390689010	**COMP-LAWTON**	Solid	01/13/22 11:00	01/14/22 23:05

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: LAWTON OK
Pace Project No.: 60390689

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60390689001	**1-1**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689002	**1-2**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689003	**1-3**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689004	**1-4**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689005	**1-5**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689006	**1-6**	SM 9222D	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689007	**1-7**	SM 9222D	MEB	1	PASI-SE
		CALC A	MEB	1	PASI-SE
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
60390689008	**COMP**	EPA 6010	MA1	14	PASI-K
		EPA 7471	CJH1	1	PASI-K
		ASTM D2974	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
		SM 2540G	JDS	1	PASI-K
		EPA 9045	MAP	1	PASI-K
		TKN-NH3 Calculation	LDB	1	PASI-K
		EPA 350.1	BLA	1	PASI-K
		EPA 351.2	SK	1	PASI-K
		EPA 365.4	CRN2	1	PASI-K
		EPA 9056	CRN2	1	PASI-K
		EPA 9056	CRN2	2	PASI-K
60390689009	**COMP-LAWTON**	EPA 8082	AJA1	8	PASI-K
		ASTM D2974	DWC	1	PASI-K
60390689010	**COMP-LAWTON**	EPA 6010	MA1	7	PASI-K

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: LAWTON OK
Pace Project No.: 60390689

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 7470	CJH1	1	PASI-K

PASI-K = Pace Analytical Services - Kansas City
PASI-SE = Pace Analytical Services - SE Kansas

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: 1-1 **Lab ID: 60390689001** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**5825**	CFU/g	9.8	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.8**	%	0.50	1		01/19/22 15:20		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.2**	%	0.10	1		01/19/22 15:20		

Sample: 1-2 **Lab ID: 60390689002** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**7339**	CFU/g	9.2	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.1**	%	0.50	1		01/19/22 15:20		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.9**	%	0.10	1		01/19/22 15:20		

Sample: 1-3 **Lab ID: 60390689003** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**6085**	CFU/g	10.1	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**90.1**	%	0.50	1		01/19/22 15:21		

Pace Analytical
www.pacelabs.com

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: 1-3 **Lab ID: 60390689003** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**9.9**	%	0.10	1		01/19/22 15:21		

Sample: 1-4 **Lab ID: 60390689004** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**7547**	CFU/g	9.4	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.4**	%	0.50	1		01/18/22 15:39		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.6**	%	0.10	1		01/18/22 15:39		

Sample: 1-5 **Lab ID: 60390689005** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**9615**	CFU/g	9.6	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.6**	%	0.50	1		01/19/22 15:21		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.4**	%	0.10	1		01/19/22 15:21		

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: 1-6 **Lab ID: 60390689006** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**8571**	CFU/g	9.5	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.5**	%	0.50	1		01/19/22 15:21		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.5**	%	0.10	1		01/19/22 15:21		

Sample: 1-7 **Lab ID: 60390689007** Collected: 01/13/22 11:00 Received: 01/14/22 10:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
MBIO 9222DS Fecal Coliform	Analytical Method: SM 9222D Preparation Method: SM 9222D Pace Analytical Services - SE Kansas							
Fecal Coliforms	**4000**	CFU/g	10	1	01/14/22 10:58	01/15/22 11:15		H3,u3
Geometric Mean	Analytical Method: CALC A Pace Analytical Services - SE Kansas							
Fecal Coliforms	**6763**	CFU/g	10	1		01/15/22 11:15		
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**90.0**	%	0.50	1		01/19/22 15:22		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.0**	%	0.10	1		01/19/22 15:22		

Sample: COMP **Lab ID: 60390689008** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050 Pace Analytical Services - Kansas City							
Arsenic	**29.1**	mg/kg	7.4	1	01/19/22 16:00	01/25/22 19:42	7440-38-2	
Cadmium	ND	mg/kg	3.7	1	01/19/22 16:00	01/25/22 19:42	7440-43-9	
Calcium	**60000**	mg/kg	147	1	01/19/22 16:00	01/25/22 19:42	7440-70-2	M1
Chromium	**40.2**	mg/kg	3.7	1	01/19/22 16:00	01/25/22 19:42	7440-47-3	

REPORT OF LABORATORY ANALYSIS

Pace Analytical www.pacelabs.com

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: COMP **Lab ID: 60390689008** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050 Pace Analytical Services - Kansas City							
Copper	**212**	mg/kg	14.7	1	01/19/22 16:00	01/25/22 19:42	7440-50-8	
Lead	**19.2**	mg/kg	7.4	1	01/19/22 16:00	01/25/22 19:42	7439-92-1	
Magnesium	**7960**	mg/kg	36.8	1	01/19/22 16:00	01/25/22 19:42	7439-95-4	
Molybdenum	ND	mg/kg	14.7	1	01/19/22 16:00	01/25/22 19:42	7439-98-7	
Nickel	**24.6**	mg/kg	3.7	1	01/19/22 16:00	01/25/22 19:42	7440-02-0	
Potassium	**3870**	mg/kg	368	1	01/19/22 16:00	01/25/22 19:42	7440-09-7	M1
Selenium	ND	mg/kg	11.0	1	01/19/22 16:00	01/26/22 11:07	7782-49-2	
Silver	ND	mg/kg	5.1	1	01/19/22 16:00	01/25/22 19:42	7440-22-4	
Sodium	**1650**	mg/kg	368	1	01/19/22 16:00	01/25/22 19:42	7440-23-5	
Zinc	**420**	mg/kg	73.5	1	01/19/22 16:00	01/25/22 19:42	7440-66-6	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471 Pace Analytical Services - Kansas City							
Mercury	ND	mg/kg	0.13	1	01/19/22 12:30	01/20/22 13:35	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**89.5**	%	0.50	1		01/19/22 15:22		
2540G Total Percent Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Solids	**10.5**	%	0.10	1		01/19/22 15:22		
2540G Total Volatile Solids	Analytical Method: SM 2540G Pace Analytical Services - Kansas City							
Total Volatile Solids	**24.1**	% (w/w)	0.10	1		01/18/22 15:39		
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - Kansas City							
pH at 25 Degrees C	**7.1**	Std. Units	0.10	1		01/21/22 13:52		
Total Organic Nitrogen Soil	Analytical Method: TKN-NH3 Calculation Pace Analytical Services - Kansas City							
Total Organic Nitrogen	**6050**	mg/kg	50.0	1		01/26/22 16:43		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1720**	mg/kg	9.5	1	01/25/22 08:16	01/25/22 13:53	7664-41-7	
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Kansas City							
Nitrogen, Kjeldahl, Total	**7770**	mg/kg	590	1	01/19/22 10:34	01/20/22 14:54	7727-37-9	

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: COMP **Lab ID: 60390689008** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
365.4 Total Phosphorus	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Kansas City							
Phosphorus	**4970**	mg/kg	215	5	01/25/22 13:23	01/26/22 11:52	7723-14-0	
9056 IC Anions	Analytical Method: EPA 9056 Preparation Method: EPA 9056 Pace Analytical Services - Kansas City							
Chloride	**676**	mg/kg	93.5	1	01/24/22 10:57	01/24/22 17:31	16887-00-6	
9056 IC Anions	Analytical Method: EPA 9056 Preparation Method: EPA 9056 Pace Analytical Services - Kansas City							
Nitrate as N	ND	mg/kg	9.3	1	01/24/22 08:40	01/24/22 23:34	14797-55-8	
Nitrite as N	ND	mg/kg	9.3	1	01/24/22 08:40	01/24/22 23:34	14797-65-0	

Sample: COMP-LAWTON **Lab ID: 60390689009** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB SW	Analytical Method: EPA 8082 Preparation Method: EPA 3546 Pace Analytical Services - Kansas City							
PCB-1016 (Aroclor 1016)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	12674-11-2	
PCB-1221 (Aroclor 1221)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	11104-28-2	
PCB-1232 (Aroclor 1232)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	11141-16-5	
PCB-1242 (Aroclor 1242)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	53469-21-9	
PCB-1248 (Aroclor 1248)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	12672-29-6	
PCB-1254 (Aroclor 1254)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	11097-69-1	
PCB-1260 (Aroclor 1260)	ND	ug/kg	1760	1	01/17/22 19:36	01/19/22 01:28	11096-82-5	
Surrogates								
Decachlorobiphenyl (S)	67	%	35-120	1	01/17/22 19:36	01/19/22 01:28	2051-24-3	CL
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**88.9**	%	0.50	1		01/24/22 09:49		

Sample: COMP-LAWTON **Lab ID: 60390689010** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, TCLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1311; 01/19/22 14:37 Initial pH: 7.19; Final pH: 5.24 Pace Analytical Services - Kansas City							
Arsenic	ND	mg/L	0.050	1	01/20/22 15:10	01/21/22 10:23	7440-38-2	
Barium	ND	mg/L	0.25	1	01/20/22 15:10	01/21/22 10:23	7440-39-3	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: LAWTON OK
Pace Project No.: 60390689

Sample: COMP-LAWTON **Lab ID: 60390689010** Collected: 01/13/22 11:00 Received: 01/14/22 23:05 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, TCLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1311; 01/19/22 14:37 Initial pH: 7.19; Final pH: 5.24 Pace Analytical Services - Kansas City							
Cadmium	ND	mg/L	0.0050	1	01/20/22 15:10	01/21/22 10:23	7440-43-9	
Chromium	ND	mg/L	0.010	1	01/20/22 15:10	01/21/22 10:23	7440-47-3	
Lead	ND	mg/L	0.050	1	01/20/22 15:10	01/21/22 10:23	7439-92-1	
Selenium	ND	mg/L	0.050	1	01/20/22 15:10	01/21/22 10:23	7782-49-2	
Silver	ND	mg/L	0.010	1	01/20/22 15:10	01/21/22 10:23	7440-22-4	
7470 Mercury, TCLP	Analytical Method: EPA 7470 Preparation Method: EPA 7470 Leachate Method/Date: EPA 1311; 01/19/22 14:37 Initial pH: 7.19; Final pH: 5.24 Pace Analytical Services - Kansas City							
Mercury	ND	mg/L	0.0020	1	01/20/22 12:15	01/21/22 09:59	7439-97-6	

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	768021	Analysis Method:	SM 9222D
QC Batch Method:	SM 9222D	Analysis Description:	9222DS MBIO Fecal Coliform
		Laboratory:	Pace Analytical Services - SE Kansas

Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689004, 60390689005, 60390689006, 60390689007

METHOD BLANK: 3068616 Matrix: Water

Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689004, 60390689005, 60390689006, 60390689007

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Fecal Coliforms	CFU/g	<1	1.0	01/15/22 11:15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767496	Analysis Method:	EPA 7470
QC Batch Method:	EPA 7470	Analysis Description:	7470 Mercury TCLP
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689010

METHOD BLANK: 3065848 Matrix: Water

Associated Lab Samples: 60390689010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/L	ND	0.0020	01/21/22 09:43	

LABORATORY CONTROL SAMPLE: 3066810

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/L	0.015	0.015	98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3066811 3066812

Parameter	Units	60390760001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/L	ND	0.015	0.015	0.015	0.014	100	96	75-125	5	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767266
QC Batch Method: EPA 7471
Analysis Method: EPA 7471
Analysis Description: 7471 Mercury
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689008

METHOD BLANK: 3065899 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/kg	ND	0.050	01/20/22 12:58	

LABORATORY CONTROL SAMPLE: 3065900

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	0.5	0.50	99	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3065901 3065902

Parameter	Units	60390419003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	ND	3.8	3.7	3.4	3.3	81	81	75-125	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 766836
QC Batch Method: EPA 3050
Analysis Method: EPA 6010
Analysis Description: 6010 MET
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689008

METHOD BLANK: 3064562 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/kg	ND	1.0	01/25/22 19:38	
Cadmium	mg/kg	ND	0.50	01/25/22 19:38	
Calcium	mg/kg	ND	20.0	01/25/22 19:38	
Chromium	mg/kg	ND	0.50	01/25/22 19:38	
Copper	mg/kg	ND	2.0	01/25/22 19:38	
Lead	mg/kg	ND	1.0	01/25/22 19:38	
Magnesium	mg/kg	ND	5.0	01/25/22 19:38	
Molybdenum	mg/kg	ND	2.0	01/25/22 19:38	
Nickel	mg/kg	ND	0.50	01/25/22 19:38	
Potassium	mg/kg	ND	50.0	01/25/22 19:38	
Selenium	mg/kg	ND	1.5	01/26/22 11:03	
Silver	mg/kg	ND	0.70	01/25/22 19:38	
Sodium	mg/kg	ND	50.0	01/25/22 19:38	
Zinc	mg/kg	ND	10.0	01/25/22 19:38	

LABORATORY CONTROL SAMPLE: 3064563

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	100	98.1	98	80-120	
Cadmium	mg/kg	100	107	107	80-120	
Calcium	mg/kg	1000	1090	109	80-120	
Chromium	mg/kg	100	107	107	80-120	
Copper	mg/kg	100	110	110	80-120	
Lead	mg/kg	100	108	108	80-120	
Magnesium	mg/kg	1000	1120	112	80-120	
Molybdenum	mg/kg	100	112	112	80-120	
Nickel	mg/kg	100	111	111	80-120	
Potassium	mg/kg	1000	1080	108	80-120	
Selenium	mg/kg	100	102	102	80-120	
Silver	mg/kg	50	51.4	103	80-120	
Sodium	mg/kg	1000	1110	111	80-120	
Zinc	mg/kg	100	105	105	80-120	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3064564 3064565

Parameter	Units	60390689008 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	29.1	735	713	695	678	91	91	75-125	2	20	
Cadmium	mg/kg	ND	735	713	721	710	98	99	75-125	2	20	
Calcium	mg/kg	60000	7350	7130	28800	25800	-424	-480	75-125	11	20	M1
Chromium	mg/kg	40.2	735	713	774	750	100	100	75-125	3	20	
Copper	mg/kg	212	735	713	946	903	100	97	75-125	5	20	
Lead	mg/kg	19.2	735	713	768	718	102	98	75-125	7	20	
Magnesium	mg/kg	7960	7350	7130	16400	14500	114	92	75-125	12	20	
Molybdenum	mg/kg	ND	735	713	743	729	100	101	75-125	2	20	
Nickel	mg/kg	24.6	735	713	763	743	100	101	75-125	3	20	
Potassium	mg/kg	3870	7350	7130	14000	12500	138	122	75-125	11	20	M1
Selenium	mg/kg	ND	735	713	697	658	94	92	75-125	6	20	
Silver	mg/kg	ND	368	356	357	348	97	97	75-125	2	20	
Sodium	mg/kg	1650	7350	7130	9080	8860	101	101	75-125	2	20	
Zinc	mg/kg	420	735	713	1100	1040	93	87	75-125	6	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767528 | Analysis Method: EPA 6010
QC Batch Method: EPA 3010 | Analysis Description: 6010 MET TCLP
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689010

METHOD BLANK: 3065848 Matrix: Water

Associated Lab Samples: 60390689010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/L	ND	0.050	01/21/22 09:56	
Barium	mg/L	ND	0.25	01/21/22 09:56	
Cadmium	mg/L	ND	0.0050	01/21/22 09:56	
Chromium	mg/L	ND	0.010	01/21/22 09:56	
Lead	mg/L	ND	0.050	01/21/22 09:56	
Selenium	mg/L	ND	0.050	01/21/22 09:56	
Silver	mg/L	ND	0.010	01/21/22 09:56	

LABORATORY CONTROL SAMPLE: 3066921

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/L	1	0.93	93	80-120	
Barium	mg/L	1	0.97	97	80-120	
Cadmium	mg/L	1	0.98	98	80-120	
Chromium	mg/L	1	0.97	97	80-120	
Lead	mg/L	1	0.95	95	80-120	
Selenium	mg/L	1	0.98	98	80-120	
Silver	mg/L	0.5	0.48	96	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3066922 3066923

Parameter	Units	60390760001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/L	ND	1	1	0.93	0.93	93	93	75-125	1	20	
Barium	mg/L	ND	1	1	0.94	0.95	94	95	75-125	1	20	
Cadmium	mg/L	ND	1	1	0.96	0.96	96	96	75-125	0	20	
Chromium	mg/L	ND	1	1	0.96	0.97	96	97	75-125	1	20	
Lead	mg/L	ND	1	1	0.96	0.96	95	96	75-125	0	20	
Selenium	mg/L	ND	1	1	0.98	0.99	98	99	75-125	1	20	
Silver	mg/L	ND	0.5	0.5	0.47	0.48	94	95	75-125	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	766872	Analysis Method:	EPA 8082
QC Batch Method:	EPA 3546	Analysis Description:	8082 GCS PCB
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689009

METHOD BLANK: 3064676 Matrix: Solid

Associated Lab Samples: 60390689009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1221 (Aroclor 1221)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1232 (Aroclor 1232)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1242 (Aroclor 1242)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1248 (Aroclor 1248)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1254 (Aroclor 1254)	ug/kg	ND	31.3	01/19/22 07:37	
PCB-1260 (Aroclor 1260)	ug/kg	ND	31.3	01/19/22 07:37	
Decachlorobiphenyl (S)	%	75	35-120	01/19/22 07:37	

LABORATORY CONTROL SAMPLE: 3064677

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg	161	153	95	65-120	
PCB-1260 (Aroclor 1260)	ug/kg	161	141	88	65-120	
Decachlorobiphenyl (S)	%			87	35-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3064757 3064758

Parameter	Units	60390771002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
PCB-1016 (Aroclor 1016)	ug/kg	ND	163	160	145	136	89	85	30-130	6	40	
PCB-1260 (Aroclor 1260)	ug/kg	ND	163	160	129	120	79	75	15-155	7	40	
Decachlorobiphenyl (S)	%						68	64	35-120		50	CL

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767158	Analysis Method:	ASTM D2974
QC Batch Method:	ASTM D2974	Analysis Description:	Dry Weight/Percent Moisture
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689004

SAMPLE DUPLICATE: 3065593

Parameter	Units	60390416001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	96.3	96.3	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767318	Analysis Method:	ASTM D2974
QC Batch Method:	ASTM D2974	Analysis Description:	Dry Weight/Percent Moisture
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689005, 60390689006, 60390689007, 60390689008

SAMPLE DUPLICATE: 3066096

Parameter	Units	60390835008 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	7.5	7.3	2	20	

SAMPLE DUPLICATE: 3066097

Parameter	Units	60390707001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	54.0	53.9	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767862	Analysis Method:	ASTM D2974
QC Batch Method:	ASTM D2974	Analysis Description:	Dry Weight/Percent Moisture
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689009

METHOD BLANK: 3068324 Matrix: Solid

Associated Lab Samples: 60390689009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Percent Moisture	%	ND	0.50	01/24/22 08:52	

SAMPLE DUPLICATE: 3068325

Parameter	Units	60391168001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	10.9	11.7	7	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767146	Analysis Method:	SM 2540G
QC Batch Method:	SM 2540G	Analysis Description:	2540G Total Solids
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689004

METHOD BLANK: 3065544 Matrix: Solid
Associated Lab Samples: 60390689004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Solids	%	ND	0.10	01/18/22 15:37	

SAMPLE DUPLICATE: 3065545

Parameter	Units	60390416001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Solids	%	3.7	3.7	0	8	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767311	Analysis Method:	SM 2540G
QC Batch Method:	SM 2540G	Analysis Description:	2540G Total Solids
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689005, 60390689006, 60390689007, 60390689008

METHOD BLANK: 3066082 Matrix: Solid

Associated Lab Samples: 60390689001, 60390689002, 60390689003, 60390689005, 60390689006, 60390689007, 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Solids	%	ND	0.10	01/19/22 15:19	

SAMPLE DUPLICATE: 3066083

Parameter	Units	60390835008 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Solids	%	92.5	92.6	0	8	

SAMPLE DUPLICATE: 3066084

Parameter	Units	60390707001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Solids	%	46.0	46.1	0	8	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767145
QC Batch Method: SM 2540G
Analysis Method: SM 2540G
Analysis Description: 2540G Total Volatile Solids
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

METHOD BLANK: 3065542 Matrix: Solid

Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Volatile Solids	% (w/w)	ND	0.10	01/18/22 15:37	

SAMPLE DUPLICATE: 3065543

Parameter	Units	60390416001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Volatile Solids	% (w/w)	67.9	67.8	0	8	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch:	767733	Analysis Method:	EPA 9045
QC Batch Method:	EPA 9045	Analysis Description:	9045 pH
		Laboratory:	Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

SAMPLE DUPLICATE: 3067725

Parameter	Units	60390417001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.1	7.1	0	3	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 768086
QC Batch Method: EPA 350.1
Analysis Method: EPA 350.1
Analysis Description: 350.1 Ammonia
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689008

METHOD BLANK: 3068783 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	1.0	01/25/22 13:33	

LABORATORY CONTROL SAMPLE: 3068784

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	50	51.6	103	90-110	

MATRIX SPIKE SAMPLE: 3068785

Parameter	Units	60390326004 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	1680	290	2260	201	80-120	M1

SAMPLE DUPLICATE: 3068786

Parameter	Units	60390594023 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	ND		20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767232
QC Batch Method: EPA 351.2
Analysis Method: EPA 351.2
Analysis Description: 351.2 TKN
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689008

METHOD BLANK: 3065806 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	ND	62.5	01/20/22 14:36	

LABORATORY CONTROL SAMPLE: 3065807

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	625	585	94	90-110	

MATRIX SPIKE SAMPLE: 3065808

Parameter	Units	60390229003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	8790	7300	18100	128	90-110	M1

SAMPLE DUPLICATE: 3065809

Parameter	Units	60390598002 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	2580	2590	0	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767820
QC Batch Method: EPA 365.4
Analysis Method: EPA 365.4
Analysis Description: 365.4 Total Phosphorus
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689008

METHOD BLANK: 3068126 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Phosphorus	mg/kg	ND	10.0	01/26/22 10:58	

LABORATORY CONTROL SAMPLE: 3068127

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/kg	200	193	96	90-110	

MATRIX SPIKE SAMPLE: 3068128

Parameter	Units	60390429001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/kg	4120	3820	7890	99	90-110	

SAMPLE DUPLICATE: 3068129

Parameter	Units	60390399008 Result	Dup Result	RPD	Max RPD	Qualifiers
Phosphorus	mg/kg	14200	14000	1	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical
www.pacelabs.com

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767824
QC Batch Method: EPA 9056
Analysis Method: EPA 9056
Analysis Description: 9056 IC Anions
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60390689008

METHOD BLANK: 3068154 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/kg	ND	104	01/24/22 15:44	

LABORATORY CONTROL SAMPLE: 3068155

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	511	498	97	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3068156 3068157

Parameter	Units	60390656012 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/kg	10900	593	583	12900	12600	334	289	80-120	2	15	E,M1

SAMPLE DUPLICATE: 3068158

Parameter	Units	60390656013 Result	Dup Result	RPD	Max RPD	Qualifiers
Chloride	mg/kg	3820	3740	2	15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: LAWTON OK
Pace Project No.: 60390689

QC Batch: 767823
QC Batch Method: EPA 9056
Analysis Method: EPA 9056
Analysis Description: 9056 IC Anions
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60390689008

METHOD BLANK: 3068149 Matrix: Solid
Associated Lab Samples: 60390689008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrate as N	mg/kg	ND	10.0	01/24/22 20:34	
Nitrite as N	mg/kg	ND	10.0	01/24/22 20:34	

LABORATORY CONTROL SAMPLE: 3068150

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrate as N	mg/kg	200	199	99	80-120	
Nitrite as N	mg/kg	200	202	101	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3068151 3068152

Parameter	Units	60390594019 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrate as N	mg/kg	ND	246	246	263	263	107	107	80-120	0	15	
Nitrite as N	mg/kg	ND	246	246	267	267	108	108	80-120	0	15	

SAMPLE DUPLICATE: 3068153

Parameter	Units	60390594020 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrate as N	mg/kg	ND	ND		15	
Nitrite as N	mg/kg	ND	ND		15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALIFIERS

Project: LAWTON OK
Pace Project No.: 60390689

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

CL	The continuing calibration for this compound is outside of Pace Analytical acceptance limits. The results may be biased low.
E	Analyte concentration exceeded the calibration range. The reported result is estimated.
H3	Sample was received or analysis requested beyond the recognized method holding time.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
u3	Analysis initiated more than 8 hours but less than 24 hours after sample collection.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: LAWTON OK
Pace Project No.: 60390689

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60390689009	**COMP-LAWTON**	EPA 3546	766872	EPA 8082	767101
60390689008	**COMP**	EPA 3050	766836	EPA 6010	767514
60390689010	**COMP-LAWTON**	EPA 3010	767528	EPA 6010	767620
60390689001	**1-1**	SM 9222D	768021	SM 9222D	768022
60390689002	**1-2**	SM 9222D	768021	SM 9222D	768022
60390689003	**1-3**	SM 9222D	768021	SM 9222D	768022
60390689004	**1-4**	SM 9222D	768021	SM 9222D	768022
60390689005	**1-5**	SM 9222D	768021	SM 9222D	768022
60390689006	**1-6**	SM 9222D	768021	SM 9222D	768022
60390689007	**1-7**	SM 9222D	768021	SM 9222D	768022
60390689007	**1-7**	CALC A	768023		
60390689010	**COMP-LAWTON**	EPA 7470	767496	EPA 7470	767566
60390689008	**COMP**	EPA 7471	767266	EPA 7471	767381
60390689001	**1-1**	ASTM D2974	767318		
60390689002	**1-2**	ASTM D2974	767318		
60390689003	**1-3**	ASTM D2974	767318		
60390689004	**1-4**	ASTM D2974	767158		
60390689005	**1-5**	ASTM D2974	767318		
60390689006	**1-6**	ASTM D2974	767318		
60390689007	**1-7**	ASTM D2974	767318		
60390689008	**COMP**	ASTM D2974	767318		
60390689009	**COMP-LAWTON**	ASTM D2974	767862		
60390689001	**1-1**	SM 2540G	767311		
60390689002	**1-2**	SM 2540G	767311		
60390689003	**1-3**	SM 2540G	767311		
60390689004	**1-4**	SM 2540G	767146		
60390689005	**1-5**	SM 2540G	767311		
60390689006	**1-6**	SM 2540G	767311		
60390689007	**1-7**	SM 2540G	767311		
60390689008	**COMP**	SM 2540G	767311		
60390689008	**COMP**	SM 2540G	767145		
60390689008	**COMP**	EPA 9045	767733		
60390689008	**COMP**	TKN-NH3 Calculation	768452		
60390689008	**COMP**	EPA 350.1	768086	EPA 350.1	768249
60390689008	**COMP**	EPA 351.2	767232	EPA 351.2	767274
60390689008	**COMP**	EPA 365.4	767820	EPA 365.4	768416
60390689008	**COMP**	EPA 9056	767824	EPA 9056	767928
60390689008	**COMP**	EPA 9056	767823	EPA 9056	768156

PaceAnalytical

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page : 1 Of 1

Section A
Required Client Information:

Company:	Hodges Farms & Dredging LLC
Address:	501 N West Street
	Lebo, KS 66856
Email:	jhodges@ewrllc.com
Phone:	620-343-0513 Fax
Requested Due Date:	

Section B
Required Project Information:

Report To:	Jeff Hodges
Copy To:	
Purchase Order #:	
Project Name:	Lawton, OK
Project #:	

Section C
Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote:	
Pace Project Manager:	alice.spiller@pacelabs.com Nicole Wood
Pace Profile #:	2421 line 1

Regulatory Agency
ODEQ
State / Location
OK / Lawton

MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Other OT; Tissue TS

SAMPLE ID — One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique

Preservatives | Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	START TIME	END DATE	END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Fecal Coliform	% solids	Geometric Mean	PCB	Metals 6010/7471	SOUR	Phos, Ammonia, TKN	pH	NO2/NO3	Total Organic Nitrogen	TVS, Total % Solids	TCLP *	Residual Chlorine (Y/N)	60390689
1	1-1 → 1-7	WW	C	1-13-22	9:00	1-13-22	11:00		7	X									X	X	X											7SPST-001-007
2	Comp	↓	C	↓	↓	↓	↓		1	X													X		X	X	X	X	X			
3	Comp - Lawton	↓	C	↓	↓	↓	↓		1	X												X										
4	Comp - Lawton	↓	C	↓	↓	↓	↓		1	X																				X		
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
*TCLP → Arsenic	C. C. / HFD	1-13-22	1330	[signature] Pace	1-13-22	1330				
Barium, Cadmium, chromium	[signature] Pace	1-13-22	1700	[signature] Pace	1/14/22	1050	3.2	Y	Y	Y
Lead, Mercury, Selenium	[signature] Pace	1/14/22	1600	[signature]	1-14-22	2305	0.2	Y	Y	Y
Silver										

All Dry Weight

SENT FECAL DIRECT TO FRONTENAC

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Aaron Gruenewald

SIGNATURE of SAMPLER: [signature] DATE Signed: 1-13-22

Temp in C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

Pace Analytical

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page : 1 Of 1

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: Hodges Farms & Dredging LLC	Report To: Jeff Hodges	Attention:
Address: 501 N. West Street	Copy To:	Company Name:
Lebo, KS 66856		Address:
Email: jhodges@ewrllc.com	Purchase Order #:	Pace Quote:
Phone: 620-343-0513 Fax:	Project Name: Lawton, OK	Pace Project Manager: alice.spiller@pacelabs.com Nolie Wood
Requested Due Date:	Project #:	Pace Profile #: 2421, line 1

Regulatory Agency: ODEQ

State / Location: OK / Lawton

Requested Analysis Filtered (Y/N)

60390689

MATRIX / CODE: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Other OT, Tissue TS

SAMPLE ID — One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	START TIME	END DATE	END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Fecal Coliform	% solids	Geometric Mean	PCB	Metals 6010/7471	SOUR	Phos, Ammonia, TKN	pH	NO2/NO3	Total Organic Nitrogen	TVS, Total % Solids	TCLP *	Residual Chlorine (Y/N)	
1	1-1 → 1-7	WW	C	1-13-22	9:00	1-13-22	11:00		7	X									X	X	X											
2	Comp	↓	C	↓	↓	↓	↓		1	X													X		X	X	X	X	X			
3	Comp - Lawton	↓	C	↓	↓	↓	↓		1	X												X										
4	Comp - Lawton	↓	C	↓	↓	↓	↓		1	X																				X		
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
*TCLP → Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver	C. e. / HFD	1-13-22	13:30	[signature] Pace	1-13-22	1330				
	[signature] Pace	1-13-22	1700	[signature] / Pace	1-14-22	0935	1.7	Y	Y	Y

All Dry Weight

SENT FECAL DIRECT TO FRONTENAC

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Aaron Gruenewald

SIGNATURE of SAMPLER: [signature] DATE Signed: 1-13-22

TEMP in C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

EXHIBIT M

MASTER SITE LIST

CITY OF LAWTON, OKLAHOMA APPLICATION
MASTER SITE LIST 2022

TOTALS:	1,090.0						22,825.35		54,780,837
Field ID	Total Acres	2021 Crop	Anticipated Crop 2019	Nitrogen Rate lbs per Acre *	Plant Available Nitrogen (Lbs / Dry Ton)	Application Rate Dry Tons per Acre	Total Dry Tons to be Applied	Application Rate Gallons per Acre (@10% Solids)**	Total Gallons (@ 10% Solids)
Site 1	145.0	Soybeans	Corn	215.0	10.19	21.1	3,060.87	50,663	7,346,097
Site 2	150.0	Alfalfa	Alfalfa	200.0	10.19	19.6	2,944.06	47,105	7,065,751
Site 3	80.0	Corn	Corn	220.0	10.19	21.6	1,727.18	51,816	4,145,240
Site 4	155.0	Corn	Corn	220.0	10.19	21.6	3,346.42	51,816	8,031,403
Site 5	200.0	Corn	Corn	195.0	10.19	19.1	3,827.28	45,927	9,185,476
Site 6	150.0	Bermudagrass		230.0	10.19	22.6	3,385.67	54,171	8,125,613
Site 7	150.0	Bermudagrass		240.0	10.19	23.6	3,532.88	56,526	8,478,901
Site 8 and 9	60.0	Bermudagrass		170.0	10.19	16.7	1,000.98	40,039	2,402,355

*** Per Soil Analysis Report Recommendation (260 lbs Nitrogen / Ac)**

**** Agronomic Application Rate (dt/ac) / % Total Solids (as a decimal) x 240**