CCR Certification: Wetlands Siting

CCR Certification: Wetlands Siting for the Ash Ponds and Scrubber Sludge Pond
Texas Municipal Power Agency
Gibbons Creek Steam Electric Generating Station
Anderson, Texas

Prepared for:

Texas Municipal Power Agency
12824 FM 244 Road, Anderson, Texas 77830

10/16/2018

Wood Environment & Infrastructure Solutions, Inc.
3755 S. Capital of Texas Highway
Austin, Texas 78704
www.woodplc.com

10/16/2018

Craig York
Plant Manager
Texas Municipal Power Agency
Gibbons Creek Steam Electric Station
12824 FM 244 Road
Anderson, Texas 77830

Dear Mr. York,

Enclosed is the Coal Combustion Residuals (CCR) Wetlands Certification Report. This Coal Combustion Residuals (CCR) Certification for the Ash Ponds (AP) and Scrubber Sludge Pond (SSP) at the Texas Municipal Power Agency Gibbons Creek Steam Electric Station has been prepared in accordance with the requirements specified in the United States Environmental Protection Agency (USEPA) CCR Rule under 40 Code of Federal Regulations §257.64 (40 CFR §257.64). These regulations require that the specified documentation and assessments for an existing CCR landfill and surface impoundment be prepared by October 17, 2018.

The AP and SSP were found to meet all requirements as required by 40 CFR §257.64.

Sincerely,

Wood Environment & Infrastructure Solutions, Inc.	**Reviewed by:**
Casey J. Richards	Greg Seifert, P.G.
Wetlands Scientist	Principal Geologist

Attachments:

Attachment A: Natural Resources Conservation Service Web Soil Survey
Attachment B: Federal Emergency Management Agency Flood Insurance Map

CJR/GGS

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List of Acronyms

AP	Ash Ponds
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
CWA	Clean Water Act
FEMA	Federal Emergency Management Agency
Ft	Feet
GCSES	Gibbons Creek Steam Electric Station
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
PEM	palustrine emergent wetland
SFL	Site F Landfill
SSP	Scrubber Sludge Pond
TMPA	Texas Municipal Power Agency
USACE	U.S. Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
Wood	Wood Environmental & Infrastructure Solutions, Inc.

1.0 Introduction

The Texas Municipal Power Agency (TMPA) Gibbons Creek Steam Electric Station (GCSES) is located at 12824 FM 244 Road, Anderson, Texas 77830 (Figure 1: Site Location Map). The GCSES began operating as a 405 Megawatt (MW) capacity power plant burning lignite from the adjacent Bryan Lignite No. 1 mine in 1983. In 1996, the GCSES converted to Powder River Basin coal and the lignite mine was closed.

The GCSES currently operates one Coal Combustion Residuals (CCR) landfill identified as the Site F Landfill (SFL), and two CCR surface impoundments, the Scrubber Sludge Pond (SSP) and Ash Ponds (AP), that are subject to regulation under 40 CFR 257 Subpart D. The SSP and AP, as exsisting surface impoundments, are subject to the wetlands siting requirements of in the United States Environmental Protection Agency (USEPA) CCR Rule under 40 Code of Federal Regulations §257.61 (40 CFR §257.61). The SFL is an existing landfill, and therefore is not subject to 40 CFR §257.61. The locations of the surface impoundments CCR units are shown in Figure 1.

This CCR Certification for wetlands at the SSP and AP located at the TMPA GCSES has been prepared to document that the requirements specified in 40 CFR §257.61 have been met. These regulations require that the specified documentation and assessments for existing CCR surface impoundments be prepared by October 17, 2018. Wood Environmental and Infrastructure Solutions, Inc. (Wood) conducted a high-level wetlands review of the SSP and AP in general accordance with the wetland siting restrictions in 40 CFR §257.61. Per these restrictions, existing CCR surface impoundments must not be located in wetlands.

2.0 Background

2.1 CCR Surface Impoundments

2.1.1 Scrubber Sludge Pond

The SSP was constructed in 1978 and began receiving CCR in 1983. The SSP is approximately 7.4 acres and 20 feet (ft) deep from the crest of the berm to the bottom of the pond. The SSP is located west of the AP.

2.1.2 Ash Ponds

The AP consists of three interconnected ponds that began operation with the start-up of the GCSES in 1983. Each pond is approximately 265 ft. wide, 1,820 ft. long and 20 ft. deep. Gibbons Creek Reservoir is located to the east (Figure 1: Site Location Map).

3.0 Scope and Methods

The extent of the wetlands assessment was limited to desktop review and visual observations of the SSP and AP. Soil pits, typically used to verify the presence or absence of hydric soils, were not dug. The scope of this assessment was adequate to meet the requirements of 40 CFR §257.61 but does not constitute a Clean Water Act (CWA) compliant, full-scale wetlands delineation.

The first step of this assessment included desktop review of the potential for wetlands at each of the units using publicly available datasets including wetlands data from the United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) , the Natural Resources Conservation Service (NRCS) Web Soil Survey (Attachment A), Federal Emergency Management Agency (FEMA) Flood Insurance Map (Attachment B), aerial photography from Google Earth, and the U.S. Army Corps of Engineers (USACE)

Great Plains Regional Supplement. Following the desktop review, a qualified wetland scientist performed a limited wetlands evaluation to compare field observations to the information shown on the NWI map.

Ms. Casey Richards of Wood conducted the high-level wetlands evaluation on October 10, 2018. Ms. Richards utilized vegetation and hydrology observations in the field to classify potential wetland areas in and around the SSP and AP. Findings, overlaid with the NWI map, are annotated in Figure 2: Wetlands Findings Map.

4.0 Findings

4.1 Scrubber Sludge Pond

Two areas of potential wetlands were observed within the SSP. These areas were categorized as potential palustrine emergent (PEM) wetlands based on hydrology and vegetation (cattails) observed at the time of site reconnaissance. Outside of the pond, including the berms, the vegetation was of upland assemblage (common sunflower and Bermuda grass). Soils in the surrounding area were identified by NRCS as Arents and Burlewash fine sandy loam, neither of which are classified as hydric soils. The SSP is not located within any flood hazard areas as defined by FEMA. The potential PEM wetlands inside the SSP were observed to be a result of the growth of hydrophytic plants from the continuous inundation of the SSP. Based on soils and the upland vegetation observed on the berms and the surrounding area, the original habitat which characterized the location of the SSP prior to construction was not a wetland.

4.2 Ash Ponds

Within the AP, areas of "Moderate" probability wetlands were observed as potential PEM fringe within the west, south, and east boundaries of each pond with a width of 5 to 10 ft from the ordinary high-water mark. Within the northern portion of each pond, potential PEM wetlands that were approximately 1,000 square ft were noted. Both areas of potential PEM wetlands were categorized based on hydrology and vegetation (cattails) observed at the time of site reconnaissance. Outside of the pond, including the berms, the vegetation was of upland assemblage (Texas woolly croton, gulf vervain, and various upland grass species). Soils in the surrounding area were identified by NRCS as Arents and Burlewash fine sandy loam, neither of which are classified as hydric soils. The AP are not located within any flood hazard areas as defined by FEMA. The potential PEM wetlands inside the AP were observed to be a result of the growth of hydrophytic plants from the continuous inundation of the AP. Based on soils and the upland vegetation observed on the berms and the surrounding area, the original habitat which characterized the location of the AP prior to construction was not a wetland.

5.0 Conclusion

Based on field observations and desktop review, the SSP and AP were constructed in upland areas and did not impact any existing wetland areas. Therefore, both impoundments comply with the wetland siting restrictions in 40 CFR §257.61. Potential PEM wetland habitat may occur within the existing CCR impoundments due to the operational use of these units as continuously inundated ponds. However, this is not a reflection of the conditions of the impoundment locations prior to construction.

6.0 CCR Wetland Regulations

Regulatory Citation: 40 CFR §257.61 Wetlands

The Wetlands Siting Certification for the Ash Ponds and Scrubber Sludge Pond is described in this section.

6.1 Wetlands Siting

Regulatory Citation: 40 CFR §257.61 (a): *New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in § 232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.*

The Ash Ponds and Scrubber Sludge Pond are not located in wetland areas.

7.0 Certification

This Certification Statement documents that the Ash Ponds and Scrubber Sludge Pond at the Texas Municipal Power Agency Gibbons Creek Steam Electric Station meets the Wetlands Siting requirements specified in 40 CFR §257.61. The Ash Ponds and Scrubber Sludge Pond are existing CCR impoundments as defined by 40 CFR §257.2. The CCR Rule requires than a Wetlands Siting Certification be prepared for existing CCR surface impoundments by October 17, 2018.

I, Seth Green being a Registered Professional Engineer in good standing in the State of Texas, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Units, that the Wetlands Siting Certification dated October 17, 2018, meets the requirements of 40CFR §257.61.

STATE OF TEXAS
SETH EDWARD GREEN
109563
LICENSED
PROFESSIONAL ENGINEER

10/16/18

Seth Green
Printed Name of Registered Professional Engineer

Signature of Registered Professional Engineer

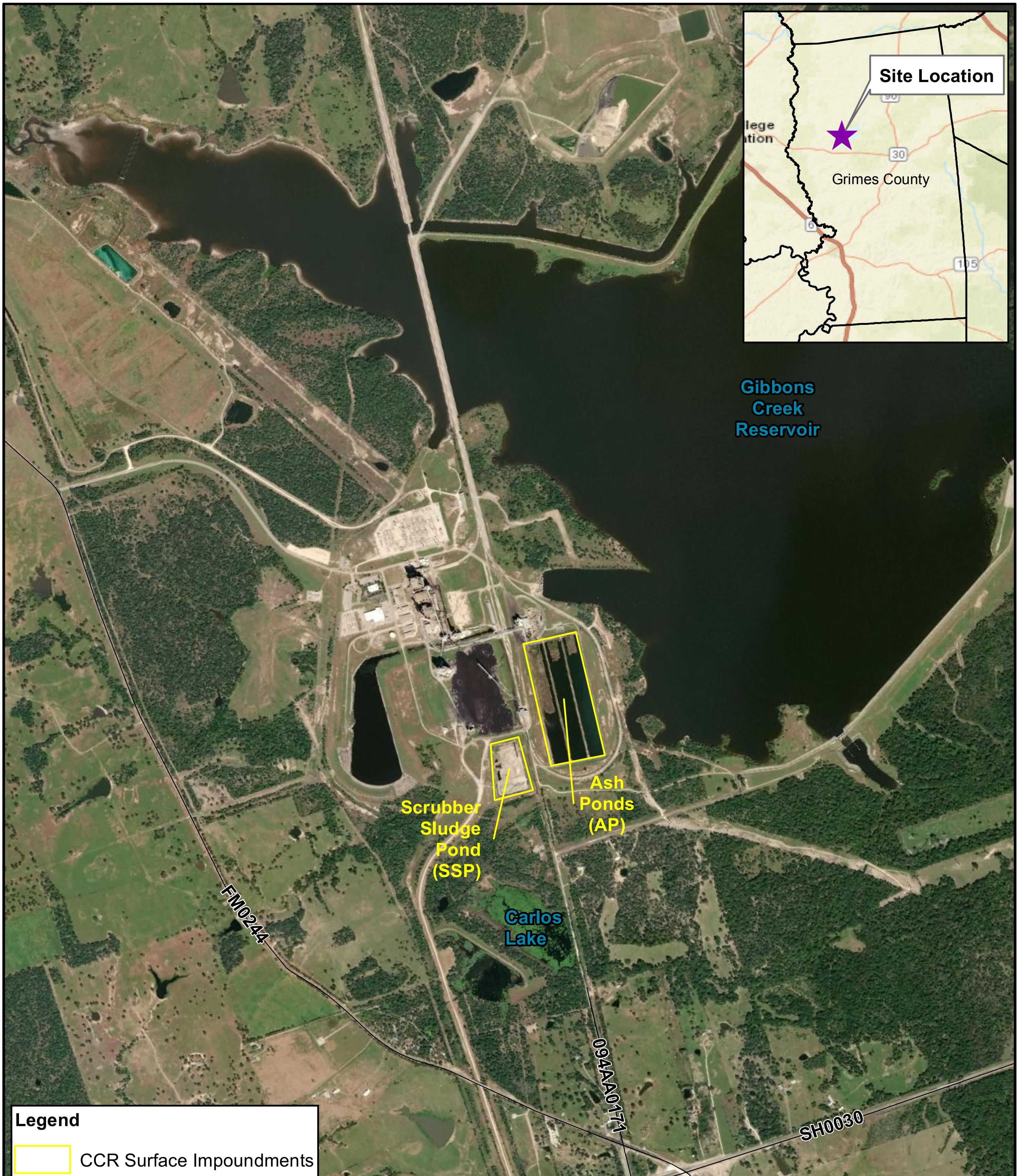
October 16, 2018
Date

Wood Environment & Infrastructure Solutions, Inc.
Company

F-00012
License Number

Texas
State of Registration

Figures



Texas Municipal Power Agency
Gibbons Creek Steam Electric Station
Grimes County, Texas

wood.

N

0 1,000 2,000 Feet

CCR Certification: Wetlands Siting

Site Location Map

DATE	OCTOBER 2018
SCALE	1 " = 2,000 feet
PROJECT NO.	6706180002
FIGURE	1

DRAWN BY: CJR CHECKED BY: GS

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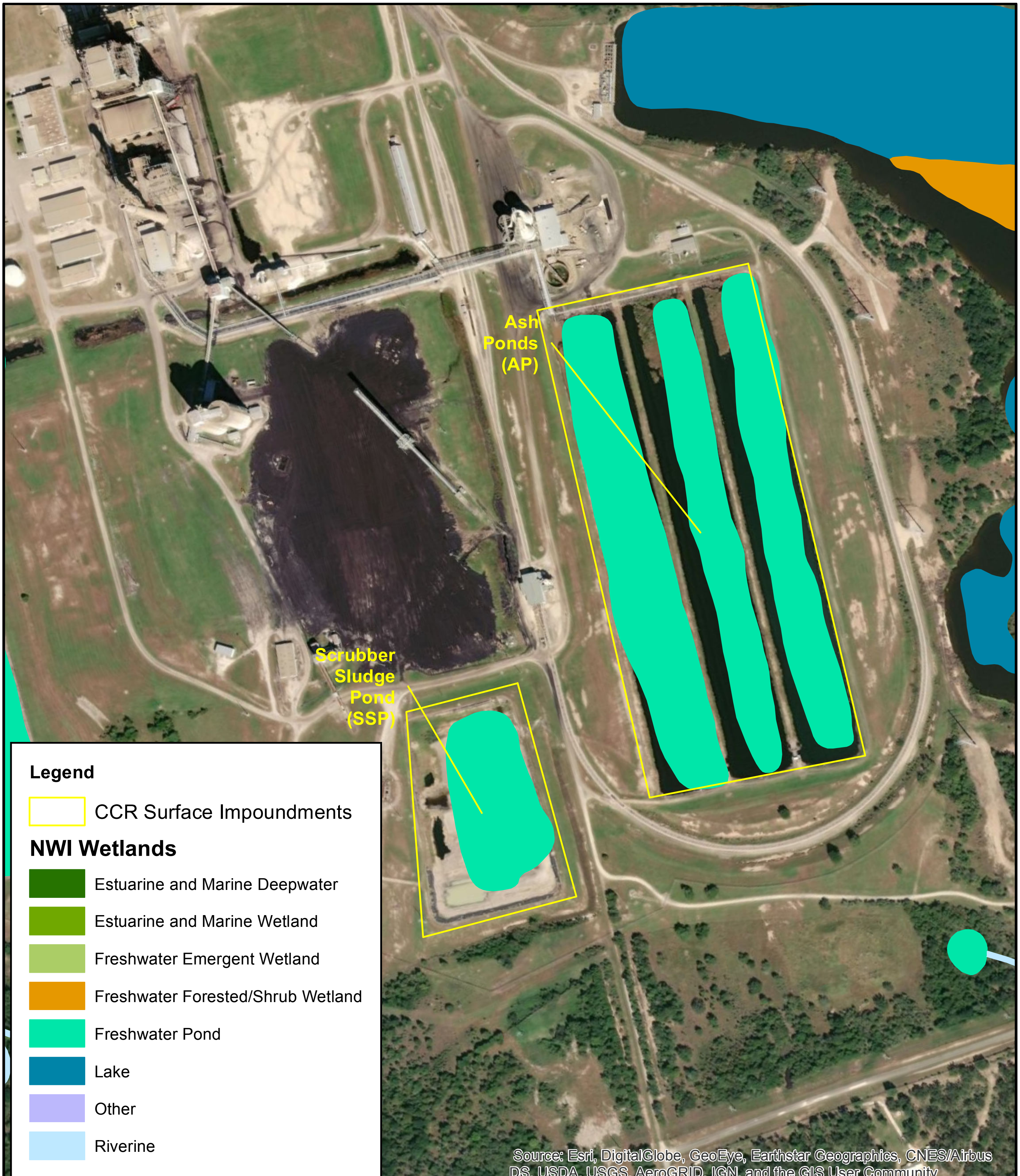

Texas Municipal Power Agency Gibbons Creek Steam Electric Station Grimes County, Texas	USFWS NWI Data Accessed from: http://www.fws.gov/wetlands/ October 2018	CCR Certification: Wetlands Siting	DATE OCTOBER 2018	SCALE 1 " = 500 feet
wood.	0 250 500 Feet	Wetlands Findings	PROJECT NO. 6706180002	FIGURE 2

DRAWN BY: CJR CHECKED BY: GS

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Attachment A

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

Grimes County, Texas

Ash Ponds and Scrubber Sludge Pond

October 11, 2018

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.

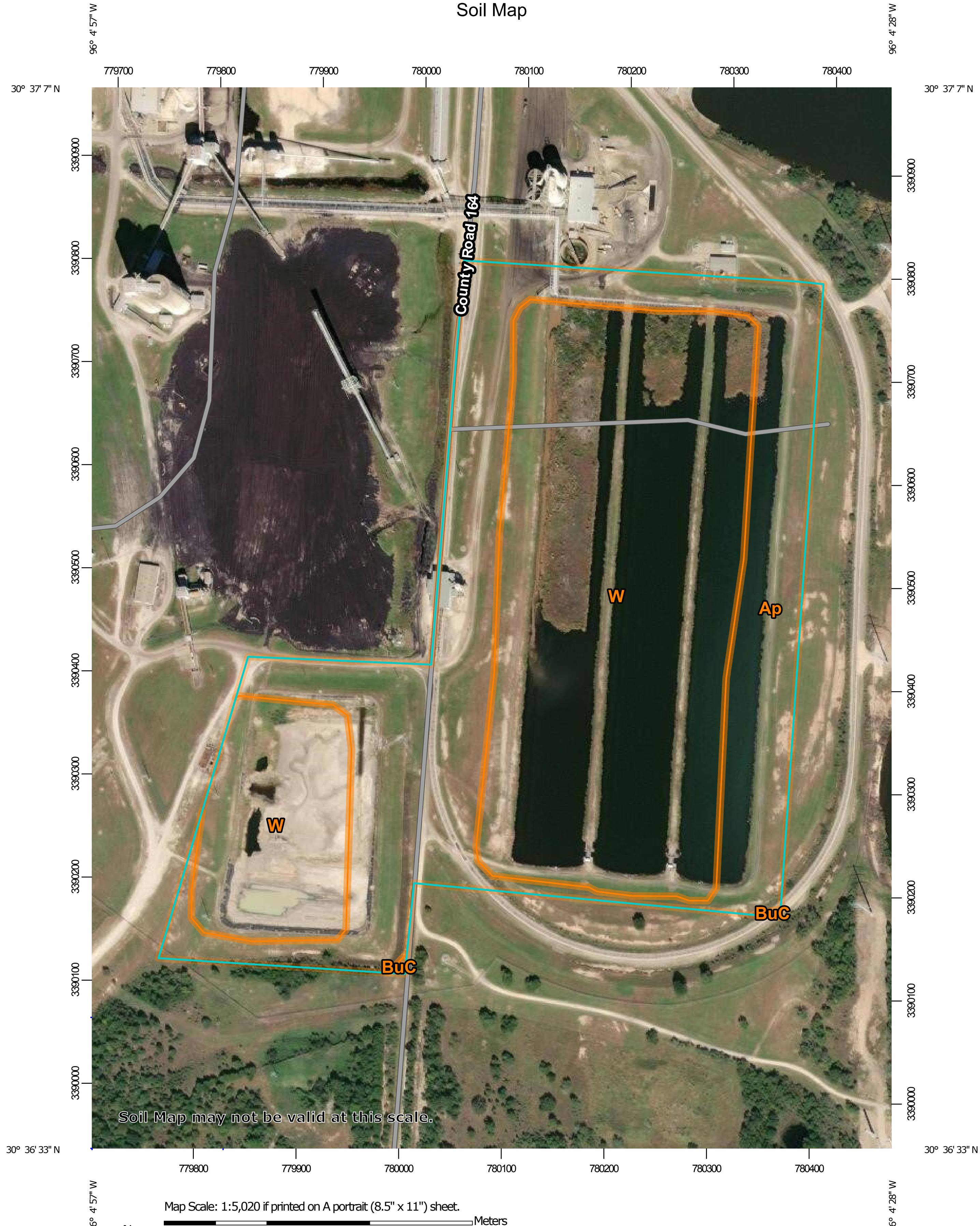
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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: 1:5,020 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 200, 400, 800, 1200

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Grimes County, Texas
Survey Area Data: Version 14, Sep 14, 2018

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

Date(s) aerial images were photographed: Sep 6, 2017—Nov 25, 2017

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
Ap	Arents	28.6	41.3%
BuC	Burlewash fine sandy loam, 1 to 5 percent slopes	0.1	0.1%
W	Water	40.6	58.6%
Totals for Area of Interest		**69.3**	**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.

Grimes County, Texas

Ap—Arents

Map Unit Setting

National map unit symbol: d9lz
Elevation: 250 to 400 feet
Mean annual precipitation: 32 to 48 inches
Mean annual air temperature: 64 to 70 degrees F
Frost-free period: 230 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Arents

Setting

Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy mine spoil or earthy fill derived from sandstone and siltstone in the jackson group of eocene age

Typical profile

H1 - 0 to 6 inches: silt loam
H2 - 6 to 60 inches: silty clay loam

Properties and qualities

Slope: 1 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

BuC—Burlewash fine sandy loam, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2vtj0
Elevation: 200 to 450 feet
Mean annual precipitation: 35 to 46 inches
Mean annual air temperature: 67 to 69 degrees F
Frost-free period: 262 to 288 days
Farmland classification: Not prime farmland

Map Unit Composition

Burlewash and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Burlewash

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Eocene age clayey residuum weathered from tuffaceous sandstone and siltstone

Typical profile

A - 0 to 8 inches: fine sandy loam
Bt - 8 to 28 inches: clay
BCt - 28 to 34 inches: clay
Cr - 34 to 45 inches: cemented bedrock

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: 26 to 34 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): 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
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 3.0
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D

Ecological site: Claypan Savannah (R087AY003TX)
Hydric soil rating: No

Minor Components

Rehburg

Percent of map unit: 10 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: Sandy (R087AY006TX)
Hydric soil rating: No

Shalba

Percent of map unit: 10 percent
Landform: Ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: Claypan Savannah (R087AY003TX)
Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

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Attachment B

drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane central zone (FIPSZONE 4203). The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC- 3, #9202
1315 East- West Highway
Silver Spring, MD 20910- 3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242,** or visit its website at http://www.ngs.noaa.gov/.

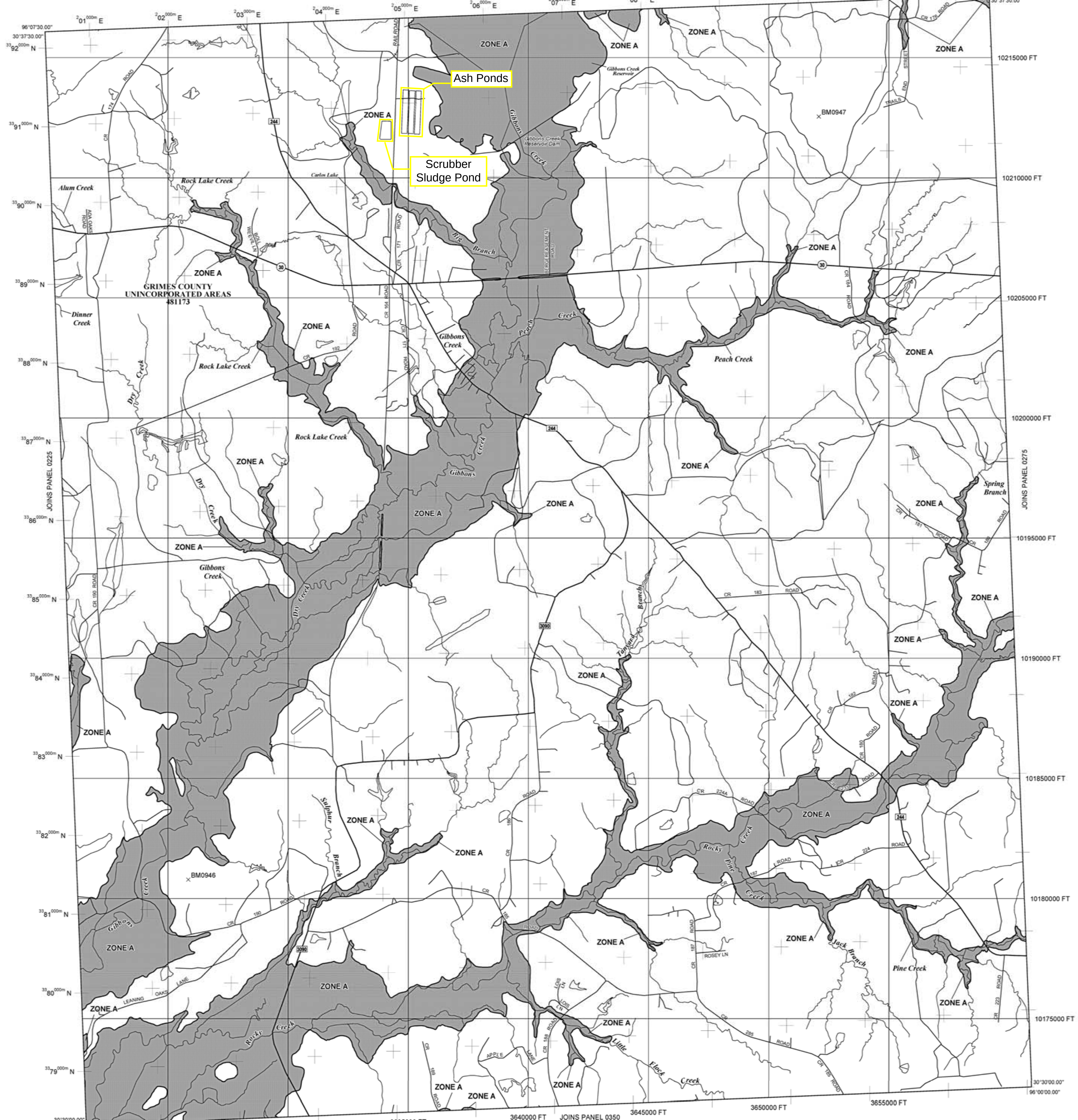
Base map information shown on this FIRM was obtained in digital format from Texas Natural Resources Information System, Texas Railroad Commission, NOAA National Geodetic Survey, U. S. Geological Survey, National Agriculture Imagery Program, and FEMA.

This map reflects more detailed and up- to- date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de- annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the **FEMA Map Service Center** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the **FEMA Map Service Center** website or by calling the FEMA MAP Information eXchange.



The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 - - - 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000m N	1000-meter Universal Transverse Mercator grid , zone 15
6000000 FT	5000-foot grid : Texas State Plane coordinate system, central zone (FIPSZONE 4203), Lambert Conformal Conic
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
APRIL 3, 2012
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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

MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP

PANEL 0250C

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
GRIMES COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 250 OF 575
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GRIMES COUNTY	481173	0250	C

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48185C0250C

EFFECTIVE DATE
APRIL 3, 2012