RANGER
ENVIRONMENTAL SERVICES, INC.

June 10, 2013

Mr. Steven Radke
Vinson Radke Investments
3933 Steck Ave B110
Austin, Texas 78759

Re: City of Austin Environmental Assessment Report
VRI Site
1201 Robert E. Lee Road
Austin, Texas 78704
Ranger Project No. 4120
Sent Via Electronic Format

Dear Mr. Radke:

Ranger Environmental Services, Inc. (Ranger) is pleased to provide a copy of the Environmental Assessment (EA) report for the referenced site. The EA was conducted in accordance with the City of Austin Land Development Code (LDC), Section 25-8-121.

The results and opinions documented within this EA are based solely on the professional opinion(s) of Ranger. Additionally, our opinions are based on the field conditions as they were observed during our field inspections. It should be noted that only areas readily accessible were inspected. There may be environmental features and/or critical environmental features (CEFs) present that were not identified as part of this study. This visual field assessment cannot wholly eliminate the possibility of environmental features and/or CEFs at the site. It should be noted that some CEFs may be seasonal or weather dependent and therefore not observed. Ranger is not liable for CEFs that may be exposed, created or identified after the date of our field assessments.

We appreciate the opportunity to provide our services. Should you have any questions or require additional services, please do not hesitate to contact me at 512-335-1785 ext. 22.

Sincerely,

Keith Copeland, P.G.
Ranger Environmental Services, Inc.

Enclosure

STATE OF TEXAS KEITH COPELAND GEOLOGY 1020 LICENSED PROFESSIONAL GEOSCIENTIST

6/10/13

ENVIRONMENTAL SERVICES, INC.

CITY OF AUSTIN
ENVIRONMENTAL ASSESSMENT REPORT

VRI SITE
1201 ROBERT E. LEE ROAD
AUSTIN, TEXAS 78704

PREPARED FOR:

VINSON RADKE INVESTMENTS
3933 STECK AVE B110
AUSTIN, TEXAS 78759

PREPARED BY:

RANGER ENVIRONMENTAL SERVICES, INC.
P.O. BOX 201179
AUSTIN, TEXAS 78720

RANGER PROJECT NO. 4120

June 6, 2013

STATE OF TEXAS PROFESSIONAL GEOSCIENTIST KEITH COPELAND GEOLOGY 1020 LICENSED

6/6/13

Mr. Keith Copeland, P.G.
Project Geologist

SWS PCP EDUCATION EXPERIENCE PWS ETHICS CHAD M. COPELAND 2309 PROFESSIONAL WETLAND SCIENTIST

6/6/13

Mr. Chad M. Copeland, PWS
Project Manager

CITY OF AUSTIN
ENVIRONMENTAL ASSESSMENT REPORT
VINSON RADKE INVESTMENTS
1201 ROBERT E. LEE ROAD
AUSTIN, TEXAS

1. Introduction

1.1 Purpose

Ranger Environmental Services, Inc. (Ranger), performed an Environmental Assessment (EA) in accordance with the City of Austin Land Development Code (LDC), Section 25-8-121 for the subject property located at 1201 Robert E. Lee Road, in Austin Texas. Site field investigations were conducted on May 14, May 23, May 28, and June 5, 2013. The City of Austin requires that an EA be performed when a proposed development is located: over a karst aquifer, within an area draining to a karst aquifer or reservoir, in a water quality transition zone, in a critical water quality zone, in a flood plain, or on a tract with a gradient of more than 15 percent.

1.2 Scope of Work

On May 14, May 23, May 28, and June 5, 2013, Ranger performed an EA at the subject property. The Ranger field team included Project Geologist, Mr. Keith Copeland (P.G.), Senior Biologists, Mr. Chad M. Copeland (PWS) and Mr. Todd B. Standlee, and Environmental Technician, Mr. Robby Proctor. The subject site was investigated on 50-foot transects where possible by way of foot in order to identify potential critical environmental features (CEFs) as defined by the City of Austin LDC, Section 25-8-121.

2. Background

2.1 Site Description and Features

The subject property is located on an approximate 3 acre lot at 1201 Robert E. Lee Road in Austin, Texas. The site is located south of Barton Springs Road *(Please see Attachment A)*.

- Site address: 1201 Robert E. Lee Road, Austin, Texas 78704
- Site Features: One residential structure and attached garage
- Site elevation: ~530 - 575 feet above mean sea level
- General Coordinates: N 30.2593, W 097.7712
- Land Use: Residential and undeveloped native vegetation
- Surface Drainage: Towards the west/northwest along Robert E. Lee Road and east/northeast on the eastern portion of the site
- Adjacent Property Use:

- North: Residential
- South: Residential
- East: Residential
- West: Robert E. Lee Road and Residential

3. Critical Environmental Features

In compliance with the City of Austin, an EA must identify all critical environmental features (CEFs) on the subject property and propose protective measures for those features. The feature types to be identified are as follows: springs, bluffs, canyon rimrocks, caves, sinkholes and recharge features and wetlands.

During the field assessment a scour pool was noted in the unnamed tributary to Barton Creek with water issuing from the pool area. This area is located at coordinates N 30.2589 and W 097.7707 and was investigated as a possible spring. Upon investigation Ranger determined that the scour pool is located at the contact of the Buda Limestone and Del Rio Clay. At the outcrop, the Buda Limestone is a massive, fractured, weathered limestone. The underlying Del Rio Clay is primarily clay, which is much less competent than the overlying limestone. The contact of the two units is well displayed in the creek. At the contact, in the absence of the harder overlying Buda Limestone, the creek has developed a small water fall and eroded a scour pool. The scour pool is an erosion feature within the creek bed. The scour pool measures approximately 18 feet in diameter and appears to be approximately three feet deep.

Exposed within the scour pool is a City of Austin 8-inch diameter waste water line. The City of Austin construction plans were obtained and reviewed. Copies of the plans are provided in Attachment H. The waste water line appears to have been installed in 1988. In this area of the creek, the line was bored below the creek bed and installed. An old 8-inch diameter waste water line was also located in the creek bed and was abandoned in place.

The plans indicate that the waste water line was placed approximately two feet below the bottom of the scour pool. Erosion has caused the waste water line to be exposed. The plans indicate that the line was placed by boring below the creek, while 280 feet upstream, it is encased in concrete.

The City of Austin reported that the waste water line has a hole in it and the City has conducted water quality testing of the creek at the scour pool. The test results confirm high levels of *E. coli* bacteria at the scour pool. The City of Austin test results are presented in Attachment I.

Ranger has discussed this project with the City of Austin, conducted field investigations of the site, and reviewed geologic reports. It is Ranger's professional opinion that the water issuing from the scour pool appears to be related to the utilities below the creek bed rather than a spring issuing from Del Rio Formation. This conclusion is based, in part, on the following:

- The Buda Limestone and Del Rio Clay contact is exposed. There is no spring flow at the contact.
- The utilities below the creek appear to be acting like a french drain, collecting surface water and the water is following the backfill material of the new and abandoned waste water lines.
- The limestone exposed above the scour pool is fractured, therefore allowing surface water to communicate with the utility corridor.
- The City of Austin reportedly conducted a camera survey of the line approximately two years ago. No holes were observed. The positive *E. coli* tests suggest that water and waste water can migrate along the backfill of the waste water lines. The source of the *E. coli* (e.g. manway, line, service line, etc.) is unknown. If there is no hole in the line, then there has to be an avenue of transport along the line, (i.e., utility backfill).
- No faulting was observed in the creek or study area.
- The waste water line exposed at the scour pool appears to be larger than 8-inches in diameter. The line may be encased.

4. Hydrogeologic Elements

4.1 Topography

The site topography ranges from generally flat at the center of the subject property to increasing relief towards the west, north, and east. The western portion slopes north/northwest at 0 to 10 percent and the eastern portion slopes east/northeast at 5 to 40 percent. A small drainage feature bisects the tract on the far eastern edge with a flow direction generally to the north. The topographic map for this area documented general elevation changes on the site ranging from approximately 535 – 575 feet above mean sea level. A copy of the topographic map is included in Attachment B. According the Texas Commission on Environmental Quality (TCEQ), the subject property is located in an Edwards Aquifer Recharge Zone. A copy of the TCEQ Edwards Map is presented in Attachment C.

4.2 Soils

Pursuant to the United States Department of Agriculture (USDA) Natural Resources Conservation Service, the soils at the site consist of the Tarrant soils and Urban land, 15 to 18 percent slopes (TeE), the Tarrant soils and Urban land, 18 to 40 percent slopes (TeF), and the Urban land and Brackett soils, 1 to 12 percent slopes (UuE). The soils are residuum weathered from limestone. The Tarrant soils are typically very stony clay while the Brackett soils are typically clay loam; both are classed as hydrologic soil group D. Complete soil data is included on the attached USDA Natural Resources Conservation Service Custom Soil Resource Report for Travis County, Texas, 1201 Robert E Lee Road, Austin, TX 78704. A copy of the report is provided in Attachment D.

4.3 Geology

Referencing the Geologic Atlas of Texas, Austin Sheet, and The University of Texas Bulletin No. 3232, The Geology of Texas, Volume 1, the subject site is underlain by Cretaceous sedimentary strata. In general, the Cretaceous strata dip regionally towards the east-southeast. The area lies along the Balcones Fault Zone, a geologic province characterized in this region by north-northeast trending en echelon normal faults with the downthrown side most commonly to the east of the fault planes.

The local stratigraphic section for the area is the Del Rio Clay, Buda Formation, Eagle Ford Formation and alluvium. The Cretaceous Del Rio Formation is primarily calcareous and fossiliferous clay. In the unweathered section, the clay typically contains kaolinite and illite. The Del Rio is approximately 65 feet thick and provides a confining layer to the underlying Georgetown Formation. At the site, the Del Rio Clay was observed in an outcrop along the unnamed tributary to Barton Creek.

The Buda Limestone is a generally hard to massive, poorly bedded to nodular, fossiliferous limestone. The Buda is typically light grey which weathers to dark grey to brown. The limestone is argillaceous near the upper contact. Burrows are present and typically filled with chalky marl. The Buda Limestone is exposed in the unnamed tributary to Barton Creek and is a characterized as a buff, weathered massive, fractured limestone.

The Eagle Ford Group generally consists of shale and chalky limestone. The Eagle Ford Group can be silty, grading to calcareous siltstones, flaggy, and contain bentonite and similar clayey material in thin seams interbedded with the flagstones and shale.

Alluvial sediments are present along the creek and in terrace deposits. Referenced geologic maps are provided in Attachments E and F.

5. Conclusions

As previously stated, Ranger conducted an EA in accordance with the City of Austin Land Development Code (LDC), section 25-8-121 for the subject property located at 1201 Robert E. Lee Road, Austin, TX 78704 on May 14, May 23, May 28, and June 5, 2013. Based primarily on the conducted field investigation, geologic data available, and past utility construction information provided by the City of Austin, Ranger opines that a natural spring is not currently present on the subject property and that the water upwelling from the scour pool appears to be related to the utilities below the creek bed rather than a spring issuing from Del Rio Formation

6. Recommendations

Ranger recommends that the Project Engineer review this report and incorporate the use thereof as necessary.

7. Limitations

Ranger conducted this study in accordance with the City of Austin LDC Section 28-8-121. Ranger did not conduct a geotechnical study.

It should be noted that only areas readily accessible were inspected. There may be environmental features present that were not identified as part of this study. This visual field assessment cannot wholly eliminate the possibility of critical environmental features at the site. Overgrown vegetation may have obscured site conditions.

It should be noted that environmental conditions may be documented in public records that were not reviewed. No EA can wholly eliminate the uncertainty regarding the potential for critical environmental features.

The report was limited to information concerning the observed physical characteristics of the property and standard environmental record sources. Information gathered for this report was reasonably ascertainable, publically available, and practically reviewable.

Maps, aerial photographs, or similar documents in the report may show approximate locations, property boundaries, or similar information and are included to assist the reader in visualizing the property. Ranger has made no land survey of the property.

Ranger assumes there are no hidden or unapparent environmental conditions and/or features of the property. Ranger assumes no responsibility for such conditions or inspections which might be required to discover such conditions and/or features.

Information gathered and reported from the site reconnaissance is based on the conditions existing on the date of Ranger's visit to the property. Property conditions are dynamic and subject to change, variations at the property could exist which were not documented in this report.

8. References

Bureau of Economic Geology. *Geologic Atlas of Texas. Austin Sheet. Scale: 1:250,000.* Austin, TX 78712.

(COA) City of Austin. Austin Watershed Regulation Areas. Austin, Texas: City of Austin, Department of Planning and Development. 30 January 1998.

(COA) City of Austin. Land Development. *Title 25. Chapter 25-8. Environment.* Austin: American Legal Publishing Corporation, 2008. Web. <http://www.amlegal.com/nxt/gateway.dll/Texas/austin/title25landdevelopment?f=templates$fn=default.htm$3.0$vid=amlegal:austin_t&xgt;.>

(FEMA) Federal Emergency Management Agency. Map. *Flood Insurance Rate Map, Travis County, Texas.* 2008.

Google Maps. Map. *1201 Robert E Lee Road, Austin, TX.* 2013.

Sellards, E.H., W.S. Adkins, F.B. Plummer. *The Geology of Texas. Volume 1. Stratigraphy.* University of Texas Bulletin, 1932. Austin.

(TCEQ) Texas Commission on Environmental Quality. Edwards Aquifer Protection Program. Edwards Aquifer Viewer, <http://gis.tceq.state.tx.us/website/iredwards1/viewer.htm>. Accessed 5 June, 2013.

Terrain Navigator Pro. Map. Austin West. My Topo, 2009.

(TWDB) Texas Water Development Board. Water Information Integration and Dissemination System. TWDB Groundwater Database (ArcIMS), <http://wiid.twdb.state.tx.us/ims/wwm_drl/viewer.htm?DISCL=1&>. Accessed 17 February 2012.

(USDA) U.S. Department of Agriculture. (NRCS) Natural Resources Conservation Service. *Custom Soil Resource Report for Travis County Texas.* May 20, 2013.

ATTACHMENT A
SITE MAP(S)

To see all the details that are visible on the screen, use the "Print" link next to the map.

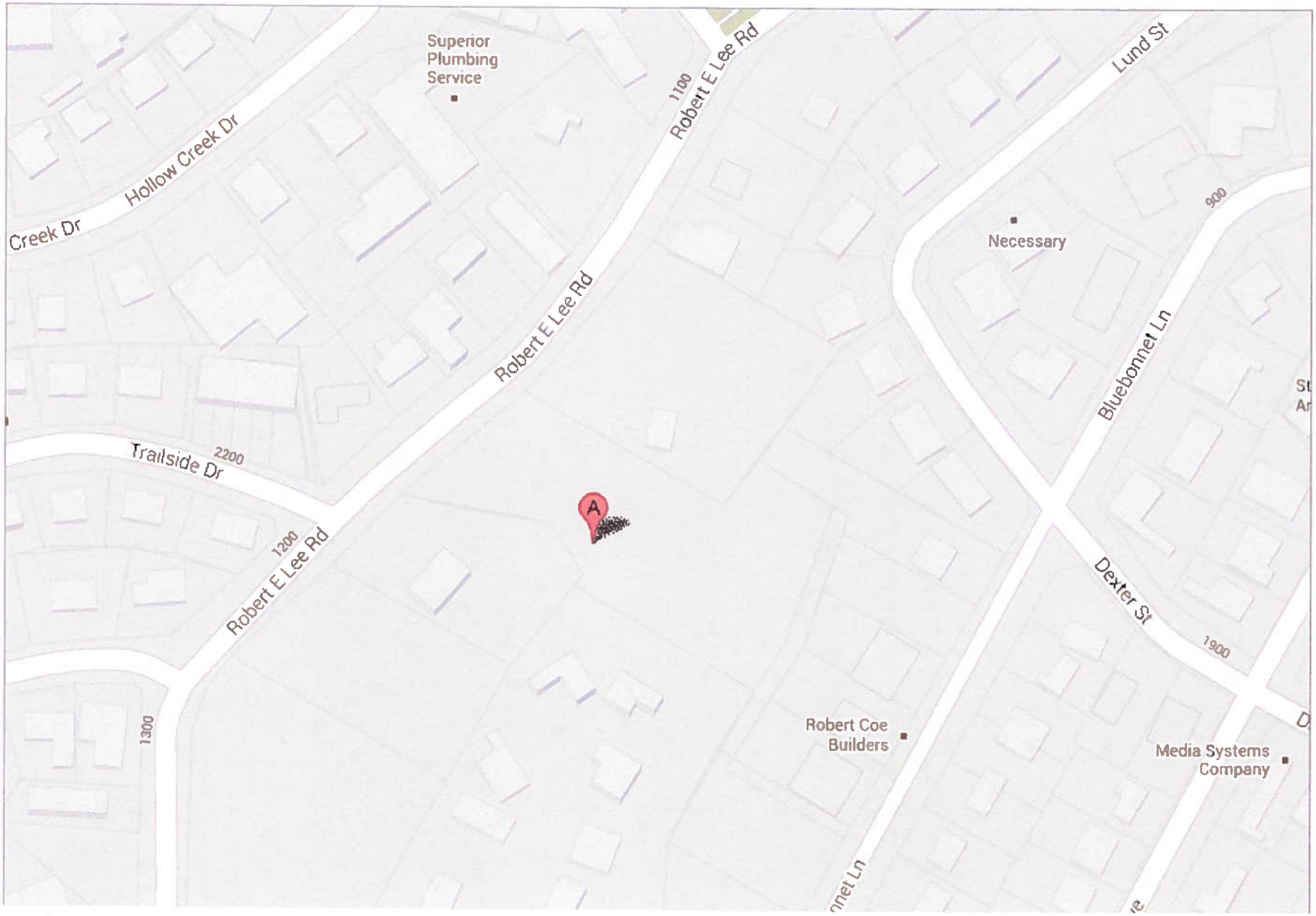


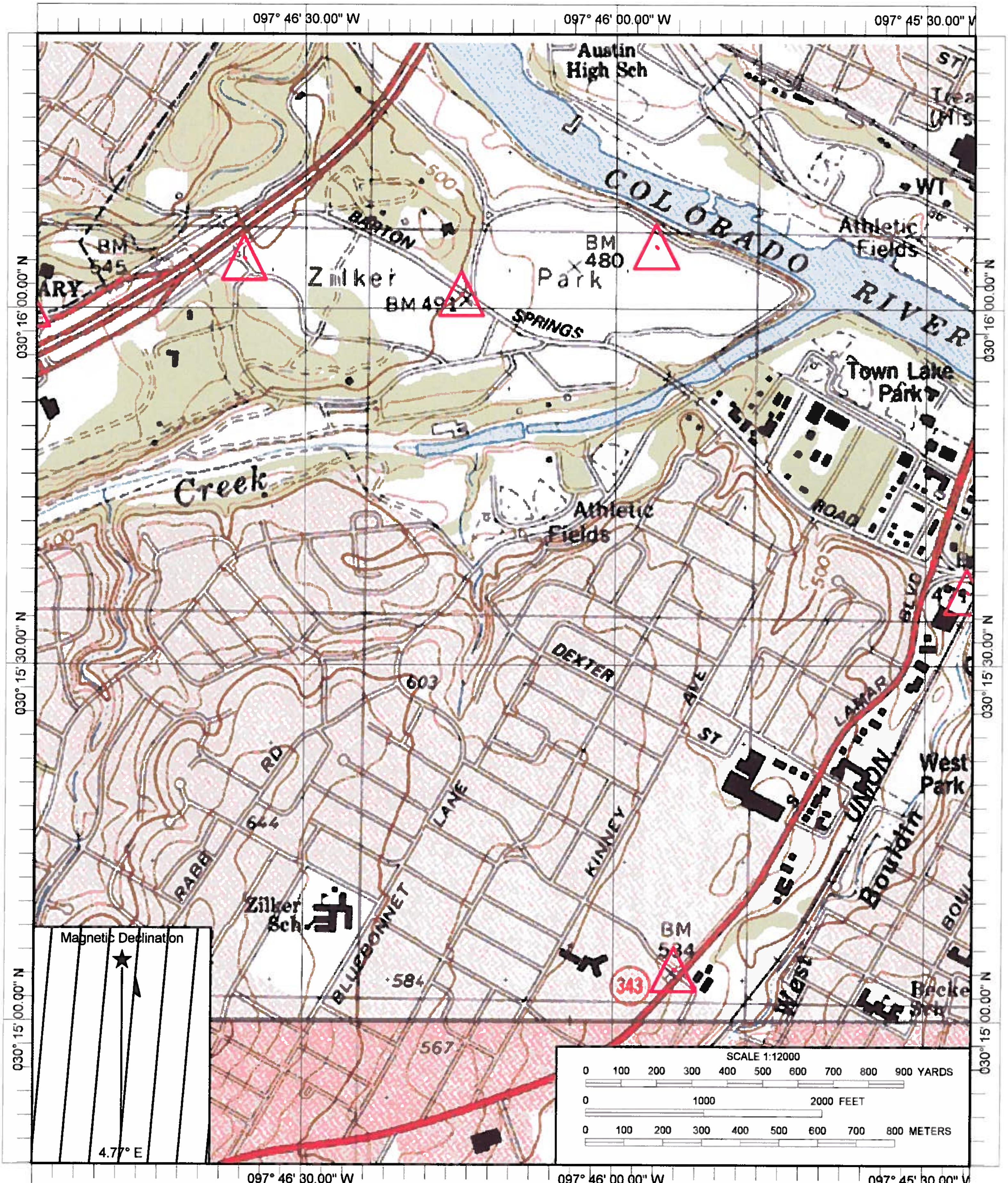
Exhibit R - 10

Google

To see all the details that are visible on the screen, use the "Print" link next to the map.

Exhibit R - 11

ATTACHMENT B
TOPOGRAPHIC MAP



Name: AUSTIN WEST
Date: 6/3/2013
Scale: 1 inch equals 1000 feet

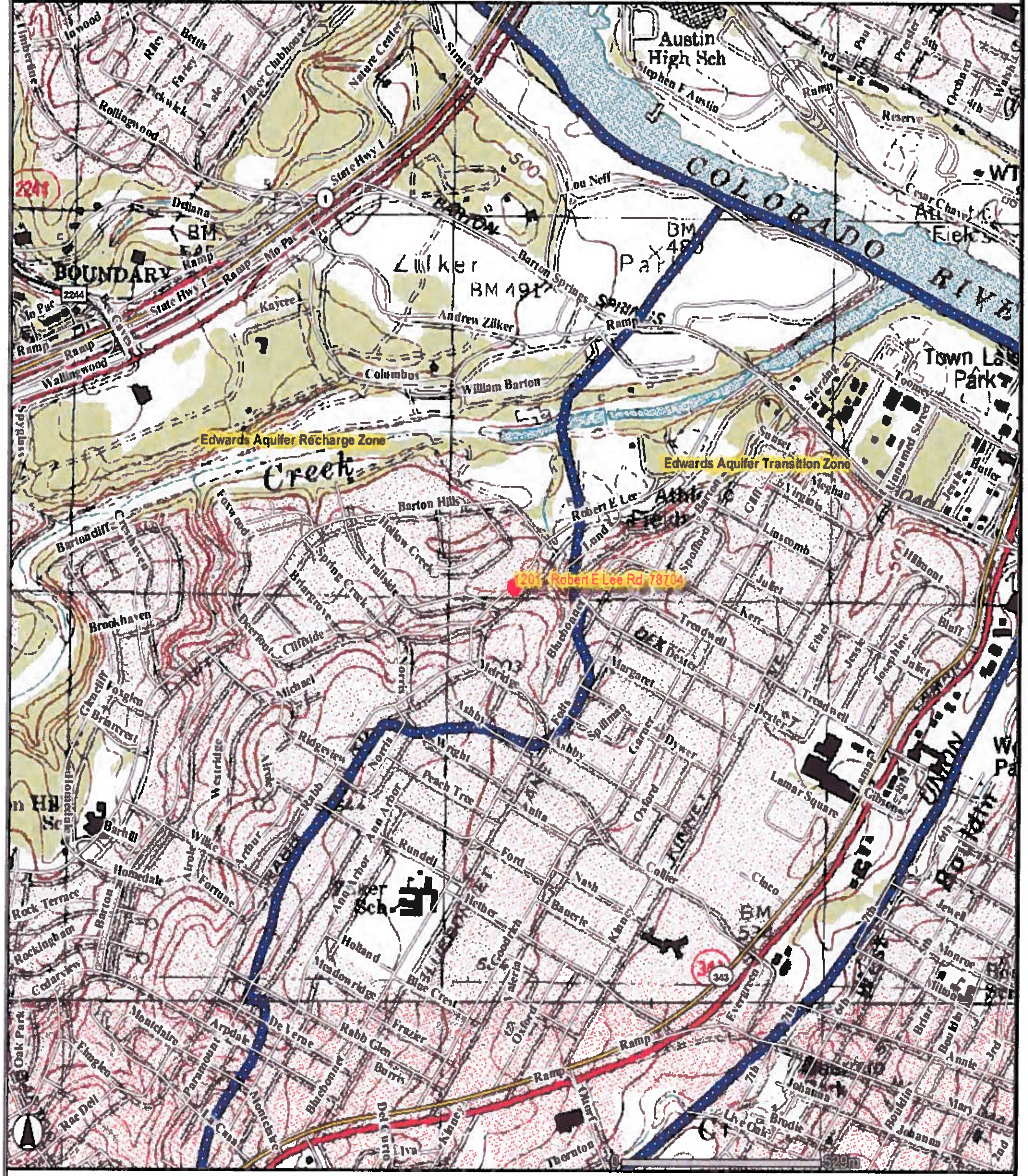
Location: 030° 15' 35.58" N 097° 46' 10.77" W NAD27
Caption: VRI COA EA
Topography Map

Exhibit R - 13

Datum: NAD27

ATTACHMENT C
TCEQ
EDWARDS AQUIFER MAP

Edwards Aquifer Viewer



VRI Site - Environmental Assessment

Exhibit R - 15

ATTACHMENT D
NRCS SOIL SURVEY

USDA 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

Travis County, Texas

June 4, 2013

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://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

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 Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the 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.

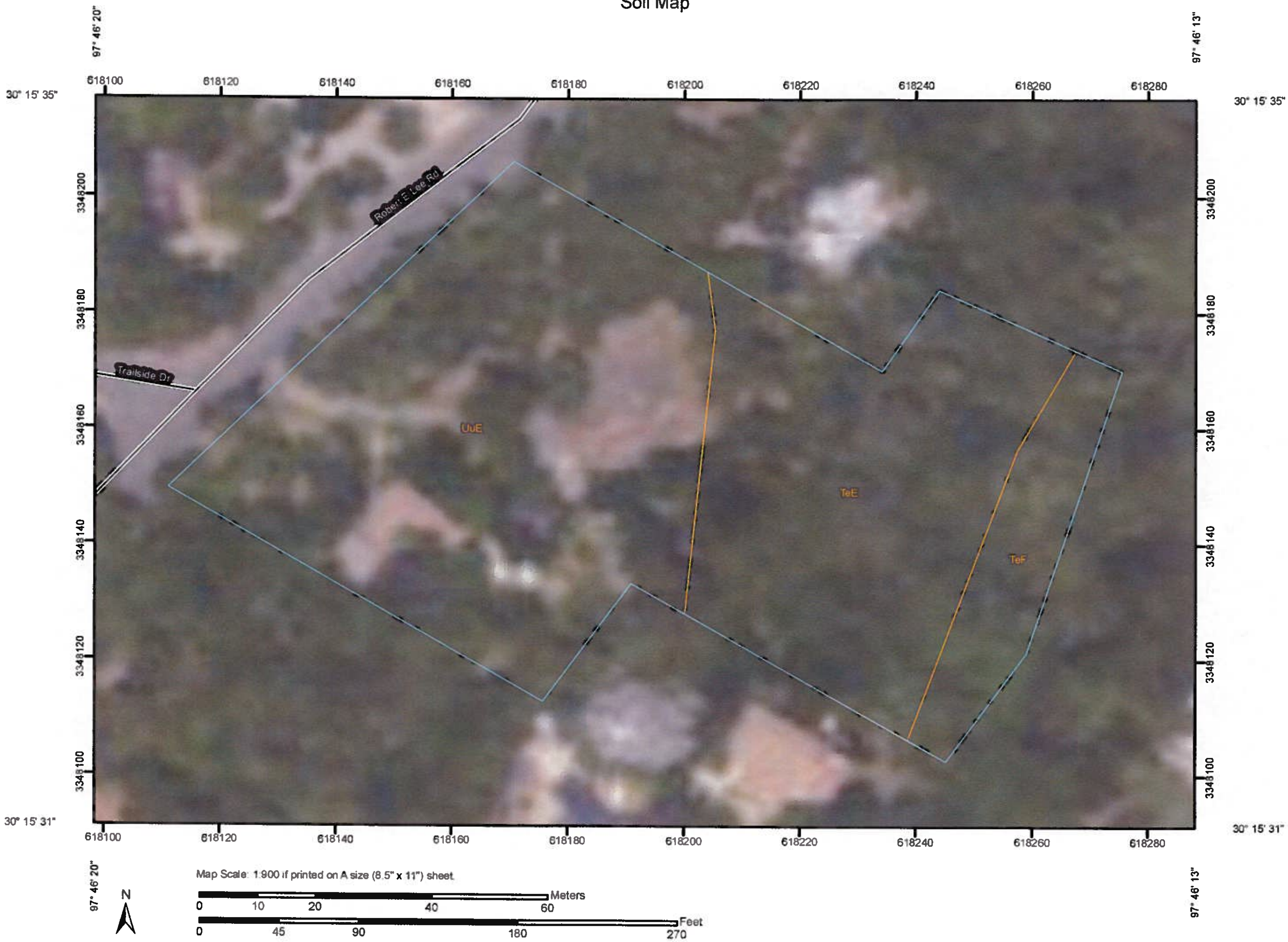
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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


97° 46' 20"
97° 46' 13"
30° 15' 35"
30° 15' 31"
618100
618120
618140
618160
618180
618200
618220
618240
618260
618280
3348200
3348180
3348160
3348140
3348120
3348100
Robert E Lee Rd
Trailside Dr
UuE
TeE
TeF
Map Scale: 1:900 if printed on A size (8.5" x 11") sheet.
N
0
10
20
40
60
Meters
0
45
90
180
270
Feet

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

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
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

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

MAP INFORMATION

Map Scale: 1:900 if printed on A size (8.5" × 11") sheet.

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 accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 14N NAD83

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

Soil Survey Area: Travis County, Texas
Survey Area Data: Version 13, Sep 21, 2012

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

Travis County, Texas (TX453)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
TeE	Tarrant soils and Urban land, 5 to 18 percent slopes	0.8	35.4%
TeF	Tarrant soils and Urban land, 18 to 40 percent slopes	0.2	9.5%
UuE	Urban land and Brackett soils, 1 to 12 percent slopes	1.2	55.1%
Totals for Area of Interest		**2.3**	**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.

Travis County, Texas

TeE—Tarrant soils and Urban land, 5 to 18 percent slopes

Map Unit Setting

Landscape: Plateaus
Elevation: 0 to 4,000 feet
Mean annual precipitation: 8 to 60 inches
Mean annual air temperature: 54 to 73 degrees F
Frost-free period: 180 to 310 days

Map Unit Composition

Tarrant, pe >44, and similar soils: 70 percent
Urban land: 25 percent
Minor components: 5 percent

Description of Tarrant, Pe >44

Setting

Landform: Plains
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from limestone

Properties and qualities

Slope: 5 to 18 percent
Depth to restrictive feature: 6 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 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: 40 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 0.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: D

Typical profile

0 to 8 inches: Very stony clay
8 to 12 inches: Bedrock

Description of Urban Land

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 8s

Typical profile

0 to 40 inches: Variable

Minor Components

Unnamed, minor components

Percent of map unit: 5 percent

TeF—Tarrant soils and Urban land, 18 to 40 percent slopes

Map Unit Setting

Landscape: Plateaus
Elevation: 0 to 4,000 feet
Mean annual precipitation: 8 to 60 inches
Mean annual air temperature: 54 to 73 degrees F
Frost-free period: 180 to 310 days

Map Unit Composition

Tarrant, pe >44, and similar soils: 80 percent
Urban land: 15 percent
Minor components: 5 percent

Description of Tarrant, Pe >44

Setting

Landform: Plains
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from limestone

Properties and qualities

Slope: 18 to 40 percent
Depth to restrictive feature: 6 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 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: 40 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 0.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: D

Typical profile

0 to 6 inches: Very stony clay
6 to 12 inches: Bedrock

Description of Urban Land

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 8s

Typical profile

0 to 40 inches: Variable

Minor Components

Unnamed, minor components

Percent of map unit: 5 percent

UuE—Urban land and Brackett soils, 1 to 12 percent slopes

Map Unit Setting

Landscape: Plateaus
Elevation: 0 to 4,000 feet
Mean annual precipitation: 8 to 60 inches
Mean annual air temperature: 54 to 73 degrees F
Frost-free period: 180 to 310 days

Map Unit Composition

Urban land: 40 percent
Brackett and similar soils: 35 percent
Minor components: 25 percent

Description of Urban Land

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 8s

Typical profile

0 to 40 inches: Variable

Description of Brackett

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from limestone

Properties and qualities

Slope: 1 to 12 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock

Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 90 percent
Gypsum, maximum content: 5 percent
Available water capacity: Very low (about 1.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6e
Hydrologic Soil Group: D

Typical profile

0 to 6 inches: Clay loam
6 to 14 inches: Clay loam
14 to 48 inches: Bedrock

Minor Components

Unnamed, minor components

Percent of map unit: 25 percent

References

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ATTACHMENT E
GEOLOGIC ATLAS OF TEXAS

Austin Sheet

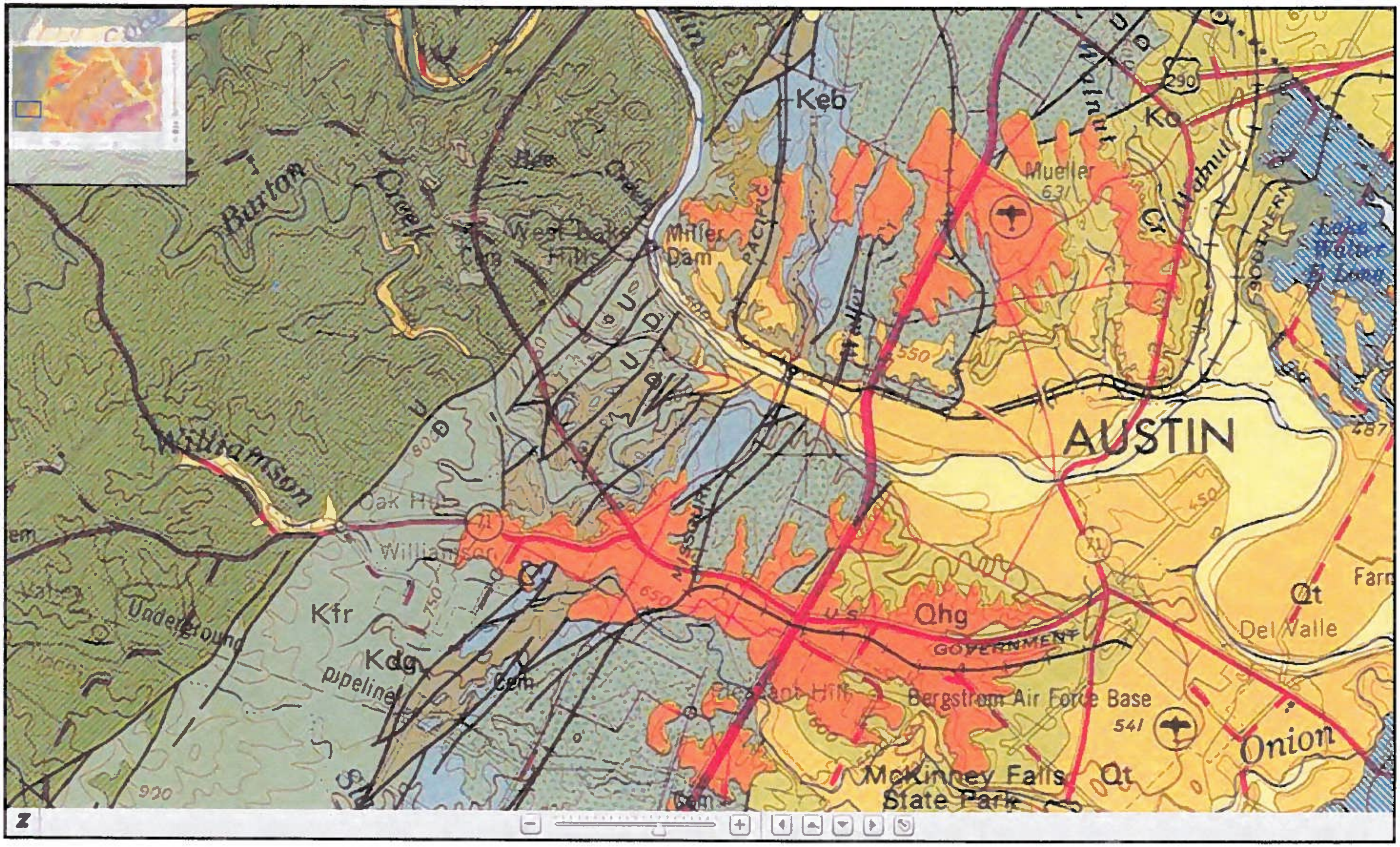


Exhibit R - 35

Austin Sheet

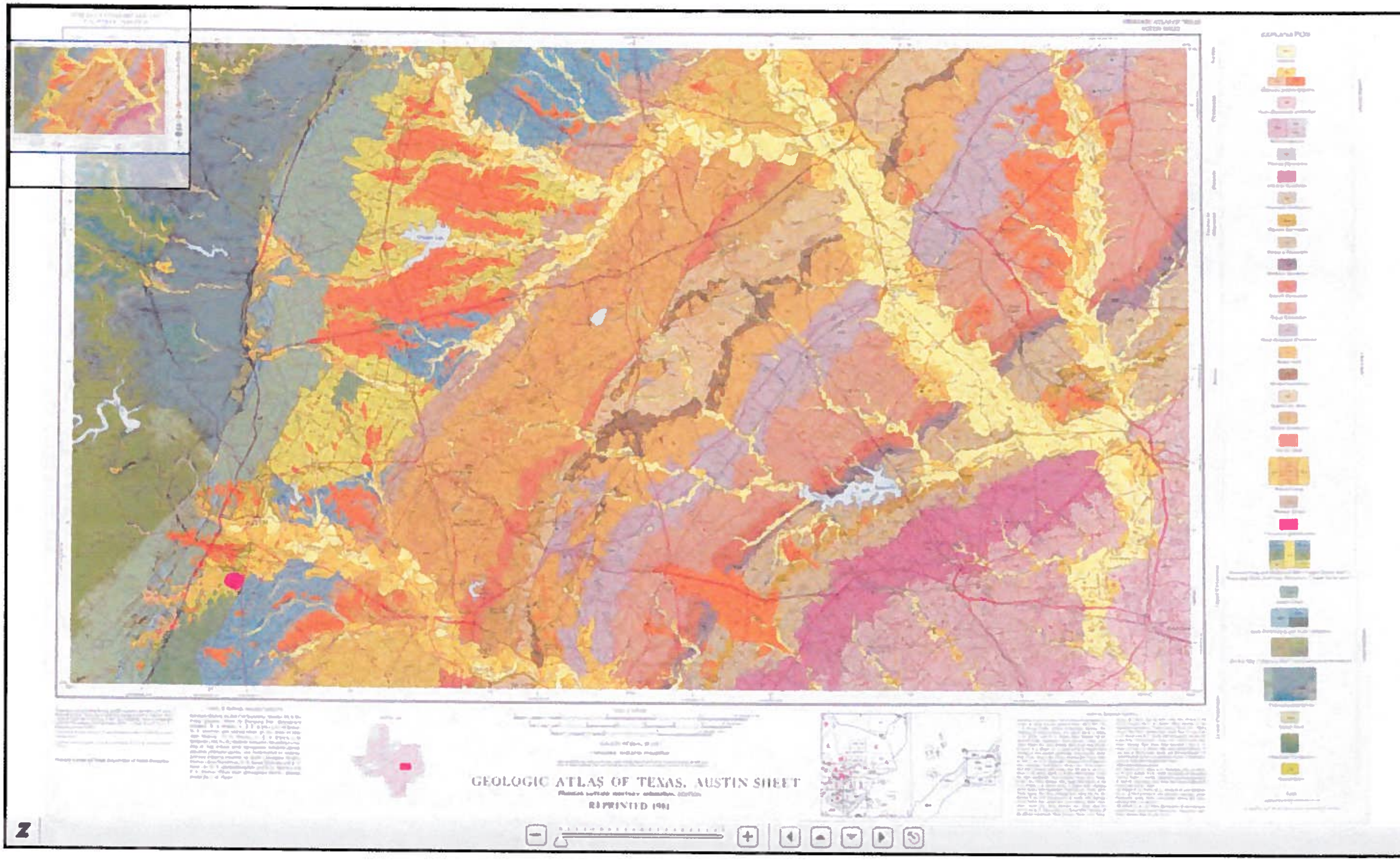


Exhibit R - 36

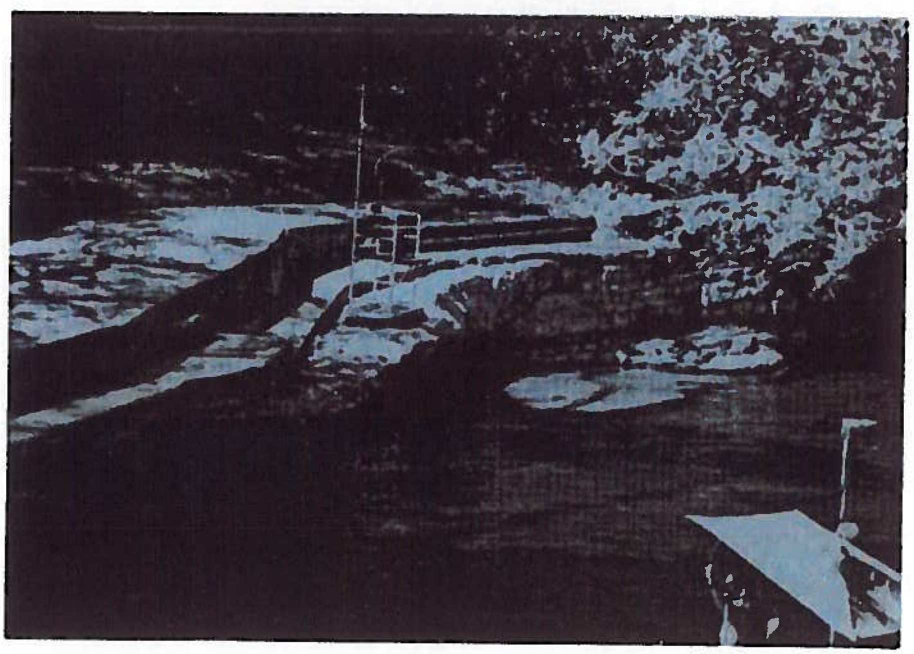
ATTACHMENT F
ZILKER GEOLOGY

ZILKER PARK WALKING TOUR GUIDEBOOK:

A RECREATIONAL VISIT TO THE EDWARDS LIMESTONE

A SPORTING EVENT OF
THE GULF COAST ASSOCIATION OF GEOLOGICAL SOCIETIES
1994 CONVENTION,
AUSTIN, TEXAS , OCTOBER 5 – 7, 1994

Energy
&
Environment
Expanding Professional Horizons
GCAGS
Austin 1994



PREPARED BY JENNIFER L. WALKER AND PAUL R. KNOX

Exhibit R - 38

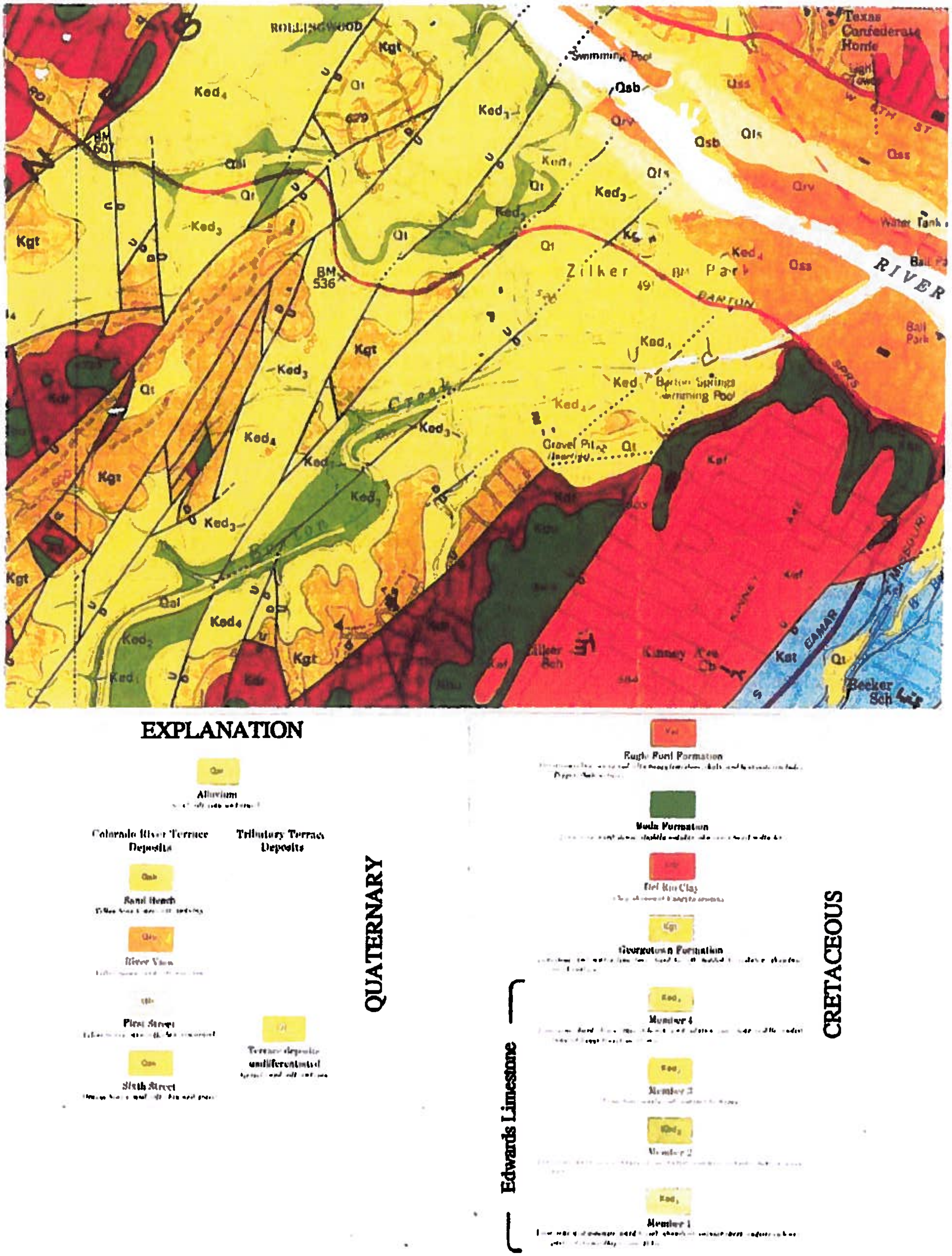
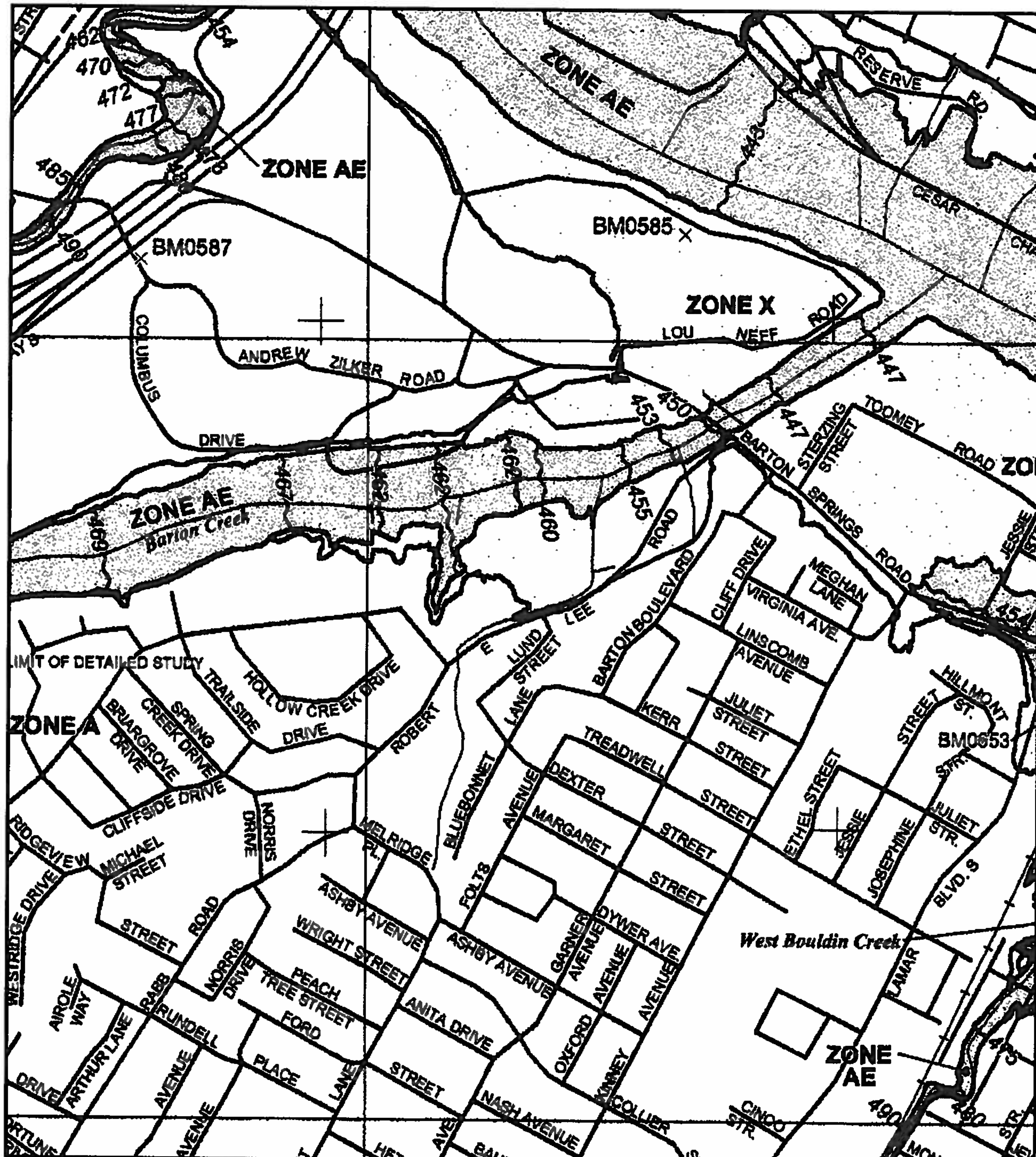
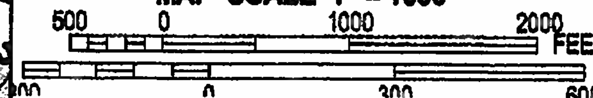


Figure 3. Geologic map of the Zilker Park area, showing major structural and stratigraphic features of the park and most of the greenbelt area. From Rodda and others (1970).

ATTACHMENT G
FEMA FLOODPLAIN MAP



MAP SCALE 1" = 1000'



PANEL 0445H

NATIONAL FLOOD INSURANCE PROGRAM

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

PANEL 445 OF 730
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
TRAVIS COUNTY	481026	0445	H
AUSTIN, CITY OF	480624	0445	H
ROLLINGWOOD, CITY OF	481029	0445	H
WEST LAKE HILLS, CITY OF	481030	0445	H

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
48453C0445H

MAP REVISED
SEPTEMBER 26, 2008

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

ATTACHMENT H
CITY OF AUSTIN CEF WORKSHEET

N/A

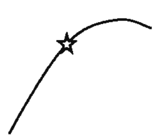
City of Austin Site Review Critical Environmental Feature Worksheet

1	Project Name:	VRI Site	5	imary Contact Name:	Mr. Keith Copeland, P.G.
2	Project Address:	1201 E. Robert E. Lee, Austin, Texas	6	Phone Number:	512-335-1785
3	Date:	6/5/2013	7	Prepared By:	Mr. Keith Copeland, P.G.
4	Environmental Assessment Date:	5/14/2013	8	S Located? {yes,no} :	NO

9	FEATURE TYPE {Wetland,Rimrock,Recharge Feature,Seep,Spring}	FEATURE ID (eg S-1)	FEATURE LONGITUDE (WGS 1984 in Meters)		FEATURE LATITUDE (WGS 1984 in Meters)		WETLAND DIMENSIONS (ft)		RIMROCK DIMENSIONS (ft)	
			coordinate	*notation*	*coordinate*	*notation*	X	Y	Length	Avg Height

City of Austin Use Only WPDRD CASE NUMBER:	

For rimrock, locate the midpoint of the segment that describes the feature.



For wetlands, locate the approximate centroid of the feature and the estimated area.

For a spring or seep, locate the source of groundwater that feeds a pool or stream.

STATE OF TEXAS
KEITH COPELAND
GEOLOGY
1020
LICENSED
PROFESSIONAL GEOSCIENTIST
6/6/13

ATTACHMENT I
CITY OF AUSTIN RECORDS

CITY OF AUSTIN, TEXAS
WATER AND WASTEWATER UTILITY

INDEX OF SHEETS

S-88-001
H 21-1
G-21-2
WASTEWATER

PLANS OF PROPOSED

RECEIVED JUN 27 1988 WATER AND WASTE WATER MAPS AND RECORDS

RELOCATION OF 8-INCH WASTEWATER LINE
ROBERT E. LEE ROAD EASEMENT

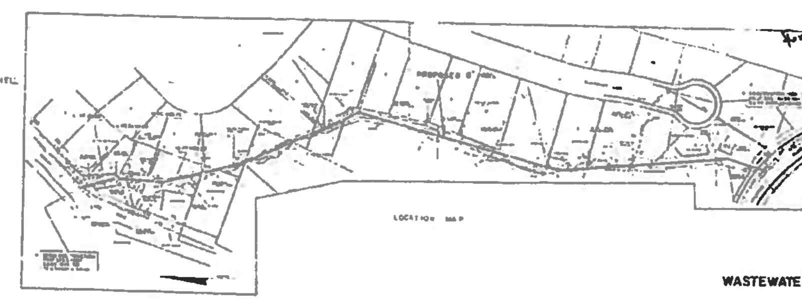
RELEASED FOR CONSTRUCTION
DATE 10-16-87 BY

7805
SITE DEVELOPMENT PERMIT NO

MAYOR
FRANK C. COOKSEY

COUNCIL
MARK ROSE
GEORGE HUMPHREY
SALLY SHIPMAN
SMOOT CARL MITCHELL
JOHN TREVINO JR
CHARLES E URDY

CITY MANAGER
JORGE CARRASCO



for [signature] DIRECTOR OF LAND DEVELOPMENT SERVICES — DATE 1/27/86

[signature] 9/5/86
[signature] 9/5/86
PROJECT DESIGNERS — DATE

[signature] PROJECT ENGINEER — DATE 12/19/85

[signature] BRANCH MANAGER WATER AND WASTEWATER — DATE 2/18/87

[signature] JAMES E. THOMPSON P.E. DIRECTOR WATER & WASTEWATER UTILITY — DATE 2/24/87

WASTEWATER C.I.P. NO. 234001

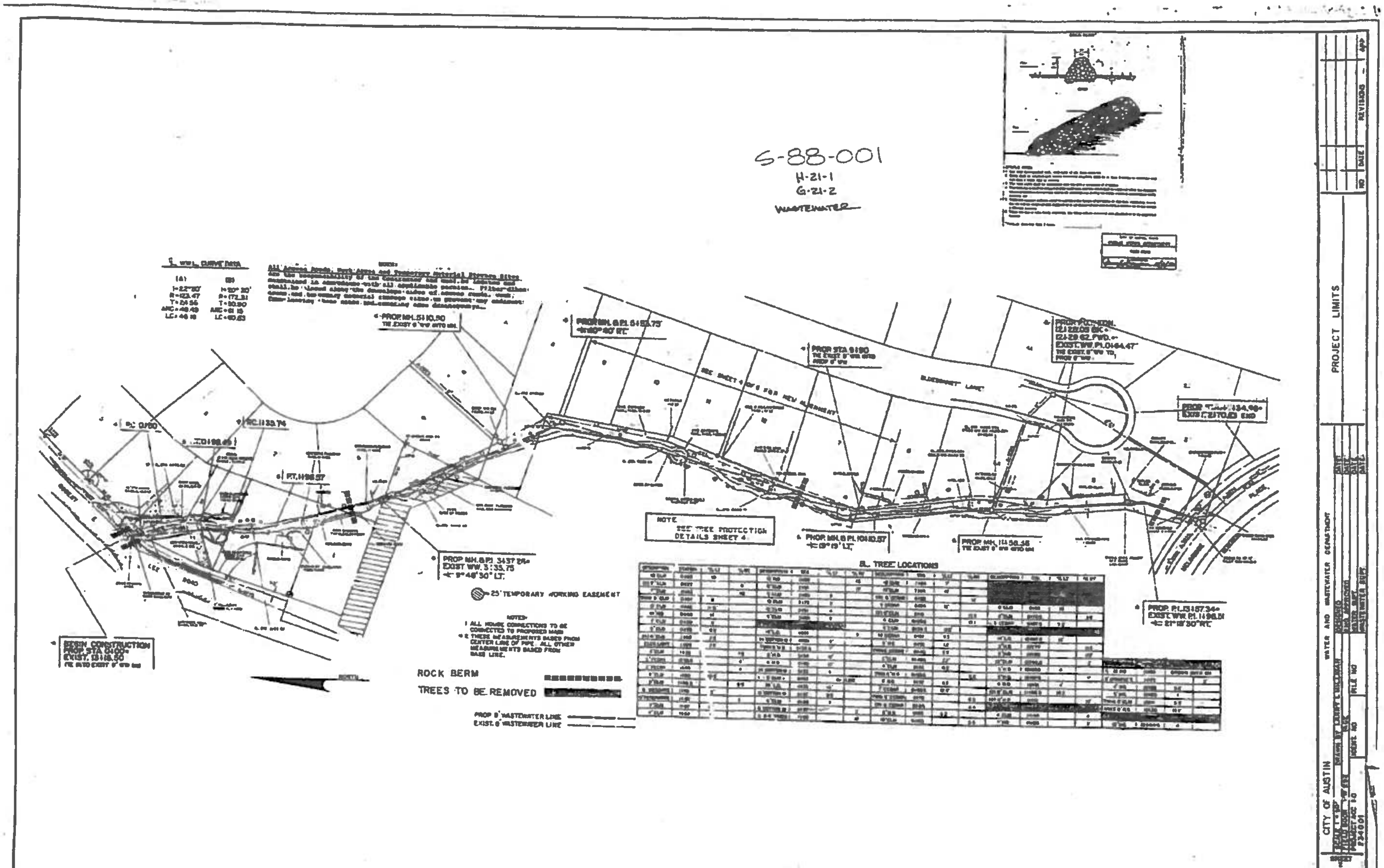
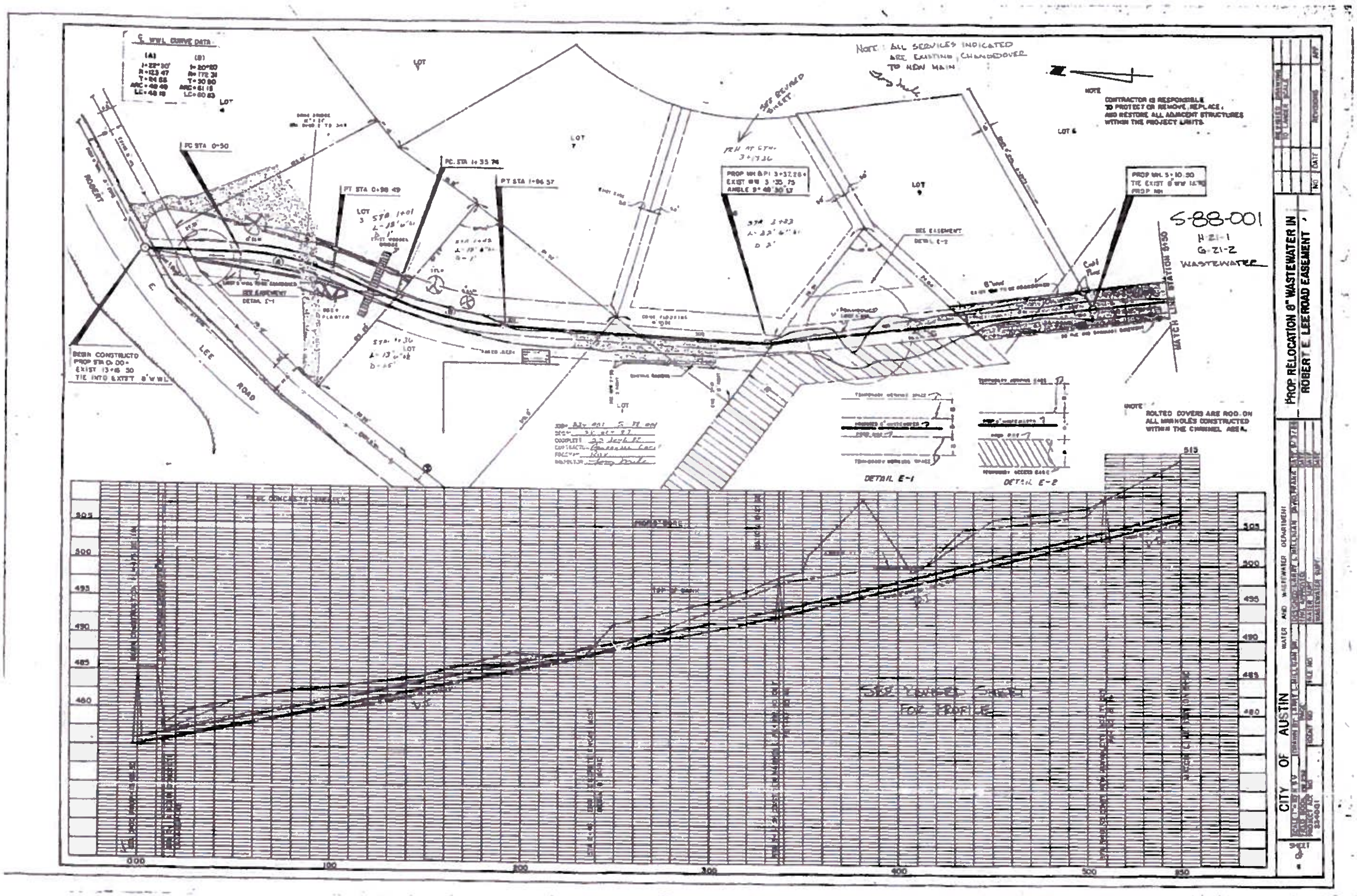
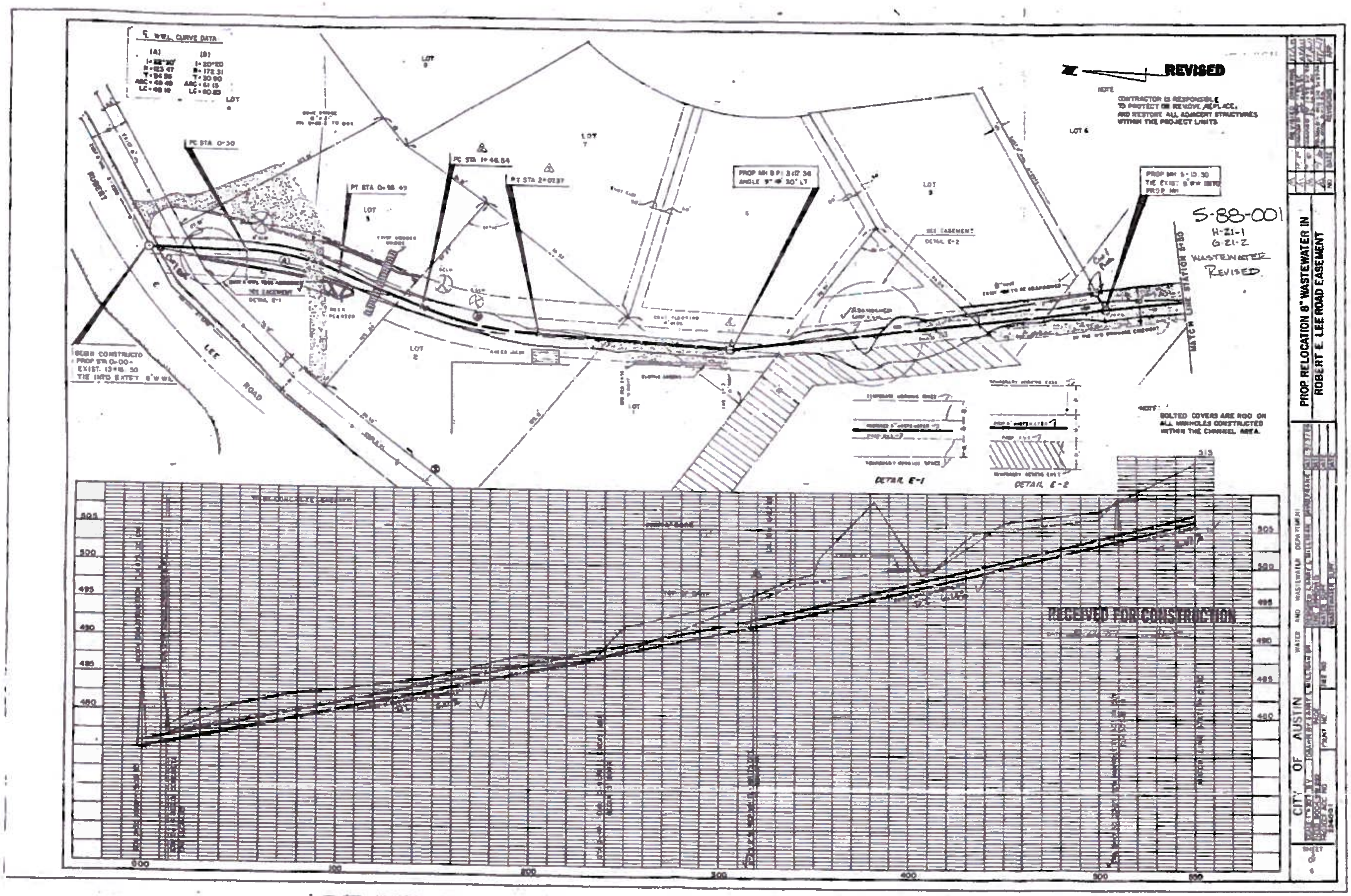

PROJECT LIMITS
CITY OF AUSTIN
WATER AND WASTEWATER DEPARTMENT
REVISIONS
S-88-001
H-21-1
G-21-2
WASTEWATER
CURVE DATA
I=22°20'
R=123.47
T=24.56
ARC=48.49
LC=48.18
PROP. MH. 5+10.50
PROP. MH. 6 P.I. 5+15.75
PROP. STA. 9+90
PROP. P.I. 10+34.98
SEE SHEET 4 OF 6 FOR NEW ALIGNMENT
NOTE
SEE TREE PROTECTION DETAILS SHEET 4.
PROP. MH. 8 P.I. 10+10.57
PROP. MH. 11+56.56
PROP. P.I. 13+57.34
EXIST. WW. P.I. 11+96.51
BEGIN CONSTRUCTION
PROP. MH. 8 P.I. 3+37.29
EXIST. WW. 3+33.75
25' TEMPORARY WORKING EASEMENT
NOTES:
1. ALL HOUSE CONNECTIONS TO BE CONNECTED TO PROPOSED MAIN
2. THESE MEASUREMENTS BASED FROM CENTER LINE OF PIPE. ALL OTHER MEASUREMENTS BASED FROM BASE LINE.
ROCK BERM
TREES TO BE REMOVED
PROP. 8" WASTEWATER LINE
EXIST. 8" WASTEWATER LINE
TREE LOCATIONS
P.C. 0+80
P.C. 11+33.74
P.T. 11+96.57

Exhibit R - 46



PROP RELOCATION 8" WASTEWATER IN ROBERT E. LEE ROAD EASEMENT
CITY OF AUSTIN
WATER AND WASTEWATER DEPARTMENT
S-88-001
H-21-1
G-21-2
WASTEWATER
NOTE: ALL SERVICES INDICATED ARE EXISTING, CHANGEDOVER TO NEW MAIN
NOTE
CONTRACTOR IS RESPONSIBLE TO PROTECT OR REMOVE, REPLACE, AND RESTORE ALL ADJACENT STRUCTURES WITHIN THE PROJECT LIMITS.
NOTE
BOLTED COVERS ARE REQ. ON ALL MANHOLES CONSTRUCTED WITHIN THE CHANNEL AREA.
℄ WWL CURVE DATA
PC STA 0+50
PT STA 0+98 49
PC STA 1+35 74
PT STA 1+96 57
PROP MH & PI 3+37.28
EXIST MH 3+35.75
PROP MH 5+10.50
MATCH LINE STATION 5+50
BEGIN CONSTRUCTION PROP STA 0+00
EXIST 13+16 50
TIE INTO EXIST 8" WWL
ROBERT E. LEE ROAD
LOT 6
SEE EASEMENT DETAIL E-1
SEE EASEMENT DETAIL E-2
DETAIL E-1
DETAIL E-2
SEE REVISED SHEET
SEE REVISED SHEET FOR PROFILE
505
500
495
490
485
480
0+00
100
200
300
400
500
550

Exhibit R - 47



REVISED
CONTRACTOR IS RESPONSIBLE TO PROTECT OR REMOVE /REPLACE, AND RESTORE ALL ADJACENT STRUCTURES WITHIN THE PROJECT LIMITS
5-88-001
H-21-1
G-21-2
WASTEWATER
REVISED
LOT 6
LOT 7
LOT 2
ROAD
LEE
ROBERT
PC STA 0+30
PT STA 0+98.49
PC STA 1+46.54
PT STA 2+01.37
MATCH LINE STATION 5+80
SEE EASEMENT DETAIL E-2
DETAIL E-1
DETAIL E-2
BOLTED COVERS ARE REQ. ON ALL MANHOLES CONSTRUCTED WITHIN THE CHANNEL AREA.
RECEIVED FOR CONSTRUCTION
PROP RELOCATION 8" WASTEWATER IN ROBERT E. LEE ROAD EASEMENT
CITY OF AUSTIN
WATER AND WASTEWATER DEPARTMENT

Exhibit R - 48

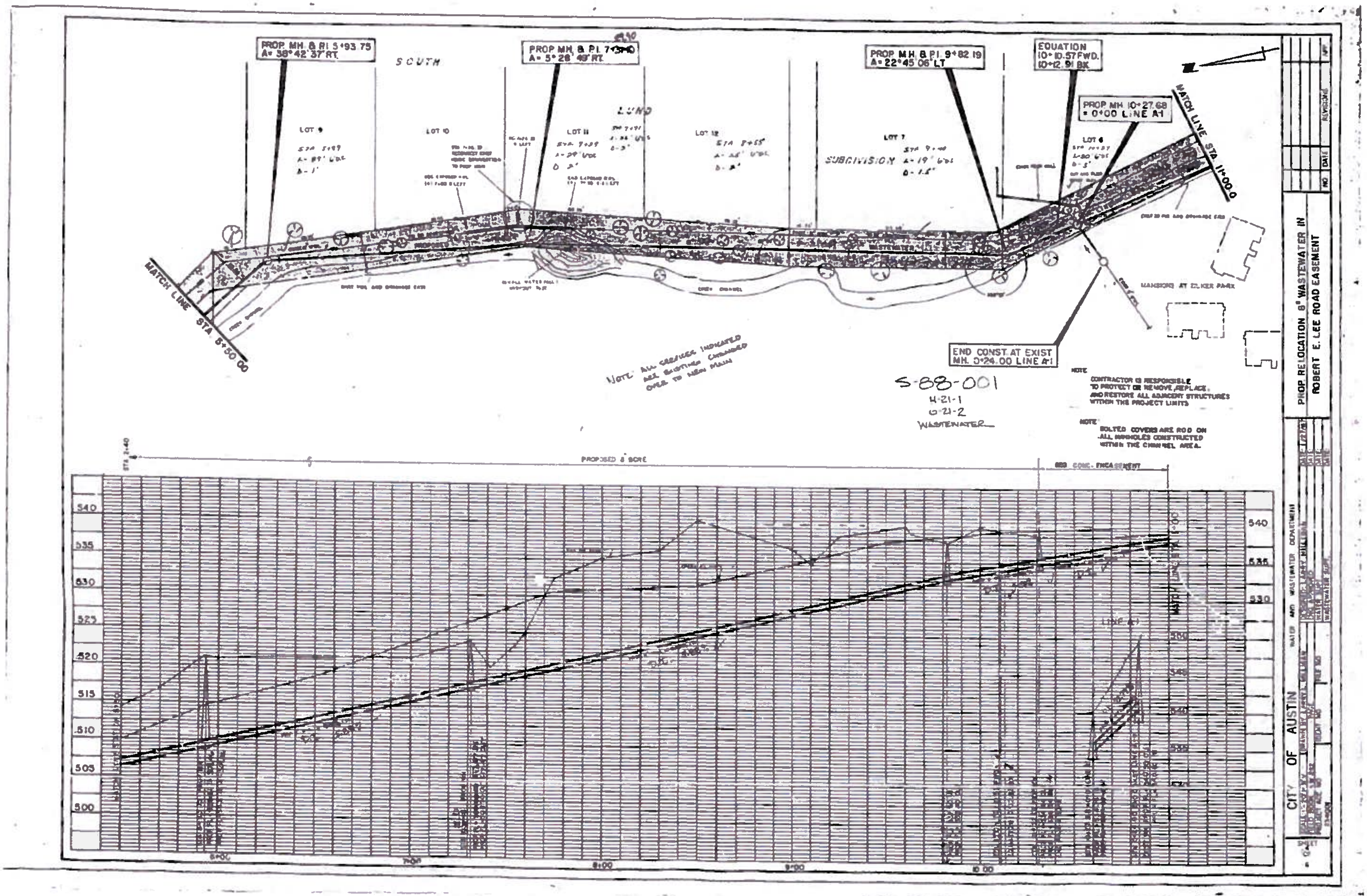
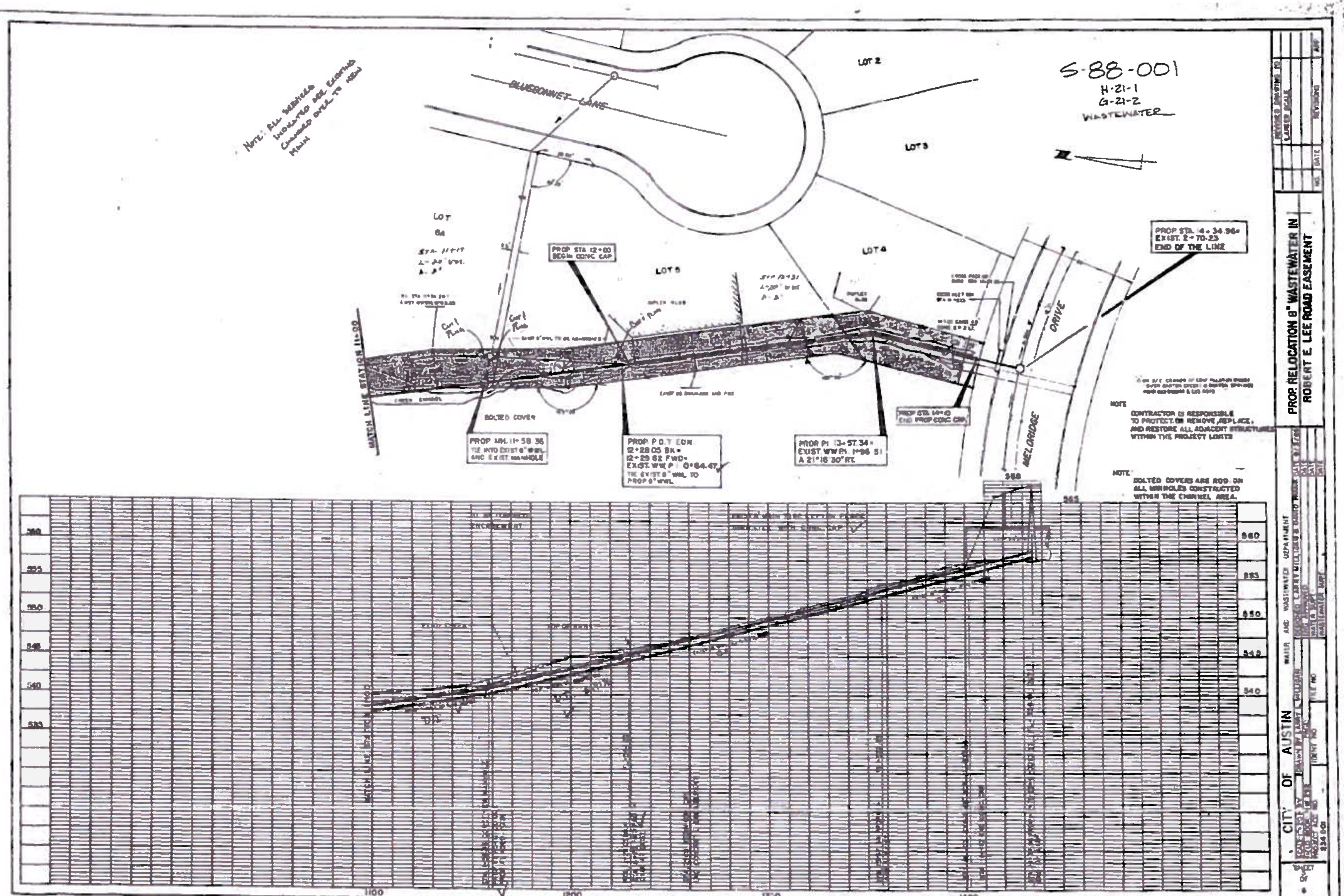
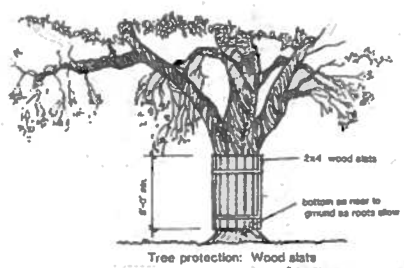

PROP. MH. & P.I. 5+93.75
A= 38°42'37" RT.
SOUTH
PROP. MH. & P.I. 7+39.40
A= 5°28'49" RT.
LUND
SUBDIVISION
PROP. M.H. & P.I. 9+82.19
A= 22°45'06" LT.
EQUATION
10+10.57 FWD.
10+12.91 BK.
PROP. MH. 10+27.68
= 0+00 LINE A1
MATCH LINE STA. 11+00.0
MATCH LINE STA. 5+50.00
LOT 9
LOT 10
LOT 11
LOT 12
LOT 7
LOT 6
MANSIONS AT ELKER PARK
END CONST. AT EXIST. MH. 0+24.00 LINE A1
S-88-001
H-21-1
G-21-2
WASTEWATER
NOTE: ALL SERVICES INDICATED ARE EXISTING CHANGED OVER TO NEW MAIN
NOTE: CONTRACTOR IS RESPONSIBLE TO PROTECT OR REMOVE, REPLACE, AND RESTORE ALL ADJACENT STRUCTURES WITHIN THE PROJECT LIMITS
NOTE: BOLTED COVERS ARE ROD ON ALL MANHOLES CONSTRUCTED WITHIN THE CHANNEL AREA.
PROPOSED 8" BORE
CONC. ENCASEMENT
PROP. RELOCATION 8" WASTEWATER IN ROBERT E. LEE ROAD EASEMENT
CITY OF AUSTIN
WATER AND WASTEWATER DEPARTMENT
540
535
530
525
520
515
510
505
500
6+00
7+00
8+00
9+00
10+00

Exhibit R - 49

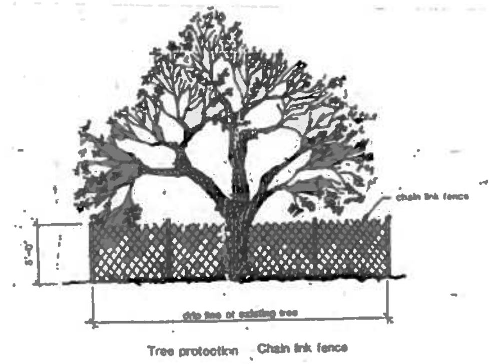


S-88-001
H-21-1
G-21-2
WASTEWATER
LOT 2
LOT 3
LOT 4
LOT 5
LOT 6A
BLUEBONNET LANE
MELRIDGE DRIVE
MATCH LINE STATION 11+00
PROP STA 12+60 BEGIN CONC CAP
PROP STA 14+34.96= EXIST. 2+70.23 END OF THE LINE
PROP MH. 11+58.36 TIE INTO EXIST 8" WWL AND EXIST MANHOLE
BOLTED COVER
PROP P.O.T. EQN 12+28.05 BK= 12+29.62 FWD= EXIST. WW P.I. 0+64.47 TIE EXIST 8" WWL TO PROP 8" WWL
PROP PI 13+57.34= EXIST WW PI 1+96.51 A 21°16'30" RT.
PROP STA 14+0 END PROP CONC CAP
NOTE
CONTRACTOR IS RESPONSIBLE TO PROTECT OR REMOVE, REPLACE, AND RESTORE ALL ADJACENT STRUCTURES WITHIN THE PROJECT LIMITS
NOTE
BOLTED COVERS ARE REQ. ON ALL MANHOLES CONSTRUCTED WITHIN THE CHANNEL AREA.
Note: All services located are existing changed over to new main
PROP. RELOCATION 8" WASTEWATER IN ROBERT E. LEE ROAD EASEMENT
CITY OF AUSTIN
WATER AND WASTEWATER DEPARTMENT
1100
1200
1300
1400
560
555
550
545
540
535

Exhibit R - 50



TREE PROTECTION DETAIL-(A)



TREE PROTECTION DETAIL-(B)

CITY OF AUSTIN
STANDARD TREE PROTECTION NOTES

1. All trees shown on this plan to be retained shall be protected during construction with temporary fencing.
2. Tree protection fences shall be erected according to Office of Land Development Standards for Tree Protection.
3. Tree protection fences shall be installed prior to the commencement of any site preparation work (clearing, grubbing or grading).
4. Fences shall completely surround the tree or clusters of trees; will be located at the outermost limits of the tree branches (dripline); and will be maintained throughout the construction project in order to prevent the following:
   a. soil compaction in the root zone area resulting from vehicular traffic or storage of equipment or materials
   b. root zone disturbances due to grade changes (greater than 6 inches cut or fill) or trenching not reviewed and authorized by the City Arborist.
   c. wounds to exposed roots, trunk or limbs by mechanical equipment
   d. other activities detrimental to trees such as chemical storage, cement truck cleaning, and fires.
5. Exceptions to installing fences at tree driplines may be permitted in the following cases:
   a. where permeable paving is to be installed, erect the fence at the outer limits of the permeable paving area.
   b. where trees are close to proposed buildings, erect the fence no closer than 6 feet to the building
   c. where there are severe space constraints due to tract size, or other special requirements, contact the City Arborist at 499-2760 to discuss alternatives.

S-88-001
H-21-1
G-21-2
WASTEWATER

6. Where any of the above exceptions result in a fence being closer than 4 feet to a tree trunk, protect the trunk with strapped-on planking to a height of 8 feet (or to the limits of lower branching) in addition to the reduced fencing provided.
7. Where any of the above exceptions result in areas of unprotected root zones (under driplines), these areas should be covered with 4 inches of organic mulch to minimize soil compaction.
8. All grading within protected root zone areas shall be done by hand or with small equipment to minimize root damage. Prior to grading, relocate protective fencing to 2 feet behind the grade change area.
9. Any roots exposed by construction activity shall be pruned flush with the soil. Backfill root areas with good quality top soil as soon as possible. If exposed root areas are not backfilled within 2 days, cover them with organic material in a manner which reduces soil temperature and minimizes water loss due to evaporation.
10. Prior to excavation or grade cutting within tree driplines, make a clean cut between the disturbed and undisturbed root zones with a rock saw or similar equipment to minimize damage to remaining roots.
11. Trees most heavily impacted by construction activities should be watered deeply once a week during periods of hot, dry weather. Tree crowns should be sprayed with water periodically to reduce dust accumulation on the leaves.
12. Any trenching required for the installation of landscape irrigation shall be placed as far from existing tree trunks as possible.
13. No landscape topsoil dressing greater than 4 inches shall be permitted within the dripline of trees. No soil is permitted on the root flare of any tree.
14. Pruning to provide clearance for structures, vehicular traffic and equipment shall take place before construction begins.
15. All finished pruning must be done according to recognized, approved standards of the industry (Reference the National Arborist Association Pruning Standards for Shade Trees available on request from the City Arborist).

NO	DATE	REVISIONS	APP

CITY OF AUSTIN
WATER AND WASTEWATER DEPARTMENT

SHEET

Exhibit R - 51

Gmail by Google [redacted]

1201 Robert E Lee

Hauwert, Nico < Nico.Hauwert@austintexas.gov> Mon, May 20, 2013 at 3:41 PM
To: [redacted]

Keith:

Below are readings I took with a Quanta meter both inside the grotto pool and upstream in the first sanitary sewer manhole. The total coliform and e coli we measured in our lab. I measured flow with a Marsh McBirney flow meter.

Site	Date	temp	spC	pH	Diss Oxygen	T. Coli	E. Coli	Flow Measurement				
		Deg C	uS/cm			(col/100ml)	(col/100ml)	widthft	depthft	velocity(ft/s)	flow(cfs)	flow (gal/min)
Little Zilker pool	4/30/2013 11:30	19.75	844	6.72	1.77	>24,210	1,553	0.3	0.1	0.57	0.0171	7.68
Sanitary sewer	4/30/2013 11:50	22.22	554	7.73	2.74	>24,210	>24,210					

Attached is historical description of the creek.

Nico M. Hauwert, Ph.D., P.G.

Sr. Hydrogeologist, Senior Environmental Scientist City of Austin Watershed Protection Department

(Mailing address) PO Box 1088

Austin, Texas 78767

(Physical address) 505 Barton Springs Road, 11th Floor

Austin, Texas 78704

(512) 974-2148; cell 695-4597

nico.hauwert@austintexas.gov

Historical Observation of Creek discharging to Zilker Park.doc
51K

Exhibit R - 52

Gmail by Google

Keith Copeland[redacted]

Plans

Hauwert, Nico < Nico.Hauwert@austintexas.gov> Wed, May 29, 2013 at 2:37 PM
To: Keith Copeland <[redacted]

Hi Keith:

The bacteria were read Friday here at our lab, but I was out of the office until today.

Grotto pool, 5/23/13 11:20: total coliform: >2,420 colonies/100ml, E. Coli: 387 colonies/100 ml.

Upwelling flow in pool: 5/23/13 11:30: total coliform: 5,504 colonies/100ml; E Coli: 598 (10% sample dilution)/649 colonies/100ml (undiluted)

Attached is my flow measurement, I got 3.0 gallons per min discharge from the grotto pool.

Thanks for the plans. It looks like the wastewater line was installed after 1987 sometime.

Also, as we discussed you might be interested in some of this free literature:

Hauwert, Nico M., 2009, Groundwater Flow and Recharge within the Barton Springs Segment of the Edwards Aquifer, Southern Travis County and Northern Hays County, Texas: Ph.D. Diss., University of Texas at Austin, Texas. 328 p
http://www.ci.austin.tx.us/watershed/publications/files/FinalDissertationNH2009710.pdf

http://repositories.lib.utexas.edu/handle/2152/14107

Hauwert, Nico., Hiers, Scott, and Beatty, Heather, ed., Field Trip Guidebook for Understanding Upland Recharge for Geologic Assessments, Feb. 18, 2010, City of Austin Watershed Protection Dept.
http://www.ci.austin.tx.us/watershed/publications/files/Tabor%20guidebookfinal20100519.pdf

Hauwert, Nico, David Johns, Thomas Aley, and James Sansom, 2004, *Groundwater Tracing Study of the Barton Springs Segment of the Edwards Aquifer, Southern Travis and Northern Hays Counties, Texas*: Report by the Barton Springs/Edwards Aquifer Conservation District and City of Austin Watershed Protection and Development Review Department. 110 p. and appendices.

http://www.ci.austin.tx.us/watershed/publications/files/2004maintracingreport_Part1.pdf

Exhibit R - 53

http://www.ci.austin.tx.us/watershed/publications/files/2004maintracingreportappG.pdf

Hauwert, N., Hunt, B, Johnson, S and Gary, M, 2011, Blanco River Recharges Barton Springs: Save Barton Creek Association Annual Newsletter.

http://savebartoncreek.org/blanco-river-recharges-barton-springs-during-drought/

Hauwert, Nico M., 2011, Could Much of Edwards Aquifer "Matrix Storage" Actually be Trinity Aquifer Contributions from the Blanco River?: Interconnection of the Trinity (Glen Rose) and Edwards Aquifers along the Balcones Fault Zone

and Related Topics, Karst Conservation Initiative February 17, 2011 Meeting Proceedings, Austin, Texas, p. 15-24. http://www.bseacd.org/uploads/AquiferScience/Proceedings_Edwards_Trinity_final.pdf

Remind me if there is anything else I promised to send you.

Nico M. Hauwert, Ph.D., P.G.

Sr. Hydrogeologist, Senior Environmental Scientist City of Austin Watershed Protection Department

(Mailing address) PO Box 1088

Austin, Texas 78767

(Physical address) 505 Barton Springs Road, 11th Floor

Austin, Texas 78704

(512) 974-2148, cell 695-4597

nico.hauwert@austintexas.gov

From: kjcope762@gmail.com [redacted]] **On Behalf Of** Keith Copeland
Sent: Tuesday, May 28, 2013 2:05 PM
To: Hauwert, Nico
Subject: Plans

[Quoted text hidden]

20130523flowZilker.xls
32K

Exhibit R - 54

ATTACHMENT J
SITE PHOTOS

VRI SITE PHOTOGRAPHIC DOCUMENTATION

Photo 1 – Scour pool and manway in unnamed tributary to Barton Creek. The Buda Limestone and Del Rio Clay contact is exposed.

Photo 2 – Waste water line in scour pool.

Photo 3 – Typical view of the creek upstream of the scour pool. Note the fractured limestone.

Photo 4 – Exposure of active 8-inch waste water line downstream of scour pool.


Photo 5 – Abandoned 8-inch waste water line.

MEMORANDUM

FROM: Nico Hauwert, Ph. D., PG, Sr Environmental Scientist

DATE: July 24, 2013

SUBJECT: Comments on Submitted Environmental Assessment and Water Discharge in Zilker Neighborhood Creek On or Adjacent to Proposed Bluebonnet Hills Site

In 2013, creek discharge commences below a grotto in an unnanmed creek called by local residents as "Little Zilker Creek". The measured flow range, measured intermittently between March and July 2013, is about 2 to 8 gallons per minute. A small seep can be observed from the face of the moist grotto headwall, but most of the discharge occurs within a pool where the apertures cannot be observed. A pipe is exposed at the base of the grotto, and appears to have been bored in the base of the grotto. The discharge appears as a natural spring, although in a June 6, 2013 environmental assessment by Ranger Environmental and other response comments suggests that the flow is actual surface runoff diverted along the wastewater line rather than a natural spring. The City of Austin Environmental Criteria manual section 1.3.0 Environmental Assessment defined a spring as *"points or zones of natural groundwater discharge in upland and/or riparian zones which produce measurable flow down gradient of the source, or a pool, or both, or (during drought conditions) an area characterized by the presence of a mesic plant community (refer to Facultative-wet or Obligate plant species as listed in the National List of Plant Species That Occur in Wetlands, South Plains, Region 6, U.S. Department of the Interior, Washington D.C."* The Little Zilker pool feature follows the code definition of a spring. Although by definition the feature is known to be a spring, we are continuing to gather additional information on the spring and welcome any additional data.

The following comments below are made regarding the water discharge and pipe:

1) Several lines of evidence suggest that water discharge in the creek on the proposed Bluebonnet Hills site is actually a spring and not surface runoff diverted along a wastewater line

    a. Groundwater springs commonly discharge from the Buda Limestone in the vicinity of its contact with the underlying Del Rio Clay. Each tributary on the south side of Barton Creek that exposes the Buda Limestone/Del Rio Clay contact includes a spring, including Barton Lodge Spring and two known springs between Brodie Oaks Mall and Barton Creek north of Loop 360. Continuous flow near the Buda Limestone and Del Rio Clay contact can be observed along Barton Springs Road just north of the site and along Lamar Boulevard just east of the site. Numerous examples of springflow from the vicinity of the Buda Limestone and Del Rio Clay contacts are evident along Shoal Creek in Pease Park. Each of these springs discharge within a few vertical feet of the contact of the Buda Formation and underlying Del Rio Clay, and not necessarily precisely at the contact.
    b. The groundwater discharge is perennial, not ephemeral as would be expected if the creek were sustained by surface runoff. Since 1993, I have always observed flow where the

creek crosses under Robert E. Lee Road. In 2013, flow in the creek has been observed on at least seven visits at measured flow rates of two to eight gallons per minute.

c. Basic water quality analysis I conducted indicate a spring water source. On March 8 and April 30, 2013 I measured specific conductance to range from 721 to 844 μS/cm. These values suggest water with a fair amount of dissolved constituent concentration, consistent with a spring source. For comparison I measured specific conductance of 679 μS/cm at nearby Barton Springs on November 27, 2012, measured 554 μS/cm in the sanitary sewer in the same "Little Zilker" creek on April 30, 2013, and typically measure CoA tap water and storm-water runoff to have specific conductance of about 200 μS/cm. Other field measurements of pH, temperature and dissolved oxygen are also consistent with spring water sources.

d. Facultative-wet plant species are present in the moist head wall of the grotto, including maiden-hair fern (*Adiantum capillus-veneris*) and common lady fern (*Athyrium filix-femina*).

Figure 1. Photo taken June 28, 2013 showing moist headwall of grotto, "Little Zilker"pool, and submerged wastewater line.

2) In agreement with the EA, it does appear that the pre-1986 wastewater line trench may divert some of the groundwater. A hole visible at the top of the abandoned wastewater line sleeve or underlying trench visibly discharges a smaller portion of the entire discharge. However, given the boring and associated disturbance with the installation of two wastewater lines in the late 1980's and earlier, it would be hard to imagine that this level of disturbance would not affect the spring by diverting at least a portion of the springflow, if only a few feet away from its original discharge orifice. The smaller water discharging from the sleeve appears to be groundwater and not wastewater. Even if the spring outlet was impacted by infrastructure, it still functions as a spring.

3) At this time we have not detected a leak of wastewater into the "Little Zilker" pool. *E. coliform* has been measured in 2013 ranging from 214 to 1,553 colonies/100 ml. These levels are common for urban source springs and urban runoff. For comparison, attached is the measured concentration of *E. coli* in runoff from Davis Lane in South Austin, where the source is roadway

and residential yards with no wastewater system leak source. As mentioned in 1c above the specific conductance of Little Zilker pool (721 to 844 µS/cm) is similar to Barton Springs (679 µS/cm) but is significantly higher than wastewater upstream in a Little Zilker Creek manhole (554 µS/cm). In May, 2013 Austin Water Utility conducted a dye trace of the active wastewater line in Little Zilker Creek and a television survey and discovered no leaks of wastewater into the creek. In urban areas it can be expected that tap and wastewater leaks may occur, although any amount of wastewater contribution to Little Zilker spring would be small.

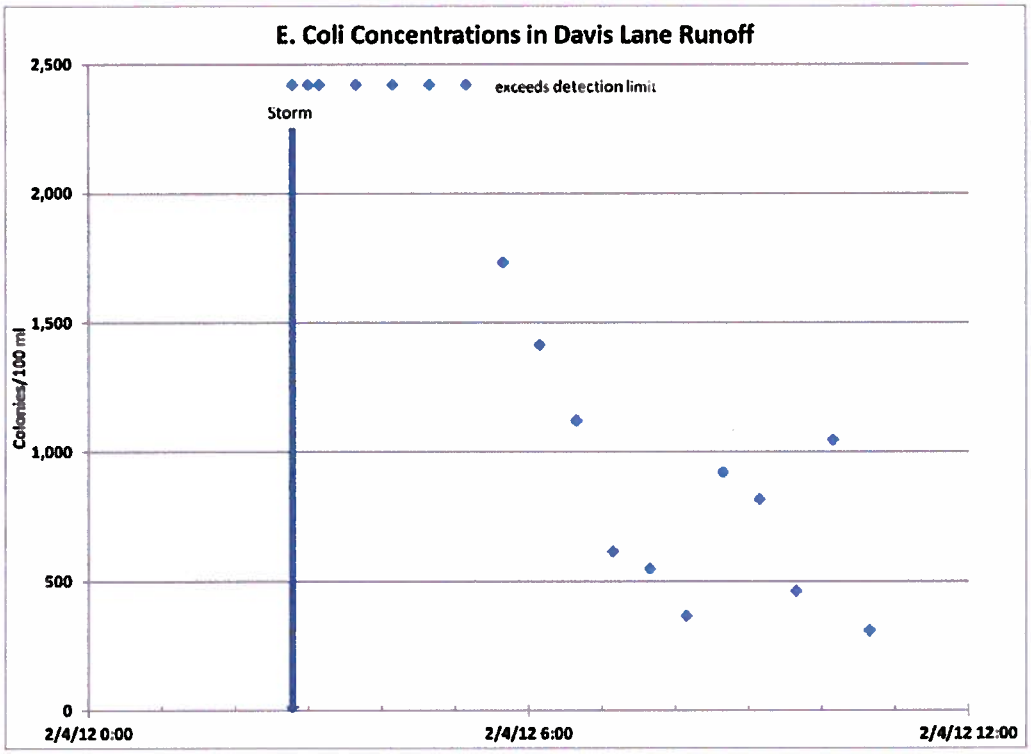


Figure 2. Comparison measurements of E. Coli from roadway runoff of Davis Lane in South Austin with no wastewater contribution. The level of E. Coli measured in roadway runoff is similar to concentrations measured in "Little Zilker" pool, and are typical for urban runoff and groundwater.

Conclusion

Based on the available information, "Little Zilker " pool appears to be springfed. It appears likely that the spring naturally discharged into the grotto, although two wastewater lines bored into or below the grotto may have impacted the spring. The flow is follows the Environmental Criteria Manual definition for a spring.